Profit Maximization as a Management Goal on Southeastern Montana Ranches

Basudeb Biswas, John R. Lacey, John P. Workman and Francis H. Siddoway

While tests of producer rationality defined as conformity to the rules of profit maximization (or a similar postulate) for less developed countries are numerous, such tests for high-income countries are rare. This study investigates the extent of rationality observed in the production behavior of ranchers in southeastern Montana. The procedure used is that of Wise, Yotopoulos, and Nugent, based on a profit-maximizing production model. The data were collected by personal interviews for 69 ranchers. Results indicate that profit maximization is a reasonably good postulate for studying the behavior of ranchers, and that various policy measures could, at least tentatively, proceed on that basis.

Investigation of producer efficiency or rationality is important for the understanding of supply behavior. It enables one to judge how closely the producer behavior conforms to the optimality rules of standard economic theory. Thus, one can get a feel for the validity of prevalent beliefs concerning the irrational or unresponsive character of some of the economic agents on the supply side.

It has now become commonplace to find assessments of rationality in studies of decision makers in less-developed country (LDC) settings. Largely as a result of many such assessments, particularly in agriculture, the notion that suppliers in LDCs are irrational, inefficient, or unresponsive to economic incentives seems to have been greatly deemphasized. In fact, partly basing his judgment on such studies, T. W. Schultz stated in his Nobel Lecture "... farmers the world over in dealing with costs, returns and risks are calculating economic agents. Within their small, individual, allocative domain they are fine-tuning entrepreneurs, tuning so subtly that many experts fail to realize how efficient they are."

Suggestions that some groups of producers even in high-income, developed countries, are not "rational" are not lacking. For example, J. Schultz remarked that

Basudeb Biswas is an Associate Professor in the Economics Department at Utah State University. John R. Lacey is Extension Range Specialist at Montana State University. John P. Workman is Professor in the Range Science Department at Utah State University. Francis H. Siddoway, former Location Leader of the Northern Plains Soil and Water Research Center, USDA SEA AR at Sidney, Montana.

Partial support for this work was provided by the Utah Agricultural Experiment Station, Utah State University, under Project No. UTA 037. Four anonymous referees of this journal and the editors made several useful suggestions on earlier versions of this paper. Our debt to the co-editor Richard Johnston and to one anonymous reviewer is enormous. Their comments and suggestions were very insightful and elaborate. A special acknowledgment is accorded to Rati Ram whose editorial assistance was most valuable. We have also benefited from discussion with Delworth Gardner. Competent research assistance was rendered by Hamid Beladi, currently serving as an Assistant Professor in the Economics Department at Central Michigan University. The responsibility of all remaining deficiencies and errors is entirely that of the authors.

Western Journal of Agricultural Economics, 9(1): 186–194

economists feel ranchers, "... when contrasted to more progressive agriculturalists, seem to make irrational economic decisions and continue to employ economically unproductive managerial strategies." Although suggestions that producers in some sectors of even high-income economies may be irrational, in the sense of not being profit maximizers, are not lacking, and although the issue is at least as important in the high-income countries as in the LDCs, systematic assessments of such claims relative to the high-income countries seem rare. In one of the few studies in this area, Smith and Martin tended to conclude that a postulate of profit maximization as the major goal of livestock producers in the western United States would probably be unrealistic, and that the business attitudes and goals of Arizona ranchers studied by them tended to be influenced also by what they called "family fundamentalism," "conspicuous consumption," and "local social satisficing." In another study, based on six large California farms, Lin *et al.* concluded that Bernoullian and Lexicographic utility functions explained these farmers' behavior better than the postulate of profit maximization.[1]

The main objective of this study is to investigate directly the question of whether the behavior of livestock ranchers in southeastern Montana conforms to the standard producer optimality rules and, in particular, whether profit maximization is a reasonable postulate for their production behavior.[2] As a secondary matter, regression estimates are used to judge elasticities of supply of capital and labor. As explained above, such an investigation of the degree of producer rationality seems useful since, despite several suggestions that ranchers in the western U.S. might not be profit maximizers and might not be "rational" decision makers in this sense, there are very few studies that throw light on the issue. Aside from any conceptual insight that such an investigation may provide, as a practical matter, it is perhaps important to know whether livestock ranchers make marginal calculations and are willing to use their resources so as to maximize returns, or whether they are unresponsive to marginal changes, ignorant of the possibilities of technological change, and primarily want to raise cattle the traditional way and maintain their lifestyles. Communications would be improved among all facets of the livestock industry if conservationists working for land management agencies, range scientists, and policy makers acquire a little better understanding of the economic strategies of ranchers.

