MISSING MARKETS AND THE COOPERATIVE FIRM

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Abstract. Fixed costs limit opportunities for socially beneficial production and exchange in any setting where a firm's consumers have private information about their individual valuations. A firm that is organized to maximize consumer welfare can expand the range of economic environments that support equilibrium production by requesting contributions from consumers prior to incurring its fixed cost. Further, committing to consumer interests ensures time-consistent pricing behavior, encourages demand revelation, and exploits the potential existence of other-regarding preferences. We use these results to interpret the emergence of cooperative enterprise as an endogenous institutional response to missing markets across a wide range of historical and sectoral contexts.

Introduction

Textbook discussions of market failure generally focus on external intervention as a potential remedy. Institutional responses that arise endogenously from among the affected parties are less well understood and documented. This paper considers cooperative enterprise as one kind of endogenous institutional response. We focus on settings where a profit-maximizing firm chooses not to enter a potential market, and show how a cooperative firm can support equilibrium production. We argue that this type of response is the genesis for much of the cooperative business activity that exists today. Consumer banking and insurance, retail grocery, news collection, farm credit supply, rural utility service, to name just a few examples, are settings where economic agents in the economy have used the cooperative firm structure to provide for themselves goods and services not available through more conventional means. Ostrom (1990) provides extensive evidence on endogenous institutional responses to market failures associated with common pool resources, and there is a rich literature associated with private provision of public goods (Bergstrom et al., 1986; Bagnoli and McKee, 1991). Our focus here is the private provision of *private* goods that investor-financed enterprise does not support.

Previous work by economists to explain the existence of cooperative enterprise has focused almost exclusively on imperfect competition, and on

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its potential pro-competitive effect.[1] Nourse (1922) provides the earliest articulation of this view when he characterizes the function of cooperatives as providing a yardstick against which the performance of noncooperative firms can be measured.[2] Sexton and Sexton (1987) provide the first formal analysis of this effect in a model where consumers can enter into production in an oligopoly market. The authors show that potential entry by a consumer coalition provides a stronger discipline against anticompetitive behavior than potential entry by a profit maximizing firm operating with the same technology. Hansmann (1996) argues that cooperatives are a response to a wider range of market failures,[3] but he focuses on potential barriers to the formation and operation of cooperative enterprise (collective decision making costs, principally), without formally articulating the special attributes of a cooperative firm that allow it to function in settings where a profit maximizing firm cannot. More recently, Hueth and Marcoul (2014) study the missing markets phenomena in a setting that is specific to producer cooperation. The works by Banerjee et al. (1994) and Guinnane (2001) are closely related to ours. In both cases, the authors consider informational advantages associated with cooperative operation, and they restrict attention to the banking sector. We consider a wide range of economic sectors, and our cooperative firm does not have an informational advantage. Like Greif et al. (1994), we focus instead on *commitment* as a key function of institutions that enables the expansion of markets and trade.

In particular, we distinguish a cooperative firm by its formal commitment to the economic interests of *patron* members—individuals who not only finance the firm, but who also have a transactional relationship of some kind.[4]

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[1]Though not considered in this paper, there is also a large literature on worker cooperatives that takes as given the desire by labor to participate in workplace decisions through democratic control. In this context, the focus has been to understand why, given its assumed desirability, workplace democracy is not more commonly observed in modern economies. See Bonin et al. (1993) and Dow (2003) for surveys.

[2]He doesn't say so directly in this early paper, though he does provide a general critique of the view that cooperatives represent an alternative to contemporary (at the time) capitalism, and argues instead that cooperatives can "...at least establish the plane upon which competitive forces can operate." Twenty years later he is much more direct, arguing that the objective of a cooperative "...is not to supersede other forms of business but to see that they are kept truly competitive (Nourse, 1942)."

[3]Though he too argues that protection against monopoly is the most prominent function for cooperative firms (pp. 4-25, 122-25, 150).

[4]We use the generic term "patron" ("user" could serve equally well) throughout our paper to preserve generality with respect to producer and consumer cooperation. Also, we note that there is ambiguity in the producer- consumer taxonomy for cooperative enterprise. Some authors make a distinction based on the *action* taken by a patron with respect to the firm; i.e., a patron *consumes* from the firm or *produces* for it. But many cooperatives are hybrid in the sense that a member may both consume from (a farmer purchases fuel) and produce for (a farmer sells grain) the same firm. We use instead a taxonomy based on the *objective* of the patron in using the firm's services. A *consumer cooperative* has patron members who seek consumption utility directly with

This commitment directly expands the scope of operation for the same reason that a price taking firm produces more output than a monopolist. Additionally, in a setting where patrons have private information, commitment to their interests increases the potential scope for up-front contributions to finance setup and operations. Intuitively, patrons are willing to give up more surplus *ex ante* for the purpose of initiating operations, if they have confidence that rents will not be fully appropriated once the firm is active. This effect is further enhanced by the social (e.g., "working together") and procedural dimensions of cooperative enterprise (e.g., democratic control and proportionality) to the extent that these matter in eliciting voluntary contributions. Of course, these beneficial effects do not come for free: committing to patron interests is achieved by operating in an organizational structure that has well-understood costs.[5] It is only when markets are missing that the relevant parties must effectively produce for themselves the goods and services that the market does not provide.

