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Comparison of Alternative Equity Management Systems

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Many agricultural marketing and farm supply cooperatives operate under a structure of revolving equity. These cooperatives distribute a portion of their profits to members in a combination of cash patronage and equity patronage. The non-cash portion is commonly referred to as "retained patronage." Cooperative patrons realize the value of the retained patronage when it is redeemed into cash at face value at a future point of time. This process is commonly referred to as "equity redemption," and the equity involved in the process is termed "revolving equity." The process of equity redemption has implications for the cooperative's balance sheet and cash flow and also impacts the patron's return from the cooperative.

Most cooperatives strive to manage their revolving equity under a structured system. Decision variables are available for the cooperative board of directors within each equity management system. Equity management decisions should be coordinated with other decisions to optimize the financial objectives of the cooperative (Barton and Schmidt, 1988). The objective of this research is to evaluate alternative equity management systems under the criteria of proportionality, member benefit, the required equity redemption budget, and the percentage of equity redemption payments that occur as estate settlements. All of

these criteria are considered to be important characteristics for an equity management system. The research also considers how the practice of retaining a portion of profits as unallocated equity affects those same criteria.

Relationship to Previous Work

Boland and Barton (2013) provide an excellent overview of previous research relating to cooperative equity management. Various authors have examined the equity management systems used by agricultural cooperatives, or they have analyzed the impact on capital structure on the growth of the cooperative firm. In regard to the specific question of comparing equity management systems, Cobia, et. al. (1982) provide a descriptive review of equity redemption issues and alternatives and describe the advantages and disadvantages of alternative plans. Royer and Cobia (1984) examined three alternative equity management systems and introduced the concept of a disparity index between a member's percentage of patronage and their percentage of equity. The authors examined the plan over a 30 year time horizon with five different ad-hoc assumptions as to how patronage changed over that time period. The primary evaluation criteria were the proportionality of the patron's investment and business volume over the patron lifecycle.

Barton and Schmidt (1988) expanded on the concept of patron lifecycle using data from a Kansas farm recordkeeping association. The authors fitted a quadratic equation to the sales by age data from the Kansas data. They analyzed

the proportionality of five alternative equity management plans, but did not consider member benefit or the equity redemption budget. Various studies including Beierlein and Schrader (1978), Royer (1987, 1993) and Corman and Fulton (1990) have examined member benefit (as measured by the present value of cash flows distributed by the cooperative) for evaluating alternative equity management systems while not considering proportionality. Royer (1992) provides a critical discussion of equity management practices in agricultural cooperatives. He stresses the importance of maintaining patron equity in proportion to patron business volume. He indicates that the portion of equity held by inactive members is increasing and violates the unwritten but well understood rule of cooperative fairness. His partial solution to improving proportionality is for cooperatives to accelerate and improve their equity management programs.

Royer and Shilihipar (1997) examined how the cash patronage percentage affects patron cash flow and how individual preference for equity revolvement varies by the age of the producer. The authors develop a choice model based on the preference of the median producer but do consider proportionality. Boland (2012) discusses current equity management practices and comments that many cooperatives are transitioning from age of patron systems to age of stock systems. While all of these studies provide important insights into equity management, none have simultaneously examined the criteria of proportionality, member

benefit, and cooperative cash flow. The impact of retaining a portion of member profits as unallocated equity has also not been explicitly examined.

Equity Management Systems

Six different equity management systems are commonly used by agricultural cooperatives. The alternative plans are: (1) Estate Settlement Plan, (2) Age of Stock Plan, (3) Age of Patron Plan, (4) Age of Patron Pro-Rata Pool, (5) Percentage of All Equities Plan, and (6) Base Capital Plan. The first alternative, the Estate Settlement Plan, is not a systematic plan and eliminates any control over the timing of redemptions by the board of directors. Some of the equity management systems have variations. Boland (2012) notes that many cooperatives use a combination of systems, which often reflects the fact that patrons continue to earn equity after the redemption event, which necessitates an additional redemption in the form of an estate settlement. Despite these minor variations, analyzing the characteristics of the basic system is useful.

The simplest, and perhaps least desirable equity management plan is the Estate Settlement Plan. Under the Estate Settlement Plan, the allocated equity of a deceased patron is redeemed to the estate. The Age of Stock Plan (also called a Revolving Fund) redeems equity on a first in-first out basis with a fixed revolving period such as 10 or 15 years. The Percentage of all Equities Plan redeems a percentage of all allocated equity (example: 5%) each year without consideration of the age of the patron or the equity. Under the Age of Patron Plan, the

cooperative redeems the patron's equity balance when they reach a trigger age such as age 70. A common permutation of the Age of Patron Plan is the Age of Patron Pro-Rata Pool. Under this system, a portion of a patron equity balance is distributed each year for a designated period of time after the trigger age is reached (for example, 20% each for five years beginning at age 65).