Unlike the usual procedures based on constant-parameter production relations, we compute and assess a rationality index that is derived from a multiequation model of supply in which (a) input and output prices are permitted to vary across firms, and (b) a firm-specific technical efficiency parameter is introduced, thus imparting to the study a greater degree of realism and relevance. While the framework used does have some weaknesses, it seems better than the more conventional procedures.

Section II states the methodology and

[1] That does not, of course, mean that the farmers are "irrational" in any significant sense; only that profit-maximization is not as good a postulate for their objective functions as the postulate of maximization of certain types of utility functions.

[2] As footnote 1 indicates, it is not our position that the goal of profit-maximization is the only or even the most plausible sign of producer rationality. Many other, perhaps equally plausible, goals of rational producers have been suggested. These include some kind of a "satisficing" principle suggested by Herbert Simon (1978) and others, the X-efficiency approach of Harvey Leibenstein restated by him recently and (subject to some target profit constraint) maximization of sales or rate of growth of the firm or of the firm size (e.g., De Alessi). Our general position is that rationality is certainly consistent with a variety of behavioral postulates; profit-maximization seems to be a reasonable enough approximation to the behavior of rational producers.

describes the data set used; section III discusses the main results; and section IV contains a few summarizing and concluding remarks.

II. The Model, Methodology, and the Data

For the main purpose of the study, namely, to assess the extent to which production behavior of Montana ranchers could be regarded as consistent with the goal of profit maximization, we utilize the index of producer rationality proposed by Wise and Yotopoulos (1969a) and Yotopoulos and Nugent. Since their framework is adopted by us with only minimal modifications, we shall state the methodology in its barest outline, and the reader is referred to the authors cited, especially Yotopoulos and Nugent (pp. 87–94) for details. The Wise-Yotopoulos-Nugent index of producer rationality is grounded in a rather neat model of supply. Since we compute the rationality index for several ranch size groups as well as provide estimates of three equations from which input supply estimates can be derived, we shall first state the main model and then give the formulation for the rationality index.

Postulating a Cobb-Douglas type production function, writing constant-elasticity labor, capital supply, product demand functions, and using the profit maximization rules along with the introduction of firm-specific technology parameter and error components in the use of labor and capital inputs and the choice of output, a set of three equations is obtained in the major observables, namely, labor input (L_i), capital input (K_i), and total revenue (Y_i).

The final estimating equations are of the form:[3]

$$\ln Y_i - \nu_i = a + \left(1 + \frac{1}{\eta}\right)(\ln K_i - U_{1i}) \quad (1)$$

$$\ln Y_i - \nu_i = b + \left(1 + \frac{1}{\epsilon}\right)(\ln L_i - U_{2i}) \quad (2)$$

and

$$\ln K_i - U_{1i} = d + \frac{(1 + 1/\epsilon)}{(1 + 1/\eta)}(\ln L_i - U_{2i}) \quad (3)$$

where ln stands for the natural logarithm of the variable, η and ϵ are the supply elasticities of capital and labor, ν's and U's are random error terms (possessing certain assumed properties), and a, b, and d are constants. Estimation of (1) and (2) would yield elasticities of supply of capital and labor, respectively, and estimation of (3) would yield an estimate of the ratio $\frac{(1 + 1/\epsilon)}{(1 + 1/\eta)}$ which can be used to check internal consistency of the estimates obtained from (3) with those from (1) and (2).

