

RESEARCH ARTICLE

Collective action and market formation: An integrative framework

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Research Summary: While extant research recognizes the importance of collective action for market formation, it provides little understanding about when and to what extent collective action is important. In this article, we develop a novel theoretical framework detailing what collective action problems and solutions arise in market formation and under what conditions. Our framework centers on the development of market infrastructure with three key factors that influence the nature and extent of collective action problems: perceived returns to contributions, excludability, and contribution substitutability. We apply our framework to diverse market formation contexts and derive a set of attendant propositions. Finally, we show how collective action problems and solutions evolve during market formation efforts and discuss how our framework contributes to strategic management, entrepreneurship, and organization literatures.

Managerial Summary: This article lays out the key considerations that players operating in new markets should contemplate when making nontrivial investments in those spaces. As collective action problems can thwart efforts to establish new markets, we ask: When and under what conditions should market players collaborate rather than act independently? And if players collaborate, how should they coordinate to establish a new market? To address these research questions, we develop a novel generalizable framework of collective action in market formation. Our framework assesses the presence and type of collective action problems that hinder market formation and identifies potential solutions tied to those collective action problems.

KEYWORDS

collective action, collective action problems, coordination, market formation, uncertainty

1 | INTRODUCTION

Scholars have long advanced theories regarding the creation of new markets (Aldrich & Fiol, 1994; Rao, Morrill, & Zald, 2000) and sought to empirically identify the mechanisms and processes associated with market origins and trajectories (Hiatt, Sine, & Tolbert, 2009; Lounsbury, Ventresca, & Hirsch, 2003; Ozcan & Santos, 2015; Sine & Lee, 2009). Much of this work is based on the premise that collective action is central to market formation, and that such efforts often resemble social movements (G. F. Davis & McAdam, 2000; Fligstein, 2001; Rao et al., 2000). Studies emphasize the collective nature of market elements such as the promotion of new cognitive frames (Benner & Tripsas, 2012; Gurses & Ozcan, 2015), the solidification of identities and categories (Lee, Hiatt, & Lounsbury, 2017; Kennedy, 2008; Navis & Glynn, 2010), the use of mobilization structures (Hiatt et al., 2009; Weber, Heinze, & DeSoucey, 2008), the creation of supportive regulation (Lee, 2009; Schneiberg & Bartley, 2001), and the achievement of legitimacy (Pacheco, York, & Hargrave, 2014; Sine, Haveman, & Tolbert, 2005). This work indicates that market formation often requires the creation of a shared market infrastructure—material and sociocognitive elements supporting the functioning of a stable market (Van de Ven, 1993)—that benefits market actors (albeit differentially). Achieving this market infrastructure generally requires efforts that supersede those possible by any single actor (Ozcan & Santos, 2015). That is, collective action across distinct actors is often necessary to construct new markets and to redirect resources from existing uses in established markets (Rao et al., 2000; Van de Ven & Garud, 1993). We conceptualize collective action situations as those in which a group of actors have an interest in the construction of a collective good (in the case of new markets, market infrastructure), which cannot easily or fully be withheld from others (Marwell & Oliver, 1993, p. 4). Collective action is then any activity aimed at the provision of this collective good. This notion of collective action is illustrated by the key challenges that actors faced in the early commercialization of radio broadcasting, which centered on integrating novel technological components for achieving, transmitting, and receiving radio signals (Leblebici, Salancik, Copay, & King, 1991). Market actors viewed these components as private property, protected by patents. However, because the development, production, and use of these technologies were interdependent, creating actual value was contingent on others' contributions and willingness to cooperate.

Yet, while collective action is critical, it is often difficult to achieve because actors may not perceive their own and others' contributions as making a difference (Marwell & Oliver, 1993), may have conflicting goals (Simcoe, 2012), may be unfamiliar with or untrusting of one another (J. P. Davis, 2016), and/or may strategically withhold making contributions because they realize that others may provide those instead (Olson, 1965).

While scholars recognize that collective action is central in market formation and takes a wide range of forms, the extant literature faces two limitations. First, there are no clear boundary conditions for when, what kind of, and to what extent collective action is important. Second, much of the literature assumes a shared rationale for collective action. For example, while not explicitly focused on market creation, DiMaggio (1988) stated, "New institutions arise when *organized* actors with *sufficient* resources see in them an opportunity to realize interests that they value highly" (p. 14, emphasis added). Such language implies that actors have shared interests, possess adequate resources, and are already organized. In other words, extant literature assumes that collective action comes about naturally because different actors all want the market to emerge. But this may not be the case. Resource-constrained actors, for instance, may not understand what other actors will contribute to building the market. Further, different actors may hold contrasting views and expectations regarding the market and how they will participate in it. This tends to positively bias researchers toward ex-post

explanations of market formation in which a shared basis for collective action is unproblematic. As a result, questions regarding the nature and need for collective action in market formation remain unanswered. We focus on this gap. Specifically, we ask: *What collective action problems tend to prevent market formation, and under what conditions? And what are the solutions that actors pursue across those respective situations?*

To address these research questions, we develop a novel generalizable framework of collective action in market formation. Our theoretical framework assesses the presence and type of collective action problems that hinder market formation and identifies potential solutions tied to those collective action problems. We then draw upon the collective action literature (Hardin, 1968; Marwell & Oliver, 1993; Olson, 1965; Ostrom, 1990) to spotlight and synthesize key collective action processes and dynamics relevant for market formation. The first two factors center on the perceived returns of actor contributions to market infrastructure development (Fligstein & Dauter, 2007; Marwell & Oliver, 1993) and the degree to which the benefits associated with those contributions are excludable (Olson, 1965). In contrast to these canonical collective action factors, the building of market infrastructure often necessitates distinct contributions from specific actors (Ansari & Garud, 2009; Gurses & Ozcan, 2015). That is, contributions from such actors may not be fully substitutable. Hence, for the analysis of market formation contexts, we include as a third factor the degree of contribution substitutability (Monge et al., 1998). After describing our framework, we apply it to a range of market formation efforts¹ to provide a better understanding of collective action problems and solutions. Finally, we demonstrate how the framework can be used dynamically to reveal how collective action problems and solutions associated with market formation may evolve over time.

This article contributes in three ways. First, despite much work on market formation, little progress has been made in abstracting from specific markets to develop a general theory of market formation (Fligstein, 2001). Providing an integrative framework that identifies when collective efforts are most likely needed and when they are not prepares the way for a more comprehensive and programmatic study of market formation dynamics (Forbes & Kirsch, 2011). Second, we develop a contingency approach to understanding the solutions to collective action problems in market creation. Our framework helps identify when market creation is more likely to be achieved by actors working independently of one another versus when more formal coordination may be needed. Third, the phenomenon of market formation has been explored by multiple scholars in diverse fields, but to date, there has been little effort to integrate theories and findings across disciplinary boundaries of organization, entrepreneurship, and strategy literatures. By establishing a framework for under what conditions collective action is most likely needed for market formation, we provide a bridging theory that will enable greater dialogue across distinct disciplinary boundaries.

In the next section, we provide the theoretical grounding for our approach. We then introduce the collective action framework and detail the drivers of collective action problems inherent in distinct forms of market formation. Next, we use this framework to analyze a range of market formation efforts and develop a typology to derive propositions regarding the nature of collective action problems and solutions in market formation. Finally, we highlight the dynamic nature of market formation efforts and conclude with a discussion of the research contributions.

¹We choose to use the term “market formation efforts” rather than “nascent market” (Santos & Eisenhardt, 2009), “industry emergence” (Grodal, Gotsopoulos, & Suarez, 2015), “industry incubation” (Moeen & Agarwal, 2017), “market emergence” (Ozcan & Santos, 2015), or “field formation” (Fligstein, 2001) because it emphasizes the actions that actors pursue regardless of whether such efforts culminate in the successful formation of a market.

2 | MARKET FORMATION AND COLLECTIVE ACTION

Markets are “social arenas that exist for the production and sale of some good or service ... characterized by structured exchange” (Fligstein, 2001, p. 30). Structured exchange means that because market actors desire repeated exchange, market infrastructure such as agreed-upon categories, product prototypes, norms of exchange, or technology standards must exist to guide and stabilize transactions and enable ongoing investment (Fligstein, 2001). Through such infrastructure a market can form wherein recognition for the good or service is established among buyers, a status hierarchy emerges among sellers, and the seller role is relatively stable (Lounsbury et al., 2003; Rao, Monin, & Durand, 2003; White, 1981). Based on these conceptual foundations, we define markets as structured and patterned exchanges that exhibit a high degree of regularity in product/service offering, the roles that actors play in the exchange, and the infrastructure that enables and governs the exchange. This definition covers a range of markets, including arm’s-length exchanges, but implies that market infrastructure requires investment and the mobilization of resources (Van de Ven, 1993).

