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Effect of Pooling on Equity Capital and Current Assets of Large Producer Marketing Cooperatives

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INTRODUCTION

Producer marketing cooperatives have been categorized as buy-sell and committed (Knutson, Black). The primary distinction is that buy-sell cooperatives, by definition, do not operate a pool. Cooperatives with pooling make marketing decisions on behalf of their members while buy-sell cooperatives do not. Pooling operates in tandem with marketing agreements. Cooperatives that operate pools are the "committed" type. Their members sign a formal contract between the producer and the cooperative which pledges the member's production to the pool.

There are perceived benefits to cooperatives in operating a pool via a marketing agreement (Black). Committed marketing cooperatives, compared to buy-sell marketing cooperatives, have assured member support and more predictable costs. The effects of pooling should be reflected in selected financial variables of cooperatives, such as equity capital or leverage, if the perceived benefits of pooling are real. An important hypothesis concerning the perceived benefit of pooling is that marketing cooperatives with pooling have less market risk compared to those without pools, and as a consequence can incur more financial risk. This means such cooperatives may be able to borrow more money per unit of equity capital. A corollary is that pooling results in greater "efficiency" of equity capital in the sense that greater total assets per unit of equity capital may be controlled by equity owners.

The importance of identifying and quantifying the impact of pooling on the financial aspects of cooperatives is substantial. First, a quantified relationship serves as a test of the general conclusions of previous literature. Second, studies concerning marketing cooperatives sometimes recommend the establishment of a pool or committed structure, without any

specific knowledge concerning the long-term implications of pooling on financial structure. The purpose of this research is to quantify the effect of pooling on selected financial variables.

Previous Research

One study examining the possibility of multinational cooperatives, suggests pooling on an international level (Knutson, Cook, Sporleder). This study suggested a multinational cooperative which would take title to grain and handle internationl grain trading functions.

Product marketing, rather than commodity marketing, has become more typical and cooperative competitiveness with proprietary multinationals has become a concern. Pooling, supported by member commitment and vertical integration often has been suggested to provide volume expansion and, through per-unit retains, generate the capital required for member service and cooperative competitiveness. The per-unit-capital retain often associated with the operation of a pool provides cash flow in the same way the equity retained from patrons generates cash to finance growth and retire debt (Moore and Fenwick). In this sense, the operation of a pool puts a greater financial burden on current patrons rather than past patrons, while providing necessary capital (Fenwick).

One problem faced by many cooperatives is satisfying the needs of member-patrons while attempting to acquire the equity capital required for growth. Cooperatives have traditionally relied on current patrons to provide financing. However, member-patrons no longer using the cooperative expect relief from their investment (Brown and Volkin). The majority of cooperatives have a redemption system, but the equity redeemed by the cooperatives is sometimes 20 or 30 years old. The cooperatives that do redeem equity do so depending on savings or amount of retained earnings.

Many cooperatives have experienced pressure from member-patron organizations in the form of complaints and withdrawals, which have led to testimony and Supreme Court involvement (Cook, Sporleder, Dahl). In 1979, the U.S. general accounting office recommended that unless cooperatives offer more equitable retirement programs, the Secretary of Agriculture should develop legislation for mandatory payment of interest or dividends on retained equity and/or mandatory equity retirement within a specific time period (Royer).

Royer also suggests that the threat of mandatory retirement programs could force a weak cooperative into financial failure. Royer, however, allows that some cooperatives may be able to meet mandatory requirements through direct investments, increased retained patronage refunds, or per-unit capital retains.

Generating cash to finance growth gains importance as traditional financing methods become increasingly restricted. A per-unit capital retain, typically associated with pools, provides cash flow for growth and debt retirement (Fenwick). Pooling provides a commitment to combine the output of participating members and jointly market. Pooling is often viewed as a means to provide retains and facilitate product marketing, as distinct from commodity marketing.

This study analyzes effects of cooperative operation of a pool on selected financial variables. The analysis offers cooperative managers and members additional information on the potential long-term financial impact of pooling. The results should aid in decision-making about the impact of the operation of a pool on cooperative capital and growth requirements.

Objectives

The purpose of this research is to examine the financial structure of producer marketing and marketing/supply cooperatives and quantify the relationship between pooling and other variables. Specifically, the objectives are to determine, quantitatively, if the financial structure of marketing and marketing/supply cooperatives operating pools differs from those that do not. In addition, implications of the quantitative analysis for cooperative managers and patrons are formulated.

METHODS

Background

Agricultural Cooperative Service (ACS) of the USDA collects financial data from the 100 largest cooperatives. Among the information collected are assets, liabilities, equity capital, and sources and uses of funds. Cooperatives are categorized by major function, tax status, organizational structure and commodities handled. The data for this research included 100 of the largest cooperatives with assets greater than one million dollars in 1976. Actual analysis is based on 89 cooperatives with assets greater than 19 million dollars in 1980, 1981, and 1982. Variables, such as cooperative number of members (associations or individuals), cooperative type, major function, commodity type, presence of pooling, presence of integration and presence of export operations, were identified in consultation with ACS personnel.

