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The relative capital structure of agricultural grain and supply cooperatives and investor owned firms [The cooperative capital constraint revisited]

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Abstract
A recent set of articles in Choices identified some of the major issues facing agricultural cooperatives. Among these are the challenges related to identifying the financing activities and equity capital management strategies that will lead to growth and longevity of cooperatives (Barton, et al 2011). Like their investor-owned counterparts, cooperatives must be profitable and competitive in the markets they face. However, cooperatives face unique challenges in managing equity capital. Because they are limited in their access to outside investments and have nontradable stock, cooperatives rely on member-provided equity through voting shares and equity accumulation through the allocation of profits as retained patronage as the primary sources of equity. Thus, a number of theoretical and empirical investigations identify that cooperatives are constrained in their ability to access capital and, therefore, are limited and perhaps inefficient in their investment activities. This paper seeks to examine the issue of capital constraints on U.S. agricultural supply and grain cooperatives and investor-owned firms (IOFs). A variant of the DuPont model – a technique that breaks down a firm's rate of return to equity into measures that relate to profitability, efficiency in asset use, and leverage – permits an empirical comparison between IOFs and cooperatives on their activities, debt structure, equity, and liquidity factors. Using firm-level panel data of financial information for cooperativeand IOF agricultural grain and supply firms in Iowa, the two ownership types are compared to identify whether significant differences exists in their investment activities and financial efficiency. Whether capital structure is impacted by firm type and the financial determinants which may contribute to such differences is highlighted.

Keywords
cooperatives, equity, capital constraint

Disciplines
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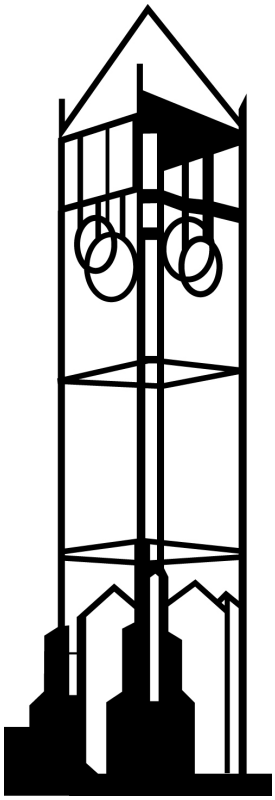

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A recent set of articles in *Choices* identified some of the major issues facing agricultural cooperatives. Among these are the challenges related to identifying the financing activities and equity capital management strategies that will lead to growth and longevity of cooperatives (Barton, et al 2011). Like their investor-owned counterparts, cooperatives must be profitable and competitive in the markets they face. However, cooperatives face unique challenges in managing equity capital. Because they are limited in their access to outside investments and have nontradable stock, cooperatives rely on member-provided equity through voting shares and equity accumulation through the allocation of profits as retained patronage as the primary sources of equity. Thus, a number of theoretical and empirical investigations identify that cooperatives are constrained in their ability to access capital and, therefore, are limited and perhaps inefficient in their investment activities.[1]

This paper seeks to examine the issue of capital constraints on U.S. agricultural supply and grain cooperatives and investor-owned firms (IOFs). A variant of the DuPont model – a technique that breaks down a firm's rate of return to equity into measures that relate to profitability, efficiency in asset use, and leverage – permits an empirical comparison between IOFs and cooperatives on their activities, debt structure, equity, and liquidity factors. Using firm-level panel data of financial information for cooperative and IOF agricultural grain and supply firms in Iowa, the two ownership types are compared to identify whether significant differences exists in their investment activities and financial efficiency. Whether capital structure is impacted by firm type and the financial determinants which may contribute to such differences is highlighted.

Evidence of Capital Constraint in Cooperatives

There is little reason *a priori* to expect that a cooperative firm's capital needs are different from a non-cooperative firm's needs if the two firms are otherwise similar in function and size and operate within similar market economies (Cobia 1989). "Cooperatives are not immune from market forces. They must meet the same market test that investor oriented firms meet" (Ginder 1999). However, cooperative finance outcomes and their choices in meeting financing needs are purported to be unique from non-cooperative firms. In particular, cooperatives may be constrained in acquiring sufficient risk capital to finance investments which

[1] Chaddad and Cook (2002) provide an excellent discussion of the mechanisms by which cooperatives are financially constrained and the relevant theoretical and empirical investigations.

may in turn limit their growth and ultimately their competitiveness. The essence of this uniqueness derives from a number of defining characteristics of cooperatives: they operate with the "user-owner" principle; there is an implied obligation to pay out accumulated allocated equity to members; they face special tax consequences for profits distributed on the basis of use; and investment, financing, and operational choices may not be driven by profit maximization as the primary objective as it is with IOFs. Whether and the extent to which these characteristics imply relatively higher or lower reliance on debt by cooperatives remains unsettled in previous theoretical and empirical literature.

Theoretical Underpinnings

In cooperative theory, discussions of capital structure and access to capital are typically motivated by recognition of the "user-owner principle" of cooperatives and the practical implications of it on equity and financial management decisions. An examination of the literature reveals, however, that whether this results in a higher or lower reliance on debt financing relative to the IOF counterpart is unclear.

The user-owner principle of cooperatives reflects the requirement that cooperatives are capitalized by and operated for the benefit of its users. In the case of agricultural cooperatives, ownership requires that users have agricultural production at risk. The decision to use a cooperative is a joint decision by the producer to both use it and invest it in, where the investment is the purchase of the membership stock and also a retained allocation of the profits in the form of equity. Thus, this principle not only limits the potential pool of investors – those who contribute equity to the business must also patronize the business – but also limits the rate at which equity can be acquired. In a cooperative, equity is built through the allocation and retention of the co-op's profits to its members. An agricultural supply or grain marketing firm operating as an IOF can solicit investors without the requirement to buy products or deliver grain and does not rely on equity accumulation through profits. Thus, the user-owner principle creates a capital constraint, further implying that co-ops' short-term investments and perhaps longer-term ones, too, must rely more heavily on debt than do IOFs (Lerman and and Parliment 1990). Furthermore, members' equity in a traditional cooperative is non-marketable, non-transferable, and does not appreciate through changes in market values. The illiquidity of equity exacerbates the problem of equity financing if members, or potential members, do not view the cooperative as an attractive investment. Farmer members may view the investment in a cooperative as having a high

opportunity cost given the money they contribute to the cooperative could alternatively be invested in their own operations (Soboh, Lansink and Van Dijk 2012). Illiquid equity also creates a horizon problem, reducing the incentive for older members who may soon retire from farming to support investments in long-term projects when the benefits from the investment will accrue to those who use (patronize) the cooperative in the future (Porter and Scully 1987; Knoeber and Baumer 1983; Cook and Iliopolos 2000).

