A Nonparametric Approach to Estimate Multiproduct and Product-specific Scale and Scope Economies for Agricultural Cooperatives

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Abstract

The purpose of this research is to estimate product-specific and multiproduct economies of scale and economies of scope using a nonparametric data envelopment analysis (DEA) approach. Product-specific economies of scale exist for other product sales, but not for grain and farm inputs sales. Overall, multiproduct economies of scale and economies of scope exist. However, the median value of multiproduct scale economies are higher and greater than one for small cooperatives, which imply that cooperatives mergers likely to continue to exhaust the benefits from economies of scale.

1 Introduction

Agricultural cooperatives in the United States have gone through significant changes after 2005 due to high commodity prices, increased competition, international market access, consolidations, mergers and acquisitions. The number of grain, oilseed, and farm supply cooperatives has decreased by almost 50 percent from 1990 to 2012; however, the gross sales are nearly doubled and the majority of the share is concentrated to just a few large cooperatives (Ariyaratne, Briggeman, and Mickelsen 2014). Moreover, during the same time period, farmer cooperatives and investor-owned cooperatives had strategic alliances that may change the structure of cooperatives (Reynolds 2012; Ariyaratne, Briggeman, and Mickelsen 2014). This structural change in farmer cooperatives may cause them to operate efficiently. Otherwise, they may be forced to leave the industry if they are not competitive with investor-owned firms (Schroeder 1992). The future structure of farm supply and marketing cooperatives depends on the relative cost and efficiency of individual cooperatives in the industry (Ariyaratne et al. 2000).

The cost frontier is the basis for calculating the efficiency, economies of scale and scope (economic) measures. Two approaches have been used to estimate these economic measures. The first employs the parametric approach (econometric or stochastic frontier methods) to estimate the cost frontier. Previous studies that use the parametric approach to estimate economies of scale or scope include Schroeder (1992); Featherstone and Moss (1994); Ray (1999); and Paul et al. (2004), Gao and Featherstone (2008), among others.

A second line of research estimates the cost frontier using the nonparametric data envelopment analysis (DEA) approach developed by Farrell (1957) and updated by Banker, Charnes, and Cooper (1984); Färe et al. (1985). The advantages of the DEA method are that it uses a one-sided error system without any distributional assumptions and does not impose functional restrictions on technology. It can handle multiple inputs and multiple outputs. Parman (2013) shows the ability of the DEA approach in estimating multiproduct and product-specific economies of scale and scope.

Chavas and Aliber (1993) use the DEA approach to estimate scale and scope economies for Wisconsin farmers and find that economies of scale exist on small farms, and some diseconomies of scale in large farms. Paul et al. (2004) use data envelopment analysis and stochastic frontier methods to estimate scale economies and efficiency of corn-belt family farms from 1996 to 2001. The small farms are both technically and scale inefficient and these farms could increase their competitiveness by increasing both the scale and scope of the operations. Similarly, Schroeder (1992) uses translog cost to estimate scale and scope economies. The results show that product-specific scale economies exist for some products like grain, petroleum, feed etc. However, the translog cost is problematic for estimating scope economies because of the multiplicative nature of outputs, which imposes extreme diseconomies of scale on data sets (Berger, Hunter, and Timme 1993). The translog cost functional form uses two two-sided error systems which violates the economic theory of the cost frontier.

Ariyaratne et al. (2000) estimates X-efficiency and scale efficiency of Great Plains grain marketing and farm supply cooperatives using a nonparametric DEA method. The results indicate that large cooperatives are fairly scale efficient, indicating a relatively flat cost frontier. However, scale efficiency does not tell why a firm produces more than one output. The concept of multiproduct economies of scope and scale is helpful to understand a firm's decision of producing multiple outputs (Coelli et al. 2005). In addition, the aggregate estimation of cost function does not provide information about the impact of output-mix and output level on total cost. Thus, the multiproduct cost approach is useful to understand how cost is changing over a variety of output (Baumol, Panzar, and Willig 1982). Since the DEA method provides robust results compared with parametric methods in multiproduct settings (Parman 2013), the estimation of scale and scope economies using DEA is used in a multiproduct framework.

The objective of this study is to estimate multiproduct and product-specific economies of scale and economies of scope using a nonparametric DEA approach for agricultural cooperatives. The use of a multiproduct framework in estimating economies of scale and scope has important implications for cooperatives because most of agricultural cooperatives sell more than one product. Understanding the impact of changing outputs level or mix to cost structure is helpful to improve the performance of cooperatives.

