Journal of Cooperatives

Volume 29 *2014* *Page 27-49*

Distributing Patronage Income Under Differing Tax Rates and Member Risk Preferences

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Abstract:

This paper examines the effects of income tax rates and member risk preferences on the distribution of patronage income in a local agricultural cooperative. The paper uses a modified mean-variance model to provide some discussion points on how to consider the interaction of tax and member risk preferences on maximizing member benefits. Our results suggest that qualified earnings distributions should be relatively low under current tax policy conditions, and consideration should be given to using non-qualified distributions. Also, optimal patronage income distributions are more affected by significant changes in member risk preferences than significant changes in taxes.

Key Words: Cooperatives, Finance, Tax Policy, Risk Preferences, Capital Structure

JEL Classifications: Q13, Q14, Q18,

Introduction

The purpose of this article is to examine a unique and complex decision for a cooperative's board of directors, the distribution of the cooperative's patronage income. When it comes to patronage income, that is income generated by the patron-owners, the cooperative board of directors must decide what portion will be returned to the membership in the form of cash patronage, what portion will be retained as allocated equity held in the patron-owner's name, what portion will be retained as unallocated equity (i.e., cooperative retained earnings), or some combination of these decisions. Furthermore, these decisions have tax implications for the patron-owner and the cooperative. If patronage income is distributed on a qualified basis, then the patron-owner pays their marginal tax rate on the allocated income (either distributed as cash or as allocated equity). Non-qualified distributions indicate that the cooperative pays the tax, which is the case on unallocated equity and on non-qualified, allocated equity (note that the cooperative receives a tax credit at the redemption of this equity). As such, the decision to distribute patronage income can be complicated, but the distribution

should always be done in a way that maximizes the patron-owner's or member's return, which is largely held as the primary goal of any cooperative (VanSickle and Ladd, 1983; Sexton, 1986).

While there is no universally accepted "optimal" distribution of a cooperative's earnings to its membership, some studies have attempted to provide guidance to a cooperative board of directors. For example, the decision to pay relatively large or small portions of refunds in cash has produced mixed results. Research focusing on member cash flows (Royer and Shihipar 1997, and VanSickle and Ladd 1983) and on least-cost financial structure (Dahl and Dobson 1976) suggests that benefits to members are higher under a high-cash-patronage refund regime (Royer and Shihipar suggest that this situation holds only for younger producers). In contrast, findings from Knoeber and Baumer (1983) suggest that optimal cash patronage is dependent on the relative returns of the farm and cooperative. Given that they find that returns to the cooperative are higher than farming returns, cash patronage refunds (which are invested in the farm) should be low.

Beierlein and Schrader (1978) examined the effects of various financing strategies, including qualified earnings, on member benefits of cooperative membership. Their results suggest that the use of a qualified earnings revolving fund to finance 15% of the cooperative is superior to a 100% qualified revolving fund in terms of the after-tax present value of member benefits.

Finally, member risk preferences also play a significant role in the board's decision to distribute earnings. In particular, the decision to build capital through patron-owner equity or through debt capital was examined by Parcell, Featherstone, and Barton (1998). Using various member risk aversion levels, they derived optimal solvency ratios for cooperatives using stochastic interest rates. They found that as cooperatives increased equity levels derived from earnings, a cooperative was able to reduce business risks, but the result was lower profitability. However, the use of debt to leverage the business was heavily influenced by member risk preferences with more risk-averse members preferring lower amounts of leverage.

Recently, a renewed interest has occurred in examining a cooperative's decision to allocate patronage income. In particular, distributing patronage income on a non-qualified basis has received a lot of attention by academics (Boland, 2013; and Kenkel, Barton, and Boland, 2014) as well as at numerous farmer cooperative conferences. Non-qualified distributions of patronage income are still held as retained patronage or allocated equity with the patron-owner's

name on the equity by the cooperative, but the cooperative pays the tax initially. When the non-qualified distribution is redeemed or paid back to the patron-owner, the patron-owner pays the tax and the cooperative receives a tax credit. The tax implications of these non-qualified distributions provide another way for a cooperative's board of directors and management to maximize member's return.

