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HOG PRICES RECEIVED AND THE
VALUE OF INFORMATION: A LOGIT ANALYSIS

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The economics of imperfect information has captured the imagination of
numerous economists. Stigler's seminal article pointed out the often quoted
result that information is sought until the value of its last unit equals the
marginal cost of obtaining it. Several authors have subsequently studied
consumer's information search process including Gastwirth, Milde, Nelson, Hey,
Lamouroux, Schwartz and Wilde, Manning and Morgan, Karni and Schwartz,
Braverman, and Burdett and Malueg. Researchers who have studied primarily the
search for price information include Landsberger and Peled, Telser, Goldman and
Johansson, Russo, Alcaly, and Devine and Marion. Others such as Colantoni et. al.
have concentrated on information about product quality. Kinsey, Roe, and
Senauer integrated imperfect information into consumer utility theory.

The study discussed in this paper integrates the economics of information,
production theory, and the theory of human capital to determine the optimum
amount of price information collected by profit maximizing hog producers.
Increased use of price information is believed to increase profits but questions
about the actual profitability of acquiring and using information as a produc-
tion factor are unanswered in much agricultural research. One of the reasons
for neglecting this area of research may be the scarcity of cross-sectional data
on information use.

Theory predicts that a profit maximizing hog producer would seek information
until the value of the marginal product of an additional unit of information
ceases to exceed its marginal cost. That marginal cost is determined largely by
the opportunity costs of farmers' time which is, in turn, determined by the
amount of human capital invested in the farmer. Studies by Schultz, Mincer

and Ghez and Becker describe the positive effects of investment in schooling, health and other human capital enhancers on income and wage rates and hence on the value of time. Considering price information as a variable input into the production and marketing of hogs, a profit maximizing production model was used in this study to determine the optimum amount of information for farmers with varying investments in human capital.

A description of the data collected specifically to study the impact of farmers' human capital on the use and profitability of information appears next. The theoretical model is presented followed by a methodology section which develops the logit estimating equations. A discussion of the findings of three different model specifications reveals generally similar results. The theoretically derived hypotheses are confirmed for the sample of hog farmers used in this study.

Data Sources

For this study a survey was conducted in one of the most important centers of hog production in Germany, namely Northern West Germany. Confining the survey to a region where hog producers are highly specialized eliminated regional price differences, and contributed to the homogeneity of the sample. That is, farm size or the quantity of hogs sold by individual producers can be assumed not to have influenced the received hog price. These farmers produced an average of 900 slaughter hogs per year per farm. Farmers reported their use of hog price information and the prices they received for hogs. The price of slaughtered hogs within the EEC is not a guaranteed price. Therefore, one would expect to find highly specialized hog producers with a homogeneous product to be receiving various prices mainly because their management abilities vary and depend on their education, experience and information use.

Data was gathered via written questionnaires distributed to 665 hog farmers by 40 county agents in the specified region. Three hundred and eighty two completed questionnaires were collected for a response rate of 57 percent. Besides questions about the price farmers received for slaughtered hogs, there were questions about the farmer's age, level of education, including education in agriculture, the number of years operating the farm, and their use of various sources of price information. On the basis of the survey data the effect of price information and human capital factors on prices received for hogs could be estimated.

Theoretical Model

The central idea of the human capital theory is that lifetime earnings depend on formal and informal education including experience. The costs of increased formal education include not only direct costs such as tuition and other school related expenditures but the value of earnings foregone while one is being educated. The costs of informal education include direct outlays for printed material, equipment or travel as well as opportunity costs equivalent to the value of time which could have been used in other activities. For hog farmers, the opportunity cost of the time spent searching farm magazines or newspapers for hog price information is the value of alternative activities that might also increase their income and/or their utility.

The theoretical model predicts that profit maximizing farmers will search for current price information until the value of the marginal product of information equals the factor price of information. Assuming a farm magazine or newspaper would be purchased whether or not it was were used for hog price information, the direct costs of purchasing newspapers and farm magazines can be

ignored and the price of information becomes the farmer's opportunity cost of
time as measured by the wage rate.

The model presented below illustrates this simple result after showing how
the demand for information is decreased by increased formal education. The
result depends on those with more formal education being more productive at all
input levels. The formally educated were assumed to process information more
efficiently and therefore, to use less information for a given level of produc-
tion. Education and information became substitutes. Education acts to shift
the production function.

