EMERGENCE OF COOPERATIVES AND FARMER HETEROGENEITY

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Abstract

This paper studies patterns of emergence of cooperatives. We examine how heterogeneity of farmers, reflected in a distance measure, affects equilibrium outcomes. Our results show that when distance costs are low, a cooperative emerges bottom-up by all farmers taking an initiative. With medium distance costs, one of the farmers takes a lead. With high distance costs, no cooperative emerges. Including an outsider in the game changes the equilibrium strategies of the players. With complete information, a cooperative is either formed with an initiative of one farmer or it emerges top-down with outsider's support. When information is incomplete, a cooperative thus emerges either bottom-up, i.e. with two active farmers, or top-down.

Keywords: Cooperative emergence, heterogeneity, life cycle

Introduction

"It is generally recognized that cooperatives are harder to organize than for-profit enterprises. Whereas the entrepreneur needs only his own resources or impersonal capital markets to launch a venture, forming a cooperative requires explicit coordination, usually among many players who must agree (usually via formal contract) both to capitalize the organization and to patronize it."

Sexton and Sexton (1987, p. 585)

Empirical evidence suggests that different patterns of emergence of cooperatives exist. [2] First, worldwide there are numerous cooperatives that emerged bottom-up, i.e. due to the initiative of farmers only. For example, starting from 1882, many of the Danish dairy cooperatives were formed by energetic entrepreneurial farmers (Svendsen and Svendsen, 2000). These initiatives led to higher quality of dairy products and also allowed farmers to charge higher prices. Second, cooperatives may emerge due to some members separating from an existing cooperative and forming one of their own. When a cooperative consists of heterogeneous members, it may become more attractive for high-quality farmers to leave the cooperative and form a smaller homogeneous high-quality cooperative (Hendrikse and Bijman, 2002). Such "bee-hiving" pattern was recently observed in several Swedish cooperatives, which emerged due to members de-associating themselves from larger cooperatives and forming smaller entities (Hakelius et al., 2013). Third, LeVay (1983, p. 26-27) provides historical evidence of cooperatives that were organized by individuals inspired by the idea of cooperation. She argues that the initial stage of formation of a cooperative is not spontaneous but rather is a result of a collective perception of an opportunity. According to the 1913 report of the Long Clawson Dairy Ltd., British cooperative that originally started as "an intangible myth in the minds of two or three enthusiasts", turned into a well-performing business (LeVay, 1983). Cooperation principles based on Raiffeisen or the

[2] Dunn (1988) outlines three core principles of a cooperative enterprise: user-owner, user-control and user-benefitted principles. Users are either sellers of buyers of the cooperative enterprise. Reasons to form a cooperative include lowering transaction costs, benefiting from economies of scale, building countervailing power, gaining access and providing member services (Feng and Hendrikse, 2013).

Rochdale principles are other examples that may have been crucial in the bottom-up formation of cooperatives.

Fourth, top-down genesis of cooperatives is initiated by the government in other countries. In their study of agricultural cooperatives in Russia, Golovina and Nilsson (2011) find that top-down emergence is common but proved to be largely unsuccessful in the current Russian environment. Similarly, empirical analysis of 37 farmer cooperatives in China indicated that cooperatives rarely emerge as a result of bottom-up collective action (Liang and Hendrikse, 2013). Rather, Chinese cooperatives emerge due to top-down mechanisms involving either entrepreneurial farmers or the government[3]. Fifth, as in the case of the Northern USA, the initiative may also come from associations like the Farmers Union (Olson, 1971). Finally, an initiative to form a cooperative may also originate from a key player. In the Southern part of the Netherlands, cooperatives were often formed with an initiative of highly educated members of local communities, such as lawyers, doctors, or religious persons. For instance, priest Van den Elsen was responsible for setting up many cooperatives in the Netherlands.

Various development stages of a cooperative enterprise are analyzed in the cooperative life-cycle literature. Cook and Burress (2009) differentiate between five phases in the life of a cooperative: economic justification, organizational design, growth–glory–heterogeneity, recognition and introspection, and choice. In the first stage, economic motives that lead to cooperation between farmers are defined. Cooperative emergence is viewed as a collaboration of producers attempting to improve their socio-economic position in the presence of market failures and corresponding market contracting costs.[4] During the second stage, cooperative principles are formally incorporated into organizational architecture. The latter three stages mark the process from evolving member heterogeneity in preferences and struggle against the vaguely defined property rights problems to "exit" choices. In this paper, we focus on the first stage of cooperative life-cycle and examine how farmer heterogeneity relates to different patterns of emergence. To our knowledge, our article is the first attempt to model different types of emergence of farmer cooperatives.