The Base Capital Plan is the most unique equity management system. In a Base Capital Plan, a patron's share of the total allocated equity is matched with their share of the total patronage. If the equity investment is less than the target, the patron is required to pay in equity or forego cash patronage. If the equity investment exceeds the target, the patron is overinvested and receives a redemption in the amount of the overinvestment. Cooperatives implementing the Base Capital Plan typically calculate the equity and patronage percentages using a multiple year moving average to smooth out year-to-year variations.

Assumptions

A number of assumptions were required for this analysis. First, the lifecycle of business activity was empirically estimated from the USDA Agricultural Census Data, Farm Sales by Age of Operator (USDA 2012). Smoothing procedures were used to convert the census data that is reported in 10 year intervals into an annual series for ages 25-75. This series was used to model business volume for each age and thus the accumulated equity of a typical patron over their lifetime. While this profile of current farm business volume by age is

not a perfect proxy for the lifetime business volume of a typical producer, it generates a very reasonable profile that matches the member business volume profile in case study cooperatives. This procedure was similar to the procedures used by Barton and Schmidt (1988) to model patron lifetime business volume. The major difference is that those authors used data from the Kansas recordkeeping association and fitted a quadratic curve. Our procedures use the Ag Census data and interpolate between the 10 year age intervals provided in that data. Like Barton and Schmidt (1988), we use data on current farming business volume by age groups as a proxy for the business volume of a typical patron over their lifespan.

Because the goal of this research was to compare alternative equity management systems, no assumptions as to the ratio of cash and retained patronage were needed. This study simply examined the consequences from the timing of equity redemption under alternative systems. The patron business lifecycle profile was used to determine the equity balance and dates of equity issued for each age level. Using that information, the profile of business volume by age created the percentage of total cooperative equity currently held by each member age and the stock age distribution of equity held at each member age level. These assumptions imply a steady state cooperative so the equity creation at each age was solely a function of the member's business volume and was not influenced by changes in the cooperative's profitability.

The equity redemption budgets were calculated using the age profile of patronage and the assumption that the cooperative had been systematically managing equity under each system for a time period equal to our patron lifecycle. The redemption budgets measured what percent of the total equity was redeemed in the current year, given the age and equity profile of the membership. The redemption budgets were calculated with and without the estate settlement component. For convenience, the redemption budget was expressed as a percent of the cooperative current year net profit, assuming that profits were 15% of allocated equity (15% return on equity, all equity allocated) That step was simply a linear transformation to aid in the interpretation of the redemption budget and had no impact on the comparisons.

Several additional minor assumptions were needed to complete the analysis. The patron business lifecycle was assumed to begin at age 25 and terminate at age 75. Estate settlement of all remaining equity balance in each system was assumed to occur at age 80. Various lengths of Age of Stock revolving periods were analyzed with the 10 year, 15 year, and 20 year periods reported, and the Age of Patron Plan was analyzed at various trigger ages with age 70 reported. The Age 65 Pro-Rata Pool was modeled with 20% of the Age 65 equity balance redeemed for four years and the remaining balance redeemed at age 70. The Base Capital Plan was modeled using a three year moving average of patronage and equity percentages. Patrons with a three- year moving average of

equity lower than their three-year moving average of patronage (underinvested) were assumed to make an equity contribution to eliminate the difference. Overinvested patrons received equity redemption payments on the same basis.

Evaluation Criteria

The alternative equity management systems were evaluated on the criteria of proportionality, member benefit, redemption budget, and the percentage of equity retired as estates. The ability of an equity management system to keep quity in proportion to patronage is desirable because it implies that the patrons that are currently using the cooperative are providing the equity financing. Proportionality was measured as one minus the mean absolute difference between the percentage of total patronage and the percentage of total equity over the lifecycle as the ratio of the average annual patronage over the lifecycle. In simple terms, if the patron equity, as a percent of total cooperative equity at all ages, was on average 40% different from the patronage at those same ages, then the proportionality rating was 60%.

