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Enhancing the financial performance of small meat processors

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Abstract

The small firms examined produce meats in the State of Texas and emphasize such products as sausage, jerky, brisket, and fresh meats. The authors test hypotheses with the intent to identify operational factors associated with firm financial success. A quartile model and an econometric model are both used for this purpose. Results generally suggest important factors for firms to be profitable include product selection, pricing strategies, special equipment, and location.

1. Introduction

IBP and other large meat processors are now placing increased emphasis on value-added sales to both food service and retail. In this environment, smaller processors, most of whom have long emphasized value-added, must adjust their strategies to succeed. As a decision aid, economic research pertaining to the meat industry is of little help. This is because the literature has focused on industrial organization issues such as economies of scale, industry concentration, and the competitive nature of livestock markets. Past economic research has generally not focused on further processing opportunities nor on the strategies smaller processors might adopt to enhance profitability.

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Is the small meat processor worthy of examination? The answer is yes when these value-added processors are viewed as having the potential to influence consumption patterns in the entire red meat category. It is possible that the unique products of small meat processors hold the potential to spur overall meat consumption growth. One can make an analogy in regard to microbreweries and what they have done to create excitement in the beer industry. "The shift in beer sales arrested a decades-long consolidation, which had seen the number of U.S. brewers dwindle to about 80, from 600 in 1940, as big brewers gobbled up market share. Today, there are more than 700 breweries. . . . "(Charlier, 1993, p. B-1). Thus, from both the standpoint of individual small firm owners as well as the potential such small firms have to enhance the entire red meat category, research on small meat processor financial performance has merit.

2. Background

Most small meat processors in Texas use long-time family recipes for making their sausages and other smoked meats. Many of the families that started Texas small meat processing businesses were of German, Czech, or Polish descent and several were first or second generation Americans. The meats they produce are usually representative of their background and culture. Such unique products stand apart from the other meat products on the market. In Texas, these firms often play an important role in both the cultural identity and the celebrations of the region in which they are located.

The histories of most small meat processing businesses are as colorful and varied as the products they make. Texas has many such firms. Often originating as local butcher shops, today most remain closely held and managed by the owner and their family. Such plants originally operated a kill floor, performed custom orders for local ranchers, and sold fresh meat out of meat cases in the front of the shop. Meat trimmings and meat that was not moving out of the store fast enough were a drain on the profit of the business. Owners began to make these cuts into sausage as a way to preserve the meat and give it a longer shelf life. Soon many of their customers came to expect the unique sausages from the butcher shop, and so owners began to produce them on a daily or weekly basis instead of only producing them when sales were slow.

Today's small meat processor transforms the generic raw products created by large slaughterers into specialty meat products. Such products can be considered value-added in that they realize significant mark-ups per pound over the raw product. Common products made by small meat processors include sausages, jerky, smoked brisket, hams, smoked ribs, and many others.

2.1. Literature review

Structural change in the meat industry has placed economic pressure on the small meat processor. MacDonald, Ollinger, Nelson and Handy (2000) and Ollinger, MacDonald, Handy and Nelson (1997) examined the meat processing industry using U.S. Census Bureau data. MacDonald et al. (2000) concluded that concentration in the livestock slaughter industry increased for the following three reasons: "(1) shifts in scale economies provided larger plants with modest cost advantages; (2) aggressive price competition forced prices to quickly move near the costs of the low-cost market participants; and (3) slow demand growth limited the number of efficient large plants in the market" (p. iii).

Ollinger et al. (1997) examined both livestock slaughter and further processing. Regarding sausage, they found that the sales value accounted for by the four largest U.S. firms increased from 20% in 1963 to 38% in 1992. Although their definition of firm failure was not perfect, they also found that "the smallest plants (less than 25 employees) fail at noticeably higher rates than large (over 24 employees) plants, but both categories show sharp attrition" (p.13). Thus, both in the production of the feedstock needed by value-added meat processors and in the production of the value-added product itself, concentration appears to be increasing.

Hayenga (1998) interviewed eight plant managers in the pork slaughter industry. The estimates of these managers, all of whom worked for different companies, pertained to fixed and variable cost. Hayenga concluded that "excess capacity and low short-run marginal costs provide a strong incentive to bid more hogs away from competitors. For firms processing hogs into relatively undifferentiated fresh or processed wholesale pork products, this makes it very difficult to consistently reap high profit levels" (p. 582).

