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Social movements and entrepreneurial activity: A study of the U.S. solar energy industry

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ABSTRACT

We explore how the size of social movements and the ecology of their target industries influence entrepreneurial entry. By leveraging a 14-year panel in the solar energy industry, we demonstrate how a larger social movement stimulates entry. We reveal how this relationship is contingent upon the density of both the focal industry and the industries that are mutually connected to the cause of the movement, as well as the concentration of generalist firms. We demonstrate how larger social movements act in a compensatory role to elicit entry when ecological conditions are least favorable to entry. By uncovering the conditional influence of movements, we contribute to theory at the intersection of social movements and entrepreneurship.

1. Introduction

As activism around social issues rises (Anderson et al., 2018), so does the growth of new industries inspired by social movements (Carlos et al., 2018; Sine and Lee, 2009; Vasi, 2009, 2011). Social movements carry great weight in guiding industries that have implications for social and environmental responsibility (Briscoe and Gupta, 2016), such as those in renewable energy (Sine and Lee, 2009; Pacheco et al., 2014; Vasi, 2009), green building (York et al., 2018), standards-setting (Manning and Reinecke, 2016), and recycling (Lounsbury et al., 2003). Social movement organizations (SMOs)—organizations with goals that address the interests of a movement (McCarthy and Zald, 1973)—can help diffuse values and norms that legitimize new industries (King and Pearce, 2010; Rao et al., 2000; Sine and Lee, 2009). Through their efforts to align the industry's practices with cultural expectations (Aldrich and Fiol, 1994; Scott, 1995), SMOs garner the support of key audiences—such as customers, government bodies, and the media—which favors the legitimacy of the industry (Deephouse et al., 2017; Zimmerman and Zeitz, 2002). This in turn reduces entry barriers and motivates entrepreneurial activity (Eberhart et al., 2017; Eesley, 2016; Tolbert et al., 2011; Sine et al., 2007).

Researchers have uncovered institutional and political mechanisms by which SMOs drive entrepreneurial activity in an industry (Hess, 2014; Hiatt et al., 2009; Pacheco et al., 2014; Sine and Lee, 2009). Rather than examining the structure of industries (Carlos et al., 2018), scholars have mostly focused on the agency of SMOs to inspire prospective entrants. As a result, there is a critical gap in our understanding of the role of SMOs, since their ability to influence industry-level legitimacy and competitiveness to stimulate firm entry (Aldrich and Fiol, 1994; Sine et al., 2007; Tolbert et al., 2011) depends upon the ecology and structure of their target industry (Delacroix and Carroll, 1983; Hannan and Freeman, 1989; Seidel and Greve, 2017). Thus, we investigate *how the organizational ecology of an industry shapes the influence of SMOs on entrepreneurial firm entry*.

Drawing on social movement theory (Briscoe and Gupta, 2016; McCarthy and Zald, 1973), we build on the idea that collective action can be leveraged to legitimate new industries (King and Pearce, 2010; Rao et al., 2000; Schneiberg et al., 2008). Specifically, we posit that the size of a movement reflects its relative and effective potential to influence important audiences and scale collective action to catalyze firm entry (Johnson, 2008; McCarthy and Zald, 1973; Pacheco et al., 2014; York et al., 2018).

Although we anticipate that larger social movements prompt increased entry, we also expect that industry structure impacts the

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extent to which social movements stimulate entry. To explore these relationships, we adopt an organizational ecology perspective that contends that the structure of an industry influences its legitimacy and competitive processes, which in turn either incentivizes or deters firm entry (Aksaray and Thompson, 2017; Bogaert et al., 2016; Hannan and Freeman, 1989). We argue that SMOs may be more influential at stimulating firm entry when the structure of an industry is less favorable to entry—i.e., when the density of the industry (Hannan and Freeman, 1989), the concentration of generalist firms (Carroll, 1985), and the density of mutualistic industries that share the cause of the movement (Barnett, 1990; Bertoni et al., 2019) lead to lower legitimacy or competitiveness. Larger social movements are able to compensate for these unfavorable conditions and leverage their resources to influence key audiences that can enhance the industry's legitimacy and thereby, stimulate entry.

We test our hypotheses by examining the U.S. solar energy contracting industry. In this industry, specialized and technology-focused social movement organizations (TSMOs[1]) like The Acadia Center take on a broad range of activism initiatives such as market expansion and policy advocacy to promote the benefits of clean energy to a broad audience (Hess, 2005; Pacheco et al., 2014; York et al., 2018). Our data reveal substantial state-level differences in the evolution of this industry. While many states experience growth, others remain relatively stagnant. By focusing on the state-year level of analysis, we explore the varying structural conditions that prospective entrants encounter within the same period and across distinct industry sub-ecologies (Baum and Mezias, 1992; Hannan et al., 1995; Hess, 2016; Sorenson, 2017).

We contribute to current understandings of the relationship between social movements and entrepreneurial entry. We show that the ability of social movements to influence growth in their target industries is not only a product of their agency—as commonly depicted in the literature (Hiatt et al., 2009; Pacheco et al., 2014; Sine and Lee, 2009; York et al., 2016)—but also of the ecology of these industries. First, we demonstrate how larger social movements mitigate unfavorable industry density to create or renew entry interest. Building on the work of Carlos et al. (2018), we posit that larger movements elicit firm entry during low levels of industry density; yet, SMO intervention is also critical to restoring industry legitimacy and competitiveness at higher levels of industry density—i.e., when the interest of prospective entrants may begin to plateau or when industry opposition arises. Thus, we point to the importance of examining more developed and denser environments, where an industry's structure may still be guided by the influence of social movements.

Second, we show how resource-partitioning conditions affect the efficacy of larger social movements to legitimate the industry and motivate greater entry. Specifically, we suggest that a larger presence of SMOs can stimulate the entry of specialist firms and deter the dominance of generalists. Through this, we uncover how SMO activity does not influence industries uniformly, an implicit assumption in the literature, but rather encourages more vulnerable sub-populations (i.e., specialist firms) to counteract others that are more dominant (i.e., generalist firms). Third, we demonstrate how the success of SMOs in attracting entrepreneurial activity into an industry is not only influenced by the density of firms in that industry (Carlos et al., 2018), but also by the density of mutualistic industries that offer equivalent social value. Firm density in these mutualistic industries may provide legitimacy spillovers to the focal industry that render social movement efforts as less productive in legitimating the latter and attracting new entry. This contribution draws attention to inter-industry dynamics in assessing the outcomes of social movement intervention. Finally, we highlight the importance of addressing ecological conditions when examining the agency of actors, like social movements, who both influence the ecology of an industry by altering entry patterns but are also dependent on that ecology to achieve their goals. With this contribution, our study reinvigorates discussions of organizational population dynamics (Carroll, 1985; Hannan and Freeman, 1989).

We begin by explaining social movements and their effects on industry legitimacy. We then describe how social movements shape firm entry into their target industries. Following this, we explain how this relationship is dependent upon intra- and inter-industry ecology.

2. Theoretical development

2.1. Social movements

Social movements "can be viewed as collective enterprises seeking to establish a new order of life" (Blumer, 1969, p. 99). They are initiated by coalitions of individuals or organizations with shared goals that promote changes in cultural, social, or business practices (Diani and McAdam, 2003; Georgallis, 2017; McCarthy and Zald, 1977). The success of social movements is primarily dependent upon their engagement with framing activities, political action, and resource mobilization (McAdam et al., 1996), and their ability to engage public support through these means (Stern et al., 1999). Social movements both frame social problems and legitimate solutions by modifying meanings that resonate with key audiences (Benford and Snow, 2000). Movements undertake social causes, such as the protection of the natural environment, and advocate for related values, norms, and behaviors to influence public opinion (Barkan, 2004; Stern et al., 1999). Unlike pure interest groups, movements are organized around normative claims, seeking the support of target audiences to address a common good (Schneiberg and Lounsbury, 2017; Stern et al., 1999).

With direct applicability to SMOs (Zald and McCarthy, 1986), resource mobilization theory examines how the structure of movements—in particular, their resources, organizations, and relationships—are applied to influence their targeted audiences (Gamson, 1975; McCarthy and Zald, 1973, 1977). As the central actors in this theory, SMOs formally control and manage the resources that define the movement's potential. SMOs aggregate resources and apply them toward recruiting constituents and mobilizing audiences in support of their causes (Jenkins, 1983; Zald and McCarthy, 1986). With greater resources, they are able to scale their negotiation with and management of other actors that are capable of representing the movement, such as the media, governments, consumers, and the general public (McAdam et al., 1988).

SMOs vary in terms of the scope of their target causes (Johnson, 2008; Soule and King, 2008). Some operate as generalists toward broader social goals, while others like TSMOs, take on narrower social goals, such as the promotion of specific technologies or practices. These include recycling, birthing practices, and the empirical focus of this study, clean energy (Hess, 2005). While generalist SMOs tend to employ confrontational tactics geared toward incumbent industries (Hess, 2016), TSMOs tend to focus on market creation and technology development (Pacheco et al., 2014; York et al., 2018). TSMOs are differentiated from trade associations in that they are viewed as being aligned with consumer interests and open to competing technology options that help realize social change. To animate the missions, structures, and initiatives of TSMOs, Table 1 provides a sub-sample of clean energy TSMOs (henceforth "SMOs") leveraged in our study.

2.2. Social movements and industry legitimacy

The role of SMOs in accelerating industry development has been explored in a variety of settings (Carlos et al., 2018; Pacheco et al., 2014; Sine and Lee, 2009; York et al., 2018). When the goals of a movement are aligned with the offerings of an industry, SMOs can assist by

[1] Technology-focused social movement organizations are defined as specialized SMOs "that exclusively focus on supporting the development and adoption of a specific technology to advance its social goals" (Pacheco et al., 2014, p. 1610).

