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Risk and Equity in Agricultural Cooperatives

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This research examines the effect of risk on the proportion of equity held by agricultural cooperatives. The measured components of risk are business risk and the financial risk that is dependent on the proportion of debt in the cooperative's capital structure. The empirical results indicate the proportion of equity is inversely related to financial risk and positively related to business risk. These risk effects are estimated to differ based on the commodity handled by the cooperative. No significant relation between the proportion of equity and whether or not the cooperative operates on a pooling basis is estimated.

Banks, lenders, and financial managers look at the proportion of equity in the balance sheet in order to obtain information about a firm's soundness and solvency. A firm with low equity capital may have difficulty borrowing in order to grow and expand. Although it is possible to establish a firm financed totally by equity, it is hardly feasible to finance a firm entirely with borrowed capital. Equity capital thus plays an important role in the investment and growth strategies of both investor-owned firms and cooperatives.

Equity capital provides a cushion or a buffer that can absorb swings in earnings. With little equity, a firm facing a large loss as a result of fluctuating earnings performance may be unable to meet its obligations and may ultimately be forced into bankruptcy and dissolution. If a firm holds a sufficient amount of equity, however, losses can be absorbed by equity capital and the firm can continue operating, although its owners will be that much poorer. Thus, firms faced with high variability of earnings, or high risk, are expected to maintain a higher proportion of equity in order to absorb extreme downswings in performance (Brealey and Myers).

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This reasoning on the role of equity is usually developed in finance theory in application to investor-owned firms, but it may be equally valid for the user-owned cooperatives. Insofar as equity capital provides a measure of protection against adverse business outcomes, the proportion of equity is expected to depend on the risk faced by a cooperative. Although it may be accepted that equity holdings vary among cooperatives, the effect of various risk-related factors on cooperative equity has yet to be examined. Unlike investor-owned firms, cooperatives do not necessarily seek the objective of maximizing the rate of return on equity, nor is the notion of equity in a cooperative identical to that in an investor-owned firm. It is therefore relevant to examine to what extent the behavior of equity in cooperatives is similar to that in investor-owned firms.

The purpose of this research is to determine whether traditional measures of risk affect the proportion of equity in the capital structure of agricultural cooperatives. After a brief review of the components of risk and the sources of equity capital for cooperatives, the methodology will be outlined, the data described, and the results summarized.

Business and Financial Risk

Risk can be defined in the business context as the uncertainty of future outcomes that arises from variations in the economic environment (Brealey and Myers). Risk is affected by a variety of factors that include demand variability, changes in the efficiency of labor, changing quality of managerial decisions, the degree of operating and financial leverage, interest rate fluctuations, weather, pest infestation, natural disasters, and policy or technological changes. All these factors combine to produce variability in earnings, which is an accepted measure of risk for firms.

The portion of risk that depends on the uncertainty of operating income is usually referred to as business risk (Brigham and Gapenski). Another risk component, financial risk, depends on the firm's financial leverage, i.e., the proportion of equity and debt in the firm's capital structure. The financial expense associated with borrowing increases the variability of residual earnings beyond the variability associated with the firm's business risk (Brealey and Myers).

A firm's overall or total risk, as represented by the observed variability of earnings, is thus the sum of the business risk, independent of the firm's financial structure, and the financial risk that is dependent on the firm's proportion of debt and equity (Brigham and Gapenski). Firms facing different levels of business risk can maintain the same total or overall risk by controlling their financial risk through the adjustment of their proportions of equity and debt. A higher proportion of equity translates into a lower financial risk component of the firm's total risk. Thus, utilities with relatively safe operation outcomes tend to borrow more and accept a higher financial risk than, say, pharmaceutical corporations, whose business risk is much higher.

Risk may also be affected by structural factors that can be explicitly identified and examined. One of these structural factors is size. It is usually assumed that larger size confers a measure of safety or stability to a firm

(Brigham and Gapenski). Banks and other creditors may have greater confidence in the repayment capacity of large firms, assuming they are more diversified and represent less of a credit risk (Sporleder, Malick, and Tough). Therefore large cooperatives may be able to borrow proportionately more than small cooperatives and function with a lower proportion of equity capital.