The supply of hogs for sale is a function of their output price, factor
input prices, education and experience.

1) $H = h(P_H, \pi_H; E)$

   H is supply of hogs produced for sale

   P_H is the price received for hogs

   π_H is the full cost of producing and marketing hogs

   E is education and experience.

2) $\pi_H = r_k x_k + \sum_j r_j x_j + r_t t$ $k \neq j$

where the r's are the factor prices, x_k is the quantity of information used in
producing and selling hogs, the x_j's are other variable inputs and t is time.
Assuming that the only cost of gathering price information is the cost of the
farmer's time, $r_k = r_t =$ wage rate.

Following the procedure detailed by Robert T. Michael (pp. 94-95) for
looking at the impact of education on household production we find that holding
inputs constant and collapsing all x's into one vector (x_i), the production
function and the change in production due to education is depicted by equations

(3) and (4). Converting (4) to a percentage and dividing through by H shows

$$3) \quad H = x_k MP_{x_k} + t MP_t$$

$$4) \quad \frac{dH}{dE}\bigg|_{x,t} = MP_H = x_k \left(\frac{\partial MP_{x_k}}{\partial E}\right) + t \left(\frac{\partial MP_t}{\partial E}\right)$$

that the percentage change in the marginal productivity of hog production due to education ($\widetilde{MP}_H$) equals the weighted sum of the percentage changes in the marginal productivities of factor inputs due to education ($\widetilde{MP}_{x_{i,t}}$).

$$5) \quad \widetilde{MP}_H = \sum_i W_{x_i} \widetilde{MP}_{x_i} + W_t \widetilde{MP}_t$$

where ~ designates the percentage change due to education, $W_{x_{i,t}}$ is the weight of each factor of production. For example, $W_t = t MP_t / H$, the proportion of hog production determined by the input of time.

Alternatively, allowing factor quantities to change with education results in the percentage change in hogs produced equaling the weighted sum of the percentage changes in factor inputs.

$$6) \quad \widetilde{H} = \sum_i W_{x_i} \widetilde{x}_i + W_t \widetilde{t}$$

In equation (5) education affected hog production through its impact on productivity whereas equation (6) shows the indirect effect of E on H through induced changes in quantities of inputs.

The effect of education on the full cost of producing and selling hogs is evaluated as follows with H and r_i held constant.

$$7) \quad \frac{d\pi_H}{dE}\bigg|_{r_i,H} = \sum_i \left(\frac{r_i}{H}\right) \left(\frac{dx_i}{dE}\right) + \left(\frac{r_t}{H}\right) \left(\frac{dt}{dE}\right)$$

To evaluate the effect of education on the quantity of inputs (dx_i/dE), equations 5 and 6 are summed, set equal to zero, and solved for x_i. Since the

information input (x_k) is of particular interest in this paper the change in its

quantity will be derived to illustrate the effects of education on its use.

Summing equations (5) and (6) and solving for $\tilde{x}_k$ yields (8a, b).

8a) $\quad M\tilde{P}_H + W_{x_k} \tilde{x}_k + \sum_j W_{x_j} \tilde{x}_j + W_t \tilde{t} = 0$

8b) $\quad \tilde{x}_k = - \dfrac{M\tilde{P}_H}{W_{x_K}} - \left(\dfrac{W_t}{W_{x_k}}\right) \tilde{t} - \sum_j \left(\dfrac{W_{x_j}}{W_{x_k}}\right) \tilde{x}_j$

Substituting from (5) for $- M\tilde{P}_H$ and consolidating, yields

9) $\quad \tilde{x}_k = - M\tilde{P}_{x_k} - \left(\dfrac{W_t}{W_{x_k}}\right) (M\tilde{P}_t - \tilde{t}) - \sum_j \left(\dfrac{W_j}{W_k}\right) (M\tilde{P}_{x_j} - \tilde{x}_j)$

For the sample being studied it is assumed that $M\tilde{P}_{x_k} \geq 0$, which means that the

first term on the right hand side (rhs) of (9) is zero or negative. If educa-

tion increases the marginal productivity of time and decreases the amount of

time that is spent for a given H, the second term on the rhs is also negative.