Table 1
Illustrations of TSMO mission and objectives, funding support, board and/or member, structure, and mechanisms for audience reach.

TSMO	Mission/vision/objectives	Funding resources	Membership/organizational structure	Mechanisms to target key audiences (consumers, government, community, media)
Acadia Center (originally Environmental Northeast), Maine; https://acadiacenter.org	"AC is a non-profit, research and advocacy organization committed to advancing the clean energy future. AC is at the forefront of efforts to build clean, low carbon and consumer friendly economies. AC's approach is characterized by reliable information, comprehensive advocacy and problem solving through innovation and collaboration."	Program grants from the Barr Foundation, Common Sense Fund, Educational Foundation of America, Energy Foundation, Grantham Foundation for the Protection of the Environment, Heising-Simons Foundation, Horizon Foundation, Inc., Island Foundation, Inc., John Merck Fund, Merck Family Fund, New York Community Trust, Rhode Island Foundation, and Transportation for Massachusetts (T4MA).	• Board of directors is composed of advocates and educators with professional experience ranging from law to banking to engineering that "are committed to supporting AC as a responsible organization and an effective agent of change." • Staff is composed of economists, attorneys and environmental scientists. • Advisory council is composed of academics, non-profit consultants, & private equity management groups.	• Create energy efficiency through demand side management to maximize investments in energy efficiency • Clean up energy supply by advancing renewable energy. • Reform outdated utility regulations and financial rules so that the regional power grid embraces renewable energy and new energy technologies installed [in] homes and businesses • Advocate for electrification of using low- or no-carbon electricity to heat and cool • Bring top-quality analysis to answer pressing questions, support good ideas, fight misinformation, and find common ground for stakeholders • Raise awareness of the benefits of a clean energy future among the general public, key stakeholders, and opinion leaders • Advocate and design market-based strategies and complementary policies that foster cleaner energy supplies across all sectors • Update policy models so they align utilities' financial incentives with the public's clean energy, carbon reduction, and economic goals • Educate audiences through developing visualizations, graphs, reports, trackers, analyses, and maps using macroeconomic and econometric modeling, emissions inventory construction, energy and emissions forecasting, statistical analysis, spatial analysis, energy cost/consumption/emissions scenario analysis, and energy system optimization.
Nextenergy Center, Michigan; https://nextenergy.org	"Our mission is to accelerate energy security, economic competitiveness, and environmental responsibility through the growth of advanced energy technologies, businesses, and industries."	Funding from grants; contributions from donors	• Board of directors is composed of former successful entrepreneurs, senior member of university administration, an academic, an attorney with regulation experience, a private equity investor. • Members include large and small corporations, universities, and nonprofit organizations.	• Create studies for green transportation technology adoption programs in urban areas • Provide training and education support to small businesses focused on green technology development • Develop green technology innovation competitions and pitch contests for small businesses to demonstrate prospects for new innovations • Develop roadmaps for identifying and advancing energy efficiency building technologies, products, services and clean energy manufacturing • Provide education programs on green energy solutions in the lighting sector, including technology developers, manufacturers, distributors, installers, and customers, to facilitate growth, create connections, and generate investment across the state
Alternative Energy Resources	The mission of AERO is to empower communities to nurture and	Majority of funding from sponsors.	• Board of directors consists of an agricultural outreach educator,	• Create green power feasibility promotion campaigns by

(continued on next page)

Table 1 (*continued*)

TSMO	Mission/vision/objectives	Funding resources	Membership/organizational structure	Mechanisms to target key audiences (consumers, government, community, media)
Organization (AERO), Montana; https://aeromt.org	promote a more sustainable Montana. The vision is for Montanans to have access to clean energy, healthy food, sustainable agriculture, and a network that provides leadership, resources and advocacy.		non-profit administrators, an environmental planning specialist, agricultural industry entrepreneurs, and a marketing communications specialist. • Sponsoring partners come from public support Montana-based businesses.	producing features of homes, business, and farms that have adopted renewable energy sources and technologies • Create a task force to advise local municipalities on energy conservation programs • Encourage and recommend public/private partnerships to create broader adoption of renewable energy programs • Organize tours for homeowners, small businesses, local governments, farmers, and ranchers to see renewable energy projects, such as solar panels and wind turbines up close. • Create a variety of automated tools/calculators, such as the “Solar-Estimator” automated tool, designed to teach about the financial and energy benefits of solar hot air, solar hot water, photovoltaics, or wind systems and utility consumption and expenses for homes or businesses according to location
Carolina Land & Lakes RC-D Inc., North Carolina; https://www.carolinalandandlakes.org	"Our mission is to improve the quality of life for our communities, provide a safer environment, and create a better economy by supporting beneficial projects and creating partnerships in our region. We achieve this goal by supporting projects that address conservation of resources, such as: water quality, bio-energy, energy efficiency, stream restoration, and dam removal. Through these projects we can achieve our desired goal of a better and happier place to live."	Majority of funding from grants with a small amount from donations.	Board consists of rural entrepreneurs and administrators of non-profit organizations.	• Create grant proposals to study effects of power creation via dams and the effects on wildlife, ecosystem development • Establish projects with universities and local farmers to create case studies of upgrading to green technology-based heating systems • Provide education services to local farmers and small businesses interested in finding grants or incentives to upgrade to LED lighting, greenhouse insulation, and solar photovoltaic power • Develop self-assessment tools for local farmers and small businesses to evaluate technology upgrade feasibility and costs • Provide on-site and online guidance and education to businesses seeking to improve energy efficiency
Renewable Northwest Project, Oregon; https://renewablenw.org	"We advocate for the expansion of environmentally responsible renewable energy resources in the Northwest through collaboration with government, industry, utilities, customers, and advocacy groups. We envision the Northwest powered by clean, affordable, reliable, renewable energy that protects the climate, strengthens the economy, and preserves our quality of life."	Roughly half of revenue from leading renewable energy programs in communities and half from contributions, gifts, and grants.	Board chair, vice chair and secretary made up of individuals from non-profit renewable energy and environmental conservation organizations. Board treasurer is from an Oregon-based solar energy industry association. Board members are from four renewable energy product and service firms and six non-profit renewable energy organizations.	• Initiate community projects focused on mobilizing audience support for renewable energy generator systems in Northwestern states. As of June 2017, they have 130 established or in process solar projects and five wind projects.
Energy Trust of Oregon Inc, Oregon; https://www.energytrust.org	"Energy Trust is dedicated to helping 1.5 million utility customers in Oregon and southwest Washington save energy and generate renewable power. We provide comprehensive energy efficiency and renewable energy programs, and our success is measured in kilowatt-hours of electricity saved or produced with renewable energy and efficient and	Majority of funding from contributions, grants, and gifts, with a small percentage from investment revenue.	• Board comprised of individuals from public utility commissions, academics and state-funded energy research groups, energy providers, various environmental non-profits and banks. • Advisory council is comprised of interest groups and stakeholders with strong experience in renewable energy.	• Create promotion initiatives focused on bridging funding gaps for renewable energy adoption. They promote financial incentives for renewable adoption. Their projects work to deliver renewable energy to residential, commercial and agriculture customers from energy providers by coordinating program management and energy delivery contractors. • Facilitate solar technology

(*continued on next page*)

Table 1 (*continued*)

TSMO	Mission/vision/objectives	Funding resources	Membership/organizational structure	Mechanisms to target key audiences (consumers, government, community, media)
	effective delivery of services to utility customers."			adoption with Solar for Your Home and Solar for Your Business, where to be listed as an installer, the organization must be qualified by the Energy Trust • Create information portals for finding and selecting solar installation contractors and providing a system for the installation to be inspected by the Energy Trust • Assist customers in obtaining their adoption incentives from sponsored sources and in how to file for available tax credits
NC GreenPower Corporation Non-Profit, Inc., North Carolina; https://www.ncgreenpower.org	GreenPower is a nonprofit improving our state's environment by supporting renewable energy, carbon offset projects, and providing grants for solar installations at K-12 schools.	Supported entirely by voluntary contributions from citizens and businesses across the state. In earlier years, they have applied for grants to help cover administration and marketing expenses but depend primarily on donations to support our projects. Contributions to renewable energy and carbon offsets are given by individuals and businesses either directly to us, or through their utility.	The board of directors consists of 17 members representing a diverse group of stakeholders, such as non-profit consulting companies and organizations. Officers are a former US Environmental Protection Agency program manager, a member from the NC Board of Education and a section chief from the NC Department of Environment and Natural Resources. Board members come from various non-profit environmental and consulting organizations, academia, and two for-profit energy industry firms.	• Create funding systems to collect matching donations for implementing solar panel arrays in K-12 schools within the state. • Assist in finding offset funding for over 300 residential solar panel installation projects and five commercial projects
Center for Ecological Technology, Massachusetts; https://www.centerforecotechnology.org	"Our mission is to research, develop, demonstrate and promote technologies that have the least disruptive impact on the natural ecology of the Earth. We help people and businesses in Massachusetts save energy and reduce waste. Together with our partners, we'll move the needle in energy efficiency and waste reduction through innovative pilot efforts in the areas of local carbon offsets, deeper energy retrofits, building deconstruction and more. We make green make sense."	Funding from grants; service revenue; investment revenue	• Board of directors is composed of a municipality services manager, a non-profit administrator, a bank executive, healthcare firm executives, executives at manufacturing firms headquartered in Massachusetts, a volunteer community member, entrepreneurs, environmental scientist, an academic in environmental policy studies, and a business development consultant. • Sponsoring partners come from private donors, banks, philanthropic organizations.	• Conduct awareness campaigns around rebates and incentives for green technology upgrades • Manage programs for swapping or upgrading to green technology related to electricity and fuel for heating for homes and businesses • Conduct in-home consumer energy use assessments of legacy technologies, such as oil heating systems, and retrofit adoptions of solar technologies • Provide education seminars in communities, clubs, religious groups, town/city officials on design and adoption potential for green technologies and the management of waste reduction

mobilizing resources to enhance the sociopolitical legitimacy of an industry (King and Pearce, 2010; Rao et al., 2000; Weber et al., 2008). Commonly applied at the industry and/or sector level, sociopolitical legitimacy (henceforth "legitimacy") refers to a degree of congruence between the industry's "characteristics or behaviors and the normative expectations in the cultural meaning system" (Suddaby et al., 2017: 454). It is conferred to an industry by key audiences—such as those made up of government bodies, consumers, and financial investors—who determine whether the industry's activities are appropriate within a set of social values and norms (Aldrich and Fiol, 1994; Deephouse et al., 2017; Scott, 1995; Suchman, 1995; Suddaby et al., 2017).