Equity Capital in Cooperatives

Cooperatives, like investor-owned firms, obtain equity capital through direct investment by members and from retained earnings (Cobia and Brewer). The initial funds for starting a cooperative are traditionally raised by direct contribution from members through the purchase of shares. Yet direct investment generates the smallest percentage of equity among cooperatives (Kane). Cooperatives on the whole are unable to raise equity easily through the sale of stock because the returns to cooperative owners are based on patronage, not investment (Schrader). As a result, there is no market mechanism to raise equity through the sale of stock on an ongoing basis (Staatz).

The alternative to raising equity through direct contribution from members and owners is provided by the accumulation of equity through the retention of earnings. This is a common mechanism among investor-owned firms and cooperatives, whereby a portion of net income is added to the equity capital rather than paid out in cash patronage refunds or dividends.

Despite apparent similarities, equity capital in cooperatives is conceptually different from equity in investor-owned firms. First, not all retained equity components in cooperatives are linked to net earnings. A unique component of equity retention among cooperatives is provided by the per-unit capital retains: the cooperative makes deductions from payments due to members based on their volume of business and not on net profit and retains these amounts as part of the equity capital account. Second, the equity of cooperatives, contrary to that of investor-owned firms, cannot be all viewed as permanent capital. Part of the retained earnings in a cooperative are allocated to members based on patronage. These allocated retained earnings and the per-unit retains are eventually distributed back to the members through a revolving fund or other equity redemption program (Cobia, Royer, and Ingalsbe). Thus, allocated patronage refunds can be viewed as a pool of "deferred cash dividends" that the cooperative temporarily employs as a component of its equity capital.

These distinctive factors may produce differences in the proportion of equity in the capital structure of cooperatives as a function of risk compared with investor-owned firms. Thus, the relationship between the proportion of equity and the variability of earnings, as hypothesized above, may not hold for cooperatives. On the other hand, it can be argued that cooperatives operate in the same economic environment as investor-owned firms and in practice are apparently judged by the same criteria by their lenders. This environment may force the cooperatives to assume the same patterns of financial behavior as investor-owned firms, despite the intrinsic differences in the notion of equity. The present analysis in effect tests whether

the unique features of cooperative equity are overweighed by the pressures of a common business environment.

Analysis

The theoretical considerations suggest that the proportion of equity capital held by a firm is a function of risk-related factors:

$$EQ/TA = f(\text{business risk, financial risk, size}) \quad (1)$$

where *EQ/TA* is the ratio of equity to total assets. Financial theory indicates that *EQ/TA* is an increasing function of business risk (the higher the business risk, the greater the equity cushion that the firm employs), a decreasing function of financial risk (higher financial risk implies higher borrowing, hence a lower proportion of equity), and a decreasing function of size (larger firms can afford to accept a lower level of equity than smaller firms of comparable business risk).

Data

The model (1) is estimated using cross-sectional time-series data from annual financial statements for fifty-nine agricultural cooperatives for the years 1973 to 1987. The cooperatives included in the analysis are those that responded to a request for financial statement data sent to nonbargaining cooperatives listed by the USDA Agricultural Cooperative Service (Jermolowicz and Kennedy). They represent a selection of different industries and cover a wide spectrum of sizes as measured by total assets or sales: the average total assets of the sample cooperatives for 1973–87 range from $4 million to $1.4 billion, and the average sales for the same period range from $13 million to $3.1 billion.

The availability of sufficiently long time series for each cooperative (15 years of data) makes it possible to estimate the risk measures as standard deviation of earnings over time. This is a particular strength of the data used in this research and distinguishes the present analysis from previous studies of factors affecting equity capital.

Variables

The dependent variable *EQ/TA* in model (1) is calculated as the ratio of total equity to total assets for each cooperative in each year. The use of this ratio instead of the actual equity capital controls for the strong positive correlation between equity and size and allows comparison for cooperatives of different size. Cooperative size is then measured by the cooperative's total sales in each year, rather than total assets, to avoid the danger of spurious correlation between the dependent variable and the size variable.

