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WHY DO COOPERATIVES EMERGE IN A WORLD DOMINATED BY CORPORATIONS? THE DIFFUSION OF COOPERATIVES IN THE U.S. BIO-ETHANOL INDUSTRY, 1978–2013

CHRISTOPHE BOONE
University of Antwerp, Belgium

SERDEN ÖZCAN
WHU – Otto Beisheim School of Management, Germany

Given the strong economic disincentives that exist, why do cooperatives continue to emerge? And why is it that, in some communities, these cooperatives are collocated with their commercial counterparts, yet, in others, territorial partitioning occurs? In this paper, we develop a community ecology approach that integrates economic and sociological accounts of cooperatives, in an attempt to reconcile these contradictory observations. Using a detailed panel data set for the county-level founding process of cooperatives in the U.S. ethanol industry from 1978 to 2013, consistent with rational economic arguments, we find that the founding rate of cooperatives decreases in the presence of high, local, corporate ethanol production capacity. However, this negative competitive interdependence is attenuated in local communities where: (1) corporations represent a potential threat to the autonomy of local farmers, (2) there is a generally anti-corporate climate, and (3) there is a well-established organizational infrastructure supporting a cooperative ideology. Consistent with sociological theories that emphasize the mobilizing force of ideology, these local conditions spur and facilitate collective action among farmers to establish cooperatives in response to the local diffusion of corporations. We show further that the diffusion of plants owned by big business (oil and agribusiness) in communities characterized by a general anti-corporate climate especially promotes greater ideological contestation and the mobilization of resources to form cooperatives.

The continuing attention to the cooperative as an alternative organizational form over the past century stands in sharp contrast to the fact that the overall number of cooperatives relative to the general firm population has always been small (Aldrich & Stern, 1983; Schneiberg, King, & Smith, 2008). This somewhat contradictory situation provokes the question of whether it is true that "organizing modes that are viable only among small communities of highly motivated members are scarcely interesting for purposes of organizing economic activity in society at large" (Williamson, 1980: 33). This question is especially relevant since, time and time again, cooperatives seem to emerge in waves, within industries such as insurance, dairy, grains, and electricity (Schneiberg, 2007; Schneiberg et al., 2008).

A similar trend has been observed in the U.S. bio-ethanol industry. This industry expanded rapidly based, initially, on the entry of corporate plants in the late 1970s, which subsequently was countered by the entry of cooperative ethanol producers (see Figure 1). Cooperative plants currently account for close to 40% of ethanol production, and are scattered over many U.S. counties and states. This trend is especially remarkable given that—compared to corporations—cooperatives are subject to strong economic disincentives, espe-

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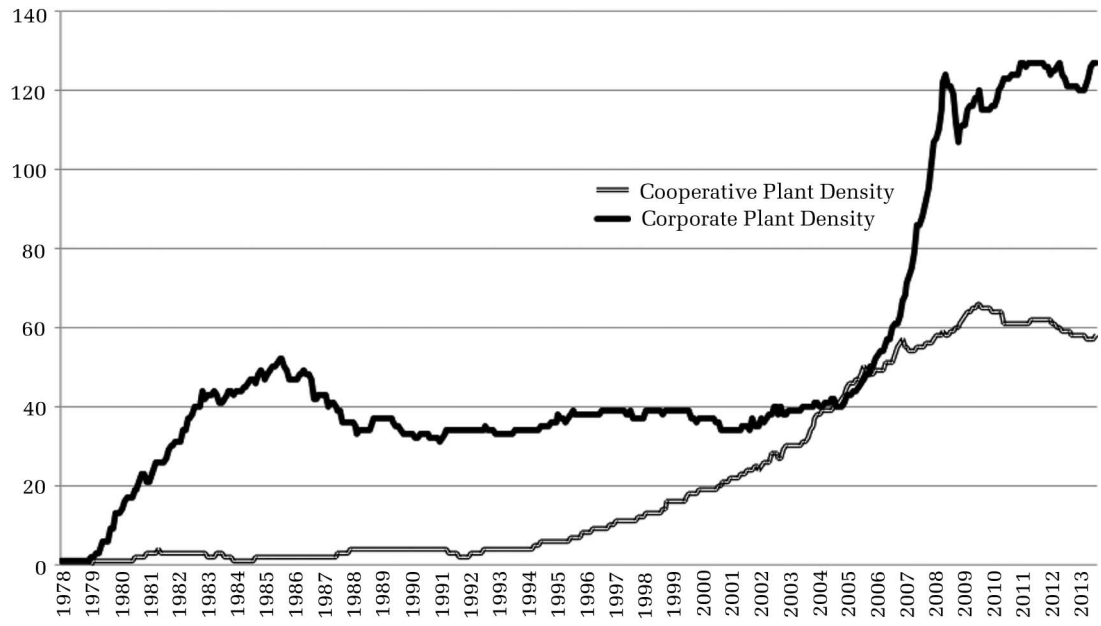
Figure 1
Density of Cooperative and Corporate Ethanol Plants in the US, 1978–2013



cially in capital-intensive industries (Aldrich & Stern, 1983; Hansmann, 1996; Williamson, 1980, 1985). While, in some states, cooperatives and corporate plants exist side by side, in others, there has been a territorial partitioning that has resulted in corporate or cooperative plants dominating the scene.

This paradoxical situation calls for systematic research into why and where cooperatives emerge. These questions are important because they inform us about the origins of institutional diversity (Greve, Pozner, & Rao, 2006; Ingram & Rao, 2004; Schneiberg et al., 2008). Systematic empirical research on this topic is scarce, and different strands of the literature propose different explanations. Economists stress the relative inefficiency of the cooperative form, based on its lack of hierarchy and performance-monitoring problems (Hansmann, 1996; Williamson, 1985). Cooperatives are seen as transient compromises that emerge out of necessity, as a response to economic recessions, industry restructurings, or market failures (Ben-Ner, 1984; Caves & Petersen, 1986). Sociological accounts emphasize the collective entrepreneurship nature of the cooperative, and the importance of anti-corporate social movements that contest mainstream capitalist ideology (Schneiberg et al., 2008; Sine & Lee, 2009). They suggest that cooperatives are deeply rooted in the institutional repertoires of local communities and co-evolve with liberal market economies (Greve & Rao, 2012; Schneiberg, 2007).

However, neither the economic nor the sociological arguments on their own are able to account for the "mass of contradictions" (Aldrich & Stern, 1983: 372) that characterize the literature on cooperatives. The economic-based view that (especially producer) cooperatives are "impossible organizations" (Estrin & Jones, 1992: 328) is not easily reconciled with the rapid diffusion of the form and its temporal stability in, for example, the U.S. ethanol industry. It also does not explain why, even across similar resource environments, cooperative founding activity can be uneven. For instance, in corn-belt states such as Illinois and Ohio, cooperative ethanol plants are virtually absent, while, in Minnesota and South Dakota, they outnumber commercial plants. Economic motivations matter for the collective creation of organizations, but so do non-pecuniary considerations. For instance, several farmers committed to grass-fed food and dairy operations despite the strong likelihood of financial ruin; their commitment thus became an expression of moral identity that went beyond economic concerns (Weber, Heinze, & DeSoucey, 2008).

On the other hand, sociological accounts generally present a portrait of cooperative founders whose decisions are affectively charged, guided not by economic rationale but by emotion, and tend to overlook that the cooperative is costly to organize

and manage.[1] Since there are several alternatives for disciplining corporate behavior, ranging from protests and boycotting (Bell, 2009; Hiatt, Sine, & Tolbert, 2009; Ingram & Rao, 2004) to influencing state power and regulation (Sine & Lee, 2009), the cooperative may not be an economically attractive organizational solution even for communities with anti-corporate sentiments. Indeed, Schneiberg et al. (2008) called for research on how social movements can moderate the effects of microeconomic conditions on the birth of cooperatives.

We argue that both the economic and sociological research traditions need to be integrated in order to understand the process through which cooperative forms emerge. In this paper, we draw on community ecology, which focuses on systematic study of the interdependency between different organizational forms (Barnett & Carroll, 1987; Freeman & Audia, 2006). Since cooperatives compete directly with corporations for resources, such an approach is particularly well suited to understanding their respective diffusion processes as well as their co-evolution. We propose that the nature of the interdependence between cooperatives and corporations depends heavily on the local community context in which the actors are embedded, because cooperative founding requires effective local, collective action (Greve & Rao, 2012).

We start from economic theory, which predicts that rational agents will only establish cooperatives out of necessity when corporations are absent. However, we argue that this rational economic logic (based on "cold cognition," DiMaggio, 2002) will only dominate until specific local conditions spur contestation between oppositional identities, fueling affectively laden "hot cognition" (DiMaggio, 2002; Sine & Lee, 2009). Under such conditions, anti-corporate sentiments provide forceful ideological motives, which are essential for overcoming the economic disincentives for cooperative entrepreneurship, and galvanizing local collective action to marshal resources against the diffusion of corporations (Aldrich & Stern, 1983).

Based on social movement theory, we predict that strong local anti-corporate sentiments will be triggered in communities where: (1) corporations represent a potential threat to community autonomy and welfare, (2) there is a general anti-corporate climate, or (3) there is a well-established organizational infrastructure supporting cooperative ideology. In these contexts, the negative interdependence between corporations and cooperatives predicted by economic theory will be attenuated, and might even be reversed. Since not all corporate businesses are perceived equally as the "enemy," we differentiate between the targets of antagonism, studying whether certain types of corporations (i.e., big business vs. independent owners) are even more likely to transform local actors into a social movement that produces a cooperative.