As the targeted intent of social movement intervention (McCarthy and Zald, 1977; Hiatt et al., 2009), this form of legitimacy is based on a deep moral sense and understood to be both agentic and intendedly manipulated (Benford and Snow, 2000). SMOs influence the legitimacy of an industry by activating the (implicit or explicit) social judgement of key audiences who evaluate the fit between the industry's offerings with their personal values and/or related social norms. Through framing and persuasion tactics, SMOs deliver positive associations between the industry's practices and social welfare outcomes, invoking feelings of responsibility and obligation that impel key audiences to support the industry.

In the case of solar energy, SMOs advocate for power generation that delivers environmental benefits and offers a solution to the climate crisis. As illustrated in Table 1, SMOs like The Center for Ecological Technology (TCET), Acadia Center, and Green Power Corp work to accelerate environmental responsibility by promoting the ecological benefits of carbon offsetting projects and renewable energy technologies to distinct audiences. They use persuasion tactics through awareness campaigns, educational programs, regulatory reform agendas, and technology demonstration projects that seek favorable judgements toward clean energy technologies. These tactics of influence are well captured, for example, in the mission of TCET: "We make green make sense" (see Section 2.3 for more details on SMO tactics in this context).

Because SMOs act to create a sense of shared appropriateness for all industry members, their influence on sociopolitical legitimacy is accrued by the entire industry (Aldrich and Fiol, 1994; Rao, 1998: Zimmerman and Zeitz, 2002). Industry legitimacy, in this sense, is a resource that is available to any current or prospective firm within the industry that is collectively aligned with the movement's causes (Aldrich and Fiol, 1994). Thus, SMOs hold an ideal position to influence the sociopolitical legitimacy of an industry. As compared to industry members, they are perceived as more objective and altruistic toward their social causes, thus delivering a more authentic message to distinct audiences (Walker and Stepick, 2020). Movement members may also have superior access to diverse resources, industry-level networks, and persuasion skills (Hargrave and Van de Ven, 2006; Rao et al., 2000; Schneiberg, 2013), which may enable a more efficacious influence on winning the support of target audiences (Khoury et al., 2022).

SMOs leverage their resources and skills to help industry members overcome the “liability of newness” (Stinchcombe, 1965) that is typical of emerging industries (Aldrich and Fiol, 1994). They also clarify the normative underpinnings behind the offerings of debated or uncertain industries. Movement intervention is particularly necessary when industries exist in a “temporary and unstable state” or in “middle categories” of legitimacy (Deephouse et al., 2017: p. 12). These categories represent industry populations in a liminal state of potential or unrealized legitimacy (Deephouse et al., 2017). Legitimacy, in this conceptualization, need not be fully dichotomous (legitimate or illegitimate), but rather takes on mid-level positions (Ashforth, 2019; Deephouse et al., 2017; Suddaby et al., 2017), whereby industries can affect legitimacy in indeterminate states toward attaining greater audience acceptance (Deephouse et al., 2017; Zimmerman and Zeitz, 2002).[2]

The extent to which industry legitimacy is attained is dependent upon the industry's unique spatial context, or formed sub-ecologies (Baum and Mezias, 1992; Hannan et al., 1995; Sorenson, 2017; York et al., 2018). In the case of the U.S. solar energy industry, state-level legal boundaries define perceptions toward the industry, and audiences that reside within these boundaries vary greatly in their evaluations of the appropriateness of the industry and its practices (Hansen and Coenen, 2015; Meek et al., 2010).

2.3. Social movement size and firm entry

To enhance the legitimacy of an industry, SMOs reach out and influence key audiences in distinct ways. First, SMOs attempt to obtain regulatory endorsements by engaging in political activity. They communicate policy preferences, mobilize voters, and share information on legislative action with audiences (Burstein and Linton, 2002; McCarthy and Zald, 1977; Stern et al., 1999). Through these efforts, they advocate for policies and market incentives that support the practices and technologies of their target industries (Carlos et al., 2018; Hiatt et al., 2009; Sine and Lee, 2009; Vasi, 2011) or mandate changes in the practices of competing industries (Pacheco et al., 2014). For example, The Acadia Center is a clean energy SMO that seeks to reform regulation to incentivize the use of renewables in regional power grids, while Montana's AERO advises municipalities on energy conservation projects and recommends public-private partnerships to facilitate renewable energy adoption.[3]

In addition, SMOs actively target prospective customers through direct marketing campaigns and educational programs aimed at breaking down information barriers and promoting widespread adoption of products or services that advance their goals (Wilkinson et al., 2007; Stern, 2014). In doing so, SMOs often appeal to values and norms, as the technologies and products they endorse may not deliver economic or individual benefits to consumers (Stern et al., 1999).[4] Ultimately, SMOs seek changes in consumer preferences and behaviors, which sends a signal to government and other powerful audiences regarding demand patterns and citizen concern (Dubuisson-Quellier, 2013; Stern et al., 1999; Vasi, 2011). In line with these tactics, The Center for Ecological Technology influences consumer preferences by educating on technical specifications, installation options, and financial incentives for clean energy technology; while Carolina Land and Lakes helps small businesses and farmers get government grant assistance for energy projects in renewables. Alongside AERO, other SMOs, such as Energy Trust of Oregon seek to accelerate consumer adoption through offering in-home assessments of retrofitting solar technology to existing electrical systems, the development of calculators for financial and energy savings in solar systems, and the creation of portals for locating solar panel installers.

By targeting distinct audiences like government bodies, prospective customers, and the public at large, SMOs help to legitimize and transform the institutional environment of industries (Carlos et al., 2018; Hiatt et al., 2009; Sine and Lee, 2009). They alter their normative and regulative landscapes through the promulgation of shared beliefs that deem some industry practices as acceptable and others as inappropriate (Benford and Snow, 2000), and by advocating the enactment of laws that promote their values (Zald et al., 2005). These changes in turn have important repercussions for determining entrepreneurial activity in an industry (Dobbin and Dowd, 1997; Eberhart et al., 2017; Eesley, 2016; Sine et al., 2007; Tolbert et al., 2011). First, they reduce the uncertainty of starting new firms through formally influencing legal systems and, more informally, through building grassroots social support from consumers (Lee and Sine, 2012; Lee et al., 2017; Rao, 1994). From the view of a potential entrant, both efforts help to clarify the direction of demand and need for supply within the industry. Regulatory changes, such as those instigated by SMOs, can incentivize production and adoption of an industry's products and dampen competition from other sectors, thereby growing demand and helping to secure valuable supply channels (Dobbin and Dowd, 1997; Meek et al., 2010; York and Lenox, 2014). Industry endorsements also help to clarify consumer preferences and create new market opportunities that may be otherwise unattainable (Lee et al., 2017). In addition, growing legitimacy and institutional support facilitate entrepreneurial activity by easing the acquisition of valuable resources like financial capital, inventory, and employees for startup firms (Eesley, 2016; Sine and David, 2003; Sine et al., 2007; Zimmerman and Zeitz, 2002), which ultimately enhance the potential for higher venture returns. Therefore, with increased levels of legitimacy, potential entrants are more likely to evaluate an industry in favorable terms, as the prospect of better financial outcomes reduces their perceptions of risk (Eberhart et al., 2017; Eesley, 2016). Taken together, this implies that the activism of movements influences entrepreneurial entry by means of increased industry legitimacy, which is gained from a variety of audiences. This mechanism forms the basis of our logic and is implicitly understood to drive the relationship between SMO presence and firm entry throughout all of our theorizing.[5]

[2] This view is aligned with multiple perspectives in the legitimacy literature. Legitimacy may exist in a continuous state, since there are different degrees of compliance with normative prescriptions (Ashforth, 2019). In addition, an organization or a population may require a certain threshold of legitimacy to exist and survive but can also gain or increase its legitimacy levels (i.e., Deeds et al., 2004; Deephouse et al., 2017; Khoury et al., 2013; Kuilman and Li, 2009; Zimmerman and Zeitz, 2002). In many contexts, legitimacy cannot be simply viewed as the presence or absence of a property (i.e., a dichotomous construct) since different attributes that define the state of legitimacy may be evaluated simultaneously and dynamically (Ashforth, 2019; Suddaby et al., 2017).

[3] Table 1 shows a summary of this and other mechanisms of action for a subsample of the SMOs in our analysis.

[4] When switching to clean energy, for example, many consumers do not experience economic or functional benefits since the outcome (powering their buildings) remains the same regardless of the source of their energy. Hence, consumer motivation to adopt these technologies often arises from a normative motivation to enhance social, as opposed to individual, benefits (Stern et al., 1999).