Whether education changes the $\sum_j M\tilde{P}_{x_j}$ and $\sum_j \tilde{x}_j$ is indeterminate but it is generally

expected that the signs will be positive and negative respectively. On balance

$\tilde{x}_k$ should be negative -- less information will be sought by those with more edu-

cation.

How does this result affect the profitability of hog farmers and their

returns from information search? The purpose of searching for hog price infor-

mation is to alter the price received for hogs. The farmer is still a price

taker but can adjust profits by timing the sale of hogs to correspond with the

best market price available. The relevant profit maximizing criteria is to

equate the factor input price (r_k) to the value of the marginal product (VMP).

10a) Profits $= \theta = HP_H - (r_k x_k + \sum_j r_j x_j - r_t t) - F$

where $P_H = f(x_k)$, F are fixed costs.

10b) $\theta = Hf(x_k) - (r_k x_k + \sum_j r_j x_j + r_t t) - F$

Maximizing θ with respect to x_k yields

11a) $\dfrac{d\theta}{dx_k} = H\left(\dfrac{\partial f(x_k)}{\partial x_k}\right) - r_k = 0$

11b) $H\left(\dfrac{\partial f(x_k)}{\partial x_k}\right) = r_k$

11c) VMP $= r_k =$ wage rate

By assumption $r_k = r_t =$ wage rate, therefore, the value of the marginal product of information is equal to the wage rate. Farmers will seek information on hog prices until the value of the last price sought equals their wage rate.

Figure 1 illustrates the theoretical linkages between equations (4), (9) and (11c). Panel a shows the generally higher production achievable by more formally educated farmers. Since information is not the only input into hog production the functions need not start at zero. It can be seen that for a given level of hog production (H*) the educated need to use less information than the uneducated, $(x_k^E < x_k^U)$. Panel b shows the relationship between total revenue and total variable costs of information. Assuming the value of hog farmer's time increases with education, as it has been found to do in other human capital, studies (Schultz, Mincer, Ghez and Becker), the wage rate for the educated (w^E) is higher than for the uneducated (w^U). If both sets of farmers sold the same quantity of hogs at the same price they would both receive total revenue equal to TR*. The profit maximizing amount of x_k for the educated

farmer is found to be x_k^E where marginal revenue equals the wage rate, W^E, (points a and b). For the uneducated farmer marginal revenue equals the lower wage rate, W^U, at information input X_k^U (points c and d). Panel C reconfirms that the more educated farmer, with a higher wage rate, will use less information since both types of farmers will maximize profits where VMP = r_k = W.

In this study the increase in P_H with increased use of information is tested by estimating the probability that a hog farmer with a given set of human capital characteristics will receive a higher than average price for hogs when s/he uses more information. The change in the probability of receiving a higher price with increased use of information is called the reaction coefficient of information (RCI). The hypotheses tested were:

1. Hog price information increases the probability of receiving a higher than average P_H for farmers at all levels of education and experience.

2. The RCI is greater for farmers with less education (or experience) than for those with more education (or experience).

Methodology

The hypotheses were tested by asking the question "What is the probability that a farmer with an observable set of human capital characteristics will secure a higher price for slaughtered hogs than the average price for the week?" The change in that probability for farmers using one as opposed to no sources of price information is interpreted as the RCI.

The dependent as well as the independent variables were qualitative. The dependent variable took on two values: 1 if farmers received a price above average and 0 if they did not. In a regression model with a binary dependent

variable which is a discriminate function, ordinary least squares (OLS) is not appropriate because:

(a) the error terms are not normally distributed

(b) the error terms do not have a constant variance

(c) predicted probabilities from the OLS estimated equation could yield values outside the 0-1 probability interval.

A logit transformation of the dependent variable making use of the cumulative logistic probability function can correct for these problems (Theil, 1971, pp. 628-636). Rather than the probability of the occurrence being a linear function of the coefficients of the explanatory variables, as in the standard linear probability model, the logit formulation assumes the log of the odds (or logit) is a linear function of the coefficients. In this study the conditional probability of receiving a price above average was estimated by a linear logit method.