We make important contributions to the literature. By fully exploiting geographical variation in community characteristics and heterogeneity in terms of entrepreneurial origins, we extend economic and sociological theories on cooperative form emergence by delineating and refining their boundary conditions. We contribute also to the development of community ecology by reintroducing the "local community" into the theory of organizational founding processes. Although early ecological work includes the spatial dimension in its concept of "community" (Barnett & Carroll, 1987), over time, community has come to be seen as predominantly a set of functional relations between organizational forms. Nonetheless, the social structures, ideologies, and social identities that characterize a spatial context are decisive in the birth and diffusion of organizational forms (Freeman & Audia, 2006). Furthermore, much past research in this tradition focuses on the diffused and indirect rivalry between corporations and cooperatives, showing, for instance, that the number of commercial banks suppresses the founding rate of worker cooperatives with clear socialist identities (Ingram & Simons, 2000). The lack of research in settings where cooperatives and corporations directly compete for resources within the same industry is a significant gap, given that ideological struggles, coalescing in direct competition for resources, are the main drivers of social, institutional, and political change (Barnett & Woywode, 2004; Haveman, Rao, & Paruchuri, 2007; Simons & Ingram, 2004; Weber et al., 2008).

We test our hypotheses on a detailed panel data set for the county-level founding process of cooperative plants in the U.S. ethanol industry from January 1978 to June 2013. This industry is an ideal setting to study form emergence because the ideological rivalry between cooperative and corporate plants goes hand in hand with cutthroat competi-

[1] This is partly because research that connects social movements to entrepreneurship primarily examines the creation of firms (which are less complex to organize and manage) as an outcome.

tion in local input (i.e., corn) and output (i.e., ethanol) markets. Also, because the cooperative founding process is highly locally embedded, we can exploit community differences in order to understand the spread of cooperatives—not only over time, but also in geographical space.

ETHANOL INDUSTRY: A HISTORY OF CONTESTATION

The history of the ethanol[2] industry is characterized by contestation and cycles of emergence and death. Each rebirth was fueled by social movements that mobilized economic and sociopolitical resources. Ethanol activists pursued a reformist strategy of market creation, as in the case of green energy (Sine, Haveman, & Tolbert, 2005) and grass-fed meat and dairy products (Weber et al., 2008). The values propagated (e.g., self-reliance, agrarianism) were progressive. The ethanol insurgency quickly generated a countermovement from the incumbent oil industry. The pro- and anti-ethanol coalitions pursued differing sets of institutional changes, and only since the late 1970s did this collective action lead to the entry of entrepreneurs and plants dedicated to the production of ethanol, and, subsequently, to the birth of ethanol producer cooperatives.

From the Origins of Ethanol Production to the Modern U.S. Ethanol Industry

Ethanol appeared as a transportation fuel at the turn of the last century, but never caught on since it was produced mainly at alcohol distilleries and Prohibition squelched its production by shutting down the distilleries or capping production permits. The repeal of Prohibition in 1933 generated a rebound, but efforts to promote ethanol failed. By 1939, commercial ethanol production had ceased and did not resume until 1978.

The first oil crisis of 1973 was a turning point for this forgotten fuel. The rapid doubling in oil prices turned the spotlight on ethanol. The state of Nebraska took the lead, launching a multi-year ethanol road test to mobilize the attention of the public and policymakers. The test confirmed that most vehicles could run on ethanol-blended gasoline. Subsequently, farm groups in the Midwest began to lobby their state legislatures for subsidies to produce this "home-grown fuel." The breakthrough was rapid: in 1978, Congress passed the National Energy Tax Act to reduce the excise tax on ethanol-blended gasoline. This made ethanol competitive with gasoline, triggering production and marking the official beginning of the modern ethanol industry. The second oil price shock in 1979 increased the appeal of ethanol. The number of stations selling it jumped from 100 in 1978 to 9,000 in 1980. Ethanol corporations multiplied and production capacity increased from 80 million gallons per year (mgy) in 1979 to 15 billion gallons in 2013. Today, ethanol is produced in 23 states, and 92% of all gasoline sold is blended with ethanol.

The Rise of Ethanol Cooperatives in an Emergent Market Dominated by Corporations

Subsequently, the number of cooperatives also began to rise. Farmer cooperatives espouse ideological values that run counter to the values of the dominant capitalist corporations (Schneiberg et al., 2008; Simons & Ingram, 2004). These cooperatives constitute a distinct organizational form (Hansmann, 1996; Schneiberg et al., 2008) the identity of which is defined by three basic principles. They are organized and owned by farmers, the members exert democratic authority over primary policy decisions, and the members receive benefits on the basis of use.

The cooperative form in U.S. agriculture is as old as the nation itself. The widespread diffusion of farmer cooperatives that started at the end of the 19th century was rooted in social movements such as the Grange, which rejected corporate liberal ideas of national markets and corporations. These anti-corporate movements stressed the values of community autonomy, social solidarity, and self-reliance, and were based on the principle of development through cooperation (Schneiberg, 2007; Schneiberg et al., 2008). More than a century later, these values still underpin the cooperative landscape. Recent research shows that production cooperatives display a more collectivist identity than do their private counterparts (Brickson, 2005), and that members prefer farmer cooperatives with a limited business focus (Foreman & Whetten, 2002).

These ideals were also the defining features of the ethanol movement. From its beginnings, there was a close marriage between the promise of ethanol and the ideological tenets of farmer cooperatives. Soaring gas prices had produced a general

[2] Ethanol is a fuel additive distilled predominantly from corn.

feeling of helplessness among the public and strong resentment towards oil corporations. Farmer cooperatives felt obliged to step in and spearhead a movement. Farming was not only about "feeding the nation," it was also about "growing towards independence," and the cooperatives strove to create demand for ethanol. A similar ethos underpinned the establishment of cooperative ethanol plants. These plants appealed to farmers and also resonated with nonfarmers in the same communities, which boosted the social movement character of their formation. The founders of ethanol cooperatives not uncommonly found that almost all the local population was keen to invest in their plants and to show their support for agriculture, energy independence, and the creation of local jobs. Local media provided ongoing supportive coverage. Local businesses endorsed the cooperatives, and local community colleges offered free training for cooperative employees (Thompson, 2004).

THEORY AND HYPOTHESES

Community ecologists study how the prevalence of one organizational population affects the vital rates of another, as revealed by so-called "competition coefficients" (Hannan & Freeman, 1977). The interdependence between two different forms is said to be competitive if these coefficients are *negative*, and mutualistic if they are *positive* (Barnett & Carroll, 1987; Freeman & Audia, 2006). Ecological work differentiates between two types of mutualism. Direct mutualism occurs when organizations work together concertedly to benefit from cooperation; for instance, to increase common resources or to enhance institutional standing (Barnett & Carroll, 1987). Diffuse mutualism occurs without any coordination of efforts. These benefits may accrue from the adaptive behavior of organizations sharing the same environment resulting in spillovers and opportunities to free-ride (Barnett & Carroll, 1987; Baum & Oliver, 1996). They can also arise when organizations provoke oppositional identities and, as a result, increase the carrying capacity of another form/subpopulation by unintentionally facilitating collective mobilization for it—by uniting opponents into a social movement and serving as narratives for their frame. For instance, consumers who want an alternative to for-profit day-care services can be stimulated by the prevalence of the latter to create their own non-profit day-care organizations (Baum & Oliver, 1996). It is to this form of diffuse mutualism that we refer in the present study.

We argue that the nature of the cross-form effect between corporations and cooperatives is not constant but depends on specific local conditions (Ingram & Yue, 2008). Due to the strong disincentives for starting a cooperative, we expect the baseline cross-form effect, grounded in the "cold cognition" of rational economic arguments, will be negative. That is, cooperatives are generally born of necessity, and rational farmers only establish cooperatives if ethanol corporations are absent. In contrast, in local communities with strong anti-corporate sentiments, the diffusion of corporations triggers ideological rivalry, providing the necessary ideological incentives grounded in affective-based "hot cognition," to overcome the strong economic disincentives for cooperative ownership (Aldrich & Stern, 1983). The negative cross-form effect will, accordingly, be attenuated and will become less negative, or even positive; that is, mutualistic.[3]

Necessity Entrepreneurship

There are major economic disincentives associated with the formation of cooperatives. First, transaction cost economists claim that their internal governance systems are less efficient than those of corporations. They are examples of the "peer group" governance mode, while corporations' governance systems exemplify the "hierarchy" mode. Transaction costs are assumed to be relatively higher in "peer groups," because implementing hierarchical leadership and monitoring performance are more difficult within groups of peers. In "hierarchies," leadership and control are implemented by fiat; therefore, organizational problems associated with opportunism and information asymmetry are more easily resolved (Williamson, 1980, 1985). The costs of collective decision-making in cooperatives are particularly high if members' interests are heterogeneous; this variety undermines efficiency and spurs free-riding behavior among members (Hansmann, 1996; Staatz, 1987).

Second, common ownership in cooperatives together with the limited possibility of cooperative owners to sell their shares at a market price lead to a fragile financial system (Ben-Ner, 1984; Bonin,

[3] As there are no clear theoretical arguments to predict that local anti-corporate sentiments could be strong enough to completely invert this main effect from negative to positive, we hypothesize monotonic interaction effects in the remainder of the paper.

Jones, & Putterman, 1993; Estrin & Jones, 1992). In particular, it is difficult to justify to members that they should keep on investing in the cooperative. On the one hand, there will inevitably be different investment horizons among the members. Those with shorter horizons will tend to refrain from committing further, whereas those with longer horizons will insist on not only making additional investments, but also reinvesting the returns in the cooperative. On the other hand, upon leaving a cooperative, the former member does no longer have access to the accumulated assets. At the same time, new members have immediate access to all accumulated assets, creating a form of free-riding (Caves & Petersen, 1986; Cook, 1995).

Third, Aldrich and Stern (1983) link these disincentives to the rise of modern monopoly capitalism, which makes it easier for entrepreneurs to establish corporations than cooperatives. The collective nature of the latter requires greater entrepreneurial effort for their establishment, compared to a traditional firm. In addition, the quasi-rents from this entrepreneurial effort are more difficult to appropriate, which explains why cooperatives are generally assumed to suffer from underinvestment (Jones, 1979) and often "degenerate" and revert to conventional forms of ownership with the passage of time (Aldrich & Stern, 1983; Ben-Ner, 1984; Bonin et al., 1993).

Fourth, many economic actors prefer not to be part of a cooperative simply because they value autonomy, even when joining could reduce their performance hazard. Gómez-Mejía, Haynes, Núñez-Nickel, Jacobson, and Moyano-Fuentes (2007), for instance, find that family-owned olive oil mills in southern Spain were reluctant to become members of a cooperative due to a desire to preserve the family's socio-emotional wealth (including its independence), despite the bigger business risk associated with this choice.