Business risk is measured by the variability of the stream of operating earnings, i.e., earnings before interest and tax (EBIT). It is estimated as the standard deviation of the return to total assets, or ROA (the ratio of EBIT to total assets) over the period 1973–87. This is a standard measure of business risk proposed in the literature for investor-owned firms (Brigham and Gapenski); it captures the variability associated with the pure

business decisions of the firm before the effects of financing decisions, which are reflected in interest payments, and government policy, which is reflected in taxes.

Financial risk is not directly observable, and it is defined as the difference between total risk and business risk (Brigham and Gapenski). Total risk of a firm is measured by the variability of the stream of net earnings to shareholders, and it is estimated in this research as the standard deviation of the return to equity before tax (ROE) over the period 1973–87. Before-tax ROE is used because not all cooperatives in the sample report profit after tax.

Estimation

The functional model (1) can first be specified as a linear regression model describing the panel data in the form:

$$(EQ/TA)_{it} = \alpha + \beta_1 \text{BUSINESS\_RISK}_i + \beta_2 \text{FINANCE\_RISK}_i + \beta_3 \text{SIZE}_{it} + u_{it}. \quad (2)$$

The subscript i identifies the cooperative, $i = 1, \ldots, 59$; the subscript t indicates the year in the time series, $t = 1973, \ldots, 1987$. The two risk variables do not carry a time subscript because they are based on summary statistics (standard deviations) for the period 1973–87.

Time-series cross-sectional data are usually prone to strong serial correlation. The panel data in this research are no exception, producing a Durban-Watson statistic of 0.3 for the OLS regression based on the model (2). To avoid the difficulties associated with serial correlation in OLS analysis of panel data, the model (2) is summed over time and is restated in the usual way (Hsiao) in terms of mean variables over the period 1973–87 for each cooperative i:

$$\overline{(EQ/TA)}_i = \alpha + \beta_1 \text{BUSINESS\_RISK}_i + \beta_2 \text{FINANCE\_RISK}_i + \beta_3 \text{SIZE}_i + u_i. \quad (3)$$

Here the variables averaged over time for each coop are denoted by a superior bar. The risk variables from the original model (2) remain unchanged.

The model (3) does not attempt to differentiate among cooperatives on the basis of their industry classification. This model in effect assumes that the intercept α and the slope coefficients β_1-β_3 are homogeneous across industries. However, the commodity handled by an agricultural cooperative could be an identifiable factor that affects risk in addition to the standard deviation of ROA used as a measure of business risk. A recent study (Lerman and Parliament, 1991a) has demonstrated that the proportion of debt (the complement of the proportion of equity) varies significantly across cooperatives handling different commodities and performing different functions.

To allow for the possible effect of the commodities handled by the cooperative, a categorical variable is introduced in the model. The cooperatives are classified into five categories based on commodities handled: dairy marketing cooperatives, fruit and vegetable processors, bulk commodity

Table 1.—Distribution of Cooperatives by Commodity Category

Commodity Category		Number of Cooperatives
Bulk		6
Dairy		10
Diversified		4
Fruit & Vegetable		15
Inputs:		24
Farm Inputs	9	
Farm Inputs/Grain	10	
Grain	5	
Total		59

marketers (sugar, rice, and cotton), farm supply cooperatives, and diversified cooperatives. More than half the farm supply cooperatives in the sample market grain in addition to purchasing farm inputs for their members. The farm supply category is thus a mixed category, and, to simplify the classification, grain marketing cooperatives that do not handle farm inputs are also included in this category. The combination of three groups of cooperatives into a single farm supply category is justified, as a statistical analysis has shown that the subsamples of the mixed farm input/grain cooperatives, the grain marketing cooperatives, and the cooperatives that only sell farm inputs are indistinguishable by their equity and risk characteristics. The fifth industry category consists of the diversified cooperatives that are involved with a very wide variety of commodities, including farm inputs and processed foods. The distribution of the cooperatives by commodity handled is provided in table 1.