Given this elevated interest in qualified and non-qualified distributions, this article develops a straightforward two-period portfolio model that examines the decision to distribute patronage income. In particular, we build off of the existing literature but specifically consider the impact of taxes and member risk preferences on the decision to distribute patronage income. Our review of the literature shows very few studies consider taxes and member risk preferences when addressing the "optimal" patronage income distribution decision. Therefore, our analysis adds to the extant literature in this manner.

While our analysis does not provide the "optimal" strategy for a board of directors to distribute the cooperative earnings, it does provide some further discussion points on how to consider the interaction of taxes and member risk preferences on maximizing member benefits. In short, our results suggest that qualified earnings distributions should be relatively low under the actual returns scenario primarily because the patron-owner's tax rates are greater than the cooperative tax rate. Also, the effect of changes in member risk preferences on optimal qualified earnings distribution is more economically significant than potential changes in tax policy. Finally, the estimated certainty equivalent rate of return to the patron-owner should be about 8 percent.

Distributing and Retaining Patronage Income

A critical decision for a cooperative's board of directors is to distribute patronage income for the benefit of the patron-owner. While many details contribute to this decision, the primary issue is how much patronage income should be held as equity for the cooperative or paid in cash back to the patron-owner. For many farmer cooperatives, a primary source of equity is the patron-owners' patronage business. In return for providing equity to the cooperative, patron-owners want the cooperative to use the equity in a way that provides services through non-monetary returns such as faster elevator legs, more storage capacity, and spraying services. By contrast, patron-owners may want cash patronage, which reduces the amount of equity available to the cooperative. As a result, a cooperative's board of directors must give special consideration when they decide whether to distribute patronage income back to the patron-owner as cash or retain it as equity on either an allocated and/or unallocated basis.

Paying cash patronage to members is also crucial as some members may prefer to use these cash funds to invest in their own operations. From a discounted cash flow perspective, all members will prefer to receive cash today as opposed to receiving it in the future because of the time value of money. The relative preference of receiving cash today will be driven by the median-member's discount rate. Furthermore, cash patronage comports with the view that cooperatives raise (lower) the net price received (paid) for the members' outputs (inputs).

While paying out cash patronage might be in the best short term self-interest of the membership, retaining adequate equity is critical for a cooperative's long term viability and success. Using and building equity from earnings is necessary to replace depreciated assets and invest in expansion of the cooperative. Expansion and growth also allows the cooperative to take advantage of economies of scale, a key part of the purpose of its establishment according to Nourse's Competitive Yardstick Theory (Nourse, 1922).

Given a cooperative's single taxation structure, the decision to retain patronage income or pay out cash patronage to members is influenced by the relative income tax structures faced by cooperatives and their members. Members pay taxes on "qualified" earnings, whether the member receives them as cash patronage refunds or as earnings allocated to them and held on the cooperative's balance sheet. Cooperatives pay federal taxes according to the C corporation tables on all "non-qualified" earning distributions, at least initially in the case of non-qualified, allocated equity, as well as any earnings from non-member or non-patronage sources. Furthermore, cooperative boards of directors' interest on the tax implications has elevated recently as some are exploring the use of non-qualified distributions (Boland, 2013).[a]

Another responsibility of the cooperative board, when it comes to distributing patronage income, is to align decisions with the risk preferences of members. Particularly important in this regard is the members' investment of equity in the cooperative. Cooperative net worth has grown rapidly in recent years. Total U.S. cooperative net worth grew from $20.57 billion in 2006 to $31.3 billion in 2011, an average yearly increase of 9% (USDA). Given these increases in equity, and the associated increased responsibility of the board to manage this equity in accordance with member preferences, the present study will also

[a] Key Cooperative in Iowa is using non-qualified distributions to manage the tax burden on members. (Kenkel Barton, and Boland, 2014)

consider the effect of member risk preferences on the retention of patronage income as equity.

While retaining and distributing earnings are two important decisions for a board of directors, few studies have addressed the implications of taxes and member risk preferences on patronage income distribution. Though a significant amount of research has been conducted regarding optimal equity allocation, taxes have not been treated as a variable of interest. For example, Royer and Shihipar (1997) explicitly state that while taxes are included in their model of patron preferences, the tax rate is treated as neutral to the results of the analysis and is chosen arbitrarily. Another contribution of this article is an analysis of the impact of effective tax rates on the distribution of patronage income.