Although it might seem that equations (1)–(3) constitute a system of simultaneous equations, since each has an endogenous variable on the right side, actually these can be regarded as semireduced form equations as they are reformulations of the three reduced form relations in which each endogenous variable (L_i, K_i, Y_i) is expressed in terms of the exogenous term (A_i). At any rate, since estimation of η and ϵ is not the focus of the study, we do not use any of the conventional simultaneous equation methods to estimate these parameters. However, as Yotopoulos and Nugent explain, because of the structure of the error terms, the equations cannot be consistently estimated by the use of the ordinary least-squares method (OLS). As should be evident, the problem can be regarded as one of errors-in-variables, and a procedure appropriate to that situation is needed. While there are several approaches to handling the errors-in-variables problem, we follow the method adopted by Wise-Yotopoulos-Nugent, namely, the use of diagonal regression estimates. Besides others, C. E. V. Leser (pp. 22–24) and Peter Kennedy (pp. 95–96)

[3] These are adapted, with only minor notational modification, from Yotopoulos and Nugent (p. 92).

explain the nature of the diagonal regression procedure. Broadly speaking, the method minimizes the sum of the squares of the *shortest* distances between the regression plane and the observations after the variables have been standardized to have the same variance. The method is appropriate in those cases where the ratio of the variances of the errors in the dependent and the independent variables equals the ratio of the variances of the two variables themselves (which is the condition the authors of the model assume to hold). In the two-variable case, the diagonal regression estimator (β_d) is given by Leser, (p. 24) to be $\beta_d = \pm$[(variance of the dependent variable)/(variance of the independent variable)]$^{1/2}$ and the estimator takes the sign of the covariance between the two variables. It is easy to show that $\beta_d = \beta_{12}/\rho_{12}$, where β_{12} is the OLS estimator and ρ_{12} is the correlation coefficient between the two variables. The above expression will be used to obtain the diagonal regression estimates from OLS estimates.

The index of rationality (i.e., an indicator of the extent to which producers are motivated by profit maximization) is derived in the Wise-Yotopoulos-Nugent framework from their supply model along with a few further assumptions about the structure of the error terms. It has been shown by them that the rationality index (P) is simply the correlation coefficient between the natural logarithms of the *observed* labor and capital inputs across the sample firms. Although we will avoid the details of the underlying reasoning, the broad logic is, as equation (3) shows, that the model implies a linear relation between the natural logarithms of the true (i.e., profit maximizing) inputs of labor and capital (and as equations (1) and (2) show, between the logarithms of each of the inputs and the total revenue). Therefore, if each producer used exactly the profit maximizing quantities of labor and capital, the correlation between the observed quantities of (logarithms of) the two inputs would be perfect. On the other hand, if the actual input usage is entirely random and there is no systematic (profit maximizing) component, the correlation coefficient between the (logarithms of) observed quantities of labor and capital is expected to be zero. The larger the relative size of the profit-maximizing component in the actual input use, the closer to unity would be the correlation coefficient between the logarithms of observed usage of labor and capital. The smaller the relative size of such a systematic component, the closer the correlation coefficient would be to zero. Thus, the size of the correlation coefficient between the logarithms of the observed inputs of labor and capital can be treated as the index of producer rationality in the sense mentioned. Making the normality assumption, one can even test the hypothesis of no rationality ($P = 0$) at any preassigned level of significance.

It might be noted that we do not claim that the Wise-Yotopoulos-Nugent index of rationality is flawless. As the exchanges between Wise and Yotopoulos (1968, 1969b, 1969c) and Paul Johnson (1968, 1969) show, a high or perfect correlation between the (natural logarithms of) observed labor and capital usage can indeed be consistent with postulates quite different from that of profit maximization.[4] Also, while one can find a formal test statistic for the hypothesis of no rationality ($P = 0$), it is not as easy to test rigorously the hypothesis of perfect rationality ($P = 1$).[5]

---

[4] An appropriate test statistic for H_o: $P = 0$ would be $(\hat{P}\sqrt{n-2}/\sqrt{1/\hat{P}^2}) \sim t_{n-2}$ where $\hat{P}$ is the sample value of P and n is the sample size. However, the test statistic for the null hypothesis that the "true" P is 1 is not obvious.