The user-owner principle also has implications for a cooperative manger's attitudes towards and propensity to take-on risk. Cooperative managers may view the cooperative principle of risk sharing and mutual responsibility as an insurance policy, prompting them to assume more risk and borrow more heavily than managers of IOF firms (Lerman and Parliament 1990; Gentzoglanis 1997). As a result, cooperatives may be less discriminating in their investments than IOFs causing an overinvestment in assets and lower asset efficiency in generating profits.

While certain features of the cooperative business form imply a greater reliance on debt capital to finance investments relative to IOFs, other features suggest the contrary: that cooperatives will rely more heavily on equity than debt to finance growth. The user-owner principle creates an implied obligation to return a co-op's profits to members. This happens in two ways. First, current patrons are allocated a portion of the current year's savings (profits) proportional to their individual use. The co-op pays a portion of this as cash to the patron-member and a portion is allocated to the member but retained as cooperative equity. A member's equity accumulates over time as s/he uses the cooperative but will be redeemed out to the member at some time in the future. In the eyes of potential lenders, equity from retained patronage is likely viewed as a liability since it has an implied maturity date, albeit somewhat vague. The illiquidity of member equity and the uncertainty surrounding the timeframe for retiring member equity in a traditional cooperative has implications for management as well. "Perhaps the most attractive feature of the method of capitalization is the fact that it capitalizes the cooperative with money that the member would never have received had he or she done business with a non-cooperative firm rather than the cooperative…equity in a cooperative has been called, 'found money'" (Ginder 1999, p 2). Members do not expect a direct appreciation of their equity investment, so managers may treat this portion of equity as a costless source of capital and members' incentive to monitor management's use of it may be weaker, leading both to ignore the opportunity costs of capital (Lerman and Parliament 1990). If the opportunity cost of this capital is not realized, reliance on equity financing may be greater than in an IOF where stock is valued based on expectations and management outcomes.

Even absent constraints on borrowing, cooperatives might rely more on equity than debt capital due to the differential tax treatment of profits in cooperatives relative to IOFs. Profits in an IOF are taxed at the entity level and any profits passed to owners through stock dividends are taxed again at the individual level. Most profits in a cooperative are taxed only once – at the cooperative level or member level – depending on how the profits are distributed. The Modigliani-Miller theory of capital structure implies that the pass-through single taxation of earnings reduces the incentive for co-ops to maximize debt financing as compared with IOFs (Caves and Peterson 1986) . IOFs use the cost of debt financing to reduce their taxable income but cannot do the same with dividends paid to stockholders. Cooperatives deduct both the cost of borrowing and the profits distributed to patrons from taxable income, creating an additional incentive for equity financing particularly when members and management do not assign the appropriate value or cost of equity capital.

Finally, differences in financing behavior and performance stem from differences in business objectives of cooperative and non-cooperatives (Lerman and Parliament 1993; Akridge and Hertel 1992; Soboh Lansink and Van Dijk 2012). Cooperatives must be profitable; however, it is unclear whether cooperatives are managed to strictly maximize profits or rather that boards and management target multiple objectives that include maximizing patronage payments, optimal net prices to producers, maximizing value to members, and maximizing quantities of products sold and marketed. The objective(s) will influence financing behavior, albeit in ambiguous ways. If the co-op positions itself in the "purest" sense of a cooperative, acting as an extension of the farm, then it will maximize members' on-farm profits, leading to lower profitability, slower equity accumulation and, ceteris paribus, a greater proportional use of debt financing. If instead the cooperative is on the other end of the spectrum and behaves like s a profit-maximizing firm, it allocates profits as unallocated equity, total equity accumulation is enhanced, and investments are financed proportionally by equity. Cooperatives likely place different weights on the varied objectives, and even so, this may not necessarily lead to differences in capital structure between cooperatives and IOFs. Instead, we note that differently structured firms have different objectives, and even if the capital structure achieved is not different, the mechanism by which is happens may be.

Empirical Evidence

The theories of cooperative capital structure provide reasons why one might expect a higher reliance on debt capital in some cases and a lower reliance in others. Moreover, that cooperative firms have different objectives and the ability to pursue profit maximization suggests the possibility of no difference in capital structure, only a difference in the mechanism by which the resulting capital structure is achieved. The ambiguity in capital structure from cooperative theory suggests that a cooperative debt usage relative to IOFs is largely an empirical issue.

Evidence from existing studies of cooperatives relative to their counterpart investor-owned firms is inconclusive on the question of differences in capital structure. Several studies fail to find significant differences between the performance of cooperative and similar IOFs. Lerman and Parliament's (1990) analysis of capital structure in a sample of dairy firms finds debt to asset ratios are not significantly higher for cooperatives relative to IOFs. A later study by these same authors finds cooperatives finance about half of investment in assets with equity, roughly the same as IOFs between 1973 and 1983, but significantly higher than IOFs after 1984, when IOFs reduced equity financing and used more long term debt financing (Lerman and Parliament 1993). Chaddad, Cook and Heckelei (2005) test for the presence of financial constraints in cooperatives using panel data for U.S. agricultural cooperatives from CoBank by examining the sensitivity of investment in physical assets to cash flow. The key hypothesis is that investment should not be a function of cash flow if cooperatives do not face financing constraints; yet the authors do find a positive and significant effect of cash flow in investment. In comparison, cash flow does not affect investment in a comparable sample of IOFs in the food manufacturing industry.