The present work examines the effects of tax rates and farmer risk preferences on the cooperative board's decision to distribute patronage income. To do so, we use a standard two-period expected utility model similar to Knoeber and Baumer (1983) and sensitivity analyses to determine the robustness of these effects. Effective tax rates from 2005 to 2010 and empirically-determined farmer risk preferences from Parcell, Featherstone, and Barton (1998) are used to incorporate member risk preferences into the analysis.

Theoretical Model

To simplify and focus the complex patronage income distribution decision, a set of reasonable, albeit simplistic, assumptions are necessary to create a tractable model that focuses on the role of taxes and member risk preferences in making patronage income distribution decisions. First, boards of directors are assumed to be perfect agents of the members with perfect knowledge of the members' preferences as to the management of the assets of the cooperatives. While this is a strong assumption, it is not entirely unreasonable because a cooperative's board of directors is made up of members who come from the local area. These preferences of the members dictate the decisions of the board and its management.

A set of qualified and non-qualified assumptions are imposed so the model focuses on the tradeoff between different tax rates. The model assumes that all qualified, allocated patronage earnings are paid as 100% cash. From here on, this distribution assumption is referenced as QE. The percent of available patronage income to distribute is designated as qualified earnings are denoted by ω. The remaining percentage amount of available patronage income, $(1 - \omega)$, is retained as unallocated equity so the cooperative pays the tax on these earnings because

the distribution is not qualified. From here on, this distribution assumption is referenced as NQE.

Though these assumptions clearly deviate from any one specific cooperative firm's complex decision framework, we believe they are reasonable for providing guidance and insights into the interaction between taxes and member risk preferences. Furthermore, these assumptions are made so that the problem can be analyzed in an analytically tractable model. In addition, a variant of this model (discussed below) has been used in previous research (Knoeber and Baumer 1983) on cooperative capital decisions. Finally, several cooperatives do employ a similar approach to distributing patronage income such as the Harvest Land Co-op in Indiana, most Farm Credit Associations, and other marketing and supply cooperatives.

For any cooperative board of directors, their objective should be to maximize the member's return on investment in the cooperative. To capture this objective along with the differences between member (QE) and cooperative (NQE) tax rates and member risk preferences, we employ a two-period portfolio model to analyze the effect of tax rates and member risk preferences on the patronage income distribution policy. Furthermore, this model ignores redeeming any allocated equity so there is no discounting of future cash flows to the patron-owner (however, further extensions of this model could consider allocated equity and how differences in discount rates impact member return on investment).

In our proposed framework, the member only receives a return on investment if they conduct patronage business with the cooperative. This "return on use" comes in the form of cash patronage payments and in having access to and utilizing the cooperatives fixed assets, such as elevators and services and agronomics. Using the cooperatives assets and services provides a return on investment that comes in the form of "non-monetary" returns but still provide benefits to members. As such, the after-tax return on the member's use of the cooperative (R_U) is decomposed into the return on patronage income allocated to patron-owner (R_{QE}) and the return on unallocated equity (R_{NQE}). Decomposing returns in this manner allows us to focus on the difference between tax structures for the patron-owner and the cooperative.

The after-tax return on qualified earnings, R_{QE}, is approximated by the member's after-tax return on assets. This procedure is a reasonable proxy for the return on QE because the opportunity cost of investment in the cooperative is the member investing in his or her own operation. Therefore, the assumption is that

the cash patronage refund received will be invested in the member's operation and receive a return equal to the member's after-tax return on assets.

The after-tax return on non-qualified earnings, R_{NQE}, is approximated by the cooperative's after-tax return on assets. This procedure is a reasonable proxy for the return on NQE because the unallocated equity (retained earnings) of the cooperative funds the fixed assets which generate value for the patron owners, such as non-monetary returns that provide benefits to farmers through faster elevator legs, more storage space, additional agronomy services, etc. Given that the return on non-qualified earnings is taxed at the cooperative level, the after-tax return on cooperative assets is a reasonable proxy for the return on these earnings.

Thus, the after-tax return on the member's investment in the cooperative can be described as follows:

$$R_U = R_{QE}T_f + R_{NQE}T_c \quad (1)$$

where

$$T_f = (1 - t_f), \quad (2)$$

$$T_c = (1 - t_c), \quad (3)$$

and t_f and t_c are effective farm and cooperative income tax rates, respectively.