The lack of material incentives would suggest that rational economic actors establish cooperatives only out of necessity. Several authors provide evidence that the collective entrepreneurial energy of a cooperative has survival–defensive roots and responds to economic downturns, industry restructurings, or the negative economic impacts of market failure (Caves & Petersen, 1986; Cook, 1995; Staatz, 1987).

What do these arguments imply for our framework? Obviously, corn farmers benefit greatly from the fast-growing ethanol market in the United States, since the presence of local ethanol plants guarantees steady demand for their produce. Ethanol producers are the major buyers of local corn, and, in 2012, nearly half of the corn harvested in the United States went to ethanol production. Thus, the presence of corporate plants producing large volumes of ethanol in the local community means demand for local corn will be high, and there will be no (economic) need for farmers to establish a cooperative.[4] In addition, given the alleged efficiency advantages of corporations, farmers could not hope to gain much from integrating forward into ethanol production by founding a cooperative. In contrast, if there is an absence of corporate plants in the local community and/or ethanol production is low relative to local corn production, establishing cooperative ethanol plants will be necessary for farmers to secure a steady outlet for their production. Therefore:

> *Hypothesis 1. The lower the local corporate ethanol production capacity, the greater the likelihood that ethanol cooperatives will be founded.*

Local Conditions that Spur Collective Entrepreneurship

We predict that the negative baseline cross-form effect described in Hypothesis 1 will be attenuated in communities where there is a strongly negative attitude towards corporations. In these circumstances, people commit to cooperation as an ideal and "might be willing to ignore the obvious material disincentives involved in creating cooperatives and instead provide the resources required" (Aldrich & Stern, 1983: 387). We expect affective processes to fuel entrepreneurial decision-making ("hot cognition") if corporations represent a potential threat, or if local communities have an anti-corporate climate, or there is an existing organizational infrastructure supporting cooperative ideology.

Threat of vertical integration by ethanol corporations into farming. Extensive involvement of corporate ideology in agriculture is more likely to mobilize farmers to organize ethanol cooperatives as a reaction against commercial ethanol plants.

[4] McNew and Griffith (2005) estimated the impact on local grain prices of ethanol plants that opened between 2001 and 2002. They found that corn prices increased by 12.5 cents per bushel at the plant site, and that positive price responses were observed up to 68 miles from the plant.

This is because corporate farming poses a competitive threat, and violates a number of the ideological beliefs of independent farmers. An invasion on farmers' primary activity challenges their fundamental identity, which is built upon a family-based production system and the values of empowerment, engagement, and autonomy (Thompson, 2004). The corporate mentality clashes with the farmers' view that agriculture is more than a purely economic activity, and is likely to unsettle deep-seated values in their communities such as commonwealth and equality (Schneiberg et al., 2008). Farmers have long feared that corporate farming will alter the agrarian community structure by creating a segment of farmers who are structurally equivalent to factory production workers, eventually polarizing families (Lobao, 1990).

Ideological resentment will also be triggered by the erosion of farmers' control over production decisions, and the fear that corporate domination of agriculture will result in their exploitation. Moreover, when corporations own the farmland, as absentee owners, they contribute very little to the local economy and cohesion. In contrast, the family farm earns and spends locally, and is often a more committed steward of land, water, and other resources that enrich the farm environment (Lyson & Welsh, 2005). Indeed, research shows that the quality of life, standard of living, level of income equality, and social participation in counties dominated by corporate farming are significantly lower than in family-farm-dominated counties (Lobao, 1990).

To avoid corporate involvement in farming, many communities adopted anti-corporate farming regulations. Although these laws reflect local, preexisting, anti-corporate sentiments, their existence settles the ideological tension between corn farmers and ethanol corporations by preventing the latter from integrating backwards into corn production. As a result, corn farmers in counties with such protective laws benefit maximally from growth in local ethanol production by corporations since their position vis-à-vis those corporations is secure. The law provides immunity, and reduces the resource overlap between corporations and farmers since the former can only be buyers and not (potential) producers of corn (Lyson & Welsh, 2005). In counties where there are no prohibitions in place, corporations have ample opportunity to engage in farming, which represents a serious threat to farmers. The absence of laws generally depresses corn prices and spurs absentee ownership, leaving farmer communities with very few economic benefits (Lobao, 1990; Lyson & Welsh, 2005). This, in turn, can trigger anti-corporate sentiments and ideological opposition to the proliferation of corporate ethanol plants (Jonsson, Greve, & Fujiwara-Greve, 2009). Thus, we hypothesize that farmers are more likely to become mobilized to establish ethanol cooperatives in response to commercial ethanol enterprises if the latter have the potential to enter into farming (i.e., in communities that have no anti-corporate farming laws). This will moderate the negative cross-form main effect of Hypothesis 1.

Hypothesis 2. The negative relationship between local corporate ethanol production capacity and cooperative founding will be weaker in counties where corporate ethanol producers can vertically integrate into farming.

General anti-corporate climate. Since the birth of the United States, ideological clashes between two approaches—the community logic of governance, stressing autonomy, and the nationally dominant, corporate logic of governance focusing on centralization and mass-market consolidation—have affected the dynamics of several industries (Marquis & Huang, 2009: 1241). Anti-corporate sentiments embedded in deep-seated distrust of the latter mindset have spurred social movements to target corporations (Rao, Yue, & Ingram, 2011). For instance, local communities have mobilized resources to prevent large retail chains such as Wal-Mart from opening stores, in an effort to protect local economic activity (Ingram & Rao, 2004). Cultural resistance to large-scale organizations has also been forceful among communities with respect to the commercial banking industry (Marquis & Huang, 2009; Marquis & Lounsbury, 2007), the U.S. brewing industry (Carroll & Swaminathan, 2000), and U.S. radio broadcasting industry (Greve et al., 2006).

These studies reveal great variety among communities in the prevalence of pro- versus anti-corporate sentiments. For instance, Marquis and Huang (2009) found that local agrarianism suppressed the positive impact of state legislation allowing statewide bank branching on the growth of U.S. commercial banks during the 20th century. Bell (2009) documents that, even within the same state, corporate entry through the buying-out of small independent mines was unproblematic in some communities, while, in others, the community did not give in without a fight. Rao et al. (2011) showed that, in states without right-to-work laws (which serve as a signal of the "pro-business climate in a state"),

there was a higher risk of protest activism targeting corporations.

The geographical variety that characterizes an anti-corporate climate in communities generally traditionally applies also to farmer communities. The Grange—the leading anti-corporate movement—did not enjoy the same level of support across U.S. farming regions (Schneiberg et al., 2008). Ingram and Rao (2004), in their study of the anti-chain legislation, describe how rural America is divided in the sense that, in some communities, farmers were sympathetic to the "Northeastern capitalistic values" that chains represented, and effectively rallied for pro-chain legislation, while, in others, farmers were outraged by the advances of corporate America and allied themselves with the anti-chain movements to protect rural interests.

We expect that, in communities with a strong anti-corporate climate, the diffusion of corporate ethanol facilities could generate a backlash in the form of cooperative founding. In such communities, ideological rivalry between forms that are directly competing for resources makes common causes and sentiments sharper, distinct, and salient (Boone, Divarci, & van Witteloostuijn, 2011; Carroll & Swaminathan, 2000; Haveman et al., 2007; Simons & Ingram, 2004). It galvanizes opposing groups, and creates a strong local "we feeling" among farmers characterized by loyalty and devotion to the ideals of autonomy and development based on cooperative commonwealth (Schneiberg et al., 2008). This spurs the formation of cooperatives that carry forward these oppositional identities and aim to protect the local social order (Greve et al., 2006; Marquis & Lounsbury, 2007; Pozner & Rao, 2006). Therefore:

Hypothesis 3. The negative relationship between local corporate ethanol production capacity and cooperative founding will be weaker in counties with an anti-corporate climate.

Organizational infrastructure in support of cooperative ideology. Since alternative organizational forms such as cooperatives challenge existing interests, their birth is a contentious process that requires collective action, ideological activism, and resource mobilization (Carroll & Swaminathan, 2000; Greve et al., 2006; Greve & Rao, 2012; King & Pearce, 2010). As "organization-generating organizations" (Stinchcombe, 1965), anti-corporate social movements "foster cooperatives in their efforts to establish alternative economic orders" against corporate capitalism (Schneiberg et al., 2008: 638). They provide the necessary supportive social structures that facilitate collective action and resource mobilization, boosting entrepreneurship around new forms in several ways (Schneiberg et al., 2008).

First, alternative organizational forms are institutional projects that must be assembled, theorized, politically defended, legitimated, and made available as an organizational solution to a problem as well as becoming integrated with the prevalent institutional order (Rao, 1998; Schneiberg et al., 2008; Sine & Lee, 2009). Movements are important cultural forces that operate as agents of theorization and framing (Rao, 1998; Schneiberg et al., 2008). By constructing and propagating theories about unresolved problems, contesting the value of existing solutions and showing how cooperatives can solve them more effectively, anti-corporate social movement organizations can disrupt existing market arrangements, direct market actors' attention to alternative forms, and embed their norms and visions in regulation (Greve & Rao, 2012; Sine & Lee, 2009). In so doing, cooperatives gain legitimacy as a taken-for-granted rational alternative to corporate capitalism, boosting cooperative entrepreneurship (Schneiberg et al., 2008).

Second, by creating cultural codes and a supportive organizational infrastructure, anti-corporate movements provide cooperators with organizational templates that enhance the diffusion of cooperatives (Schneiberg et al., 2008). This increases the likelihood that entrepreneurs will recognize new opportunities, acquire new information about them, and marshal the resources necessary to exploit them (Schneiberg & Lounsbury, 2008; Sine & Lee, 2009). Moreover, by morally sanctioning particular activities and linking them to deeply held values, movements can inspire a class of entrepreneurs to engage in those activities even if they are extremely risky (Schneiberg, 2007; Sine et al., 2005; Weber et al., 2008).