According to Hansman (1996), homogeneity of interests among cooperative's members is critical for farm marketing cooperatives because it minimizes costs of collective decision-making. Establishing a cooperative requires coordination among many members and the associated coordination costs are lower when players are homogeneous. Sexton and Sexton (1987) observe that cooperatives are often formed within local areas, which suggests higher coordination costs across larger geographical distances. Additionally, due to lower coordination costs within homogeneous reference groups, members of cooperatives often share similar demographic and social characteristics. Liang and Hendrikse (2013) identify several reasons why coordination costs are lower for farmers within local areas: similar nature conditions, same cultural and economic backgrounds of farmers, high degree of kinship and

[3] "Core" entrepreneurial farmers and "common" farmers are distinguished. The former group consists of farmers who used to work in agricultural departments or manage private enterprises and thus have substantial capital, marketing capabilities, and/or social and professional networks. These "core" farmers organize "common" farmers, who have little experience in marketing and management, into agricultural cooperatives. "Core" farmers often include members of the "village elites". Such elites are represented by large farmers, village officers, and/or middlemen with higher levels of natural resources, capital resources, human resources, and social capital (Lin and Huang 2007). It is often the case, that elite member decide to form a cooperative to extract extra policy rents (Lin and Huang 2007). In addition to entrepreneurial farmers and elite members, emergence of cooperatives in China is driven to a large extent by the government. It can facilitate the creation of cooperatives through subsidies and tax benefits.

[4] Market failures and contracting costs may include simple market power, ex-post market power, lock-in, asymmetric information, margin reduction, risk reduction, access to markets, inclusion and participation, and coordination inefficiencies.

same dialect among members. Sommer et al. (1983) also finds significant homogeneity among members of food purchasing cooperatives.

The relationship between member heterogeneity and the efficiency of a cooperative has been discussed extensively in the literature on collective organizations and cooperatives in particular. Iliopoulos and Cook (1999) propose that membership heterogeneity could be measured by variables such as geographic dispersion, the number of different commodities produced or inputs purchased by the members, the variance in members' age, the variance in members' educational levels, the differences between members in farm size, the percentage of non-farm income, or the differences between members in terms of business objectives. Functions of a cooperative maybe negatively affected by heterogeneity of members due to issues involving coordination and commitment, as well as decision making, influence and agency costs (Bijman, 2005).

To address the question of how cooperative emergence is related to farmer heterogeneity, we refer to the literature on link formation. The organization of individual agents in groups and networks influences outcomes of many social and economic interactions. In his seminar paper, Granovetter (1985) developed an "embeddedness" argument suggesting that existing ties in social networks influence rational economic decisions. Bala and Goyal (2000) analyze a model of network formation where agents are connected through pair-wise links. Such an approach to network formation allows investigating equilibrium network structures. It shows that an equilibrium network is either empty, i.e. no links were formed, or is a center-sponsored star, i.e. one player forms links with all the other players.

In this paper we formulate a non-cooperative game theoretic model to explain why and how the cooperative form of enterprise emerges. We view a cooperative as a group of farmers who voluntarily choose to produce collectively and therefore form links with each other. The presence of an outside party allows us to differentiate between top-down and bottom-up emergence of cooperatives. In our model, we incorporate a distance measure between farmers to reflect their heterogeneity. Distance is to be interpreted as a several-dimensional vector capturing dimensions such as spatial and social distance between farmers.[5] Our assumption is that heterogeneity of farmers leads to higher costs of link formation and therefore makes formation of a cooperative more challenging. Our main results suggest that that in the absence of the outsider, the cooperative emerges bottom-up with an initiative of both farmers only when distance costs are sufficiently low. With medium distance costs cooperative emerges as a result of the initiative of one of the farmers. When no outsider is present and when the distance parameter exceeds a threshold value of 2/3, no cooperative is formed. When a third party is included in the game, farmers strategically adjust their choices during the earlier stages of the game. Under complete information, a cooperative is either formed with an initiative of one farmer or it emerges top-down with outsider's support. When information is incomplete, a cooperative can emerge bottom-up, i.e. with two active farmers, or top-down.

The rest of the paper is structured as follows. Section 2 describes the model and presents equilibrium results. Section 3 concludes and discusses predictions of the model in the light of existing empirical evidence about cooperatives worldwide.

[5] As suggested by Iliopoulos and Cook (1999) other dimensions of the heterogeneity vector may include variables such as the number of different commodities produced or inputs purchased by the members, the variance in members' age, the variance in members' educational levels, the differences between members in farm size, the percentage of non-farm income, or the differences between members in terms of business objectives.