We can write the expected rate of return on this portfolio as

$$E(R_U) = \omega E\big(R_{QE}\big)T_f + (1 - \omega)E\big(R_{NQE}\big)T_c \quad (4)$$

where ω is the percent of expected available patronage income available to distribute to the member on a qualified basis. The variance of $E(R_U)$ is

$$\sigma_U^2 = \omega^2 T_f^2 \sigma_{QE}^2 + (1 - \omega)^2 T_c^2 \sigma_{NQE^2}^2 + 2\omega(1 - \omega)T_f T_c Cov_{R_{QE}R_{NQE}}. \quad (5)$$

The board selects ω so that the next period's member's utility, E_1, is maximized (Knoeber and Baumer, 1983). We assume that the utility function exhibits constant relative risk aversion and is specified as

$$v(E_1) = A - e^{-\lambda E_1} \quad (6)$$

where A is a constant that restricts the range of the function, and λ, which is positive, is the coefficient of absolute risk aversion (Pratt 1964). Since E_1 is assumed to be a normally-distributed random variable, the certainty equivalent z is

$$z = E(E_1) - \frac{\lambda}{2}\sigma_{E_1}^2. \tag{7}$$

According to Freund (1956), maximizing z is equivalent to maximizing expected utility. Since $E(E_1)$ is equal to $E_0[1 + E(R_U)]$, and $\sigma_{\mathrm{E}_1}^2$ is equal to $\mathrm{E}_0^2\sigma_{\mathrm{R_U}}^2$, the maximization problem is

$$\underset{\omega}{\mathrm{Max}}\ \mathrm{z} = \mathrm{E}_0[1 + \mathrm{E}(\mathrm{R_U})] - \frac{\lambda}{2}\mathrm{E}_0^2\sigma_{\mathrm{R_U}}^2 \tag{8}$$

$$s.t. 0 \le \omega \le 1.$$

The constraint on ω ensures that there are no short sales. Using equations 4 and 5 and noting the restriction on ω in equation 8, the first order condition is

$$\begin{aligned}\frac{\partial \mathrm{z}}{\partial \omega} = {} & \mathrm{E}_0\left[\mathrm{E}(\mathrm{R_{QE}})\mathrm{T_f} - \mathrm{E}(\mathrm{R_{NQE}})\mathrm{T_c}\right] \\ & - \lambda\mathrm{E}_0^2\left[\omega\sigma_{\mathrm{R_{QE}}}^2\mathrm{T_f}^2 - (1-\omega)\sigma_{\mathrm{R_{NQE}}}^2\mathrm{T_c}^2 + (1-2\omega)\mathrm{Cov}\mathrm{R_{QE}}\mathrm{R_{NQE}}\mathrm{T_f}\mathrm{T_c}\right] \\ & = 0\end{aligned} \tag{9}$$

Solving for the optimal portfolio allocation gives

$$\omega^* = \left.E(R_{QE})T_f - E(R_{NQE})T_c\right/\lambda E_0\left(\sigma_{R_{QE}}^2 T_f^2 + \sigma_{R_{NQE}}^2 T_c^2 - CovR_{QE}R_{NQE}T_f T_c\right) \tag{10}$$

Finally, we find the following comparative statics:

$$\frac{\partial \omega^*}{\partial \lambda} = \frac{E_0^2[\omega\sigma^2_{R_{QE}}T_f^2 - (1-\omega)\sigma^2_{R_{NQE}}T_c^2 + (1-2\omega)Cov_{R_{QE}R_{NQE}}T_fT_c]}{\frac{\partial^2 z}{\partial \omega^2}} \lessgtr 0 \quad (11)$$

$$\frac{\partial \omega^*}{\partial T_f} = \frac{-E_0E(R_{QE}) + 2T_f\lambda E_0^2[\omega\sigma^2_{R_{QE}} + (1-2\omega)Cov_{R_{QE}R_{NQE}}T_c]}{\frac{\partial^2 z}{\partial \omega^2}} \lessgtr 0 \quad (12)$$

$$\frac{\partial \omega^*}{\partial T_c} = \frac{E_0E(R_{NQE}) + 2T_C\lambda E_0^2[-(1-\omega)\sigma^2_{R_{NQE}} + (1-2\omega)Cov_{R_{QE}R_{NQE}}T_f]}{\frac{\partial^2 z}{\partial \omega^2}} \lessgtr 0 \quad (13)$$