To illustrate the problem examined, the questionnaire results are presented in table 1. The farmers were classified by level of education, years of experience on the farm, and frequency of reading a weekly farm magazine and/or the newspaper for price information. The first three rows of table 1 contain the number of observations in each category. The observed numbers and proportions of those farmers who secured a price above average are shown on rows 4-6 and 7-9 respectively. For example, 27 percent of the 15 less-educated farmers with less than 10 years of experience on farm, read the newspaper as well as the farm magazine and received a price higher than average; 73 percent of these farmers did not receive a price higher than average. Table 1 presents 36 such categories of farmers, one for each combination of the level of education, years of experience on farm, and the use of one or more sources of price information per week.

The explanatory variables from table 1 are outlined below.

Education (X) is a set of dummy variables where:

x_1 = 1 if less-educated
   = 0 otherwise

x_2 = 1 if well-educated
   = 0 otherwise

x_3 = 1 if best-educated
   = 0 otherwise

Years of experience on a farm (Y) is a set of dummy variables where:

y_1 = 1 for less than 10 years experience
   = 0 otherwise

y_2 = 1 for 10-20 years experience
   = 0 otherwise

y_3 = 1 for more than 20 years experience
   = 0 otherwise

Reading a farm magazine once a week for price information (Z) is a set of dummy variables where:

z_1 = 1 if a farm magazine was read
   = 0 otherwise

z_2 = 1 if no farm magazine was read
   = 0 otherwise

Reading a newspaper once a week for price information (T) is the last set of dummy variables where:

t_1 = 1 if a newspaper was read
   = 0 otherwise

t_2 = 1 if no newspaper was read
   = 0 otherwise

The conditional probability of securing an above average price is $P_{ijk\ell}$ assuming that the independent variables (X, Y, Z, T) take the values $X = x_i$, $Y = y_j$, $Z = z_k$, and $T = t_\ell$. Thus P_{1111} is the conditional probability of farmers receiving an above average price when they are less-educated ($X = x_1 = 1$),

have farming experience less than 10 years ($Y=y_1=1$) and read a farm magazine as well as the newspaper ($Z=z_1=1$, $T=t_1=1$). The observed relative frequency recorded on line 7 (f_{1111}) corresponding to p_{1111} was .27. The theoretical value for the conditional probability p_{1111} was determined by:

$$12) \quad L_{ijkl} = \log \frac{p_{ijkl}}{1 - p_{ijkl}}$$

The logarithm of the ratio is called the logit corresponding to the conditional probability p_{ijkl}. The logit as a function of the corresponding probability is a monotonically increasing function and it is not bounded by finite upper and lower limits as is the proportion. The logit function describing p_{ijkl} as a linear function of the coefficients α, β_i, γ_j, ∂_k and η_l is defined as follows:

$$13) \quad \log \frac{p_{ijkl}}{1 - p_{ijkl}} = \alpha + \beta_i + \gamma_j + \partial_k + \eta_l$$

The parameter α is the constant term, coefficients β_1, β_2 and β_3 describe the effects of education, γ_1, γ_2 and γ_3 those of farming experience, ∂_1 and ∂_2 describe the effects of reading the farm magazine, and η_1 and η_2 that of reading the newspaper. The left-hand side of (13) involves the probability p_{ijkl} which is unknown. Substituting the observed relative frequencies (f_{ijkl}) from table 1 (lines 7-9) into (13) for the unknown probabilities and adding an error term, yields equation (14):

$$14) \quad \log \frac{f_{ijkl}}{1 - f_{ijkl}} = \alpha + \beta_i + \gamma_j + \partial_k + \eta_l + (\log \frac{f_{ijkl}}{1-f_{ijkl}} - \log \frac{p_{ijkl}}{1-p_{ijkl}})$$

where the logit corresponding to the observed relative frequency is expressed linearly in terms of the unknown parameters and an unobservable error term (in parentheses). The observed logit for the left side of (14) can be written as:

15) $\quad \hat{L}_{ijk\ell} = \log \dfrac{f_{ijk\ell}}{1-f_{ijk\ell}}$

Where there is an insufficient number of observations $(n_{ijk\ell})$ on which $f_{ijk\ell}$ is based, the method of least squares does not have optimum properties because the error terms do not all have the same variance. A multiplication of both sides of equation (14) by the square root of $\left(n_{ijk\ell}\, f_{ijk\ell}\, (1 - f_{ijk\ell})\right)$ is sufficient to guarantee the applicability of the standard least-squares procedure (Theil, 1972). This multiplication amounts to weighting the 36 observed relative frequencies of table 1 with appropriate weights permitting the method of weighted least squares to be applied.

