Cooperative Finance and Governance: Signaling Risk with Investment and Retained Earnings

Abstract This study proposes a signaling model to better understand how information asymmetry affects retained earnings and debt for investment in a context where cooperative governance can be either managerial or member-oriented. When cooperatives cannot observe investment of other cooperatives, banks can infer their type, safe or risky, based on their investment behavior. When they can observe the investment of others, banks set interest rates to elicit different behaviors regarding retained earnings. Signaling plays a key role in the loan path of cooperatives. Our model also explains how the managerial orientation of cooperatives affects their bank relationship.

Keywords
Cooperative governance, cooperative finance, loan path, asymmetric information, signaling.

1 Introduction

Cooperatives are purpose-based organizations. Owners are not only investors seeking financial performance but also users of productive assets. Control is democratic (one person, one vote), preventing concentration of power. Profit sharing is based on the volume of transactions made with the cooperative and not on financial investment, so that the organization does not deviate from the initial purpose. From a historical perspective, cooperatives are long-lasting. They are major actors in the agribusiness and finance industry. This success is puzzling when considering the disincentives (Boone and Özcan, 2014) and property rights issues (Cook, 1995) implied by the statutory limitations related to their governance principles[1].

From an economic perspective, a first drawback of cooperative governance is the non-tradability of shares, implying financial constraints (Chaddad and Heckelei, 2005) and short-term horizon (Cook, 1995). It prevents the exchange of cash for value and makes banks cooperatives' main external financial partner. A second drawback of cooperative governance is that the democratic control does not incite members to invest optimally. On the one hand, members limit necessary investment as they tend to want cash transfers to their own business, a bias known as the horizon problem (Cook, 1995). On the other hand, members may freeride on the effort of others, leading to a principal/agent issue à la Jensen and Meckling (1976). In practice, cooperatives can be rather traditional and underinvest, or managerial and diversify extensively (Hogeland, 2006; Iliopoulos, Cook and Chaddad, 2016).

We propose a model where banks are not able to distinguish risky from safe cooperatives. We investigate how investment and retained earnings can signal risk, and how the managerial orientation affects this relationship. We find that safe coops have an interest in using more retained earnings to signal their type, which is in line with observations (Lerman and Parliament, 1990; Russell and Featherstone, 2017; Royer and Mckee, 2020; Cadot, 2022). Moreover, the signaling effect of investment is magnified by the managerial orientation. This latter may decrease the initial interest rate and imply conflicting loan renegotiation (Roberts, 2014) when cooperatives are managerial.

By focusing on asymmetric information between banks and cooperatives, we depart from most models which characterize cooperative finance by generally dealing with heterogeneity in membership structures. We propose a parameter to characterize the preference for investment reflecting the managerial orientation of cooperatives. The original contribution of our model is to establish a link between the internal governance of cooperatives and their bank relationships based on the signaling dimension of investment and financial structure.

Section 2 presents the model and the coop financial behavior in perfect information. Section 3 shows how signaling occurs and how it is affected by managerial orientation.

[1]Cooperatives benefit from a special legal status in most countries, but the main principles are the same: democratic control, profitt allocation based on patronage, user/owner.

2 The Model

2.1 Financing cooperatives with debt

2.1.1 Cooperatives' profit function

We define G as an exogenous gain (profit from past operations) at $t = 0$. The discount factor of the cooperative is ρ_c, and $V(i)$ is the long-term value function created by investment i. Furthermore, function $V(i)$ is increasing and concave in i and the first derivative, $V_i(i)$, is decreasing and convex in i,[2] meaning that $V_i > 0$, $V_{ii} < 0$, and $V_{iii} > 0$.

The exogenous gain G is not large enough to finance investment, but the cooperative can use debt d provided by the bank. We distinguish short- from long-term utilities for cooperative members who decide the level of debt and investment. The cooperative profit function is:

$$\Pi(d, i) = U(d, i, G) + \rho_c V(i) - \rho_c p(1 + r^*)d, \tag{1}$$

Where function $U(d, i, G)$ corresponds to the short-term utility, with d the level of debt raised. Function U is quasi-concave and subject to the following assumptions:

Assumption 1 $U_i(d, i, G) = Um_1 < 0$.