Equation 11 shows the effect of risk aversion on the optimal share of patronage earnings designated as qualified earnings. Intuitively, the sign of this derivative is dependent on the variances and covariance of the return on QE and NQE. A positive (negative) sign on equation 11 indicates that more (less) risk-averse members prefer a larger (smaller) share of their patronage income designated as QE. The expectation is that a higher variance of returns on QE will tend to make this derivative negative, while a higher variance of returns on NQE will tend to make it positive.

Equations 12 and 13 depict the effect of farmer and corporate taxation on the optimal allocation of patronage income, respectively. The signs of these derivatives are uncertain and depend on the expected returns and variances on QE and NQE, the covariance between these returns and the farm and cooperative income tax rates. These comparative statics also illustrate that the impact of one tax rate on the optimal allocation is affected by the other; the comparative statics in equations 12 and 13 are functions of both tax rates. A positive (negative) sign on equation 12 indicates that a lower (higher) effective tax rate on farm profits would increase (decrease) the optimal allocation of QE. A positive (negative) sign on equation 13 indicates that a lower (higher) effective tax rate on cooperative profits would increase (decrease) the optimal allocation of NQE.

Recalling the definitions given in equations 2 and 3, we expect that equation 12 will generally be positive, and equation 13 will generally be negative. All other things equal, an increase in farm tax rates will likely decrease the share of net income allocated as QE. Conversely, an increase in cooperative income tax rates will likely increase the share of net income allocated as QE. Both of these effects are due to their direct effect on after-tax returns on member equity. Sensitivity analyses described in the next section will examine the relationships described in equations 11, 12, and 13.

Empirical Analysis

To examine the effects of member risk preferences and tax rates on the optimal share of patronage income allocated to patron-owners, we use empirically-estimated farmer risk preferences and data on farm, cooperative, and publicly-traded agribusiness firm rates of return and tax rates. Empirically-estimated member risk preference information is taken from Parcell, et. al (1998) in the form of relative risk aversion coefficients used in that study. Four tax scenarios are chosen to illustrate the effect of changes in tax policy on the decision to allocate available patronage income on a qualified basis.

Financial statement data on Kansas farms and cooperatives from 2005 to 2010 from the Kansas Farm Management Association (KFMA) and CoBank RiskAnalyst Database are used to estimate effective tax rates and rates of return for farms and cooperatives, respectively. Returns and their variances can be found in Table 1, and summary statistics for the effective tax rates can be found in Table 2. As indicated in these tables, the cooperative returns were both higher and less variable than the farm returns over the time period considered.

Corporate level effective tax rates were estimated for two investor-owned firms. Effective tax rates for two publicly-traded agribusiness firms, Syngenta and Archer Daniels Midland, were calculated using the firms' annual reports from 2005 to 2010. Summary statistics for the effective tax rates can be found in Table 2.

The covariance between average returns of farms and cooperatives in the six years of data was roughly zero. Since we did not have access to data that would allow a more robust calculation of the covariance, we selected three covariance values of -0.1, 0, and 0.1. Further support for this low to zero covariance is found in Knoeber and Baumer (1983). They examined the relationship between covariance of farm and cooperative returns and the share of earnings allocated to members. The covariance was not statistically significantly related to the share of patronage refunds retained by cooperatives, and thus was not a significant factor in determining the board's patronage income distribution policy. This suggests that the covariance between the two returns is low.

Approximations of actual returns and variances were used to generate the two scenarios in Table 3. The first scenario assumes that farm returns and variances exceed cooperative returns and variances. The second scenario assumes that cooperative returns and variances are higher than farm returns and variances.

On average and over the time period considered, the average cooperative tended to have a higher return than the farm.

To determine the effects of changes in the effective tax rates paid by farms and cooperatives on the optimal share of patronage income designated on a qualified basis, four tax rate scenarios were examined. The first uses estimated tax rates from actual data from KFMA and CoBank, which shows the cooperative tax rate is lower than the farmer tax rate. The second assumes that cooperative tax rates increase to the level of farms. The third assumes that cooperative tax rates are equal to the average tax rate for publicly-traded agribusiness firms, which would be akin to a cooperative only using nonqualified distributions. Finally, the fourth assumes that cooperative tax rates are equal to the maximum rate paid by the agribusiness firms.