Third, anti-corporate movements provide solutions to the technical, organizational, and market-related challenges that entrepreneurs face when developing their businesses (Weber et al., 2008). They create favorable environments for supplying actors with resources, knowledge, and social networks needed to establish cooperatives (Schneiberg et al., 2008).

Finally, they decrease the costs of collective action by cultivating social ties within local communities. This social fabric unites people around common values and ideologies, which increases

loyalty, trust, and cohesion in the community and curtails free-riding (Ingram & Simons, 2000; Schneiberg et al., 2008). This is particularly important for the successful emergence of cooperatives, given the collective nature of cooperative entrepreneurship. For all the reasons mentioned, we expect that local actors will be more likely to mobilize against the diffusion of corporations if anti-corporate sentiments are embedded in a well-developed, activist organizational infrastructure that supports the value of the alternative form.

Hypothesis 4. The negative relationship between local corporate ethanol production capacity and cooperative founding will be weaker in counties with more established organizational infrastructures supporting cooperative ideology.

Corporate Plant Heterogeneity: Who is the Common Foe?

The presence of a salient and more powerful enemy, which triggers the development of a strong in-group identity, is a major prerequisite for effective collective action and the emergence of new organizational forms (Pozner & Rao, 2006). The more salient the enemy, the more in-group identification is triggered and the more forceful the reaction against the out-group (Pozner & Rao, 2006). According to this logic, not all corporate ethanol plants will fuel anti-corporate sentiments to the same extent. Some corporations will be more likely than others to be perceived as a salient threat and the common foe, with ethanol plants owned by oil companies and agribusiness companies more likely to produce rifts. *The New York Times* summed up why ethanol plants owned by oil firms are viewed as adversaries:

> For decades, the big oil companies and the farm lobby have been fighting about ethanol, with the farmers pushing to produce more of it and the refiners arguing it was a boondoggle that would do little to solve the country's energy problems.
>
> (Krauss, 2009)

In most cases, oil companies not only stalled the ethanol industry's advancement; they brought it down. For instance, by pushing for mandatory pump labeling requiring service stations to post notices telling consumers whether their fuel contained ethanol, oil producers brought the ethanol industry to the brink of extinction in several states.

Local farmers and activists can also be expected to find the involvement of agribusiness in ethanol production especially threatening. These companies are often accused of exploiting local farmers, thereby reducing rural welfare (Lyson & Welsh, 2005). In 1990, the four largest agribusiness firms already controlled over 60% of the U.S. grain business. By 2008, these firms controlled 95% of the U.S. corn market. Because they deal in high volumes, these vertically and horizontally integrated companies have significant leverage in terms of setting the purchase price, and exert a tight grip on the farming economy (Murphy, Burch, & Clapp, 2012). Some farmers even contend that these agribusiness corporations "should be required to donate capital and resources to the development of the bio-economy as reparations for a history of funneling farm profits away from the farmer" (Meyer, 2008: 115).

We thus expect the local diffusion of "big business" ethanol plants to trigger collective entrepreneurship among farmers, and thus cooperative entry in communities with latent anti-corporate sentiments. Specifically, the negative cross-form effect of corporate prevalence on cooperative founding will be attenuated if the corporate enemy is particularly salient (i.e., big business corporations) *and* if the local communities share anti-corporate sentiments. Formally, this implies:

Hypothesis 5. (a) The attenuating effects of the threat of vertical integration (Hypothesis 2), (b) anti-corporate climate (Hypothesis 3), and (c) supportive infrastructure (Hypothesis 4) will be stronger the more that corporate ethanol production is controlled by oil and agribusiness companies.

METHODS

Data

Our population consists of 365 plants across 36 states that entered the industry between January 1978 (the year of entry of the first ethanol plant) and May 2013. Of these, 85 plants, spread across 17 states, were cooperative-owned; 78 were incorporated according to state incorporation statutes governing traditional cooperatives (the 1922 Standard Act provides the basis for these statutes), and 7 were chartered under the "limited cooperative association acts," which allowed them to raise funds from non-farmer local community residents. Most cooperative entries occurred in Iowa (22) and Min-

nesota (16), with Arkansas, California, Kentucky, Michigan, Ohio, Pennsylvania, and Virginia hosting only one plant each.

We assembled the data based on archival sources, including Renewable Fuels Association reports, industry analyses by Information Resources Inc., the U.S. Department of Energy and Department of Agriculture, magazines such as *Oilgram News*, *Oxy-Fuel News*, and *Ethanol Producer Magazine*, newspaper archives, and press releases.

Dependent Variable and Estimation

We analyze the rate of cooperative plant founding in a given U.S. county. Founding can be understood as an arrival process and therefore can be modeled as a semi-Markov process. Accordingly, we estimate event history models, and, following Haveman et al. (2007), use Cox proportional hazards regressions (see also Sine et al., 2005; Sine & Lee, 2009). Unlike parametric event history models, the Cox model makes no assumption regarding the shape of the baseline hazard, which gives it greater flexibility. The hazard rate is given by:

$$h_i(t) = h_0(t)\exp(\beta^* z)$$

where $h_0(t)$ is the baseline hazard function, β is the vector of parameters associated with the explanatory variables included in the model, and z is the vector of the explanatory variables. We estimate coefficients and confidence intervals using maximum likelihood techniques, and report robust Huber–White standard errors to account for clustering of observations within states.

Our county-level study includes all U.S. counties except those in Hawaii and the District of Columbia (D.C.), giving a sample of 3,127 counties and a total of 444,034 spells. Hawaii and D.C. are excluded because of lack of data on key variables; the excluded counties have not hosted a plant. The remaining counties are included in the risk set for the period January 1978 to June 2013. We define time of entry as the date when the plant officially began production. We obtained precise entry dates for 332 plants, and precise failure dates for all but two failed plants. For the rest, we can identify the month when the plant came online or was closed permanently. Given the large number of counties, we constructed quarterly spells. No two cooperative plants were founded in the same quarter/county.

Our dependent variable is a dummy, which is coded "1" if, in a given quarter/county, a cooperative plant officially commenced production. The clock variable in each county starts in January 1978 and ends when a founding event takes place in that county, which then resets the county clock. Our archival search showed that the process of founding—from the first equity drive to start of production—takes 18 months on average. We therefore lagged our explanatory variables by six quarters.[5] We also tested the sensitivity of our results by lagging all explanatory variables by eight instead of six quarters. The estimates obtained differed very little.

Focal Independent Variables

For a given county/quarter, *local corporate ethanol production capacity* is the logged sum of the production capacity of all corporate plants operating in that county and the counties adjacent to it. We included adjacent counties since research shows that the impact of a mid-sized cooperative ethanol plant on corn prices and supplies is felt up to 70 miles' distance from the plant (McNew & Griffith, 2005). We chose to examine production capacity, rather than density, because the former matters more in terms of its effect on the process of competition, and much can be learned about the ecological dynamics of organizational populations by studying the evolution of size distributions (Hannan, 1988). Following this operationalization, we constructed the variable *local cooperative ethanol production capacity.*

We measure *vertical integration threat* with a dummy that indicates whether the county permits corporate farming ("1" = yes) or not ("0" = otherwise). Currently, all counties in South Dakota, Minnesota, Wisconsin, Nebraska, North Dakota, Oklahoma, Iowa, and Kansas; five counties in Pennsylvania; and all but three counties (Putnam,

[5] A few cooperatives bought idle plants and retooled them, which accelerated the process of founding. Among those who built their own plants is KAAPA. This cooperative started an equity drive in January 2002, and, in November 2003, its plant processed its first corn. Ground was broken for the Show Me Ethanol plant in March 2007, and the plant began production in May 2008. Construction of the CVEC plant began in June 1995, and finished in April 1996. Big River Resources held its first capital meeting in February 2002, and the plant ground corn in April 2004. Corn Plus raised its equity in 3 weeks, and constructed its plant in less than a year.

Sullivan, and Mercer) in Missouri have laws prohibiting corporate farming.

Following Holmes (1998) and Rao et al. (2011), we use the absence of right-to-work (RTW) laws—which ban compulsory union membership as a requisite for employment, among other provisions—to serve as a general indicator of *anti-corporate climate* (dummy = "1" if RTW law absent). RTW laws are a good proxy, because, to opponents of corporations, they signify not just a management–labor issue but a general threat posed by those corporations to local autonomy, commonwealth, and self-sustainment, as well as the ability to defend against their excesses.[6] This expanded view is reinforced by the fact that the RTW laws were accompanied by the adoption of other policies (e.g., low capital taxes, lax environmental regulations) especially favorable to corporations, and the same actors who lobbied for RTW laws later worked to realize many corporate-friendly policies (Holmes, 1998; Rao et al., 2011). By June 2013, 24 states were RTW states.

We operationalize the *supportive organizational structure* by Farm Bureau tenure, which indicates the history of the Farm Bureau in a given county, measured by the logged number of quarters. Nearly 2,600 counties had active bureaus in 1978. By June 2013, this number had risen to 2,772. We obtained the founding dates of Farm Bureaus from states' business entity filings.

We chose Farm Bureau for four reasons. First, it is the largest agrarian social movement organization in the United States. Second, it represents the ideological extension of the Grange, which was a leading anti-corporate social movement (Schneiberg et al., 2008). Many county Farm Bureaus were founded by local Grange leaders and members, rallying around the same principles of equality and independence (Kile, 1948). As the Grange declined in influence, the Farm Bureau absorbed its members and ideology, and, by 1960, Bureau membership totaled more than all other farmer interest organizations combined. Third, the Farm Bureau is pro-cooperative. In fact, it successfully revived the ailing cooperative movement in the United States, which had first surged in the late 19th century but then rapidly declined. Unlike Grange offices, county bureaus quickly saw the need for the organization of economic activities as a means of providing services to farmers that public agencies were unable to offer. But there was more: for members, economic cooperation seemed a way of gaining some measure of control over market processes and preserving the rural way of life (Berlage, 2001). Throughout the last century, county bureaus created marketing, supply, and insurance and electricity cooperatives. Fourth, from its beginnings, the Farm Bureau Federation has been a fervent proponent of ethanol. Farm Bureaus lobbied in legislative courts, sponsored education campaigns, distributed ethanol through their cooperative service stations, petitioned the state to use ethanol in state vehicles, and threatened oil and large food companies to stop their campaign against ethanol.