Other studies find evidence that cooperatives tend to use relatively more debt than investor-owned firms. Gentzoglanis (1997) examines 12 large Canadian dairy firms – half cooperatives and half IOFs – from 1986 – 1991 and finds that cooperatives use significantly more debt than IOFs. Moller, Featherstone and Barton's (1996) study of the sources of financial stress in a sample of grain and supply cooperatives estimates that in roughly half of cooperatives experiencing financial stress, the stress stemmed from leverage or interest rate problems. This, they conclude, "suggests that these cooperatives may not be using an optimal capital structure" (Moller, et al p. 50).

The inconclusive nature of the theoretical and empirical evidence of capital structure differences between cooperatives and IOFs suggests that there is need for more studies on this

topic. We revisit this question of differences in capital structure using a panel data set of cooperative and investor-owned firms in the grain and supply industry in Iowa. Restricting our analysis to a common industry and common geographic area limits the extent to which any differences in capital structure are due to heterogeneous market conditions. The panel nature of the data is also an advantage of this study, since it allows us to control for time invariant unobserved firm level characteristics.

The DuPont Profitability linkage model is used to decompose the return on equity ratio into a product of asset turnover, profit margin, and leverage ratio. DuPont Analysis is widely used in the financial world to help analysts identify the impact of managerial decisions on financial performance and interactions among important financial/efficiency ratios (Barnard and Boehlje 2006). The DuPont model has been introduced in the agricultural economics literature, mainly as a diagnostic tool to understand the drivers of profitability. It allows researcher to identify which operational activities could be improved (Melvin et al). Theoretical contributions to this topic have included analyzing the relationship between a firm's decisions and capital structure (Collins 1985) and the linkage between a firm's production and investment decisions (Gabriel and Bake 1980). Featherstone et al. (1988) draw on Collin's model to assess the impact of farm policies on farm financial leverage, while Mishra, Moss and Erickson (2009) and Mishra et al (2012) apply a DuPont expansion to analyze differences in rates of return on equity and key profitability drives across regions and time at the farm level. In this paper we utilize DuPont techniques to examine and compare the impact of important financial ratios on the capital structure of the cooperative and investor owned firms.

Methodology

Determinants of Capital Structure

Collins (1985) derives the optimal capital structure (debt to asset ratio) for a farm enterprise using the DuPont identity and an expected utility maximization framework in which the objective is to maximize the expected return on equity. Following Collins (1985), we assume that cooperatives and IOFs choose the level of leverage given their equity positions. Patrons of cooperatives are also the owners, thus, the different ownership structures of cooperatives and IOFs may give rise to different operational and financing strategies. In reduced form, the optimal capital structure, δ* is a function of the expected return on assets $E(R_a)$, the variance of the anticipated return on assets (σ_a^2), the interest rate on debt (i), and risk aversion (ρ):

$$\delta^* = \delta(E(R_a), i, \rho, \sigma_a^2) \qquad (1)$$

Following the DuPont expansion method, R_a can be further decomposed into a measure of operating efficiency (profit margin) and asset efficiency (total asset turnover) as follows:

$$R_a = \frac{\pi}{A} = \frac{\pi}{S} \cdot \frac{S}{A} \ , \qquad (2)$$

where π denotes profit (gross revenue minus the cost of production) and *S* is sales revenue; profit margin is defined as the ratio of profit to sales $\left(margin = \frac{\pi}{S}\right)$; and asset turnover is $ATO = \frac{S}{A}$. Although increase in either operating efficiency or asset efficiency will result in higher return on asset, profit margin and asset turnover are purported to have different information about the company in the view of analysts. In particular, profit margin generally reflects the cost efficiency in firm's operating process especially in the agricultural grain industry. This is because crops can be viewed mostly as homogenous and company doesn't have much pricing power. On the other hand, asset turnover reflects a company's marketing effort in generating sales without increasing asset size. Thus a higher asset turnover would require hiring more sales person or engaging in media advertisement etc, which in turn lead increase in variable cost. Overall, a company is unlikely to have both high profit margin and high asset turnover.

Substituting (2) into (1) the optimal capital structure is given by:

$$\delta^* = \delta(E(margin), E(ATO), i, \rho, \sigma_a^2). \qquad (3)$$

The optimal capital structure is a function of expected values of profit margin and asset turnover, cost of debt, and risk and decision- maker preferences. In Collin's study, he concludes that factors that increase expected return on asset shall leads to an increase in firm's leverage, i.e. margin and ATO have positive impacts on δ^*; On the other hand, high level of interest rate, risk aversion and business risk tend to reduce firm's use of debt financing. Note that Collin's study assumes that a farm enterprise is an expected utility maximizer of profit which may not be true for co-ops. In other words, we are unsure if optimal capital structures for firms with different organizational structures differ from each other. Then the signs of right hand side variables derived from his model, may not universally apply to either co-ops or IOFs. For instance, an increase in profit margin indicates increased efficiency in converting revenue to profit and expense management. A higher asset turnover ratio is associated with shorter cash conversion cycles. Both allow firms to service more debt, suggesting a higher debt-to-asset, but also may be used to pay down existing

debt, reducing the amount of leverage. Thus, the expected impacts of profit margin and asset turnover ratio on capital structure are ambiguous.

While not explicitly in Collin's (1985) model, liquidity is an important determinant of debt financing needs in practice, and a firm's liquidity likely has implications for capital structure. Gabriel and Baker (1980) show that liquidity serves as a risk management tool to offset a cash shortage in the case of a negative shock to the business. Current assets are those that can be converted to cash most quickly and the relative size of these assets signals a firm's ability to meet their debt obligation. Therefore, we include in the empirical specification a ratio of the value of inventory to current assets as the liquidity measure. The inventory carried by farm supply and grain cooperatives includes things such as grain, fertilizer, chemicals, fuel, and other readily salable products. Because this type of inventory is less liquid than the other current assets – like cash reserves – a large inventory relative to current assets indicates the need of firms to borrow more current debt to finance the short term operations.

Empirical Strategy

In this section, we discuss the empirical models used to understand the key financial characteristics with reference to equation (3) that differentiate co-ops from IOFs and how these operating factors may contribute to the difference in capital structures between co-ops and IOFs, if there is any.