[5] For brevity, we present this core assumption as a mechanism that similarly applies to our moderating hypotheses.

SMOs with greater reach may attain higher visibility and recruit a larger number of advocates that can support their goals (Andrews and Biggs, 2006; Johnson, 2008; Pacheco et al., 2014). Similarly, SMOs with a larger aggregate resource capacity are better able to mobilize by diverting resources into more frequent political action or grassroots campaigns (Jenkins, 1983; McCarthy and Zald, 1973). Larger movements also have a greater potential for diffusing their respective mobilization efforts (Strang and Soule, 1998). When aggregating these tactics across SMOs, the effect of movement size on movement effectiveness extends to the ability of SMOs to positively influence the evaluations of key audiences and the legitimacy they confer to an industry. Through this process, larger movements can catalyze new and more certain demand, resulting in viable market opportunities that enhance the level of fitness for new entrants. Hence, we expect that larger social movements, as captured by the regional presence of SMOs, will realize greater industry-level legitimacy and stimulate greater interest from prospective entrants.

Hypothesis 1. (H1): There is a positive relationship between the size of a social movement and firm entry into the movement's target industry.

2.4. Social movement size and industry ecology

The decision to enter an industry requires a firm to scan the structure of the industry to gauge its legitimacy (Bitektine, 2008; Eberhart et al., 2017; Eesley, 2016; Sine et al., 2007) and competitive character (Kaish and Gilad, 1991). Such information on the state of industry development and the opportunities that exist for new entry (Aksaray and Thompson, 2017; Delacroix and Carroll, 1983; Geroski, 1995; Hannan and Freeman, 1989) reflect the munificence available to new entrants. Organizational ecologists have traditionally focused on industry structure according to the concept of density dependence (Hannan and Freeman, 1977, 1989)—i.e., how population size affects the entry and death rates of organizations within and across populations (Barnett, 1990; Bogaert et al., 2016; Hannan and Freeman, 1988). The density of organizations itself affects entry patterns as it provides an indication of the legitimacy of the organizational form—based on acceptance of the form, and the subsequent level of familiarization with it (e.g., Hannan and Freeman, 1988). A separate concept that shapes entry—competitive exclusion—refers to how populations using the same set of resources are unable to co-exist in equilibrium (Carroll, 1985; Carroll and Swaminathan, 2000). Competitive exclusion has been used to emphasize how the concentration of resources by generalist populations influences entry by specialized organizations (Carroll, 1985). Given the prominent role that intra- and inter-population density and the concentration of resources between sub-populations can have on legitimacy and entry patterns, we assess how these ecological conditions influence the effectiveness of social movements' efforts to inspire firm entry.

2.5. Social movement size and industry density

While we contend that the ability of social movements to influence legitimacy and inspire firm entry opportunities is dependent on movement size, we posit that industry density—i.e., the population of firms or organizations that operate in its competitive environment (Bogaert et al., 2016; Hannan and Freeman, 1989)—must also be considered. Prior research has established an inverted U relationship between industry density and entry (Hannan and Freeman, 1989; Utterback and Suarez, 1993): initial low entry levels increase to intermediate levels with strong momentum, peak, and then decline (Hannan and Freeman, 1989). A density-dependence model reflects initial, upward shifts in legitimacy for the industry, followed by eventual, declining entry due to oversaturation and competitive intensity amidst struggles to increase demand (Haveman, 1994). Considering the effect of industry density on the legitimacy and competitiveness that an industry enjoys, it is conceivable that different levels of industry density will present distinct opportunities for SMOs to influence similar outcomes, thereby shaping the perceptions of prospective entrants.

At low levels of industry density, what constitutes an acceptable organizational form—i.e., a narrower view of competitive fitness—is still developing within the local environment since the industry lacks legitimacy (Carroll and Swaminathan, 2000). This, in turn, can discourage entry since prospective entrants may encounter a resource-scarce environment that may lack the support of key audiences, such as customers, supply chains, investors, and governments. Therefore, entry into smaller industries may be perceived as risky given the inherent market uncertainties of these environments (Lee et al., 2017).

At low levels of industry density, there is no clear validation of entry opportunities that can be derived from scanning industry dynamics alone (Bitektine, 2008). Rather, this context yields an opportunity for legitimacy manipulation by social movements whose interests are aligned with those of the industry. Here, SMOs pursue strategies that advocate and promote a perception of potential market opportunity to prospective entrants through engaging audiences relevant to increasing both supply (i.e., suppliers, investors) and demand (consumers, government) for the industry (Vasi, 2011).[6] SMO efforts to reach these audiences elevate the industry's legitimacy through "influencing the social context—i.e., rules, norms, values, beliefs, and models" (Zimmerman and Zeitz, 2002, p. 423). Acceptance from the audiences that define the social context effectively provides legitimacy that is missing during earlier periods of lower entry. When SMOs are able to leverage greater resources, they can realize greater efficacy in reaching key audiences (Dubuisson-Quellier, 2013), which diminishes the perception of entry risk (Vasi and King, 2012).

In addition to initial periods of lower density, social movements have more opportunities to be effective during periods of higher density. In these contexts, industries typically experience a decline in the level of interest from prospective entrants (Bogaert et al., 2016; Carroll and Hannan, 1989; Hannan and Freeman, 1989; Haveman, 1994), since they may perceive greater competitive threats (Barnett and Hansen, 1996). Such threats may arise from increasing opposition from competing industries who become vulnerable with increasing density in the focal industry (Zucker, 1989). For example, the proliferation of solar power has triggered a pushback from electric utilities who rely on conventional power generation, with some utilities demanding the removal of state incentives for solar rooftop technologies (Schuppe, 2022). Similarly, states like California, with higher density in solar energy, are experiencing public criticism for rooftop solar initiatives, as unintended consequences such as lower housing affordability have become more predominant and visible (Daniels, 2018).

This type of opposition puts in question the technological paradigms put forth by SMOs, and the preferences of key industry constituents, forcing movements to defend the legitimacy of their target industries. As industry competition intensifies, the legitimacy of the focal industry must thereby "be repeatedly created, recreated, and conquered" (Tamm Hallström and Boström, 2010: 160). Therefore, the acquisition and retention of legitimacy is a strategic activity that must occur at the beginning of an industry—i.e., when density is low—but also when industry viability is under threat by rival industries (Rindova and Fombrun, 1999). The latter is more likely to take place at higher levels of industry density (Haveman, 1994), where the visibility and proliferation of the industry motivate players with competing technologies or interests to question its value and appropriateness.

Larger social movements take on the task of enhancing the industry's

[6] In an interview, an SMO manager described their industry role: "Regardless of budget, I think that organizations like ours are critical with smaller [or] new markets. How relevant they are as a market matures and grows depends on how much influence they can have relative to the size of the market, and what interventions they are focused on."

legitimacy. These movements can leverage a critical mass of activity to further promote the industry to key audiences.[7] SMO initiatives reinvigorate optimism during high density conditions and enhance the industry's competitiveness. Their efforts increase the availability of valuable resources to the industry's members, thereby reducing the competitive entry risks that arise at this stage.

The extremes of the density-dependence model differ from the midpoint when entry momentum increases. In these contexts, there is a less sensitive positive effect induced by the social movement. Specifically, mid-range levels of industry density convey that there is a sizeable density of active firms, yet there is also a viable and legitimate market for those considering entry (Hannan and Freeman, 1989; Haveman, 1994). Thus, during periods of increasing density, larger social movements likely offer a still positive yet more modest amplification of an industry's opportunities, as a reflection of its legitimacy. Exceptionally higher levels of legitimacy are attained by industries at mid-range density levels, and the legitimation efforts of the social movement can be lost in the high levels of legitimacy drawn from industry density.

The positive effect of larger social movements on entry is lessened in intermediate density industries when compared to low- and high-density industries, since the latter respectively have a greater need for legitimacy growth and recovery. In low- and high-density industries, legitimation opportunities can be seized by larger social movements since their initiatives stand out in contrast to the less obvious signals of entry coming from market actors. Thus, social movements are less efficacious at inducing entry at intermediate density levels since these conditions are naturally more favorable to entry and there is a reduced need for legitimacy and competitiveness enhancement by movement activism. Hence, the effect of social movement size on entry can be more easily appropriated by industry conditions that require compensatory legitimation.

Hypothesis 2. (H2): The relationship between social movement size and firm entry into an industry is more positive at smaller and larger levels of industry density.

2.6. Social movement size, specialist entry, and generalist concentration

The ability of SMOs to legitimate an industry and motivate entry may also depend on the resource-partitioning conditions of the industry (Carroll, 1985; Hannan and Freeman, 1977). We posit that SMO efforts may be most salient in influencing entry when they counteract the dominance of resourceful and powerful organizational forms (i.e., generalists), by calling on audience support that ultimately legitimizes populations with lower resources and competitiveness (i.e., specialists). Hence, movements may be best positioned to have a compensatory effect that may support the more vulnerable organizational forms of an industry.