[5] Johnson (1968) argues that a high value of P is quite consistent with the postulate of fixed input proportion, independently of profit-maximization. Of course, that would be the case if output varies across the firms. Another possibility was indicated in an extremely perceptive comment of an anonymous

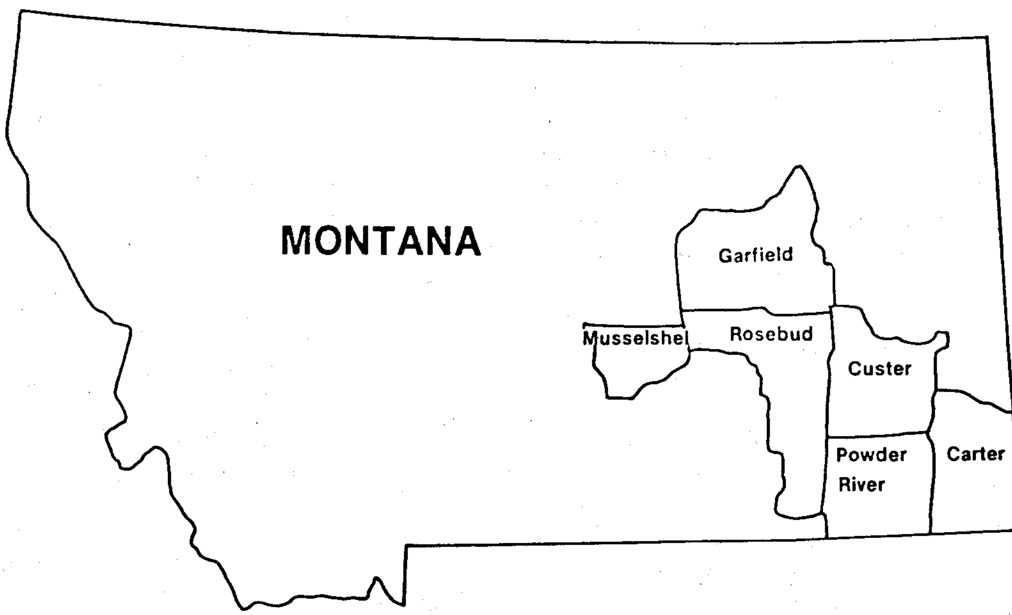

Figure 1. Ranchers Residing in Six Counties in Southeastern Montana Were Personally Interviewed.

Even with the test of no rationality, there may be problems with the power of the test. In that spirit, therefore, we would regard the value of P as a broad indicator of the extent to which the observed behavior is consistent with profit maximization. A high value of P would suggest greater conformity of the data to the hypothesis of rationality (profit maximization), and a low P value would indicate that profit maximization may not be a good postulate for the sample farms. One cannot really speak meaningfully about a rigorous test of rationality.[6]

It also might be noted that Herbert Simon (1979) and others have argued that estimation of neoclassical production relations of the Cobb-Douglas type basically involves verification of an identity, and production function estimates simply reflect such an accounting identity. However, if the production function exhibits constant returns to scale, the value of the output would also approximate the sum of the values of the inputs. We do not go into these issues here. One can find arguments on both sides. At any rate, estimating the production functions is not the core of our work; the rationality index can be simply computed independently of the estimation of the production parameters and is not directly dependent on the interpretation of estimates of these parameters.

The data were collected during personal interviews with 69 ranchers in southeastern Montana (Figure 1). These ranchers consented to be interviewed when they responded to a questionnaire that was mailed to 830 ranchers in this region. Livestock was the most important agricultural product in this region (75 percent of the ranchers reported that they earned 75 percent or more of their income from the sale of livestock or livestock products). However, 61 percent of the ranchers did

referee. Suppose that firms do not produce profit maximizing output although, given a level of output, they minimize the cost of production. It is possible that all firms are on the (linear) expansion path. Thus P may be very high even though profits are not maximized by assumption.

[6] The insightful suggestions of the co-editor and an anonymous reviewer helped us much on this point.

derive some income from the sale of wheat, hay, or other crops.

Output (Y) was defined as the value of a ranch's gross agricultural production for the year 1979, expressed in dollars. It includes receipts from sale of livestock, wheat, barley, hay, and alfalfa seed. It excludes the value of seed and grain produced and retained on the ranch for use as seed or livestock feed.

Land was treated as a fixed input that cannot be changed during the short-run planning period. Therefore, the land input was lumped with other fixed inputs that enter the exogenous efficiency parameter and vary between ranches. However, acreage was related to the number of animal units (A.U.) that each ranch supports, and A.U.s were used to divide the sample into three groups (small—50–200; medium—201–400; and large—401 or more animal units). Buildings were treated as part of capital stock rather than as land investment because the investment in buildings was closely related to the amount of farm machinery. Thus, they reflected land-use, rather than the inherent potential of the fixed resources.