Research (e.g., Ward, 1990 or Melton and Huffman, 1995) has been done to discriminate between the beef slaughter experience of high concentration and the pork slaughter experience of relatively less, but still high, concentration. The fact remains that both these industries are highly concentrated and this trend appears to be on-going. Although research has been done to measure the adverse effects that such concentration may or may not have upon livestock producers (Azzam and Anderson, 1996) it also appears, from the recent actions of IBP, that these competitive forces are responsible for increased vertical integration toward the consumer.

2.2. Large packer invests in value-added

Price competition in fresh, raw meat appears to have been the driving force responsible for the vertical integration acquisitions made by IBP during 1999. These acquisitions include Corporate Brands America, Thorn Apple Valley, H&M Food Systems, and Wilton Foods (*New York Times*, 1990; *Omaha World–Herald*, 1999). According to the *New York Times*, "Corporate Brand Foods, based in Houston, specializes in 'value-added' processed products like sliced deli meat and sausage, which carry higher margins than commodity meats." (*New York Times*, 1999, p. C-4) The other manufacturers acquired by IBP make value-added products such as bacon, hot dogs, lunch meats, kosher meats, pizza toppings, and taco filling.

When companies such as IBP enter the value-added area, they bring substantial resources that are likely to change the competitive rules of the game. As described in Christensen's Brandenberg Sausage (1999) case, the cost savings achievable through large, modern manufacturing plants can be channeled into marketing programs. These marketing programs and associated brand names have the potential to gain market-share at the expense of existing value-added processors. Consequently, at this time, small value-added meat processors have a tremendous need for strategic information to face this challenge.

3. Model development

Every small meat processing business is unique in that it reflects the owner's style in relation to local customer preferences. Nevertheless, small meat processors sell similar products and produce these products using similar equipment. The firms considered for this study were very homogeneous in that the typical firm configuration consisted of a receiving/shipping dock where raw cuts of meat are received in jumbo boxes, and where finished products are shipped out to market. Cold storage facilities existed for the purpose of holding incoming raw meat, as well as storing out-going finished products. The processing areas of these firms were divided into several sections including: (1) raw meat grinding, seasoning, mixing, and stuffing; (2) cooking and smoking; and (3) cooling, packaging, labeling, boxing, and palletizing.

Because of such homogeneity among firms, there is considerable potential for one small meat processor to learn from the operations of another. Thus, a model was conceptualized that relied upon firm operations information to predict financial performance. The authors' intent was not to study financial ratios, as in a normal benchmarking study such as those published by Robert Morris Associates (1994). Instead, operations information was collected on such variables as business location, facility, product mix, and sales strategy. Using this information, the authors sought to develop a general model regarding excellent firm financial performance.

3.1. Data collection

The data were gathered by surveying firms belonging to the Southwest Meat Association, the Texas Association of Meat Processors, and also firms simply listed as being inspected by either a federal or a state inspection agency. To enhance survey participation, both the Southwest Meat Association and the Texas Association of Meat Processors notified their members that this study was being conducted.

Beginning in the winter of 1999, a draft questionnaire was developed with the aid of both the meat science faculty of Texas A&M University as well as the manager of the Southwest Meat Association. The survey instrument was pretested, in person, with 10 meat processors of various sizes and business configurations. In the questionnaire, sensitive financial information was gathered by means of multiple choice questions. These questions asked the participant to select responses from among a range of intervals. For purposes of analysis, such responses were coded at their midpoints. In the case of a few interval questions, it was found that respondents checked the highest response level available. Thus, no midpoint existed. To solve this problem, the authors created additional intervals. Then the firms in question were recontacted and a more definitive response was obtained.

The initial contact with a firm was made by means of a telephone call. Firms whose owners or managers indicated a willingness to cooperate were then faxed a three page questionnaire. Occasionally firms returned a completed fax survey on that same day. Firms not responding were called again and/or sent additional faxes. The survey protocol was to continue contacting every firm until obtaining a completed questionnaire or a refusal. Following this procedure, questionnaires were faxed to 137 firms of which 65 firms completed all questionnaire information in full for an effective response rate of 47%. Note that a few firms did not have fax machines, in which case the survey was administered by mail.