Inherent in all efforts to form a market is uncertainty (Aldrich & Fiol, 1994; Santos & Eisenhardt, 2009). Uncertainty in a new market is directly related to the degree of novelty associated with the product or service offering (Fleming, 2001). Uncertainty can stem from potential customers having little or no experience with the product or service, or from their preferences being ill-formed and/or unarticulated (Benner & Tripsas, 2012). Likewise, uncertainty can emanate from the feasibility of a product, commercial success and long-term value of a technology, or the rate of performance improvement (Anderson & Tushman, 1990). Actors can thus conceptualize possible outcomes but cannot reliably estimate the likelihood of those outcomes being realized (Knight, 1921).

Actors attempt to reduce market formation uncertainty via activities such as the establishment of categories, the development of rules of exchange, or the achievement of taken-for-granted-ness in a new market (Fligstein, 2001). All of these actions require some degree of collective action because their attainment is usually beyond the ability and resources of any one actor. Research that invokes collective action as a key mechanism of market formation is dominated by single case studies where collective action is central to market formation success (e.g., Lounsbury et al., 2003; Sine & Lee, 2009; Weber et al., 2008). But without synthesis across them, single case studies shed little light on the boundary conditions regarding the need for collective action in market formation efforts. In some market settings, individual actors may successfully form a market by pursuing their own interests without coordinating with other actors (Santos & Eisenhardt, 2009), whereas in other market settings, the market will not form unless different actors contribute beyond what they would if each were only pursuing their individual interests (Lounsbury et al., 2003). To identify these boundary conditions for collective action problems, we outline a theory of market formation efforts.

2.1 | Collective action and the process of market infrastructure development

An actor situated in a new market may seek to reduce market formation uncertainty through actor-oriented efforts, activities aimed to develop one’s internal capabilities. Provided the actor perceives sufficient returns to these contributions, she will continue to contribute resources to build these capabilities and so improve her prospects in the nascent market. However, actors’ prospects depend not only on their own capabilities but also on a developed market infrastructure that either has resulted from the contributions of other interested actors or is available from related established markets (Schneiberg & Berk, 2010). A fundamental challenge for actors forming markets is to “develop social structures to mediate the problems they encounter in exchange, competition and production” (Fligstein & Dauter, 2007, p. 9). If actors focus only on their own business success, market

infrastructure elements such as legitimacy may still unintentionally develop as a spillover of actor-oriented actions. (Hannan & Freeman, 1989). Hence, while actors invest in their own capabilities, de-facto categorical prototypes coalesce due to spillovers and form a critical element of the market infrastructure.

However, in other situations, market formation may require that actors take intentional, market-oriented (rather than actor-oriented) actions. Such actions include promoting the product category rather than just their particular product (Navis & Glynn, 2010), organizing meetings with others concerning standard-setting (Simcoe, 2012) or information exchange (Moeen & Agarwal, 2017), or collectively lobbying for favorable regulation (Lee, 2009). If actors perceive that an improved market infrastructure increases their prospects and produces a return, it is more likely that ongoing resource contributions will occur even if those efforts require some degree of sacrifice of one's private interests or involve coordination costs. Thus, the resource allocation problem under market formation uncertainty is not a simple dichotomous choice between building the market or developing internal capabilities. However, in the absence of market infrastructure, actors may be reluctant to invest in resources to develop internal capabilities suited for the new market.

Resource allocation decisions related to developing firm capabilities and market infrastructure are intimately tied to collective action problems and solutions. If collective action is any action aimed at the construction of some collective good (Marwell & Oliver, 1993), then collective action problems arise when actors refrain from committing the necessary resources for its construction, even when a majority has an interest in its development. The likelihood and nature of collective action problems vary across market formation efforts, and we draw upon the collective action literature to outline the sources of these collective action problems below.

2.2 | Sources of collective action problems in market formation

The first source of collective action problems is the lack of market infrastructure. If market infrastructure exists, actors do not have to consider allocating resources to building it, and the likelihood for collective action problems is low (Lounsbury et al., 2003; Rao et al., 2003; Weber et al., 2008).

The second source of collective action problems is low perceived returns—that is, the degree to which actors' contributions to building the market infrastructure (and firm capabilities) is perceived to make a difference. The perceived returns to contributions depend on the context, and therefore change as the market develops. During market formation, early contributions to the market infrastructure tend to provide few tangible benefits. When market infrastructure is lacking, the costs of contributing to its initial development may outweigh the benefits. Thus, returns to contributions are low. However, as more contributions are made, the market infrastructure begins to take shape. Cumulative contributions result not only in the development of market infrastructure but also in the probability of market formation. At this point, returns to contributions are much higher. Therefore, given uncertainty, the formation of market infrastructure in the early stages is often obstructed due to low perceived returns to contributions.²

The third source of collective action problems is low excludability. A fundamental characteristic of collective goods is that the benefits one actor realizes from contributing to the development of a good spill over to others. As a result, those not contributing cannot be excluded from benefiting from its development (Heckathorn, 1996; Olson, 1965). Excludability affects not only how actors perceive their own prospects but also how actors may contribute to the cause. In particular, under

²This concept is akin to the concept of an accelerating production function of a collective good (Marwell & Oliver, 1993: 62–63) and similar to technology lock-in under strong returns to scale (David & Greenstein, 1990).

non-excludability actors may strategically refrain from contributing to the public good (Olson, 1965). In market formation, excludability of benefits from market infrastructure tends to be low, but the degree to which this is true is context dependent. Excludability can result from actors possessing intellectual property (Arrow, 1962), attaining scale economies from assets (Teece, 1986), or achieving network effects (Katz & Shapiro, 1994).

The final source of collective action problems is limited substitutability of contributions. High substitutability implies that neither a particular combination nor the sequence of contributions is consequential for market formation efforts (Marwell & Oliver, 1993). While contributions to collective action efforts, such as strikes and social movements, may often be considered perfectly substitutable, this is generally not the case with market formation efforts. In market formation, contributions often play a highly specific role or are sequence dependent and are therefore less substitutable (Gurses & Ozcan, 2015; Monge et al., 1998). For example, market formation may require multiple and distinct contributions from actors to induce compatibility between distinct products within a value chain (P. A. David & Greenstein, 1990), to mobilize actors to support a common technology (Garud, Jain, & Kumaraswamy, 2002), or to jointly invest in complementary technologies (Adner & Kapoor, 2010; Moeen & Agarwal, 2017). When market formation requires actors to make distinct (and therefore less substitutable) contributions, actors must undertake alignment efforts by identifying interfaces between one another. Costs of coordination may be high and perceived benefits from efforts to develop market infrastructure may be suppressed in cases where there are strong needs for alignment across different contributions to market infrastructure (Ansari & Garud, 2009). In sum, market infrastructure, perceived returns to contributions, excludability, and substitutability condition to what extent collective action problems emerge and, if so, whether they can be solved by independent actors or require coordinated efforts from multiple actors.

2.3 | Actor heterogeneity

Market infrastructure, perceived returns to contributions, excludability, and substitutability affect market-formation-related uncertainty, which in turn results in market formation problems. Yet, not all actors respond to or perceive uncertainty in the same way. In some situations, collective action problems are avoided as the individual interests of some actors sufficiently align with the collective good. Collective action problems dissipate quickly if a powerful and interested actor is willing and able to single-handedly build the needed market infrastructure. Or, market formation uncertainty may be resolved as a few resource-rich actors lead in organizing collective action. In line with this, much collective action literature discusses how heterogeneity in the willingness or ability of different actors to act affects collective action problems (Granovetter, 1978; Heckathorn, 1996). While originally intended to explain how phenomena such as strikes (Granovetter, 1978) and insurgencies (Gould, 1991) occur, the impact of actor heterogeneity on collective action has begun to receive attention in market settings (e.g., Von Krogh, Spaeth, & Lakhani, 2003).