The model tested with the categorical commodity variable has the form:

$$\overline{(EQ/TA)}_i = \alpha + \beta_1 \text{BUSINESS\_RISK}_i + \beta_2 \text{FINANCE\_RISK}_i + \beta_3 \overline{\text{SIZE}}_i + \beta_4 \text{COMMODITY} + \beta_5 \text{COMMODITY*BUSINESS\_RISK} + \beta_6 \text{COMMODITY*FINANCE\_RISK} + u_i. \quad (4)$$

This regression model, in addition to the three continuous variables of model (3), incorporates the commodity categorical variable and interaction terms between the categorical variable and the two continuous risk variables. This model is known as "heterogeneity of slopes" model, and it is an extension of the analysis of covariance model, which includes continuous and categorical variables but no interaction terms (Freund and Littell).

The heterogeneity of slopes model (4) allows for possible differences in the intercepts and the coefficients across industries. Different intercepts reflect differences in the average level of the ratio of equity to total assets across industries, while the coefficients of the interaction terms allow for possible differences in the rate of response (the "slope") of the dependent variable *EQ/TA* to risk in different industries. Thus, the intercept α in the model (4) represents the average level of the effect for one of the industries

only (the so-called base or reference industry). Similarly the slope coefficients β_1, β_2, β_3 represent the response to the continuous variables as estimated for the base industry. The other coefficients in the model associated with the categorical variable and the interaction terms (β_4, β_5, β_6) modify the base-industry estimates to produce intercepts and response coefficients for each industry. Thus, the coefficient β_4 of the variable COMMODITY allows for possible deviation of the average level of the dependent variable for each industry from that estimated for the base industry. The estimate of the intercept for each commodity category is given by $(\alpha + \beta_4)$, where β_4 is estimated separately for each nonbase category. The interaction terms between commodity and the two risk measures assume that the coefficients β_1 and β_2 of the continuous risk variables may not be homogeneous across commodity categories. Thus, the estimated coefficient of the variable BUSINESS_RISK for each commodity category is given by $(\beta_1 + \beta_5)$, and the estimated coefficient of the variable FINANCE_RISK is given by $(\beta_2 + \beta_6)$, where the interaction coefficients β_5 and β_6 are estimated separately for each commodity category. In other words, the model (4) assumes that both the average level and the rate of change of the proportion of equity with risk may differ among cooperatives based on commodities handled.

Alternative Dependent Variable Model

Although the ratio of equity to total assets is an accepted measure of capital structure of a firm, other measures are frequently used in the literature. One such ratio is the ratio of equity to the sum of all borrowed capital and equity. Here the denominator does not include the firm's accounts payable, which is a component of its working capital financing.

This ratio may be particularly appropriate for cooperatives, where a large proportion of accounts payable are amounts owed to members for goods delivered to the cooperative—a financing component that probably has entirely different risk characteristics compared with other borrowed funds. Accounts payable to members, when reported as a separate item in the financial statements of cooperatives, averaged 16 percent of total assets for the sample used in this research over the period 1973–87. This, however, is a lower bound, because in many cases accounts payable to members is not reported separately from all accounts payable, which averaged 26 percent of total assets in the sample. The actual level of accounts payable to members is thus between 16 percent and 26 percent, which constitutes a significant portion of the cooperative-specific funds. Therefore, in addition to the model (4), a model is estimated with the dependent variable $\overline{EQ}/(\overline{TA - AP})$, where $(TA - AP)$ excludes the "accounts payable" from the calculation of the cooperative's total assets.

Pooling

A structural factor specific to cooperatives is the distinction between pooling and nonpooling marketing cooperatives (Cobia). Sporleder, Malick, and Tough have previously estimated pooling cooperatives (defined as those with member marketing agreements) to operate on smaller proportions of

equity than nonpooling cooperatives. They suggest this result is due to lower risk exposure of a pooling cooperative, where a portion of management and marketing uncertainty is eliminated through the contractual commitment of the members to deliver their output to the cooperative.