The following equations shows the estimated model. (For simplicity subsequent notation does not reflect the weighting procedure described above.)

16) $\quad \hat{L}_{ijk\ell} = \alpha + \displaystyle\sum_{i=1}^{3} \beta_i x_i + \sum_{j=1}^{3} \gamma_j y_j + \sum_{k=1}^{2} \partial_k z_k + \sum_{\ell=1}^{2} \eta_\ell t_\ell + \varepsilon_{ijk\ell}$

where

x_i = level of education		$i = 1, \ldots, 3$
y_j = years of experience		$j = 1, \ldots, 3$
z_k = information from farm magazine		$k = 1, 2$
t_ℓ = information from newspaper		$\ell = 1, 2$
$\varepsilon_{ijk\ell}$ = unobserved error term		

The right-hand side of (16) involves 11 unknown parameters which are subject to indeterminacy. These variables are exhaustive sets of dummy variables. To overcome the problem of perfect multicollinearity with a constant term in the equation, the following normalization was imposed:

17) $\quad \beta_1 = \gamma_1 = \partial_1 = \eta_1 = 0$

Seven parameters remain for estimation. Substituting $i = j = k = \ell = 1$ in (13),

the normalization (17) implies that the constant term α is equal to the logit of farmers securing a higher than average price if they are less educated, have experience of less than 10 years and read the farm magazine and the newspaper. An example of two equations with the system of dummy variables follow:

$$18) \quad \hat{L}_{1111} = \alpha + \beta_2 \cdot 0 + \beta_3 \cdot 0 + \gamma_2 \cdot 0 + \gamma_3 \cdot 0 + \partial_2 \cdot 0 + \eta_2 \cdot 0 + (\hat{L}_{1111} - L_{1111})$$

$$\hat{L}_{1112} = \alpha + \beta_2 \cdot 0 + \beta_3 \cdot 0 + \gamma_2 \cdot 0 + \gamma_3 \cdot 0 + \partial_2 \cdot 0 + \eta_2 \cdot 1 + (\hat{L}_{1112} - L_{1112})$$

Each of them has a constant term (α) and in each case the parameters β_2, β_3, γ_2, γ_3, ∂_2 and η_2 are multiplied by a dummy variable which is either zero or one. The observed logits $\left(\hat{L}_{ijk\ell}\right)$ are thus linear functions of the unknown parameters of the dummy variables.

To make it possible to measure the combined effect of reading the farm magazine and the newspaper, interaction terms were introduced into equations creating models II and III. It is expected that the effect of the additional reading of the newspaper is lower than the effect of reading only the farm magazine or the newspaper. Extending this, different interaction specifications should lead to a considerably better fit for the estimates of the coefficients presenting combined influences of information, and education on received prices.

Results

The hypothesis was that farmers' reading of price information, their education, and experience would influence prices received for slaughtered hogs. Estimated coefficients and the calculated probabilities of three different specifications of the model (equation (16)) are discussed below. All specifications include the variables x_i, y_j, z_k, t_ℓ and $\varepsilon_{ijk\ell}$. Where one interaction term was included, the involved variables only appear in the interaction term.

The estimated coefficients for those variables which did not change significantly and are not reported in the following discussion.

The first specification of the model contains no interaction terms. The resulting parameter estimates are shown below, with their standard errors in parentheses.

Model I

$\hat{\alpha} = - .95$ (.21)   the logit estimate of securing a higher than average price for farmers being <u>less-educated</u>, having <u>less than 10 years</u> of experience and <u>using both information sources</u>.

$\hat{\beta}_2 = -1.34$ (.21)   the estimated effect on the logit of being <u>well-educated</u> instead of being less-educated.

$\hat{\beta}_3 = 0.70$ (.24)   the estimated effect of being <u>best-educated</u> instead of being less-educated.

$\hat{\gamma}_2 = .68$ (.22)   the estimated effect of having <u>10-20 years</u> of experience instead of less than 10 years.

$\hat{\gamma}_3 = -.24$ (.22)   the estimated effect of having <u>more than 20 years</u> of experience instead of less than 10 years.