2 Literature Review

Several past studies have examined the efficiencies, economies of scale, and scope for banking, credit unions, cooperatives, and farms. There are two approaches, in general, for estimating efficiency, economies of scale and scope (economic measures): parametric and nonparametric approaches. Past research that uses the parametric approach to estimate economic measures include Murray and White (1983); Kim (1986); Akridge and Hertel (1986); Thraen and Roof (1987); Schroeder (1992); Featherstone and Moss (1994), among others. Murray and White (1983) examine the economies of scale and economies of scope in a multiproduct setting for credit unions in Canada using a translog cost function. They find that most credit unions experienced increasing returns to scale with output expansion. The authors use cost complementarity approach to measure scope economies. Kim (1986) argues that the approach of Murray and White (1983) in estimating scale economies ignores efficiency obtained from product-specific economies of scope and reexamines the economies of scale and scope using the translog cost function. The results show that British Columbia credit unions experience mild overall scale economies and mild product-specific economies of scale associated with investment and mortgage loans. In addition, these credit unions exhibit product-specific diseconomies of scale with non-mortgage loans.

Clark (1988) reviews thirteen studies related to economies of scale and scope for saving and loan associations, credit unions, and commercial banks and the main findings are: (i) these financial institutions experience overall economies of scale at low level of outputs, (ii) no consistence evidence of the existence of economies of scope, (iii) some evidences for the existence of cost complementarities, and (iv) robust results, in general, among financial institutions.

Akridge and Hertel (1986) use translog cost to analyze multiproduct cost relationships for retail fertilizer plants and find that plants can reduce average cost by increasing the size and through product diversification. Schroeder (1992) estimates scale and scope economies for grain marketing and farm supply cooperatives using the translog cost specification. The results indicate that these cooperatives experience economies of scale. Moreover, product specific economies of scale exist for some products such as grain, petroleum, feed, and other sales. Featherstone and Moss (1994) estimate the economies of scale and scope in agricultural banking using the indirect multiproduct and normalized quadratic cost functions with disaggregated outputs. They show that large economies of scale exist at the mean size without the imposition of curvature. When curvature was imposed, there was some evidence of the existence of cost economies at the mean output level based on the economies of scale and scope.

Paul et al. (2004) examine the efficiency of the U.S. corn-belt farmers using DEA and stochastic frontier methods. They find that large farms are technically and scale efficient and higher technical efficiency is the driving force for increased farm size in the region.

3 Data and Research Methods

This research uses financial data obtained from CoBank, a part of the Farm Credit System. CoBank provides loans to farmer cooperatives and agricultural businesses across the United States. The data contain annual financial records with complete balance sheet and income statement from audited financial statements of grain marketing and farm supply (agricultural) cooperatives. The input data available are labor and capital expenses. The output data are grain sales, farm input supply sales (aggregated form of feed, fertilizer, chemicals, petroleum etc.) and other products sales. All expenses for inputs and outputs are converted to 2014 constant dollar values using gross domestic product (GDP) price deflator.

Since CoBank only reports inputs and outputs in dollar expenses, input and output expenses are transformed into respective quantities (indices). For example, average hourly earnings for the manufacturing sector (BLS 2015) and GDP price deflator (BLS 2015) were used to convert labor expenses to labor index (quantity). The real interest rate is used as the cost of capital (Federal Reserve System 2015). Ariyaratne, Briggeman, and Mickelsen (2014) defined capital expense as the sum of annual depreciation, rent and leases, and total assets times bank prime loan rate. Since depreciation is not an economic cost, including depreciation as capital expense overestimates capital expense, which results in higher cost for cooperatives.

Three outputs: grain sales, farm input supply sales, and other products sales are used for our analysis. Since these outputs are expressed in dollar values, they are transformed into output quantities (indices). The nominal dollar expenses are transformed into real values for all outputs using GDP price deflator. Then, producer price index (PPI) by commodity for crude foodstuffs and feedstuffs (BLS 2015), PPI by commodity for crude materials for further processing (BLS 2015) and PPI by commodity for finished goods are used to convert grain sales, farm input supply sales, and other products sales into output quantities (indices), respectively.