Model

We model cooperative emergence as a non-cooperative game with two farmers and an outsider. In the first stage, distance between farmers is determined by the choice of nature. Distance parameter d can take any values from 0 to 1, i.e. $d \in (0,1)$, and it is uniformly distributed. During the second stage, two farmers simultaneously make decisions about forming a link with each other. After observing the value of parameter d, both farmers make decisions regarding link formation. In the third stage, the adopted network structure is observed by an outsider who decides on the contract to be offered to the farmers. In the last stage, farmers decide to either accept or reject the contract.

We proceed as follows. First, the game is specified with only the first two stages and it is solved for its sub-game perfect equilibrium. Second, the entire game is presented to determine the impact of an outsider.

Network formation when there is no outsider

Four possible network structures are presented in Figure 1. When no player chooses to be active, no emergence of the cooperative occurs. When both players initiate the link, a cooperative emerges bottom-up. When only one player is active, a cooperative is formed with an initiative of that player. An arrow from player 1(2) to player 2(1) in Figure 1 indicates that player 1(2) is active while player 2(1) is passive, i.e. player 1(2) initiates the emergence of a cooperative.

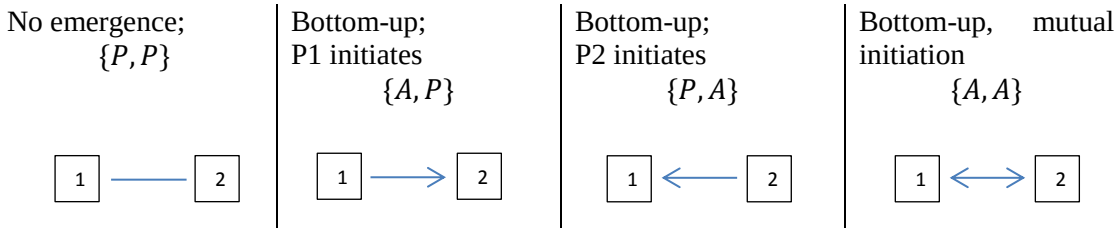

Figure 1: Four Network Outcomes

When both farmers choose to be passive, no cooperative is formed. Payoff of each farmer producing in isolation is equal to $(2 - d)$. [6] If only one player is active, then this player bears the cost of link formation but also receives a larger share of benefits. Suppose the cost of a link between players is a function of farmer heterogeneity, and therefore depends on the measure of distance between farmers. We assume a linear relationship between link formation costs and distance between players: $c = 4d$, where $d \in (0,1)$ is the distance between two farmers. When only one of the farmers is active, she bears the cost of link formation $c=4d$, but receives a larger share of benefits (*4*) when compared to the passive player (*3*). This implies that a payoff to the initiator is equal to $(4 - 4d)$, which reflect the larger share of benefits and the cost of link formation; the passive player does not pay for the link and therefore, only receives a smaller part of the benefits. When a cooperative is formed with an initiative of both farmers, the value generated by a cooperative (8) is greater than when only one farmer initiates the formation (7). When both players are active, more resources are pulled together, and greater value is generated due to the benefits of collective action such as improved bargaining power and access to input and output market. In such case,

[6] Payoff of each player when there's no emergence of a cooperative is equal to $2 - d$. Even though no link between farmers is formed, distance is part of the equation to reflect benefits to production that can arise from homogeneity of farmers even when they do not form a cooperative.

costs and benefits of forming a cooperative are equally shared and each active party receives the payoff of $4-2d$. Figure 2 presents the first two stages of the game in the extensive form.