Table 1
Definitions and descriptive statistics for model variables, $n = 65$ firms

Variable Name	Variable descriptive	Mean	Standard deviation	Min	Max.
Sales group					
PROD	Number of products	3.44620	3.34490	0.0	10.0
PSTOR	Proportion sales in-store	0.35231	0.37972	0.0	1.0
PSAUG	Proportion sales as sausage	0.33577	0.34677	0.0	1.0
PJRKY	Proportion sales as jerky	0.06300	0.13441	0.0	0.80
PERSH	Proportion sales as fresh meat	0.25300	0.29052	0.0	0.95
PGAME	Proportion sales as wild game	0.04446	0.09083	0.0	0.40
ADVRT	Adverising > $15,000 (1 = yes)	0.44615	0.50096	0.0	1.0
Location group					
DWNTN	Downtown location (1 = yes)	0.32308	0.47129	0.0	1.0
INDUS	Industrial location (1 = yes)	0.21538	0.41429	0.0	1.0
SHOPC	Shop. center location (1 = yes)	0.06154	0.24219	0.0	1.0
RAD100	Sales radius > 100 mi. (1 = yes)	0.52308	0.50335	0.0	1.0
INSTAT	All sales are in-state (1 = yes)	0.70769	0.45836	0.0	1.0
SLFDIS	Proportion of self-distribution	0.78292	0.35684	0.0	1.0
Facility group					
PLTAGE	Plant > 25 years old (1 = yes)	0.50769	0.50383	0.0	1.0
NUMEMP	Number of employees	17.231	18.104	2.5	75.0
OWNHRS	Owner + 50 hrs./wk. (1 = yes)	0.73846	0.44289	0.0	1.0
HACCP	Cost of HACCP, cents/lb.	4.59230	3.66670	2.0	20.0
RSQF	Retail store square footage	728	1,161	0.0	5,000
REST	Restaurant (1 = yes)	0.16923	0.37787	0.0	1.0
Financial performance group					
ASSETS	Net value of assets	609,620	595,670	75,000	2,250,000
SALES	Sales per year	2,621,500	3,744,700	150,000	25,000,000
PROFIT	Profits per year	145,190	186,590	20,000	750,000
ROS	PROFIT/SALES	0.09179	0.08070	0.04667	0.50
ROA	PROFIT/ASSETS	0.29336	0.23857	0.26667	1.16670

Table 1 describes key information collected in the surveys. These are organized into four groups identified as sales, location, facility, and financial. The sales group includes PROD, the number of different products made by the firm. Also, sales are broken down into the percentage of sales made at the store location (PSTOR) as opposed to those made off-site. Sales are further broken down into percentages by type of product, such as percentage of sausage (PSAUG), jerky (PJRKY), fresh meat (PFRSH), wild game (PGAME), and other. Finally, ADVRT is a dummy variable indicating advertising in excess of $15,000 per year.

The location group variables include those pertaining to the manufacturing plant site. These are downtown (DWNT), industrial park (INDUS), shopping center (SHOPC), and rural. RAD100 is a dummy variable indicating a sales radius exceeding 100 miles. INSTAT is a dummy variable indicating all sales are within the State of Texas. SLFDIS gives the percentage of off-site sales made by the manufacturer's own trucks as opposed to outside distributors.

The facility group includes PLTAGE, which is a dummy variable indicating the firm's manufacturing plant is over 25 years old. NUMEMP is the number of employees. OWNHRS is a dummy variable indicating the owner works over 50 hours per week. HACCP gives the cost, in cents per pound, for firm compliance with the new USDA Hazard Analysis at Critical

Table 2
Profitability sort of small meat manufacturers on the basis of return on sales (ROS)