Nevertheless, the likelihood that unilateral actions are sufficient to resolve market formation uncertainty depends on the problems to be resolved. We therefore consider how actor heterogeneity in a new market affects the likelihood of collective action problems and the solutions that actors may draw upon to resolve these problems and thereby facilitate market formation. We focus on two conceptions of actor heterogeneity: willingness of actors to contribute to the development of market infrastructure and the actual ability to do so. In markets, heterogeneity in actor willingness or ability is a fundamental premise of strategic management. Actors vary in initial resource endowments (e.g., Shane & Stuart, 2002), knowledge bases (Moeen & Agarwal, 2017), specific capabilities (Teece, Pisano, & Shuen, 1997), and in growth orientations (Eggers & Kaplan, 2009), and these

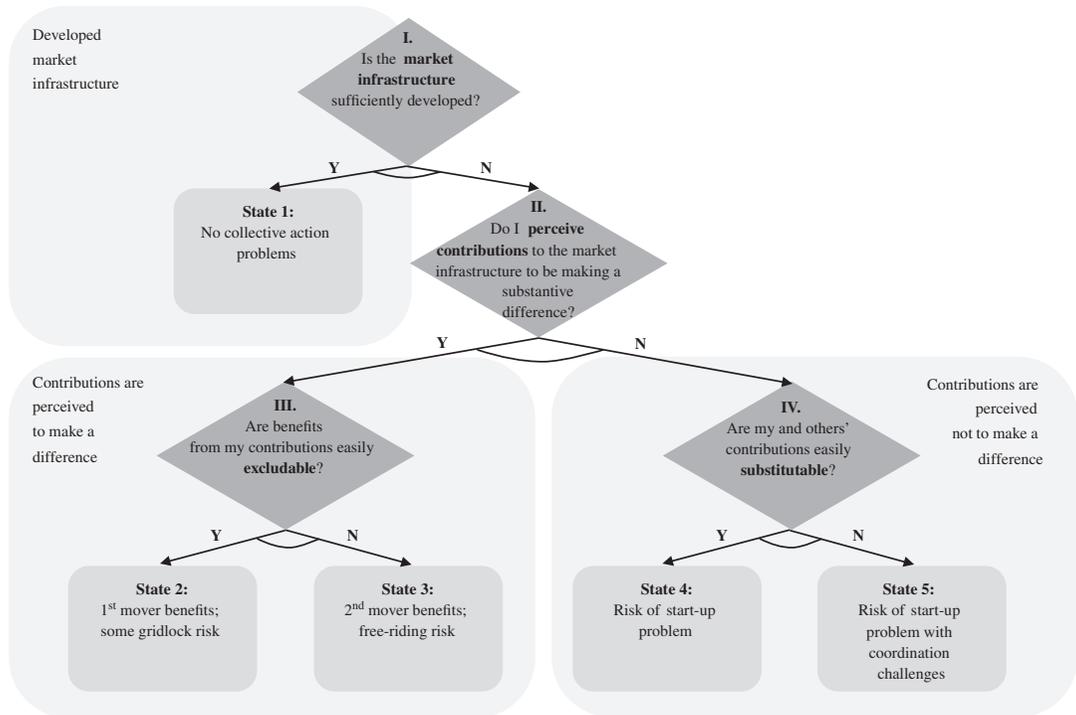


FIGURE 1 Collective action analytical framework

variations influence interests in and motivations for market formation (Fauchart & Gruber, 2011). Further, a variety of sociocultural forces condition new market entry (York & Lenox, 2014). For example, a market may be populated with ideologically motivated pioneering producers (e.g., microbrewers, grass-fed meat producers) as well as those only seeking profits. In contrast to solely profit-oriented actors, those driven largely by ideology may be willing to build market infrastructure, despite low perceived economic returns. We posit that actor heterogeneity affects market formation success as it interacts with the four sources of collective action problems.

3 | COLLECTIVE ACTION PROBLEMS AND SOLUTIONS: AN ANALYTICAL FRAMEWORK

We now set forth an integrative framework for assessing the degree to which collective action is important for market formation. We focus on how particular configurations of factors help or hurt market formation efforts depending on the particular situation of market formation. We build on the four sources of collective action problems outlined earlier—market infrastructure, perceived returns to contributions, excludability, and substitutability. In Figure 1, we present each as a question and then provide answers to those questions in a structured diagram, resulting in five ideal-typical states.

Using the framework in Figure 1, we identify within- and between-state regularities and variation in collective action problems and solutions through the use of specific examples. We relate the respective states to different degrees and types of uncertainty facing actors during market formation efforts to identify state-level regularities (Figure 2). While prior literature highlights the relevance of uncertainty to market formation efforts, it generally fails to distinguish between different types of

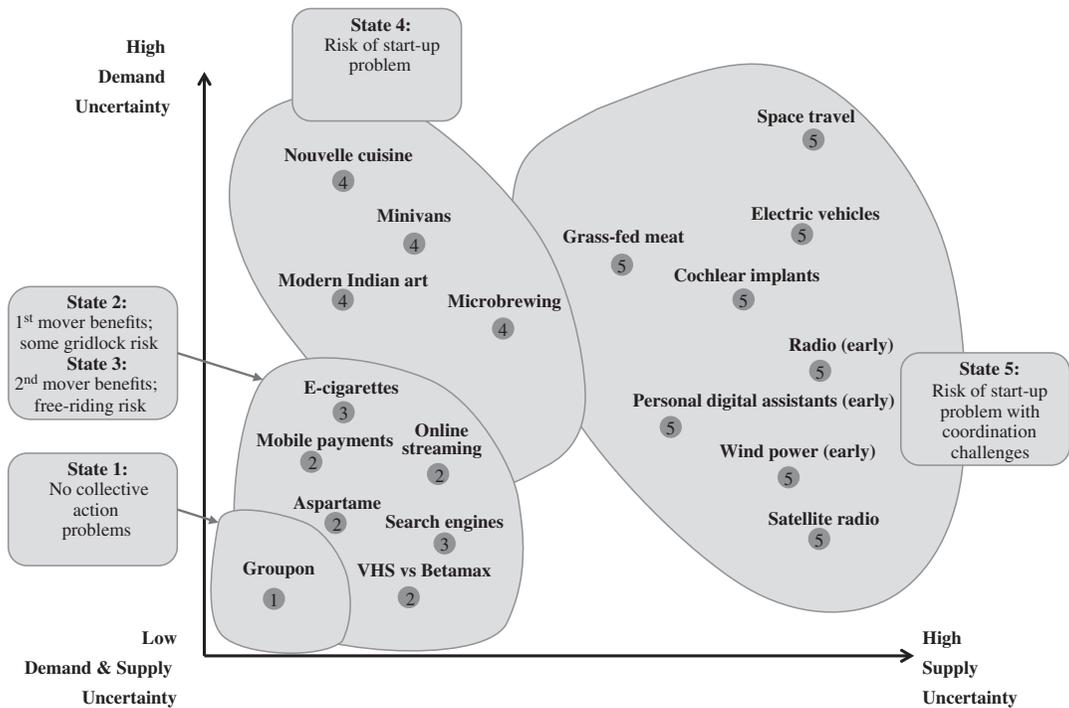


FIGURE 2 Market formation uncertainty and market formation states

uncertainty. We follow a logical differentiation between two key types—demand uncertainty and supply uncertainty (e.g., Abernathy & Clark, 1985; Wernerfelt & Karnani, 1987). Because reducing supply uncertainty involves different activities from those involved in reducing demand uncertainty, situations characterized by high demand versus supply uncertainty may be associated with different types of collective action problems and solutions. This distinction helps explain empirical regularities of collective action problems and solutions in market formation.

Demand uncertainty (Figure 2, vertical axis) is the perceived unpredictability of consumer preferences (Aldrich & Fiol, 1994; Atuahene-Gima & Li, 2004; Benner & Tripsas, 2012). The key component of demand uncertainty is cognitive recognition of a new product or service's value. Empirical research validates the importance of cognitive recognition and acceptance of a good or service in mitigating demand uncertainty (Hargadon & Douglas, 2001; Rao, 1994; Rosa, Porac, Runser-Spanjol, & Saxon, 1999). Demand uncertainty arises from shifts in and unpredictability of consumer preferences (Tripsas, 2008). When relationships between producers and consumers stabilize, demand uncertainty lessens (Fligstein & Dauter, 2007; Weber et al., 2008). Typical actions to resolve high demand uncertainty include product experimentation and market research (Bingham & Davis, 2012); developing category frames (Kaplan & Tripsas, 2008), schemes (Schneiberg & Berk, 2010), or narratives (Lounsbury & Glynn, 2001); and creating collective producer identities (Navis & Glynn, 2010).