We believe that tenure in a particular county is a better construct for our theory than a simple dummy variable. Long tenure implies organizational strength and entrenchment within the social and economic fabric of the local community. The longer the Farm Bureau's presence, the stronger should be its capacity to inspire collective entrepreneurship and mobilize the necessary resources (Sine & Lee, 2009). Further, imprinting of the Grange's anti-corporate and commonwealth ideologies should be stronger for earlier county bureaus than later ones (Marquis & Lounsbury, 2007). In similar vein, Greve and Rao (2012) show that Norwegian communities that were the earliest to establish collective social movement organizations were also more likely to experience founding of cooperative stores. The earlier was the founding of a formal nonprofit organization, the greater was the civic capacity of a community.

To test Hypothesis 5, we split local corporate ethanol production capacity into two components based on ownership. One component represents the production capacity of 46 commercial plants owned by agribusiness (ADM, Cargill, LD, Bunge, Kraft, Tate & Lyle, Heinz, MGP, GPC, Penford, Manildra, JR Simplot) and oil companies (Williams, Marathon, Valero, Sunoco, Murphy, Ashland, Texaco, Flint Hills). The other component captures the production capacity of the remaining commercial plants not owned by agribusiness or oil companies. These other plants were created mainly by

[6] For instance, Wall-Mart's expansion met greater opposition in communities with no RTW laws than in communities with such laws, but the mobilizing codes had little to do with the chain's specific relationship to labor (Rao et al., 2011). More broadly, this opposition was not just from the labor unions. From environmental organizations (i.e., Sierra Club) to civil rights organizations (i.e., NAACP), a broad-based coalition mounted fierce resistance to these laws and mobilized supporters.

owners of businesses within the farm economy, plant engineering, or renewable energy. During our period, plants owned by agribusiness and oil companies entered with an average capacity of 70 mgy, whereas other plants began production with 40 mgy capacity on average. In 1990, agribusiness- and oil-owned plants accounted for 59% of total U.S. production capacity. By June 2013, their share had declined to 21%.

Control Variables

We include several key economic controls in our models. Fortunately, many of these controls are at county level, providing even richer variety. *Corn price* denotes the state's quarterly average of the monthly corn price per bushel. Corn accounts for nearly 80% of ethanol's cost per gallon. *Corn production* denotes the focal county's logged annual production of corn in bushels, and determines the local carrying capacity for ethanol plants. Ethanol plants are not the only destination for corn. Farmers can choose to sell their corn to plants that grind grain for food. We thus control for the number of *corn processors in the county*. The presence of many processors increases the number of alternative outlets for corn farmers, but also reduces the relative market power of ethanol corporations. This suppresses transaction costs between corn farmers and corporations, and, thus, the incentive for farmers to establish cooperatives (Caves & Petersen, 1986). We obtained data from Census County Business Patterns and include flour mills, wet corn mills, and cereal mills. *County livestock* is the logged number of cattle on feed in a given county in a given quarter. We include this variable because distillers' grain is an important co-product of ethanol production, and is fed to livestock. We obtained these data from the National Agricultural Statistics Service (NASS). *Average farm size* (in logged acres), obtained from the NASS, proxies for concentration of farm ownership within the county over time. We expect a negative relationship since farmers with large fields can negotiate better terms with buyers, leaving fewer incentives for creating cooperatives. Racial diversity has been found to affect collective mobilization (Ingram & Rao, 2004), thus we also computed a *county racial diversity* index at the county level, which is 1 minus the Herfindahl index of three racial groups (Whites, Blacks, and Others) for a given year. *Retail gasoline price* is the quarterly average of the monthly price of gasoline per gallon in the state. As expected, gasoline prices are highly correlated with the rack ethanol price. We thus opted to exclude the latter from our models. Demand is measured by *State ethanol consumption*, which represents a state's quarterly ethanol consumption (in British Thermal Units, scaled by trillions) as reported by the U.S. Energy Information Administration. *State ethanol exemption* controls for excise tax exemption (in ¢) in a given quarter/state. These consumer credits have varied between and within the states over time. We coded this variable based on Highway Statistics reports. If the state governor is a member of the Governors' Ethanol Coalition, then the variable, *Coalition member*, is coded "1" (which implies the likely presence of more pro-ethanol institutional behavior in these states), and "0" otherwise. *Minimum efficiency scale* is the logged mean of the production capacities of all plants that existed in a given quarter. As the industry matured, the average size of ethanol plants dramatically increased. By including this variable, we control for changes in scale economies. We include the logged *number of farmer cooperatives* in a given state (all types), as reported by the U.S. Rural Development Agency. Finally, we include region dummies based on the U.S. Census Bureau's definition of regions.

FINDINGS

Table 1 reports the summary statistics and correlations. Correlations between the variables are low to moderate. Table 2 presents the results (coefficients) of our estimates. Model 1 excludes local corporate ethanol plant capacity; Model 2 is the full baseline model; Models 3–5 include the interactions sequentially; in Model 6, all interactions are included simultaneously.[7]

Looking across the models, several control variables are significant as expected. Counties with greater corn production are more conducive to co-

[7] In Models 1–4, all variance inflation factors (VIFs) are below 3, indicating low multicollinearity. The cross-product of local corporate ethanol production capacity and Farm Bureau tenure are highly correlated with the tenure component in Models 5 and 6, creating potential multicollinearity problems. To check this, we re-ran Models 5 and 6 after mean-centering both variables (neither is a dummy) and then generating the interaction term, which reduces the maximum VIF to below 3. As expected, these results were nearly identical to the models without mean-centering. We report the latter, as interpretation of these models is more straightforward.

TABLE 1
Descriptive Statistics for Observations in Baseline Model

Variables	Mean	*SD*	1	2	3	4	5	6	7	8	9
1. Cooperative founding	0.00	0.01	1.00								
2. Local ethanol production capacity—Corp.	0.56	1.38	0.01	1.00							
3. Local ethanol production capacity—Coop.	0.23	0.95	0.03	0.39	1.00						
4. Vertical integration threat (VIT)	0.76	0.43	−0.02	−0.23	−0.33	1.00					
5. Anti-corporate climate (AC)	0.50	0.50	−0.00	−0.01	−0.02	0.06	1.00				
6. Supportive organizational structure (SOS)	4.38	1.78	0.01	0.13	0.10	−0.11	−0.07	1.00			
7. Corn price	2.82	0.94	−0.01	0.15	0.11	0.12	−0.03	0.03	1.00		
8. County corn production	5.51	2.62	0.02	0.35	0.31	−0.36	0.05	0.38	−0.07	1.00	
9. Mean farm size in the county	5.75	1.06	0.00	0.11	0.06	−0.21	−0.11	−0.08	−0.04	0.04	1.00
10. Livestock in the county	0.04	0.09	0.00	0.03	0.01	−0.04	−0.02	0.01	0.01	0.05	0.07
11. County racial diversity	0.17	0.17	−0.01	−0.16	−0.14	0.29	−0.32	−0.02	0.09	−0.19	−0.09
12. Corn processors in the county	0.14	0.48	−0.00	0.05	0.01	0.00	0.06	0.05	0.00	0.08	−0.11
13. State ethanol consumption	5.78	12.52	0.00	0.19	0.11	0.08	0.05	0.11	0.46	0.09	−0.04
14. State ethanol exemption	0.87	2.09	0.00	0.01	0.01	−0.08	−0.09	−0.10	−0.02	−0.00	0.12
15. Coalition member	0.36	0.48	0.01	0.29	0.29	−0.22	−0.01	0.18	0.17	0.24	0.17
16. Retail gas price	1.13	0.63	0.00	0.25	0.26	0.00	−0.04	0.09	0.67	0.03	−0.02
17. Min. efficiency scale	3.28	0.92	0.01	0.18	0.17	−0.02	−0.07	0.13	0.26	0.04	−0.01
18. No. of farmer coops in the state	4.37	1.04	0.01	0.10	0.10	−0.41	0.09	0.08	−0.20	0.32	0.22

operative founding. The higher the minimum efficiency scale, the lower the likelihood of cooperative founding, because larger plant size makes it more challenging to mobilize the community. Retail gas prices in the state are negatively related to cooperative founding because the higher the gas price, the higher the demand for ethanol—and, in turn, grain, and the lesser the need for cooperative founding. Membership by the state's governor in a pro-ethanol lobbying organization facilitates the rise of cooperatives, albeit weakly.

In Model 2, the coefficient of local corporate ethanol production capacity is significantly *negative*, which confirms Hypothesis 1. Since we control for the number of corn-processing plants related to the food industry, county's supply of corn, and average farm size, this is clearly a necessity issue. In this industry, cooperatives have been founded as a response to a lack of corporate buyers in the immediate environment.

Models 3 to 6 add interaction terms to Model 2. Consistent with Hypothesis 2, Hypothesis 3, and Hypothesis 4, we find that all three interaction terms are significantly positive at less than $p = 0.01$. Model 6 includes all three interactions. Our estimations are cluster-corrected at state level making them robust, using the Huber–White Sandwich technique. For this reason, the log-likelihood values become pseudo values, and hence the standard log-likelihood ratio tests for evaluating relative model fitness are not valid (StataCorp, 2013). We therefore apply a Wald test to check whether the coefficients of these three interactions are simultaneously equal to 0. From the Wald test, we obtained a *p*-value of 0.0039 associated with a chi-square of 13.35 with 3 degrees of freedom. Based on this

TABLE 1
(continued)

	10	11	12	13	14	15	16	17
11. County racial diversity	0.04	1.00						
12. Corn processors in the county	0.03	0.04	1.00					
13. State ethanol consumption	−0.00	−0.00	0.02	1.00				
14. State ethanol exemption	−0.00	−0.08	−0.02	−0.14	1.00			
15. Coalition member	−0.00	−0.10	−0.02	0.31	−0.20	1.00		
16. Retail gas price	−0.00	0.02	−0.01	0.56	−0.08	0.42	1.00	
17. Min. efficiency scale	−0.00	0.07	−0.02	0.33	−0.18	0.44	0.47	1.00
18. No. of farmer coops in the state	0.03	−0.26	0.04	0.03	0.13	0.06	−0.23	−0.22

Note. Correlation coefficients below −0.02 and above 0.02 are significant at a 5% level.