$\hat{\partial}_2 = -.37$ (.22)   the estimated effect of <u>not reading a farm magazine.</u>

$\hat{n}_2 = .10$ (.22)   the estimated effect of <u>not reading a newspaper.</u>

The estimates indicate that being best-educated, having 10-20 years experience, and reading the farm magazine significantly increased the probability of receiving higher hog prices.

A positive impact of information on the probability of receiving a higher price is interpreted as an increase in the RCI. This is indicated by a negative sign on $\hat{\partial}_2$.

The first three rows of table 2 reveal the estimated probabilities of obtaining a higher than average price given the estimated coefficients in Model 1 'discussed above. Because data is lacking some of the categories in table 2 do not contain estimates. The estimated probability of securing an above average price for less-educated farmers with less than 10 years of experience if they read the farm magazine but not a newspaper was 30 percent; it declined to 23 percent if they sought no information. The difference between these probabilities (7 percent) shows the positive impact of additional information on the probability of obtaining an above average price. This implies an increase in the RCI. The impact of seeking price information in a farm magazine for less-educated farmers with more than 20 years experience leads to a 6 percent increase in the log odds of receiving a higher than average price (.25-.19=.06). The increase in the probability of receiving a higher price was somewhat less for more experienced farmers which is consistent with the second hypothesis. The number of well- and best-educated farmers not using any information source is insufficient to make a similar comparison for them.

The specification of model II contains estimates of an interaction term for frequency of information search besides those variables in the first specification.

$\hat{\partial}_1\hat{\eta}_2 = .26$ (.23)   the estimated combined effect of <u>reading only a farm magazine</u> instead of reading two information sources.

$\hat{\partial}_2\hat{\eta}_1 = -.08$ (.23)   the estimated combined effect of <u>not reading a farm magazine</u> but <u>reading a newspaper.</u>

$\hat{\partial}_2\hat{\eta}_2 = -.72$ (.36)   the estimated combined effect of <u>using no information</u> instead of reading two information sources.

The value of $\hat{\partial}_2 \hat{\eta}_2$ agrees with the hypothesis that the effect of using both infor-
mation sources has a positive and significant effect on the probability of
receiving higher than average prices.

The estimated probabilities from model II with an interaction term to
measure the combined effect of reading a farm magazine and a newspaper on the
logit are shown on lines 4-6 of table 2. Seeking information in the farm maga-
zine, less-educated farmers will receive an above average price with a probabi-
lity of 33 percent versus 16 percent if they use no information; the resulting
difference between the probabilities of higher prices from using one information
source versus collecting no information was 17 percent.

Considering a 17 percent increase of the probability of obtaining an above
average price, the use of a farm magazine as a source of price information would
seem to pay off. The increase of the probability of receiving an above average
price through the use of information may be interpreted as the increase of the
RCI. Under given costs and production levels this leads to an increase in the
farmers' profit.

Seeking price information in a newspaper as well as a farm magazine leads
to a probability of 26 percent of receiving an above average hog price for less-
educated, inexperienced farmers compared to 16 percent if they use no infor-
mation sources. There is still a difference of 10 percent between these
probabilities which means that the RCI still is high. The decrease of the reac-
tion coefficient (from 17 to 10 percent) may be interpreted as decreasing
returns of information. The more additional information is sought by farmers,
the lower is the price change per additional information unit.

In the specification of model III, the combined effect of the level of education and the reading of a farm magazine is shown. The following values are the estimated interaction coefficients:

$\hat{\beta}_2\hat{\partial}_1 = -1.45$ (.23) the estimated combined effect on the logit for <u>well-educated</u> farmers using <u>the farm magazine</u>.

$\hat{\beta}_2\hat{\partial}_2 = -1.45$ (.32) the estimated combined effect for <u>well-educated farmers not reading the farm magazine</u>.

$\hat{\beta}_3\hat{\partial}_1 = -.80$ (.24) estimated combined effect for <u>best-educated</u> farmers <u>reading the farm magazine</u>.

$\hat{\beta}_3\hat{\partial}_2 = -.77$ (.46) estimated combined effect for <u>best educated</u> farmers <u>using no information</u>.

The effect of information on price received by the well-educated farmers is not observable, and for best-educated farmers the information effect seems to be very small.