Cooperatives were divided into dairy and non-dairy cooperatives to allow an examination of the impacts of pooling on non-dairy cooperatives. Ordinary least squares (OLS) analysis and maximum R^2 improvement techniques were used to determine the impact of selected descriptive variables, such

as pooling, on financial variables, such as equity capital and current assets.

Definition of Continuous Variables

Continuous variables available for the analysis can be divided into the following financial categories: assets, debt and liabilities, sources and uses of funds, and member equity and net margin distribution. The definition of these items are as follows:

ASSETS:

Total assets - are from combined current assets, fixed assets, and investments on miscellaneous capital.

Total current assets - working assets consisting of cash and other assets which can be turned into cash in an operating year. Included are cash notes, accounts receivable, inventories,and short term marketable securities.

Total plant, property and equipment - the fixed portion of total assets.

DEBT AND LIABILITIES:

Total long term debt - remaining debt, net of the current portion.

Total short term debt - debt due during the current year.

Current liabilities due members - part of the current portion of other liabilities. Liabilities owed to members during the normal business year.

Other liabilities - liabilities other than borrowed capital. Included are accounts payable, proceeds payable, and deferred and accrued items. Other liabilities are accounted for as a percentage of total assets.

Farm supply sales - the dollar sales volume from farm supply activities by the cooperative.

Marketing sales - the dollar sales volume from marketing activities by the cooperative.

Other income - portion of dollar sales not derived from marketing or farm supply activities.

Total sales - denotes actual income. This income includes gross sales and other receipts from operations.

SOURCES AND USES OF FUNDS:

Net savings (losses) - the operating result for the cooperatives total business operations.

Equity capital - the excess of the value of assets over liabilities.

Total borrowed capital - borrowed capital either long term, current, or on a formal basis.

Payments on long term debt - payment made during the business cycle on debt held longer than one year.

Additions to plant, property, and equipment - additions during the normal operating year for a given year.

Taxes paid - includes Federal and State income taxes paid by the cooperative. A negative amount indicates a refund, and a zero implies no taxes were paid.

Per-unit retains - defined below.

MEMBER EQUITY AND NET MARGIN DISTRIBUTION:

Per-unit retains - investments in the cooperative made by patrons in compliance with a bylaw or membership agreement. It allows the cooperative to make a deduction from proceeds due or advances made to patrons for clearly defined capital purposes.

Unallocated equity - the amount set aside from net margins to maintain business operations. Included are all equity reserves not subject to allocation to patrons.

Cash patronage refunds - refunds paid in cash to patrons on the current year's business.

Qualified non-cash patronage refunds - refunds on which the ultimate cash redemption is deferred. A qualified refund is subject to taxation from the patron.

Non-qualified patronage refunds - refunds on which cash redemption is deferred and they are not subject to taxation from the patron, but the cooperative must pay the tax.

Dividends - dividends issued on stock or equity capital. Dividends are issued from net savings or net margin.

Definition of Discrete Variables

The following discrete variables were available for the analysis:

IRS tax status - classified as exempt or non-exempt according to federal legislation.

Farm credit district - each cooperative falls in one of the 12 farm credit districts; Springfield, Baltimore, Columbia, Louisville, New Orleans, St. Louis, St. Paul, Omaha, Wichita, Texas, Sacramento, Spokane.

Organizational structure - each regional cooperative is classified as either centralized, federated, or mixed. A centralized cooperative is owned directly by farmers. A federated cooperative is owned by local cooperatives. A mixed structure is a combination of the two types.

Organizational type - As defined by ACS, cooperatives are classified as local, regional, or interregional according to organizational structure. Local cooperatives serve a community of one or several counties and may be affiliated with a regional or other cooperatives. Regional cooperatives range in size from covering multi-counties to several states. Regional cooperatives are organizationally substructured as federated or centralized cooperatives, or as combinations of the two types. An interregional cooperative is a cooperative owned by regional cooperatives.

Major function - USDA defines major function as farm supply, marketing, or marketing/farm supply. Farm supply is a cooperative with supply business accounting for all or a major portion of total dollar volume. Marketing is a cooperative with marketing of farm products accounting for all or a major portion of total dollar volume. Market/farm supply (or mixed) is a multipurpose cooperative engaged in both marketing and supply activities with each activity accounting for a substantial portion of the total dollar volume.

Major commodity handled - the commodity classifications are: farm supply, diversified, cotton, fruits and vegetables, grain, dairy, nuts, poultry, rice and sugar.

Pooling status - the pooling categories are: no pooling with operations strictly on a net margin basis, pooling with no operations on a net margin basis, pooling with part of operations on a net margin basis.

Membership agreements - this variable indicates the presence or absence of contracts for product delivery or sale from members to the cooperative.

Export status - indicates the absence or presence of export operations to any extent.

Descriptive Statistics for Large Cooperatives

A cooperative's function can be farm supply, marketing or a combination of marketing and farm supply activity. Cooperatives with a mixed function of marketing and farm supply had the greatest average total

borrowed capital, $58.4 million above the farm supply cooperatives (Table 1). Mixed function cooperatives also had a more substantial average asset volume than farm supply cooperatives and exceeded the other two cooperative types in average sales and marketing sales.

Marketing sales of the mixed cooperatives averaged more than the pure marketing cooperatives. The farm supply cooperatives averaged more equity capital than mixed marketing cooperatives. The farm supply group also had the largest average net savings. Per-unit retains of marketing cooperatives were larger than mixed or farm supply cooperatives.