3.1 Data Envelopment Analysis

Shephard (1953) suggested a mathematical programming approach to construct a piece-wise linear surface and Farrell (1957) provided the basis for the nonparametric approach that did not get much attention until the work of Charnes, Cooper, and Rhodes (1978) who used DEA with input orientated approach under constant returns to scale (CRS). Banker, Charnes, and Cooper (1984) proposed models for DEA with variable returns to scale. DEA is a linear programming approach that uses input quantities and output quantities to construct a piecewise linear frontier over the data points. The piece-wise frontier is constructed using the optimal solution obtained from the linear programing problem for each firm or decision making unit.[1]

Traditional economic theory assumes that firms are either cost minimizers or profit maximizers. However, frontier analysis assumes that some firms operate above the cost minimizing or below the profit maximizing levels. In the DEA approach, a firm's efficiency is compared with the efficiency of frontier firms (the "best" practice firms) from the sample. This method can be applied to both input- and output-orientations. The two orientations yield the same

[1] Decision making units are used in data envelopment analysis literature. However, this paper uses the term "firm" for simplicity.

technical efficiency scores under the CRS technology, but they may give different results for technical efficiency with the variable returns to scale (VRS) assumption (Farrell 1957; Coelli et al. 2005; Coelli and Rao 2005). Some of the important assumptions for DEA are: inputs and outputs are considered to be nonnegative, less is preferred for inputs, while more is preferred for outputs, and the measurement unit of inputs and outputs can be different.

DEA can model multiple input and multiple output firms. It helps to identify inefficiencies in each input and output providing information to improve performance. DEA does not assume any specific functional form on technology and is less prone to misspecification error (Färe et al. 1985). Parman (2013) shows that the DEA approach is as appropriate as a parametric frontier approach in estimating multiproduct and product-specific economies of scale and scope and cost efficiency. However, this approach is not without limitations. The DEA approach does not account for measurement error by assuming that any deviation from the frontier estimation is due to inefficiency (Coelli et al. 2005). Measurement error and noise may affect the DEA results because DEA is an extreme point approach and the results are strongly affected by outliers if they are on the frontier. It means efficiency scores obtained from DEA are relative scores to the best firms in the sample. Moreover, hypothesis tests are not usually performed with DEA due to its nonparametric nature (Coelli et al. 2005; Charnes, Cooper, and Rhodes 1978; Färe, Grosskopf, and Lovell 1985).

3.2 Cost Measures

The objective of a cooperative is assumed to be cost minimization similar to Featherstone and Rahman (1996). The cost frontier is the minimum cost curve to produce a vector of output (y) with a vector of input (x). The minimum cost estimated from the DEA method is used to calculate multiproduct and product-specific economies of scale and scope for agricultural cooperatives following Parman (2015). The following linear program problem can be solved to estimate the cost frontier.

$$\min C_i = w_i{}' x_i^*$$
$$\text{subject to}$$

$$(1) \qquad \begin{aligned} xz &\leq x_i^* \\ yz - y_i &\geq 0 \\ \textstyle\sum_{i=1}^{K} z &= 1 \\ z_i &\geq 0 \end{aligned}$$

where C_i is the minimum cost of producing output y_i, K is the number of cooperatives, z is an intensity vector (i.e. the weight of an individual cooperative), x and y are the vector of inputs and outputs, respectively. The sum of the intensity vector is 1 under variable returns to scale. In equation (1), the input constraint restricts the cost minimizing input vector (x^*) for the *ith* cooperative to be at or below the observed input level in the data. Marginal cost can be obtained as the shadow price from the output constraint. The above program estimates the minimum cost of producing output y under CRS technology when the intensity constraint ($\sum z_i = 1$) is removed from the equation.

In a multiproduct approach, economies of scope exist if it is less expensive to produce two or more products simultaneously rather than producing the same level of outputs separately. Similarly, economies of scale exist when increasing output could lead to a decline of the average cost of production. Multiproduct economies of scale (MPSE) are the change in production cost for a proportional change in all outputs. Mathematically,

(2) $\qquad MPSE_i = C(Y)/\sum_p MC_{i,p}Y_{i,p}$

where $C(Y)$ is the total cost and $MC_{i,p}$ is the marginal cost with respect to the *i*th output (Y), which is determined by the shadow price on the *i*th constraint of equation (1).