Lines 7-9 of table 2 contain the estimated probabilities implied by the parameter estimates from Model III. Compare the probability of less-educated, inexperienced farmers securing a price above average if they use two sources of information (29 percent) with the probability of similar farmers using no information. The probability of the more-informed farmers securing an above average price is 11 percent higher. This is true for all less-educated farmers independent of their farming experience. However, this effect declines with experience.

For well- and best-educated farmers, probability differences in obtaining an above average price were not significant between reading just a newspaper and reading both a newspaper and a farm magazine. These results indicate that the observable increase of the RCI is greater for less-educated than for better-

educated farmers. This implies that the optimal amount of additional infor-
mation declines with increasing education and is consistent with theoretical
hypotheses.

Conclusions

The purpose of this study was to estimate the relative value of information
to farmers. Theory provides some guide to the optimal use of information by
farmers with different amounts of education. Collecting price information from
a farm magazine and a newspaper was chosen to indicate information use. Other
variables such as education and farming experience were taken as further deter-
minants of farmers' human capital stock.

Theoretical predictions were confirmed. Improved education implies a
higher marginal value of time, and, therefore, a higher implicit wage rate.
This increases the marginal cost of information, decreasing the quantity sought.
The optimum quantity of information gathered occurs where the wage rate equals
the value of the marginal product.

To show the effects of education, experience and information on the proba-
bility of receiving higher slaughter hog prices, a linear logit model was esti-
mated. The optimal quantity of additional information was found to be smaller
for well-educated farmers. Increases in the probability of obtaining higher
prices as a result of using price information were systematically greater for
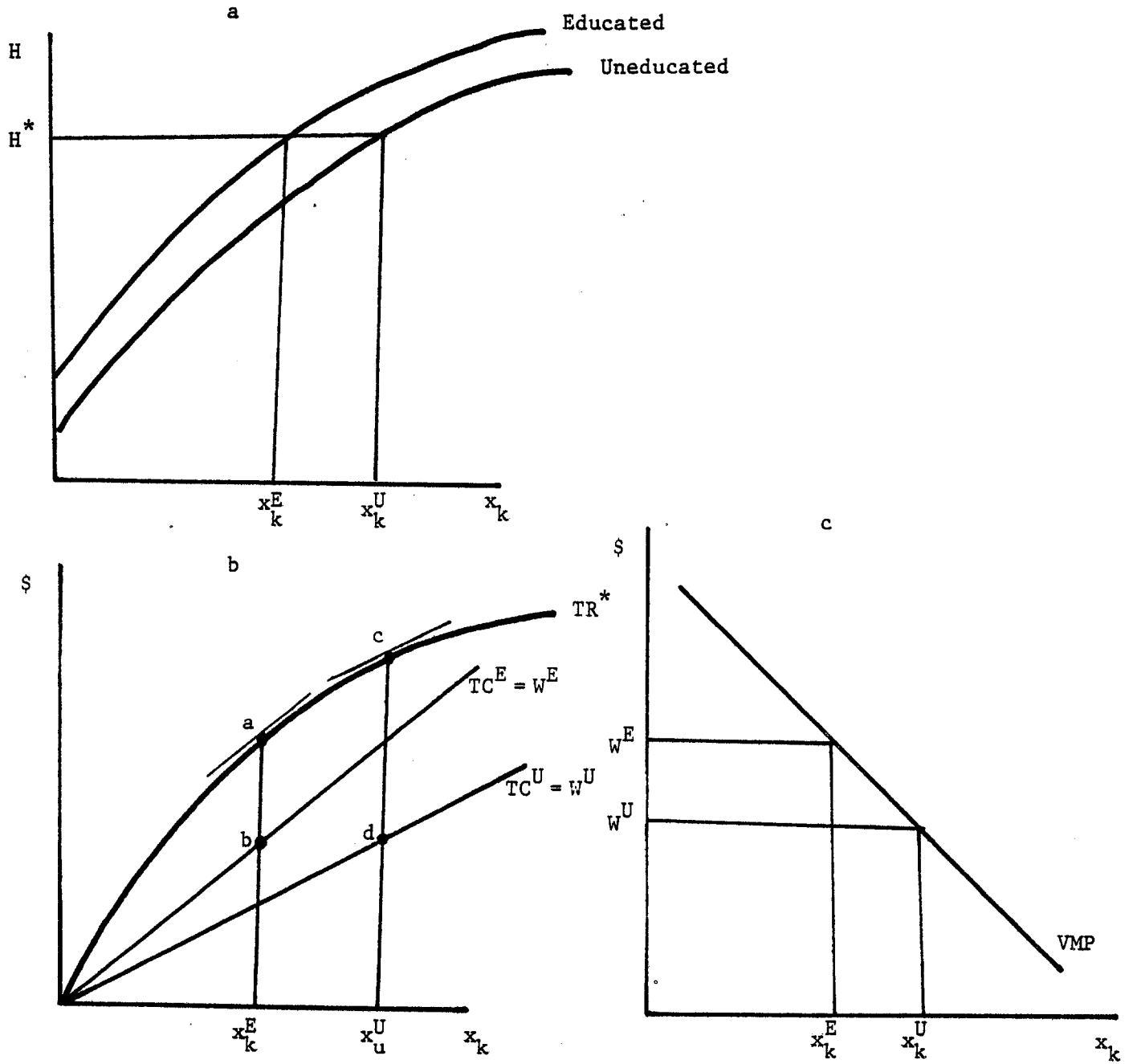those with less education and less experience.