Relative to previous literature on theory of the firm, our contribution is to model formally a specific feature of the contractual nexus that characterizes a cooperative, and to demonstrate how this feature leads such firms into market environments where conventional profit-maximizing ones will not go. We then illustrate implementation of this mechanism in practice with historical and contemporary institutional examples. There is no consensus view on how to model the firm, despite many insightful contributions (e.g., Coase, 1937; Williamson, 1975; Hart, 1995; Spulber, 2009). For the purpose of this paper, we assume that a firm is a productive unit whose objective is shaped by the economic interests of its formal owners. Further, unlike Hansmann (1996) who characterizes the cooperative firm as a more general structure of which the "capital cooperative" (i.e., investor owned firm) is a special case, we argue that cooperative incorporation statutes impose costly *restrictions* on future operations so as to fully commit the organization to its patron owners' economic interests.

In any full-information environment, there are well-known first-best solutions to market failures. We consider a private information environment that captures the essential feature of startup for any kind of market activity.[6]

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their patronage. A *producer cooperative* has patron members who seek to enhance their income as producers.

[5]The most widely cited of these arguably are increased collective-decision making costs (Hansmann, 1996), and underinvestment due to the so-called "horizon problem" (Jensen and Meckling, 1979; Cook, 1995). Conceptually, both are a consequence of the lack of a market for ownership, which in turn is caused by two-way heterogeneity in the value of ownership to potential patrons. Some patrons are more valuable to the firm than others, and likewise patrons differ with regard to what they want the firm to produce. Interestingly, we are not aware of any direct empirical evidence that documents these costs, though Hansmann (1996) informally infers their existence with descriptive evidence on the incidence of cooperative business activity in the U.S. economy.

[6]This is to provide the capital (and perhaps in-kind labor) to enable startup. To the extent that marginal production costs are not too steep, this problem is formally analogous

We then identify second-best solutions that can arise as the equilibrium outcome of interaction among the affected parties. Our work builds on Cornelli (1996) who considers the behavior of a monopoly firm in a setting where contributions are sought from consumers *prior* to committing to produce. In this context, the threat of not producing at all serves as incentive for consumers to contribute. We note that this mechanism fails to work in any setting with repeat sales, unless a firm can fully commit to a long-term contract. We interpret a cooperative firm as just such a commitment, made even stronger because the fact that firm and patron interests are fully aligned. Formally, our model is directly analogous to a voluntary contribution mechanism (VCM) for a club good. A considerable experimental literature exists on public good VCMs, and a much smaller one exists for club good VCMs. We examine instances of cooperative startup in relation to findings from these literatures to demonstrate how the "cooperative mechanism" is used to bootstrap economic activity that otherwise would not take place. In this sense, we also contribute to the emerging literature on endogenous institutional formation in social-dilemma settings (e.g., Tyran and Feld, 2006; Kosfeld et al., 2009; Markussen et al., 2014).

In what follows, we first characterize the unique features of cooperative enterprise and summarize briefly the incidence of cooperative firm activity in the U.S. economy. We then discuss four prominent historical instances where economic agents endogenously initiated new market activity using the cooperative firm. The subsequent section presents a model where organizing a cooperative is interpreted as a mechanism design problem for provision of a club good. We demonstrate the mechanics of the model, present our main result on market extension, and discuss several extensions of the model. The penultimate section discusses implementation in light of results from the experimental literature on public and club good VCMs. Here we relate prominent features of the operating principles for cooperative enterprise (e.g., democratic decision making, proportionality, appeals to a collective identity, leadership) to factors that have demonstrated efficacy in enhancing contributions in the lab. This discussion is offered as further evidence that the cooperative firm is a mechanism for solving collective action problems in the organization of markets, and as direction for further research that specifically addresses this empirical context.

Cooperatives in the Economy

In its most general form, a cooperative firm is a commercial entity organized to benefit (via the production of goods and services) its patrons. This type of organization has been around probably from the very beginning of commercial activity. Indeed, the Maghribi Trader Coalitions and Merchant

to providing a club good where *ex post* exclusion is an endogenous institutional design decision that can have an effect on *ex ante* willingness to contribute.

Guilds described in Greif (1993) and Greif et al. (1994) were themselves informally operated cooperatives.[7] The explanation we provide below for the emergence of cooperative enterprise complements existing interpretations for these particular institutions. Similar (but formal) market-supporting institutions exist today that operate as patron- controlled entities. Standards bodies are perhaps the most prominent example, but industry consortia also collectively set market rules, conduct joint R&D and promotion, and develop market platforms that enhance access for consumers. The output for each type of consortia has strong public-good attributes, but there are also many examples of cooperative activity in the context of pure private goods. Because this commercial activity continues to be an important, but poorly-documented part of modern economies, we briefly summarize the state of the cooperative economy in the United States.[8]

Heflebower (1980) provides a descriptive overview of cooperative activity in the United States. More recently, citetdeller2009 report results of an economic census conducted by the University of Wisconsin Center for Cooperatives. Table reftab:summary summarizes their results with regard to number of firms, assets, and revenue in each of four sectoral categories.

TABLE 1. U.S. cooperative economic activity by sector.

Sector	**Assets**	**Revenue**	**Employment**
	(billion)	(million)	(thousand)
Commercial Sales and Marketing	60	176	266
Social Services	1.7	4.4	92
Financial Services	2,862	265	376
Utilities	119	36	80
Total	3,043	481	814

Source: The University of Wisconsin Center for Cooperatives, Research on the Economic Impact of Cooperatives.