		Lowest ROS 16 firms	Middle ROS 33 firms	Highest ROS 16 firms
Sales group				
PROD	Number of products	2.00	3.76	4.25
PSTOR	Proportion sales in-store	0.26	0.39	0.45
PSAUG	Proportion sales as sausage	0.41	0.36	0.43
PJRKY	Proportion sales as jerky	0.02	0.11	0.05
PFRSH	Proportion sales as fresh meat	0.43	0.28	0.19
PGAME	Proportion sales as wild game	0.01	0.06	0.06
ADVRT	Advertising > $15,000 (1 = yes)	0.50	0.52	0.25
Location group				
DWNT	Downtown location (1 = yes)	0.31	0.39	0.19
INDUS	Industrial location (1 = yes)	0.31	0.18	0.19
SHOPC	Shop. Center location (1 = yes)	0.00	0.09	0.06
RAD100	Sales radius > 100 mi. (1 = yes)	0.56	0.52	0.50
INSTAT	All sales are in-state (1 = yes)	0.81	0.64	0.75
SLFDIS	Proportion of self-distribution	0.82	0.72	0.88
Facility group				
PLTAGE	Plant > 25 years old (1 = yes)	0.50	0.58	0.38
NUMEMP	Number of employees	14.69	17.73	18.75
OWNHRS	Owner + 50 hrs./wk. (1 = yes)	0.63	0.79	0.75
HACCP	Cost of HACCP, cents/lb.	4.56	4.42	4.97
RSQF	Retail store square footage	647	595	1,081
REST	Restaurant (1 = yes)	0.31	0.09	0.19
Financial performance group				
ASSETS	Net value of assets	$454,688	$710,606	$556,250
SALES	Sales per year	$3,703,125	$2,886,364	$993,750
PROFIT	Profits per year	$62,813	$172,500	$171,250
ROS	PROFIT/SALES	1.8%	7.64%	19.69%
ROA	PROFIT/ASSETS	23.59%	30.07%	33.57%

Control Points regulation. RSQF gives the square footage of the retail store. Finally, REST is a dummy variable indicating the presence of a restaurant.

The last variable group pertains to financial performance. These variables include ASSETS, the net book value of firm assets. SALES is the firm's annual dollar sales volume. PROFIT is the firm's annual profit. ROS is PROFIT divided by SALES. Finally, ROA is PROFIT divided by ASSETS.

3.2. Simple comparisons

Consider beginning the modeling effort with a profitability sort among sampled firms. This approach follows the same 'learn from each other premise' that has been traditional to comparative farm record keeping systems. For example, the Center for Farm Management (1999) at the University of Minnesota maintains such a system. In the case of the small meat manufacturers examined herein, Table 2 presents a separation of firms on the basis of return on sales (ROS). This table compares the lowest quartile of 16 firms to a middle group of 33 and a top quartile of 16 firms.

Table 3
Profitability sort of small meat manufacturers on the basis of return on assets (ROA)

		Lowest ROA 16 firms	Middle ROA 33 firms	Highest ROA 16 firms
Sales group				
PROD	Number of products	2.88	3.64	3.63
PSTOR	Proportion sales in-store	0.34	0.27	0.62
PSAUG	Proportion sales as sausage	0.38	0.40	0.39
PJRKY	Proportion sales as jerky	0.18	0.03	0.06
PFRSH	Proportion sales as fresh meat	0.22	0.32	0.31
PGAME	Proportion sales as wild game	0.06	0.04	0.05
ADVRT	Advertising > %15,000 (1 = yes)	0.38	0.48	0.44
Location group				
DWNT	Downtown location (1 = yes)	0.31	0.42	0.13
INDUS	Industrial location (1 = yes)	0.25	0.24	0.13
SHOPC	Shop. Center location (1 = yes)	0.00	0.00	0.25
RAD100	Sales radius > 100 mi. (1 = yes)	0.50	0.61	0.38
INSTANT	All sales are in-state (1 = yes)	0.75	0.61	0.88
SLFDIS	Proportion of self-distribution	0.87	0.77	0.73
Facility group				
PLTAGE	Plant > 25 years old (1 = yes)	0.63	0.42	0.56
NUMEMP	Number of employees	12.66	22.80	10.31
OWNHRS	Owner + 50 hrs./wk. (1 = yes)	0.75	0.70	0.81
HACCP	Cost of HACCP, cents/lb.	0.50	0.61	0.38
RSQF	Retail store square footage	588	632	1,066
REST	Restaurant (1 = yes)	0.13	0.21	0.13
Financial performance group				
ASSETS	Net value of assets	$646,875	$778,788	$223,438
SALES	Sales per year	$2,025,000	$3,336,364	$1,743,750
PROFIT	Profits per year	$45,625	$202,955	$125,625
ROS	PROFIT/SALES	5.5%	9.68%	11.3%
ROA	PROFIT/ASSETS	7.85%	24.85%	60.09%

