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Investment Constraints in Agricultural Cooperatives

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Abstract

Though horizon and portfolio problems are commonly thought to limit cooperatives' ability to capitalize on investment opportunities, empirical inquiry into the existence of these constraints is sparse, and recent conceptual arguments suggest that the horizon problem in particular may be less severe than commonly believed. Using surveys of members of three cooperatives, this study investigates the extent to which indicators of potential horizon and portfolio problems influence members' preferences for cooperative investment in value-added processing technology. The evidence points to the existence of two types of horizon problems and two types of portfolio problems influencing cooperative members' investment preferences.

Key words: Cooperatives, Investment Constraint, Horizon Problem, Portfolio Problem

Investment Constraints in Agricultural Cooperatives

Introduction

Scholars suggest that restrictions on transferability of residual claim rights and a lack of a liquid secondary market for them result in a disincentive for user-owners to invest in business growth opportunities (Condon, 1990; Iliopoulos, 1998; Nilsson, 2001; Vitaliano, 1985). For these reasons, traditional cooperatives seem particularly susceptible to investment horizon and portfolio problems, and in some cases, adopt non-traditional cooperative models (Chaddad and Cook, 2002; Cook, 1995; Cook and Iliopoulos, 1998; Nilsson, 1999). These investment constraints are two of the five vaguely defined property rights problems identified by scholars as limitations of the cooperative form (Cook, 1995; Iliopoulos, 1998; Peterson, 1992; Porter and Scully, 1987; Staatz, 1987; Vitaliano, 1985).

Despite conceptual and anecdotal support of horizon and portfolio problems, empirical evidence is scarce and inconclusive. Though Iliopoulos (1998) finds evidence of both constraints using surveys of U.S. cooperatives' CEOs and CFOs, Fahlbeck (2007) fails to find evidence of horizon problems using surveys of Swedish cooperatives' members. Moreover, mathematical models by Olesen (2007) and Fulton and Giannakas (2012) imply that the horizon problem is less severe than typically argued. Olesen (2007, p. 252) concludes from his own findings that, "horizon problems cannot explain underinvestment in cooperatives. Instead, underinvestment must be explained by other problems, e.g. free rider problems, portfolio problems, or limited access to capital." Still, Chaddad, et al. (2005) find that U.S. cooperatives are capital constrained, suggesting that one or all of these potential constraints are binding to some degree.

This study investigates the extent to which variants of the investment horizon and portfolio problems exist in a traditional multipurpose cooperative, a member-investor

cooperative, and a new generation cooperative using 1170 responses to member surveys. Binary logit analysis of survey data informs whether members' attributes (e.g., nearness to retirement, commodity diversification, intentions to expand production) significantly impact their preferences for cooperative investments in value-added processing technologies.

Literature on the investment horizon problem has focused primarily on the residual horizon problem (Ellerman, 1986; Gittinger, 1972). This issue is also referred to as the *short-term* horizon problem, as active members nearing retirement may oppose investments from which they cannot extract the complete *present value* of future benefits during their membership horizon. In addition to this horizon problem, this study finds support for a *current obligation* horizon problem, wherein members with high debt obligations and/or cash constraints may oppose additional investments, particularly if they have limited ability to borrow against their cooperative investment (i.e., lender places little value on cooperative shares as collateral).

The quintessential portfolio problem is believed to occur in cooperatives spanning many commodity divisions with increasingly specialized members (Plunkett, 2005). Such lateral portfolio problems arise as members are unable to adjust their cooperative asset portfolios to reflect their degree of commodity specialization. In addition to this version of the portfolio problem, this study also finds evidence of a vertical dimension that arises as members are unable to adjust their cooperative asset portfolios to reflect their preference for degree of vertical integration and capital intensity within a specialized commodity.

The paper proceeds with a summary of the relevant literature and resulting hypotheses. Next, the survey data and research context are discussed, followed by the empirical results. The paper concludes with implications and direction for further research.

Literature & Hypotheses

Difficulties in acquiring and redeeming cooperative patrons' equity capital are considered major constraints to the growth and sustainability of these organizations (Bonin, et al., 1993; Caves and Petersen, 1986; Furubotn and Pejovich, 1972; Murray, 1983). Several explanations are offered for the inability of user-owned organizations to acquire sufficient risk capital to finance investment opportunities.