Results in Table 4 indicate that, using actual returns and variances from KFMA and CoBank, the percentage of available patronage income allocated to members should be low because expectations for cooperative returns are high. Values for the optimal share of QE under the assumption of observed returns ranges from 10% to 13%, which means the NQE distribution would be between 87% and 90%. This result is expected since observed cooperative returns are both higher and less variable than farm returns. The certainty equivalent ranges from 6.6% to 8.3% indicating that expectations for after-tax returns to members' use of the cooperative are high relative to returns to the farm. In fact, the certainty equivalent is highest under the assumption of observed levels and variances of return on farm and cooperative assets. Under the assumption of observed returns, variances, and tax rates, the optimal share of qualified earnings is 10% and the certainty equivalent is 8.3%.

The certainty equivalent is particularly important as it indicates the return a member would consider to be equal in a riskless scenario to the risky return presented in the model. Thus, it represents a minimum after-tax return the member requires from his or her investment in the cooperative. Cooperative boards can use the certainty equivalents found in this study as an indication of a required after-tax return. A return generated by the cooperative's assets below the certainty equivalent would incentivize disinvestment from the firm and, in the long run, liquidation of the firm's assets.

Under the assumption of relatively high returns and variances for farms, the share of QE ranges from 53% to 57% indicating that members prefer that more than half of the available patronage income be designated as qualified earnings when farm returns are relatively high and more variable. This result

indicates that the higher variance is not high enough to deter members from their preference for the higher returns, given the levels of risk aversion used in the study. The impact of risk aversion on the distribution of earnings is examined later.

When cooperative returns are relatively high and more variable, but they are paying the maximum tax rate paid by publicly-traded firms, the share of QE ranges from 43% to 52%. This indicates that, should cooperatives lose the tax advantages they enjoy and be subject to the same tax laws of publicly-traded firms, members could potentially require more than half of their earnings be distributed on a qualified basis. One reason this occurs is because the farm would have a tax advantage through a lower effective tax rate.

The certainty equivalent in the high farm returns and variances scenario ranges from 5.5% to 5.9% and from 5% to 6.2% in the high cooperative returns and variances scenario (Table 4). The certainty equivalent is much lower in the hypothetical scenarios because the coefficient of variation of returns on NQE held at the cooperative is much lower in these scenarios.

The effect of changes in the cooperative tax regime on the optimal share of QE is greatest under the assumption of relatively high cooperative returns and variances. Table 5 shows the differences in the share of QE and certainty equivalents between the hypothesized changes in cooperative taxes and the actual tax rates paid by cooperatives in the sample. Increases in the optimal share of QE are as high as 8.8% under the assumption of relatively high cooperative returns and variances. This result is intuitive, as higher returns in cooperatives incentivize a higher optimal level of NQE, and changes in cooperative taxes affect the return on NQE.

As the tax rate on cooperatives increases, the certainty equivalent falls. This result occurs because the return a member would expect under a riskless scenario can only fall as the risky return falls. The magnitude of the reduction ranges from -0.1% to -1.8% and is greatest under the assumption of actual returns.

Risk Aversion Impact on Qualified Distributions

To further examine the effects of risk aversion on the optimal distribution of patronage income, we specify the following measure of the effect of risk aversion on ω^*:

$$\delta = \omega^*_{4.5} - \omega^*_{1.0} \qquad (14)$$

where δ is the difference between the optimal distribution of patronage income as QE under the assumption of the highest considered risk aversion level ($\lambda = 4.5$) and the optimal distribution under the assumption of the most risk-neutral preferences ($\lambda = 1$). Larger values of δ in terms of absolute value indicate a larger impact of risk aversion on optimal patronage income distribution to QE. This value is computed for each tax regime, which allows us to determine the effects of risk preferences on the optimal patronage income distribution of QE.