Supply uncertainty is a second primary type of uncertainty. Supply uncertainty (Figure 2, horizontal axis), is the absence (perceived or real) of producers and suppliers of a new good or service or the perceived unpredictability of existing ways to produce a product or service in a new market (Anderson & Tushman, 1990; Dixit & Pindyck, 1994; McGrath, 1997). Supply uncertainty exists when there is confusion about how to act or when there are inadequate capabilities to develop and

deliver the product to market. Supply uncertainty also involves the lack of knowledge to secure needed inputs, capital, partners, and other critical resources. Reducing supply uncertainty requires the creation of material and social structures corresponding to the nature of relationships among and within producers (Fligstein & Dauter, 2007; Moenen & Agarwal, 2017; Weber et al., 2008). Typical actions to reduce supply uncertainty include investing in R&D; building venture skills and production knowledge; establishing supplier relationships; forming joint ventures; developing industry standards, exchange technologies, or complementary technologies; and achieving favorable regulation (Van de Ven, 1993).

We further characterize the empirical regularities by considering how heterogeneous actors impact collective action problems and solutions within each of the states outlined in Figures 1 and 2. We summarize the most fundamental problems—those involving greater market formation uncertainty—in a number of propositions. Finally, we discuss the value of applying the framework longitudinally to market formation efforts, showing how collective action problems shift across states as the market develops and how solutions to those problems evolve. We begin by moving through Figure 1 starting with the question in diamond I: *Is the market infrastructure sufficiently developed?*

3.1 | Developed market infrastructure (State 1)

If the market infrastructure is sufficiently developed, then there is no basis for collective action problems (Figure 1, top left shaded area, “State 1”). For example, Groupon created a new market of online discounted vouchers by connecting buyers and sellers in a novel way (Edelman, Jaffe, & Kominers, 2016). Although the product category is new, it is based on longstanding norms and practices of coupon exchange. Groupon relied on extant market infrastructure—existing knowledge structures, input factor markets, and norms that enabled successful market formation. Thus, in cases where market infrastructure is developed, market formation occurs as a result of actors pursuing their individual interests (Kirzner, 1973). Because the market infrastructure in State 1 is well developed, consumers understand the nature of the product or service offering and demand for it exists. On the supply side, existing resources can be exploited to provide needed inputs and the requisite knowledge to do so exists. In other words, perceived supply and demand uncertainty is low (Figure 2, State 1), there is little basis for collective action problems, and market formation success does not hinge upon the heterogeneity of actors that engage in market formation efforts.

3.2 | Contributions make a substantive difference (States 2 and 3)

If the market infrastructure is not sufficiently developed, then the likelihood of collective action problems increases. Underdeveloped market infrastructure leads to the next question—*Do actors perceive that their contributions to building market infrastructure increase the probability of market formation* (Figure 1, diamond II)? If actors perceive that their contributions make a difference, this leads to the question in diamond III: *Are benefits from my contributions easily excludable?* (Figure 1, shaded area bottom left). When the benefits from contributions are highly excludable, actors have a strong incentive to contribute to market infrastructure because they will benefit from doing so (Figure 1, “State 2”). The possibility of appropriating value from developing the market infrastructure is likely when some actors already possess specialized capabilities or assets and enjoy strong scale economies (Ozcan & Santos, 2015; Teece, 1986). Excludability implies that when one or a few actors recognize an opportunity, and are able and willing to act, they will benefit from first-mover advantages (Bekkers, Duysters, & Verspagen, 2002). Here, collective action problems

are unlikely and the probability of market formation is much higher. The market for sugar substitutes is a good illustration. As part of the Food Additives Amendment of 1958, sugar substitutes in the United States were required to obtain approval from the Food and Drug Administration prior to market introduction. In 1965, a researcher at the pharmaceutical company G. D. Searle & Co. discovered a combination of amino acids that he labeled Aspartame and for which the company obtained patents in the early 1970s. It took several years to scale up production, but despite being three times more expensive than Sweet'N Low (a saccharin-based product), Aspartame found great success in the dry use market (Brandenburger, 1993). The company then focused on the soft drink market and eventually replaced saccharin as the artificial sweetener of choice by both Coke and Pepsi.

State 2 market formation efforts tend to involve moderately low market formation uncertainty (Figure 2, State 2). Because of high excludability, when two or more pioneering organizations or coalitions compete to establish a de-facto standard or format, market formation may be hindered by gridlock (Farrell & Klemperer, 2007). Because the race to become the future dominant design (Anderson & Tushman, 1990) implies winning the market (at least temporarily), coalitions vie for dominance, exemplified by the battle between Betamax and VHS (Cusumano, Mylonadis, & Rosenbloom, 1992). Gridlock occurs when actors cannot convince other actors in the value chain to commit to their technology. For instance, compatible fax systems stalled for decades until the 1970s (Rohlfis, 2001). Similarly, actors in the formation of the mobile payment market struggled to reach an agreement on market architecture due to their prior dominance in their respective industries (Ozcan & Santos, 2015). While delaying market formation, such gridlocks are often temporary. Solutions may come through strategies that seek collaboration with competitors (Axelrod, Mitchell, Thomas, Bennett, & Bruderer, 1995) or through policies that stimulate compatibility (Farrell & Klemperer, 2007).

Heterogeneity in actors' ability or willingness has a mixed impact on gridlock problems and solutions. While heterogeneity in actor strategies increases the likelihood of competing coalitions, heterogeneity in capabilities facilitates selection of some coalitions over others because they are more easily adopted.

State 3 is like State 2 in that actors face relatively low market formation uncertainty and perceived returns to contributions are relatively high (see Figure 2, States 2 and 3). However, State 3 differs from State 2 in that the benefits from contributing to market infrastructure are not easily excludable (Figure 1, "State 3," following a "No" to the question in diamond III).³

The limited excludability in State 3 implies that second-mover advantages exist, despite the presence of high returns to contributions (Markides & Geroski, 2005). For example, in the context of search engine markets (Figure 2), many companies had access to novel market infrastructure innovations such as developments in Internet advertising. Although Google adopted these technologies later than many of its rivals, it rose to dominance thanks to its strong internal capabilities to develop superior search algorithms (Cusumano, 2005). In cases where actor contributions are not excludable, others may reap benefits at the cost of earlier contributors while evading the cost of contributing (Heckathorn, 1996; Olson, 1965). This suggests a possible free-riding problem. An illustration of a free-riding problem is the formation of interoperability or public standards. The establishment of standards requires negotiations between market actors. Because standards involve investment and coordination across committed actors, and because standards are readily available to late entrants,

³There is no compelling theoretical argument for why excludability is more or less associated with either demand or supply uncertainty. The collection of empirical examples from within the two states did not suggest any pattern among these dimensions. Therefore, we have grouped States 2 and 3 together in Figure 2.

actors can strategically free-ride on the efforts of those that initially developed them (Farrell & Saloner, 1988). For example, the formation of pay cable TV required the adoption of a protocol for scrambling satellite signals. Once Home Box Office, the largest player in the market, chose the proprietary scrambling system of the firm VideoCipher, this technology was adopted by most cable TV programmers within 2 years (Farrell & Saloner, 1986). More broadly, free-riding is often a problem in contexts of industry self-regulation (Lenox, 2006).

While free-riding is common and may sometimes delay market formation, it is unlikely to deter it. This is particularly the case for situations with heterogeneous actors. Because willing and able early movers often anticipate receiving sufficient private benefits from developing market infrastructure, they are likely to take the lead in such efforts. The market for electronic cigarettes provides such a case. The modern e-cigarette is a battery-powered nicotine delivery system invented in 2003 by a Chinese pharmacist. This new product market grew dramatically, generating \$7 billion in global sales, with over 450 brands producing over 7,500 unique flavors (Zhu et al., 2014). However, its success depended heavily on government regulation. By 2010, many countries banned or strictly regulated e-cigarettes, but in the United States e-cigarettes remained exempt from regulation and have only recently been banned for sale to minors (*New York Times*, 2016). Collective lobbying efforts from industry associations such as the Electronic Cigarette Association and Vapers International Inc. enabled these favorable regulatory conditions (Noel, Rees, & Connolly, 2011). New companies—about 10 per month in 2014—were able to free-ride on the lobbying efforts of pioneering players in e-cigarettes because the benefits were non-excludable. Even though early movers may face free-riding by others, they may undertake action as long as they perceive sufficient benefits from joining efforts or when the cost of *not* participating is too large (Lenox, 2006). Even though free-riding behavior may sometimes hurt early movers, free-riding may also facilitate market formation.