Cooperative members only realize the value of revolving equity when it is redeemed into cash, which makes member benefit an obvious criteria for an equity management system. Member benefit was measured as the net present value of equity redemption over the lifecycle as a percentage of the net present value of the equity distributed over the lifecycle. Due to the length of the assumed lifecycle (55 years), the net present value of equity redemptions were

significantly below their face value. Indexing the NPV of equity redemption to the NPV of a similar stream of cash payments when the equity was issued adjusted for the lifecycle timing and better reflected the differences between equity management systems. Immediate redemption of all equity patronage would be equivalent to receiving the distribution as cash patronage and would have a member benefit value of 1.0. A conservative discount rate of 3% was used in the analysis reflecting the fact that most members consider revolving equity to be a low risk investment. The relative performance of the alternative systems was not particularly sensitive to the discount rate.

While the timing of the redemption payments is the most important criteria from the member's perspective, the redemption budget required to support the program is a key factor for the cooperative board. As discussed previously, the equity redemption budget was measured by determining the average portion of the equity that a cooperative would redeem in the current year, assuming that it had been systematically managing equity under the prescribed system. This procedure created a current snapshot of equity redemption and was obviously impacted by the portion of producers reaching estate settlement. For that reason, the redemption budget was calculated with and without estate settlements.

The final evaluation criteria was simply the percentage of lifecycle equity redemptions that occur as estate settlements. The timing of estate settlements is obviously unpredictable. In addition to being undesirable to members (already

reflected in the member benefit criteria) revolving a higher portion of equity as estates makes it more difficult for the cooperative to manage its cash flow and balance sheet. Some state statues require immediate redemption of cooperative equity at the time of estate. Estate settlement values ranged from 100% for the estate settlement only plan to 0% for the Base Capital Plan.

Estate Settlement Plan

Redeeming patron equity only at the time of estate requires the lowest level of management by the cooperative. Not surprisingly, the Estate Settlement Plan ranked low on all criteria. In our model, it yielded a proportionality ranking of 35%, which implies that over the lifecycle, the member's underinvestment or overinvestment in equity percentage averaged 65% of their average patronage percentage. It achieved a member benefit level of 40%, implying that the NPV of estate settlement was 40% of the NPV of a similar lifetime stream of cash payments. The Estate Settlement Plan obviously had no redemption budget aside from estates and those redemptions required, 16% of the cooperative's annual profit. The result is that 100% of the redemptions occurred as estates. The proportionality of the Estate Settlement Plan is shown in Figure 1.

Age of Stock

The proportionality, member benefit, and estate residual of Age of Stock Plans all improve as the revolving period decreases, at the cost of higher

redemption budgets. The 20 Year Age of Stock Plan achieved a proportionality rating of 53% that improved to 62% and 73% for the 15 year and 10 year plans, respectively. The member benefit was 48% for the 20 year plan, which increased to 61% at the 10 year revolving period. The 20 year plan required a redemption budget (not considering estate settlements) equal to 8% of annual profit, which increased to 21% for the 10 year plan. The 20 year plan left 38% of settlements as estates since the estate was assumed to occur 10 years after the last patronage. The 15 year plan left 17% of equity as estate settlement, while the 10 year plan resulted in 3% equity at the time of estate. When estate settlements were also considered, the total redemption budgets for the 10 Year, 15 Year, and 20 Year Age of Stock Plans were 23%, 25%, and 27% of average annual profits, respectively. This result reflects the fact that a cooperative that had historically managed equity with a 10 year revolving cycle would have a slightly lower current equity redemption budget relative to a similar cooperative that had traditionally managed equity with a 20 year system. The proportionality of various Age of Stock Plans is shown in Figure 2. As the revolving period decreases, the time period for the member to become adequately invested increases slightly. The major effect of shorter revolving periods is to decrease overinvestment later in the lifecycle.

Age of Patron Plan

The Age of Patron Plan with a 70 year trigger age was only slightly more proportional relative to the Estates Settlement Plan. The member's lifecycle starts out underinvested as they build equity, and then they become overinvested for a period of years prior to the trigger age. Since our assumption implied that they continued patronage for five years past the trigger age, the member was underinvested after the trigger age. The Age of Patron-Age 70 Plan did achieve a high member benefit rating of 61%. Under the patron business lifecycle, patrons earn a significant portion of the lifetime equity late in life. The redemption at age 70 actually provides more redemption dollars at an earlier time relative to the 15 Year or 20 Year Age of Stock Plans. Not considering estates, the Age 70 plan's redemption budget requires 30% of the cooperative's profits, which is higher than the 10 year Age of Stock Plan. One percent of equity is projected to remain as an estate settlement, raising the total budget to 31% of the average profit. The proportionality of the Age of Patron-Age 70 Plan is shown in Figure 3.