Similar to equation 14 above, we specify the following equation to examine the effects of risk aversion on the certainty equivalent:

$$\Omega = CE_{4.5} - CE_{1.0} \quad (15)$$

where Ω is the difference between the certainty equivalent under the assumption of the highest risk aversion and the certainty equivalent under the assumption of the most risk-neutral preferences. Larger values of Ω in terms of absolute value indicate a larger impact of risk aversion on the certainty equivalent or members' required rate of return. As above, this value is computed for each tax regime and determines the effects of risk preferences on the certainty equivalent.

Using the actual farmer and cooperative data, changes in member risk preferences has little impact on the optimal QE. Table 6 shows values of δ and Ω. Under the assumption of actual returns and variances of farms and cooperatives, changes in the optimal QE are small and range from 3.7% to 4.9%.

These results change quite dramatically under the high farm and cooperative returns scenario. Under the high farm returns and variance scenario, a reduction in optimal QE of -55.1% to a reduction of -55.9% is estimated. The steep reduction is due largely to elevated variances. That is, risk-averse producers view the farm return as too risky. Safer returns at the cooperative are preferred. Furthermore, the lower-risk cooperative returns in this scenario are still valued more highly than the more risky farm returns even though cooperative returns are lower, and cooperative taxes are higher. In the high cooperative return and variance case, the optimal QE increases by factors of 35.8% to 44.2%. As effective tax rates on cooperatives increase, after-tax returns of farms and cooperatives begin to converge reducing the effects of member risk aversion.

Conclusion

Cooperative boards of directors are faced with many decisions, including the distribution of patronage income. The complexity of this decision is driven by maximizing members' returns on investment, while balancing the tax implications

of this decision for patron-owners and the cooperative along with member risk preferences. To glean a set of insights into this decision, we developed a portfolio model of the board's decision to either allocate patronage income on a qualified basis to the members (they pay the taxes) or to retain patronage income as unallocated equity (the cooperative pay taxes). We defined cases that were composed of relative risk aversion coefficients, effective tax rate scenarios, sets of means and variances of returns on qualified and non-qualified returns, and covariances of these returns.

Cooperative boards can benefit from this study in four primary ways. First, this research gives insights into the relative impacts of effective tax rates and member risk preferences on the optimal share of patronage income allocated to members. Current returns and tax policies for farms and cooperatives indicate that the cooperative absorbing some of the tax burden from its members will help maximize the members' return on investment in the cooperative. In fact, our model shows that under actual return and tax policy information, the certainty equivalent or required rate of return for a member rises to 8%, which is a sizable return given today's low interest rate environment.

Secondly, and related to the first, non-qualified distributions of allocated, retained patronage income do provide a monetary and ownership benefit back to the members. While the model above does not consider retiring allocated equity back to the membership, the results do imply that there are some clear benefits of non-qualified distributions. A clear benefit is that they ease the tax burden of the membership, which has been discussed in various forums, which in turn enhances the members' overall return in the cooperative (an estimated 8% in this model). Furthermore, as modeled in this paper, non-qualified distributions are a way to maintain the members' ownership within the cooperative because they are held as allocated equity or retained patronage income with a members' name on it. Further research should consider how these distributions and the median-members' discount rate impact overall member returns.

Third, member attitudes toward risk are very important in determining a patronage income distribution policy, especially under high returns and high variance scenarios. Plausible changes to tax rates do not have as economically significant an impact on certainty equivalents or optimal patronage income distributions as changes in member risk preferences. For example, in the case of high farm returns and high variability, a strongly risk averse membership would prefer to have more investment in the "safer" cooperative investment than their own farms. This result holds even when the cooperative tax rates are increased. As a result, the board of directors should consider the implications of their

membership's risk tolerance when making patronage income distribution decisions.

Finally, certainty equivalents give cooperative boards a target after-tax rate of return to communicate with members. Our results suggest that cooperatives with rates of return higher than that of the certainty equivalents could retain and grow membership. The certainty equivalent provides another benchmark for cooperative board's to measure the value they are providing back to their membership, which explicitly accounts for taxes and member risk preferences.

Further research is needed to examine a more complicated model that includes different assumptions regarding the percent of cash patronage paid or retained as allocated equity as well as equity retirement. This more realistic examination of the decisions of cooperative boards would lead to an improved understanding of the implications of taxes and member risk preferences on the cooperative's membership. Still, this paper does add to the store of knowledge and only reinforces the importance of a board of directors having a deep understanding of their own patronage income distribution decisions.