Assumption 1 means that the short-term marginal disutility of investment is negative. It formalizes the reluctance of members to use profit as retained earnings instead of proceeding to cash payments or allocating profits to themselves.

Assumption 2 $U_d(d, i, G) = U_G(d, i, G) = Um_2 > 0$.

Assumption 2 implies that the short-term marginal utility of cash is independent of the origin of funds (debt or exogenous gain). Then, we can define the coefficient $\alpha \in]0, 1]$ as an index of managerial orientation, such as:

Assumption 3 $Um_1 = -\alpha Um_2 < 0$.

Assumption 3 relates the short-term marginal disutility of investment to the short-term marginal utility of cash inflows. Parameter α reflects the preference for investment of the cooperative board, i.e. its managerial orientation.

If $\alpha = 1$, the cooperative is indifferent between investing or renouncing one dollar in the short term. This corresponds to the rational preference of standard governance. When $\alpha < 1$ the marginal disutility of investment in absolute value is lower than the marginal utility of cash inflows in the short term, corresponding to managerial governance, the cooperatives being more manager-oriented when $\alpha \to 0$.

We also assume that $U(G) = \alpha G$, so that α reflects the discount on cash holding by managerial boards who do not value cash per se, but rather its impact on investment capacity. As such, the index of managerial orientation, α, captures the managerial behavior regarding both the value and use of cash.

[2]We use an indexed variable in the function to refer to the first partial derivative.

Function $V(i)$ corresponds to the long-term value of investment, being independent of the repayment capacity and probability of success p. This assumption states that members can benefit from asset value through their business relationships as users even if their owner status may be jeopardized by financial mismanagement.

Finally, $\rho_c p(1+r^*)d$ corresponds to the discounted total cost of debt, which is determined by the expected utility of the bank. Interest rate r^* is determined by p, the probability of success, and collateral $k \in [0,1]$, which reflects the investment tangibility.

The bank is risk neutral, so the interest rate decreases with the probability of success and investment tangibility. As such, expected gain EU_b for the bank is the weighted sum of the discounted repayment recovered in the case of success, and the discounted collateral in case of default (where ρ_b represents the discount factor of the bank). We assume that the bank industry is competitive and has an expected profit equal to zero:

$$EU_b = \rho_b\big(p(1+r^*)d + (1-p)ki\big) = d. \tag{2}$$

Finally, the cooperative members and the banks differ in their investment horizons (Staatz, 1989; Cook, 1995), as per the following assumption:

Assumption 4 $\rho_c < \rho_b$.

Assumption 4 is consistent with the common wisdom of a short investment horizon of cooperatives.

2.1.2 Optimal Strategic decisions

Under perfect information, the cooperative's objective is to find the optimal levels of debt and investment (d^*, i^*) that maximize profit subject to financial constraint. This aims to maximize the profit function subject to the financial constraint:

$$\begin{cases} \max_{\{d,i\}} \ \Pi(d,i) = U(d,i,G) + \rho_c V(i) - \rho_c p(1+r^*)d \\ \ s.t. \\ G + d \geq i. \end{cases} \tag{3}$$

The optimal amount of investment and debt are the solutions of the following system:

$$\begin{cases} U_d(d^*\,,\, i) \ - \rho_c p(1+r^*) = 0 \\ U_i(d\,,\, i^*) + \rho_c V_i(i^*) = 0. \end{cases} \tag{4}$$

By Assumption 3, the optimal level of investment for any α is solution of :

$$\alpha p(1+r^*) = V_i(i^*). \tag{5}$$

The result (5) shows that cooperatives invest until the long-term value created by investment equals the long-term cost of debt weighted by the index of managerial orientation.

2.1.3 Standard Governance Cooperatives

Let us consider the case of standard governance under perfect information, when decisions are taken by rational leaders ($\alpha = 1$).