Age of Patron Pro-Rata Pool

The Age of Patron Pro-Rata Pool improved proportionality relative to the age 70 plan because it began returning equity to overinvested members at a younger age. Member benefit also increased (from 61% to 67%) because the redemption payments were initiated at a younger age. The redemption budget, which reflects the situation today for a cooperative that had historically used the

Age 65 Pro-Rata Pool was lower than the Age of Patron Plan-Age 70. The Age of Patron Pro-Rata Pool redemption budget was still higher relative to the 10 Year Age of Stock Plan, a plan which achieved greater proportionality. The proportionality of the Age 65-5 Year Pool Plan is shown in Figure 4.

Percentage of the All Equities Plan

The 5% of the All Equities Plan achieved a proportionality rating of only 33%, which was lower than the Estate Settlement Plan. Redeeming a portion of equity each year increases the time for the patron to become adequately invested. The percentage plan also returns equity to overinvested members at a slower rate, with the net result being low proportionality. The 5% of the All Equities Plan does result in a fairly high member benefit rating of 60% since equity payments begin early in the patron lifecycle. The plan requires a redemption budget of 26% of profits for regular redemptions, which falls between the 15 year and 10 year Age of Stock Plans. The 5% of the All Equities Plan leaves 36% of equity settlements as estates, increasing the total redemption budget to 31% of average profits. The percentage system redeems equity at a decreasing rate, which results in a high residual balance. The 10 Year Age of Stock Plan outperformed the 5% of the All Equities Plan in terms of member benefit and proportionality at a lower redemption budget. The proportionality of the 5% of the All Equities Plan is shown in Figure 5.

Base Capital Plan

As mentioned previously, the Base Capital Plan is a unique approach to managing equity and its unique features are reflected in the results. Even with the use of a three year moving average for the patronage and equity calculations, the Base Capital Plan yielded an extremely high proportionality rating of 93%. The Base Capital Plan requires no equity retirement budget since the redemptions to overinvested patrons are matched with additional investments by underinvested patrons. The Base Capital Plan also results in no estate settlements since all equity is returned by age 78, three years after the member's patronage was assumed to terminate. While excelling in three criteria, the Base Capital Plan generated an extremely low member benefit rating of only 1%. Under the Base Capital Plan, members must pay in additional equity early in life and receive equity payments later in life only to the extent that their equity percentages exceed their patronage percentage. This process generates a very low present value profile. The proportionality of the Base Capital Plan is shown in Figure 6.

Summary of Comparative Performance

The comparative performance of the alternative equity management systems is provided in Table 1. As in many aspects of the cooperative financial model, tradeoffs occur in equity management. None of the alternative equity management systems excelled at all criteria. In general, there were tradeoffs between member benefit and the cooperative's redemption budget. That tradeoff

was very clear when estates were excluded. When estate settlements were also considered, the tradeoff between member benefit and redemption budget was not as direct because the lower redemptions during the members' lifetime may have produced a negative situation for the cooperative at the time of estate settlements.

In terms of proportionality, the Base Capital Plan was the clear choice followed by the Age of Stock Plan with shorter revolving periods. The Age of Patron Plan and the Percentage of All Equities Plan yielded poor proportionality. Under the criteria of member benefit, the Age 65 Pro-Rata Pool Plan yielded the highest member benefit followed by the 10 Year Age of Stock Plan. The choice of the low trigger age for the Pro-Rata Pool Plan contributed to its high member benefit ranking. In terms of redemption budget, the Base Capital Plan was the clear choice since it basically eliminated the redemption budget. The next lowest budgets were generated from the Estate Settlement Plan and the 20 Year Age of Stock. There was a general tradeoff between member benefit and the redemption budget with a few exceptions. The Age 70 Plan had a significantly higher redemption budget relative to the 10 Year Age of Stock Plan, a plan with higher member benefit. This result reflects the age distribution of current cooperative members.

As mentioned previously, leaving a larger portion of equity redemption as estate creates both planning and balance sheet management challenges for the cooperative board. Many of the plans including the Percentage of All Equities

Plan, the Age of Stock Plan with longer revolving periods, and the Estate Settlement Plan were protected to leave a relatively large percentage of total equity redemption as estates. The Base Capital Plan, the Age of Member-Age 70, the Age 65 Pro-Rata Pool, and the 10 Year Age of Stock Plan all performed well in avoiding estate settlements.