An examination of Table 2 reveals the following continuous patterns that can be framed as testable hypotheses:

H_1: ROS is positively associated with number of products (PROD).
H_2: ROS is positively associated with percentage of in-store sales (PSTOR).
H_3: ROS is negatively associated with percentage of sales as fresh meat (PFRSH).
H_4: ROS is positively associated with number of employees (NUMEMP).
H_5: ROS is positively associated with retail square footage (RSQF).

In Table 2, SALES exhibits an inverse relationship with ROS, but this is expected by the fact that ROS is defined as PROFIT/SALES. Also in Table 2, ROA exhibits a positive relationship with ROS, but this too is expected because both of these variables have PROFIT as their numerator. Thus, no hypotheses will be tested about the relationship between ROS and SALES or the relationship between ROS and ROA.

Table 3 presents a different separation of firms, this time on the basis of return on assets (ROA). It can be seen that ROA ranges from an average of 7.85% in the lowest quartile, to

24.85% in the middle group, up to a 60.09% in the highest quartile. Table 3 reveals additional patterns that can be examined as testable hypotheses:

H_6: ROA is negatively associated with an industrial location (INDUS).
H_7: ROA is positively associated with a shopping center location (SHOPC).
H_8: ROA is negatively associated with the percentage of self-distribution (SLFDIS).
H_9: ROA is positively associated with retail square footage (RSQF).

4. Econometric model

Four different general linear models were used to test the above hypotheses as well as to better understand relationships between sales, profits, and other variables. The sales model took the following form:

$$\text{SALES} = f\,[\,\text{PROD, PSTOR, PSAUG, PJRKY, PFRESH, PGAME, ADVRT, DWNTN, INDUS, SHOPC, RAD100, INSTAT, SLFDIS, PLTAGE, NUMEMP, OWNHRS, HACCP, RSQF, REST, ASSETS, PROFIT}\,] \tag{1}$$

In addition, a profit model was estimated which was identical to Eq. (1) except that the variables PROFIT and SALES were substituted for one another. Further, an ROS model was built that was also identical to Eq. (1) except that in this case ROS was the dependent variable, whereas PROFIT was excluded as an independent variable. Finally, an ROA model was built that was again nearly identical to Eq. (1). However, in this model, ROA was the dependent variable whereas ASSETS and PROFIT were excluded as independent variables. Also, SALES was added as an independent variable.

4.1. General findings

The general linear models were estimated using the SHAZAM ordinary least squares regression program. Estimation results are shown in Table 4 (White, 1978). First consider the equations estimated with SALES and with PROFIT as dependent variables. These are examined in an effort to gain a general understanding of the business.

The first column of Table 4 shows that, at the 0.10 level of significance, the dependent variable SALES is positively associated with the independent variables PFRESH, RAD100, PLTAGE, ASSETS, and PROFIT. Examining these variables one at a time, the significance of PFRESH is a surprising finding. This means that even though this study has examined meat processors (i.e., firms that smoke, season, or cure meats), unprocessed fresh meat sales play an important role in the product mix. The significance of RAD100 is not a revealing finding in that one would expect businesses with larger sales to make those sales over a wider territory. PLTAGE is also not too revealing, perhaps indicating that older, more established businesses tend to be larger. In the case of ASSETS and PROFIT, one would expect, *ceteris paribus*, that larger sales would be associated with more assets and more total profit. In conclusion, on the basis of the SALES regression findings, the researcher could make a useful recommendation that processors seeking to grow their sales should be sure to include

Table 4
General models of firm performance, $n = 65$ firms. (The numbers in parenthesis are p-values.)