Selected Variables by Pooling Operations

Cooperatives with no pooling operations (Table 2), with one exception, had a larger average value of the selected variables than the pooling cooperatives. Non-pooling cooperatives showed $62.1 million more average total borrowed capital and $58.5 million more equity capital. Assets also averaged greater, with total assets in non-pooling cooperatives and total current assets slightly less than twice as much. Sales of non-pooling cooperatives were considerably larger than the pooling group. Net savings were also substantially larger. Thus, pooling cooperatives tend to be relatively small. The pooling cooperatives had a larger average volume of per-unit retains than the non-pooling group.

Pooling and Per-Unit Retains

Per-unit retains are classified by pooling or non-pooling as well as major function for the non-dairy cooperatives examined (Table 3). Of the pooling cooperatives, only those with marketing as the major function deducted per-unit retains.

Table 1. Mean Values of Selected Financial Variables by Major Function, U.S. Non-Dairy Agricultural Cooperatives, 1980-1982.

Marketing			
Item	Number Included	Mean (thous. $)	Range (thous. $)
Total Borrowed Capital	107	61,349	29,276
Equity Capital	107	29,875	101,589
Total Assets	107	125,181	700,598
Total Current Assets	111	85,023	612,057
Sales	107	383,469	3,193,687
Net Savings	107	1,978	89,031
Per-Unit Retains	107	3,231	27,978
Marketing Sales	111	374,406	3,196,949

Marketing/Farm Supply			
Item	Number Included	Mean (thous. $)	Range (thous. $)
Total Borrowed Capital	60	166,546	1,138,195
Equity Capital	60	99,590	540,038
Total Assets	60	361,089	2,194,392
Total Current Assets	63	191,919	1,080,845
Sales	60	1,186,027	5,590,175
Net Savings	60	10,075	238,077
Per-Unit Retains	60	5	280
Marketing Sales	63	640,845	2,826,218

Farm Supply			
Item	Number Included	Mean (thous. $)	Range (thous. $)
Total Borrowed Capital	30	108,105	430,684
Equity Capital	30	117,414	510,607
Total Assets	30	284,408	1,143,657
Total Current Assets	30	129,263	437,970
Sales	30	462,050	1,403,198
Net Savings	30	17,330	311,945
Per-Unit Retains	30	257	7,466
Marketing Sales	0	---	---

Source: Computed

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Table 2. Mean Values of Selected Financial Variables by Pooling Operations, U.S. Non-Dairy Agricultural Cooperatives, 1980-1982.

No Pooling			
Item	Number Included	Mean (thous. $)	Range (thous. $)
Total Borrowed Capital	116	125,982	1,139,132
Equity Capital	116	88,063	544,337
Total Assets	116	285,902	2,197,704
Total Current Assets	116	154,395	1,080,845
Sales	116	900,526	5,590,175
Net Savings	116	9,771	311,945
Per-Unit Retains	116	68	7,466
Marketing Sales	87	691,834	3,239,778
Pooling			
Item	Number Included	Mean (thous. $)	Range (thous. $)
Total Borrowed Capital	81	63,920	292,479
Equity Capital	81	30,537	97,290
Total Assets	81	128,639	368,686
Total Current Assets	80	87,990	308,845
Sales	81	265,274	899,400
Net Savings	81	2,443	69,937
Per-Unit Retains	81	4,289	27,978
Marketing Sales	80	253,478	938,889
Total			
Item	Number Included	Mean (thous. $)	Range (thous. $)
Total Borrowed Capital	201	100,246	1,139,132
Equity Capital	201	64,130	544,337
Total Assets	201	220,360	2,197,704
Total Current Assets	199	128,478	1,080,845
Sales	201	634,339	5,590,175
Net Savings	201	6,888	311,945
Per-Unit Retains	201	1,768	27,978
Marketing Sales	168	481,829	3,239,778

Source: Computed

Table 3. A Selection of Non-Dairy Pooling and Non-Pooling Cooperatives using Per-Unit Retains Classified by Major Function, 1980-82.

Operations	Cooperatives deduction per-unit of capital retains					
	1980	1981	1982	1980	1981	1982
	Number			1,000 dollars		
POOLING						
Major Function:						
Marketing	25	25	25	119,920	121,765	105,760
Marketing/ Farm Supply	2	2	2	-	-	-
Farm Supply	-	-	-	-	-	-
TOTAL	26	28	27	119,920	121,765	105,760
NON-POOLING						
Major Function:						
Marketing	12	12	13	40	-	-
Marketing/ Farm Supply	18	17	18	148	280	-
Farm Supply	8	10	9	7,466	-	-
TOTAL	39	39	40	7,654	280	-

Source: Computed

The non-dairy cooperatives in this study are examined on a pooling and non-pooling basis using per-unit retains, and classified by major commodity handled (Table 4). Non-dairy cooperatives show an increase of deductions from 1980 to 1981 and a decrease from 1981 to 1982 for pooling cooperatives. Rice cooperatives that pooled had the largest increase from 1980 to 1981 of $9.8 million. The largest decrease from 1980 to 1982 was among the fruit and vegetable cooperatives that pooled. Fruit and vegetable cooperatives had a decrease in retains of $19.4 million from 1980 to 1981 and a decrease of $3.9 million from 1981 to 1982.