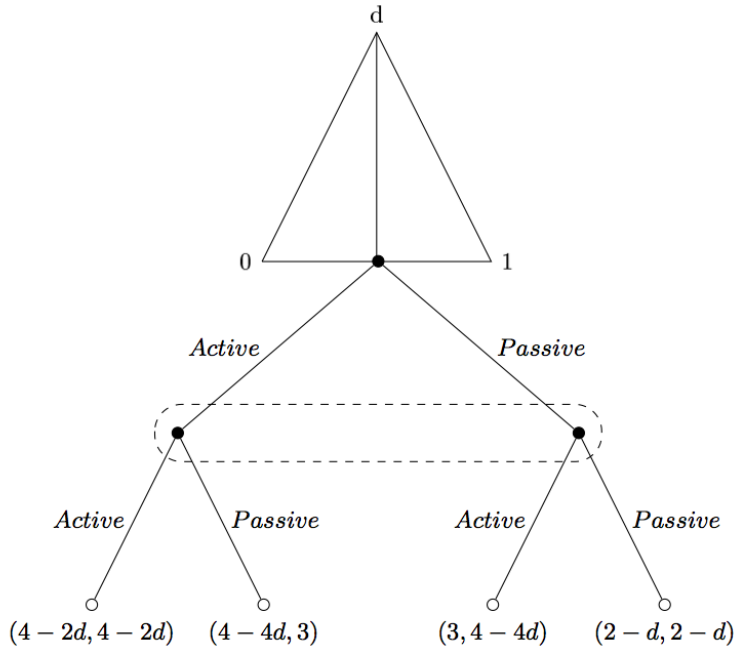

Figure 2. Extensive Form

The game is solved by applying the Nash equilibrium solution concept. We distinguish between three ranges of the distance parameter. When distance costs are high, in particular when d>2/3, the game takes the form of a Prisoners' Dilemma. Both players choose to be passive in the Nash equilibrium, and thus no cooperative is created. With medium distance costs, i.e. 1/2<d<2/3, the game changes to a coordination game with two pure strategy equilibria. In the first (second) equilibrium player 1(2) is passive and player 2 (1) is active. These equilibria are characterized by the formation of a cooperative as a result of one of the players taking a lead. There is also a mixed strategy equilibrium. Each player chooses to be active with probability $\frac{3d-2}{d-1}$ and to be passive with probability $\frac{1-2d}{d-1}$. When distance costs are low, i.e. d<1/2, the game results in a unique outcome with two active players. With more homogeneous players, and smaller geographical distances, costs of forming a cooperative decrease. Therefore, the cooperative emerges bottom-up with the initiative of both farmers.

Outcomes of the first two stages of the game are summarized in Figure 3. Several conclusions are to be emphasized. First, when no outsider supports the formation process, the threshold which separates bottom-up emergence from no emergence of a cooperative enterprise is d=2/3. When distance is above this threshold, no cooperative is formed because no farmer has an incentive to take the initiative. When distance is below this threshold, costs of forming the link between players are lower. Thus, in the absence of an outsider, a cooperative can be formed either as a result of the initiative of both farmers (d<1/2) or as a result of one of the farmers taking a lead (1/2<d<2/3).

The highest surplus of 8-4d is generated when the cooperative emerges bottom-up with the initiative of both farmers. Thus, an efficient structure entails that both farmers are active and jointly initiate the link formation. A situation when only one player is active (total surplus of 7-4d) is not an efficient equilibrium because the total surplus could be increased by

1 if both players were active. When both players choose to be passive in the Nash equilibrium, total surplus is equal to 4-2d. This indicates that no emergence is an inefficient equilibrium with the scope for improvement of 4-2d. Two observations are formulated regarding the efficiency of outcomes in stages 1 and 2. First, the efficiency of the emergence of a cooperative depends on the value of parameter *d* which is determined by nature. In the absence of an outsider, efficient equilibrium with two active players occurs when d<1/2, i.e. the distance parameter is low and provides sufficient incentives for both farmers to become active. Distance parameter exceeding the value of 1/2 entails inefficient equilibria. Second, there exists some scope for improvement in situations when the cooperative is formed with an initiative of one player, and when there's no emergence, scope of 1 and 4-2d respectively. This suggests potential contribution of an outside party in increasing efficiency of a cooperative emergence.