Dependent variables	SALES	PROFIT	ROS	ROA
Coefficient estimates—sales				
PROD	−180,390	384.91	0.00582	−0.00166
	(0.106)	(0.926)	(0.119)	(0.848)
PSTOR	−116,260	95,051*	0.05920	0.13105
	(0.924)	(0.025)	(0.114)	(0.384)
PSAUG	−525,910	37,081	0.02536	−0.03314
	(0.587)	(0.368)	(0.381)	(0.681)
PJRKY	−2,637,100	−245,210*	−0.11121	−0.53322
	(0.230)	(0.005)	(0.137)	(0.004)
PFRSH	3,718,500	−22,567	−0.07674*	−0.00053
	(0.003)	(0.670)	(0.059)	(0.996)
PGAME	−2,327,500	97,230	0.04038	0.09168
	(0.276)	(0.304)	(0.6110	(0.736)
ADVRT	503,420	11,221	−0.03569	−0.00791
	(0.454)	(0.664)	(0.101)	(0.901)
Coefficient estimate—location				
DWNTN	1,181,100	2015.90	0.00132	0.03511
	(0.118)	(0.934)	(0.950)	(0.558)
INDUS	−439,540	63,660*	0.02259	0.07508
	(0.731)	(0.096)	(0.399)	(0.412)
SHOPC	−530,750	35,082	−0.01471	0.30037*
	(0.501)	(0.321)	(0.736)	(0.070)
RAD100	1,396,200*	−4,933.4	−0.00990	0.00762
	(0.099)	(0.906)	(0.672)	(0.890)
INSTAT	1,042,600	19,490	−0.02642	0.05293
	(0.218)	(0.723)	(0.311)	(0.563)
SLFDIS	179,010	−32,034	0.02869	−0.09541
	(0.810)	(0.339)	(0.220)	(0.213)
Coefficient estimates—facilities				
PLTAGE	1,140,300*	18,863	−0.04133*	0.01547
	(0.069)	(0.456)	(0.036)	(0.790)
NUMEMP	22,497	1,788.4	−0.00036	−0.00050
	(0.451)	(0.122)	(0.552)	(0.785)
OWNHRS	−799,650	10,088	0.02344	−0.00360
	(0.252)	(0.757)	(0.258)	(0.958)
HACCP	2,247.1	701.07	0.00077	−0.00179
	(0.972)	(0.810)	(0.743)	(0.778)
RSQF	135.72	4.438	0.00000	0.00003
	(0.537)	(0.758)	(0.603)	(0.344)
REST	−660,650	15,606	−0.01454	0.00746
	(0.571)	(0.745)	(0.628)	(0.925)
Coefficient estimates—financial performance				
ASSETS	1.834*	18,200*	0.00000	
	(0.072)	(0.000)	(0.905)	
PROFIT	8.0216*			
	(0.021)			
SALES		0.01281*		0.00000
		(0.009)		(0.433)
Coefficient estimates—the constant				
CONSTANT	−1,953,600	−94,370.0	0.08159	0.24997*
	(0.315)	(0.270)	(0.130)	(0.075)
R^2	0.696	0.804	0.373	0.242

* Statistically significant at 0.10 level or higher.

fresh meats in their sales mix. However, other than this, there appear to be no actionable findings of value to firm management.

The second column of Table 4 shows that, at the 0.10 level of significance, the dependent variable PROFIT is positively associated with INDUS, ASSETS, and SALES, while being negatively associated with PJRKY. The positive association between INDUS and PROFIT might be explained by several different factors. First, industrial parks usually have excellent infrastructure amenities such as sewer, water, highway access, and more. Furthermore, successful firms would be expected to have the resources needed to move to an industrial park. Finally, older plants with less efficient configurations would be unlikely to have an industrial park location simply by virtue of their age.

The negative association between PJRKY and PROFIT in Table 4 is interesting. Our discussions with manufacturers revealed jerky production to be a time consuming, low yield (i.e., low moisture) manufacturing process. To succeed with this product line, the manufacturer must have specialized equipment, high output, and high pricing.

The findings pertaining to ASSETS and SALES are relatively mundane in that they are obvious on their face. That is to say, one would expect a large asset base and also a large sales level to be associated with high firm profits.