Selected Variables by Cooperative Form

Interregional cooperatives had larger average values of the selected variables than the other categories, with the exception of per-unit retains which were zero (Table 5). The average borrowed capital in interregionals was more than regionals, while average equity capital exceeded regionals. Interregionals had more average total assets than regionals and locals. Average total current assets of the interregionals were greater than the mean of the regionals and locals.

The majority of the cooperatives in the data set are classified as regionals. The regionals had a sizably larger average volume of borrowed capital than the locals. Average equity capital for the locals' was approximately 25% of the regionals' equity capital. Average total assets were more in the regional and average current total assets surpassed the locals. Sales of the regionals averaged approximately 6.5 times larger than average local sales, while average marketing sales were about 7.5 times larger than the locals. Mean per-unit retains of regionals were more than twice that of the locals.

Table 4. Selected of Non-Dairy Pooling and Non-Pooling Cooperatives using Per-Unit Retains Classified by Major Commodity Handled, 1980-82.

Operations	Cooperatives deduction per-unit capital retains					
	1980	1981	1982	1980	1981	1982
	Number			1,000 dollars		
POOLING						
Commodity:						
Fruits and vegetables	14	14	14	72,632	53,241	49,363
Rice	4	4	4	12,247	22,042	23,666
Sugar	3	3	3	5,150	11,992	843
Cotton	2	2	2	3,195	14,811	12,510
Nuts	2	2	2	22,531	18,516	17,916
Diversified	-	2	1	0	0	0
Grain	1	1	1	4,165	1,163	1,462
TOTAL	26	28	27	119,920	121,765	105,760
NON-POOLING						
Commodity:						
Grain	17	17	18	0	0	0
Farm supply	9	10	10	7,466	0	0
Diversified	8	6	7	148	280	0
Cotton	3	3	3	40	0	0
Poultry	1	1	2	0	0	0
Fruits and vegetables	1	1	1	0	0	0
TOTAL	39	38	41	7,654	280	0

Source: Computed

Table 5. Mean Values of Selected Financial Variables by Cooperative Form, U.S. Non-Dairy Agricultural Cooperatives, 1980-1982.

Local			
Item	Number Included	Mean (thous. $)	Range (thous. $)
Total Borrowed Capital	21	24,734	36,435
Equity Capital	21	15,702	18,348
Total Assets	21	52,199	47,674
Total Current Assets	20	34,127	49,068
Sales	21	102,182	40,545
Net Savings	21	1,090	10,211
Per-Unit Retains	21	1,052	4,453
Marketing Sales	20	87,893	82,685
Regional			
Item	Number Included	Mean (thous. $)	Range (thous. $)
Total Borrowed Capital	163	105,023	1,139,132
Equity Capital	163	63,970	544,337
Total Assets	163	227,013	2,197,704
Total Current Assets	163	132,421	1,079,845
Sales	163	674,140	5,590,175
Net Savings	163	6,674	238,077
Per-Unit Retains	163	2,045	27,978
Marketing Sales	141	498,685	2,881,433
Interregional			
Item	Number Included	Mean (thous. $)	Range (thous. $)
Total Borrowed Capital	14	156,580	415,777
Equity Capital	14	189,610	496,377
Total Assets	14	396,721	1,139,314
Total Current Assets	14	194,209	600,803
Sales	14	1,008,553	3,098,790
Net Savings	14	16,052	311,945
Per-Unit Retains	14	0	0
Marketing Sales	6	1,399,215	3,101,466

Source: Computed

EFFECTS OF POOLING

Several models were specified and estimated in an attempt to determine the impact of pooling. The two most successful and revealing models are discussed. The two models presented and analyzed have dependent variables of equity capital divided by total assets, and total current assets, respectively. Data from non-dairy cooperatives with assets greater than 19 million dollars for the years 1980 through 1982 were used in the econometric estimation. Four observations were dropped due to missing values.

Equity Capital Model Specification

Equity capital is positively correlated with the size of the cooperative. In an attempt to control for the significance of plant size, equity capital was divided by total assets in defining the dependent variable (denoted as ECT_i). ECT_i can vary between zero and 1.0. For the data period ECT_i had an average value of 0.314, a minimum value of 0.032 and a maximum value of 0.8. Thus, the average marketing or mixed cooperative had 31.4 cents of equity per dollar of total assets.

Dividing equity by total assets also avoids problems with heteroskedasticity that are encountered when only equity is used as the dependent variable. Heteroskedasticity exists when the variance of the disturbance is not constant over observations. Not correcting for heteroskedasticity does not imply that the estimate is biased but it does imply that the variance is apt to be overstated.

ECT_i is more difficult to explain than equity because equity is highly correlated with the other variables correlated with firm size. However, including a ratio as the dependent variable in the specification, potential problems with accounting identities are minimized. Possible

multicollinearity among explanatory variables in this type specification must be recognized and considered in interpretation. For example, sales, total property, plant and equipment, total borrowed capital, assets, and other available variables will tend to be larger in value for larger cooperatives, making it difficult to attribute causation to a particular variable.