Proposition 1 *Under standard governance and perfect information, the cooperative trades off between the marginal cost of debt and the long-term marginal value of one dollar invested. This trade-off (i) does not depend on the discount factor of the cooperative and (ii) the cooperative uses the exogenous gain for cash payment to members.*

Proof:

(i) ρ_c does not appear in the trade-off illustrated in result (5).

(ii) Let us denote by Π^{pay} the profit G allocated to members for cash payment and by Π^{inv} the profit when cooperatives invest G. Then:
$\Pi^{pay} = U(G) + \rho_c(V(i^*) - i^*p(1 + r^*))$,
$\Pi^{inv} = U(0) + \rho_c(V(i^*) - (i^* - G)p(1 + r^*))$.
As $\alpha = 1$, $U(G) = G$. Moreover, $U(0) = 0$. Then, $\Pi^{pay} > \Pi^{inv} \Leftrightarrow \rho_c < \frac{1}{p(1+r)}$
Because of equation (2), $\rho_b < \frac{1}{p(1+r)} \Leftrightarrow (1 - p)ki > 0$, which is always true.
From Assumption 4, it is always true that $\Pi^{pay} > \Pi^{inv}$.

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A key result of the proposition 1 is that the marginal cost of debt has more impact on investment behavior than the investment horizon of cooperatives. This is interesting, as the possible underinvestment of cooperatives is often explained by their supposedly short investment horizon (Cook, 1995; Liang and Hendrikse, 2013). Furthermore, the second part of proposition 1 implies that the entire investment is financed by debt.

2.1.4 Managerial Governance Cooperatives

Let us consider the case of managerial governance under perfect information ($\alpha < 1$). We denote by i^*_α the level of investment of managerial cooperatives.

Proposition 2 *Under managerial governance and perfect information, the cooperative trades off between the marginal cost of debt weighted by the managerial governance index and the long-term marginal value of one dollar invested. This trade off implies that*

(i) $i^*_\alpha > i^*$

(ii) managerial cooperative invests G *iif* $\alpha < \hat{\alpha} = \rho_c(1 + r^*)p$.

Proof:

(i) In the trade-off illustrated in the result (5), the left-hand side decreases as α decreases since $p(1+r^*)$ is constant. The right-hand side decreases and is convex in i. Therefore, level of investment i^*_α increases to maintain the equality true.

(ii) Let us denote by Π_α^{pay} the profit when managerial cooperatives capture G and by Π_α^{inv} the profit when managerial cooperatives invest G. Then:

$\Pi_\alpha^{pay} = \alpha G + \rho_c(V(i^*) - i^* p(1 + r^*))$
$\Pi_\alpha^{inv} = \rho_c(V(i^*) - (i^* - G)p(1 + r^*))$
Then, $\Pi_\alpha^{pay} \geq \Pi_\alpha^{inv}$ if and only if $\alpha \geq \hat{\alpha} = \rho_c(1 + r^*)p$

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From proposition 2, under perfect information, cooperatives are more prone to retain earnings ($i^* = d^* + G$) when they are more managerial, when they have a longer investment horizon, and when debt cost is high. The different levels of investment reflect the divergences between the "traditional" governance leaders and managers more prone to invest (Iliopoulos et al., 2016).

2.2 Financing different types of co-ops under perfect information

In the following, we consider that cooperatives can differ in their probability of success p (ability to repay the loan). For modeling purposes, we consider the simple case where two types of cooperatives coexist. The risky cooperative (indexed under bar) is the bad type, the $\underline{p}$-coop. The safe (indexed upper bar) is the good type, the $\overline{p}$-coop (with $\underline{p} < \overline{p}$).

We assume that default implies non-contractible costs related to the higher risk of default. Therefore, the bank always applies a higher cost of debt to the risky cooperatives than to safe ones (assumption 5), implying that $\underline{r}^* > \overline{r}^*$. :

Assumption 5 $\overline{p}(1 + \overline{r}^*) < \underline{p}(1 + \underline{r}^*)$,

From assumption 5 and result (5), the following result holds:

$$\begin{cases} \alpha\underline{p}(1 + \underline{r}^*) = V_i(\underline{i}^*) \\ \alpha\overline{p}(1 + \overline{r}^*) = V_i(\overline{i}^*). \end{cases} \tag{6}$$

For managerial governance cooperatives ($\alpha < 1$), the following proposition holds.