The commercial sales and marketing categories include mostly farmer cooperatives and account for a substantial share of aggregate revenue and employment. Social services include healthcare and health insurance, child and elderly care, transportation, education, and housing cooperatives. The financial services sector, which includes the Farm Credit and Federal Home Loan Bank Systems, credit unions, and mutual insures, accounts for over 90% of total assets held by cooperatives.

[7]The traders and merchants were patrons in these cooperatives, providing market organziation service for themselves.

[8]This overview is highly incomplete because it does not count the many types of commercial clubs and associations that produce goods and services for members. It also does not count commercial non-profits whose directors are patrons (rather than appointed non-patron fiduciaries as in the case of a purely charitable non-profit). Nevertheless, the information we do present here provides a lower-bound on total activity accounted for by cooperatives businesses.

Missing Markets

Our intent in this section is to demonstrate with several examples that a significant portion of the activity reported above emerged as a response to unmet latent demand, rather than as a response to market power. We discuss four cases in some detail, and then briefly summarize the story behind several others. If there is no market where there exists demand for something, then the opportunity exists for monopoly, or at least for the exercise of some market power. As an empirical matter, therefore, the distinction can be subtle; there may be a functioning "market," just not one that works well with a dominant incumbent specialized in the relevant activity.

Mutual Insurance. The earliest formal companies established for the purpose of providing property and life insurance services to households were organized as mutual societies. This kind of company seems to have evolved naturally out of the activities of earlier "Friendly Societies" that provided mutual insurance for proper burial at death (Prudential Insurance Company of America, 1915). The Hand-in-Hand Fire and Life Insurance Society (later becoming the Amicable Contributorship), established in 1696, was among the earliest such firms. Love (1994) provides a particularly detailed account of the Mutual Assurance Society of Virginia, which was among the first formal mutual insurance companies established in the United States. According to this account, William Frederick Ask of Richmond met with a group of Richmond citizens in 1794 to discuss the need for fire insurance in Virginia. According to the author, "Three Philadelphia companies—the Philadelphia Contributorship (1752), the Mutual Assurance Company (1784), and the Insurance Company of North America (1792), as well as the New York Mutual Assurance Company (1787) and the Baltimore Equitable Society (1794), offered policies to insure buildings against loss from fire, but likely none of these operated in Virginia." It is noteworthy that among the other existing companies during this time, only one was not organized as a mutual, and of the others, the Philadelphia Contributorship, New York Mutual, and the Baltimore Equitable, all still operate today.

Consumer Banking. Guinnane (2001) discusses the historical development of credit unions in late nineteenth century Germany. He points out that, despite a well developed commercial banking infrastructure at the time, "Prior to the introduction of credit cooperatives, small holders and the landless in Germany depended for credit on shop keepers, agricultural dealers, and other informal lenders." There were no specialized firms focused on providing financial services to households. Two individuals, Hermann Schulze-Delitzsch and Friederich Raiffeisen, responded in slightly different ways to this missing market, each creating what would later become the modern "credit union." Interestingly, a formal financial services industry did not develop in Canada or the United States until a similar pair of "social entrepeneurs" (Alphonse Dejardins and Edward Filene) aggressively pursued

their creation. These examples are suggestive of the need for an external catalyst to resolve collective actions frictions at start up. Once established, these industries flourished, but it took the activism of a small number of individuals to initiate startup.

Farm Credit. The U.S. Farm Credit System (FCS) provides lending services to farmers for land purchase and operating credit.[9] Creation of this system was a response to the absence of credit institutions in rural areas, and to a lack of lending services tailored to the needs of farmers in settings where some form of commercial credit was available. The system as it exists today slowly emerged after initial efforts in the early 20th century to establish federal land banks modeled after the German Landschaft system. It was the first of what have become known today as "Government Sponsored Enterprises" (GSEs), which are hybrid public-private entities designed to facilitate the flow of credit to targeted sectors of the economy (Kosar, 2007), and it is one of only two GSEs that are cooperatively owned by their borrowers.[10] Creation of the system was a joint effort between the federal government and rural communities to provide credit services to farmers. During it's initial years, farmers were directly involved in startup and administration. According to Hoag (1976),

> The farmer boards of directors of those associations... faced an almost impossible task of building a strong local underpinning for the Farm Credit System. Those who went around organizing Production Credit Associations frequently had difficulty in finding five farmers at well-attended meetings who had five dollars apiece to buy their first share of stock and thus become charter members.
>
> Farmers and ranchers serving on the boards of directors of the local associations, then and in the ensuing years, had tough decisions to make not only in setting loan and other policies for their organizations but also in the making of individuals loans. These farmer-directors were often troubled by the knowledge that their decisions were determining the future course of the lives of entire farm families–often their neighbors and friends.

Natural Foods Retail. There are over 300 retail grocery cooperatives in the United States that emerged in response to increasing awareness in the early 1970s of potential hazards from pesticide exposure on food. A small number of consumers desired "natural foods" that, at the time, were not

[9]This system also provides credit to farmer cooperatives, but here we only discuss the efforts to finance farming activities directly. The historical material in this section is drawn from Hoag (1976) and Knapp (1973).

[10]The other is the Federal Home Loan Bank System, which provides liquidity for commercial banks that offer home mortgage lending services.

available in conventional retail grocery stores. Here is the founding story of one such cooperative that is typical of most[11]:

> Our Co-op was one of the many food co-ops begun in the 1970s that gave birth to and nurtured the market for natural food. Like most other consumer food co-ops, the Community Food Co-op began literally with nothing but the energy of the people involved. For the first six months, the Co-op operated as a food buying club, with the support of Puget Consumers Co-op in Seattle—itself a small co-op in those days. The Co-op storefront opened its doors in 1970 in the Good Earth Building in the Fairhaven district with about 40 members. It operated with a volunteer staff and offered just eight items: cornmeal, bread, honey, flour, rolled wheat, rice, wheat germ, and granola.