FIGURE 1

a

H

Educated

Uneducated

H^*

x_k^E x_k^U x_k

b

$

c

a

TR^*

$TC^E = W^E$

b   d

$TC^U = W^U$

x_k^E x_u^U x_k

c

$

W^E

W^U

VMP

x_k^E x_k^U x_k

TABLE 1. Farmers Determined by Education, Experience and Use of Price Information

Level of Education	Less-educated				Well-educated				Best-educated			
Farm Magazine 1/	yes		no		yes		no		yes		no	
Newspaper 2/	yes	no	yes	no	yes	no	yes	no	yes	no	yes	no
Row							All Farmers					
1 < 10 yrs.	15	5	3	4	34	–	15	–	21	–	6	–
2 10-20 yrs.	11	–	–	5	47	–	12	–	17	–	4	–
3 > 20 yrs.	51	34	9	9	30	–	11	–	10	–	–	–
					Farmers Receiving a Price Above Average							
							In Absolute Terms					
4 < 10 yrs.	4	1	1	1	2	–	1	–	4	–	1	–
5 10-20 yrs.	6	–	–	1	7	–	2	–	4	–	1	–
6 > 20 yrs.	11	10	1	1	3	–	1	–	2	–	–	–
							In Relative Terms					
7 < 10 yrs.	.27	.20	.33	.25	.06	–	.07	–	.19	–	.17	–
8 10-20 yrs.	.55	–	–	.20	.15	–	.17	–	.24	–	.25	–
9 > 20 yrs.	.22	.29	.11	.11	.10	–	.09	–	.10	–	–	–

1/ Weekly farm magazine.

2/ Newspaper with hog price information twice a week.

TABLE 2. Estimated Probabilities for Models I - III.

Row	Years of Experience	Less-educated				Well-educated				Best-educated			
Level of Education		**Less-educated**				**Well-educated**				**Best-educated**			
Farm Magazine [1]		yes		no		yes		no		yes		no	
Newspaper [2]		yes	no	yes	no	yes	no	yes	no	yes	no	yes	no
		Estimated Probabilities for Model I											
1	< 10 yrs.	.28	.30	.21	.23	.09	—	.07	—	.16	—	.12	—
2	10-20 yrs.	.43	—	—	.37	.17	—	.12	—	.27	—	.21	—
3	> 20 yrs.	.23	.25	.17	.19	.07	—	.08	—	.13	—	.13	—
		Estimated Probabilities for Model II											
4	< 10 yrs.	.26	.33	.26	.16	.09	—	.08	—	.15	—	.14	—
5	10-20 yrs.	.43	—	—	.27	.16	—	.15	—	.27	—	.25	—
6	> 20 yrs.	.23	.28	.22	.13	.07	—	.07	—	.13	—	.13	—
		Estimated Probabilities for Model III											
7	< 10 yrs.	.29	.32	.16	.18	.09	—	.09	—	.15	—	.16	—
8	10-20 yrs.	.44	—	—	.31	.16	—	.16	—	.26	—	.27	—
9	> 20 yrs.	.24	.27	.13	.15	.07	—	.08	—	.12	—	.12	—

[1] Weekly farm magazine.

[2] Newspaper with hog price information twice a week.

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