Proposition 3 *In the case of managerial governance, with two different types of cooperatives and under perfect information, the cooperative trades off between the marginal cost of debt weighted by the managerial governance index and the long-term marginal value of one dollar invested. This trade-off implies that:*

(i) $\overline{i}_\alpha^* > \underline{i}_\alpha^*$

(ii) $(\overline{i}_\alpha^* - \overline{i}^*) > (\underline{i}_\alpha^* - \underline{i}^*)$

(iii) $\overline{p}$*-coops and* $\underline{p}$*-coops' investment of exogenous gain depends on* α*, as follows:*

- *If* $\alpha \geq \hat{\alpha}_1 = \rho_c(1 + \underline{r}^*)\underline{p}$*, then* $\overline{i}_\alpha^* = \overline{d}_\alpha^*$*, and* $\underline{i}_\alpha^* = \underline{d}_\alpha^*$
- *If* $\alpha < \hat{\alpha}_2 = \rho_c(1 + \overline{r}^*)\overline{p}$*, then* $\overline{i}_\alpha^* = \overline{d}_\alpha^* + G$ *and* $\underline{i}_\alpha^* = \underline{d}_\alpha^* + G$
- *If* $\hat{\alpha}_1 > \alpha \geq \hat{\alpha}_2$*, then* $\overline{i}_\alpha^* = \overline{d}_\alpha^*$ *and* $\underline{i}_\alpha^* = \underline{d}_\alpha^* + G$

Proof:

(i) By Assumption 5, result (6), and because V_i is decreasing.

(ii) By Assumption 5 and because V_i is decreasing and convex.

(iii) By assumption 5, $\hat{\alpha}_1 = \rho_c(1+\underline{r}^*)\underline{p} > \hat{\alpha}_2 = \rho_c(1+\overline{r}^*)\overline{p}$. Since $\Pi_\alpha^{pay} \geq \Pi_\alpha^{inv}$, if and only if $\alpha \geq \hat{\alpha} = \rho_c(1+r^*)p$ (see proof of Proposition 2).

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From proposition 3, safe managerial cooperatives invest more than risky ones (first point of proposition 3). Moreover, the investment gap is wider when cooperative leaders behave as managers (second point of Proposition 3). Figure 1 illustrates these points. Finally, safe cooperatives are more prone to use the exogenous gain for cash payment to cooperative members (third point of proposition 3).