TABLE 2
Cox Proportional Hazard Estimates of Cooperative Plant Founding

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Corn price	−0.69	(0.47)	−0.64	(0.46)	−0.63	(0.45)	−0.64	(0.45)	−0.65	(0.46)	−0.64	(0.45)
County corn production	0.59***	(0.17)	0.65***	(0.18)	0.65***	(0.18)	0.66***	(0.19)	0.66***	(0.18)	0.66***	(0.19)
Mean farm size in the county	−0.07	(0.17)	−0.09	(0.16)	−0.14	(0.17)	−0.12	(0.16)	−0.09	(0.16)	−0.15	(0.16)
Livestock in the county	1.04	(2.02)	1.11	(1.96)	1.07	(1.93)	1.11	(1.93)	1.15	(1.96)	1.13	(1.92)
County racial diversity	−1.15	(1.72)	−1.13	(1.73)	−1.15	(1.73)	−1.16	(1.74)	−1.19	(1.70)	−1.21	(1.72)
Corn processors in the county	−0.19	(0.20)	−0.19	(0.21)	−0.19	(0.21)	−0.19	(0.21)	−0.19	(0.21)	−0.19	(0.21)
State ethanol consumption	−0.02	(0.03)	−0.02	(0.03)	−0.03	(0.03)	−0.03	(0.03)	−0.02	(0.03)	−0.04	(0.03)
State ethanol exemption	0.08	(0.06)	0.08	(0.06)	0.08	(0.06)	0.08	(0.06)	0.08	(0.06)	0.08	(0.06)
Coalition member	1.52	(0.92)	1.50*	(0.89)	1.55*	(0.88)	1.51*	(0.90)	1.53*	(0.88)	1.56*	(0.89)
Retail gas price	−1.50***	(0.32)	−1.43***	(0.33)	−1.42***	(0.33)	−1.43***	(0.33)	−1.43***	(0.33)	−1.42***	(0.33)
Min. efficiency scale	−4.33***	(1.64)	−4.18***	(1.61)	−4.14***	(1.59)	−4.15**	(1.62)	−4.18***	(1.61)	−4.13**	(1.60)
No. farm. coops in the state	0.73*	(0.43)	0.74*	(0.40)	0.75*	(0.38)	0.70*	(0.42)	0.72*	(0.40)	0.71*	(0.39)
Local ethanol production capacity (LEPC)—Coop.	0.13	(0.09)	0.13	(0.09)	0.14	(0.09)	0.13	(0.09)	0.13	(0.09)	0.14	(0.09)
Vertical integration threat (VIT)	−0.87*	(0.49)	−0.81*	(0.47)	−1.21**	(0.49)	−0.85*	(0.47)	−0.83*	(0.46)	−1.16**	(0.47)
Anti-corporate climate (AC)	0.34	(0.42)	0.21	(0.40)	0.22	(0.41)	0.01	(0.45)	0.23	(0.39)	0.13	(0.42)
Supportive org. structure (SOS)	0.01	(0.07)	−0.01	(0.07)	−0.02	(0.07)	−0.01	(0.07)	−0.11	(0.08)	−0.09	(0.07)
LEPC—Corp.			−0.13**	(0.05)	−0.17***	(0.05)	−0.19***	(0.04)	−0.41***	(0.11)	−0.42***	(0.11)
LEPC—Corp. × VIT					0.26***	(0.10)					0.19*	(0.10)
LEPC—Corp. × AC							0.18***	(0.07)			0.10**	(0.05)
LEPC—Corp. × SOS									0.05***	(0.02)	0.04**	(0.02)
Region dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Number of spells	444034		444034		444034		444034		444034		444034	
Log-likelihood	−788.52		−786.26		−784.54		−784.87		−785.71		−783.81	

Note: Robust standard errors calculated by clustering around states.
* $p < 0.10$
** $p < 0.05$
*** $p < 0.01$; Coefficient significance tests are two-tailed

p-value, we are able to reject the null hypothesis, indicating that including these interactions creates a statistically significant improvement in model fit.

Given the correlation between these interaction terms, their effect size and significance levels become weaker, as expected. Two (anti-corporate climate and supportive organizational structure) remain significant at $p < 0.05$, respectively, with two-sided tests. The third interaction term, which examines the moderating effect of a vertical integration threat, is significant at $p = 0.055$ with a two-sided test. To illustrate the unique effect of each interaction, we present figures that show the marginal impact of local corporate production capacity on the multiplier of the cooperative founding rate, based on the estimates from Model 6.

The figures show a strong negative effect of local, corporate, ethanol production capacity on the multiplier of the founding rate (supporting Hypothesis 1). Hypothesis 2, Hypothesis 3, and Hypothesis 4 are also clearly confirmed, as the moderators all attenuate this negative interdependence. When corporate ethanol production capacity reaches 100 mgy (log capacity = 4.61), the multiplier of the rate is 2.5-times larger in counties with no anti-corporate farming laws (high threat) compared to counties where vertical integration is not allowed (see Figure 2A). The multiplier is also twice as large in counties with a high (mean + *SD*) compared to low Farm Bureau tenure (mean − *SD*) at the same level of local corporate production capacity (Figure 2C). The effect of the anti-corporate climate interaction is somewhat smaller: the multiplier of the rate is about 1.6-times larger in counties with an anti-business compared to a pro-business climate (at 100 mgy; see Figure 2B).

Table 3 presents the estimates for Hypothesis 5. The first column provides estimates of local corporate production capacity split into two components: owned by oil and agribusiness, and owned by others. Both estimates are negative, but only the coefficient of oil and agribusiness is significant, and is much more negative than the coefficient of "other" capacity. A Wald test reveals that both coefficients are significantly different from each other at $p = 0.06$. In Model 2, we add the interaction between both production capacity variables and the threat of vertical integration. Hypothesis 5a is not supported since both corporate production capacity variables interact positively with the threat of vertical integration, and in a similar way. A Wald test shows that neither interaction is significantly different from the other. So, the attenuating effect of *vertical integration threat* (*VIT*) does not depend on the corporate identity of the producer. The same conclusion applies to Hypothesis 5c, which is tested in Model 4. The attenuating effect of a *supportive organizational structure* (*SOS*) is not affected by corporate identity. Both interaction coefficients involving *SOS* are not statistically different, as revealed by a Wald test.

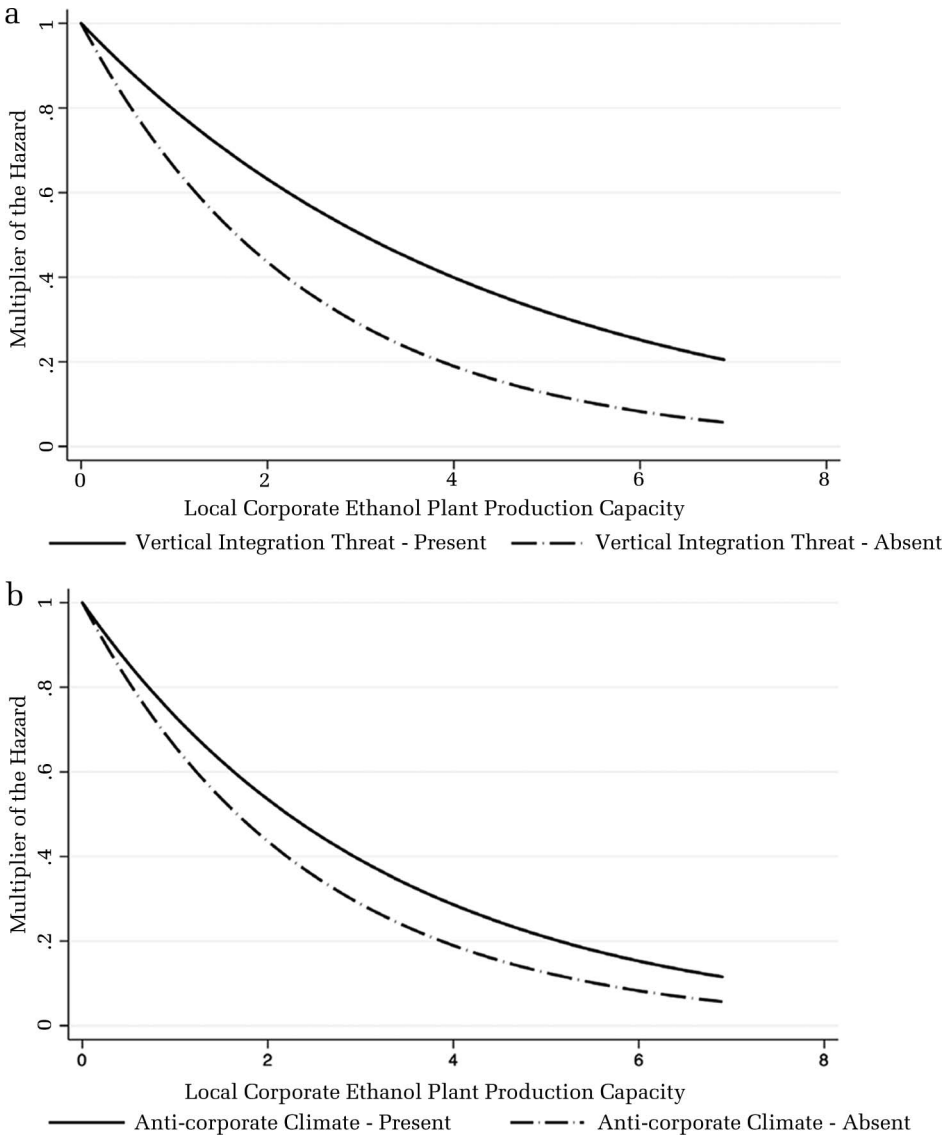
However, Hypothesis 5b is supported. A general *anti-corporate climate* (*AC*) attenuates the negative impact of local corporate ethanol production capacity, but only if the owners are oil and agribusiness corporations. Wald tests show that both coefficients are significantly different from each other, although only at the 10% level and are not simultaneously equal to 0, meaning that including these variables creates a statistically significant improvement in the model fit. We also tested Hypothesis 5 in a different but equivalent way by analyzing three-way interactions creating product terms between overall local corporate production capacity (as used in Table 2), the context moderators (i.e., *VIT*, *AC*, or *SOS*), and the proportion of total local production capacity produced by oil and agribusiness corporations. The results are the same as those reported here. That is, only the three-way interaction with *AC* is significantly positive (at $p < 0.05$, two-tailed test). We report the findings as in Table 3 because they are easier to interpret.