To identify the effect that firm type – cooperative or IOF – has on capital structure and also the firm-specific effects on financial performance measures we use a random effects Feasible Generalized Least Squares (FGLS) estimation strategy to control for firm specific effect and heterokedasticity. For each of the financial measures, the random effects treatment is given by:

$$F_{j,t}^{k} = \alpha + \gamma^{k} type_{j} + \mu_{j} + \xi_{jt}, \qquad (4)$$

where $F_{j,t}^{k}$ is financial ratio k for firm j at time t; $type_j$ is a binary variable which takes a value of 1 if the firm is a cooperative and 0 otherwise, μ_j are firm-specific unobserved time invariant effects that capture the difference in firm j's average measure from the average of other firms of the same type. [2] Our sample consists of firms selected randomly from the population of grain and marketing firms in Iowa; therefore, we assume μ_j is uncorrelated with firm's organizational

[2] We do not include time dummies as we are focusing on short panels. The consistent estimator is only asymptotically more reliable when T is large.

structure that has the similar business function. The remaining disturbance is denoted ξ_{jt} and satisfies the standard i.i.d. assumption. The conditional difference in the financial measure (variable) between co-ops and IOFs in the sample is captured by the coefficient γ^k.

The general random effects FGLS method described above is further used to identify which, if any, of the financial performance measures that impact capital structure vary by firm type. Using equation (3) as the basis for our empirical specification along with liquidity measure as an additional explanatory variable, the optimal capital structure equation is given:

$$\delta_{j,t} = \beta_0 + IC_{j,t} + \sum_{k\neq 0} \beta_k E(F^k{}_{j,t}) + \rho_j + \varepsilon_j, \quad (5)$$

where $\delta_{j,t}$ is firm $j's$ capital structure at time t; ρ_j captures the unobserved individual specific attributes including business risk and firm's attitude towards risk and ε_j is a standard error term. $E_{t-1}(F^k{}_{j,t})$ is the expected value of financial covariate *k* for firm *j* at time t and we assume it takes a naïve expectation form given by :

$$E_{t-1}(F^k{}_{j,t}) = F^k{}_{j,t-1}. \quad (6)$$

However, inventory-to-current-asset ratio ($IC_{j,t}$), a measure of firm's inventory management efficiency enters contemporaneously with the debt-to-asset ratio. Unlike the other financial measures used, the inventory-to-current-asset ratio is not an explicit part of the DuPont decomposition method and likely not a measure the manager or board reviewing the firm's financial performance would consider when formulating capital structure needs. However, it is an operational factor that impacts the debt usage of grain and farm supply firms throughout the operating year. Endogeneity is a concern if firms anticipate and seek to take advantage of inventory changes by increasing or decreasing short-term borrowing to meet inventory goals. To overcome this potential source of endogeneity, the Hausman and Taylor 2SLS estimator (1981) is used and inventory is instrumented using the measure inventory to current asset ratio (IC).

Endogeneity often remains a concern in an estimation strategy based on the DuPont deconstruction of the rate of return on equity because the DuPont model is based on an identity, and by the construction, at any time period *t*, each of the financial measures in the model are determined simultaneously and highly correlated. There is also no good instrumental variables given all firms in our sample were located in the same geographic area and prices faced by each individual firm are unknown. By taking the naïve expectation form of financial covariates as shown in equation (6), endogeneity of the covariates is partially overcome by lagging the

independent variables one-time period. We also calibrate the explanatory variables so they continue to capture the important financial performance indications given in the DuPont deconstruction while not being identical to elements in DuPont system. [3] The details of the construction calibration of the financial ratios are provided is described in the following section.

Substituting equation (6) in (5) and interacting the financial covariates ${F^k}_{j,t-1}$ with binary variable $type_j$ yield:

$$\delta_{j,t} = \beta^0 + \gamma^0 type_j + IC_{j,t} + \sum_{k\neq 0} \beta_k {F^k}_{j,t-1} + \sum_{k=1}^{K} \gamma^k F_{j,k,t-1} \cdot type_j + \rho_j + \varepsilon_{j,t} \,. \qquad (7)$$

Different financial efficiency measures may have different impacts on firms' optimal leverage decision that are of different organizational structures. Thus interaction terms between financial covariates and firm type can capture these differences.

A short coming of random effect specification is the underlying assumption that unobserved individual specific characteristics is not correlated with the included explanatory variables, i.e. $E[\rho_j | {F^k}_{j,t-1}] = 0$ (Greene). Otherwise fixed effect specification may seem appropriate but then we couldn't estimate γ^k's in equation (7), which are the key interests in this paper. So we address this issue by imposing additional structures on ρ_j. As mentioned before, theory suggests that ρ_j captures the business risk and firm's attitude towards risk as well as all other unobserved firm's specific attributes. Thus we can express ρ_j as:

$$\rho_j = \xi_j + \alpha Z_j \,, \qquad (8)$$

where ξ_j captures the individual business risk each firm faces and all other unobserved firm's specific characteristics. Our data consists of cooperatives and IOFs in the same industry in a relatively small geographic area. Since these firms operate in the same market, it's a reasonable assumption that the unobservable business risk is faced equally by all firms in the data, i.e. $E[\xi_j | {F^k}_{j,t-1}] = 0$. αZ_j represents risk attitude of firm j which depends linearly on firm's wealth level Z_j. In our data, Z_j is represented by the value of fixed asset. In the expected utility theory, unless the utility function is specified as constant absolute risk aversion (CARA), which is hardly observed empirically, the risk aversion level is varied with one's wealth level. It would be farfetched if firm's risk attitude is assumed to be uncorrelated with financial covariates. Instead,

[33] Seminar participants at NCERA 210 rightly identified that without this calibration, the estimation is of an identity. The calibration to the explanatory variables eliminates this concern.

we can substitute equation (7) into (8) and αZ_j will capture the variation of risk attitudes across firms:

$$\delta_{j,t} = \beta^0 + \gamma^0 type_j + IC_{j,t} + \sum_{k\neq 0} \beta_k {F^k}_{j,t-1} + \sum_{k=1}^{K} \gamma^k F_{j,k,t-1} \cdot type_j + \alpha Z_j + \xi_j + \varepsilon_{j,t}. \quad (9)$$