Labor (L) was expressed in homogeneous man-months. Because it was very difficult for ranchers to estimate the number of hours they actually worked, it was assumed that every adult male worked twelve months. If an adult male had an off-ranch job, his man-months of labor were reduced proportionately. High school age boys were considered to work four man-months during the year. Although a wife's contribution to the labor pool was variable (from several man-months of field work to record keeping to running errands for equipment repairs), it was difficult to quantify because some ranchers tended to exaggerate (and others to underestimate) the contribution. For this reason it was decided not to include wives in the labor pool. This omission probably contributes to the environmental noise in the model.

Measurement and aggregation of "capital" stock includes value of the ranch's structures (buildings, fences, reservoirs, wells, corrals, and all living residences except for one residence occupied by the owner), equipment, and livestock, plus the ranch's annual maintenance and operating costs (excluding the cost of hired labor). The estimated flow of capital (K) represents the annual rent (11 percent of 1979 dollar value) that a ranch would be paying if it had rented rather than owned the services of capital assets. The method for imputing the rental value is obviously not quite satisfactory. However, data limitations seem to allow no other alternative. Some caution, therefore, is needed when interpreting the results. It is clear that the capital supply function used in the model is more flexible than the method adopted for imputing the rental on the capital; the latter is a special case of the former. Table 1 gives the means and standard deviations of input and output by ranch size.

III. Empirical Results

Table 2 summarizes the statistical results.[7] First, estimates for equations (1), (2), and (3) of Section II are reported. Regressions are fitted for each of the three ranch sizes as well as for the full sample. Results from the ordinary least-squares (OLS) and from the diagonal regressions (DR) are reported. OLS regression estimates are reported to show how DR results were calculated from OLS. For each of the four samples, the implied supply elasticities for capital (η) and labor (ϵ) are reported. Estimates of P are given in each case for an assessment of the degree of rationality, i.e., the extent of conformity to the rules of profit maximization.

In regard to the elasticities of supply of capital and labor, note that an estimate of 1 for $\left(1+\frac{1}{\eta}\right)$ or $\left(1+\frac{1}{\epsilon}\right)$ implies η (or ϵ)

[7] The format of the table is adopted from Wise and Yotopoulos (1969a) and Yotopoulos and Nugent.

TABLE 1. Descriptive Statistics.[a]

	All Ranches		Small Ranches		Medium Ranches		Large Ranches	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
No. of Observ.	69	—	18	—	21	—	30	—
Capital ($)	114,221	86,254	44,217	17,206	82,300	28,006	178,569	93,099
Labor (man-mos.)	24.4	13.1	14.6	5.9	20.9	8.5	32.8	13.9
Land (acres)	15,746	13,962	4,355	1,596	10,365	3,983	26,349	15,061
Production ($)	129,487	99,125	51,159	27,831	95,787	46,250	200,073	106,423

[a] The data were collected by one of the authors by an interview questionnaire.

TABLE 2. Regression Statistics, Estimates of the Elasticity of Supply of Capital (η) and Labor (ϵ) and Estimates of the Index of Profit Maximization (P) for 69 Ranches in Southeastern Montana.

		Coefficients and Standard Errors**							
		All Ranches (n = 69)		Small Ranches (n = 18)		Medium Ranches (n = 21)		Large Ranches (n = 30)	
Regression Number and Description	Quantity Being Estimated	Least Squares Regression (OLS)	Diagonal Regression (DR)*	Least Squares Regression (OLS)	Diagonal Regression (DR)*	Least Squares Regression (OLS)	Diagonal Regression (DR)*	(LS)	(DR)*
(R1)									
Log Output on Log Capital	$[1 + (1/\eta)]$	1.003	1.065	1.121	1.272	1.314	1.46	.850	1.002
		(.0436)	(.0491)	(.1505)	(.1940)	(.1477)	(.1831)	(.1000)	(.1388)
(R2)									
Log Output on Log Labor	$[1 + (1/\epsilon)]$	1.174	1.453	.867	1.378	.893	1.210	.7079	1.165
		(.1045)	(.1600)	(.2681)	(.6778)	(.1881)	(.3464)	(.1749)	(.4739)
(R3)									
Log Capital on Log Labor	$\frac{1 + (1/\epsilon)}{1 + (1/\eta)}$	1.1704	1.461	.7734	1.082	.680	.829	.8324	1.1627
		(.0999)	(.1558)	(.2178)	(.6156)	(.1382)	(.2934)	(.1716)	(.4392)
η			15.38		3.68		2.2		500.00
ϵ			2.21		12.19		4.8		6.1
P			.80		.60		.69		.63