A particular distinction across organizational forms, relates to the difference between generalist and specialist firms on the basis of market niche (e.g., narrow vs. broad per Boone et al., 2002; Carroll, 1985; Carroll and Swaminathan, 2000 or product-width, vis a vis single versus multi-product, per Freeman and Hannan, 1983; Scott and Meyer, 1991; Usher, 1999), and their comparative fitness across different environmental conditions (Freeman and Hannan, 1983). The fitness of specialists with respect to generalists is dependent on the stability and level of development of the populations that they inhabit (Archibald, 2007; Carroll and Swaminathan, 2000). In unstable and changing populations, single-product specialists may be at a disadvantage compared to multi-product generalists. This disparity is particularly salient when scale and scope dimensions are critical to compete effectively, such as in solar energy installations (O'Shaughnessy, 2018). Since multi-product generalists operate under these circumstances with a larger number of similar resources (i.e., scale) and related distinct resources (i.e., scope), they enjoy a lower cost structure (Carroll and Swaminathan, 2000; van Witteloostuijn and Boone, 2006). When industry resources are concentrated in the hands of these generalists, they are even better equipped to consolidate resources, reduce their costs, and augment their competitiveness. We thus expect that the concentration of resources within multi-product generalists will result in unfavorable environments for single-product specialists in our context.[8]

The mobilization of SMOs may be most visible, or even amplified, in driving specialist entry when generalist concentration poses a challenge to specialist entry. Since SMO initiatives expand the support of key audiences, specialists may be better able to leverage the effects of rising legitimacy, as new endorsements may open opportunities for niche-based competition, as opposed to scale- and scope-based competitiveness.

Larger movements have an increased capacity to address diverse audiences (Andrews and Biggs, 2006; Johnson, 2008). This may in turn enable them to expand market reach, including access to niche consumer segments that facilitate competition for specialists. For example, in the solar energy sector, SMOs promote community solar projects (e.g., the aggregation of multiple residential customers), which open specialist opportunities to target this market niche. In addition, as movement participation increases, activists are more effective at influencing policies that reduce scale and scope-related entry barriers. For instance, SMOs may promote policies that lower the cost of technological adoption to consumers. In turn, these policies enable specialist firms to offset their higher costs and offer greater value. In the solar energy industry, SMOs elicit government support for installation incentives such as sales tax credits or subsidies, that target residential and small-scale projects (Madden, 2018), thereby augmenting the relative competitiveness of specialists. These types of initiatives may also increase support and interest from other audiences, like investors or suppliers, seeking to back niche-based entrants.

In sum, the efforts of social movements enable specialists to enter and compete by eliciting greater audience support (e.g., consumer and government bodies). This in turn expands the resource space in which specialists compete, reducing their competitive disadvantages over dominant generalists. Hence, in environments with high generalist concentration, larger social movements can better aid specialists to help them overcome the market entry barriers posed by generalists.

Hypothesis 3. (H3): The relationship between social movement size and entry by specialist firms will be more positive at higher levels of generalist concentration.

2.7. Social movement size and density of mutualistic industries

The success of social movements in legitimizing target industries

[7] In an interview conducted by the authors, one SMO manager described how their organization adapted to unfavorable firm entry conditions (e.g., decline) as follows: "We do that by maintaining a high level of expertise with market conditions, story-telling, sharing data, and educating policy-makers about what is happening and the impacts, [while also] making changes to our programs and services to fill gaps and overcome barriers, [and] pivoting or focusing on different parts of the market when there are opportunities."

[8] In stable populations, however, specialists can find more viable opportunities to compete. In these contexts, generalists experience consolidation, and the surviving generalists find positions at the center of the resource space, thereby opening opportunities for specialists at the periphery (Boone et al., 2002; Carroll, 1985). This partitioning of resources is prominent "in mature markets where generalists are very large and possess extremely broad target areas" (Carroll and Swaminathan, 2000, p. 719), yet these dynamics may not be present in developing or less stable industry environments like the solar energy industry. In the latter, the prevalence of uncertainty favors diversified generalists who can spread risk across markets (Archibald, 2007; Freeman and Hannan, 1983).

may also be influenced by the density of mutualistic industries that offer equivalent social value. These industries are capable of providing positive spillovers to related target industries and this scenario impacts the legitimization efforts of SMOs. We describe the definition and importance of mutualistic industries, contextualize their relevance in the solar energy field, and explain how they influence the effectiveness of social movements.

Mutualism between populations arises with positive interdependence and limited competition (Barnett, 1990; Hannan and Freeman, 1988). In mutualistic industries, "the sectoral contextual structures contain broader societal values, legal and political systems, and economic support mechanisms, which may significantly condition the further development" of each industry (Jolly and Hansen, 2021: p. 4). Therefore, depending on their density, mutualistic populations can generate positive externalities and deliver legitimacy to one another (Barnett, 1990; Bertoni et al., 2019). In this case, the legitimacy of an industry can spillover to a mutualistic industry whose activities underpin similar values and social norms (Haack et al., 2014; Kuilman and Li, 2009).

The context of the solar and wind energy industry illustrates the coexistence of mutualistic industry populations (Barnett, 1990; Bertoni et al., 2019) that share membership to the clean energy sector. Rather than representing a threat, the presence of one industry delivers legitimacy to the other by signaling the interest and acceptance of offerings that target similar social change (Zimmerman and Zeitz, 2002). Thus, support is generated for the broader sectoral category of clean energy. For example, SMOs supporting these industries target similar audiences to enhance legitimacy for clean energy. They promote government incentives, such as subsidies and tax credits that are applicable to both wind and solar technologies (EIA, 2020). In addition, investors often group wind and solar power within the "cleantech" category (Alakent et al., 2020), considering their shared ability to offer environmental benefits. Furthermore, this mutualism is strengthened by the limited competition between wind and solar power given their distinct and growing market spaces.[9] Collectively, the commonalities and limited competition between wind and solar energy create opportunities for positive spillovers across populations, where the presence of one industry may also generate both awareness of and demand for the other.

Considering the legitimation activities conducted by SMOs, the presence of mutualistic industry populations may influence the effectiveness of SMO mobilization. As the density of one industry increases, entry into other industries that deliver similar social value may take place despite lower levels of SMO activism. This occurs because industry activity can serve to legitimize opportunities in socially comparable industries and enable new entrants to evaluate industries with equivalent products more favorably (Jolly and Hansen, 2021), regardless of SMO influence. In addition, when these mutualistic industries co-exist, SMO attention may be divided across them, resulting in reduced movement activity around one single industry. For example, clean energy SMOs like The Renewable Northwest Project run parallel demonstration and educational programs in wind and solar energy technologies. This joint effort can ultimately result in lower relative visibility and audience reach for each industry, thereby reducing the industry-level effects of SMO mobilization. In contrast, when the density of industries with comparable social value is low, SMO efforts may be more effective at driving new entry into emerging industries. SMOs must build legitimacy for these industries, and their resources will thus be more intensely focused toward gaining the support of key audiences like government and media channels.

In sum, we propose that as the density of a mutualistic industry offering similar social value, increases, the positive relationship between movement size and firm entry rate will exhibit diminishing returns. Hence, a larger mutualistic industry (e.g., wind energy) legitimizes a focal industry offering equivalent social value (e.g., solar energy) and acts as a substitute for the legitimacy provided by SMOs, thus eliciting entrepreneurial interest in the focal industry.

Hypothesis 4. (H4): The relationship between SMO size and firm entry is less positive with increasing density of an industry that is mutually aligned with the focal industry.

3. Method

3.1. Sample

We tested our hypotheses within the context of the U.S. solar energy industry.[10] In many states, clean energy SMOs have played an active role in promoting and advancing an environmental agenda that is aligned with the technology of the industry. We assessed entry into the solar energy contracting industry (i.e., with the primary SIC code of 17110403) using the SIC code to identify the boundary of the industry (Scott and Meyer, 1991). The solar energy contracting industry is composed of installers of residential and commercial solar energy systems. Most of these contractors design and install photovoltaic (i.e., solar electric) systems for generating home or commercial electricity, while some complement these services by providing installation and related sales of solar water heating systems and electrical contracting. This segment of the solar energy industry is an ideal context for this study since contractors are dependent on consumer demand and the adoption of market programs often promoted by SMOs.

Our unit of analysis is at the *state-year* level, since there is much variation in the structure and evolution of the industry across states at more localized levels—i.e., at the sub-ecology level (Baum and Mezias, 1992; Hannan et al., 1995; Sorenson, 2017). SMOs are commonly organized following geographic and jurisdictional boundaries to target state-level programs (Straughan and Pollak, 2008), and they are typically engaged in varying levels of social movement activism (Pacheco et al., 2014). States also vary in the support that they provide for renewable energy incentives and related initiatives (Sherwood, 2011).

We assembled a panel of data for the years 1996–2009 (inclusive), drawing from the National Establishments Time-Series (NETS) database. The NETS database was created to convert archival establishment data from Dun and Bradstreet (D&B) into a time-series database of millions of establishments across multiple U.S. industrial sectors. NETS data on solar energy establishments were used to calculate state-level variables that could capture the structure and development of the solar energy industry. In our sample, 98.7 % of the records represent *single establishments* that are not associated with other establishments or companies. Hence, the great majority of these establishments make independent decisions that are likely driven by their local (state-level) market environments.

We also used data from The National Center for Charitable Statistics (NCCS) to measure the density of clean energy SMOs within a state. For control variables, we drew data from the National Renewable Energy Laboratory, the U.S. Census Bureau, the Kaufman Foundation, and the Database of State Incentives for Renewables and Efficiency (DSIRE).

3.2. Variable measurements

3.2.1. Firm entry

We used data from the NETS database to capture the number of new active "solar energy contractor" establishments using the primary SIC

[9] Wind power is mostly applied in utility(large)-scale applications, while solar power remains primarily a small-scale technology deployed in residential and smaller commercial applications (EIA, 2020).

[10] The U.S. solar energy industry has experienced growth with a consistent annual increase in the number of photovoltaic installations (O'Shaughnessy, 2018).

code of 17110403 for every state-year combination in our sample.

3.2.2. Specialist firm entry

In the solar energy contracting industry, specialist firms take the form of single-product installers, while generalists offer a variety of products and/or services. A product-width distinction is relevant when determining the character of competition in this industry (O'Shaughnessy, 2018). To arrive at our sample of specialist firms, we included contractors that are exclusively listed within the primary SIC code of 17110403. These establishments were dedicated to solar energy contracting alone, and do not list alternative or secondary SIC codes. Upon manual inspection, the majority were dedicated to photovoltaic installations. We then aggregated the number of new active establishments by state and year to determine specialist firm entry.