To the extent that pooling may affect the cooperative's risk, the effect of pooling is analyzed for the subsample of fifteen cooperative fruit and vegetable processors, among which nine are pooling. The number of pooling cooperatives within the other industries in the data base was too small to conduct a similar analysis.

The pooling status of a cooperative is based on information provided in the annual financial statements. Cooperatives are defined in this study to be pooling if the cost of goods sold does not include payments for products delivered by members: this is the case when the cooperatives pool costs and revenues, leaving the members with the residual. The reported profit in these pooling cooperatives is upward-biased, and, for purposes of analysis, it is adjusted according to a previously suggested methodology (Lerman and Parliament, 1991b). The analysis is based on the model (4) with a categorical variable added for the pooling status and the categorical commodity variable omitted, as only the fruit and vegetable industry is analyzed.

The definitions of the variables used in the various regressions are summarized in table 2. The estimations are performed using the General Linear Models procedure in the SAS/PC package.

Results

The estimated coefficients of the linear regression model (3) are:

$$\overline{(EQ/TA)}_t = \underset{(15.09)}{0.39} + \underset{(4.69)}{2.24}\ \text{BUSINESS\_RISK}_t - \underset{(-7.50)}{1.00}\ \text{FINANCE\_RISK}_t - \underset{(-1.54)}{0.03}\ \overline{\text{SIZE}}_t.$$

The respective t-statistics are indicated in parentheses under each estimated coefficient. For this regression, the R-square is 0.52 and the F value is 20.02, which is significant at the 0.0001 level.

The estimation results indicate that the proportion of equity in a cooperative's capital structure is affected by risk. As hypothesized, the estimated coefficient on the business risk variable is significant and positive, implying that the proportion of equity is directly related to the variability of net earnings before tax and interest; and the estimated coefficient on the financial risk variable is significant and negative, implying that higher financial risk is associated with a lower proportion of equity.

The size of cooperatives, as measured by mean total sales, is estimated to have a negative effect on a cooperative's proportion of equity. The size coefficient, however, is only estimated to be significantly different from zero at the 15-percent level of significance.

The estimated coefficients of the model with the alternative dependent variable, $[\overline{EQ/(TA - AP)}]$, are:

$$\overline{[EQ/(TA - AP)]}_t = \underset{(13.61)}{0.64} + \underset{(1.34)}{1.14}\ \text{BUSINESS\_RISK}_t - \underset{(-4.67)}{1.12}\ \text{FINANCE\_RISK}_t - \underset{(-2.20)}{0.08}\ \overline{\text{SIZE}}_t.$$

Table 2.—Definition of Variables Used in Analysis

Variable	Definition
$\overline{(EQ/TA)}_i$	Mean ratio of equity to total assets for cooperative i over the period 1973–87
$\overline{[EQ/(TA - AP)]}_i$	Mean ratio of equity to total assets minus accounts payable for cooperative i over the period 1973–87
$\overline{SIZE}_i$	Mean total sales for cooperative i over the period 1973–87 (in $ billions)
$BUSINESS\_RISK_i$	Standard deviation of cooperative i's rate of return to assets (ROA—net earnings before interest and tax to total assets) over the period 1973–87
$FINANCE\_RISK_i$	Difference between the standard deviation of cooperative i's rate of return to equity before tax (ROE) and the standard deviation of cooperative i's rate of return to assets over the period 1973–87
COMMODITY	Categorical variable that classifies cooperative i into one of five categories based on commodity handled: bulk commodity, dairy, diversified, fruit and vegetable, or inputs
COMMODITY*BUSINESS_RISK	Variable representing interaction between the measure of business risk and the commodity category variable
COMMODITY*FINANCE_RISK	Variable representing interaction between the measure of financial risk and the commodity category variable
$POOL_i$	Categorical variable that classifies cooperative i as a pooling or nonpooling cooperative
u_i	Error term

The respective t-statistics are again indicated in parenthesis. For this regression, the R-square is 0.34 and the F value is 9.46, which is significant at the 0.0001 level.