Only the variable ASSETS is significant in both the SALES and PROFIT regressions. Thus, if one wanted to advise a small processed meat manufacturer regarding how to boost both sales and profits, one is likely safe in saying that a large asset base will be needed. However, this is far different, and less important, than advising a small manufacturer about how to gain profits efficiently. In an effort to answer this crucial question, we turn to the last two equations estimated in Table 4 and to hypotheses H_1 through $H_{9.}$

4.2. Hypothesis test results

Hypotheses H_1 through H_5 were derived from examining patterns in the ROS quartile analysis of Table 2. First consider H_1 (ROS is positively associated with independent variable PROD), H_2 (ROS is positively associated with independent variable PSTOR), and H_3 (ROS is negatively associated with independent variable PFRSH). As shown in column 3 of Table 4, with *p*-values of 0.119, 0.114, and 0.059, respectively, only the first two of these three hypotheses can all be rejected at the 0.10 level of significance. Because of higher *p*-values, we also reject H_4 and $H_{5.}$

Next consider certain results in the ROS regression that were not apparent from the quartile analysis of Table 2. In column 3 of Table 4, the estimated coefficient on PLTAGE is significantly different from zero, with a high level of confidence (*p*-value = 0.036). This result indicates a negative relationship between plant age and ROS. In other words, older plants are associated with lower profit margins.

Hypotheses H_6 through H_9 were derived from examining patterns in the ROA quartile analysis of Table 3. As shown in column 4 of Table 4, H_6 (ROA is negatively associated with independent variable INDUS) is rejected at the 0.10 level of significance. However, we fail to reject H_7 (ROA is positively associated with independent variable SHOPC) at the 0.10 level of significance. Thus, we conclude that industrial park locations are not negatively associated with return on assets, whereas shopping center locations are positively associated with return on assets. H_8 and H_9 are rejected at the 0.10 level.

Next consider a result in the ROA regression that was not apparent from the quartile analysis of Table 3. Column 4 of Table 4 shows that the estimated coefficient on PJRKY is significantly different from zero, with a high level of confidence (p-value = 0.004). This finding indicates a negative relationship between the percentage of jerky sales and ROA. As seen above, this result again shows that traditional quartile pattern analysis can miss the presence of statistically significant relationships.

4.3. Implications

When evaluating small meat processor financial performance using the common accounting measures ROS and ROA, one can conclude as follows. First, number of products (PROD) and in-store sales (PSTOR) are positively associated with ROS. Second, the percentage of sales as fresh meat (PFRSH) is negatively associated with ROS. Third, the PJRKY is negatively associated with ROA, whereas a shopping center location is positively associated with ROA.

Given these findings, if one were to advise a small meat manufacturer about how to enhance ROA, one would be justified in making the following recommendations. First, do not make and sell jerky. This product is likely problematic because of a slow production process and low yield. Second, do consider locating in a shopping center. Our discussions with manufacturers reveal that shopping centers have close proximity to potential shoppers as well as ready availability of parking.

Our results also show that simple quartile pattern analysis may be useful for detecting meaningful variables associated with business management success. Quartile analysis, however, should be used with caution as it may overlook statistically significant variables (Type I Error) or it may detect patterns that are, in fact, statistically invalid (Type II Error).

5. Conclusions

The broader implications of our findings for the food processing industry are as follows. First, simple financial ratio analysis may be misleading. Hypotheses one through six each tested benchmark-derived findings pertaining to ROS enhancement methods and all were rejected. Therefore, we can conclude that managers seeking top financial performance cannot simply look to other companies' performance and/or behavior as a guide. The quest for profit improvement may require a much more individualized solution than that which comes to light from simple comparisons. Second, product lines with high margins and low volume (e.g., jerky) may not positively influence profits nearly as much as lower margined, high volume products (e.g., fresh meats). In effect, volume does matter and all that glitters is not gold. Third, nonmonetary variables, such as location, can be powerful determinants of financial performance. However, special care and attention is needed when it comes to measuring such nonmonetary variables. In the case of this study, we found that few nonmonetary variables were statistically significant.

During the conduct of this research, many small meat processors expressed the desire to grow sales. Often it was mentioned that selling through supermarket outlets was becoming increasingly difficult because of concentration. On the other hand, many small meat processors expressed a lack of knowledge regarding sales practices in the fast growing restaurant industry. Therefore, future research is necessary to assess and determine the meat buying practices of restaurants.

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