These last two examples demonstrates clearly the "self help" aspect of producer (farm credit) and consumer (retail grocery) cooperation with patron members providing for themselves items that were not available in the market.

Other Examples. Each of the cases described evolved eventually into robust sector-wide use of the cooperative firm. There are many other instances of more idiosyncratic (and much less well-documented) uses that, at least on the surface, seem again to be a response to the absence of a market. We briefly describe several of these:

The Associated Press, a news gathering organization that refers to itself as "not-for-profit news cooperative," was established in 1846 when "... five New York City newspapers got together to fund a pony express route through Alabama in order to bring news of the Mexican War north more quickly than the U.S. Post Office could deliver it." The Hospital Cooperative Laundry coordinates the handling of linens for 32 hospitals and clinics in Colorado. The is only one of many such organizations represented by the International Association of Textile Managers (formerly the Association of Cooperative Hospital Launders). In 1938, Lloyd and Mary Anderson, together with 21 other mountaineering enthusiasts, founded Recreation Equipment Incorporated to organize the purchase of equipment from an Austrian supply source. This action took place subsequent to the Andersons purchasing $3.50 worth of equipment for themselves in 1936. A small group of Wisconsin dairy farmers who were intent on using organic production techniques (because of strongly-held beliefs about their superior environmental performance) founded CROPP Cooperative (the organization behind the Organic Valley retail label) to *create* a market for organic dairy products. Finally, we mention Kickstarter as a platform that is used to connect entrepreneurs with interested consumers who contribute financially toward to startup in

[11]See, `http://www.communityfood.coop/join/history` (accessed on August 14, 2014).

return for privileged access conditional on project success. Though not a cooperative, this mechanism addresses the central economic phenomena that is the focus our work, and recent controversy regarding improper use of consumer contributions points toward the potential for *ex post* conflict absent a strong commitment that ensures congruence between founder and contributor interests.

The first two among this group of firms are examples of a business-to-business cooperative. Unfortunately, it is difficult to know how pervasive such firms are, because they do not have a strong reason to associate collectively through a trade association or other like organization. Indeed, many such firms do not self identify as cooperatives, though clearly they are non-investor patron- controlled and patron-financed firms.[12] The two examples cited here provide a mechanism for sharing fixed costs across firm boundaries. As mentioned earlier, the distinction between this rationale for startup, and the more conventional "countervailing- market-power" rationale, can be blurry. The National Cable Television Cooperative, for example, purchases hardware and supplies, and negotiates contracts with content providers, for nearly 1000 independent cable T.V. providers. Here it seems plausible that market power concerns were at least partially a motivation for the firm's original founding in 1984.

For the purpose of this paper, the unifying feature in each these examples is that patrons make significant up-front contributions to initiate the relevant enterprise. Though we are not aware of any formal systematic study on the topic, it is likely that nearly all cooperatives start out as quasi worker cooperatives, and then transition as the organizations become self sustaining and able to hire full-time management. In a recent case study of 14 cooperative startups, Berner (2013) provides anecdotal evidence suggesting this is the case. Summarizing various aspects of the startup process for the study subjects, the author concludes, "A significant amount of volunteer labor is responsible for organizational and management tasks before the first employee is hired. In nearly every cooperative we interviewed, an all-volunteer steering committee or interim board was driving the planning process. Even in cases where a project coordinator was hired during the development process, volunteers still contributed many hours."

At an abstract level, this is a form of non-linear pricing where patrons contribute a portion of their expected surplus up front. With private information and heterogeneous valuations among members, the specific mechanism that is used to solicit contributions can determine economic feasibility. In the next section, we present a simple model based on Cornelli (1996) to demonstrate the optimal mechanism from the perspective of a profit-maximizing monopolist. We then show how committing to patron interests expands the *equilibrium* region for market activity, and argue further that it expands the *feasible* region for economic activity in any setting with repeat

[12]See Reynolds and Wadsworth (2009) for further examples.

sales. Subsequently, we discuss several extensions to the basic model in light of recent theory on implementation in settings with correlated information and social preferences.

Model

Consider a two-period setting where N patrons each demand a single unit of a good or service that can be produced at zero marginal cost after incurring the fixed setup cost $K > 0$. Each patron knows his own value v_i for the good, but not the values held by each of the other patrons. We suppose that all patrons hold common beliefs on the distribution $F(v)$, for $v \in [\underline{v}, \overline{v}]$, from which each patron's value is independently drawn.

Profit Maximization. The manager of a monopoly firm, who we assume holds the same beliefs as patrons regarding the distribution of patron types, chooses p in each period to maximize expected revenue, $\Pi(p) \equiv Np(1 - F(p))$, with the solution satisfying $p^* = (1 - F(p^*))/f(p^*)$, where $f(\cdot)$ is the probability density associated with $F(\cdot)$. If $\beta < 1$ is the discount factor for the firm's period 2 payoffs, then the firm will enter into production if $(1+\beta)\Pi(p^*) \geq K$. We assume that selling at a uniform price is not feasible:

Assumption 1 (Missing Market)**.** *A profit-maximizing monopoly firm cannot earn positive profit by charging a uniform price in each period:* $(1 + \beta)\Pi(p^*) < K$.