In terms of overall structure, the Age of Stock Plan appears to have some advantages. As the revolving period is decreased, proportionality, member benefit and estate avoidance all improve at the cost of a higher redemption budget. Under an Age of Stock Plan, the cooperative board can determine the level of performance that they can afford. The Age of Patron Plan does not have the same characteristics because reducing the trigger age improves member benefit but reduces proportionality and increases estate settlements. While not every permutation of the plan was modeled, the Percentage of All Equities Plan appears to have a somewhat undesirable structure in that it delays equity accumulation by younger members and then returns equity to overinvested members at a decreasing rate. The system may be easy to understand and attractive to young patrons, but it appears to have some inherent disadvantages. The Base Capital Plan requires a change in mindset on the part of the patron from building equity as a by-product of patronage to accepting a responsibility to finance the cooperative.

Impact of Retaining Patron Profits as Unallocated Equity

Cooperative firms also have the option of retaining profits as unallocated equity which is identified by several names including unallocated retained earnings and unallocated reserve. As the name implies, unallocated equity is not associated with a member name and is not subject to redemption. These characteristic raise the question of how a strategy of retaining a portion of profits as unallocated equity would impact the performance of the alternative equity management systems. This effect can be examined using the previous procedures but the concept of proportionality must be expanded to reflect all equity.

Table 2 provides the performance of the alternative equity management systems when 50% of profits are retained as unallocated equity. The general effect across most of the equity management systems is to reduce the proportionality and member benefit while also reducing the redemption budget. The only exception is the age of patron based programs where the largest challenge to proportionality is the member's underinvested status after the trigger age. While member benefit under the Age of Patron Plan declined with the unallocated equity retention, proportionality actually increased. The patrons were not as underinvested after the trigger age since their "share" of the unallocated equity was not revolved.

While not tabled, it is interesting to note that the 10 Year Age of Stock Plan with 38% channeled to unallocated equity had the same redemption budget

as the 20 Year Age of Stock with no unallocated equity retention. While the redemption budgets were equivalent, the proportionality and member benefit both declined with the retained earnings option. This result answers a possible question as to whether the change in proportionality and benefit can be offset by adjusting the revolving cycle. Channeling a portion of profits to unallocated equity results in a portion of the equity being managed and a portion being unmanaged. Not surprisingly the general effect was to decrease member benefit and proportionality.

Final Thoughts

Revolving equity can be an important part of the cooperative value package. Managing that revolving equity creates complex decisions for the cooperative board of directors. This analysis compared alternative equity management systems and highlighted the relative performance and tradeoffs. The analysis of proportionality, member benefit, and percentage of estate settlements was based on our model of lifetime patronage. The analysis of the cooperative redemption budget reflected the budget of a cooperative in the current year, under the assumption that the cooperative had been systematically redeeming equity under the selected system. Individual cooperatives may have patron and equity profiles that differ from our assumptions. These results should still be very useful for cooperative leaders who desire a better understanding of their equity management alternatives.

Agricultural retailers fulfill an important role as intermediaries in financing producers' purchases through the extension of trade credit: an arrangement where the farmer purchases and uses agricultural inputs such as seed, nutrients, crop protectants, and fuel with financing provided by the retailer. The expectation is that the farmer makes payment at harvest. Trade credit may become an increasingly important source of financing in sustained low-margin environments, when producers' access to capital from traditional lenders is costly and restricted as well as when cash flow management tightens due to timing of operations and unexpected market conditions. From the retailer perspective, trade credit can be advantageous as a mechanism to create a competitive advantage in the marketplace and to generate financing income and margins on potentially more sales than without trade credit. Particularly in competitive and/or low-margin periods, agricultural retailers face an incentive to 'bundle' the sales and financing of production inputs to prevent erosion of sales or perhaps to gain a competitive advantage. However, trade credit creates a cost to the firm: the use of liquidity to finance sales on credit competes with the firm's internal need to fund short and longer-term investments. Trade credit may expose the cooperative to default risk.

Firms offering trade credit must balance the costs and benefits of doing so, and a primary balancing mechanism relates to the pricing of trade credit goods.

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Figure 1: Patronage versus Equity No Revolving or Estates Only