In a multiproduct approach, product-specific economies and economies of scope are the two sources for economies of scale. Product-specific economies of scale appear if the per unit cost of producing output decreases as the output increases. Note that product-specific economies of scale are similar to scale economies of the single output case. Incremental cost (IC) and marginal cost are required to estimate product-specific economies of scale. Incremental cost for the *i*th output is calculated as subtracting the cost of all outputs except the *i*th output $C(Y_{N-i})$ from the total cost of producing all outputs ($C(Y)$). The economic measures for two products are expressed below:

(3) $IC_i = C(Y) - C(Y_{N-i})$

where $Y_{N-i} = (Y_1,...,Y_{i-1},0,Y_{i+1},...,Y_N)$.

Product-specific economies of scale (S_i) are the ratio of the average incremental cost of producing the *i*th output to marginal cost of producing the *i*th output. Mathematically, it can be expressed as:

(4) $S_i = AIC_i / MC_i$

Product-specific economies of scale exist if $S_i > 1$ in equation (4).

Economies of scope (EOS_i) show the potential for cost saving from the combined production of two or more products. Economies of scope present if it is cheaper to produce in a multiproduct firm than producing the same level of outputs in separate firms. This happens from sharing or joint use of inputs, which results in the reduction of unit costs. For example, in a two products case, economies of scope exist if

(5) $C(Y_1) + C(Y_1) > C(Y)$

where $C(Y_1)$ and $C(Y_2)$ are the cost of producing outputs 1 and 2 in a single product firm, while $C(Y)$ represents the total cost of in a multiproduct firm. If the above strict inequality in equation (5) is replaced by greater than or equal to sign, then economies of scope are said to be weak. This indicates that there may be gain from multiproduct production but no loss (Baumol, Panzar, and Willig 1982). Economies of scope for two outputs case can be expressed as:

(6) $EOS_N(Y) = [C(Y_1) + C(Y_2) - C(Y)] / C(Y)$

if $EOS_N(Y)$ is greater than zero, then economies of scope exist, which show the cost reduction through product diversification.

To calculate scope economies in a multiproduct framework, the cost associated with individual outputs needs to be calculated. In a linear programming approach, to compute the cost of individual outputs, delete all outputs constraints except the output constraint of interest. For example, to calculate the cost of output one, delete all outputs constraints except the constraint for output one. This will give the minimum cost associated with output one. In a similar way, individual cost for other outputs can be calculated. Similarly, to compute product-specific scale economies, we need to calculate incremental cost. Incremental cost is the difference between total cost and cost of all outputs except the output of interest. In a non-parametric approach, for example, if a firm produces three outputs, then three linear programs should be estimated by omitting one of the outputs at a time. In total, four linear programs should be estimated to get incremental cost for three outputs firms.

In estimating incremental cost in a multiproduct framework, one of the output constraints is dropped in DEA. However, the DEA approach may allow for the omitted output to be non-zero i.e. the production of the output when using the data with no single output firms. This may overestimate the cost of that output (C_p), which results in higher scope economies. For example, C_1 is the cost of producing Y_1, which assumes that Y_1 is only output being produced. However, DEA allows some Y_2 or Y_3 to be produced. This estimation process overestimates the cost of Y_1 (Parman 2013). To avoid or minimize this problem, we adjust the cost of output 1 by multiplying the share of the output. Similar method is used for the adjusting cost of other two outputs or other individual outputs. When incremental cost and marginal cost for each product are estimated, scale and scope economies can be calculated. Note that marginal cost for each output is obtained from the cost minimization problem as mentioned in equation (1) as the shadow price for each output constraint.

4 Empirical Results

Table 1 reports summary statistics of inputs and outputs expenses. Two inputs (labor and capital) and three outputs (grain, farm inputs, and other products sales) quantities or indices are used for analysis. The average labor and capital expenses are $4237.12 thousand and $666.9 thousand. On average, the contribution of farm input sales is largest in total revenue of cooperatives.

Table 2 reports descriptive statistics of product-specific and multiproduct scale economies and scope economies. On average, the product-specific scale economies for grain sales and farm input sales are slightly less than 1, which indicate that cooperatives benefit by reducing the scale of these products. However, the mean score of product-specific scale economies for other products sales is 1.10, which implies that cooperatives can reduce cost by 10% by increasing the scale of other products sales. Note that the number of product-specific scale economies is different for each product as not all cooperatives handle all three products. If a cooperative only sells a product, product-specific economies of scale is estimated for only that product. For example, to calculate grain specific scale economies, we dropped those cooperatives if the quantity of grain is zero or marginal cost is zero. The reason why they were dropped is that if either quantity or marginal cost is zero or both are zero, average incremental cost or product-specific scale economies are undefined. The similar approach is used to calculate product-specific economies of scale for farm inputs other products sales.