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Table 1. Average Pre-tax Returns and Variances of Returns on Assets, 2005-2010*

	Mean	Variance
Farm Return on Assets	3.60%	3.70%
Cooperative Return on Assets	8.50%	0.70%

*Sources: Kansas Farm Management Association and CoBank RiskAnalyst Database

Table 2. Average Effective Tax Rates, 2005-2010

	Mean	Standard Deviation	Median
Kansas Farms[1]	14.10%	3.70%	13.10%
Kansas Cooperatives[2]	9.40%	4.00%	10.80%
Publicly-Traded Agribusinesses[3]	24.50%	6.40%	23.70%

[1]Kansas Farm Management Association
[2]CoBank RiskAnalyst Database
[3]Archer Daniels Midland and Syngenta Annual Reports

Table 3. Returns and Variances of Return on Assets used in Sensitivity Analysis

	Return on Qualified Earnings	Return on Non-Qualified Earnings	Variance of Return on Qualified Earnings	Variance of Return on Non-Qualified Earnings
Higher Return and Variance on Qualified Earnings	9%	4%	5%	1%
Higher Return and Variance on Non-Qualified Earnings	4%	9%	1%	5%

Table 4. Mean-variance Model Results: Share of Allocated Qualified Earnings and Certainty Equivalents

	Actual Returns and Variances		High Farm, Low Co-op Returns and Variances		High Co-op, Low Farm Returns and Variances	
	ω*	CE†	ω	CE	ω	CE
Actual Tax Rates	0.107	8.3%	0.535	5.9%	0.436	6.2%
Cooperative and Farm Tax Rates Equal	0.111	8.0%	0.543	5.8%	0.457	5.9%
Cooperative Tax Rate Equal to Average of Agribusinesses	0.119	7.2%	0.560	5.7%	0.496	5.4%
Cooperative Tax Rate Equal to Maximum of Agribusinesses	0.129	6.6%	0.572	5.5%	0.524	5.0%

*Patronage income share of allocated qualified earnings paid as 100% cash (note that (1 – ω) is assumed to be retained as unallocated equity)
† Certainty Equivalent

Table 5. Changes in Share of Allocated Qualified Earnings and Certainty Equivalents due to Changes in Taxes

	Actual Returns		High Farm Returns		High Coop Returns	
	Change in ω*	Change in CE†	Change in ω	Change in CE	Change in ω	Change in CE
Cooperative Tax Rate Equal to Farm Tax Rate	0.003	-0.4%	0.008	-0.1%	0.021	-0.3%
Cooperative Tax Rate Equal to Average of Agribusinesses	0.012	-1.2%	0.025	-0.3%	0.060	-0.8%
Cooperative Tax Rate Equal to Maximum of Agribusinesses	0.021	-1.8%	0.038	-0.4%	0.088	-1.1%

* Patronage income share of allocated qualified earnings paid as 100% cash (note that (1 – ω) is assumed to be retained as unallocated equity)
† Certainty Equivalent
Baseline ω = 0.107, 0.436, and 0.535 for the Actual Returns, High Farm Returns, and High Coop Returns scenarios, respectively.
Baseline CE = 8.3%, 6.2%, and 5.9% for the Actual Returns, High Farm Returns, and High Coop Returns scenarios, respectively.

Table 6. Changes in Allocated Share of Qualified Earnings and Certainty Equivalents due to Changes in Risk Preferences

	Actual Returns		High Farm Returns		High Coop Returns	
	δ*	Ω†	δ	Ω	δ	Ω
Actual Tax Rates	0.049	1.3%	-0.551	-0.1%	0.442	-0.4%
Cooperative Tax Rate Equal to Farm Tax Rate	0.045	1.3%	-0.562	-0.2%	0.421	-0.2%
Cooperative Tax Rate Equal to Average of Agribusinesses	0.035	1.4%	-0.584	-0.4%	0.384	0.3%
Cooperative Tax Rate Equal to Maximum of Agribusinesses	0.037	1.4%	-0.599	-0.6%	0.358	0.6%

*Difference between allocated share of qualified earnings with risk aversion coefficient of 4.5 and the allocated share of qualified earnings with risk aversion coefficient of 1.

† Difference between certainty equivalent with risk aversion coefficient of 4.5 and the certainty equivalent with risk aversion coefficient of 1.