To enhance the scope for entry, the firm can request *ex ante* contributions from patrons and elect to produce only when contributions are sufficiently high. There are of course a wide variety of specific mechanisms that the firm might consider for this purpose. Our focus is not on implementation, but on how conditioning production on *ex ante* contributions can enhance feasibility. For this purpose, we consider only the direct mechanism where each patron reports his true value to the firm in return for a probability of access $p_i(v_i, v_{-i})$, and a promised interim utility that ensures incentive compatibility. For now, we also restrict attention to outcomes that can be implemented assuming full commitment across both periods. Baron and Besanko (1984) show that in this setting (independent private values that do not vary across periods), a monopolist can do no better than to offer the profit-maximizing single-period contract twice to each patron. Accordingly, let $R(v) = v - (1 - F(v))/f(v)$, which can be interpreted as the marginal revenue contribution from selling to a patron with valuation v, net of the information rent that must be paid to ensure truthful reporting (Bulow and Roberts, 1989). Assume that $R(v)$ is a monotone strictly increasing function, and define v^* as the solution to $R(v^*) = 0$. Letting $\mathbb{1}\{\cdot\}$ be the indicator function, then we have

Proposition 1 (Cornelli)**.** *A monopolist will choose to produce and sell the good if and only if*

$$(1+\beta)\sum_{i=1}^{N}\mathbb{1}\{v_i \geq v^*\}R(v_i) - K \geq 0.$$

If it produces, the firm will provide access only to patrons whose values satisfy $v_i \geq v^*$.

The intuition for this result can be understood in the context of a simple example environment where there are just two patrons, and where $F(\cdot) = U(0,1)$. Then $R(v) = 2v - 1$ with $v^* = 1/2$, and the set of profit maximizing allocations takes the form presented in figure 1. With optimal uniform pricing, the firm charges a take-it-or-leave-it price of $1/2$ to each patron, earning an expected profit $(1+\beta)/2 - K$ across both periods. If the firm instead requests *ex ante* contributions, then it only produces when announced values are sufficiently high. If $v_1 < 1/2$, then production takes place if and only if $(1+\beta)R(v_2) \geq K$, or when $v_2 \geq \hat{v} \equiv 1/2 + K(1+\beta)^{-1}/2$. In this case, production takes place, but the firm grants access to only one of the patrons. Relative to the take-it- or-leave-it pricing strategy, the firm forgoes sales that would have occurred (assuming production were feasible) in the region labeled d. From the perspective of a patron, there is an exclusion risk even when announcing a value above what would have been the optimal uniform monopoly price:

If patron 1 reports a value between $1/2$ and $\hat{v}$, he only gets access if patron 2 reports a value above the line separating areas "d" and "e," defined by $v_1 + v_2 = \hat{v}$. Regions a and g correspond to outcomes where only one patron gains access, while the other is excluded even though this is of course not efficient *ex post*. We have assumed that a profit maximizing firm will choose not to produce if it is constrained to take-it-or- leave-it pricing. We see in figure 1 that, for this example environment, allowing the firm to request *ex ante* contributions increases the scope for equilibrium production to include (v_1, v_2) profiles represented by the areas a–g, excluding the area d.

Cooperation. There are several ways to think about modeling a "cooperative" in this environment. Arguably the most obvious starting point is to consider a mechanism that maximizes patron welfare, rather than profit. The following corollary to Proposition 1 summarizes the allocations that are optimal under this objective. Define $\tilde{v}$ as the solution to $\tilde{v} + R(\tilde{v}) = 0$, and let $\lambda = \mathbb{1}\{\sum_i v_i + R(v_i) < K\}$. Then, we have

Corollary 1. *A cooperative firm that maximizes patron surplus will produce and distribute the good if and only if*

$$(1+\beta)\sum_{i=1}^{N} v_i + \lambda R(v_i) - (1+\lambda)K \geq 0.$$

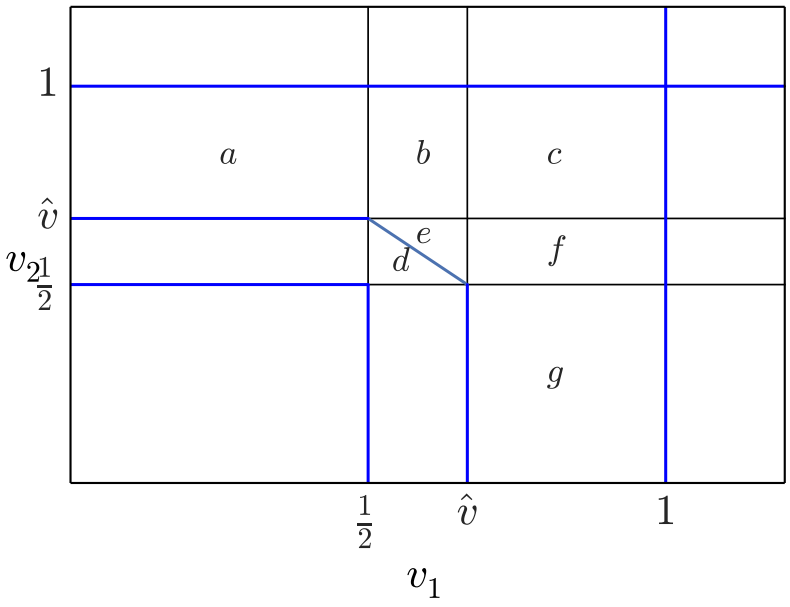

FIGURE 1. Profit-maximizing allocations with *ex ante* contributions when v_i is distributed U(0,1) and for $K < 1$.