Similarly, Table 2 also reports multiproduct scale and scope economies. The mean value of multiproduct scale economies is 1.52, which suggests that cooperatives can reduce cost by 52% through simultaneous operations (sales) of three outputs rather than handling them separately. Similarly, the mean value of scope economies is greater than 0 (0.11), which implies that economies of scope exist. In other words, product diversification could result in a 11% cost saving for cooperatives, on average.

Since the benefit through product-specific scale economies or product diversification could be different for small and large cooperatives, scale and scope economies based on the size of cooperatives may provide more accurate information for adjusting the size of operations. Thus, we also report product-specific, multiproduct scale economies and scope economies classifying cooperatives based on the value of the total assets. In general, smaller cooperatives have higher mean values for PSE, MPSE, and scope, which indicates that smaller cooperatives have larger incentives to increase the scale of outputs sales.

Table 3 reports product-specific scale economies by the size of cooperatives. The mean score for product-specific economies of scale for grain sales is close to 1; particularly for cooperatives with less than 15 million or greater than 100 million of total assets, which indicates that the cooperatives are operating under constant returns to scale. Similarly, the middle part of Table 3 shows summary statistics for farm inputs specific economies of scale. On average, the PSE measure for farm inputs decline with the increasing size of cooperatives. For example, cooperatives with the total assets value of less than or equal to 50 million experience constant returns to scale. However, larger cooperatives with more than 50 million of assets values could save cost by decreasing the scale of farm inputs. Likewise, the bottom part of Table 3 reports product-specific scale economies for other products sales. Small cooperatives with total assets of less than or equal to 15 million can save cost by 64% by increasing the scale of other product sales. However, the benefits from other products sales tend to be exhausted with increased size of cooperatives.

Economies of scope represent the cost saving through product diversification. If significant cost reduction is possible through scope economies, then it indicates that diversified firms are more profitable than specialized firms (Clark 1988). Table 4 reports scope economies by the size of cooperatives. Small cooperatives with total assets of less than 50 million have the mean scope measure great than 0, which suggests that cooperatives can save cost by simultaneous operation (sales) of grain, farm inputs, and other products. However, larger cooperatives with more than 50 million of total assets have negative mean scope economies, which indicates that this size of cooperatives did not obtain benefit through products diversification. In other words, these cooperatives may benefit by specialization rather than product diversification.

Table 5 depicts multiproduct scale economies (MPSE) by the size of cooperatives. The mean MPSE value of cooperatives with the size of 50 million is greater than 1, which implies that these cooperatives are operating under increasing returns to scale and they can reduce average cost by increasing outputs sales. However, the mean MPSEs of large cooperatives (with total assets greater than 50 million) are lower than 1, which suggests that these cooperatives are operating on the region diseconomies of scale. Thus, larger cooperatives can reduce cost by decreasing the scale of output sales.

Overall, the mean values of PSE, scope and MPSE of small cooperatives are higher than those measures of large cooperatives. Thus, smaller cooperatives have larger incentives to increase their scale of sales. However, the benefits tend to be exhausted with increased size of cooperatives.

5 Discussion and Conclusion

Agricultural cooperatives sell a variety of outputs such as grain, farm inputs, which creates problem for an inter-firm comparison among agricultural cooperatives. Further, managers of cooperatives lack an adequate framework for analyzing the impact of changes on product mix on cost (Akridge and Hertel 1986). This study provides a framework for an inter-cooperative performance comparison and the impact of change on product mix on the cost structure for an individual cooperatives level decision. In other words, the use of multiproduct and product-specific economies of scale and scope measures provide more accurate estimate to change output-mix or level to improve the performance of cooperatives.

The nonparametric approach allows to estimate scale and scope measures even using a single year of data and the annual estimates are useful to understand how cost is changing over period and make strategy annually to operate efficiently. Scope economies are estimated in a multiproduct framework, which is useful to understand how the diversification of products change average cost of cooperatives whereas product-specific scale economies indicate that which product is on optimal size. Since each product is not equally profitable for a cooperative, understanding the contribution of each product on total revenue of cooperatives is helpful whether to increase or decrease the size of that product. Moreover, a multiproduct framework allows for the examination of cost-output relationships, which have not been possible in a single product framework. The multiproduct framework provides a greater extent of information to managers about the impacts of outputs mix and outputs level change on cost and the framework is also useful to managers for price and promotional decisions (Akridge and Hertel 1986).