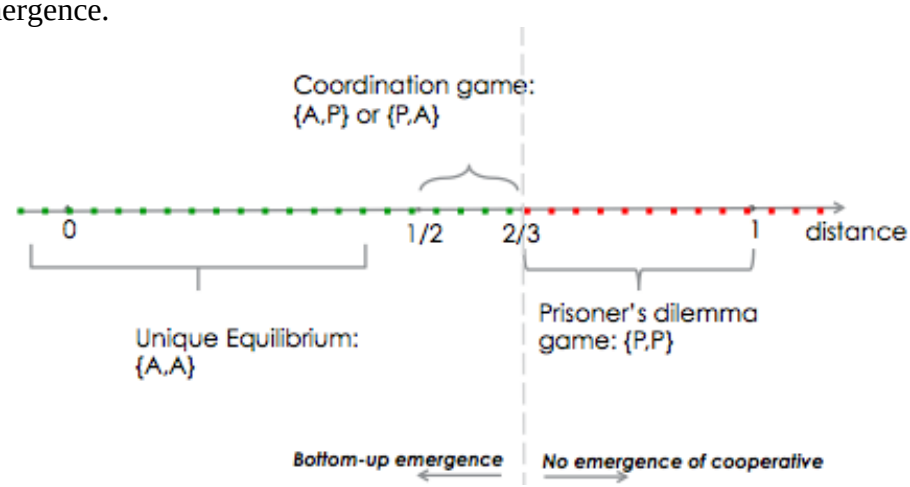

Figure 3. Equilibrium Outcomes of Stages 1 and 2

Network formation when there is an outsider

In the third stage of the game, we introduce an outside party into the game. An outsider reflects a third party who might be interested in the formation of a cooperative. It could exemplify a governmental agency, an independent entrepreneur or a nonprofit organization supporting the creation of a cooperative for various reasons. The outsider offers a contract consisting of t_1 and t_2 to the farmers to form a cooperative, where $t_1(t_2)$ is the payment to farmer 1(2). We assume that the outsider maximizes her own profit. In the last stage farmers decide to either accept or reject the contract.

Two types of information structures are distinguished – complete information and incomplete information structures. When there is complete information, the outsider observes the outcome of the previous stage and the value of *d*. The incomplete information structure entails that the outsider only observes emergence or no emergence of the cooperative, and the distance parameter is unknown to the outsider. This implies that due to incomplete information, the outsider cannot distinguish between emergence due to initiative of both players and emergence due to initiative of only one player.

Complete Information

Figure 4 presents the game with complete information. Given that an outsider knows the value of the parameter *d*, she offers a contract $\{t_1(d,\ s_1, s_2), t_2(d, s_1, s_2)\}$, where t_1 (t_2) is a transfer from farmer 1 (2) to the outsider, based on the observed value of *d* and the actions s_1 and s_2 of both players during the second stage of the game, where s_1, s_2=A,P.

The outcome {A,A} is observed by the outsider when the distance parameter is low, i.e. $d \in (0, \frac{1}{2})$ and thus both farmers initiate the formation of a cooperative. According to the specification of the game, total and individual payoffs cannot be further improved when a cooperative is already formed with an initiative of both players. Hence, when the outcome {A,A} occurs, a contract by the outsider is never accepted.

When the distance parameter is in the medium range, i.e. $d \in (\frac{1}{2}, \frac{2}{3})$, a cooperative is formed with an initiative of one of the farmers. Given that the value of d is common knowledge, it is known to the outsider that an active player would be better off with a formation of a cooperative by two active members, and is willing to pay *2d* for the other farmer also becoming an active member. [7] On the other hand, a passive player would be worse off in a situation where both members are active, and therefore requires a compensation of the amount *2d-1* in order to become active. [8] Therefore, an outsider's objective is to maximize her payoff by offering a contract $\{t_1(d,\ s_1, s_2), t_2(d, s_1, s_2)\}$, where t_1 (t_2) is a transfer from active farmer 1 (passive farmer 2) to the outsider:

$$Max\ \pi_{out} = \int_{\frac{1}{2}}^{\frac{t_1}{2}} t_1\, f(d)\, dd + \int_{\frac{1}{2}}^{\frac{t_2+1}{2}} (-t_2)\, f(d) dd$$

$$= \int_{\frac{1}{2}}^{\frac{t_1}{2}} t_1\, 3\, \left(\frac{(3d-2)(1-2d)}{(d-1)^2}\right) dd + \int_{\frac{1}{2}}^{\frac{t_2+1}{2}} (-t_2)\, 3\, \left(\frac{(3d-2)(1-2d)}{(d-1)^2}\right) dd$$

where $t_1 \in \left(1, \frac{4}{3}\right)$ and $t_2 \in \left(0, \frac{1}{3}\right)$ and *f(d)* is a conditional cumulative distribution function of parameter d on the interval $\left(\frac{1}{2}, \frac{2}{3}\right)$. Upper limits of the two definite integrals are computed based on players' and outsider's willingness to pay to induce the activity of the other player. For instance, because an active player is willing to pay $t_1 = 2d$ for the other farmer to become active, an arbitrary value of t_1 corresponds to the value of $d = \frac{t_1}{2}$. Similarly, outsider's willingness to pay $t_2 = 2d - 1$ implies an upper limit of $d = \frac{t_2+1}{2}$. Solution to such a maximization problem entails that the outsider asks an active player for a payment $t_1 = 1$, and offers a passive player a payment of $t_2 = -\frac{1}{3}$.