First, property rights allocations in traditional cooperatives do not offer strong incentives to invest (Cook, 1995; Cook and Iliopoulos, 2000; Knoeber and Baumer, 1983; LeVay, 1983; Vitaliano, 1983). Residual claims in these organizations are non-appreciable, since they are non-transferable and are redeemable only at book value (Van Wassenae, 1989). As patrons therefore benefit mainly through usage via favorable prices and patronage refunds, their incentive to invest risk capital is limited. Furthermore, patrons may share in the cooperative's return on equity without investing, thereby giving rise to free-riding and under-financing of the cooperative (Knoeber and Baumer, 1983).

Second, cooperatives traditionally have restricted residual claims since only active members provide equity capital. That is, traditional cooperatives can only source equity from active members. Thus, the acquisition of risk capital is limited by the number, wealth, and risk bearing capacity of current members. The aforementioned inability to transfer residual claims prevents the functioning of secondary markets for cooperative stock and leads to portfolio and horizon problems. That is, members of traditional cooperatives tend to influence investment decisions since they cannot capture the future payoffs of the cooperative's risky investments due to the horizon problem, nor adjust their individual investment portfolio to match their risk preferences due to the portfolio problem (Jensen and Meckling, 1979; Porter and Scully, 1987).

Other arguments supporting the presence of capital constraints in cooperatives include that equity capital is tied to patronage, cooperative equity is not permanent, and cooperatives have limited access to external funding. Cooperatives depend mainly on internally generated capital or patronage to acquire risk capital. Internally generated capital is redeemable at the discretion of the cooperative's board of directors. Since redeeming equity is a cash outlay, lenders may not consider allocated patronage refunds sufficiently permanent equity capital to support loans, thus limiting cooperatives' access to debt capital (Parliament and Lerman, 1993).

Each of these explanations for potential investment constraints in cooperatives seems to stem from heterogeneity in cooperative membership. While cooperative memberships have always included farmers of all ages and at all points in the life of their farm businesses, most farms in the Midwest U.S. (and likely elsewhere) were typically diversified family operations with grain, hogs, cattle or perhaps dairy, and similar production technologies up until the 1970s (Ginder, 1999). However, over time, membership became more heterogeneous, placing greater emphasis on the time horizon issue. The degree of membership heterogeneity can be measured by variation in size, degree of specialization, financial position, and geographic dispersion of farm operations, farmers' age or time horizon, education level, and percentage non-farm income (Ginder, 1999; Iliopoulos and Cook, 1999).

The literature on the cooperative investment horizon problem has largely focused on the return on capital in the *residual* or *short-term* horizon problem, in which members who are near retirement prefer only short-term investments that may be recouped quickly.¹ This horizon problem occurs when a member's residual claim on the net income generated by a growth opportunity is shorter than the asset's productive life and ownership rights to the firm's assets are non-transferable (Ellerman, 1986; Porter and Scully, 1987). Traditional cooperatives tie formal

claims on residual income to patronage (Staatz, 1987). Thus, members benefit from investments until they cease to patronize the cooperative and surrender any future residual claims (Staatz, 1987; Vitaliano, 1983). That is, members do not directly realize the capitalized value of the cooperatives' future income streams beyond their expected membership horizons. Thus, active members nearing retirement might have time preferences skewed slightly toward the present. Since they have shorter membership horizons, these members discount associated income streams beyond their membership horizon to zero. These members prefer short-term investments with a quick payback since they cannot capture the future value of long-term investments during their membership horizon.

Hypothesis 1. The number of years until retirement is positively associated with the preference for further investments in the cooperative.

Following Krumpleman-Farmer (2005), other variants of the horizon problem may exist. Under the *current obligation* horizon problem, members with current cash flow constraints have time preferences skewed toward the present (Krumpleman-Farmer, 2005). While such members benefit from residual claims, taxes on residual claims in combination with current obligations to service debt may outweigh those benefits. Therefore, these members pressure the cooperative to not retain all of the equity allocated as they generally prefer to receive higher cash in the year earned but may accept slightly lower amounts if they can borrow against the cooperative investment. However, if members are unable to secure such loans, then they will likely oppose any further investments. Thus, we hypothesize:

Hypothesis 2. The ability to borrow against the cooperative investment is positively associated with support of investment opportunities.