Notes: The estimating equations are (1)–(3) in the text.
V is total output in dollars.
K is treated as capital.
L is labor months.
η is the elasticity of supply of K.
ϵ is the elasticity of supply of L.
P is the index of economic rationality.
"ln" before a variable indicates natural logarithm of that variable.

* Estimated by using the property $\beta_{12} = \rho_{12}(\sigma_1/\sigma_2)$. Since the diagonal coefficient is σ_1/σ_2 sign σ_{12}, it can be estimated by β_{12}/ρ_{12}.

** These are first approximations of the standard errors obtained by assuming that var (b/r) = (var b)/r^2.

P = proportion of the variance of the log in both inputs that is due to variation in the systematic profit maximizing component of the inputs, that is P = (var X_1^*/var x_1 = (var X_2^*/var x_2). It is estimated by the product moment correlation coefficient between log capital and log labor.

is infinite and thus the input market is perfectly competitive. A formal test of the hypothesis H_o: $\left(1 + \frac{1}{\eta}\right) = 1$ and H_o: $\left(1 + \frac{1}{\epsilon}\right) = 1$ is rejected (at the 5 percent level) for labor in full sample and for capital in the case of medium size ranches.

Therefore, there is something to be gained by letting the input prices vary across ranches.

In regard to the degree of rationality, in the sense of conformity to the profit maximization rules, the last row in Table 2 giving the value of "P" for various samples, is relevant. As the simple correlation coefficient between ln L and ln K, P is bound by 0 and 1, with the latter reflecting perfect profit maximization and the former reflecting the situation in which little of the variance in the logarithms of labor and capital inputs is due to systematic input changes associated with profit maximization. For the full sample, the index of rationality is 0.80, which suggests that the firms are fairly close to the profit maximizing levels of labor and capital inputs. Note that some deviation in P from the perfect value of 1 would be due to stochastic reasons like measurement errors and environmental "noise" and would not reflect a systematic deviation on the part of the ranchers from the profit maximization rules. Hence, as Yotopoulos and Nugent (p. 91) also mention, the estimated value of P could be regarded as an indicator of the lower bound on the degree of rationality of the sample ranches. The values of P for the three subsamples are 0.60, 0.69 and 0.63 for small, medium and large ranches, respectively. These values, although somewhat lower than that for the entire group, are quite high. Thus, it seems reasonable to infer that ranches in all size groups operate fairly close to the profit maximizing rules. Of course, as stated in the last section, the values of P should be regarded as broad indicators and not as parameter estimates amenable to a sharp test of rationality or profit maximization. At least, perhaps, one could say the results are not inconsistent with a postulate of profit maximization.

A few words by way of comparison of the results of this study with those reported by Yotopoulos and Nugent (p. 94) may be useful. Although the degree of rationality revealed in the two settings (which are obviously very different) is similar, two differences appear striking. First, the input supply elasticity estimates obtained in this study are all positive and, thus, quite credible as opposed to the negative supply elasticity estimates reported by Yotopoulos and Nugent in three of the six cases. Second, there is much greater internal consistency in our estimates than in those reported by Yotopoulos and Nugent. For example, their estimate of the expression $\frac{(1 + 1/\eta)}{(1 + 1/\epsilon)}$ obtained by taking the ratio of the coefficients of ln K and ln L in the first two equations seems to differ greatly from the direct estimate for the expression obtained from the third equation. In our case, the "direct" and the "indirect" estimates are quite close.