When the distance parameter is large, i.e. $d \in (\frac{2}{3}, 1)$, no cooperative is formed because in the equilibrium both players remain passive. Each player's payoff *2-d* could be improved to *4-2d* if the cooperative was formed. Hence, each player is willing to pay *t=2-d*. As a result, an outsider faces the following maximization problem:

$$Max\ \pi_{out} = 2\int_{\frac{2}{3}}^{2-t} t\, f(d) dd = 2\int_{\frac{2}{3}}^{2-t} t\, 3\, dd$$

[7] 4-2d [member payoff]-(4-4d) [individual payoff]=2d>0
[8] 4-2d [member payoff]-3[individual payoff]=1-2d<0

where $t_{1,2} \in (1, \frac{4}{3})$ is the reservation price and *f(d)* is a conditional cumulative distribution function of parameter *d* on the interval $\left(\frac{2}{3}, 1\right)$. Outsider's payoff function is maximized when *t=1*. Hence, to maximize her payoff, an outsider asks for a reservation price $t_{1,2} = 1$.

The game with four stages is solved by backward induction. Including an outside party in the specification of the game alters the strategic decisions of the players during the second stage. Because players anticipate the contract from the outsider in the later stage of the game, their decisions about forming a cooperative, i.e. {Active, Passive}, are influenced by their final payoffs. As a result, in the presence of the outsider, player's 1 (2) best response to player 2 (1) being active is to remain passive. When player 2 (1) is passive, player 1 (2) is indifferent between choices {A} and {P}. Hence, when players anticipate a contract from the outsider, both farmers are never active in the equilibrium, and the cooperative always emerges top-down with a support of the outsider.

Incomplete Information

In the game with incomplete information structure, the outsider only observes emergence ({A,A}U{A,P}U{P,A}) or no emergence ({P,P}) of a cooperative. Therefore she cannot distinguish between {A,A}, {A,P}, and {P,A} and the distance parameter is unknown to the outsider. The trade-off in setting the contract price of each player for the outsider is presented in Figure 5. It illustrates that setting a contract price too high would lead to fewer farmers to accept the contract. On the other hand, lowering the price would lead to lower individual payments from farmers but more farmers accept the contract. The value of the parameter *d* is unknown to the outsider. Nonetheless, it is common knowledge that outcome {P,P} is only achievable in two cases: when $d \in (\frac{2}{3}, 1)$ and {P,P} occurs with probability 1, and when $d \in (\frac{1}{2}, \frac{2}{3})$ and {P,P} occurs with probability $\left(\frac{(1-2d)}{(d-1)}\right)^2$. This implies that the outsider specifies the contract $[t_1(E), t_2(E)]$, where E indicates that emergence of a cooperative is observed, for each passive farmer such that it maximizes outsider's payoff:

$$Max\ \pi_{out} = \int_{\frac{1}{2}}^{2-t} t\, f(d) dd = t \left\{ \int_{\frac{1}{2}}^{\min\left\{2-t, \frac{2}{3}\right\}} 3 \left(\frac{(1-2d)}{(d-1)}\right)^2 dd + \int_{\min\left\{2-t, \frac{2}{3}\right\}}^{2-t} 3\ dd \right\}$$

The payoff of the outsider is maximized at *t=1*. The game with all four stages is solved by backward induction. When the outsider has incomplete information and can only observe emergence or no emergence of a cooperative, she offers a contract to farmers only when outcome {P,P} occurs. This affects choices of players during the second stage and therefore changes their equilibrium strategies. In particular, we find that under incomplete information and with an outsider, the cooperative emerges either with an initiative of both farmers $[d \in (0, \frac{1}{2})]$ or top-down $[d \in (\frac{1}{2}, 1)]$.