3.2.3. Social movement size

Drawing from research in social movements (McVeigh et al., 2003) and clean energy SMOs (Pacheco et al., 2014), we used data from NCCS to create a measure of the size of the clean energy movement in a state. This measure consists of the total number of organizations registered in a state in the "Renewable Energy and Energy Conservation" category within the "Environmental and Conservation" umbrella classification for non-profits.[11] To confirm the robustness of our results, we measured this variable with the sum of the total assets of all clean energy SMOs in a state and found statistically equivalent results. This measurement provided a proxy for the ability of these organizations to influence entrepreneurs and other actors concerning the prospects of solar energy.

3.2.4. Industry density

To capture the density of the industry, we used data from the NETS database to calculate the total number of active establishments in the solar energy contracting industry (primary SIC code of 17,110,403) for every state-year combination.

3.2.5. Generalist industry concentration

To construct the sample of generalist firms, we included multi-product establishments that listed other SIC codes in addition to the primary SIC code of 17110403. Representing 15 % of our total sample, these establishments were also listed as electrical and general contractors, installers and sellers of solar and other heating equipment, and environmental consultants.[12] To measure their concentration, we calculated a Herfindahl Index (Herfindahl, 1950), estimating the sum of squared market share values (i.e., based on total revenues) of these generalist establishments for each state-year.

3.2.6. Mutualistic industry density

To capture the presence of an industry that is mutualistic to solar energy, we used the density of the wind energy industry by state. Like solar energy, wind energy producers deliver comparable social value and a lower environmental footprint compared to fossil fuel-based sources. As with other measures of industry activity, we relied on data from the NETS database to derive the total number of active establishments in wind energy at the state-year level.

3.2.7. Control variables

We controlled for the potential amount of solar energy that a state was capable of generating by using a measure of the average annual solar radiation, as captured by a tilted photovoltaic panel in watt-hour/m^2/day (*Solar Radiation*). We derived this information by enlisting a technical expert within the industry—i.e., a scientist at the National Renewable Energy Laboratory. We also controlled for the *State Median Income* (in millions), as captured by U.S. Census Bureau data. To measure the effect of geographic-bound tendencies toward entrepreneurship, we controlled for the level of entrepreneurial growth for each state and year. We relied on data from the Kaufman Index of Entrepreneurial Activity, which captures changes in the percentage of individuals, ages 20–64, who start businesses (*State Kaufman Index*). To account for the effect of non-market activity by the solar energy sector, we controlled for the presence of the major trade association in this industry, the Solar Energy Industries Association (SEIA), and constructed a measure of whether a state has a local SEIA chapter during a particular year, coded as '1' if state had a chapter and '0' if not. We also controlled for the extent to which the incentives and regulations of a state supported solar energy. We created a measure of the count of active incentives and rules that favored solar energy in a state (*State Renewable Incentives*). These included tax incentives (i.e., sales, property, personal, and corporate), industry recruitment programs to attract business activity, Renewable Portfolio Standards (RPS), public benefits funds (PBF), grants, performance-based incentives (PBI), state-level rebates, and net metering.[13] While RPS incentives apply to solar energy, this legislation required a specific amount of electricity be derived from solar energy in some states. Known as "solar carve-outs", these provisions favor solar over other renewable (e.g., wind) power technologies. To capture this, we included a variable (*Solar Carve-out Incentives*) that is coded as '1' if the state had such a provision in its RPS within a given year and '0' if not.

We controlled for the presence of a competing incumbent industry (Hess, 2016; Turnheim and Geels, 2013), as captured by the total size of the coal and oil industries in a state (*Coal and Petroleum Production*). We relied on data from the U.S. Energy Information Administration (EIA, 2020) to create a measure of total millions of BTUs of coal and petroleum produced in a state and then divided it by the population of a state to account for differences in state size. We also included a control for the regulatory environment of the electricity market in a state. Whether the market for electricity in a state is regulated can drive state support for clean energy (Delmas et al., 2006). To account for this, we included a contrast coded variable (*Electricity Market Regulation*), coded as '1' for deregulated states and '−1' for regulated ones. We also accounted for the role that education may have had in spurring environmentally responsible consumption (Aaker and Bagozzi, 1982). We controlled for the educational attainment in a state by measuring the percentage of the population in a state that had earned a bachelor's or higher college degree (*Educational Attainment*). We also considered the extent to which the political climate of a state was supportive of environmental causes. We used the scorecard of the *League of Conservation Voters*, which awards points based on how the Congress of a state votes on environmentally-related measures. Further, we controlled for the growth of the solar energy industry in a state (*Industry Growth*), as captured by the annual change in total active solar energy establishments (e.g., manufacturers, distributors, and installers), which we derived from the NETS database. Finally, in models that predict total firm entry (e.g., for testing Hypotheses 1, 2, and 3), we controlled for *Total Industry Concentration* using a Herfindahl Index that includes all solar contractor establishments in the sample rather than only generalist ones.

3.3. Analysis

To account for the presence of over-dispersion in our dependent

[11] For the variable "Environmental and Conservation", the natural log transformation was used due to a positive skew in its distribution.

[12] When including the variable "Generalist Industry Concentration", our sample size was reduced to 390 state-year observations.

[13] RPS legislation requires that a certain percentage of electricity generation in a state be produced by renewable energy. PBFs involve a small surcharge on electricity consumption to ensure continued support for renewable energy, energy efficiency, and low-income energy programs. PBIs provide cash payments for the amount of energy produced by an energy system (e.g., feed-in tariffs), while net metering allows customers to use excess generation from a renewable source to offset future purchases from an electric utility.

variable, we tested our hypotheses using a negative binomial regression estimator (Cameron and Trivedi, 1998). This estimator models the number of occurrences of an event of interest, or the rate of occurrence of an event, as a function of a set of independent variables.

All models included yearly fixed effects and Huber-White sandwich standard errors (Arellano, 1987; White, 1980), which enabled us to account for potential non-identical and non-independent distribution of errors associated with repeated observations at the state-level. This approach allows disturbances within each state to be correlated, while maintaining the assumption of independent errors between states (Petersen, 2009). Using this method modifies the estimated VCE of the estimated parameters and results in more conservative standard errors (Baum, 2006). To measure the time lapse between the relationships studied, all independent variables were also lagged by one year to the dependent variable.

3.4. Results

Descriptive statistics and pairwise correlations are presented in Table 2. Table 2 illustrates bivariate correlations between firm entry and industry density, mutualistic industry density, and social movement size that are significant at the 0.001 level. Within a state, the number of SMOs ranged between 0 and 58 organizations (not logged) and the average number of SMOs was 4.06.

To account for potential biases that multicollinearity could have introduced in our results, we examined the variance inflation factors (VIF) for all models. VIFs for our predictors were all below the recommended threshold of ten (Chatterjee and Hadi, 2006).

Table 3 presents the results of the negative binomial analysis for the *Firm Entry* dependent variable. Model 1 tests the effect of control variables. We find a positive relationship between entry into the solar contracting industry in a state and the average solar radiation ($p = .000$), the League of Conservation Voters score ($p = .045$), the presence of a SEIA chapter in a state ($p = .008$), and the growth of the solar energy industry ($p = .003$). We also find that firm entry is negatively related to the presence of coal and petroleum production ($p = .045$) and the total concentration of solar energy contractors in a state ($p = .000$). Model 2 introduces the social movement size variable and all the industry density covariates. Consistent with H1, Model 2 reveals that, when controlling for the ecological structure and dynamics of the industry, the number of clean energy SMOs in a state is positively related with entry into the solar energy industry ($p = .045$).

Model 3 tests the interaction between social movement size and industry density (H2). We find that the effect of the number of SMOs on firm entry is dependent on the density of the industry and that the character of this effect varies at different levels of industry density. Consistent with H1, our model reveals a significant quadratic moderation effect between industry density and SMO size ($p = .000$). As illustrated in Fig. 1, the relationship between social movement size and entry becomes stronger with increasing movement size at low levels of industry density. Indeed, at average social movement participation, the effect of social movement size on entry is 6.33 times greater at lower industry density (1 standard deviation [s.d.]) below the mean) as compared to average density levels. In addition, we observe that at high levels of industry density (1 s.d. above the mean), the relationship between movement size and entry is 3.4 times stronger than at average industry density. The latter effect, however, is mostly observed when the size of the movement is very high (over 2 s.d.), suggesting that only large enough movements can compensate for the circumstances present in denser industry environments. This is observed in Fig. 1: with small social movement size, the relationship between density and entry exhibits an inverted U-shape form. However, as movement size increases to these high levels, the relationship between density and entry becomes increasingly positive, and entry decline is no longer observed.

Table 4 presents the results for the specialist firm entry dependent variable. Model 1 includes all control variables and Model 2 tests the

Table 2
Descriptive statistics and pairwise correlations.