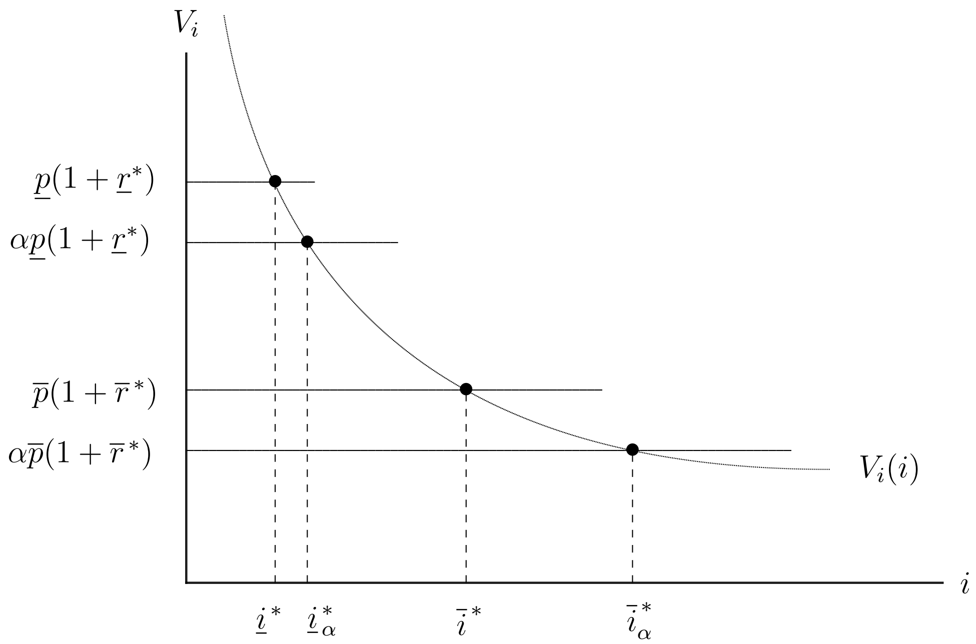

Figure 1. Optimal level of investment for different types of cooperatives under perfect information.

If cooperative types are not observable by the bank (asymmetric information), the risky cooperatives have an interest in mimicking the safe ones for two reasons: to enjoy a lower cost of debt, and to benefit from the value created by a higher level of investment. We address this issue for two cases of incomplete information - when cooperatives cannot observe the investment of other cooperatives, and when cooperatives cannot observe the retained earnings of others.

3 Signaling types of co-ops under imperfect information

This section studies how banks counteract the asymmetric information about the cooperatives' probability of success with different degrees of incomplete information between cooperatives. The timing of events is the following for the two cases of incomplete information:

1. Nature draws p in set $\{\underline{p}\,;\,\overline{p}\}$ with, $\underline{p} < \overline{p}$ and probabilities ν and $1-\nu$.
2. Cooperatives observe p and the bank only observes the set of p.
3. The bank proposes r^S in set $\{\underline{r}^S\,;\,\overline{r}^S\}$ with $\underline{r}^S > \overline{r}^S$.
4. Cooperatives choose an interest rate $r^S \in \{\underline{r}^S\,;\,\overline{r}^S\}$ under incomplete information and decide the level of investment i^S and level of debt d^S.
5. The bank observes $\{\underline{i}^S\,;\,\overline{i}^S\}$ announced by both types of cooperatives and can readjust its interest rate proposal if necessary.
6. Cooperatives review their level of investment and debt according to the terms proposed by the bank.

3.1 Financing co-ops with signaling investment

Let us consider the following imperfect information case: the bank cannot distinguish between the different types of cooperatives (asymmetric information); cooperatives cannot observe the investment behavior, nor the level of requested debt of other cooperatives (first case of incomplete information). The following proposition describes the optimal solutions in this case:

Proposition 4 *Let $[(\underline{r}^S;\overline{r}^S)]$ be the contract under asymmetric (the bank does not observe p) and incomplete information (cooperatives do not observe i, d, nor G of others), then signaling via investment occurs, whatever the governance of the cooperative:*

(i) $\underline{r}^S = \underline{r}^*$, $\underline{i}^S = \underline{i}^*$ *and* $\underline{d}^S = \underline{d}^*$

(ii) $\overline{r}^S = \overline{r}^*$, $\overline{i}^S = \overline{i}^*$ *and* $\overline{d}^S = \overline{d}^*$

Proof: Under asymmetric information, $\underline{p}$-coops will claim a low default likelihood (high probability of success), equal to those of $\overline{p}$-coops to enjoy a lower interest rate. Consequently, the bank will first propose the interest rate of $\overline{p}$-coops to $\underline{p}$-coops and then readjust (see the timing of events). As their likelihood of default is higher, the total level of expected repayment is lower than safe cooperatives. So:

$$\underline{p}(1+\overline{r}^S) < \overline{p}(1+\overline{r}^S) < \underline{p}(1+\underline{r}^S). \tag{7}$$

From results (5) and (7), the announced levels of investment for both types of cooperative, $\underline{i}^S$ and $\overline{i}^S$, are such that:

$$V_i(\underline{i}^S) < V_i(\overline{i}^*) = V_i(\overline{i}^S) < V_i(\underline{i}^*). \tag{8}$$

As function V is increasing and concave, $\underline{p}$-coops have an incentive to invest more than $\overline{p}$-coops which do not have any incentive to modify their behavior (the long-term marginal value of investment is still equal to the marginal cost of debt). Therefore:

$$\underline{i}^S > \overline{i}^* = \overline{i}^S > \underline{i}^*. \tag{9}$$

However, as the bank observes the announced level of investment, this will act as a signal. As the $\underline{p}$-coop's announcement clearly reflects overinvestment, the bank can detect the type of each cooperative. Then, the bank provides cooperatives with the debt and interest rate related to their level of risk, like under perfect information. In this context, the bank does not need to design an incentive contract to screen the different types and the optimal solution of perfect information holds.