3.3 | Contributions do not make a substantive difference (States 4 and 5)

Returning to diamond II in Figure 1, the “No” branch captures situations where there is not a clear indication that contributions make a substantive difference to market infrastructure development (Figure 1, shaded area bottom right). Here the possibility of the start-up problem exists—a situation where the costs of contributing outweigh the benefits (at least initially). This problem differs from free-riding in that the crux of the start-up problem is not whether people will free ride, but who will *initiate* those efforts. The start-up problem “is one of *feasibility*, the problem of inadequate interests and inadequate resources to overcome start-up costs. The usual outcome ... is that *nobody rides free because nobody contributes and there is no ride*” (Marwell & Oliver, 1993, p. 92, emphasis added). Thus, the start-up problem is a higher barrier to market formation efforts than free-riding, as it logically precedes it. The start-up problem characterizes States 4 and 5.

Given that the start-up problem involves the interdependence of actor contributions, a critical next question is the degree to which actor contributions are substitutable. Thus, we ask in diamond IV: *Are my and others' contributions easily substitutable?* Even if contributions are easily substitutable (the “yes” branch of diamond IV), low returns to contributions for initial contributors means that unless some actors are willing to assume start-up costs, collective action never occurs (Heckathorn, 1996) and actors face a start-up problem (“State 4,” Figure 1). A good example of a State 4 market formation effort is Nouvelle cuisine (Rao et al., 2003). For nearly a century, classical cuisine dominated French gastronomy. As the prevailing orthodoxy, classical cuisine emphasized conservatism and conformity to formulaic rules and practices. Transforming a market dominated by classic gastronomy involved major start-up costs. Key to the success of Nouvelle cuisine was

convincing other chefs, especially those of high status, to adopt new practices, principles, and ingredients. Given the highly professionalized nature of the industry and its societal importance, moving away from classical cuisine involved risks for restaurateurs of being rejected by customers and powerful food critics. Hence, building the legitimacy of Nouvelle cuisine vis-à-vis its classical counterpart provided low early returns to contributions for two decades.

In the case of Nouvelle cuisine, the market formation uncertainty was predominantly demand-related. The legitimacy of Nouvelle cuisine in the eyes of consumers and critics presented a formidable obstacle to the development of this market—not the lack of culinary talent, recipes, or other supply-side concerns. This combination of high demand uncertainty and low supply uncertainty is representative of State 4 (Figure 2, State 4). In market formation efforts falling under State 4, actors have developed a product (or can easily do so from existing knowledge and input markets), but there is demand uncertainty regarding its meaning, utility, and/or desirability. As a result, little to no demand exists and the willingness to pay is low. Here, collective action problems center on gaining recognition for new product categories. In the early stages of such markets, labels are unstable, incomplete, and disjointed (Rosa et al., 1999). Producers collectively discover and shape the use and users of the new market category, identifying and reaching some consensus regarding early product attributes (Montgomery, Dacin, & Dacin, 2012). Demand uncertainty lessens as product categories become coherent and legitimate (Doganova & Karnøe, 2015).

Substitutability of actions that facilitate the resolution of demand uncertainty tends to be relatively high in State 4. While actions that increase legitimacy, such as storytelling and enlisting advocates, require consistency over time, achieving this typically does not require specific and deliberate alignment—rather, more exposure is better. Conditions of high substitutability mean that the resolution of collective action problems depends more on the total rather than on the specific resource commitments. But due to the start-up problem, individual actors rarely are able or willing to unilaterally resolve high demand uncertainty. Consequently, market formation often requires intentional coordination of collective action. Through coordination, actors develop shared identities that build and cement the meaning of a market category by enacting similar market-focused actions. As with Nouvelle cuisine, the U.S. microbrewery market involved intensive intentional coordination to establish a collective producer identity and a recognized product category. Microbrewers collectively identified and tightly coordinated the promotion of a distinctive set of product attributes based on taste, craftsmanship, lifestyle, anti-mass-production sentiment, love for crafting, and tradition (Carroll & Swaminathan, 2000). Formal coordination and promotion occurred through organizations such as the Association of Brewers and the Institute of Brewing Studies (McKendrick & Carroll, 2001). These arguments lead to our first proposition:

Proposition 1 (P1) *Market formation efforts involving high demand uncertainty tend to involve start-up problems, resulting in a need for coordinated collective action.*

However, solutions to State 4 start-up problems do not necessarily need to be intentionally coordinated. Developing a recognized new product market category may emerge as a byproduct of motivated actors pursuing their own interests. For example, as actors highlight distinct dimensions of their new product (Kaplan & Tripsas, 2008; Rosa et al., 1999), they challenge and deinstitutionalize prevailing products and practices (Lounsbury et al., 2003; Rao et al., 2000). As more actors engage in sensemaking and sensegiving, an array of product attributes become recognized as a product category by consumers (Kennedy, 2008). To illustrate, product attributes such as “low step-in height,” “seven passenger,” and “cargo space large enough for a 4 × 8 sheet of plywood between the wheel

wells” came to be constitutive of the product category of “minivan” (Rosa et al., 1999). Thus, efforts by a few motivated actors may spill over, leading to market formation.

In State 4, actor heterogeneity may also catalyze market formation when actor-oriented contributions do not easily spill over to the market infrastructure. Some actors may choose to engage in market formation efforts, despite high uncertainty because of ideological or intrinsic motivation (Boudreau & Lakhani, 2011; Lee et al., 2017). In this situation, first movers may fail and more strategic second movers capitalize on their efforts (Markides & Geroski, 2005), creating a situation that resembles that of State 3. Consider the online bookstore market, where market formation uncertainty was high. Books.com and others that pioneered the category and built consumer familiarity paved the way for Amazon to enter and scale the market (Raff, 2000). Thus, the presence of actor heterogeneity (in willingness and ability) may reduce the likelihood of start-up problems. Together, these arguments lead to our second proposition:

Proposition 2 (P2) *Heterogeneity in actor ability/willingness reduces the need for coordinated collective action in market formation.*

The start-up problem of State 4 is compounded when actors’ contributions are imperfectly substitutable (the “No” branch of diamond IV, Figure 1). Contributions are needed from a variety of actors such as market intermediaries, state agencies, educational organizations, and producers of complementary goods—all of whom perform distinct roles, possess unique capabilities, or control resources that others do not (“State 5,” Figure 1). A key issue in overcoming the start-up problem in State 5 is alignment—the coordination of not only the provision of sufficient resources but also distinct resources in the right amount and proper sequence for infrastructure development (Guérard, Bode, & Gustafsson, 2013; Gurses & Ozcan, 2015). Misalignment reduces the perceived value of all contributions and suppresses further contributions. The need for intentional coordination to align crucial contributions that are substitutable increases the likelihood and severity of the start-up problem. Moreover, competing ideas about how to develop market infrastructure can complicate coordination efforts because in such situations it is unclear and/or contentious what actors should be coordinating. These elements intensify the underlying start-up problem. The emergence of alternative fuel vehicles is a good example. For decades, vehicle producers introduced many alternative fuel vehicles (hybrid electric vehicles [EVs], pure EVs, plug-in hybrid EVs, hydrogen fuel cell vehicles, diesels, etc.). These producers face uncertainty about how to shape demand and whether, which, and at what rate consumers will buy their vehicles. They also face uncertainty about which fuel types or technology standards to commit to. Therefore, market infrastructure is not well developed and requires diverse contributions. Contributing further to the uncertainty is the presence of strong economies of scale, providing cost advantages for high-volume producers.

In 2007, the company BetterPlace positioned itself as an industry coordinator to provide batteries and a battery-swapping infrastructure for EVs. BetterPlace viewed international standards as critical to the success of the EV market and attempted to persuade key market players including automakers, utility companies, charge station providers, and city governments to participate (Etzion & Struben, 2015). Despite backing by governments, NGOs, and external investors as well as demonstrations through actual launches in Israel and Denmark, BetterPlace had great difficulty mobilizing automobile providers and generating consumer interest. As a result, BetterPlace filed for bankruptcy in November 2013. This example demonstrates how low substitutability across various market infrastructure elements intensifies collective action problems.