An alternative specification of regression (9) is to add quadratic forms of the financial covariates to recognize the "sticky" nature of change in capital structure.

$$\delta_{j,t} = \alpha\beta^0 + \gamma^0 type_j + IC_{j,t} + \sum_{k\neq 0} \beta_k {F^k}_{j,t-1} + \sum_{k=1}^{K} \gamma^k F_{j,k,t-1} \cdot type_j + \sum_{k=1}^{K} {\gamma_2}^k F^2_{j,k,t-1} \cdot type_j + \alpha Z_j + \xi_j + \varepsilon_{j,t} \ , \quad (10)$$

and the marginal effects take the form:

$$\frac{\partial \delta_{j,t}}{\partial {F^k}_{j,t-1}} = \beta_k + \gamma^k type_j + 2{\gamma_2}^k F_{j,k,t-1} \cdot type_j \quad (11)$$

Clearly, the empirical specification (10) allows the marginal impact of any financial measures on capital structure to be limited by the past performance.

Based on prior theoretical and empirical investigations in the literature, the effect of firm type on capital structure is ambiguous. Our testable hypotheses are based on two distinct schools of co-op theories, co-op financial constraint hypothesis and co-op equity constraint hypothesis. Our regression model lends us the unique advantage of understand the source of difference in capital structure between co-op and IOF without making a prior assumption regarding co-op's objective. These hypotheses are summarized in table 3. If the financial constraint hypothesis holds for cooperatives, they rely more heavily on equity than debt to finance growth and therefore the debt-to-asset ratio of cooperatives should be more sensitive to interest rate changes relative to IOFs because of less portion of debt in their capital structure. We would also expect that any improvement in operating efficiency particularly regarding generating cash flow would lower the debt level of cooperatives for the difficulty in accessing the risky capital implying higher cost of borrowing. However, on the other hand, if cooperatives were not able to obtain sufficient equity funds from patron members, the limiting pool of potential equity investors due to cooperatives' user-owner principle may imply more debt financing. This situation is often referred to the equity constraint hypothesis of cooperatives and describes a much distinct situation from the prior. As for inventory management, we don't expect there is any difference between co-ops and IOFs as to how they might impact capital structure since these two entities are very similar in functions. If

it's more difficult for one firm to finance this type of daily operations than others in such a competitive market, this firm may not survive.

The comparison of financing behavior of cooperatives and IOFs is rather puzzling from a theory perspective. In the next section, we first compare the debt to asset ratios of cooperatives to IOFs and analyze empirically the potential operating factors that may play a role in driving the difference in capital structures between the two entities, if there is any.

Data

The data are a panel of annual accounting information for approximately 100 agricultural grain marketing and supply co-ops and 50 IOFs in Iowa from 1992 – 1995 collected by survey on annual basis. Random sample of firms was selected from the population of facilities licensed with the Iowa Grain and Feed Association. Financial data were provided by the Grain Warehouse Bureau after firm identifying information was removed (Ginder and Baumler, 1997). Table 1 summarizes the accounting information of firms in our dataset which is used to construct the financial ratios. Based on average asset size and annual sales, the cooperatives in our sample are on average larger than the IOFs.

Table 2 provides descriptions of the variables used in this analysis and the estimation for equation (5) which compares the average capital structure and financial efficiencies between co-ops and IOFs. For purposes here, capital structure is measured as the ratio of total liability to total asset. We leave out the firms with debt-to-asset ratio greater one because the interpretations of efficiency measures are not straight forward for firms with negative equity. This procedure is done for 3 observations. Cooperative firms in our sample have a lower debt to asset ratio than do investor owned firms. This observation is consistent with many previous findings while it couldn't serve as an evidence of cooperatives' financial constraint hypothesis for other operating factors could result in co-op's lower leverage besides difficulty in access the risky capital.

A firm's operating efficiencies are reflected in profit margin and asset turnover. *Margin* is the ratio of taxable income to total revenue; taxable income is used instead of pretax profits because of the differential tax treatment cooperatives received that IOFs do not. Cooperatives' profits are generally only taxed once at either the entity or member level where IOF profits are taxed at both the entity level and investor level when distributed as dividends. Interest expense is tax deductible; therefore, IOFs may have a stronger incentive to use debt financing relative to cooperatives. Also, using pretax profit margins isolate a firm's profitability from the effect of tax

treatment and permits the assumption that firms optimize based on their tax situations. In our sample, cooperatives have a higher margin on average than the IOFs which is a reflection of economy of scales as co-ops are larger in asset size and farmers are benefited from the cooperative's larger competitive yardstick. Figure 1 plots the profit margin against capital structure for co-ops and IOFs which exhibits a negative relationship for both organizational types. However, how this margin-leverage relationship might differ between co-ops and IOFs is hard to visualize. *Asset turnover* (ATO) is the ratio of sales (excluding non-operating income from total revenue) to total assets. Average cost of debt is the ratio of annual interest expense to total liability. IOFs appear to be much more efficient likely due to the diminishing margin effect of asset size on asset turnover. Figure 2 plots the asset turnover against capital structure and there is no obvious relationship can be visualized from the graph.

A firm's liability generally consists of short term debt and long term debt as well as other accounts payables. Interest rates on debt with different duration ought to be different thus a measure of average cost of total liability which is commonly used in the literature, doesn't provide an accurate picture of firm's cost of borrowing and adds noise in the analysis. Instead, we use interest coverage ratio defined as profit before tax and interest expense divided by interest expense to measure the ability of firms to meet their ongoing debt obligations. Co-ops on average generates more free cash flow after interest expense as compared with IOFs but there is lots of variability as shown in figure3, and such difference is not significant. Figure 4 plots the inventory to current asset ratio against capital structure and there is positive relationship observed for both co-ops and IOFs which is expected.

