



Factors Underlying Producer Investments in Processing Cooperatives

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Abstract

The objective of this research is to determine the factors underlying a producer's decision to invest a percentage of their production in a closed membership food processing cooperative. The average percentage of a producer's production significantly decreases if the product they are marketing can be stored for any length of time by the cooperative. The opposite is true for perishable commodities. Producers investing in cooperatives that market highly perishable commodities will likely require greater education and financial stability to offset the risk of having a greater percentage of their production invested in the cooperative.

Factors Underlying Producer Investments in Processing Cooperatives

Several driving forces have been suggested as potential motivations for the emergence of food processing cooperatives in the Midwestern United States (U.S.). The gradual lessening of trade barriers and the 1996 Federal Agricultural Improvement and Reform Act have often been cited as principal causes. One major implication is that United States farm policy will lower or remove commodity price floors by 2002. Producer income is now directly linked to commodity prices, which are driven by market forces and are projected to become more volatile in response to supply and demand (Young and Westcott 1996). Economic theory suggests that changes in commodity prices are borne by producers in the short-run (Tomek and Robinson 1995). In the long-run, consumers would share in these price changes. However, this may be difficult because retailers are reluctant to make drastic changes in food prices fearing adverse consumer reactions.

Lack of producer market power may also contribute to an inability to fully pass along changes in prices. One alternative for producers is to vertically coordinate using contractual arrangements or integration. The use of contracts has increased significantly in recent years and Sexton and Iskow (1988) indicated that producers have attempted to counteract the market power in a oligopolistic or monopolistic food industry by forming closed membership cooperatives. In 1990, an estimated 30.5 percent of total U.S. farm output was contracted compared to 34 percent in 1997 (USDA ERS). The same study found that approximately 18 percent of total U.S. farm output was produced under vertically integrated systems in 1990.

The objective of this research is to determine the factors underlying a producer's decision to invest a percentage of their production in a closed membership food processing cooperative. The ability of a cooperative to store commodities and processed products for any length of time, and size of the investment are hypothesized to affect the proportion of production that a producer invests in the cooperative. We provide a motivation for these hypotheses in the following section.

Background Information

Cooperative investments in food processing have increased in recent years. One primary motivation is food processor profitability. Forster (1996) analyzed 56 investor-oriented agribusiness and food-industry processing, wholesaling, and retailing firms for the 1984 to 1993 time period. The author reported that these firms had an average return (earnings before interest and tax) on investment of 17.6 percent, compared to 16.7 percent for the Standard and Poors 500. Similar results were found by Freberg, Boland, and Barton (unpublished data) for 17 Department of Commerce SIC categories (120 food and agribusiness firms) over the 1980 to 1998 time period.

Gallo (1995) found that food manufacturing is one of the most highly leveraged in the U.S. but that profitability remained higher than average in 1994. Some of this profitability is driven by increased globalization of the food industry. Henderson, Handy, and Neff (1996) reported that international trade in processed foods greatly exceeds that of commodities. However, some food manufacturing and processing firms have divested manufacturing assets in order to concentrate on core brands to maintain profitable margins in a mature food industry. Some of these new entrants into manufacturing and processing are cooperatives.

A second reason for the emergence of processing cooperatives is the increased use of uniform marketing agreements. A uniform marketing agreement is a contract between the cooperative and the producer indicating a specific type and certain quantity of a good will be delivered to the cooperative. A producer may hold several contracts which are typically based on a per acre or per animal head basis. Harris, Stefanson, and Fulton (1996) indicated that closed membership cooperatives link a member's investment to their marketing rights through uniform marketing agreements. Members who purchase stock and sign an agreement to deliver a certain amount of the commodity to the cooperative may transfer those agreements to other individuals should the member decide to exit from the cooperative. In theory, the stock's transfer price should reflect all the earnings accrued to that share of stock since the member had acquired it.

However, there are many barriers and risks involved with forming food processing cooperatives. One major problem is the large capital investments required to integrate into processing facilities. Traditional cooperatives have had problems acquiring equity which has limited some from realizing their full investment potential through integration. This equity can be used to increase capacity, purchase new equipment, or increase marketing services.

Knoeber and Baumer (1983) suggested that a "free rider" problem exists with traditional cooperatives because ownership is not linked to the benefit (patronage) obtained from cooperatives. Sexton (1991) reported that a "horizon" problem exists with traditional cooperatives because many cooperatives may return financial benefits after the member has quit

using the cooperative's services. A large portion of a member's patronage is typically retained by a traditional cooperative for future investment in order to overcome the problem of insufficient equity capital. The patronage is returned (at par value) at some future date. Consequently, members do not realize a return on investment that reflects a growth rate which provides disincentives for additional investment. Cook (1995) provided a historical overview of different cooperative types.