State 5 is generally characterized by high supply uncertainty (see Figure 2). High supply uncertainty is compounded in State 5 as distinct supply-side activities/resources contribute to distinct

elements of market infrastructure. In the commercialization of radio broadcasting, for example, actors needed the integration of technological components for transmitting and receiving radio signals (Leblebici et al., 1991). This required alignment between multiple actors. The challenge of coordinating alignment was exacerbated by market actors viewing technology as private property protected by patents. In general, unlike mitigating demand uncertainty through the accumulation of sufficient resources irrespective of who contributes, mitigating supply uncertainty usually requires that actors explicitly coordinate with one another to overcome alignment challenges. Taken together, these arguments lead to our third proposition:

Proposition 3 (P3) *Market formation efforts involving high supply uncertainty tend to involve alignment challenges, exacerbating the start-up problem and increasing the need for coordinated collective action.*

While alignment problems characterize supply-side concerns, other State 5 examples reveal challenges arising from both supply and demand uncertainty. Markets such as alternative fuel vehicles (Etzion & Struben, 2015), early personal digital assistants (Bayus, 1997), cochlear implants (Van de Ven & Garud, 1993), and grass-fed meat (Weber et al., 2008) all lacked demand- and supply-side market infrastructure components (Figure 2, State 5), which required alignment across actors to develop. Likewise, nascent markets such as space travel are slow to take off, as actors cannot envision how demand will take shape and supply challenges are numerous (Huang, Menon, & Zuzul, 2016). The need for alignment to develop market infrastructure means that many State 5 markets require intentional coordination. The U.S. wind power industry struggled for years despite substantial regulatory incentives and financial resources. Producers did not coordinate efforts, and evaluators focused on selecting best designs rather than on improving designs. As a result, lack of alignment coupled with limited knowledge sharing led to a fragmented market that languished in its early days (Garud & Karnøe, 2003). By contrast, Danish firms deployed resources to build a wind turbine market through deliberate coordinated efforts across multiple types of actors as a joint learning and alignment process (Garud & Karnøe, 2003).

The presence of high actor heterogeneity in State 5 amplifies the need for intentional coordination. While actor heterogeneity mitigates collective action problems when contributions are highly substitutable (as in State 4), we posit that it has the opposite effect in State 5. Actor heterogeneity combined with low contribution substitutability suggests that while willing and able actors may develop some components of the market infrastructure, actors possessing other critical components might be missing or unwilling to contribute. Consequently, there may be insufficient or uneven development of market infrastructure, which further reduces the perceived returns from investing in the market infrastructure and, with that, future contributions. Because heterogeneity can amplify misalignment, it can also intensify collective action problems and increase the need for coordination to align the distinct actions. High supply-side uncertainty and multiple coordination challenges characterized the nascent satellite radio market (Navis & Glynn, 2010). Initial market formation involved a 7-year battle with the FCC to allocate frequency spectrum because of organized resistance from incumbents in terrestrial radio. Plus, Sirius and XM had to secure massive start-up capital and develop technologies such as broadcasting satellites and receivers. Product development involved over 270 partnerships between the two firms, and although regulation set basic standards (e.g., bandwidth restrictions), their implementation had to be collectively achieved. Thus, because market infrastructure was lacking and its development involved limited substitutability, Sirius and XM deliberately coordinated early efforts to facilitate market formation. Once the market

infrastructure sufficiently developed, both firms pursued competitive growth strategies (Navis & Glynn, 2010). Overall, these arguments lead to our final proposition:

Proposition 4 (P4) *Heterogeneity in actor ability/willingness increases alignment challenges for start-up problems with low contribution substitutability.*

In State 5 successful coordination requires trust, reliability, and a reputation (Bateson, 1988), something especially difficult to achieve when actors are heterogeneous. It is here that critical partners may lack sufficient incentive to take part in market formation efforts (Aldrich & Fiol, 1994). Further, disputes among distinct actors magnify collective action problems, as they increase the risk of premature dissolution of intentional coordination (Benford & Snow, 2000). With low substitutability and actor heterogeneity, market formation is therefore more likely when there are preexisting industry bodies and associations, powerful lead actors, or strong norms among those involved. The formation of the biotech industry (Whittington, Owen-Smith, & Powell, 2009) illustrates the importance of a favorable environment that provides social, geographic, and physical propinquity, stimulating the formation of collaborative networks across a diverse set of actors.

The compounding effect of supply and demand uncertainty, low substitutability, and actor heterogeneity makes market formation very challenging and can result in several market outcomes. First, markets can fail. During the 1980s, the New Zealand natural gas vehicle market benefited from strong intentional coordination between private and public partners (Sperling, 1988), evidenced by the establishment of a committee within the Ministry of Energy to increase consumer awareness, coordinate the rollout of fuel stations, establish quality standards, and keep fuel affordable. But, after early demand and supply growth, the nascent market collapsed when the government withdrew support (Flynn, 2002). Second, markets may develop but remain local and unscalable as solutions that resolve demand uncertainty may be inconsistent with those that address producer identities. Grass-fed meat (Weber et al., 2008) remained local, as scaling-up was partially inconsistent with the collective producer identity. Third, market formation may stall due to multiple competing but incompatible ideas. Segway failed because it was unable to define a specific market segment and lacked a supportive and dedicated market infrastructure, including favorable regulation and clarity about how it could be used and by whom (Sloane, 2012). Likewise, in the automotive industry, competing ideas about the relative prospects of different propulsion systems, including hydrogen, electric, and natural gas, remain largely unresolved (Sperling & Gordon, 2009). The compounding effects of supply and demand uncertainty complicate actors' abilities to foresee market outcomes and to develop a common vision about what to align and how to do it. Similarly, while intentional coordination is critical under conditions of supply and demand uncertainty, it is difficult to achieve and prone to failure. Willing and able actors may not be sufficient to overcome collective action problems, and powerful actors like the state may have to step in.

Overall, our framework (see Figures 1 and 2) details a novel model for market formation by revealing five different market formation states, each of which faces different degrees and forms of collective action problems. In States 2 and 3, collective action problems may occur despite returns from actor contributions. However, free-riding and gridlock are unlikely to hinder market formation in the long run. By contrast, the most fundamental collective action problem—the start-up problem—is likely to occur in States 4 and 5, where perceived returns to contributions are low. State 5, characterized by low substitutability among resource contributions, faces an even larger collective action problem due to the coordination challenges associated with alignment concerns.