Estimation

We estimate equation (6) using a random effects model to exploit the panel nature of our data and to control for unobserved firm-specific characteristics[4]. We focus on whether and to what extent capital structures of cooperatives and IOFs are affected by the four financial and efficiency measures: profit margin, asset turnover, liquidity ratio and effective interest rate. We also compare the marginal impact of these financial measures on capital structure between coops and IOFs. Table 2 presents the results. It is consistent with our observation that cooperatives are less

[4] The Breusch and Pagan Lagrangian multiplier test for random effects indicates that random effects is preferred over OLS, while the Hausman test indicates that a fixed effect model is preferable to random effects. However it assumes all individual characteristics are captured in the unique intercept which will not allow us to compare the differences among the marginal impact of financial measures on capital structure

leveraged than their counterpart IOFs, as indicated by the significantly negative coefficient on $type_{jt}$. As mentioned previously, inventory management affects the same period debt to asset ratio as the operating activities associated with managing inventory requires short term borrowing. The empirical results suggest that for both cooperatives and IOFs, greater inventory to current asset ratio results in higher leverage; however cooperatives are more sensitive to inventory-related changes than are IOF's. That means for additional units of inventory per unit of current assets, coops borrow more to finance the inventory than do IOFs. From the perspective of past operating factors, Cooperatives appear to increase debt usage as they become more efficient in managing sales generated from their assets. This conforms with the functionality of cooperatives since the more capable the cooperatives are of generating sales, the better they are at helping patron members gain access to the output market. The leverage effect will simply increase the sales by allowing the cooperatives to either invest more in capital such as machineries or storage capacities in the long run, or just simply manage to purchase more product from members in the near term. Combining this finding with the impact of inventory to current ratio on capital structure, the latter case seems more plausible. However, in order to generate a competitive return on owner's equity, asset turnover must also be paired up with profit margin. The empirical result suggests that higher profit margins, which ceteris paribus, imply firm are able to generate more internal cash flow result in deleveraging activities for both firm types. In other words, firms tend to rely more on equity financing as they become more profitable. There is no significant difference between coops and IOFs in this regard. Finally we found that even with lower average cost of debt, cooperatives' debt-to-asset ratios respond negatively to the cost of borrowing, while there is no significant effect of interest rates on the debt-to-asset ratio for IOFs in our sample. This may lend support the hypothesis that cooperatives may face greater difficulty accessing the external capital market relative to similar IOFs. However, since the cooperatives capital structure tends to be more related to short term operating activities as discussed earlier and the effective interest rate only is only lagged one time period which may only capture the rate change in the short run, one might suspect that cooperatives are only short term financially constraint but the impact of long term borrowing on capital structure is unidentified.

To investigate this further, we add a measure of debt structure (the ratio of long term liabilities to current liabilities) to our model. Table 3 presents the results. Comparing to table 2, the marginal effects are robust to the change in specification. Comparing the estimates of debt structure between coops and IOFs, we see that as long term liability increases relative to current liability, the debt-to-asset ratio increases for IOFs, which is intuitive (i.e. borrow to finance a long

term project). However, the marginal impact of debt structure on capital structure is negative for coops, suggesting that when coops finance a long term investment using equity and debt, they would raise significant more equity than debt. This is a strong evidence that explains supports our belief that coops rely mainly on equity fund rather than debt to finance the long-lived capital assets or coops may just take a conservative investment strategy to extended that fixed assets can be financed with available equity (Lerman and Parliament, 1993).

Conclusion

Utilizing panel data of agricultural grain and supply firms in Iowa, we find that ownership structure does impact the operating capital structure of a firm. Our empirical findings have shown that cooperatives are less leveraged as compared with IOFs but the evidences that lend support to the financial constraint hypothesis of cooperatives are mixed. That is cooperatives may face higher borrowing cost in the short term but not necessarily in the long run. Given the size of cooperatives, it's understandable that the marginal cost of borrowing is higher when the short term loans in most cases are only backed by the full faith of borrower. However, from a long run perspective, the company usually borrows money to expand business or build a new project. In these situations, the loan is backed by collateral (the fixed asset of a project etc.) and the loan will only cover part of the project's expense. Even in case of default, the lenders (or bond holders) will always be the primary claimer of firm's liquidated assets regardless of the organizational structure of a firm since the equity members will always be the residual claimers. So the lender usually is faced with limited risk and the covenants on a loan are determined case by case. The fact cooperatives carry with more short term debt than long term may be explained by the horizon problem: the empirical result suggests that cooperatives are more likely to follow a conservative investment strategy by using more equity to finance long lived asset, but the older member is not likely benefited from investment of cooperatives' long term projects since the equity is illiquid and she may no longer patronize with cooperatives before the return on investment is realized.

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Table 1. Description of Variables

		Cooperatives		Investor-Owned Firms	
Variable	**Description**	**Mean**	**St. dev.**	**Mean**	**St. dev.**
A_{it}	Total Assets	$8,500,646	$1,020,000	$1,770,871	$2,238,160
D_{jt}	Total Liabilities	$4,246,756	$4,595,540	$ 958,909	$1,198,911
Π_{it}	Pre-tax Profit	$335,814.3	$430,734.9	$44,549.02	$124,968.4
Rev_{it}	Total Revenue	$2,110,000	$2,530,000	$6,830,383	$7,454,138
S_{jt}	Sales (Revenue – non-operating income)	$20,100,000	$24,700,000	$6,687,238	$7,320,792
Int_{it}	Annual Interest Expense	$156,996.4	$159,655	$45,736.33	$61,475.39
CA_{jt}	Current Assets	$4,856,792	$8,635,551	$1,098,971	$1,222,467
Inv_{it}	Inventory	$2,941,892	$3,210,552	$551,073.6	$841,635.3
LTD_{jt}	Long Term Liabilities	$621,783.7	$987,774.8	$243,728.7	$430,761.1
CL_{jt}	Current Liabilities	$3,624,972	$3,900,748	$715,180.9	$882,876.6

Table 2. Constructed Ratios

		Cooperatives	Investor-Owned Firms	
Ratios	**Definition**	**Mean**	**Mean**	Difference
δ_{jt}	Debt to Asset Ratio = D_{jt}/A_{jt};	0.468	0.519	-0.052*
$margin_{jt}$	Profit Margin = $\pi_{jt}\ /Rev_{jt}$;	0.018	0.011	0.007***
ATO_{jt}	Asset Turnover = $S_{jt}\ /A_{jt}$	2.467	5.115	-2.648***
Liq_{jt}	Liquidity = $Inv_{jt}\ /CA_{jt}$	0.605	0.434	0.170***
i_{jt}	Interest coverage ratio= $EBIT_{jt}\ /Int_{jt}$	15.824	6.597	9.228
$DebtStr_{jt}$	Debt Structure = LTD_{jt}/CD_{jt}	0.157	.477	-0.290***

Notes: Significance levels indicated as: * p<0.1; ** p<0.05; *** p<0.01.