With accounts payable subtracted from total assets, business risk loses its significant effect on equity proportions and size increases its effect. The estimated coefficient on the financial risk variable is significant and negative, but the estimated coefficient on the business risk variable is not significantly different from zero. The size coefficient is estimated to be significantly different from zero at the 5-percent level of significance, implying larger cooperatives hold a lower proportion of equity capital.

The coefficients estimated for the heterogeneity of slopes model (4), including the commodity categorical variables along with the continuous risk and size variables, are given in table 3. Again regressions were run for the two different measures of the proportion of equity. The coefficients indicated as lines 1–4 in table 3 are the estimated coefficients for the intercept, risk, and size variables for the cooperatives in the inputs category, used as the base commodity category in the analysis. The coefficient estimates given in lines 5–16 for the other four commodity categories must

Table 3.—Estimated Coefficients of Regression Models

Dependent Variable:	$\overline{(EQ/TA)}$	$\overline{[EQ/(TA - AP)]}$
Independent Variable	Parameter Estimate	Parameter Estimate
1 Intercept	0.46***	0.64***
	(0.050)	(0.098)
2 Business Risk	2.72***	2.39
	(0.790)	(1.561)
3 Financial Risk	−1.70***	−1.90***
	(0.293)	(0.579)
4 Size	−0.03	−0.67
	(0.030)	(0.059)
Commodity Handled		
5 bulk commodities	−0.13*	−0.10
	(0.077)	(0.151)
6 dairy	−0.21	0.00
	(0.167)	(0.331)
7 diversified	−0.11	−0.11
	(0.118)	(0.234)
8 fruit & vegetable	−0.13**	−0.17
	(0.064)	(0.127)
Business Risk * Commodity Handled		
9 bulk commodities	−1.33	−1.89
	(1.269)	(2.506)
10 dairy	4.93	−1.99
	(3.950)	(7.801)
11 diversified	5.20	6.23
	(11.004)	(21.735)
12 fruit & vegetable	−1.34	−0.99
	(1.026)	(2.028)
Financial Risk * Commodity Handled		
13 bulk commodities	1.06**	1.15
	(0.451)	(0.891)
14 dairy	0.24	3.60
	(1.355)	(2.678)
15 diversified	−1.21	−1.43
	(4.087)	(8.074)
16 fruit & vegetable	1.16***	1.27*
	(0.338)	(0.667)
R^2:	.73	.53
Mean Value of Dependent Variable:	.38	.53
Number of Observations:	59	59

Note: Numbers in parentheses are standard errors.
*** Estimated to be significantly different from zero at the 1 percent significance level.
** Estimated to be significantly different from zero at the 5 percent significance level.
* Estimated to be significantly different from zero at the 10 percent significance level.

Table 4a.—Estimated Combined Coefficients: Equity to Total Assets as a Function of Business Risk, Financial Risk, and Size

Commodity	Intercept	Business Risk	Financial Risk	Size
Inputs	0.46***	2.72***	−1.70***	−0.03
Bulk	0.33^	1.39	−0.64^^	−0.03
Dairy	0.25	7.65	−1.46	−0.03
Diversified	0.35	7.91	−2.91	−0.03
Fruit & Vegetable	0.33^^	1.37	−0.54^^^	−0.03

Table 4b.—Estimated Combined Coefficients: Equity to Total Assets Less Accounts Payable as a Function of Business Risk, Financial Risk, and Size

Commodity	Intercept	Business Risk	Financial Risk	Size
Inputs	0.64***	2.39	−1.90	−0.07
Bulk	0.54	0.40	−0.75	−0.07
Dairy	0.64	0.30	−1.70	−0.07
Diversified	0.53	8.62	−3.33	−0.07
Fruit & Vegetable	0.47	1.40	−0.63^	−0.07

Note:
*** Estimated significantly different from zero at the 1 percent significance level.
^^^ Significantly different from the estimated coefficient for inputs at the 1 percent level of significance.
^^ Significantly different from the estimated coefficient for inputs at the 5 percent level of significance.
^ Significantly different from the estimated coefficient for inputs at the 10 percent level of significance.

be added to the corresponding base-category estimates in lines 1–3 to obtain the final estimates for each commodity category. Tables 4a and 4b recast the estimated coefficients from table 3 into the form of linear regression equations for the five commodity categories.