The *portfolio problem* constitutes another investment constraint in traditional cooperatives. The lack of transferability, liquidity, and appreciation mechanisms for residual claims prevents members from adjusting their cooperative asset portfolios to match their personal risk preferences (Cook, 1995). Since investment and patronage decisions are linked, some members find they hold suboptimal investment portfolios and pressure the cooperative to rearrange the portfolio to be more consistent with their preferences, even if it means lower expected returns. As noted earlier, most farms were historically diversified family operations producing several commodities with similar technologies (Ginder, 1999), but more recently many operations have become more specialized, and traditional multipurpose cooperatives now serve the input procurement and marketing needs of a more heterogeneous mix of diversified and specialized patrons. This variation in diversification/specialization among cooperative memberships leads to the classical (lateral) portfolio problem. Accordingly, we hypothesize:

Hypothesis 3. Diversification in commodity production is negatively associated with support of investment into specialized value-added technology.

Plunkett (2005) introduces the possibility of a vertical portfolio problem, where support for cooperative investments that entail vertical integration, for instance into value-added processing, may also vary with the size of members' farm operations. Research indicates that larger farmers tend to participate more in cooperatives (Wadsworth, 1991), and in general, larger farmers are more likely to adopt new technology (Barham, et al., 2014; Just, et al., 1980; Khanna, 2001). Furthermore, smaller, diversified members may prefer less investment in cooperative assets that underpin further specialization in value added processes relative to larger,

expanding, specialized farmers. Hence, larger farmers may be relatively more supportive of cooperative investments and those in value-added processing technologies in particular.

Hypothesis 4a. Intentions to expand the farm operation are positively associated with support of investment into specialized value-added technology.

However, Plunkett (2005) argues that patron-members with larger and expanding operations may be more interested in investment opportunities that support farm profitability and expansion, whereas members with smaller operations that face constraints in expansion will more likely support investment opportunities that add value to existing production. This conclusion is drawn based on the logic that large farmers should enjoy a greater on-farm return on investment (ROI) than smaller farmers due to economies of scale. Hence, any prospective cooperative investment in *investor-assets* (e.g., value-added processing technology) with an anticipated ROI between that of small and large farmers will be more likely to be supported by small farmers than by large farmers. Large and expanding farmers rather support investments in *user-assets* (e.g., collection stations, warehousing, and agronomy services, like spraying) that further facilitate on-farm ROI. Hence, we may also hypothesize:

Hypothesis 4b. Intentions to expand the farm operation are negatively associated with support of investment into specialized value-added technology.

Measures and Methods

Research Design

This study analyzes data from mail surveys of three agricultural cooperatives conducted between December 2004 and May 2005. Table 1 summarizes the ownership rights and survey response

rates for each of the four cooperatives. West Central is a traditional cooperative, whereas Northeast Missouri Grain Processors is a new generation cooperative and Fonterra Co-operative Group is a member-investor cooperative. West Central is a traditional grain marketing multipurpose cooperative located in west central Iowa. Northeast Missouri Grain Processors is a new generation cooperative that provided the majority of equity for a corn ethanol plant in Macon, Missouri. Fonterra is a leading multinational dairy company owned by over 13,000 New Zealand dairy farmers and represents about 95% of New Zealand's milk.

Personal interviews with cooperative top management, the board of directors, and researchers from various institutes informed the general survey design. This draft was sent back to key individuals (e.g., general manager, chief financial officer, board chairperson) at each cooperative, and meetings were arranged to modify the survey to better fit the circumstances of each cooperative in order to enhance comprehension of the questions. Once approved by the respective cooperatives, finalized surveys were sent to the entire memberships of Northeast Missouri Grain Processors and Fonterra and subsamples of West Central Cooperative's membership based on size and specialization. Surveys were sent to 910 members of West Central Cooperative, and 160 completed surveys were returned for a 17.6% response rate or about 5% of the membership (Table 1). Surveys were sent to all 311 members of Northeast Missouri Grain Processors, and 96 completed surveys were returned for a 31% response rate. Surveys were sent to the entire Fonterra membership of 12,144 shareholders at that time, and 997 completed surveys were returned for an 8.2% response rate.