If it produces, the cooperative will provide access only to patrons whose values satisfy $v_i \geq \max\{\underline{v}, \lambda\tilde{v}\}$.

When the incentive compatible payments that can be generated from potential cooperative members are high enough, a first best outcome can be achieved: production takes place when $(1 + \beta)(v_1 + v_2) > K$, and both patrons are granted access—even those who generate negative marginal revenue. Given the firm's objective, it is optimal to use one patron's contributions to subsidize access for another patron. When $\sum_i v_i + R(v_i) < K$, then the cooperative cannot afford these subsidies, because they jeopardize project feasibility. But even here, the cooperative objective generates a set of equilibrium allocations that involve production over an expanded range of valuation profiles, relative to the outcome with a profit maximizing firm. Thus, we have

Proposition 2. *A cooperative firm, defined as an organization that maximizes patron surplus, produces over a wider range of patron valuation profiles than a profit maximizing firm, increasing the* ex ante *probability that production takes place.*

This proposition is analogous to the standard comparison between competitive and monopoly firms in a full-information environment. Here, however, the focus is on the decision to enter into production. The reorientation of a firm's objective from profit maximization to patron surplus maximization changes startup behavior. The organization is more permissive in the

sense that it seeks to support access over a wider range of valuations and cost structures. Of course, in practice this reorientation is costly: committing to patron interests is accomplished by limiting access to outside capital, and by governing according to potentially a more heterogeneous set of interests. Also, the startup activity must be initiated through the collective action of many heterogeneous individuals. It is efficient to avoid these costs whenever possible, so we should expect to see cooperatives emerge only in settings where conventional profit maximizing firms do not enter.[13]

Extensions. So far, there is nothing about the cooperative firm that changes the *feasible* set of allocations. In this subsection, we briefly describe three plausible ways that organizing as a cooperative might enable outcomes not attainable for a profit maximizing firm.

Commitment. The monopoly behavior characterized above depends critically on the firm's ability to commit not to use information revealed in the first period to alter the promised second-period allocation. Laffont and Tirole (1988) show that when a firm cannot commit to a long-term contract, generally there is pooling in the first period. The best the firm can do in a sequence of one-period contracts is to offer the optimal uniform price in the first period, and then the optimal static contribution mechanism described above in the second period. Is there a reason to believe that organizing as a cooperative might alter the firm's ability to commit to a long-term contract? To answer this question, consider the incentives each type of organization has to renegotiate the second-period contract after observing truthful reports and implementing the optimal first-period outcome.[14] If aggregate valuations exceed K, but the decision was *not* to produce, then clearly both types of firms have an incentive to renegotiate the second-period contract and produce. Similarly, if the decision is to produce in the first period, but one or more patrons are excluded from access, in the second period it is optimal for both types of firms to grant access to the excluded patrons. The difference between a profit maximizing firm and cooperative firm lies in the incentive to renegotiate the access prices for all patrons (assuming $\sum_i v_i > K$) in the second period. The cooperatives seeks to minimize transfers, while the profit maximizing firm seeks to maximize transfers. Because the cooperative sought initially to minimize transfers, its second-period commitment is *time consistent*, while the profit maximizing firm's is not.

[13]An incumbent firm can deter entry of a cooperative startup by offering patrons at least the surplus that each would receive if the cooperative were to form. However, the threat of potential cooperative entry reduces expected profits, further limiting for-profit entry (Hueth and Moschini, 2014).

[14]We do not consider the possibility of renegotiating the terms of the revelation game in the first period, which is more a theoretical device than the actual physical period over which contract renegotiation might occur.

Remark 1. *For a valuation profile where all patrons are granted access, a cooperative firm has a time-consistent contribution-request strategy; a profit maximizing firm does not.*

In other words, by committing to patron interests, a firm resolves an important dilemma for the purpose of eliciting up-front contributions at startup. If a profit maximizing firm cannot credibly commit to a long-term price policy that does not exploit information revealed when first-period contributions are made, it cannot elicit truthful reports in the first period. The optimal policy of a cooperative firm is, by construction, credible. This has an important effect on *ex ante* feasibility if long-term contracts are not feasible.

Information. Bergemann and Välimäki (2006) discuss how information that is available to agents within a given economic setting is potentially endogenous to the choice of mechanism. For example, a mechanism might be used to encourage agents to acquire information that is needed to make an efficient allocation decision, or a mechanism designer might choose to disclose information for the purpose of generating more competitive bidding. For the purpose of our analysis, it is natural to think of patrons as having better information than an external firm about their private valuations. Does a mechanism designed to maximize patron welfare provide an incentive for patrons to reveal this information to the designer?

Segal (2003) provides a useful framework for formalizing this idea. In particular, suppose that demand is unknown to an outside firm in the sense that the distribution of private values is conditioned on a parameter θ. We now write $F(v) = F(v|\theta)$, and note that for a given prior on θ held by the firm, direct reports on v_i, $i = 1, \cdots, N$, in the revelation game can be used to update beliefs and generate a new distribution, say $\hat{F}(v_i)$, which can then be used to compute the optimal mechanism. Assume that this parameter is something that each patron knows for certain. Do they want to report its value to the firm? Clearly, either type of firm can do no worse optimizing with knowledge of θ than without it; there is value to each firm in learning θ. By construction, if the cooperative firm gains from learning θ, then aggregate expected patron surplus rises. However, it is not clear whether knowledge of θ by a monopoly firm helps or harms patrons. The firm can use its knowledge of θ to design a mechanism that leaves less information rents to patrons for a given allocation, but the information also can be used to achieve a different allocation.