For the regression using $(\overline{EQ/TA})$ as the dependent variable, the R-square is 0.72 and the F value is 7.32, which is significant at the 0.0001 level. The signs of the estimated coefficients for the risk variables are as hypothesized, with both business and financial risk factors significant. Although the size coefficient is negative, it is not estimated to be different from zero. The estimated coefficients on the commodity classifications and the interaction variables indicate that significant differential effects among the commodity categories exist (see table 4).

For the commodity classification regression model with $[\overline{EQ/(TA - AP)}]$ as the dependent variable, the R-square is 0.53 and the F value is 3.26, which is significant at the 0.001 level. The estimated coefficients indicate that the proportion of equity capital is only significantly affected by finan-

Table 5.—Estimated Coefficients of the Pooling Regression Model: Equity to Total Assets as a Function of Business Risk, Financial Risk, Size, and Pooling for the Fruit and Vegetable Industry

Variable	Parameter Estimate
Intercept	0.32*** (0.0599)
Business Risk	1.37* (0.0669)
Financial Risk	−0.51** (0.1798)
Size	−0.02 (0.1688)
Nonpooling	−0.00 (0.0479)

R^2 = .50
Mean Value of *EQ/TA* = .31
Number of Observations = 15

Note: Numbers in parentheses are standard errors.
*** Estimated to be significantly different from zero at the 1 percent significance level.
** Estimated to be significantly different from zero at the 5 percent significance level.
* Estimated to be significantly different from zero at the 10 percent significance level.

cial risk, and this financial risk effect for the fruit and vegetable category is significantly different from the other cooperatives. The coefficient of the size variable that was estimated to have a significant effect on this dependent variable before the introduction of the commodity variable loses its significance when the commodity categorical variable is introduced into the model. Apparently the wide variability in accounts payable among cooperatives reduces the explanatory power of the effect of business risk and size on the proportion of equity to assets excluding accounts payable.

The results of the regression testing the effect of pooling on the capital structure of fruit and vegetable cooperatives is reported in table 5. The signs of the estimated coefficients for the risk variables are as previously hypothesized, with both business and financial risk factors significant. Size is again estimated to not have a significant effect on the proportion of equity. Contrary to the results of Sporleder, Malick, and Tough, pooling is not found to significantly affect a cooperative's proportion of equity. In this analysis, the explicit business and financial risk factors have apparently captured the explanatory power of pooling operations. The difference in findings may be attributable to a difference in the exact definition of pooling in the two studies and to the fact that the present analysis was conducted only for fruit and vegetable cooperatives, while the results of the previous research were obtained across pooling cooperatives from all industries.

Conclusion

Equity holdings among agricultural cooperatives are found to be affected by risk-related factors. The empirical analysis indicates that the ratio of equity to total assets is affected by measures of business risk and financial risk, and, in some cases, these risk factor effects are estimated to differ based on the commodity handled by the cooperative. The proportion of equity capital is found to be unrelated to cooperative size, as measured by sales, in most of the regressions. The proportion of equity is unrelated to whether the cooperative operates on a pooling basis.

These results support other empirical evidence (Lerman and Parliament 1991a; Royer) indicating that the equity-based performance measures of U.S. agricultural cooperatives (return on equity, leverage) are very similar to those of investor-owned firms. Therefore, in practice, managers in cooperatives may follow the same equity policy as managers in investor-owned firms, and we can expect to observe the same relationship between equity and risk that is assumed for investor-owned firms. Perhaps the common pressures of the competitive business environment and the standard demands of the financial community overweigh the unique features of cooperative equity and account for this similarity in behavior.

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