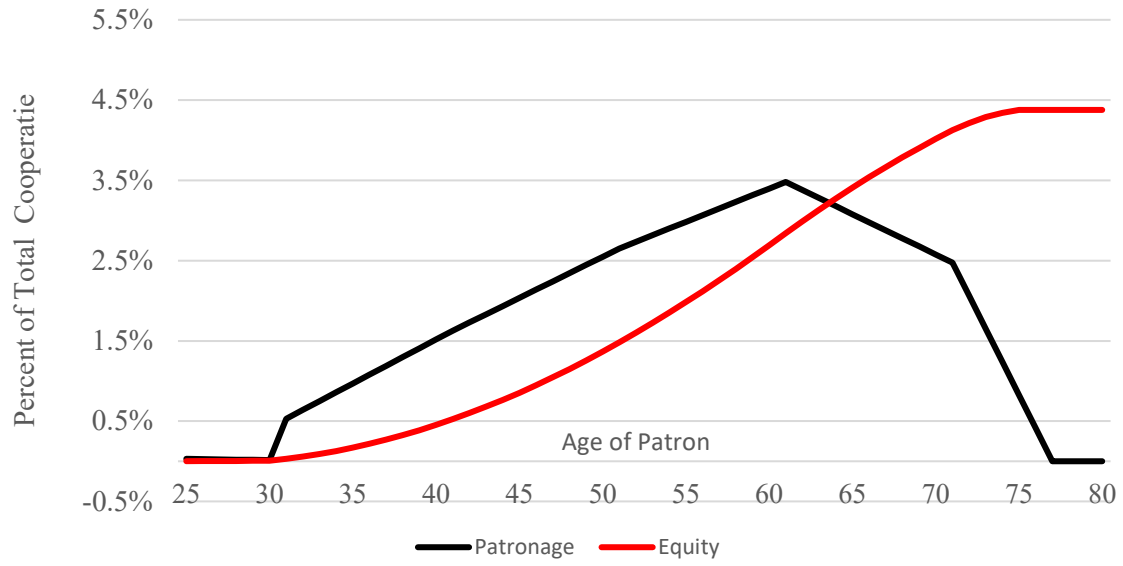

Figure 2: Patronage versus Equity with Various Age of Stock Revolving Periods

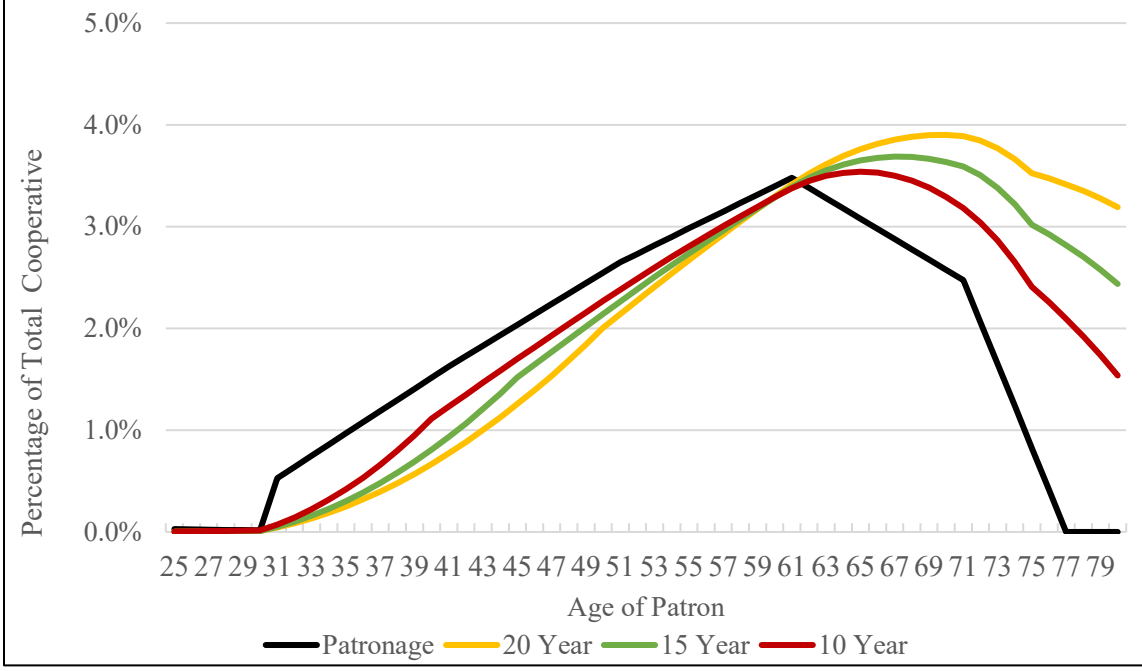

Figure 3: Patronage versus Equity Age 70 Plan

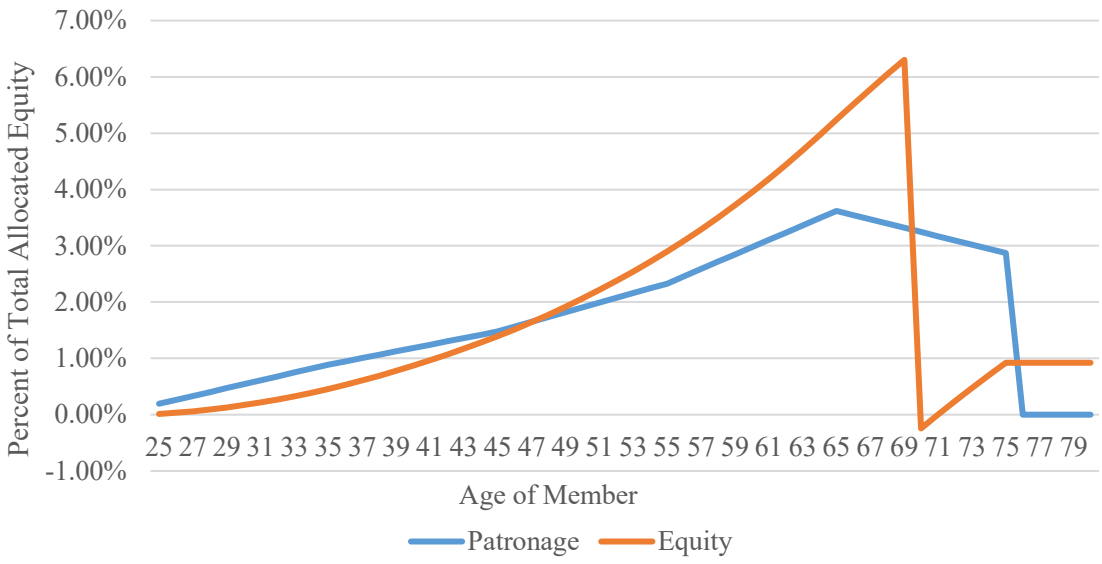

Figure 4: Patronage Versus Equity-Age 65 5 Year Pool

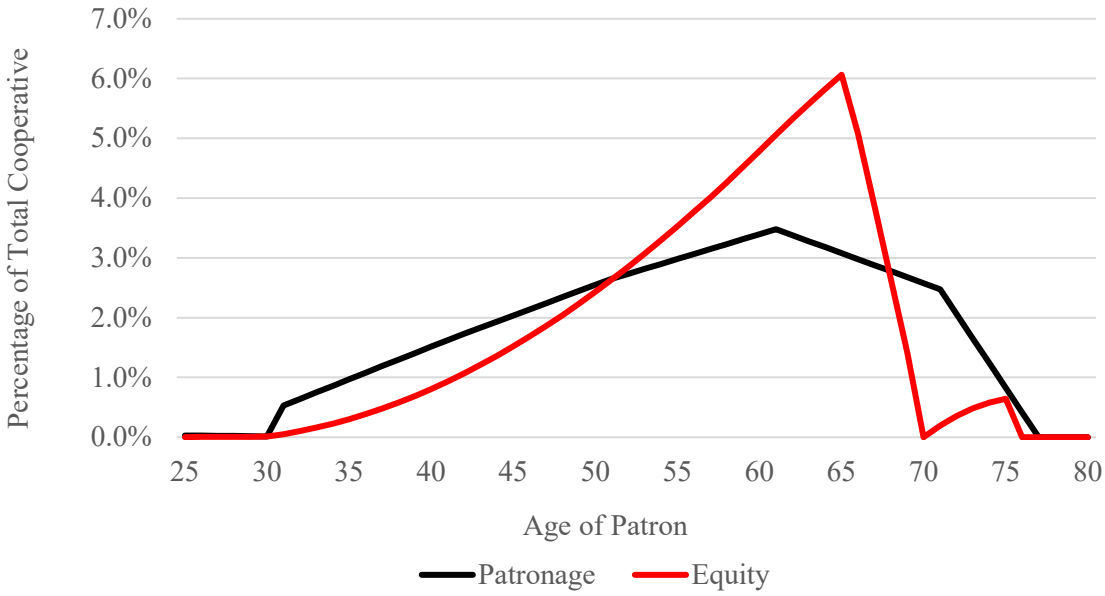

Figure 5: Patronage versus Equity 5% of all Equity Revolved Each Year

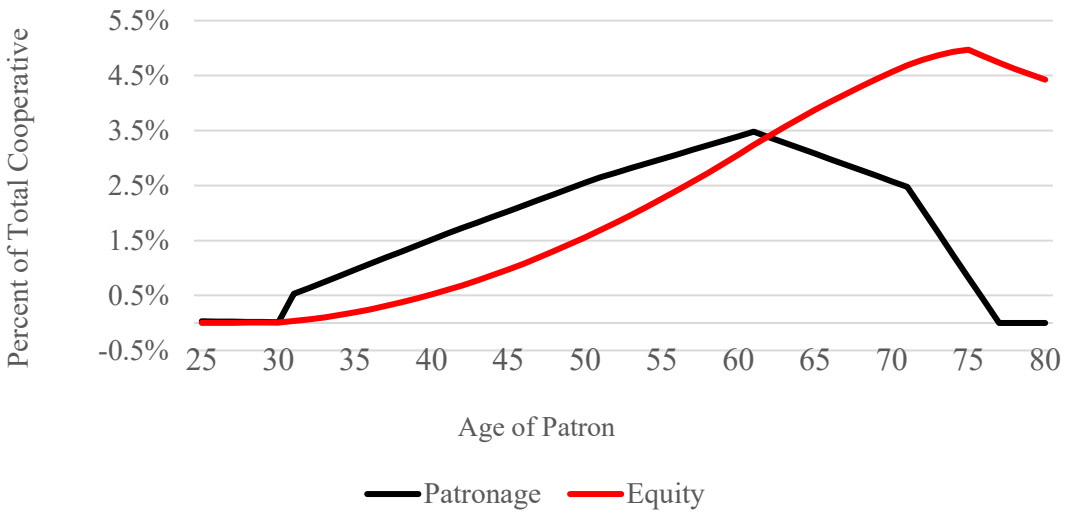