Conjecture 1. *Patrons are better off* not *disclosing θ to a monopoly firm.*

Other-Regarding Preferences. Each patrons' contribution to cooperative startup generates a positive externality in the form of an increase in the probability of access for other members. Kucuksenel (2012) shows that when patrons experience a direct utility benefit from access by other members, mechanisms that produce public goods get closer to the efficient level of provision,

and that in private goods settings, agents trade more often. The question we ask here is whether operating to maximize patron welfare should make these preferences even more effective, relative to a firm that operates to maximize profit. In both cases, other-regarding preferences elicit greater contributions from patrons, but there is a stronger effect in a cooperative organization if other-regarding behavior by patrons does not apply to profits of the firm. In particular, suppose that each patron's utility is given by $\rho(v_i - t_i) + (1 - \rho)\sum_i(v_i - t_i)/N$ so that patrons get indirect utility from increasing their collective payoff, but not from increasing firm profit. Then, we have

Remark 2 (Kucuksenel)**.** *Other-regarding preferences increase the scope for equilibrium production. If patrons do not value firm profit directly, then the increase is larger in a cooperative firm than in profit maximizing firm.*

Of course, it is far easier to imagine reasons for other-regarding behavior with respect to patron utility than for firm profit. In the next section we briefly discuss relevant experimental results. The purpose of this discussion is to add further empirical support for our hypothesis that the "cooperative" firm structure is an endogenous response to missing markets. We have already discussed a wide variety of field settings where this seems to have been the case. In the next section, we discuss complementary experimental evidence that we can interpret in the context of the model presented above, and in reference to several other prominent attributes of cooperative enterprise as it occurs in the field.

Missing Markets and Cooperative Enterprise in the Lab

So far we have described the emergence of cooperative enterprise in response to missing markets, and presented a simple economic model to show how this behavior can be understood as a mechanism for committing a firm to pursue the interests of its patrons. This mechanism is more effective when trade is repeated over time and full intertemporal commitment is not feasible, when there is not common knowledge about patron demand, and when patrons have other-regarding preferences. Possibly with the exception of the last item in this list, none of these effects are behavioral. The cooperative firm is defined in terms of an objective and information structure for the relevant economic environment. In this section, we discuss briefly the so-called "cooperative principles" in relation to several behavioral phenomena that have been observed in experiments designed to identify factors that promote pro-social behavior. We are not aware of any experimental analysis that addresses cooperative startup and missing markets directly, but there is a large and related literature on the private provision of public goods and common pool resources, and a smaller literature on the private provision of club goods. Our discussion in this section therefore not only provides further evidence in support of the notion that the cooperative firm is a mechanism for serving missing markets, but it also offers direction for

future research that is more targeted to the specific question we ask in this paper.

Democracy, Proportionality, and Inclusion. The principles that guide cooperative operation are usually attributed to the famed Rochdale Pioneers, but Fairbairn (1994) (citing Lambert (1963) heavily) notes that many of them were already widely used by cooperative-like firms at the time the Pioneers combined and codified their use.[15] Arguably, the most prominent of these principles are democratic governance with one-member-one-vote for director elections (and other major corporate decisions), proportionality between use benefit and financing of the enterprise, and open membership.

Unlike public corporations, which transitioned to one-share-one-vote during the late 19th century (Dunlavy, 1998), cooperative enterprise has largely preserved the one-member-one-vote principle through state-level statutory provisions (Zeuli et al., 2004). Why should cooperatives operate according to a one-member-one-vote rule? One view is that such voting provides protection to small shareholders against *ex post* appropriation of rents by larger shareholders (Hilt, 2008), or to consumers when they are the firm's owners (Hansmann and Pargendler, 2014). Another possibility, however, is that the democratic process engenders pro-social behavior that supports start up. Dal Bó (2010) surveys evidence on the effect of democratic institutions on public goods provision, and distinguishes among studies that have demonstrated the *indirect* effect of democracy on behavior via institutional design (and therefore on the incentives that economic agents face), its *direct* effect on behavior that operates by "strengthening social norms or operating as a coordination device" (p. 18), and, finally, its *spillover* effect on nondemocratic institutions as those who have experienced democracy bring heightened (and learned, presumably) pro-social behavior into non-democratic institutions. Markussen et al. (2014) refer to these effects collectively as the "democracy dividend."

Cooperatives also normally try to maintain proportionality between a patron member's "use" and financing of the enterprise. Of course, such a system is difficult to maintain when there is heterogeneity across members in the net return they generate for the enterprise. Further, there are clear *costs* to maintaining such a system to the extent that members have different risk preferences, and demand for liquidity. Likewise, the principle that membership be open to everyone after successful startup limits the incentives that can be provided *ex ante* through the threat of exclusion. From a behavioral perspective, however, proportionality and open membership can be seen as attempts to achieve "fairness" and "solidarity." Noting that the social psychology literature emphasizes "costs in proportion to benefits in exchange" as an important fairness principle, Clark (1998) tests whether

[15]The International Cooperative Alliance and the U.S. Department of Agriculture provide widely cited contemporary articulations of these principles that differ somewhat in emphasis.

individuals are willing to incur a cost to achieve proportional outcomes in a public goods VCM. His findings support a preference for proportionality among the participants in his experiments. Gailmard and Palfrey (2005) report on experiments comparing the efficacy of serial cost sharing (Moulin and Shenker, 1992; Moulin, 1994), with a proportional non-exclusionary rule that has less attractive properties theoretically (it does not have a dominant strategy equilibrium) than serial cost sharing, but that performs much better in their laboratory experiments. Both sets of results provide support for the notion that proportionality and inclusion are institutional design choices that are used because they promote pro-social behavior.