IV. Concluding Remarks

Tests of producer rationality defined as conformity to the rules of profit maximization (or a similar postulate) for less-developed countries are numerous. However, such tests for high-income countries are rare even though producer rationality has been questioned in such countries. These suggestions about lack of rationality cannot be simply dismissed as not meriting serious investigation. One such situation relates to questions concerning the degree of rationality in the behavior of ranches in the western U.S. This study investigates the extent of rationality observed in the production behavior of ranchers in southeastern Montana. The procedure used is that of Wise, Yotopoulos, and Nugent, based on a profit maximizing production model in which input and product prices and a technology parameter are allowed to vary across firms. The degree of rationality is judged by the degree of correlation between logarithms of the inputs of labor and capital. Although the model is certainly not perfect, besides providing very simply an estimate of the index of rationality, it lets one estimate input supply elasticities. The data used pertain to 69 ranchers and were collected by personal interviews. The input supply elasticities do not seem very high in some cases, thus justifying to some extent the postulate of input price variability across firms. The degree of rationality, as judged by the index P, being of the order of 0.8 on a scale of 0–1 for the entire sample, seems quite high, thus suggesting reasonably good conformity to the rules of profit maximization. Moreover, the degree of rationality seems fairly uniform across the three size groups (small, medium and large) even though the values of P for the subsamples are somewhat lower than that for the entire group. Thus, one might conclude that the evidence is consistent with the view that profit maximization is a reasonably good postulate relative to the behavior of ranchers in the western United States, at least in the state of Montana; and that various policy measures could, at least tentatively, proceed on that basis. Needless to say, such results are seldom perfect and should be interpreted with appropriate caution because of data limitations, difference of opinion regarding the assumptions underlying the models, and the possible deficiencies of the procedures used.

References

De Alessi, L. "Property Rights, Transaction Costs, and X-Efficiency: An Essay in Economic Theory." *American Economic Review*, 73(1983): 1 64–81.

Johnson, P. "Discussion: A Test of the Hypothesis of Economic Rationality in a Less-Developed Economy." *American Journal of Agricultural Economics*, 50(1968): 2 398–99.

Johnson, P. "On Testing Competing Hypotheses: Economic Rationality vs. Traditional Behavior: Reply." *American Journal of Agricultural Economics*, 51(1969): 1 208–09.

Kennedy, P. *A Guide to Econometrics*. The MIT Press, Cambridge, 1979.

Leibenstein, H. "Property Rights and X-Efficiency: Comment." *American Economic Review*, 83(1983): 4 831–42.

Leser, C. E. V. *Econometric Techniques and Problems*. Hafner Press, New York, 1974.

Lin, W., G. W. Dean, and C. V. Moore. "An Empirical Test of Utility vs. Profit Maximization in Agricultural Production." *American Journal of Agricultural Economics*, 56(1974): 3 497–508.

Schultz, J. L. "Sociocultural Factors in Financial Management Strategies of Western Livestock Producers." Final Report. Economic Research Service Farm Production Economics Division, U.S. Department of Agriculture, Washington, D.C., 1972.

Schultz, T. W. "Nobel Lecture: The Economics of Being Poor." *Journal of Political Economy*, 88(1980): 4 639–55.

Simon, H. A. "Rationality as Process and as Product of Thought." *American Economic Review Proceedings*, 68(1978): 2 1–16.

Simon, H. A. "On Parsimonious Explanations of Production Relations." *Scandinavian Journal of Economics*, 81(1979): 4 459–74.

Smith, A. H. and W. E. Martin. "Implications of Socioeconomic Goals and Attitudes of Cattle Ranchers on Rural Community Development in the West." *American Journal of Agricultural Economics*, 53(1971): 5 846.

Wise, J. and P. A. Yotopoulos. "A Test of the Hypothesis of Economic Rationality in a Less-Developed Economy: An Abstract." *American Journal of Agricultural Economics*, 50(1968): 2 395–97.

Wise J. and P. A. Yotopoulos. "The Empirical Content of Economic Rationality: A Test For a Less-Developed Economy." *Journal of Political Economy*, 77(1969a): 6 976–1004.

Wise J. and P.A. Yotopoulos. "On Testing Competing Hypotheses: Economic Rationality Versus Traditional Behavior—A Further Development." *American Journal of Agricultural Economics*, 51(1969b): 1 203–08.

Wise, J. and P. A. Yotopoulos. "On Testing Competing Hypotheses: Economic Rationality Versus Traditional Behavior: Rejoinder." *American Journal of Agricultural Economics*, 51(1969c): 1 209–10.

Yotopoulos, P. A. and J. B. Nugent. *Economics of Development*. Harper and Row, New York, 1976.