It was anticipated that a cooperative that uses pooling would tend to face less uncertainty because it has a commitment from members to supply their product. Thus, pooling cooperatives could be expected to be more efficient and to have less need for cash-on-hand to meet uncertainties. It was hypothesized that these tendencies would be reflected in greater leverage and a lower equity-asset ratio for pooling firms, ceteris paribus.

Generally larger firms are more efficient and represent less credit risk, and tend to be more diversified (Sporleder and Skinner). Larger cooperatives tend to command more borrowed capital and obtain greater leverage. Thus, total borrowed capital should be an adequate measure of credit worthiness. ECT_i should tend to be lower, or leverage greater, for cooperatives with greater total borrowed capital. The impact of total borrowed capital on leverage might be influenced by the presence of pooling and cooperative function. It was reasoned that a cooperative that pools should obtain greater leverage, or lower values of ECT_i, when compared to a similar cooperative that commands the same level of borrowed funds but does not pool. The greater relative leverage is simply a consequence of less market risk which allows the cooperative to take on more financial risk.

The following model was specified:

$$(1) \quad ECT_i = \beta_0 + \beta_1 P_i + \beta_2 (1/T_t) + \beta_3 FS_i + \beta_4 MS_i + \beta_5 I1_i + \beta_6 I2_i + \beta_7 I3_i + u_i$$

where:

ECT_i = equity capital divided by total assets (cents per dollar),

P_i = dummy variable, equaling one when pooling is present and zero otherwise,

T_i = Total borrowed capital, either long term, or current (dollars),

FS_i = sales associated with the farm supply dimension of the cooperative (dollars),

MS_i = sales associated with the marketing dimension of the cooperative (note: for most cooperatives either FS_i or MS_i will equal zero; both will have positive values if the cooperative has both a marketing and farm supply function) (dollars),.

$I1_i$ = interaction term: $(1/T_i)$ x P_i,

$I2_i$ = interaction term: $(1/T_i)$ x MARKET (where MARKET equals 1 when the cooperative has only a marketing function and zero otherwise),

$I3_i$ = interaction term: $(1/T_i)$ x MIXED (where MIXED equals 1 when the cooperative has both a marketing and farm supply function and zero otherwise),

u_i = error term.

The motivation behind the specification is to isolate the impact of pooling by accounting for factors related to firm size and function. Sales and total borrowed capital are positively correlated with cooperative size, while function can be categorized as either marketing, farm supply or mixed. Usually, leverage does not vary much for extremely large cooperatives. A difference of say 10 million dollars in total borrowed funds reveals little insight into possible differences in leverage for large cooperatives. This tendency does not hold true for relatively small cooperatives. Generally, a difference in total borrowed capital of 10 million dollars is indicative of a significant difference in leverage for

small cooperatives. In other words, the impact of total borrowed capital is not linear. The model operationalizes this suspected non-linearity by employing an inverse of the total borrowed capital variable ($1/T_i$). The results are presented in Table 6.

The $1/T_i$ coefficient being positive implies that smaller firms tend to have a larger equity-asset ratio. The impact of T_i approaches an asymptote as total borrowed capital increases. The impact of borrowed capital for a farm supply cooperative is $\hat{\beta}_2(1/T_i)$, for a marketing cooperative it equals $(\hat{\beta}_2 + \hat{\beta}_6)(1/T_i)$, and for a mixed cooperative it is $(\hat{\beta}_2 + \hat{\beta}_7)(1/T_i)$. Similar results are obtained if T_i is replaced with highly correlated variables such as assets or total property, plant and equipment. Total borrowed capital was chosen because it is a more direct measure of credit worthiness. FS_i and MS_i have only minor impact. Since sales is highly correlated with total borrowed capital, it is misleading to consider FS_i and MS_i in isolation. Similar results are obtained if FS_i and MS_i are dropped from the model. Further interpretation centers on the impact of pooling.

The impact of pooling varies with total borrowed capital. Pooling's effect equals $\hat{\beta}_1 + \hat{\beta}_5(1/T_i)$ and is depicted in Figure 1. The impact is independent and in addition to the impact of cooperative function. An impact of -0.06, for example, implies that a pooling cooperative, when compared to a non-pooling cooperative of similar size and function, would have a value of ETC_i that is 0.06 lower. In other words, the pooling cooperative in this example would have six cents less equity per dollar of borrowed capital.

The impact of pooling is depicted for T_i values between \$4- and \$250-million. For larger T_i values, the impact approaches -0.0588. Figure 1