Leadership, Communication, and Identity. Although there is no formal research on the determinants of successful cooperative startup, practitioners operate under a set of best practices that line up closely with factors that have demonstrated efficacy in public good VCM environments. Berner (2013) emphasizes the importance of identifying a "champion" during development. The champion "...is often the catalyst for starting a project or the energy that keeps it moving..." Summarizing best practices, Rapp and Ely (1996) suggest "using advisors and committees effectively" and "keeping members informed and involved." Each guide identifies many other factors that support success, but these quotes, and much else that is discussed by the authors, suggest the important role that *leadership* and *communication*—two modifications of the standard public goods VCM that have demonstrated efficacy—can play in overcoming collective action problems.

Isaac and Walker (1988) were among the first to examine the beneficial role that non- binding face-to-face communication can play in social-dilemma settings where the dominant strategy equilibrium is zero or minimum contribution. More recently, Hamman et al. (2011) studies electoral delegation, finding that when an individual is granted authority to make allocation decisions for the group, there tends to be full and equitable provision of the good. The same effect is observed when group members are given the choice to elect a leader ("endogenous institution formation"), but only when the group members are given an opportunity to communicate prior to making their institution design choice. In the first published meta analysis of the effect of communication on cooperation in social dilemmas, Sally (1995) finds an average 40 percent improvement in outcomes. Balliet (2010) updates and confirms these findings, but identifies several effects that can moderate the effect (particularly communication medium).

There is good reason to doubt that similar effects can be achieved when the economic environment is altered so that one person (or a "firm") stands to benefit disproportionately from equilibrium provision of the good. A profit maximizing firm could attempt to assign a leader and promote communication as a means to encourage greater contributions from patrons, but it seems natural to expect greater efficacy when patrons are jointly sharing

the surplus through a cooperative venture. Testing this conjecture represents a potentially interesting direction for future experimentation.

Group identity is another factor that has been shown to influence strongly pro-social behavior. The International Cooperative Alliance characterizes "cooperative identity and values" this way:

> **Identity:** A cooperative is an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically controlled enterprise.
>
> **Values:** Cooperatives are based on the values of self-help, self- responsibility, democracy, equality, equity and solidarity. In the tradition of their founders, cooperative members believe in the ethical values of honesty, openness, social responsibility and caring for others.

To be sure, this is not a universally accepted characterization of cooperative enterprise within the community of cooperative members and managers. Indeed, an interesting research question is whether this stated definition and set of values manifest in any economically meaningful way to facilitate cooperative startup, and in the operational behavior of currently active cooperatives firms. Nevertheless, these declarations can be interpreted as an attempt to create an identity and value system, within an institutional context, that elevates natural human tendencies toward pro-social behavior (e.g., Gächter and Fehr, 1999; Chen and Li, 2009). Similarly, and perhaps most obviously, the word "cooperative" may serve a social-psychological function in converting, in the minds of potential participants, an antagonistic relationship (firm vs. consumer) relationship into a a collective one that can promote individual contributions and partial resolution of free-riding behavior. These kinds of forces have demonstrated efficacy in the lab, though of course there is still considerable doubt that they have the same effect in real-world settings (e.g., Levitt and List, 2007; Stoop et al., 2012). Cooperative behavior and performance is perhaps one field setting where further testing can occur.

Conclusion

This paper provides a novel rationale for a wide range of economic activity that is accounted for by so-called "cooperative" firms. We note that many such firms got their start when some class of economic agents (consumers or producers) chose to provide for themselves a good or service that conventional investor-financed firms were not providing. We offer as the central defining feature for cooperative enterprise its formal commitment to the economic interests of a particular class of patrons *other than pure investors*. In itself, this tends to widen the scope of economic activity that a firm will undertake for the same reason that a price-taking firm chooses to produce more output than a monopoly firm. However, there are several additional consequences associated with organizing as a cooperative that further expand the feasible region for equilibrium economic activity. A firm committed to

patron interests can request up-front contributions from its patrons to cover fixed costs, which implicitly reveals private information about demand, *and* make a time-consistent promise not to exploit that information in subsequent periods. Further, patrons have an interest in disclosing information directly to the firm, knowing that such information will not be exploited. Also, to the extent that pro-social preferences are active at startup, organizing as a cooperative can be seen as a way to fully leverage their power. Indeed, it seems that much of the rhetoric surrounding cooperative identity and values is designed for precisely this purpose.

More broadly, this paper contributes to a growing literature on endogenous institutional choice in settings with a social dilemma, and extends existing work on private provision of public and common-pool-resource goods to a pure private goods setting where market failure occurs at startup. At this stage in production, the firm's setup cost is effectively a club good in the sense that, once incurred, everyone can access the goods and services (up to the point where congestion sets in) that it generates. This perspective offers new direction for research on private provision of "market correction," and on the interaction between state and market; it also sheds new light on discussion of public policy regarding cooperative (and other forms of alternative) ownership. Many prominent segments of cooperative business activity today are the result of focused social activism or direct government intervention in the past. This is consistent with the notion that starting a cooperative is a collective action problem, and that some form of initial "push" can have an important catalytic effect on startup success.

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