Figure 2D illustrates that in communities with a strong anti-corporate climate (based on the interaction estimate in Model 3 of Table 3), the effect of oil and agribusiness corporate production capacity is even reversed—showing a boost in cooperative founding.

ROBUSTNESS

We assessed the robustness of our results in several ways. First, we experimented with additional controls, including state per capita income, county population size, whether the state has an ethanol producers' association, whether the state requires pump labeling, period dummies to capture the presence of a production income tax credit for small ethanol producers, federal (excise) tax exemptions, whether the county is a border county, and number of ethanol plant failures in the state in the previous four years. The results were substantively the same. Since 2001, 11 states in the Midwest have gradually introduced limited cooperative association acts (as a complement to, not a

Figure 2
(a). Vertical Integration Threat and the Hazard of Cooperative Plant Founding. (b). Anti-corporate Climate and the Hazard of Cooperative Plant Founding. (c). Supportive Organizational Structure and the Hazard of Cooperative Plant Founding. (d). Anti-corporate Climate and the Hazard of Cooperative Plant Founding

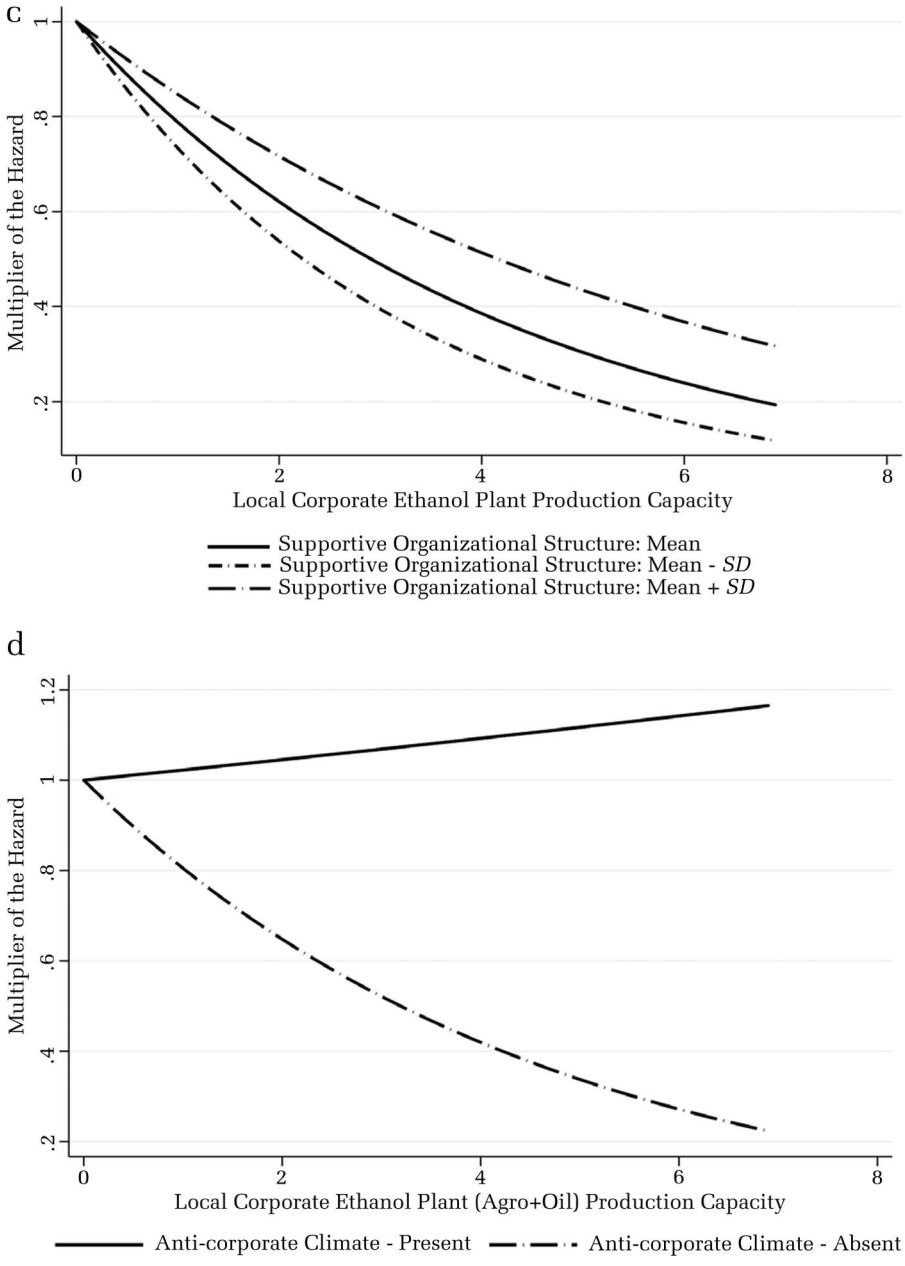


substitute for, traditional cooperative statutes). A period dummy capturing these new regulations does not affect our main findings, and is not included in the models due to its degree of correlation with our region dummies. These analyses are available upon request.

DISCUSSION

Social movement organizations have produced some of the most significant institutional and social changes in the United States (Hiatt et al., 2009; Schneiberg & Lounsbury, 2008). Over the last four decades, however, few have been as drastic in transforming rural America as the ethanol movement. The collective push for ethanol has created local wealth, accelerated technological advances in farming, and promoted physical and institutional infrastructure within communities, all of which have contributed to a rural renaissance. The founding of cooperative plants has strengthened community bonds, increased collective optimism, passion,

Figure 2
(continued)



and confidence, and paved the way to further collective action to improve communities (Thompson, 2004).

Such revivals emerge and fade, depending on changes in the community orientation of inhabitants. Simons and Ingram (2003) and Schneiberg et al. (2008), for instance, link the decline of early farmer cooperatives in Israel and the United States, respectively, to immigration and residential instability. Other accounts from alternative energy fields document that environmental groups foster entrepreneurial activity by promoting an agenda that includes increased use of renewable energy (Sine & Lee, 2009). Yet, none of these explanations fully describes the emergence of cooperative ethanol plants where local endogenous processes were the driving force. We adopted a community ecology approach precisely

TABLE 3
Cox Proportional Hazard Estimates of Cooperative Plant Founding

	Model 1		Model 2		Model 3		Model 4	
Corn price	−0.67	(0.46)	−0.66	(0.45)	−0.67	(0.45)	−0.68	(0.46)
County corn production	0.65***	(0.19)	0.64***	(0.19)	0.65***	(0.19)	0.66***	(0.19)
Mean farm size in the county	−0.13	(0.18)	−0.19	(0.19)	−0.22	(0.17)	−0.14	(0.18)
Livestock in the county	0.85	(2.04)	0.77	(2.04)	0.91	(2.01)	0.88	(2.07)
County racial diversity	−1.05	(1.75)	−1.09	(1.74)	−1.09	(1.75)	−1.12	(1.73)
Corn processors in the county	−0.20	(0.21)	−0.21	(0.21)	−0.18	(0.21)	−0.20	(0.21)
State ethanol consumption	−0.02	(0.03)	−0.03	(0.03)	−0.03	(0.03)	−0.02	(0.03)
State ethanol exemption	0.08	(0.06)	0.08	(0.06)	0.08	(0.06)	0.08	(0.06)
Coalition member	1.51*	(0.89)	1.58*	(0.88)	1.55*	(0.88)	1.55*	(0.88)
Retail gas price	−1.46***	(0.33)	−1.45***	(0.33)	−1.47***	(0.33)	−1.47***	(0.33)
Minimum efficiency scale	−4.21***	(1.62)	−4.16***	(1.60)	−4.19***	(1.62)	−4.23***	(1.63)
No. farm. coops in the state	0.75*	(0.43)	0.79*	(0.41)	0.70	(0.44)	0.72*	(0.42)
Local ethanol production capacity (LEPC)—Coop.	0.12	(0.09)	0.14*	(0.08)	0.12	(0.09)	0.12	(0.09)
Vertical integration threat (VIT)	−0.80*	(0.48)	−1.22**	(0.50)	−0.94*	(0.51)	−0.83*	(0.47)
Anti-corporate climate (AC)	0.18	(0.43)	0.21	(0.44)	0.02	(0.48)	0.19	(0.42)
Supportive org. structure (SOS)	0.01	(0.07)	−0.00	(0.07)	0.00	(0.07)	−0.11	(0.08)
LEPC—Corp. (Agro + Oil)	−0.13***	(0.05)	−0.17***	(0.05)	−0.22***	(0.05)	−0.59	(0.42)
LEPC—Corp. (Others)	−0.02	(0.05)	−0.07	(0.05)	−0.05	(0.05)	−0.31***	(0.11)
LEPC—Corp. (Agro + Oil) × VIT			0.19*	(0.10)				
LEPC—Corp. (Others) × VIT			0.28***	(0.10)				
LEPC—Corp. (Agro + Oil) × AC					0.24**	(0.11)		
LEPC—Corp. (Others) × AC					0.04	(0.07)		
LEPC—Corp. (Agro + Oil) × SOS							0.08	(0.07)
LEPC—Corp. (Others) × SOS							0.05***	(0.02)
Region dummies	Yes		Yes		Yes		Yes	
Number of spells	444034		444034		444034		444034	
Log-likelihood	−786.29		−783.75		−784.67		−785.43	

Note. Robust standard errors calculated by clustering around states.
* $p < 0.10$
** $p < 0.05$
*** $p < 0.01$; Coefficient significance tests are two-tailed

because it allows analysis of the endogenous dynamics of form emergence while simultaneously capturing the heterogeneity of community characteristics (Freeman & Audia, 2006; Marquis & Lounsbury, 2007). We hope we have shown that this focus on direct strategic and/or contentious interactions between different organizational forms, in different geographical settings, provides a more comprehensive understanding of the diffusion of the cooperative form.