Table 3. Constructed Ratios

Ratios	Co-op Financial Constraint Hypothesis	Co-op Equity Constraint Hypothesis
	Co-ops vs. IOFs	**Co-ops vs. IOFs**
Debt/Asset	Lower	Higher
The impact of financial efficiencies on capital structure		
Margin	Negative	Positive
ATO	Negative	Positive
Liquidity	No difference	No difference
ICR	Negative	Positive
Debt Structure	Positive	Positive

Figure 1 Capital structure vs. Profit Margin

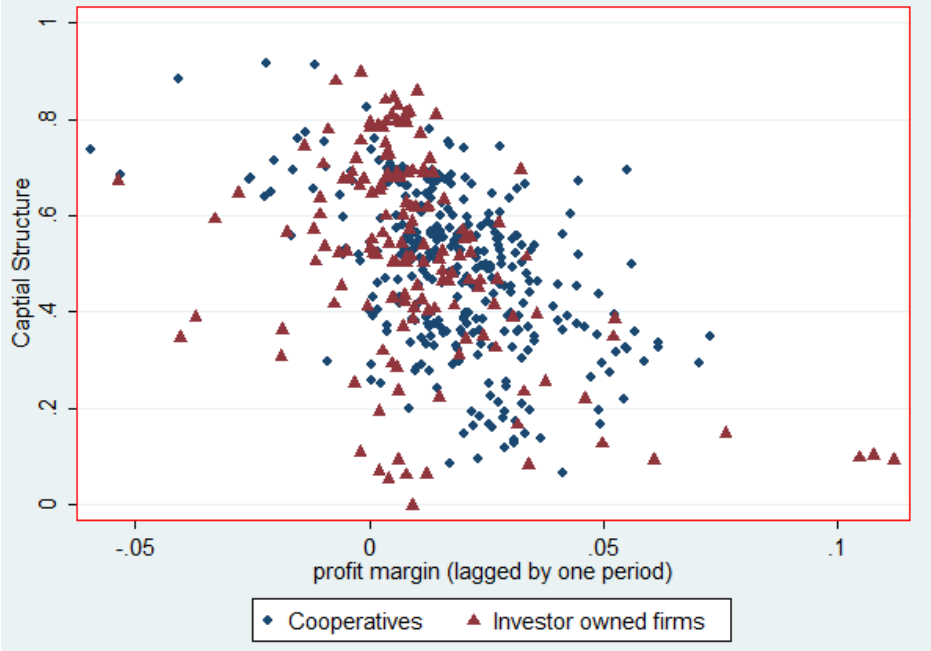

Figure 2 Capital structure vs. asset turnover

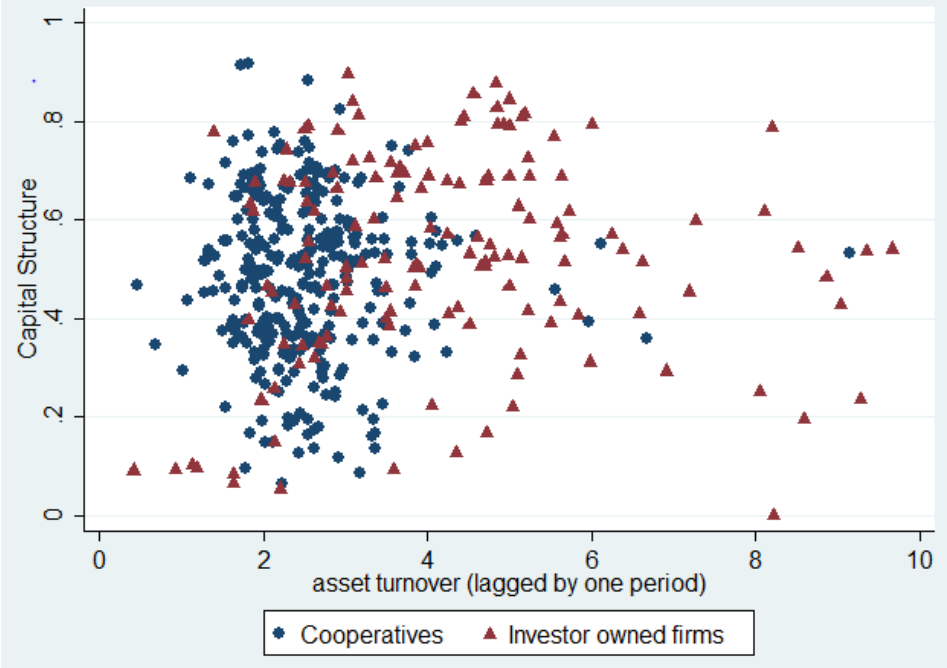

Figure 3 Capital structure vs. Interest Coverage ratio

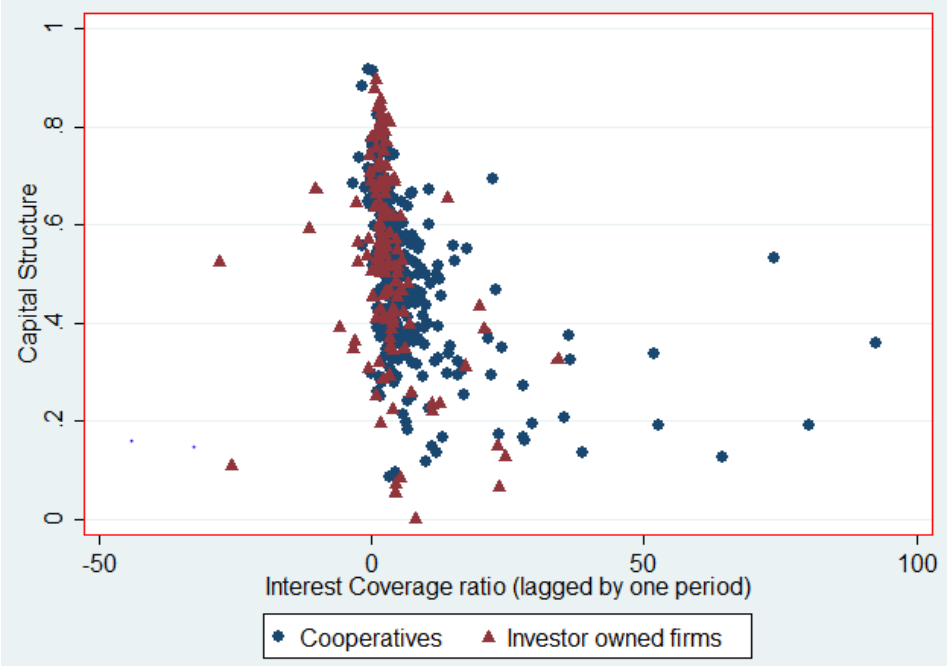

Figure 4 Capital structure vs. liquidity

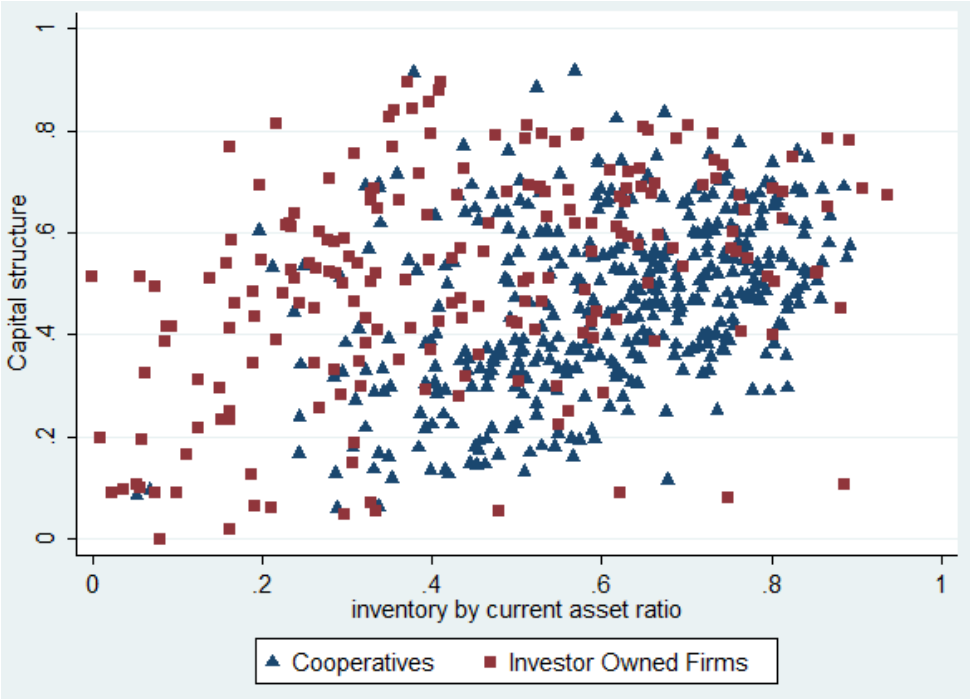

Table 1

Estimated Marginal Effects on Capital Structure from a Random Effects Model by Firm Type

Dependent variable: debt-to-asset ratio

Impact on debt ratio of different organizational structures		avg. debt cost	liquidity	margin	asset turnover
Cooperatives	est.	0.002	0.375***	-1.551***	0.101*
	(p-value)	(0.327)	(0.000)	(0.002)	(0.019)
Investor Owned Firms	est.	-0.035***	0.159***	-0.939	0.004
	(p-value)	0.001	0.006	0.127	0.583
Difference in effects between coops and IOFs	est.	0.037***	0.216***	-0.613	0.097
	(p-value)	(0.001)	(0.007)	(0.437)	(0.873)