	Variable	Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Firm Entry	2.029	5.824	0	80	1																	
2	Solar Radiation[b]	4.829	0.571	3.5	6.36	0.26	1																
3	State Kaufman Index	0.003	0.001	0.001	0.01	0.14	0.28	1															
4	Coal and Petroleum Production[b]	0	0.002	0	0.02	−0.06	0.05	0.17	1														
5	League of Conservation Voters[b]	0.094	0.057	0	0.2	0.17	−0.34	−0.24	−0.26	1													
6	Electricity Market Regulation	−0.355	0.936	−1	1	0.04	−0.17	−0.23	−0.14	0.33	1												
7	Educational Attainment[b]	0.026	0.005	0.015	0.04	0.18	−0.11	−0.02	−0.16	0.44	0.34	1											
8	State Median Income[c]	0.044	0.008	0.026	0.07	0.24	−0.18	−0.07	−0.03	0.41	0.26	0.76	1										
9	Solar Carveout Incentives	0.078	0.269	0	1	0.17	0.23	0.06	−0.06	0.13	0.09	0.09	0.24	1									
10	Solar Energy Industry Assoc.	0.542	0.499	0	1	0.2	−0.15	−0.19	−0.24	0.45	0.45	0.47	0.37	0.02	1								
11	State Renewable Incentives[b]	0.003	0.002	0	0.01	0.22	−0.13	0	−0.15	0.56	0.38	0.55	0.54	0.31	0.42	1							
12	Total Industry Concentration	0.512	0.337	0.026	1	−0.21	−0.18	−0.08	0.18	−0.27	−0.22	−0.37	−0.25	−0.26	−0.36	−0.48	1						
13	Industry Growth[a]	0.058	0.063	0	0.41	0.26	0.08	0.01	−0.08	0.1	0.04	0.08	0.12	0.16	0.01	0.15	−0.1	1					
14	Industry Density[b]	0.014	0.034	0	0.42	0.91	0.34	0.15	−0.07	0.19	0.05	0.2	0.2	0.12	0.26	0.19	−0.28	0.14	1				
15	Mutualistic Industry Density[b]	0.004	0.006	0	0.04	0.59	0.26	0.14	−0.02	0.07	0.06	0.19	0.19	0.16	0.29	0.22	−0.27	0.1	0.67	1			
16	Social Movement Size[a]	1.28	0.89	0	4.32	0.46	0.12	0.07	−0.22	0.31	0.26	0.53	0.35	0.21	0.4	0.54	−0.58	0.16	0.52	0.47	1		
17	Specialist Firm Entry	1.774	5.023	0	69	0.98	0.25	0.13	−0.06	0.18	0.04	0.19	0.24	0.19	0.19	0.23	−0.21	0.27	0.9	0.58	0.46	1	
18	Generalist Industry Concentration	0.713	0.309	0.067	1	−0.46	−0.54	−0.18	0.16	−0.06	0.02	−0.21	−0.25	−0.24	−0.27	−0.2	0.47	−0.19	−0.57	−0.52	−0.42	−0.46	1

Correlations higher than 0.07 are significant at the 0.05 level.
$N = 650$.
[a] Logged.
[b] In thousands.
[c] In millions.

Table 3
Results of negative binomial analysis (dependent variable: firm entry).

Variables	Model 1	Model 2	Model 3	Model 4
Solar Radiation[b]	1.15***	0.40**	0.17	0.35*
	(0.306)	(0.145)	(0.108)	(0.146)
State Kaufman Index	−29.51	−48.16	−36.82	−42.73
	(83.114)	(72.662)	(68.528)	(71.008)
Coal and Petroleum Production[b]	−38.84*	−54.77+	−58.09	−71.53*
	(19.375)	(30.026)	(35.824)	(32.310)
League of Conservation Voters[b]	5.92*	1.01	0.31	1.67
	(2.959)	(1.797)	(1.452)	(1.634)
Electricity Market Regulation	−0.01	0.06	0.02	0.05
	(0.123)	(0.082)	(0.073)	(0.083)
Educational Attainment[b]	41.62	3.56	−7.89	−14.48
	(33.529)	(26.109)	(21.372)	(25.113)
State Median Income[c]	−16.40	2.91	14.08	13.57
	(23.767)	(16.768)	(13.060)	(16.315)
Solar Carveout Incentives	−0.05	0.20	0.03	0.21
	(0.278)	(0.173)	(0.127)	(0.161)
Solar Energy Industry Association Presence	0.73**	0.21	−0.07	0.07
	(0.274)	(0.167)	(0.130)	(0.165)
State Renewable Incentives[b]	−26.32	−28.97	−4.36	−19.52
	(51.424)	(40.957)	(38.014)	(34.527)
Total Industry Concentration	−1.50***	−1.39***	−0.53**	−1.04***
	(0.400)	(0.262)	(0.189)	(0.274)
Industry Growth[a]	4.09**	3.36**	3.01**	3.40**
	(1.366)	(1.143)	(1.075)	(1.121)
Mutualistic Industry Density[b]		12.06	13.70	91.50***
		(15.457)	(8.780)	(27.447)
Industry Density[b]		10.61*	74.71***	15.94***
		(4.651)	(9.942)	(4.341)
Industry Density Squared			−552.67***	
			(129.628)	
Social Movement Size[a]		0.28*	0.34**	0.46**
		(0.141)	(0.113)	(0.140)
Industry Density * Social Movement Size			−10.26***	
			(2.362)	
Industry Density Squared * Social Movement Size			117.77***	
			(28.179)	
Mutualistic Industry Density * Social Movement Size				−36.32***
				(9.972)
Constant	−4.91**	−1.20	−1.25+	−1.75+
	(1.880)	(1.009)	(0.694)	(1.024)
Log Pseudolikelihood	−910.83	−849.64	−823.53	−798.23
Wald Chi-Square	1172	2344.21	51,873.12	4638.41
Observations	650	650	650	650

Robust standard errors in parentheses.
*** $p < .001$.
** $p < .01$.
* $p < .05$.
+ $p < .10$.
[a] Logged.
[b] In thousands.
[c] In millions.

interaction between movement size and generalist industry concentration ($p = .000$) (H3). As Fig. 2 illustrates, larger social movements are significantly more effective at inciting specialist entry at higher levels of generalist concentration, indicating that their intervention is particularly relevant in these contexts. We find that at average generalist concentration, increasing social movement size from average to high levels (1 s.d. above mean), augments entry by 15 %. The same increase in social movement size at high levels of generalist concentration (1 s.d. above mean), is associated with 52 % more installer entry. Interestingly, in states with little SMO activity, generalist concentration seems to deter specialist entry, and this relationship is transformed as the size of the movement increases.

Model 4 tests the interaction between mutualistic industry (i.e., wind energy) density and social movement size (H4). Fig. 3 reveals that the relationship between social movement size and entry is positive at lower levels of wind energy density, but this effect is significantly diminished with increasing wind energy density ($p = .000$). For example, we find

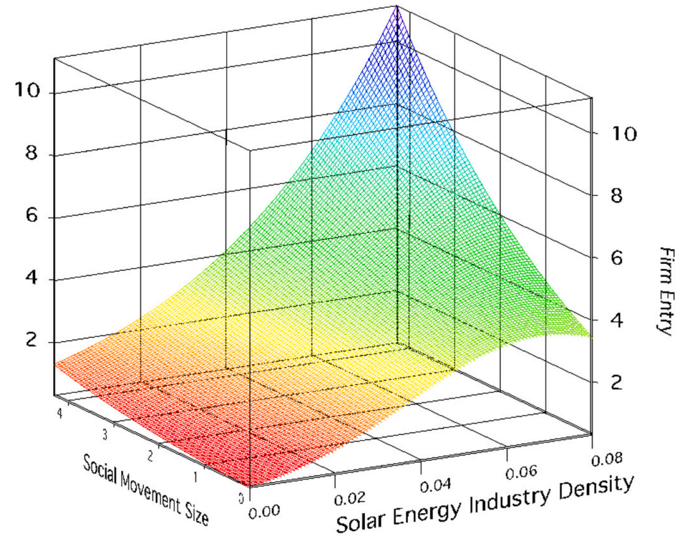

Fig. 1. The moderating effect of industry density on the relationship between social movement size and firm entry.

that increasing social movement presence from average levels to 2 standard deviations, results in 2.27 times more installer entry when wind energy establishments are below average (2 s.d. below mean). The same increase in social movement size when wind energy establishments are high (2 s.d. above mean), results in about half (0.48) the expected number of entries. Fig. 3 also illustrates that, in states with little social movement presence, the relationship between wind energy density and solar entry is positive. Hence, positive externalities across the industries, may be driving the entry effect.

3.5. Robustness analysis

To avoid reverse causality between solar contractor entry and social movement size, we conducted an endogeneity test using two-stage least-squares analysis (Greene, 2012; Khoury & Pleggenkuhle-Miles, 2011). The dependent variable was logged to induce normality in the distribution of errors, and we instrumented the SMO size variable with a measure of green pricing and marketing program availability in a state (i.e., the number of active programs for a given state-year combination).[14] We found that this variable is an appropriate instrument for social movement size ($p = .006$), based on a first stage regression analysis. We then conducted a regression-based test of exogeneity based on Wooldridge's (1995) score test, which is appropriate with robust standard errors. We could not reject the null hypothesis that TMSO size is exogenous ($p = .94$), which justified using other estimation techniques outside of instrumental variables.

To account for the relative competitiveness of solar energy with traditional sources of energy generation, we tested all of our hypotheses using an additional control variable. This measurement is based on the price of solar energy relative to the average price of electricity in the U.S. for a given year. All of our results were statistically consistent with the previous results. Because we lacked data availability (i.e., solar prices) for earlier years of our panel, we report results with the full panel. Our models with the full panel include year-level fixed effects, which capture this type of annual variation as well. Hence, our results are robust and account for differences in the competitiveness of solar energy generation

[14] In green pricing programs, customers pay a premium to cover investments made by electric utilities in renewable energy technologies. These investments typically include large-scale electricity generation. Because contractors in our sample handled small-scale solar installations, this variable is less likely to be associated with entry into the solar energy contracting industry.

Table 4
Results of negative binomial analysis (dependent variable: specialist firm entry).