Our key findings can be summarized as follows. The diffusion of ethanol corporations in local communities generally serves to decrease the founding rate of cooperatives as predicted by economic accounts. However, in communities motivated by "hot cognition," corporate prevalence mobilizes farmers to establish cooperatives. This applies especially when corporations can vertically integrate, or when communities have anti-corporate sentiments or a well-established activist organizational support structure. These contextual features attenuate the negative, competitive interdependence between these forms.

We found also that the identity of the corporation matters a great deal in communities with a general anti-corporate climate. When the common foe has a clear oppositional identity (agribusiness and oil), the competitive interdependence between the organizational forms may even be reversed, and become mutualistic in such communities. Studies show that large businesses with controversial identities generally avoid expansion into communities characterized by an anti-corporate climate (Bell, 2009; Holmes, 1998; Rao et al., 2011), and, if they do enter, are met with community protests and pickets (Bell, 2009; Rao et al., 2011). We identified a more dramatic response of the community organizing as a cooperative to challenge these large businesses directly, in both input and output markets.

Contrary to expectations, the moderating role of a vertical integration threat was found not to depend

on the identity of the local corporations. This is perhaps because the potential backward integration of corporate plants into grain production threatens the core identity of the farmer, regardless of which actors are involved. Similarly, the presence of a supportive organizational infrastructure attenuates the negative effect of corporate production capacity on cooperative founding, irrespective of corporate identity. Interestingly, this overturns the alternative view that a longstanding social movement organization, such as the Farm Bureau, might work as a mobilizing structure against, rather than in favor of, a cooperative; either due to the former's fear of loss of status and function as a key community organization, or by assuming a brokerage role between corporate buyers and farmers, hence suppressing the emergence of a cooperative while strengthening its own economic role and social status.

These "non-findings" do not necessarily undermine our claim that "hot" cognitions and ideological mobilization are important prerequisites for the emergence of the cooperative form. Rather, they suggest that complementary mobilization processes are also at work, which act as substitutes for the saliency of the particular corporate identity. We speculate that a local organizational infrastructure that supports the cooperative form as an alternative to capitalism facilitates mobilization, irrespective of the extent to which the corporate identity of the rival is controversial. Similarly, when all types of corporations represent a threat to community autonomy, corporate identity does not matter. In contrast, we find that corporate identity becomes salient only when antagonistic ideologies clash most; that is, when the mass-market logic of big business invades communities with an anti-corporate climate. Since anti-corporate campaigning is broader based, more vibrant, and more inclusive (generalist) in its corporate targets in these communities than those in which farmers live under corporate entry threat, community members are also more likely to hear about and eventually generalize from big businesses in other industries, which will make the identities of big oil and agribusinesses even more salient (Jonsson et al., 2009). Unraveling the subtleties of how different features of the local context interact with corporate identity in affecting mobilization is an important avenue for further research.

Our study contributes to organization theory by informing us about the origins of form diversity and the emergence of cooperatives in a novel way. By modeling the dynamic interplay between corporations and cooperatives, we unraveled the relative impact of instrumental, cold decision factors (which have been underemphasized in social movement explanations of cooperatives) and ideological, hot decision factors (which have relatively been ignored in economic accounts) in the cooperative form emergence process. These explanations would appear to be complementary. In this study, we showed that the trade-off between these two explanations depends on a local community's ideological blueprint and, to a lesser extent, the identity of the enemy. Hansmann (1996) argues that a major problem related to cooperatives is their high cost of ownership, especially when member preferences are heterogeneous. Our study suggests that the local context is important precisely because it unites local actors behind common ideologies, reducing such heterogeneity and the cost of collective decision-making.

These insights allow the observation that cooperatives are organizational anomalies due to the presence of economic disincentives; nevertheless, there are waves of cooperative formation. For instance, the peak of cooperative formation in the United States at the turn of the 19th century corresponds to major changes in the U.S. economic structure, which triggered collective action to defend the values of autonomy and craftsmanship against the rise of impersonal administrative hierarchies (Aldrich & Stern, 1983). As a result, ideological incentives contributed strongly to the diffusion of cooperatives in this period (Schneiberg et al., 2008). In periods marked by low ideological contestation, cooperative founding was intermittent. Similarly, our approach explains why territorial partitioning between cooperatives and corporations is juxtaposed to geographical areas where both forms exist side by side. In the absence of local anti-corporate sentiments, corporations will dominate provided there are sufficient economic incentives; otherwise, cooperatives might fill the gap.

Our study contributes also to the so-called "new organizational synthesis" in social movement research, which aims to study how social movements shape organizational fields, and vice versa (Schneiberg et al., 2008). Recently, scholars have studied the impact of social movements on the diffusion of organizational forms. Schneiberg et al. (2008) analyze how the Grange affected the birth of cooperatives at the beginning of the 20th century; Sine and Lee (2009) examine the impact of environmental movements on entrepreneurial activity in the wind energy sector; and Hiatt et al. (2009) link the American Temperance movement to the founding of firms that produced new kinds of bever-

ages. Haveman et al. (2007) show that social movements also have diffuse effects across various domains of social life, demonstrating how the Progressive movement strongly affected the spread of bureaucracy in the early Californian thrift industry. All these studies underscore that collective action and associated resource mobilization play a major role in the evolution of organizational fields, and that movements have mobilized against bureaucracies, markets, and corporations (Schneiberg et al., 2008).

Although collective action is generally targeted towards a common foe (Pozner & Rao, 2006; Rao et al., 2011), direct rivalry—with respect to both resources and ideology—is seldom explicitly taken into account. The present study shows that a community ecology approach, with a focus on direct rivalry between different populations, can fill this gap. Our study shows that the emergence of cooperatives critically depends on the *joint* presence of anti-corporate movements and direct rivals. It is interesting that neither of these factors in isolation appears to spur cooperative formation. For instance, we do not find a direct effect of Farm Bureau tenure on the emergence of cooperatives. Similarly, although Schneiberg et al. (2008) find that Grange membership has a strong positive effect on the emergence of the cooperative form at the beginning of the 20th century, its effect on cooperative diffusion in the subsequent three decades was negative. Apparently, direct rivalry is an important prerequisite for the emergence of mobilization and, ultimately, diffuse mutualism; this finding stresses the added value of a community ecology approach to social movement research.

Finally, there is a growing body of research that shows that the legal environment affects population dynamics. These studies typically analyze the direct effects of regulation on the vital rates of organizational populations (Marquis & Huang, 2009). We contribute to this literature by showing that regulation strongly affects the interdependencies between organizational forms, and, as a result, shapes the dynamics of organizational diversity. Specifically, we have provided evidence that farmers in communities with no RTW laws (implying a general anti-corporate climate) react against corporations by forming cooperatives. We found also that corporations are more likely to be regarded as a threat, spurring the emergence of cooperatives in communities with no anti-corporate farming laws. Interestingly, the presence of a legal settlement in response to anti-corporate sentiment over the right to own farms tempers future ideological rivalry in related domains of economic activity; that is, between ethanol corporations and corn farmers.

This study has some limitations. First, the measures we use to assess the likelihood of "hot" cognition in a local community have the advantage of allowing us to analyze cooperative founding over a long period of time. However, our proxy for general anti-corporate climate is based on the presence or absence of RTW laws at state level while we model cooperative establishment at county level (Rao et al., 2011). This ignores potential within-state heterogeneity in anti-corporate sentiments among counties. Future work could explore the possibility of developing more fine-grained measures; for instance, by collecting data on local anti-corporate activist events or county referendums targeting corporations (see e.g., Ingram, Yue, & Rao, 2010). Similarly, although Farm Bureau tenure is a better proxy for supportive organizational infrastructure than a simple dummy variable that captures the presence or absence of local Farm Bureau, the cumulative number of local cooperatives established by the Farm Bureau might be a better alternative. However, this information is not available in conventional data sources.

Second, we model cooperative entry as a function of corporate prevalence, ignoring the impact of incumbent cooperatives on corporate vital rates. As a first step, this is a sensible approach, because cooperatives are often assumed to emerge in response to the presence of the dominant corporate form. However, future work should develop theories of how corporations react to the emergence of cooperatives.

Third, we study the birth of cooperatives in a single, albeit important, industry. Future research might explore the generalizability of our findings. Nevertheless, we believe that the community ecology approach developed in this paper should prove a valuable tool for future work on the emergence of cooperatives, and institutional diversity more generally.

Finally, a complete understanding of the dynamics of the cooperative form would require a focus on the processes of both cooperative founding and cooperative survival. Their relative scarcity can be related to high failure rate and/or the fact that many eventually revert to the corporate form (Aldrich & Stern, 1983; Ben-Ner, 1984). Whyte and Blasi (1982) claim that the weakness of many cooperatives is the result of an absence of strong guiding ideologies. Thus, it could be particularly fruitful to investigate whether the type of incentives, i.e., material or ideological, that guide the founding of a cooperative also affect its longevity. Such an investigation would help to explain the scarcity of coop-

eratives, and the simultaneous success, in certain circumstances, of this alternative organizational form in a world dominated by corporations.

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Christophe Boone (christophe.boone@uantwerpen.be) is professor of Organization Theory and Behavior at the Faculty of Applied Economic Sciences at the University of Antwerp (Belgium). He received his PhD from the same university. His research interests focus on the antecedents and consequences of team and organizational diversity, and on the neuroeconomics of decision making.

Serden Özcan (serden.ozcan@whu.edu) is a professor and chair of Innovation and Organization at WHU–Otto Beisheim School of Management (Germany). He received his PhD from Copenhagen Business School. His research interests focus on the demography of organizations and products, the evolution of industries, entrepreneurial finance, social entrepreneurship, and the life course models of entrepreneurs.