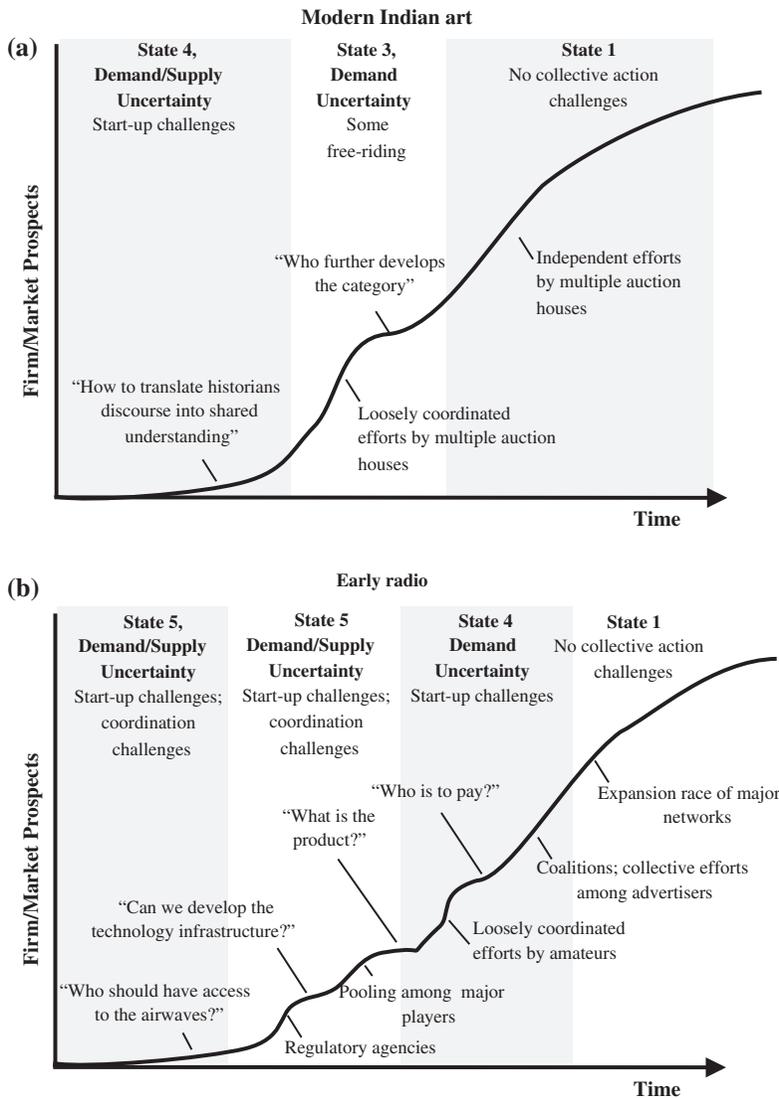


FIGURE 3 Two illustrative pathways of market formation and evolution

3.4 | Interstate dynamics of collective action and market formation

The states identified in Figure 1 are ideal-typical and, as such, should be viewed as abstractions that do not embody all empirical realities of market formation efforts. Similarly, markets are dynamic—they evolve over time and will move through multiple states outlined in our framework. As they do, the existence, nature, and severity of collective action problems change. Market formation tends to move toward State 1 as actors seek to mitigate uncertainty. Yet, given market dynamism, endogenous or exogenous changes will generate new uncertainties and, with them, potentially new and varied collective action problems, shifting markets from one state to another. To account for this dynamism, we describe how collective action problems and solutions change based on the stage of market formation. In Figure 3, we highlight two published cases of market formation, Modern Indian art (Khaira & Wadhvani, 2010) and early radio (Leblebici et al., 1991), and discuss how their market formation problems evolved from state to state.

Consider the market of Modern Indian art (Figure 3(a), from State 4 to State 1), which formed between 1985 and 2007 (Khair & Wadhvani, 2010). Before 1985, Indian art lacked a distinct and recognized category. Instead, it was lumped into a larger “hodgepodge” of South East Asian art objects. Consequently, little demand for Indian art existed. Auction houses and galleries had no interest and held no dedicated exhibitions. Given these challenges, Indian art was largely in State 4 between 1985 and 1995, due to high demand uncertainty but low supply uncertainty. With an increasing critique of modernism, opportunities arose for a category of Modern Indian art. Efforts to build this category and establish a valuation system were non-excludable because all market actors could benefit from this infrastructure—from artists to buyers. But, there were a few actors, such as the new auction house Saffronart, that were motivated and had the capabilities to develop materials in magazines and online media to help codify the category (Khair & Wadhvani, 2010). Saffronart was therefore able to overcome this collective action problem by creating a good that could be valued through loose coordination across auction houses (moving the market from State 4 to State 3, still characterized by considerable demand uncertainty). Once this was resolved, the market infrastructure developed, and more actors such as high-status museums adopted the category. Subsequently, auction houses advanced the development of the market by creating specialized exhibitions of Modern Indian art, thus making more within-category distinctions. These differentiation efforts occurred without further coordination (moving from State 3 to State 1).

Early radio also illustrates how collective action problems evolve during market formation (Figure 3(b), from State 5 to State 1). During the 1920s, radio faced several collective action problems (Leblebici et al., 1991) because little market infrastructure existed (State 5, under high demand and supply uncertainty). Coordination related to supply required addressing two main issues: (a) “To whom do the airwaves belong?” and (b) “Who should have access?” Resolving the allocation, use, and transfer of spectrum rights involved a number of regulatory agencies. Having solved the coordination of the spectrum, the radio broadcasting market then had to address the technological interdependence of the radio equipment (Leblebici et al., 1991). The resolution of this issue required alignment between actors to achieve an integrated technological system that could transmit and receive radio signals. To solve this, major players made pooling agreements with one another (from State 5 to State 4). Further, as the radio industry organizers tried to coordinate supply, ideas about demand shifted. Whereas market incumbents still conceived of radio as a way to collect a toll from senders to specific addressees, hobbyists used the nascent infrastructure and technologies for broadcasting (Leblebici et al., 1991). This stimulated the development of a market for broadcasting and broadcast content (reduced demand uncertainty, State 4).

These two examples demonstrate the dynamic nature of market formation processes and how particular markets, as they move through different market states, will face unique collective action problems. While the pathways by which new markets move from state to state differ, market formation generally involves a movement from higher to lower states of uncertainty and, with that, from more to less complex and problematic collective action problems. Although there is a tendency to move toward lower uncertainty, this path is not inevitable. In situations where collective action is problematic, markets are prone to failure, as we illustrated in the cases of alternative fuel vehicles (BetterPlace, and natural gas in New Zealand) and Segway.

4 | DISCUSSION AND CONCLUSION

Despite much work on market formation, little progress has been made in abstracting from specific markets to develop a general theory of market formation (Fligstein, 2001). While studies on market

TABLE 1 Market formation and collective action: States, problems, and solutions

Variable/context	State 1		State 2		State 3		State 4		State 5	
	Developed market infrastructure		High excludability		High excludability		Low excludability		High substitutability	
Within-state regularities	Collective action market formation problems	No collective action problem	First mover benefits; gridlock potential (Farrell & Klemperer, 2007)	Second mover benefits; free-riding potential (Olson, 1965)	Risk of start-up problem (Marwell & Oliver, 1993)	Risk of start-up problem with coordination challenges				
Example	Online discounted vouchers	Aspartame; fax	Moderate uncertainty	e-Cigarettes; satellite scrambling standard	Nouvelle cuisine; microbrewing	Alternative fuel vehicles; early radio				
Characteristic market formation uncertainty	Low uncertainty	Moderate uncertainty	Moderate uncertainty	Moderate uncertainty	High demand uncertainty; low-high supply uncertainty; (P1)	Moderate-high demand uncertainty; high supply uncertainty (P3)				
Likelihood/impact of collective action problem	na	Low/moderate	Low/low	Low/low	High/moderately high	High/high				
Conditions for collective action solutions	na	Coalitions among competitors	Commitments by some able/willing early mover	Commitments by some able/willing early mover	Critical mass of able/willing actors	See State 4, and those actors coordinating to align distinct resource commitments				
Effect of heterogeneity in actor ability/willingness on collective action solutions	na	Helps: More likely that one coalition will win out Hurts: More likely to get gridlock	Helps: Some actors, not caring about free-riders because sufficient value or limited costs, may enforce a standard	Helps: More actors, not caring about free-riders because sufficient value or limited costs, may enforce a standard	Helps: A few able/willing actors may provide critical resources, or, some actors provide initial resources for bandwagon effect (P2)	See State 4, and Hurts: May be unable to provide all requisite market infrastructure; makes alignment difficult (P4)				

formation explore various dimensions of collective action, there is a notable lack of understanding regarding the emerging and unfolding role of collective action in market formation in those studies. Specifically, scholars criticize the conventional practice of identifying a market that has already formed and then working backward to explain determinants of its formation (Aldrich & Ruef, 2006: 32; McKendrick & Carroll, 2001). Relying on observations that begin after the initiation of market formation—including the shaping of individual and collective action—means that much of the initial factors that may have been crucial to market formation remain unobserved. While markets that have survived long enough to provide data may still struggle to be perceived as legitimate, they have likely overcome early critical collective action problems we identify. As a result, scholars largely neglect such problems because their resolution generally inheres in, and is disguised by, market formation. Such neglect is particularly problematic because how collective action problems are resolved shapes and directs subsequent action that influences market formation efforts and the actors involved. We address this neglect and add to the literature by developing a more comprehensive framework of collective action in market formation than what currently exists.

We provide several insights regarding collective action in market formation. First, by identifying the three key factors that condition successful market infrastructure development—perceived returns to contributions, degree of excludability of benefits, and degree of substitutability between contributions—we are better able to detail the presence and type of collective action problems that hinder successful market formation. They include gridlock, free-riding, start-up problems, and coordination challenges (see Table 1, “Collective action market formation problems”). Gridlock and free-riding involve collective action problems that occur despite perceptible returns from actor contributions. But these issues are unlikely to hinder market formation in the long run. Early movers may invest in market infrastructure even if others free-ride (Lenox, 2006). By contrast, the main collective action problem in market formation is the start-up problem, which occurs when perceived returns to contributions are low. In market formation, the start-up problem is further compounded by coordination problems arising from low substitutability of resource contributions.