Figure 6: Patronage versus Equity Base Capital 3 Year Moving Average

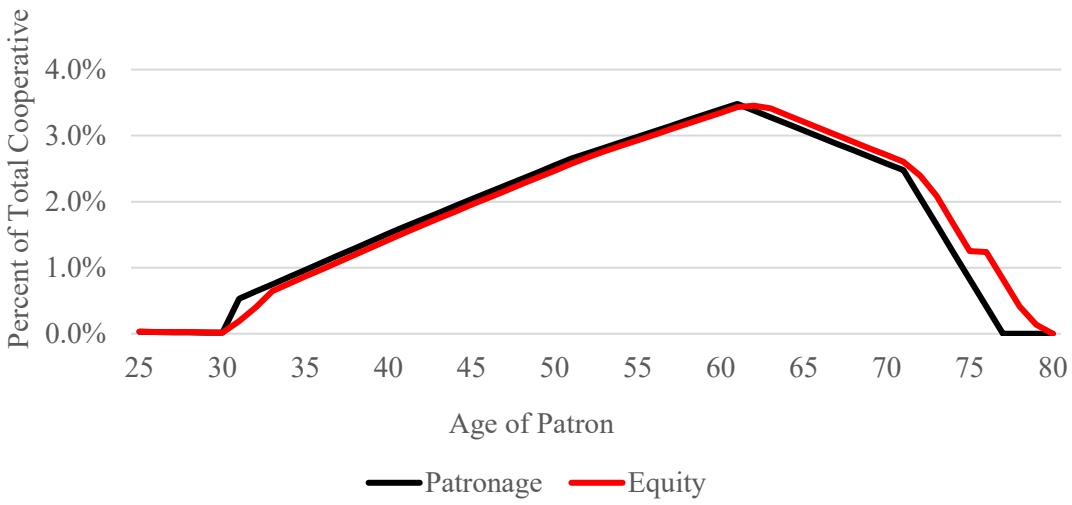

Table 1: Comparison of Equity Management Systems

	Estate Settlement	20 Year Stock	15 Year Stock	10 Year Stock	5% of All Equity	Base Capital	Age 70	Age 65 Pool
Proportionality	35%	53%	62%	73%	33%	93%	55%	61%
Member Benefit	40%	48%	55%	61%	60%	3%	61%	66%
Budget before Estate	0%	8%	14%	21%	26%	0%	30%	28%
Budget with Estate	16%	27%	25%	23%	31%	0%	31%	29%
% Estates	100%	38%	17%	3%	36%	0%	1%	1%

Table 2: Comparison of Equity Management Systems after 50% Unallocated Equity Retention

	Estate Settlement	20 Year Stock	15 Year Stock	10 Year Stock	5% of All Equities	Base Capital	Age 70	Age 65 Pool
Proportionality	31%	35%	36%	37%	31%	69%	51%	67%
Member Benefit	17%	21%	23%	26%	21%	12%	26%	29%
Budget before Estates	0%	1%	3%	4%	2%	0%	6%	5%
Budget with Estates	8%	7%	6%	5%	7%	0%	6%	5%
% Estates	100%	18%	9%	2%	31%	0%	.5%	.5%