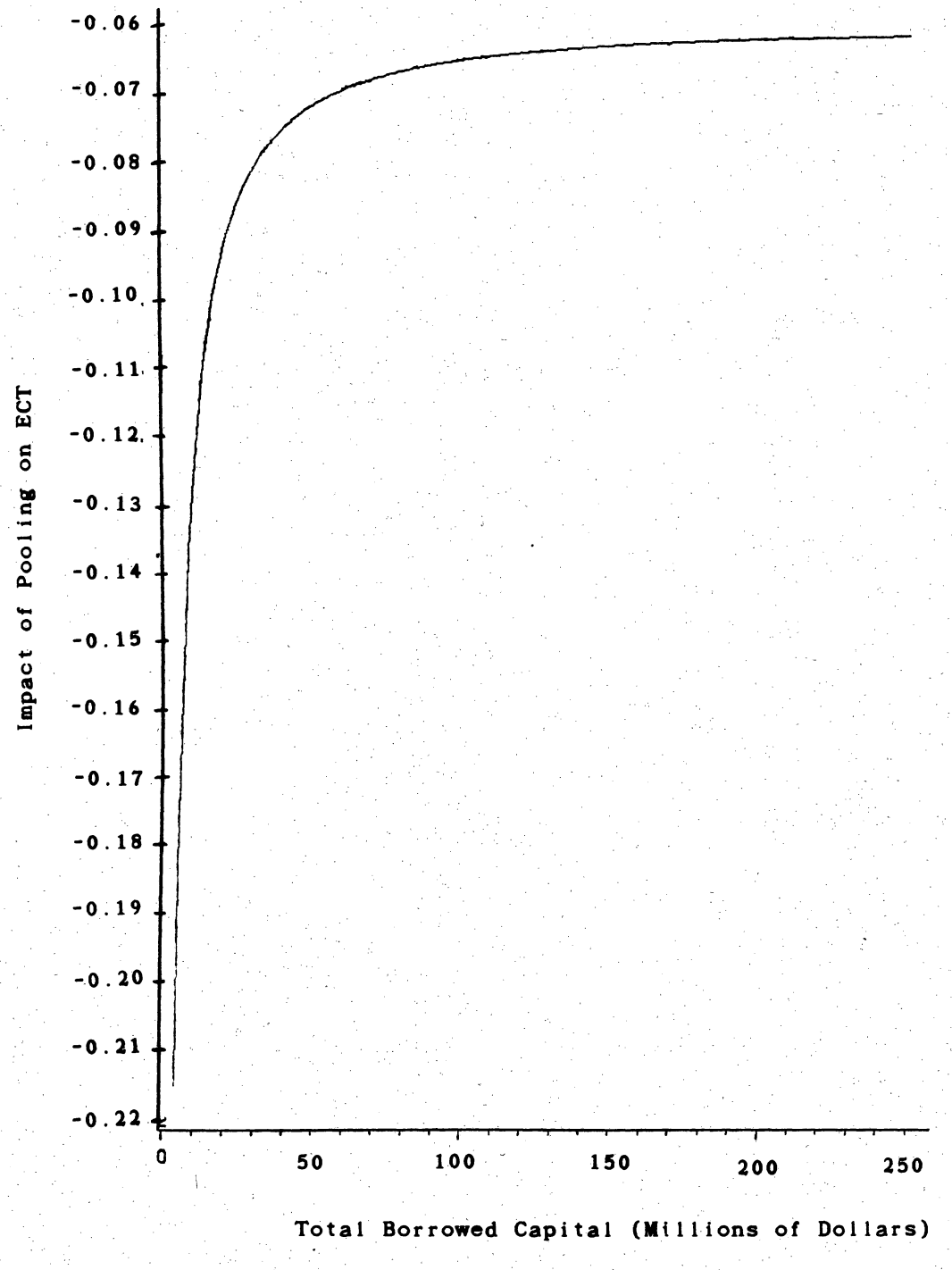
Table 6. Results of OLS Analysis of Equity Capital, Selected U.S. Non-Dairy Cooperatives with Assets Greater than 19 Million Dollars, 1980-82.

Item	Notation	Parameter Estimate	t Value
Intercept	β_0	3.0304 E-1	20.18***
Pooling	P_i	-5.8818 E-2	-3.073***
Total Borrowed Capital	$1/T_i$	1.5114 E 6	7.38***
Farm Supply	FS_i	3.4463 E-11	2.041**
Marketing	MS_i	-4.2311 E-11	-3.24***
Borrowed Capital and Pooling	$I1_i$	-6.2477 E 5	2.56***
Borrowed Capital and Marketing	$I2_i$	-3.7766 E 5	-1.43*
Borrowed Capital and Mixed	$I3_i$	-4.9907 E 5	-1.91*
	R^2	.4727	

* indicates significance at the 85% confidence level.
** indicates significance at the 90% confidence level.
*** indicates significance at the 95% confidence level.

Source: Computed

Figure 1. The Impact of Pooling on Leverage



indicates that pooling cooperatives having relatively lower levels of borrowed capital tend to obtain more leverage when compared to similar cooperatives that do not pool. As the extent of borrowing increases, leverage tends to decrease as the total impact of pooling approaches -0.0588 for higher levels of borrowed capital. Since the data are basically cross-sectional, the effect of pooling in this model is a long term measurment, after an adjustment period.

For a typical smaller cooperative (with assets of $51 million, $17 million of equity, and total borrowed capital of $22 million) leverage can be increased by an average of $1.48 million by pooling. For an average medium sized cooperative (with assets of $123 million, $31 million of equity, and total borrowed capital of $62 million) pooling will typically result in $2.14 million additional leverage. A typical large cooperative (with assets of $564 million, $170 million of equity, and $252 of total borrowed capital) will increase leverage by $10.42 million by pooling. Additional leverage gains will result, in addition to those cited above, if the level of total borrowed capital should increase due to pooling

If the interaction variables ($I1_i$, $I2_i$, $I3_i$) are removed from the model, then a constant impact of pooling is implied and the estimated coefficient for the pooling variable (P_i) is -0.0923 (the t-statistic is -5.45). However, the impact suggested by the presented model appears more accurate. Pooling has more of an impact on leverage for smaller firms.