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From proposition 4 investment may act as a signal. A consequence is that risky cooperatives may resent the bank relationship because a switch from a low interest rate offer to a higher one once the bank has identified their type. This result is in line with Roberts (2014) who provides evidence of frequent renegotiation among banks and firms to complete contracts especially following the contract implementation. Furthermore, the managerial orientation tends to exacerbate the investment differences and thus amplifies the signaling effect of investment:

Corollary 1 $\underline{i}^S_\alpha - \bar{i}^* > \underline{i}^S - \bar{i}^*$.

Proof: Because of result (5) and as $\alpha\underline{p}(1+\bar{r}^S) < \underline{p}(1+\bar{r}^S)$, it follows that $\underline{i}^S_\alpha > \underline{i}^S$. Furthermore, as function V is increasing and concave, if $\alpha > \alpha'$, then $\underline{i}^S_{\alpha'} - \bar{i}^* > \underline{i}^S_\alpha - \bar{i}^*$.

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Corollary 1 establishes that the more managerial a cooperative is, the stronger is the signaling effect. Indeed, $\underline{p}$-coops have an incentive to overinvest, which is bigger when α decreases, meaning risky cooperatives are easier to detect by the bank. Figure 2 summarizes the results. Now, a new risk of conflict appears: the rise of the debt cost may make retained earnings the preferred choice of cooperative leaders but cooperative members anticipate cash distribution.

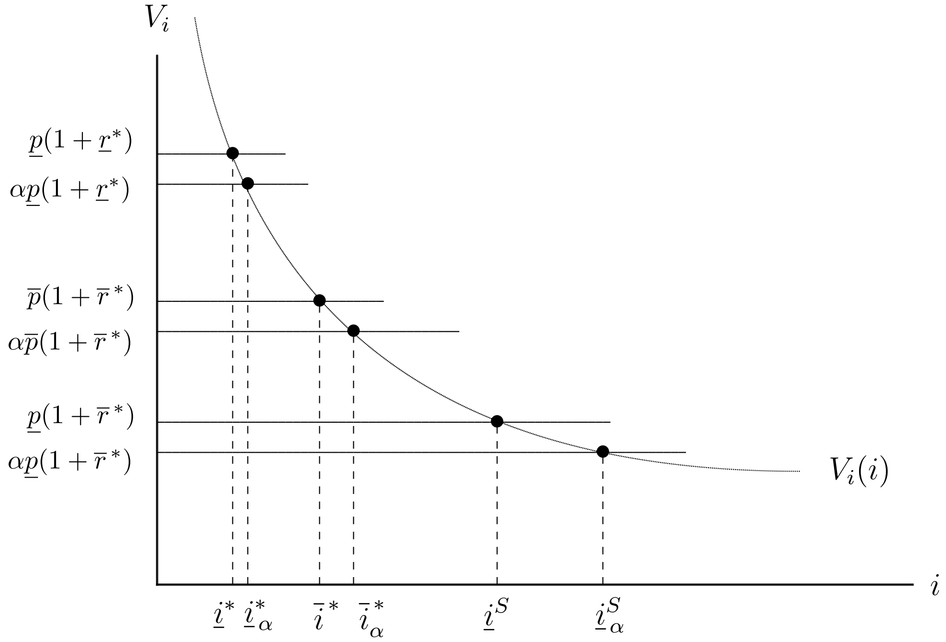

Figure 2. Optimal level of investment with signaling.