In general, higher scale economies exist for smaller cooperatives than larger cooperatives, but scale economies tend to be exhausted for cooperatives with total assets of greater than 50 million. In addition, small cooperatives obtain benefit through product diversification. When the size of cooperatives increases, particularly when total asset is greater than 50 million, scope economies become negative. This indicate that product diversification is not profitable for large cooperatives. Therefore, understanding of cost structure by size is useful to make a proper decision based on their specific issues.

Overall, scope economies are positive for small cooperatives. So small cooperatives benefit through product diversification. Similarly, multiproduct economies of scale for smaller cooperatives are greater than 1 and higher than larger cooperatives.

Table 1: Summary statistics of input and outputs for agricultural cooperatives, 2014

	Labor expense	Capital expense	Grain sales	Farm-input sales	Other sales
Mean	4237.12	666.90	2219.90	3688.69	2047.98
Median	1691.50	275.99	404.37	1249.47	344.69
Std. Dev	6529.22	941.37	4601.68	6699.64	7149.11
Min	4.35	7.94	0.00	0.00	0.00
Max	48161.40	5822.16	36645.16	49897.70	82116.79

N = 638. All expenses are in thousand dollars.

Table 2: Product-specific, multiproduct scale and scope economies for agricultural cooperatives, 2014

	N	Mean	Median	Std. Dev.	Min	Max
PSE grain	397	0.97	0.99	0.12	0.33	2.38
PSE farm	499	0.94	1.00	0.20	0.07	1.00
PSE other	331	1.10	1.00	1.52	0.03	14.48
MPSE	505	1.52	1.24	1.18	0.07	12.21
Scope	505	0.11	0.20	0.20	-0.72	0.48

PSE: product-specific scale economies, MPSE: multiproduct scale economies

Table 3: Product-specific scale economies by the size of agricultural cooperatives, 2014

Total Assets	N	Mean	Median	St. Dev.	Min	Max
		Product-specific scale economies for grain				
<= 15 M	122	0.99	0.99	0.03	0.75	1.00
>15M - <= 50M	146	0.95	0.99	0.07	0.76	1.00
>50M - <= 100M	64	0.93	0.95	0.06	0.77	1.00
> 100M	65	0.99	0.98	0.27	0.33	2.38
		Product-specific scale economies for farm input				
<=15 M	232	1.00	1.00	0.01	0.94	1.00
>15M - <= 50M	156	0.99	1.00	0.05	0.43	1.00
>50M - <= 100M	54	0.90	1.00	0.25	0.07	1.00
> 100M	57	0.57	0.36	0.35	0.08	1.00
		Product-specific scale economies for other product				
<=15 M	83	1.64	0.97	2.67	0.20	14.48
>15M - <= 50M	132	0.94	0.98	1.04	0.03	12.27
>50M - <= 100M	53	0.96	0.99	0.09	0.54	1.00
> 100M	63	0.84	0.99	0.25	0.11	1.00

Note: Cooperatives are classified based on total assets (million dollars).

Table 4: Economies of scope by the size of agricultural cooperatives, 2014

Total Assets	N	Mean	Median	St. Dev.	Min	Max
<= 15 M	229	0.21	0.14	0.12	0.00	0.48
> 15M - <= 50M	157	0.14	0.11	0.12	-0.04	0.44
> 50M - <= 100M	58	-0.01	-0.02	0.10	-0.43	0.21
> 100M	61	-0.23	-0.16	0.24	-0.72	0.04

Note: Total assets in million dollars.

Table 5: Multiproduct scale economies by the size of agricultural cooperatives, 2014

Total Assets	N	Mean	Median	St. Dev.	Min	Max
<= 15 M	229	2.19	1.76	1.37	0.82	12.21
> 15M - <= 50M	157	1.16	0.97	0.62	0.86	8.42
> 50M - <= 100M	58	0.87	0.94	0.23	0.07	1.16
> 100M	61	0.56	0.40	0.34	0.10	0.97

Note: Total assets in million dollars.

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