Variables	Model 1	Model 2
Solar Radiation[b]	1.16***	0.05
	(0.280)	(0.149)
State Kaufman Index	−1.73	−4.66
	(92.792)	(77.699)
Coal and Petroleum Production[b]	−76.51**	−45.23*
	(27.655)	(21.199)
League of Conservation Voters[b]	4.78	0.18
	(3.110)	(1.865)
Electricity Market Regulation	−0.02	0.05
	(0.130)	(0.077)
Educational Attainment[b]	50.83	42.33
	(35.604)	(25.747)
State Median Income[c]	−23.35	−1.80
	(27.041)	(17.980)
Solar Carveout Incentives	0.23	0.37*
	(0.280)	(0.167)
Solar Energy Industry Association Presence	0.95**	0.10
	(0.325)	(0.161)
State Renewable Incentives[b]	48.26	−64.36+
	(68.627)	(36.379)
Industry Growth[a]	3.83**	4.54***
	(1.482)	(1.151)
Mutualistic Industry Density[b]		37.83***
		(10.761)
Industry Density[b]		8.71*
		(3.501)
Generalist Industry Concentration		−2.90***
		(0.461)
Social Movement Size[a]		−0.61**
		(0.225)
Social Movement Size * Generalist Industry Concentration		1.08***
		(0.282)
Constant	−5.96***	1.49
	(1.577)	(1.099)
Year fixed effects	Yes	Yes
Log Pseudolikelihood	−885.36	−596.26
Wald Chi-Square	1014.07	9416.02
Observations	650	390

Robust standard errors in parentheses.
*** $p < .001$.
** $p < .01$.
* $p < .05$.
+ $p < .10$.
[a] Logged.
[b] In thousands.
[c] In millions.

over the years.

4. Discussion

This study sheds light on the efficacy of social movements in stimulating firm entry and how this relationship is dependent upon the ecology of their target industries. We find that social movements play a role in catalyzing expansion and preventing decline when the ecology of an industry is less favorable to entry. Larger social movements are more efficacious at stimulating entry when industries are more "ecologically vulnerable", such as when the industry density is low or high, when the concentration of generalist firms is high, and when the density of mutualistic industries is low. In these contexts, larger social movements can assist in combating liability of newness (Aldrich and Fiol, 1994) in underdeveloped industries, which lack the necessary legitimacy and related resources to thrive. Larger social movements can also mitigate competitive pressures by expanding support and demand for the industry. Finally, it is also possible that these movements may be in a better position to directly motivate and inspire entry from entrepreneurs whose values align with those of the movement. In this process, such entrepreneurs may respond to the more socially and/or economically desirable industry conditions that are shaped by SMOs.

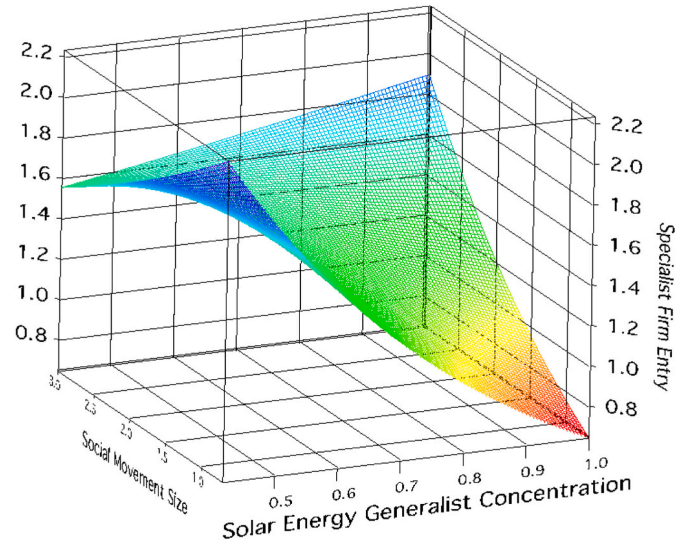

Fig. 2. The moderating effect of generalist industry concentration on the relationship between social movement size and specialist firm entry.

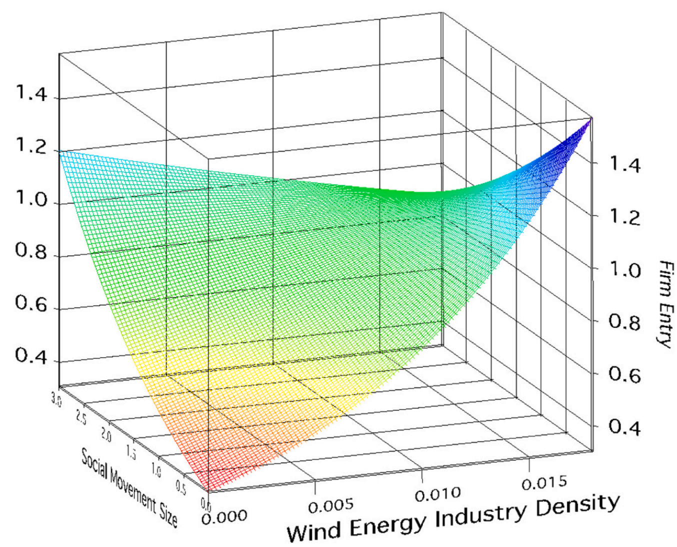

Fig. 3. The moderating effect of mutualistic industry (wind energy) density on the relationship between social movement size and firm entry.

4.1. Contribution and implications

This study contributes to the literature at the intersection of social movements and entrepreneurship (Carlos et al., 2018; Hiatt et al., 2009; Pacheco et al., 2014; Sine and Lee, 2009). Our results reveal how industry density shapes the effects of social movement size on entrepreneurial entry. Researchers have assumed that the interventions of movements are most relevant in smaller and younger industries that lack legitimacy (Carlos et al., 2018; Sine and Lee, 2009; Vasi, 2009). Our results do confirm this understanding but also point to the broader influence of social movements in larger industries. Larger social movements can mitigate entry decline in highly dense industry environments. Target industries, as they grow, continue to depend on these movements during unstable periods of legitimacy (Baum and Shipilov, 2006; Deephouse et al., 2017) and greater competitive intensity. For example, in larger industry sub-ecologies that attract greater opposition from competing industries, the intervention of social movements is required to maintain and enhance legitimacy. This has implications for grassroots organizing efforts since the efficacy of collective action is largely dependent on the size of accessible resources that are available for mobilization. For example, we ascertain these strategies of persistent and scaled interventions are particularly necessary in industries like solar energy which face competitive disadvantages in reducing negative externalities (e.g., pollution) as compared to fossil fuel-based energy production (Höök and Tang, 2013). Despite being part of higher density sub-ecologies, firms in these contexts depend on stakeholder support for competitiveness and growth. SMOs, in turn, need not cease their activism efforts when their target industries become relatively large, since their presence can still have a positive effect on firm entry.

To address density-dependence relationships, we also analyzed the density of a mutualistic industry (i.e., wind energy) and its influence on the effectiveness of SMOs at stimulating firm entry. We were thus able to address an overlooked area in the literature—i.e., the broader influences of social movements, including the relationships they have with multiple industry populations. Our results indicate that when social movements have a limited presence, the relationship between wind energy density and solar energy entry is positive. This suggests that legitimacy can be sourced from mutualistic industries that share similar social goals, even in the absence of active social movements. These results may also indicate that as the presence of a mutualistic industry increases, SMOs may be forced to divide their attention and resources across both industries, resulting in coordination complexities that may reduce the marginal effect of the movement on the target industry. However, when the density of the mutualistic industry is at lower levels, larger movements become more influential at inspiring entry. In this context, SMOs are better positioned to mobilize their resources for the focal industry and foster its growth.

We find that larger social movements can mitigate entry-deterrence, by generalist firms for specialist firms. SMOs accelerate the adoption of their target technologies by advocating for programs that reduce service or product costs. This in turn enables single-product specialists to counteract the economies of scale and scope enjoyed by multi-product generalists. Social movements can therefore stimulate the growth of specialist firms through the direct mobilization of SMOs that stand to gain from greater diversity and expansion of market opportunities.

Our study also reveals that social movements can leverage opportunity structures within industry ecologies. While research has addressed the role of opportunity structures in the success of social movements (Dubuisson-Quellier, 2013; Khoury et al., 2022; Youmans and York, 2012), most studies have focused on social or institutional-level dimensions, such as changes in policies or social attitudes (Briscoe and Gupta, 2016; Schneiberg and Lounsbury, 2017; Soule and Olzak, 2004). Beyond these conditions (i.e., which we control for), density-based and resource-partitioning conditions are meaningful for the success of social movements. Thus, we extend the work of Soule and Olzak (2004) by revealing how the ecology of an industry can serve as a new type of opportunity structure—i.e., one that is relevant to social movements seeking to influence the trajectory of an industry or technology domain.

We examined how both industry ecology and collective agency influence the emergence of new organizational forms (Hannan et al., 1995; Rao et al., 2000; Sine and Lee, 2009). While a small number of social movement and organizational ecology scholars acknowledge these interrelationships, linkages between these streams have only begun to be explored (Carroll and Swaminathan, 2000; Soule and King, 2008). We contribute to this emerging body of research in several ways. First, prior research has focused on how movements are subject to ecological dynamics within SMO populations (Soule and King, 2008) but has not fully addressed linkages between SMO activism and the ecology of their target industries (Carlos et al., 2018). We highlight density-dependent industry population effects that social movements help to shape, an otherwise unaddressed area in the literature.

Second, studies at the intersection of population ecology and social movements, have primarily focused on the role of social movement ideology, as opposed to the role of SMO agency. This stream is concerned with how movement ideologies create opportunities for specialization and prompt changes within an industry (Carroll and Swaminathan, 2000; Sikavica and Pozner, 2013; