40

Theory of cooperatives

Recent developments

Michael L. Cook and Jasper Grashuis

1 Introduction

This update responds to the call by King et al. (2010) to expand and extend our understanding of theories and frameworks that explore the complexities of the organizational form called an agriculture cooperative. The specific objective of our chapter is to highlight the cooperative theoretical work produced by scholars since the last surveys by Sexton (1984), Staatz (1989), and Cook et al. (2004). In illustrating the current state of the art, we intend to compare and contrast the main findings and conclusions while identifying new challenges and opportunities for future research directions.

Using the search term "agricultural cooperative," we searched publications in the following databases: Scopus, ScienceDirect, EBSCOhost, Web of Science, Google Scholar, and ProQuest. We then conducted a focused search by using the following criteria: (1) the article is published in 2005 or later, (2) the article is published in a peer-reviewed book or journal, (3) the article is theoretical and not empirical or conceptual in its orientation, and (4) the article relates to organizations owned and controlled by farm producers. In total, we identified 29 articles as appropriate and relevant for our literature review (see Table 40.1). The 29 articles are divided into four general functional categories: (1) performance and market structure, (2) governance, (3) management, and (4) finance. Overall, we observe an increasing recognition of the phenomenon of heterogeneity in member patron attitudes and objectives as well as cooperative firm structures. Moreover, as compared to previous theoretical work, we notice a general trend toward a more complex conceptualization of the cooperative as an organizational form with competing tensions between member patron objectives and agent-managed firm objectives.

2 Performance and market structure

The primary intention of the theoretical work reviewed in this section is to inform dynamics of economic efficiency, producer and consumer welfare, or market structure. There is limited overlap, however, as most models and frameworks place emphasis on various variables to explain changes in supply, demand, and price. Invariably, the conclusion of the formal analyses is that supply and marketing cooperatives have a positive impact on the welfare of farm producers and

Table 40.1 Overview of cooperative theory publications from 2005 to 2016

Year	*Author(s)*	*Title*	*Book/Journal*
2005	Bogetoft	An information economic rationale for cooperatives	*European Review of Agricultural Economics*
2005	Giannakas and Fulton	Process innovation activity in a mixed oligopoly: the role of cooperatives	*American Journal of Agricultural Economics*
2006	Evans and Guthrie	A dynamic theory of cooperatives: the link between efficiency and valuation	*Journal of Institutional and Theoretical Economics*
2006	Hueth and Marcoul	Information sharing and oligopoly in agricultural markets: the role of the cooperative bargaining association	*American Journal of Agricultural Economics*
2007	Fulton and Giannakas	Agency and leadership in cooperatives	*Vertical Markets and Cooperative Hierarchies*
2007	Olesen	The horizon problem reconsidered	*Vertical Markets and Cooperative Hierarchies*
2007	Rey and Tirole	Financing and access in cooperatives	*International Journal of Industrial Organization*
2009	Bontemps and Fulton	Organizational structure, redistribution and the endogeneity of cost: cooperatives, investor-owned firms and the cost of procurement	*Journal of Economic Behavior and Organization*
2009	Hovelaque et al.	Effects of constrained supply and price contracts on agricultural cooperatives	*European Journal of Operational Research*
2009	Ligon	Risk management in the cooperative contract	*American Journal of Agricultural Economics*
2009	Mérel et al.	Cooperatives and quality-differentiated markets: strengths, weaknesses, and modeling approaches	*Journal of Rural Cooperation*
2009	Saitone and Sexton	Optimal cooperative pooling in a quality-differentiated market.	*American Journal of Agricultural Economics*
2010	Drivas and Giannakas	The effect of cooperatives on quality-enhancing innovation	*Journal of Agricultural Economics*
2010	Fatas et al.	Blind fines in cooperatives	*Applied Economic Perspectives and Policy*
2012	Feng and Hendrikse	Chain interdependencies, measurement problems and efficient governance structure: cooperatives versus publicly listed firms	*European Review of Agricultural Economics*
2012	Fulton and Giannakas	The value of a norm: open membership and the horizon problem in cooperatives	*Journal of Rural Cooperation*
2013	Deng and Hendrikse	Uncertainties and governance structure in incentives provision for product quality	*Governance of Alliances, Cooperatives and Franchise Chains*
2013	Dietl et al.	Explaining cooperative enterprises through knowledge acquisition outcomes	*Managerial and Decision Economics*
2013	Fulton and Giannakas	The future of agricultural cooperatives	*Annual Review of Resource Economics*
2013	Liang and Hendrikse	Cooperative CEO identity and efficient governance: member or outside CEO?	*Agribusiness*
2014	Hueth and Moschini	Endogenous market structure and the cooperative firm	*Economics Letters*

(*Continued*)

Table 40.1 (Continued)

Year	*Author(s)*	*Title*	*Book/Journal*
2014	Kopel and Marini	Strategic delegation in consumer cooperatives under mixed oligopoly	*Journal of Economics*
2015	Agbo et al.	Agricultural marketing cooperatives with direct selling: a cooperative–non- cooperative game	*Journal of Economic Behavior and Organization*
2015	Deng and Hendrikse	Managerial vision bias and cooperative governance	*European Review of Agricultural Economics*
2015	Fulton and Pohler	Governance and managerial effort in consumer-owned enterprises	*European Review of Agricultural Economics*
2015	Hueth and Marcoul	Agents monitoring their manager: a hard-times theory of producer cooperation	*Journal of Economics and Management Strategy*
2015	Mérel et al.	Cooperative stability under stochastic quality and farmer heterogeneity	*European Review of Agricultural Economics*
2016	Giannakas et al.	Horizon and free-rider problems in cooperative organizations	*Journal of Agricultural and Resource Economics*
2016	Liang and Hendrikse	Pooling and the yardstick effect of cooperatives	*Agricultural Systems*

food consumers, respectively, although the degree of success is often dependent on solving its inherent constraints and inefficiencies.

First, by comparing pure and mixed duopolies, Giannakas and Fulton (2005) inform process innovation activity by input supply cooperatives as compared to firms. Because of its objective to maximize member patron welfare, the supply cooperative is assumed to have greater incentive to invest in process innovation to decrease the cost of input production. The model addresses the difficulty of member equity acquisition in the presence of heterogeneous member patron objectives and preferences, in particular with regard to capitalizing long-term growth opportunities. Even so, the supply cooperative is demonstrated to have a positive impact on total process innovation activity. Subsequently, the decrease in the welfare of the input suppliers is exceeded by the increase in the welfare of the member patrons. The model indicates the heavy reliance on retained income is not necessarily fatal, for input supply cooperatives engage in process innovation to drive competitiveness.

While Giannakas and Fulton (2005) studied process innovation, Drivas and Giannakas (2010) instead emphasized product and service innovation by consumer cooperatives. Like Giannakas and Fulton (2005), Drivas and Giannakas (2010) concluded the presence of the cooperative has a positive impact on innovation activity as well as welfare. The total effect, however, is dependent on the degree of consumer heterogeneity, which implies elasticity of demand to product quality differentiation. Generally, the greater the responsiveness to product differentiation, the greater the likelihood of innovation activity by the cooperative. The formal findings by Giannakas and Fulton (2005) and Drivas and Giannakas (2010) suggest cooperatives should earmark future income for investment in research and development, in particular as product differentiation is of rising importance in the agri-food industry.

Hueth and Marcoul (2006) provided a formal analysis of the welfare effect of bargaining associations, which are prominent in the Californian fruit and vegetable sector. While its primary purpose is to affect the market structure by improving the bargaining power of its member patrons, Hueth and Marcoul (2006) also envisioned an independent impact of information

sharing on the individual and the collective ability to meet demand. As each association receives an imperfect signal of future demand, sharing information is argued to reduce the variance of the signal error. However, while sharing information facilitates an increase in net welfare, the model indicates the dominant first-stage strategy is to share information. To avoid the Prisoner's Dilemma, Hueth and Marcoul (2006) recommended a contractual obligation to report information for collective price discovery.

Saitone and Sexton (2009) analyzed member patron heterogeneity in terms of product quality in relation to revenue pooling, which attenuates risk to farm producers from stochastic production of low- and high-quality products. In addition, revenue pooling decreases the incentive to overproduce high-quality products. In the first stage of the sequential game, the cooperative announces the pooling rate. Each farm producer decides to sell output to the cooperative or another company in the next stage. As indicated by the model, defection is most likely by producers of high-quality products, as the premium is in part shared with producers of low-quality products. Finding the optimal pooling rate is complicated by the degree of member patron heterogeneity in cost functions and risk preferences. Not all pooling arrangements are implementable, which implies cooperatives do not have a large margin for error.

Similarly, Mérel et al. (2009) applied the Hotelling model in a mixed duopoly to compare the performance of open and closed membership cooperatives in terms of quality-based competition. While open membership cooperatives have a yardstick effect on the industry by forcing competitive honesty, member patrons do not have incentive to make investments in value-added ventures, as part of the benefit is misappropriated to external free riders. In addition, the inability to dissuade low-quality producers or to attract high-quality producers is suggestive of the low competitiveness of open membership cooperatives in industries where demand is more responsive to quality as opposed to price. By comparison, closed membership cooperatives have a greater capacity to start value-added operations, but the yardstick effect on the industry is not as strong. The model has implications for policy makers who contemplate the tradeoff between producer and consumer welfare.

Fulton and Giannakas (2013) analyzed the impact of spatial dispersion on the price received by farm producers from processors. The analysis thus considers the fact that farm producers face variable costs of transportation. In the pure duopoly, the best-response functions and the Nash equilibrium prices depend on whether monopsonist behavior is local or regional. When introducing the cooperative to the mixed market, Fulton and Giannakas (2013) considered the impact of agency problems and membership access barriers, which directly and indirectly impact the price received by member patrons. The model in part informs the pricing strategies of large regional or even national cooperatives with member patrons in many states.

Hueth and Moschini (2014) developed a three-stage entry-deterrence model with a monopolist and a consumer cooperative. In the first stage, entry by the monopolist is dependent on the fixed entry cost and the likelihood of future competition from the consumer cooperative. When considering entry in the second stage, the consumer cooperative must incur the fixed entry cost as well as the cost of coordination, which increases with membership size. If the coordination cost is not high enough to prevent formation of the consumer cooperative, the incumbent market leader may deter entry by lowering its price and allowing the consumer coalition to reap the benefits. However, deterrence may decrease firm profit to the point where initial entry in the first stage is no longer viable. As such, their study demonstrated that the first-mover advantage of a profit-maximizing firm is at times negated by the entry threat of consumer cooperatives.

Agbo et al. (2015) employed a theoretical model to analyze a dual market structure in which individual farm producers simultaneously compete and cooperate. Homogeneous farm output is either sold to the marketing cooperative, which is active on a competitive non-local market, or

to end consumers on the local market. Given price on the national market, each member patron decides (1) the optimal quantity to be produced and (2) the optimal quantity to be sold on the local market and to be supplied to the cooperative for sale on the non-local market. According to the model, the local market assumes an oligopsonistic nature as the existence of the marketing cooperative induces tacit collusion by its member patrons to lower local supply. With emphasis on price discrepancies in local and non-local markets, the model by Agbo et al. (2015) informs the decision by marketing cooperatives to allow direct selling or to bind member patrons to exclusive supply agreements.

Liang and Hendrikse (2016) analyzed the yardstick effect of cooperatives on firms in a non-competitive market. In the mixed market, the firm discriminates to secure supply of heterogeneous quality. The firm offers a reservation wage which equals the marginal cost of production for each farm producer. Meanwhile, the open membership cooperative uses price pooling, which induces adverse selection in terms of attracting low-quality producers. While full price pooling forces the firm to increase the reservation wage offered to high-quality producers, the yardstick effect is even stronger in case of partial price pooling, which implies the price is in part based on the heterogeneous product quality. With partial price pooling, the equilibrium market structure is a mixed market with two cooperatives. Like Saitone and Sexton (2009) and Mérel et al. (2009), Liang and Hendrikse (2016) thus inform pricing and pooling strategies by cooperatives that market fruit, vegetables, nuts, and other products of heterogeneous quality.

3 Governance

Assuming a microeconomic perspective, recent cooperative theory has analyzed the complex interrelationships of member patrons, board directors, and managers. Most commonly, a multi-stage model is developed from an agency theory perspective to formally study (1) the relationship of member patrons to other member patrons or (2) the relationship of member patrons to managers. Recent advances in cooperative theory thus address the existence of multiple utility functions with many parameters and constraints. As such, the analyses for the most part apply to cooperatives in which control is delegated to one or more non-member managers who have resource allocation authority.

3.1 Heterogeneous member patron preferences

Bogetoft (2005) developed a model similar to Karantininis and Zago (2001) but did not include open or closed membership as a constraint. The model features producers of a homogeneous good with differential cost functions that are not known to the cooperative. There is consequently an adverse selection problem as the cooperative cannot identify the low- and high-cost producers. In order to maximize net benefit, the cooperative must exclude high-cost producers and attract low-cost producers, which is accomplished by means of particular combinations of individual rationality, incentive compatibility, and budget balancing constraints. Because of expected profit at the production stage as well as the processing stage, the cooperative is believed to produce and process the optimal quantity, which is higher as compared to the firm processor.

Like Bogetoft (2005), Fatas et al. (2010) also analyzed the free-rider problem in terms of heterogeneous product quality in an experimental model. Interestingly, the developed model excludes monitoring as the primary solution to the free-rider problem. Instead, the cooperative uses the success ratio (R), given as the ratio of the observed quality to the maximum quality, as an indicator at the aggregate level. For each individual member patron, the exclusion or punishment probability is $1 - R$, which implies individual dependence on the collective. If full benefit

exclusion is the punishment, quality is expected to increase by 75 percent. However, as indicated by Fatas et al. (2010), such a blind mechanism is rather unfair and has yet to be implemented in practice.

Another type of problem, namely the control and influence problem, is addressed by Bontemps and Fulton (2009), who explicitly modeled the impact of agency cost and democratic cost on the optimal contract. As compared to the monopsonist firm, the cooperative is characterized by higher output, which implies consumer welfare is superior, all else being equal. However, as output increases, the model anticipates the benefit distribution to skew toward the relatively efficient member patrons. If the efficient member patron is not representative of the average member patron, then individuals or groups of individuals will engage in influence activities. Subsequently, a control and influence problem may arise and cause agency cost and democratic cost, which may facilitate relative inefficiency. The main result informs the member governance system, which traditionally is characterized by the one member, one vote approach. However, the model indicates an efficiency-based system is expected to be superior.

Deng and Hendrikse (2013) advanced a principal–agent model to analyze the traditional relationship of many farmers at the upstream stage and one processor at the downstream stage. The model assumes yield uncertainty, risk aversion, and quality differentiation on the farm, as well as demand uncertainty in the market. In the open membership cooperative, a free-rider problem emerges as the marginal cost of product quality improvement is exceeded by its marginal benefit. In fact, product quality is decreasing in free riding, which itself is increasing in membership size. When in competition with a firm processor, the optimal income rights structure of the cooperative is given by a certain combination of the pooling ratio, the product quality incentive, and the base payment. Generally, because of the dual relationship to production risk and free riding, a low (high) pooling ratio is compatible with a low (high) quality incentive and a high (low) base payment, but product quality is never expected to be as high as compared to the firm processor.

Mérel et al. (2015) addressed the same problem of adverse selection, free riding, and heterogeneous quality. Again, distinction is made between low- and high-quality producers, who may have limited incentive to join the cooperative at any rate of pooling if no countermeasure is taken. In any situation, low-quality producers prefer full pooling, as risk sharing is optimized. For the high-quality producers, defection is only prevented if the benefit of risk sharing surpasses the decreased payoff. As demonstrated by Mérel et al. (2015), there is a stable pooling arrangement if producers are not too risk neutral, producer heterogeneity is not too great, and the price discount for low quality is not too low. Such fragile conditions imply member patron heterogeneity is difficult to address. Furthermore, any plan must likely be dynamic as heterogeneity is not a static concept.

3.2 CEO identity

The first example is offered by Fulton and Giannakas (2007), who placed emphasis on member commitment as a function of agent behavior and performance. The principal–agent model comprises three periods. In the first period, the principal screens two types of leaders in the employment market: member welfare maximizers and profit maximizers. With proper incentives, the hired agent signals her identity or objective in the second period. Subsequently, the third period is characterized by a mixed oligopoly market in which competition with a firm is based on price and quality. For the cooperative, its market share is determined by its product quality, which in turn is determined by member commitment. If the leader represents member objectives, member commitment and product quality will be relatively high.

Thus, using backward induction, the cooperative is encouraged to make an investment in screening leadership candidates who will represent member objectives to ensure member commitment.

Similarly, Liang and Hendrikse (2013) formulated a principal–agent model to analyze the identity of the cooperative CEO as a member or non-member. Of course, the member CEO is also an input supplier to the cooperative, which implies a fundamental difference in utility functions. The model addresses the impact of CEO payoff on upstream and downstream activities. Generally, the incentive must be higher for the member CEO so as to divert attention from the upstream to the downstream activity. However, CEO optimality is also dependent on the marginal productivities at the two stages. For example, when marginal productivity is equal across the two stages, a member CEO will always be more efficient. Thus, the model implies that the common decision by large cooperatives to hire non-member CEOs is in part motivated by the upstream bias in the utility function of the member CEO as well as low complementarities between value chain segments.

Deng and Hendrikse (2015) further analyzed the position of the CEO in a three-stage model comparing a cooperative with a member CEO, a cooperative with a non-member CEO, and a firm. The model considers the process of project evaluation and acceptance, where the project is first presented to the CEO and then to the board of directors. Judgment of the expected payoff of the project is in part determined by the positive and negative bias toward upstream and downstream activities, respectively, by the member CEO and vice versa by the non-member CEO. Bias implies an error in the internal valuation of projects. Efficiency of each governance structure, as given by expected payoff, is dependent on the magnitude of managerial bias, the difference in managerial bias (between the CEO and the board directors), and the upstream or downstream nature of the project. According to the main result, a member CEO is most appropriate if the majority of the growth potential is in the upstream segment of the value chain, while a non-member CEO is appropriate if the cooperative will invest in downstream activities.

3.3 CEO payment

Kopel and Marini (2014) contributed to the discussion on CEO payment, but from the perspective of a consumer cooperative that is not engaging in forward or backward integration. Kopel and Marini (2014) demonstrated that a variable pay contract for the non-member CEO has a detrimental impact on the cooperative, as the explicit emphasis on financial performance is in direct opposition to member patron utility parameters. Instead, it is in the best interest of the consumer cooperative to offer a fixed wage to an internal CEO whose objective is to set price equal to marginal cost. Thus, using backward induction, the consumer cooperative is never expected to hire a non-member CEO. Comparatively, the firm charges a higher price and sells a lower output in the final stage of the game as compared to the cooperative, for which profit is relatively low.

Fulton and Pohler (2015) also applied emphasis on the manager in their three-stage model, where the manager bonus is set in stage one, managerial effort is chosen in stage two, and member patron utility is determined in stage three by the price and quality of the product. As compared to firm shareholders, member patrons and board directors have greater incentive to monitor management as risk bearing is much higher, but the quality and quantity of monitoring is also impacted by off-farm income and age. From a managerial perspective, the combined impact of governance and remuneration is dependent on the utility and sensitivity of the manager. Furthermore, considering the ambiguous nature of performance, remuneration tied to performance is unlikely to fully align principal and agent interests, which implies monitoring is critical to the economic viability of the cooperative.

The importance of monitoring is also illustrated by Hueth and Marcoul (2015), who built a multi-task, five-stage model to find parameters for the optimal alignment of interests in the

principal–agent relationship. Unlike the previous three publications, however, there is no explicit discussion of CEO wage or CEO bonus. In addition to a monitor, each organization is modeled to have an entrepreneur and an input supplier, which for the cooperative is the same individual. Because risk bearing is relatively high, each member patron has strong incentive to monitor the behavior of the entrepreneur. In fact, the quantity of monitoring can offset any deficiency in its quality by the board of directors. Because board directors are also member patrons, director–manager collusion is less likely as compared to the firm. By extension, the model indicates agency cost is relatively low for the cooperative, thus explaining why some transactions (projects) are governed by the cooperative and other transactions are governed by the firm.

4 Management

Related to governance, recent theory is also developed to inform the management and deployment of joint assets by managers and executives for the benefit of member patrons. As compared to the theory discussed in the previous section, the next publications do not place managerial action or behavior within parameters of monitoring or principal–agent interests. CEO identity, CEO payment, and member patron heterogeneity are exogenous to the formal analyses. Instead, management behavior is often analyzed in relation to risk or vertical coordination.

4.1 Risk

As compared to the risk of input supply or market access, Ligon (2009) argued production risk management is typically suboptimal in the cooperative, which is especially problematic when the quantity and quality supplied by its member patrons is susceptible to great variability and uncertainty. The formal solution to the problem is defined by proportionality of income to average patronage, not current patronage. Full risk sharing implies below expected yield in period t is buffered by mean past yield in periods $t - k$, and member patron i will be subsidized by member patron j, which intensifies the concept of group action. Of course, such risk sharing by the collective is likely to inspire several problems, including the free-rider problem and the influence problem. Consequently, if production risk sharing is to be at all feasible, the cooperative must also consider exclusive long-term supply agreements so as to dissuade member patrons with above expected yield from exiting.

Hovelaque et al. (2009) also analyzed risk management by means of contracting with member patrons who produce a differentiated good. The constrained supply chain model contains three elements: (1) the objective function of the cooperative, (3) the consumer–cooperative relationship, and (3) the member–cooperative relationship. The cooperative must determine how much of the basic product and how much of the differentiated product to produce dependent on stochastic demand. As member supply is unconstrained, cooperative profit is only superior to firm profit in case of a price increase of the non-differentiated good. The solution to farm risk management is the extension of individualized spot price contracts, which allow member patrons to align risk preferences to expected risk in the stochastic market environment. As compared to the basic contract, the individualized contract is estimated to increase the mean price as well as its standard deviation.

4.2 Vertical coordination

Feng and Hendrikse (2012) developed a multi-task principal–agent model to address differences in corporate and cooperative governance. The model consists of a two-stage non-cooperative

game, where the principal chooses the optimal incentive in the first stage and the agent chooses the optimal action in the second stage. As usual, the agent is assumed to maximize expected utility, while farm profit maximization is the objective of the principal. Vertical integration is the key variable, and optimality of the organizational mode is determined in part by the complementarity of the upstream and downstream stages. If the downstream stage is not complimentary to the upstream stage, its value is not obvious to member patrons and the CEO will have limited incentive to invest. If the CEO does invest, the production and cost functions must be complimentary or the cooperative will risk relative inefficiency. The model implies management should not pursue non-member business if farm profit maximization or member return optimization is the true objective.

Dietl et al. (2013) developed a four-stage model to explain the cooperative mode of organization in terms of knowledge. Two variations of the model are considered: (1) two producers who collectively own the processing plant, and (2) two producers who independently supply a firm. A distinction is made between generalizable and non-generalizable knowledge, where the latter implies human asset–specific investment, which is often necessary for vertical expansion. Overall, the model concludes that the cooperative acquires less non-generalizable knowledge than the market, but more generalizable knowledge than the market if there is sufficient incentive for large member patrons. If so, the generated net welfare surplus is optimal if the impact of the knowledge on production cost is sufficiently large. The model thus explains cooperative investment in non-member business.

5 Finance

While the literature on corporate finance is in an advanced stage of development, the same is not true of cooperative finance. Yet cooperative finance is distinct from corporate finance, in part because of the dual function of organized farm producers as both patrons and capitalists. Thus, unlike the firm, the cooperative is not characterized by a clear separation of control and finance, which has severe implications for its capital structure. In order to better understand the cooperative debt or equity decision, recent theoretical contributions have placed emphasis on the tension between the desire to patronize and the obligation to capitalize the cooperative.

The lone exception is by Evans and Guthrie (2006), who advanced a dynamic theory of the cooperative by placing emphasis on the equity problem inherent to the ownership structure of traditional cooperatives. According to the authors, most cooperatives face three sources of inefficiency: (1) overproduction as marginal cost is equated to average revenue and not marginal revenue, (2) underproduction as the cost of owned capital is subsidized by other member supplies, and (3) overproduction as the return on owned capital is determined by current and not past patronage. According to the theoretical model, inefficiency is solved by fair value share pricing, which implies ownership is valued at the current value of future earnings. Evans and Guthrie (2006) thus advocate the implementation of ownership transferability and equity appreciability, which are both deviations from the capital structure of the traditional cooperative.

Rey and Tirole (2007) first provided a theoretical contribution to the analysis of free-rider and horizon problems in open and closed cooperatives by developing a two-period framework. Consistent with property rights theory, growth investment in period $t - 1$ is suboptimal in the open cooperative if less than 100 percent of the benefit is appropriable in period t. In fact, the cooperative may not even be formed as the new generation of member patrons in period t appropriate some of the rent generated by the previous generation of member patrons. In case of member patron discrimination, a large membership fee for new member patrons in period t

is necessary to incentivize new and existing member patrons in period t − 1 to make necessary investments in long-term growth.

In contrast to Rey and Tirole (2007), Olesen (2007) challenged the common assumption of underinvestment by member patrons with short horizons. In fact, Olesen (2007) argued the horizon problem is more likely to cause overinvestment as opposed to underinvestment. However, the alternative hypothesis is dependent on the availability of an exit payment, which is determined in the period before investment. If the exit payment is at least as large as the original investment, member patrons with some probability of exit have incentive to invest redeemable equity. However, as indicated by the model, the exit payment may facilitate liquidation of the cooperative if too many member patrons exit, suggesting a large reserve of unallocated equity is necessary to provide stability.

Fulton and Giannakas (2012) extended the formal discussion of the horizon problem by placing emphasis on the objectives of the member patrons of consumer cooperatives. Similar to Rey and Tirole (2007), Fulton and Giannakas (2012) built a two-period framework to model the interactions of two generations of member patrons. According to the model, investment in each period is impacted by the horizon problem, which increases the cost of equity and thus also increases the necessary return on equity to incentivize member patron investment. However, because the formation of cooperatives is often motivated by a lack of market alternatives for goods with inelastic demand, the model indicates the negative impact of the horizon problem may not be as severe as long as the consumer surplus generated by the cooperative is large enough.

Finally, Giannakas et al. (2016) also concluded the formation of the cooperative is dependent on the length of the time horizons of the first member patrons. If the expected payoff is too far in the future, *ex ante* investment in joint assets is not an optimal strategy for the individual farm producers. If the horizon problem is solved, a free-rider problem emerges as new member patrons appropriate part of the rent generated by existing member patrons. According to the model, the best response is in part determined by the impact of organizational size on income. If the operation is defined by size economies, it is in the best interest of existing member patrons to not impose any entry barriers. By contrast, the enforcement of membership fees or base capital structures is optimal if an increase in membership size is detrimental to operational efficiency. The authors thus explain why many dairy, fruit, vegetable, and nut marketing and processing cooperatives, for which returns to scale are rarely increasing, often implement some degree of closed membership.

6 Summary and conclusion

In general, the 29 articles we reviewed in this chapter employ the research approach King (2012) characterizes as "economic analysis," where a minimal set of assumptions and rigorous analytical reasoning result in an efficiency-oriented set of policy or strategic implications. There is, however, a bent toward increasing a complementary "economic design" process motivated by seeking solutions to problems identified in the "economic analysis" approach. Rather than solely focusing on what is, such articles begin with a purpose to identify what outcomes might yield satisfactory results. Such a method opens pathways to bridge the gap between outreach/ engagement and research. Advances in utilizing more behavioral and institutional branches of applied economics temper the risks of pursuing this more "what could be" or "what ought to be" type of academic output. Our review highlights a number of these economic design advances.

As indicated by the reviewed publications, another general development in the theoretical literature is the flexible or multidimensional conceptualization of the agricultural cooperative. Previous work usually approached the cooperative as (1) an extension of the farm, (2) an

independent firm, or (3) a coalition of farms. Recent theory has departed from such rigid conceptualizations and instead approached the cooperative as a complex organization with multiple and competing objectives that may or may not allow a stable solution. Many studies have emphasized a single specific parameter or constraint, either by itself or in relation to some objective of the cooperative, while price and quantity no longer serve as the de facto outcome variables. Instead, theoretical work is often advanced to find solutions to problems of product quality, supply commitment, or member equity investment.

Theorists thus increasingly consider the real multidimensional nature of agricultural cooperatives, suggesting the gap between theory and practice is perhaps closing. Altogether, the primary purpose of theoretical work is arguably to help inform or explain the various challenges and opportunities faced by agricultural cooperatives in the increasingly global and complex marketplace. Although the general ability to test theories and frameworks in practice is hampered by the limited availability of sophisticated data, the reviewed publications in our chapter should provide inspiration for future empirical as well as theoretical research on agricultural cooperatives.

References

Agbo, M., D. Rousseliere, and J. Salanié. 2015. "Agricultural Marketing Cooperatives with Direct Selling: A Cooperative – Non-Cooperative Game." *Journal of Economic Behavior & Organization* 109:56–71.

Bogetoft, P. 2005. "An Information Economic Rationale for Cooperatives." *European Review of Agricultural Economics* 32(2):191–217.

Bontemps, P., and M. Fulton. 2009. "Organizational Structure, Redistribution and the Endogeneity of Cost: Cooperatives, Investor-owned Firms and the Cost of Procurement." *Journal of Economic Behavior and Organization* 72:322–343.

Cook, M.L., F.R. Chaddad, and C. Iliopoulos. 2004. "Advances in Cooperative Theory since 1990: A Review of Agricultural Economics Literature." In G.W.J. Hendrikse, ed., *Restructuring Agricultural Cooperatives*. Rotterdam, The Netherlands: Erasmus University, pp. 65–90.

Deng, W., and G.W. Hendrikse. 2013. "Uncertainties and Governance Structure in Incentives Provision for Product Quality." In *Governance of Alliances, Cooperatives and Franchise Chains*. New York: Springer, pp. 179–203.

———. 2015. "Managerial Vision Bias and Cooperative Governance." *European Review of Agricultural Economics* 42(5):797–828.

Dietl, H.M., T. Duschl, M. Grossmann, and M. Lang. 2013. "Explaining Cooperative Enterprises through Knowledge Acquisition Outcomes." *Managerial and Decision Economics* 34(3–5):258–271.

Drivas, K., and K. Giannakas. 2010. "The Effect of Cooperatives on Quality-Enhancing Innovation." *Journal of Agricultural Economics* 61(2):295–317.

Evans, L., and G. Guthrie. 2006. "A Dynamic Theory of Cooperatives: The Link Between Efficiency and Valuation." *Journal of Institutional and Theoretical Economics* 162(2):364–383.

Fatas, E., F. Jimenez-Jimenez, and A. Morales. 2010. Blind Fines in Cooperatives. *Applied Economic Perspectives and Policy* 32(4):564–587.