The success of obtaining equity for capital investments in food processing cooperatives is dependent upon a member's ability to analyze tradeoffs between risk and potential returns. One risk arises from a member's uniform marketing agreement. Because members reside in a given geographic region, weather, insect, or disease damage will likely equally affect the majority of a cooperative's members. As an alternative, the cooperative may use a pooling arrangement to purchase the commodity in the open market where prices will likely be higher due to decreased supply. Producers are then charged the market price in order to fulfill their uniform marketing agreement. To offset this risk, if a large number of producers in a geographical region purchase stock, then the number of shares owned by any one producer is likely to be small. Consequently, we hypothesize that producers will likely commit a smaller percentage of their total production to the cooperative in order to reduce this risk.

A second risk is related to the physical nature of the commodity and resulting processed food product. Specifically, the degree of perishability leads to risk. The ability to physically store a commodity for a length of time to take advantage of any possible price fluctuations is an integral part of a firm's strategy. High fixed costs are an important element of a low cost leadership strategy because firms require maximum capacity to realize the lowest average cost per unit of output (Porter 1985). If the processed product is difficult or costly to store, firms will likely use a pricing strategy to avoid high storage costs.

Many of these perishable products are marketed directly to one processor. Martinez (1996) found that, in comparison to grain commodities, over 70 percent of all specialty crops were grown under contract to a processor. Most perishable commodities do not have futures markets where firms may hedge their prices. Brennan (1958) suggested that the risk premium required for perishable commodities is higher than for durable commodities, and that historically there was little active trading on a large scale for perishable products. This scenario is likely to be the case today. Consequently, we hypothesize that perishable commodities will have a smaller number of producers and that those producers will likely commit a higher percentage of their production to the cooperative, relative to commodities which are easily stored.

One problem with perishable products is that many require specialized handling or processing. These types of commodities are typically grown in the same geographic region to reduce handling costs. Perishable commodities are likely to have fewer number of producers because overproduction will lead to lower profitability. Within a small geographical region, we hypothesize that the number of producers is likely to be lower for perishable crops than for many storable crops which are produced in a larger geographical area due to lower transportation costs.

Methodology

An extensive search was completed to identify food processing cooperatives which have been formed or added capacity since 1992 in the Midwestern region of the U.S.¹ Issues of the

periodicals *Year in Cooperation*, *AgWeek*, and *AgriNews*; Egerstrom (1994), personal interviews with rural development specialists in seven states, and the Arthur Capper Cooperative Library were used to identify 64 agricultural and food processing cooperatives.² Virtually all the cooperatives were involved in producing one major product using a differentiation strategy focused on one or more narrow market segments (Porter 1985).

Of the 64 firms, 15 were still in development and had not yet completed a stock prospectus or had failed to generate the required equity to finance the cooperative. A detailed two page survey was sent to the remaining 49 cooperatives in the fall of 1997. Written surveys were received from 26 of these firms. Another eight who were listed as contacts were returned as undeliverable. Follow-up contacts with the local postmaster revealed that the eight individuals had moved and no forwarding address was available. Telephone interviews were conducted with another 12 firms for a total sample of 38 firms.

Participants were asked questions regarding the average percentage of a producer member's total production being marketed through the cooperative (*%Investment*), the number of producers that had purchased stock (*NProducers*), the number of shares (*NShares*), the price of shares (*SPrice*) issued, and whether the product was considered perishable (*Perishable*) or storable (*Storable*). Other questions relating to geographical location of their members, number of years in operation, and related information were also asked in each survey. Many of these cooperatives use various units to denote shares (one animal, one bushel, etc.). Consequently, we placed all shares on a per pound basis using common conversions for crop and livestock (one bushel of corn has 56 pounds, one marketing hog weighs 250 pounds, etc.). A product was considered storable if the product could be held for longer than six months to take advantage of fluctuations in price as a result of changes in supply. Table 1 presents a summary of the data collected.

Of the 38 cooperatives with complete information, 20 were involved in the marketing of storable products. The products marketed by these cooperatives included oilseeds, edible beans, alfalfa hay, corn, ethanol, wheat, fructose corn syrup, soybeans, and specialty grains such as buckwheat. In contrast, the 18 cooperatives that marketed perishable products processed carrots, cattle, beet sugar, hogs, bison, peas, sweet corn, turkeys, ostrich, potatoes, and fish.

Our three testable hypotheses are summarized as follows:

- H1: *%Investment* and *NShares* are inversely correlated with one another.
- H2: *%Investment* and *Perishable* are positively correlated with one another.
- H3: *Perishable* and *NProducers* are inversely correlated with one another.

$$\%Investment = \alpha_0 + \alpha_1 NShares + \alpha_2 Perishable + \varepsilon$$

The following two econometric models are specified to test these three hypotheses: where α_0 , α_1 , α_2 , β_0 , and β_1 are the parameters to be estimated, and ε and μ are the white noise error terms. Note that *Perishable* is a categorical variable (1 = *Perishable*, 0 = *Storable*).

$$NProducers = \beta_0 + \beta_1 Perishable + \mu$$

The dependent variable *%Investment* is limited between zero and one. Because some producers send 100% of their output to a cooperative, several of the data points are at the upper limit of the interval. Consequently, an ordinary least squares regression is not an appropriate econometric technique when the dependent variable is censored to values less than one. A tobit econometric model is specified for the first equation (Tobin 1958). Because the parameters are not readily interpretable, the nonstandardized parameters are decomposed into elasticity measures using the methods outlined by McDonald and Moffit (1980), and Roneck (1992).