legend: * p<0.1; ** p<0.05; *** p<0.01

Table 2. Estimated Marginal Effects on Capital Structure from a Random Effects Model by Firm Type

	Cooperatives	Investor Owned Firms	Difference
Type ????			
$margin_{jt}$	-1.739***	-1.244**	-0.496
	(0.002)	(0.028)	(0.503)
ATO_{jt}	0.018*	-0.003	0.022**
	(0.071)	(0.294)	(0.041)
Liq_{jt}	0.347***	0.169***	0.179**
	(0.000)	(0.002)	(0.019)
i_{jt}	-0.827**	-0.041	-0.786**
	(0.034)	(0.804)	(0.021)

Notes: Marginal effects estimated from a random effects model on debt to asset ratio. p-values in parentheses. Significance levels indicated as: * p<0.1; ** p<0.05; *** p<0.01.

Table 3. Estimated Marginal Effects on Capital Structure from a Random Effects Model by Firm Type

	Cooperatives	Investor Owned Firms	Difference
Type ????			
$margin_{jt}$	-1.819***	-1.136*	-0.683
	(0.00)	(0.041)	(0.347)
ATO_{jt}	0.021**	-0.004	0.025**
	(0.034)	(0.209)	(0.016)
Liq_{jt}	0.349***	0.206***	0.144**
	(0.000)	(0.006)	(0.056)
i_{jt}	-0.811	-0.058	-0.753**
	(0.327)	(0.724)	(0.025)
$DebtStr_{jt}$	-0.060**	0.061***	-0.121***
	(0.040)	(0.000)	(0.000)

Notes: Marginal effects estimated from a random effects model on debt to asset ratio. p-values in parentheses. Significance levels indicated as: * p<0.1; ** p<0.05; *** p<0.01.