Measures

Summary statistics are given in Table 2. The dependent variable, *ValueAddedTech*, is coded as a binary variable equal to 1 if the responding member supports cooperative investment in value-added processing technology and zero otherwise. The mean statistic indicates that 51% of respondents support such investments. The only continuous explanatory variable is number of *Commodities* that respondents produce, which ranges from one to six. The average respondent produces two commodities. The remaining explanatory variables are binary, with values of one and zero indicating affirmative and negative responses, respectively. Mean statistics indicate that about half of the respondents plan to wait at least five years before relinquishing control of the farm (*Relinquish in > 5 Years*), 18% have lenders that value cooperative equity at 90% or more of its market value (*Lender Value >90%*), 13% have over half of their household income coming from the farm (*Farm/HH Income > 50%*), and 62% intend to expand (*Intend to Expand*). About 6% of the respondents are from NEMO, 66% are from Fonterra, and 11% are from WWC.

Results

Correlations

With the exception of strongly negative correlations among cooperative binary variables, most correlations are fairly small (Table 3). The next strongest correlation is -0.28 between *Fonterra* and *Commodities*, reflecting a relatively greater focus on dairy production among members of this cooperative. Other notable correlations between *Relinquish in > 5 Years* and *WCC* (0.16) and *Intend to Expand* (0.18) reflects that several WCC members plan to continue running their farm operations well into the future, as do producers that plan to expand operations. Correlations also seem to suggest that Fonterra shares are more often valued at greater than 90% of their

market value relative to those of the other two cooperatives. Moreover, correlations are indicative of somewhat more positive sentiment regarding value-added technology among NEMO and WCC members overall than among Fonterra members.

Regressions Results

Results for probit regressions of the binary dependent variable, *ValueAddedTech*, are reported in Table 4. McFadden's (1974) R^2 is low but as Hoetker (2007) notes, this measure does not directly equate to R^2 in ordinary least squares regressions. Hence, we also consider the proportion of correct predictions. For this sample, the mean of is 0.51 (Table 2), so a naïve model (i.e., predicting a value of one for every observation) predicts 51% of the observations correctly. The reported model does only slightly better, predicting 57% of the observations correctly (Table 4). Thus, even though the model identifies some significant relationships, other factors may be identified in the future that will help to better explain cooperative member investment preferences.

As just noted, several statistically significant marginal effects are detected (Table 4). The marginal effect of 0.061 for *Relinquish in > 5 Years* indicates that cooperative members that plan to retain control of their farming operations for at least the next five years are 6% more likely to support investment in value-added technology on average, which supports Hypothesis 1 (i.e., *residual or short-term* horizon problem). Support for Hypothesis 2 (i.e., the *current obligation* horizon problem) is also obtained, as evidenced by the significant effect of *Lender Value > 90%*. Specifically, if a cooperative member's lender values cooperative equity at 90% of market value or more, then that member is 7% more likely to support the investment on average. In other

words, a cooperative member is more likely to support further investment in the cooperative if the member can use that equity as collateral against a loan.

Evidence of portfolio problems is also apparent (Table 4). Hypothesis 3 (i.e., the conventional lateral portfolio problem) is supported by the statistically significant effect of *Commodities*, which indicates that producing an additional commodity decreases the probability of support for investments in value-added technology by 3% on average. That is, specialized (rather than diversified) producers are more likely to support such investments, given that this kind of investment tends to be commodity-focused. Hypothesis 4 (i.e., vertical portfolio problem) is supported by the significant effect of *Intend to Expand*, which indicates that anticipated expansion of production in next five years increases probability of supporting said investments by 7%. This result is also consistent with the generally greater participation in and utilization of cooperatives by larger producers (Wadsworth, 1991). Finally, the binary dummy variable, *Fonterra*, indicates that members of this cooperative are significantly less likely (16% on average) than members of the base group, *NEMO*, to support such investments.