3.2 Financing co-ops with signaling retained earnings

Let us consider the following imperfect information case: the bank cannot distinguish between the different types of cooperatives (asymmetric information); each type of cooperative knows the interest rate paid by the other, and their investment behavior, but cannot observe the level of requested debt nor their retained earnings (second case of incomplete information). The following proposition describes the optimal solutions in this case:

Proposition 5 *Let $[(\underline{r}^S_\alpha; \overline{r}^S_\alpha)]$ be the contract under asymmetric (the bank does not observe p) and incomplete information (cooperatives do not observe d nor G, but can observe i of the other type), then signaling through retained earnings occurs:*

(i) $\underline{r}^S_\alpha = \underline{r}^*$, $\underline{i}^S_\alpha = \underline{i}^*$ *and* $\underline{d}^S_\alpha = \underline{d}^*$

(ii) $\overline{r}^S_\alpha = \overline{r}^*$, $\overline{i}^S_\alpha = \overline{i}^*$ *and* $\overline{d}^S_\alpha = \overline{d}^*$

Proof: Under asymmetric information, $\underline{p}$-coops will claim a low default likelihood (high probability of success), equal to $\overline{p}$-coops, to enjoy a lower interest rate, $\overline{r}^S_\alpha$. Consequently, the bank will first propose the interest rate leading to signalling behavior and then readjust it (see the timing of events). From the proof of proposition 2:

$$\Pi^{pay}_\alpha \geq \Pi^{inv}_\alpha \Leftrightarrow (1+r) \leq \frac{\alpha}{\rho_c\, p} \tag{10}$$

Therefore, the bank computes $\overline{r}^S_\alpha$ so that:

$$\frac{\alpha}{\rho_c\, \overline{p}} < (1+\overline{r}^S_\alpha) < \frac{\alpha}{\rho_c\, \underline{p}} < \frac{1}{\rho_c\, \underline{p}} \tag{11}$$

In this case, cooperatives have different financial behaviors for the same interest rate, $\overline{r}^S_\alpha$: $\underline{p}$-coops want to use G for cash payment to members ($\underline{d}^S_\alpha = \underline{i}^S_\alpha$) while $\overline{p}$-coops want to retain G to invest ($\overline{d}^S_\alpha < \overline{i}^S_\alpha$). The bank observes these different financial behaviors, screens for type, and revises the contract accordingly. Each type of cooperative pays the interest rate under perfect information related to their risk level. This result applies $\forall\, \alpha \in]0,1]$.

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From proposition 5 retained earnings act as a signal when cooperatives can observe the investment of others but not their financial structure (the proportions of debt and equity). In line with standard results in finance, retained earnings signal the quality of firms' projects (Leland and Pyle, 1977; Holmstrom and Tirole, 1997). An implication of proposition 5 is that the more managerial a cooperative is, the lower is the interest rate used to signal its type. Generally, a renegotiation for the risky cooperative follows. Safe cooperatives can benefit from a lower interest rate than expected and cooperative leaders may have the possibility to proceed to cash payment. It is the opposite for risky cooperatives. The renegotiation will result in interest rates which may lead cooperative leaders to prefer retained earnings, which is more likely if cooperatives are managerial (proposition 3).

4 Conclusion

Our model shows that investment and retained earnings can act as a signal mitigating the asymmetric information problem for cooperatives' finance. Retained earnings can act as a signal for safety leading banks to readjust their offer. The novelty of our result relies on the link between the managerial orientation and the primary offer of banks. The more managerial the cooperative, the lower the primary interest rate.

Additionally, while the signaling interest rate will be set to make them willing to transfer cash to members, the readjustment of interest rates may lead risky cooperative leaders to prefer retained earnings. Safe cooperative leaders will be in the opposite situation. They can either benefit from a better cash position (since they are not required to invest cash) or proceed to cash payment to members.

To sum up, while cooperatives present specific governance features, they should not be exposed to credit rationing. However, the re-adjustment of the bank contracts implies different loan paths (Roberts, 2014) according to the nature of the informational problem (asymmetric and/or incomplete) and their governance type (managerial or member-oriented). This opens new perspectives for empirical research on cooperative finance.

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