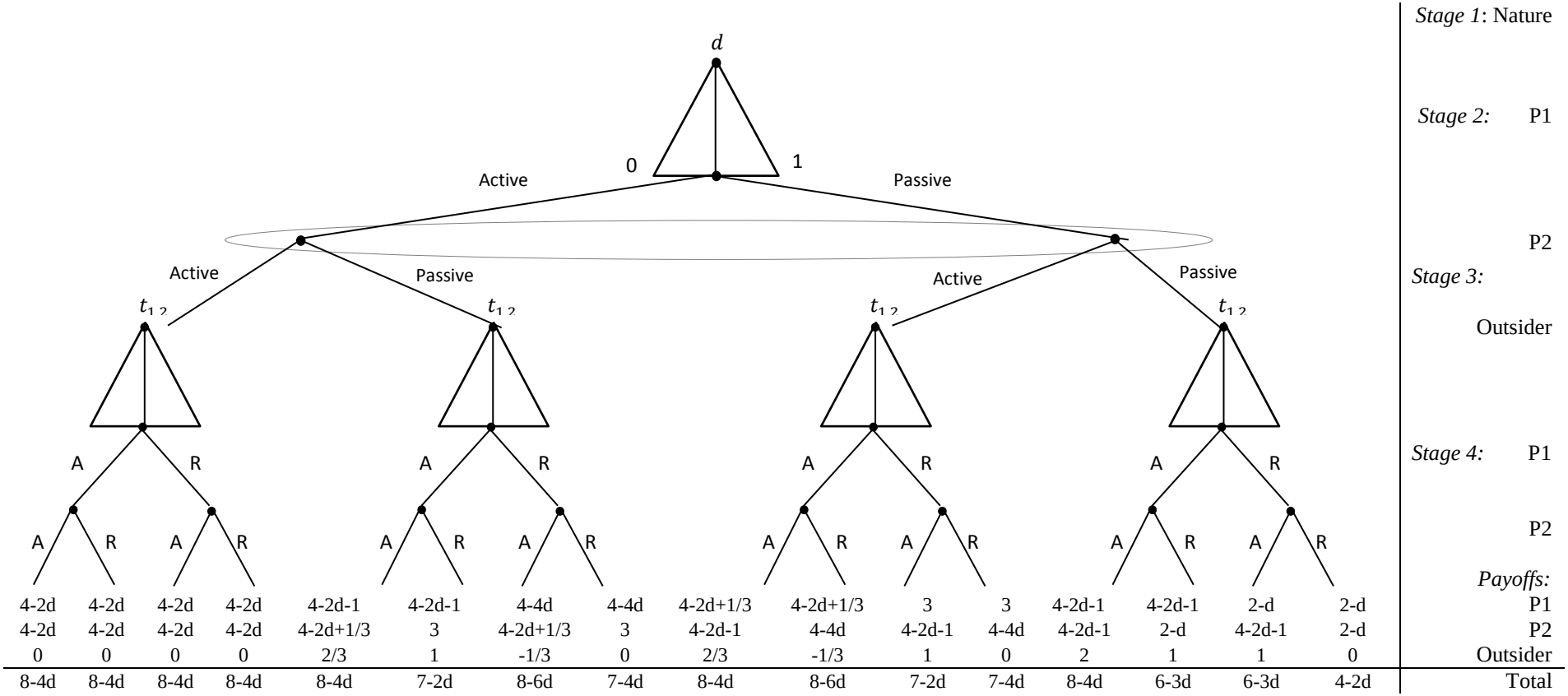

Figure 4. Four Stages of the Game, Extensive Form

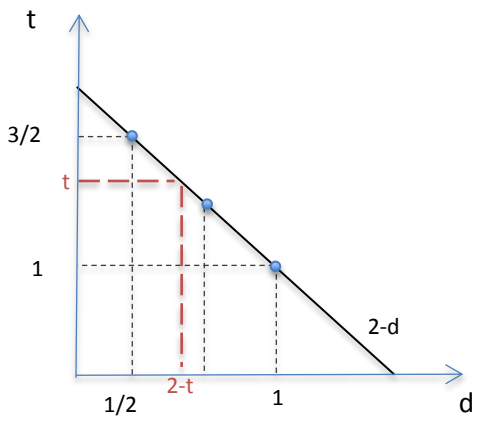

Figure 5. Trade-off in Setting the Contract Price

Discussion

We observe that in the absence of the outsider, the cooperative emerges bottom-up with an initiative of both farmers only when distance costs are low, i.e. d<1/2. This may correspond to a situation in Denmark in the early 1880's when many dairy cooperatives emerged bottom-up. Cooperative movement did not start with the support of the government, philanthropists, landlords, or other outsiders, but was initiated by a group of farmers (Chloupkova, 2002). In fact, at the time when first dairy cooperatives were formed in Denmark, conservative and anti-socialistic government did not encourage cooperative movement at all (Svendsen and Svendsen, 2000). The first dairy cooperative in Hjedding in 1882 was established, financed and managed by the farmers only. Several studies highlight the homogeneity of Danish local communities as one of the key success factors of its early cooperative movement (Larkin, 1988; Svendsen and Svendsen, 2000; O'Rourke, 2006). Our model suggests that with medium distance costs a cooperative emerges as a result of the initiative of one of the farmers. Such finding can explain numerous examples of cooperatives being formed around "core" entrepreneurial farmers, as was observed in China (Liang and Hendrikse, 2013). "Core" farmers are able to invest more in the formation of a cooperative due to higher levels of capital and other capabilities which they possess. This observation is reflected in our model through an active farmer paying the cost of the link formation when another farmer is passive. Finally, when no outsider is present and when the distance parameter exceeds a threshold value of 2/3, no cooperative is formed.