Similar results are obtained when pooling is interacted with other variables highly correlated with firm size instead of borrowed capital. Models based only on marketing or marketing and mixed cooperatives yielded similar implications as did models specified using total equity as the dependent variable.

Total Current Asset Model

Of the other financial variables modeled, a measurable empirical impact of pooling was strongest for total current assets. However, when the total current assets model is corrected for heteroskedasticity, pooling's impact is not significant.

Total current assets are working assets consisting of cash and other assets which can be turned into cash during the accounting year. Pooling may decrease uncertainty through commitment, which would decrease the need for current assets. In a sense, this is a liquidity issue or if liquidity varies significantly from pooling to non-pooling cooperatives. Here, the notion tested is that pooling may reduce market risk significantly enough so that the cooperative can be less liquid, all else equal. In specifying the model the goal was to control for cooperative size and function to isolate the impact of pooling, in a manner similar to the specification for the equity captial model. The current asset model was specified as follows:

$$(2) \quad CA_i = \beta_0 + \beta_1 T_i + \beta_2 T1_i + \beta_3 T2_i + \beta_4 T3_i + u_i$$

where:

CA_i = total current assets (dollars),

T_i = total borrowed capital (dollars),

$T1_i$ = interaction term: T_i x P_i (P = 1 if pooling exists and zero otherwise),

$T2_i$ = interaction term: T_i x MARKET (where MARKET equals 1 when the cooperative has only a marketing function and zero otherwise),

$T3_i$ = interaction term: T_i x MIXED (where MIXED equals 1 when the cooperative has both a marketing and farm supply function),

u_i = error term.

The results imply that an additional dollar of borrowed capital for a farm supply cooperative will have result in an increase in current assets of $0.9657 (Table 7). Increasing total borrowed capital by one dollar will increase total current assets by $1.4508 for a marketing cooperative and by $1.0176 for a cooperative having both a farm supply and marketing function.

Using other variables correlated with firm size, such as total property, plant, and equipment, instead of total borrowed capital yielded similar results. The variable total assets was not employed as an independent variable because current assets is a component of total assets.

The above results are for cooperatives that do not pool. If pooling exists, then the impact would be to decrease current assets by an average of $0.4443. In other words, pooling cooperatives tend to have less total current assets for any given cooperative size and function. A cooperative of average size that pools (T_i = $90 million) had $39.98 million less total current assets, on the average, than a cooperative of similar size and function that does not pool. A small cooperative that pools (T_i = $10 million) had about a $4.44 million reduction in current assets compared to a similar non-pooling cooperative. For a large cooperative (T_i = $400 million) the difference is $177.70 million.

The following relationship was estimated and used to correct for heteroskedasticity:

$$(3) \quad |\hat{u}_i| = 1424.76(T_i^{0.56}) + \text{error}$$

where $|\hat{u}_i|$ is the absolute value of the reported error from equation 2. The R^2 for this regression is 0.567 and the t-statistic is 15.96. To attempt to correct for heteroskedasticity equation 2 was estimated using ordinary least squares with all variables including the intercept divided

Table 7. Results of OLS Analysis of Total Current Assets, Selected U.S. Non-Dairy Cooperatives with Assets Greater than 19 Million Dollars, 1980-82.

Item	Notation	Parameter Estimate	t Value
Intercept	β_0	2.2734 E 7	3.86***
Total Borrowed Capital	T_i	9.96576 E-1	13.60***
Borrowed Capital and Pooling	$T1_i$	-4.4426 E-1	-2.93***
Borrowed Capital and Marketing	$T2_i$	4.8460 E-1	3.19***
Borrowed Capital and Mixed	$T3_i$	5.1824 E-2	0.71
	R^2	0.8799	

* indicates significance at the 85% confidence level.
** indicates significance at the 90% confidence level.
*** indicates significance at the 95% confidence level.

Source: Computed.

by 1424.76 ($T^{0.56}$). The results are reported in Table 8 and may be interpreted in a fashion similar to results in Table 7. The impact of pooling is not statistically significant after the correction for heteroskedasticity.

Per-Unit Retains

Per-unit retains also were used, instead of pooling variables, in estimating ECT_i and CA_i models. Firms that employ per-unit capital retains also are pooling firms; though not all pooling firms use per-unit retains.

The ECT_i model, Table 6, was estimated using two variations to account for per-unit retains. The first alternative used a dummy variable, called PU_i, which indicated the presence of per-unit retains instead of P_i or the pooling dummy variable and also used PU_i multiplied by $1/T_i$, designated $IU1_i$, instead of $I1_i$. The dummy variable, PU_i, had an estimated coefficient of -0.289 (t-value -1.496), while the interaction variable ($IU1_i$) coefficient had a similar value as $I1_i$ (- 6.1652 E 5). The other coefficients are similar as those reported in Table 6. If the actual level of per-unit retains (designated PER_i) is used along with $IU1_i$, then PER_i is not significant (t-value equals -0.905). Otherwise the model is similar to the results shown in Table 6.