Second, we identify regularities and variation in collective action problems and solutions. The severity of collective action problems is correlated with the perceived degree and nature of the underlying uncertainty facing market actors (see Table 1, “Characteristic market formation uncertainty”). While start-up problems often arise in situations where demand uncertainty is high (e.g., creative industries; Rao et al., 2003), situations involving supply-side uncertainty (e.g., complex technologies; Van de Ven, 1993) have additional alignment challenges (P1 and P3).

Third, we add by revealing how different actor configurations—defined as the presence of heterogeneity in actor willingness and ability to act—help explain variation in market formation outcomes (see Table 1, “Effect of heterogeneity in actor ability/willingness on collective action solutions”). Actor heterogeneity reduces the need for intentional coordination in start-up problems (P2), but in situations of low substitutability of actor contributions, heterogeneity can exacerbate rather than mitigate collective action and can increase the need for intentional coordination (P4).

Fourth, we contribute by demonstrating how collective action problems and solutions are not static but change over time as markets evolve. Markets stabilize by moving from high uncertainty to low uncertainty. For example, a new market may begin in State 5 (high demand and supply uncertainty), transition to State 4 as actors resolve supply uncertainty, and ultimately arrive in State 1 (see Figure 3). This shift is generally correlated with a reduction in the number and severity of collective action problems facing market actors. Further, while there is a tendency to move from higher to lower states of uncertainty, this path is not set. Since empirical studies suggest that collective action problems underlie the failure of markets (Gurses & Ozcan, 2015; Ozcan & Santos, 2015; Rao et al.,

2000), markets do not necessarily move to a state of lower market uncertainty, despite significant efforts on the part of interested actors. However, markets with start-up problems may succeed despite limited coordination if sufficient time is given for the requisite resources to accumulate and sufficient market infrastructure to form. Thus, our framework clarifies when during the market formation process coordination is needed and when not.

Finally, while scholars study the actors and actions that contribute to the construction of market infrastructure (R. J. David, Sine, & Haveman, 2013; Garud et al., 2002; Lee, 2009; Wijen & Ansari, 2007; Weber et al., 2008), what remains understudied is the nature of these contributions and their degree of intentionality. We contribute by differentiating between two important but often confounded types of actions: actor-oriented efforts that develop actors' own capabilities, and market-oriented efforts that develop the market infrastructure. Additional research that explores the implications of distinct actions for market infrastructure development would be helpful.

Overall, by shedding new light on the conditions that lead to collective action problems during market formation efforts, the forms these problems take, and the solutions pursued, we contribute to the literature by setting forth a multifaceted framework that offers a more thorough understanding of market formation dynamics than what currently exists. By differentiating between actor-oriented and market-oriented actions, we connect questions of firm success to those about market success, with implications for research on value creation and value appropriation. Moreover, by revealing, (a) the relevance of actor-oriented and market-oriented efforts to the development of market infrastructure, (b) the increased criticality of start-up problems, and (c) the unarticulated roles of supply and demand uncertainty and actor heterogeneity, as well as how these factors combine and evolve over time, we set forth a needed agenda for future research seeking to understand such market formation dynamics.

We believe our theory extends to other instances of emergence such as new organizational categories, forms, fields, and industries. Given the selection mechanisms that operate on efforts to create entities, there are few studies of formation failure. This paucity is consistent with related phenomena, such as failed diffusion efforts (Strang & Soule, 1998), failed efforts at institutional change (Rao & Giorgi, 2006), and category dissolution (Kennedy & Fiss, 2013). We contend that understudied causes in many of these cases are collective action problems and subsequent coordination failure (Gulati, Lawrence, & Puranam, 2005). We stress the need for more research into how and when coordination may break down during market formation efforts. While collaboration may eventually give way to competition, its premature dissolution may hinder market formation (Garud & Karnøe, 2003). Factors central to effective interorganizational collaboration, such as niche overlap and social identity, have been identified (Ingram & Yue, 2008), but more work is required to characterize the different forms of interorganizational coordination in new market contexts and how they evolve as markets mature. Our framework adds to this by suggesting that different forms of coordination are enacted during market formation. For example, successful collaboration depends on the state of the market and whether actors maintain different roles. Thus, while socially skilled actors may effectively mobilize resources by eliciting cooperation from others (Fligstein, 2001), their ultimate success is contingent on the severity of collective action problems.

Our study also holds implications for entrepreneurship. Whereas entrepreneurs are central actors in the formation of new markets, collective action is a key mechanism by which entrepreneurs can overcome many challenges in new market formation (Gurses & Ozcan, 2015). Our theoretical framework underscores the uncertainty in outcomes inherent in the pursuit of new opportunities. Much of the literature in entrepreneurship implicitly assumes a tight coupling between the actions of actors and outcomes that lead to formation. In some cases this assumption is justified, such as when market formation conditions allow an "era of ferment" to be resolved through pioneering and

perhaps naïve actors working on their own (Anderson & Tushman, 1990). However, in most other cases, such a tight coupling is questionable. For example, Aldrich suggests that the work on institutional entrepreneurship conceptualizes “a world designed by farsighted and clever humans that is as implausible as it is attractive” (2010, p. 349). This implies a greater recognition of the complexity and uncertainty facing entrepreneurs. By advocating a similar position, but by differentiating between unique market formation conditions, our framework approaches the efficacy of market formation actions as an open question rather than a foregone conclusion. Our framework suggests that a more accurate understanding of market formation will emerge from efforts to consider timing, pacing, and duration in models of market formation (Aldrich, 2010; Fiss, 2007). Thus, while new markets often exhibit patterns of rapid entry (Klepper, 1996), this generally occurs only once markets have moved to States 1 or 2. Our focus on market formation conditions like increasing returns to contributions, actor heterogeneity, and contribution substitutability underscore the importance of such dynamics.

More broadly, our theory contributes to a growing literature at the nexus of collective action and entrepreneurship. The myth of the lone entrepreneur has been resoundingly debunked. Research that demonstrates the socially and contextually contingent nature of entrepreneurship continues to accumulate (Aldrich & Ruef, 2006; Tolbert, David, & Sine, 2011). Advocates of such an approach (Romanelli & Schoonhoven, 2001) define entrepreneurship as “the purposive and collective market space-creating activities of entrepreneurs and others” (p. 384) and suggest that “only collective action by entrepreneurs and investors from many organizations can produce the cognitive and sociopolitical legitimacy that is needed for creation of a viable new market space” (p. 387). Other work has also called for a “collective action-based orientation to the study of entrepreneurship” (Sine & Lee, 2009, p. 150). Despite these assertions and calls to understand the role of collective action in market formation and entrepreneurship, there is surprisingly little understanding of when and under what conditions collective action is necessary for market formation. This is problematic because omitting the collective struggles in the creation of a market from theories about entrepreneurial success in new markets implies that explanations are based on empirics involving important sample selection bias. We advance knowledge in this domain by identifying important scope conditions regarding the need for collective action. A focus on the collective nature of market formation efforts has direct implications for research on factors hindering entrepreneurial opportunity capture in new markets. While this research focuses predominantly on the role of individual-level biases (Busenitz & Barney, 1997), our framework shows that actors’ resource allocation decisions are linked to processes at the collective level. Thus, biases about collective efforts should be included in such studies.

Finally, by establishing a framework detailing when and how collective action is most likely needed for market formation, we transcend theoretical domains and encourage greater dialogue across strategic management, entrepreneurship, and organization literatures. For example, while market creation is of concern to strategic management scholars, a primary focus on explaining firm-level value creation has left open questions about how challenges across actors need to be overcome for that value to be created (see Adner & Kapoor, 2010). Likewise, our framework suggests that fruitful linkages exist between strategy and entrepreneurship literatures in market creation contexts where producers need to pursue collective strategies to generate demand (Rinallo & Golfetto, 2006). For example, our framework may help us better understand under what conditions collective activities to educate consumers about the new product’s meaning, use, and value (Doganova & Karnøe, 2015) may be important for new product category emergence.

In summary, future empirical work that attends to the nature of the uncertainties facing entrepreneurs, the timing of when actors enter the new market space and what they specifically contribute to the development of shared market infrastructure, and the specific actions they engage in can test and

refine our theoretical claims. We hope that our framework and theory proves useful as scholars seek to understand these important dynamics.

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