The role of an outsider is to offer a contract to farmers to facilitate the top-down formation of a cooperative and to increase total welfare. Indeed, empirical evidence suggests that an outside party, a non-farmer, is often interested in the formation of a cooperative for various reasons and thus facilitates its creation. For instance, in China and Russia many cooperatives were formed top-down, i.e. with an initiative of the government. In the Netherlands, early cooperatives emerged with a help of highly educated members of local communities, such as priests, lawyers, and doctors. Elite members of local communities are also responsible for setting up cooperatives in China, often with a purpose of extracting extra policy rents.

Our findings indicate that including an outside party in the model of the formation of a cooperative changes equilibrium strategies of the farmers. Under complete information, the presence of a third party changes strategic decisions of farmers for all values of *d*. For low and medium distance costs, i.e. d<2/3, farmers become less active due to their anticipation of outsider's support. [9] On the other hand, for high distance costs, i.e. d>2/3, farmers become

[9] In particular, when d<1/2, equilibrium strategy of each player changes from being always active to being passive when another player is active and to being indifferent between {A} and {P} when another player is passive. When 1/2<d< 2/3,

somewhat more active - when an outsider is present, outcomes {P,P}, {A,P}, and {P,A} are equally likely, whereas without an outsider, outcome {P,P} occurs with probability 1 when d is large. The scope to be realized by forming a top-down cooperative is the largest when distance costs are high. Therefore, when anticipating a top-down formation of a cooperative, some farmers may choose to be more active to reduce the share of created surplus that goes to the outsider. [10] Under incomplete information, the outsider only offers a contract to farmers when she observes no emergence of a cooperative, i.e. the outcome {P,P}. This leads to farmers becoming less active when distance costs are in the medium range, i.e. $1/2<d<2/3$. [11] This results follows from the fact that the outsider is not able to distinguish between outcomes {A,A}, {A,P}, and {P,A}. Knowing that the outsider will only offer top-down support when outcome {P,P} occurs, it is more beneficial for both farmers to remain passive when $1/2<d<2/3$.

Suppose an outsider has complete information about the value of *d* and the actions of players. Then, when distance costs are high, the contract by an outsider does not only increase individual and total payoffs, but also leads to more active farmers. This may indicate that intervention policies could be appropriate for countries like China, where farmers are likely to be characterized by high distance parameter, i.e. greater geographical distances and higher degrees of heterogeneity. For small and medium distance parameters, outsider's contract leads to more passive strategic decisions of farmers. Perhaps, in some circumstances (e.g. Netherlands, Denmark) if it known to an outsider that parameter *d* is small, it might be better not to offer a contract to farmers not to encourage passive behavior. However, when the outsider has incomplete information about the distance parameter and actions of the players, offering a contract to farmers always results in some farmers being less active. Such result contributes to the explanation of the failure of Russian top-down approach which was linked largely to government's poor understanding of the farmers and their needs (Golovina, Nilsson, 2011).

Conclusions and Further Research

In this paper we examined different patterns of emergence of cooperatives. We observe that in the absence of the outsider, the cooperative emerges bottom-up with an initiative of both farmers only when distance costs are low, i.e. $d<1/2$. Our model suggests that with medium distance costs cooperative emerges as a result of the initiative of one of the farmers. When no outsider is present and when the distance parameter exceeds a threshold value of 2/3, no cooperative is formed. When a third party is included in the game, farmers act strategically during the earlier stages of the game which results in different equilibrium outcomes. Under complete information, a cooperative is either formed with an initiative of one farmer or it emerges top-down with outsider's support. When information is incomplete, a cooperative can emerge bottom-up, i.e. with two active farmers, or top-down.

In this paper we focused on first stage of the cooperative life cycle and examined different patterns of emergence. For further research it is suggested to integrate further stages of the cooperative life cycle into a model. It would be interesting to study the relationship between different types of emergence and corresponding consequences during later stages of a life of a cooperative. Such an approach would also contribute to the discussion of whether top-down cooperatives are "doomed to fail.

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equilibrium strategy of each player changes from being active when another player is passive to being indifferent between active and passive when another player is passive.

[10] Outcome {P,P} implies a rent of 2 collected by the outsider; when outcomes {A,P} or {P,A} occur, outsider collects a rent of 2/3 and the other 1/3 goes to the passive player.

[11] When distance costs are in the medium range, i.e. $1/2<d<2/3$, equilibrium strategy of each player changes from being active when another player is passive to always being passive.

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