Feng, L., and G.W. Hendrikse. 2012. "Chain Interdependencies, Measurement Problems and Efficient Governance Structure: Cooperatives Versus Publicly Listed Firms." *European Review of Agricultural Economics* 39(2):241–255.

Fulton, M., and K. Giannakas. 2007. "Agency and Leadership in Cooperatives: Endogenizing Organizational Commitment." In *Vertical Markets and Cooperative Hierarchies*. Dordrecht, Netherlands: Springer Netherlands, pp. 93–113.

———. 2012. "The Value of a Norm: Open Membership and the Horizon Problem in Cooperatives." *Journal of Rural Cooperation* 40(2):145–161.

———. 2013. "The Future of Agricultural Cooperatives." *Annual Review of Resource Economics* 5(1):61–91.

Fulton, M., and D. Pohler. 2015. "Governance and Managerial Effort in Consumer-owned Enterprises." *European Review of Agricultural Economics* 42(5):713–737.

Giannakas, K., and M. Fulton. 2005. "Process Innovation Activity in a Mixed Oligopoly: The Role of Cooperatives." *American Journal of Agricultural Economics* 87(2):406–422.

Giannakas, K., M. Fulton, and J. Sesmero. 2016. "Horizon and Free-Rider Problems in Cooperative Organizations." *Journal of Agricultural and Resource Economics* 41(3):372–392.

Hovelaque, V., S. Duvaleix-Tréguer, and J. Cordier. 2009. "Effects of Constrained Supply and Price Contracts on Agricultural Cooperatives." *European Journal of Operational Research* 199(3):769–780.

Hueth, B., and P. Marcoul. 2006. "Information Sharing and Oligopoly in Agricultural Markets: The Role of the Cooperative Bargaining Association." *American Journal of Agricultural Economics* 88(4):866–881.

———. 2015. "Agents Monitoring their Manager: A Hard-Times Theory of Producer Cooperatives." *Journal of Economics & Management Strategy* 24(1):92–109.

Hueth, B., and G. Moschini. 2014. "Endogenous Market Structure and the Cooperative Firm." *Economics Letters* 124:283–285.

Karantininis, K., and A. Zago. 2001. "Endogenous Membership in Mixed Duopsonies." *American Journal of Agricultural Economics* 83(5):1266–1272.

King, R.P. 2012. "The Science of Design." *American Journal of Agricultural Economics* 94(2):275–284.

King, R.P., M. Boehlje, M.L. Cook, and S.T. Sonka. 2010. "Agribusiness Economics and Management." *American Journal of Agricultural Economics* 92(2):554–570.

Kopel, M., and M.A. Marini. 2014. "Strategic Delegation in Consumer Cooperatives Under Mixed Oligopoly." *Journal of Economics* 113(3):275–296.

Liang, Q., and G.W. Hendrikse. 2013. "Cooperative CEO Identity and Efficient Governance: Member or Outside CEO?" *Agribusiness* 29(1):23–38.

———. 2016. "Pooling and the Yardstick Effect of Cooperatives." *Agricultural Systems* 143:97–105.

Ligon, E. 2009. "Risk Management in the Cooperative Contract." *American Journal of Agricultural Economics* 91(5):1211–1217.

Mérel, P.R., T.L. Saitone, and R.J. Sexton. 2009. "Cooperatives and Quality-Differentiated Markets: Strengths, Weaknesses, and Modeling Approaches." *Journal of Rural Cooperation* 37(2):201.

———. 2015. "Cooperative Stability Under Stochastic Quality and Farmer Heterogeneity." *European Review of Agricultural Economics* 42(5):765–795.

Olesen, H.B. 2007. "The Horizon Problem Reconsidered." In Kostas Karantininis, and Jerker Nilsson (eds.). *Vertical Markets and Cooperative Hierarchies*. Netherlands: Springer, pp. 245–253.

Rey, P., and J. Tirole. 2007. "Financing and Access in Cooperatives." *International Journal of Industrial Organization* 25(5):1061–1088.

Saitone, T.L., and R.J. Sexton. 2009. "Optimal Cooperative Pooling in a Quality-Differentiated Market." *American Journal of Agricultural Economics* 91(5):1224–1232.

Sexton, R.J. 1984. "Perspectives on the Development of the Economic Theory of Co-operatives." *Canadian Journal of Agricultural Economics* 32(2):423–436.

Staatz, J.M. 1989. Farmer Cooperative Theory: Recent Developments. ACS Research Report No. 84. Washington, DC: U.S. Department of Agriculture.