Conclusions

Though horizon and portfolio problems are commonly thought to limit cooperatives' ability to capitalize on investment opportunities (Cook, 1995; Iliopoulos, 1998; Peterson, 1992; Porter and Scully, 1987; Staatz, 1987; Vitaliano, 1985), empirical inquiry into the existence of these constraints is sparse (Fahlbeck, 2007; Iliopoulos, 1998), and recent conceptual arguments suggest that the horizon problem in particular may be less severe than commonly believed (Olesen, 2007). Using surveys of members of three cooperatives, this study investigates the extent to which indicators of potential horizon and portfolio problems influence member

preferences for investment in value-added processing technology. The evidence points to the existence two types of horizon problems and two types of portfolio problems influencing cooperative members' investment preferences. Reported regression models are able to account for only small amounts of the variation in investment preferences, suggesting opportunities for future work to delve deeper into determinants of cooperative members' investment preferences.

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Endnotes

¹ See Vitaliano (1985) for a conceptual framework depicting the residual horizon problem using a graphical analysis of a two period investment and Ellerman (1986) for a framework covering the residual horizon problems while comparing ownership rights in investor-owned and labor-managed firms.

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Table 1. Ownership Rights for the Surveyed Cooperatives and Survey Response Rates.

Ownership Rights	West Central	Northeast Missouri Grain Processors	Fonterra
Restricted to members	Yes	Yes	Yes
Redeemable from cooperative	C stock: 10-12 year revolving period; B stock: retire	Non-Redeemable	Immediate
Benefits user or investor	User	Investor/User	Investor
Proportional to member investment	No	Yes	Recently yes
Survey response rate	17.6% (160 of 910 sent)	31% (96 of 311 sent)	8.2% (997 of 12,144 sent)

Table 2. Summary Statistics.

Variable	N	Mean	Std. Dev.	Min	Max
ValueAddedTech	1198	0.51	0.50	0.00	1.00
Relinquish in > 5 Years	1497	0.50	0.50	0.00	1.00
Lender Value > 90%	1497	0.18	0.39	0.00	1.00
Farm/HH Income > 50%	1497	0.13	0.34	0.00	1.00
Commodities	1465	2.44	1.17	1.00	6.00
Intend to Expand	1434	0.62	0.49	0.00	1.00
NEMO	1497	0.06	0.24	0.00	1.00
Fonterra	1497	0.66	0.48	0.00	1.00
WCC	1497	0.11	0.31	0.00	1.00

Table 3. Correlations.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. ValueAddedTech	1.00								
2. Relinquish in > 5 Years	0.09	1.00							
3. Lender Value > 90%	0.04	0.02	1.00						
4. Farm/HH Income > 50%	-0.01	-0.03	-0.07	1.00					
5. Commodities	-0.02	0.02	0.04	0.01	1.00				
6. Intend to Expand	0.07	0.18	0.11	-0.01	-0.01	1.00			
7. NEMO	0.05	-0.01	-0.02	0.10	0.32	-0.04	1.00		
8. Fonterra	-0.12	-0.13	0.12	-0.10	-0.28	0.10	-0.56	1.00	
9. WCC	0.11	0.16	-0.13	0.03	0.09	-0.09	-0.12	-0.76	1.00

Table 4. Marginal Effects for Binary Probit Regression of Preference for Cooperative Investment in Value Added Technology.

	ValueAddedTech
Relinquish in	0.061**
>5 Years (Binary)	(0.031)
Lender Value	0.065*
>90% (Binary)	(0.036)
Farm/HH Income	-0.021
>50% (Binary)	(0.048)
Commodities	-0.030**
	(0.014)
Intend to Expand	0.070**
	(0.032)
Fonterra	-0.159***
	(0.057)
WCC	0.030
	(0.069)
<i>McFadden's R²</i>	0.023
Percentage correctly	
classified: Y=1	64%
Y=0	50%
Overall	57%

Note: $N = 1148$, *, **, *** denote statistical significance at 10%, 5%, 1%. Standard errors in parentheses.