Equation (2) is estimated using an ordinary least squares regression. The hypotheses tests are conducted through examination of the signs and p-values on *NShares* and *Perishable*. A failure to reject H1 would be indicated by a negative and significant sign on α_1 while a failure to reject H2 would be indicated by a positive and significant sign on α_2 . A negative and significant sign on β_1 indicates a failure to reject H3.

Results

The results for the three hypothesis tests are presented in table 2. Note that *NShares* is negative and significant at .05. Thus, we fail to reject the null hypothesis in H1 which suggests that as the number of shares (*NShares*) sold by the cooperative decreases, the average percentage of a producer's production increases (*%Investment*). The elasticity for this variable indicates that if the cooperative increases their number of shares by one percent, *%Investment* decreases by .0708 percent.

Similarly, we fail to reject H2 at the .05 level of significance. This result suggests that if the commodity or food product is considered perishable, the average percentage of a producer's production invested in the cooperative increases. If a producer is marketing a perishable commodity, they would contribute 22.9 percent more of their production to the cooperative relative to producers marketing storable products to the cooperative.

The effect of a cooperative processing a "storable" or "perishable" commodity significantly affects the number of producers that a cooperative has in this sample. Thus, we fail to reject the third hypothesis, H3, at the .05 level of significance (table 3). The average number of producers invested in a cooperative that was considered *Perishable* is 137 compared to 919 in a *Storable* cooperative. Clearly, there is a significant difference in the number of producers invested in each type of cooperative.

When the results of the hypothesis tests are compared together, the results are not surprising. Moore and Noel (1995) suggest that producers are likely to be more concerned with market

access and terms of trade. The survey by Moore and Noel (1995) indicated that producers under this scenario were very risk averse. Producers with perishable commodities invest in food processing cooperatives, in part, to improve market access because it may be more difficult to find buyers within their geographic region. In addition, some commodities such as carrots may never have been produced in that region on a large basis and the only processor is the cooperative. Thus, the ability to sell the product outside the cooperative may be limited or nonexistent. Consequently, producers will likely commit all or a large percentage of their output to the cooperative for this reason.

However, a new risk is incurred by placing a larger percentage of the producer's production in the cooperative. Education and management of a producer's investment becomes critical. Sexton and Iskow (1988) indicated that this principal agent problem may be difficult for some cooperatives. Porter (1985) suggested that firms marketing perishable commodities should use a differentiation strategy to offset possible price disadvantages from not being able to store the commodity. It may be difficult to locate enough producers to invest in a processing cooperative because it requires a greater percentage of the producer's total production. These producers are likely to be more reluctant or risk averse to producing a perishable product.

Implications

Producers require knowledge of the risks and potential returns for the commodity they are contemplating marketing through a processing cooperative. The relative perishability of a commodity or food product has a significant impact not only on the size, but also on the percentage of production for the individual producers in the cooperative. If a producer considers investing in a cooperative (similar to those in our study) that will process and market a perishable product, the cooperative will likely have fewer members. Thus, the organizers of such a cooperative should consider the number of equity shares required to capitalize the investment. If a large investment is required for a processing plant that markets perishable products, the risk is greater as the average percentage of production increases for individual producers. The risk of the cooperative is spread among a smaller number of producers relative to a cooperative that markets storable goods.

Footnotes

¹For purposes of this study, the midwestern states were Colorado, Illinois, Indiana, Iowa, Kansas, Minnesota, Montana, Nebraska, North Dakota, and South Dakota. We chose 1992 because Egerstrom (1994) noted the formation of the first new food processing cooperative in that year.

²The Arthur Capper Cooperative Library includes a searchable database of more than 4000 articles, manuscripts, magazine and newspaper clippings, and other papers on cooperatives.

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Table 1. B Summary Statistics Collected from 38 Agricultural and Food Processing Cooperatives

Variable	Mean	Standard Deviation	Minimum	Maximum
%Investment	.57	.33	.10	1.00
NProducers	548.76	1062.90	9.00	5,500.00
NShares ^a	697.580	1,66.16	.30	8.94
\$ per Share	583.44	1,246.80	1.75	5,000.00

^aNumber of stock shares has been converted to pounds and presented in 1,000 pounds.

Table 2. Tobit Regression Results with Average Percentage of Investment (% Investment) as the Dependent Variable

Variable	Parameter (Standard Error)	Elasticity
Intercept, α_0	.5489 (.1141)*	
Number of shares, NShare, α_1	-.0741 (.0338)*	-.0708
Perishable, α_2	.2292 (.1135)*	.1638

*Significant at the .05 level.

Table 3. OLS Regression Results with Number of Producers (*NProducers*) as the Dependent Variable

Variable	Parameter (Standard Error)
Intercept, β_0	812.00
Perishable, β_1	-555.72 (337.61)*

*Significant at the .05 level.