Thus, it appears that pooling serves to explain leverage better than per-unit retains. Per-unit retains yields significant results to the extent that it is a proxy for pooling.

Attempting to account for the per-unit retains using the current asset model yields different implications. Replacing $T1_i$ with PU_i multiplied by borrowed capital yields an estimated model similar to that presented in Table 7 (R^2 equals 0.8811). Thus, per-unit retains is an adequate proxy for pooling in explaining current assets, but not for explaining leverage.

Table 8. Results After Correcting for Heteroskedasticity in the Current Assets Model.

Item	Notation	Parameter Estimate	t Value
Intercept	β_0	1.1472 E 7	6.33***
Total Borrowed Capital	T_i	1.1058 E 0	11.43***
Borrowed Capital and Pooling	$T1_i$	2.8728 E-2	0.22
Borrowed Capital and Marketing	$T2_i$	6.9777 E-2	0.15
Borrowed Capital and Mixed	$T3_i$	3.5742 E-2	0.32
	R^2	0.8522	

* indicates significance at the 85% confidence level.
** indicates significance at the 90% confidence level.
*** indicates significance at the 95% confidence level.

Source: Computed.

Statistically Non-Significant Models

Results of models considered statistically non-significant also yield some interesting information. These models were estimated using maximum R^2 improvement. This technique is useful when there is little or no theory to guide model specification.

Various attempts were made to estimate a total asset model. These attempts displayed high R^2 but few significant variables. The significant variables were highly correlated with total assets and further analysis based on the model was not performed. The high R^2 values of these models simply reflect certain accounting identities.

Another model with total borrowed capital as the dependent variable displayed a R^2 of .81. Only three variables, however, cash patronage refunds, sales, and other liabilities were found significant in several variations of the model. Variables indicating pooling cooperative type and cooperative form also were found not to be significant in a total borrowed capital model.

Total net savings was also used as a dependent variable to examine the impact of pooling and patronage refunds on cooperative savings and losses. This analysis was limited due to the number of observations with missing net savings and patronage refund values and displayed low statistical significance.

Results for the other variables modeled implied an insignificant role for pooling or an impact opposite to that hypothesized. A major problem encountered in the analysis is that cooperatives that pool tend to be relatively small, making it more difficult to separate efficiencies associated with size from the impact of pooling. For several dependent variables considered, after potential explanatory variables were discarded

from the analysis due to identities, very few meaningful or potentially explanatory variables remained.

SUMMARY AND CONCLUSIONS

One problem cooperatives face is satisfying the needs of member-patrons while attempting the growth necessary for competitiveness. Some cooperatives have primarily relied on member-patrons to provide equity capital. However, patrons no longer using the cooperative's services are increasingly unwilling to continue providing equity capital. This pressure has caused cooperatives to seek marketing strategies that provide new means of retiring debt and financing growth.

The primary purpose of this research was to quantitatively analyze the effect of cooperative pools on cooperative equity capital and total current assets. The information provided on the potential long-term financial effect of pooling could aid cooperative managers and members in decisions concerning the impact of pooling on capital, growth requirements, and the wisdom of a cooperative entering into some multinational cooperative arrangement for exporting.

Commitment by a cooperative's members to use a cooperative's services often has been suggested as a key to the success for a marketing cooperative. Commitment insures delivery, and allows a cooperative to operate with the knowledge of what product volume it will handle. The evidence presented here does suggest that pooling is a proxy for commitment, which in turn reflects lower market risk to the cooperative. With a pooling operation there is typically producer commitment to deliver the product, removing the uncertainty found in buy-sell marketing cooperatives.

The results suggest that there is increased leverage and perhaps a

reduction in total current assets due to pooling. The implication is that the pooling cooperatives, because of commitment and reduced market risk, can operate on a smaller equity investment compared to non-pooling cooperatives. Stated another way, the quantitative evidence supports the hypothesis that pooling results in greater efficiency of equity capital through greater total assets per unit of equity capital controlled by the equity owners.

The impact of pooling on the equity-asset ratio was modeled by isolating the impact of total borrowed capital for farm supply, marketing, and mixed function cooperatives. The impact of pooling also was isolated and varied with total borrowed capital. To allow for the tendency for larger cooperatives to have greater leverage, the inverse of total borrowed capital was used in model specification. The reduction in the equity-asset ratio due to pooling is greater for firms with less debt and averages about 9.23 percent. For firms with substantial debt the impact is about 5.88 percent. A typical small cooperative with assets of $51 million can expect an additional $1.48 million of leverage due to pooling. For a typical medium sized cooperative, with assets of $123 million, pooling will increase leverage by $2.14 million. A typical larger cooperative with assets of $564 million will average $10.42 million additional leverage by pooling.

A reduction in total current assets would suggest that pooling cooperatives have a larger than average capacity for short term borrowed capital because of volume commitment by producers. This capacity allows a cooperative to borrow for short term operating expenses, thus decreasing the current asset volume required for cooperative operation.

The total current asset model implies a reduction in current assets

due to pooling of about $.044 for each dollar of debt for cooperatives of similar size and function. If the model is corrected for heteroskedasticity, then the influence of pooling on total current assets is not statistically significant.

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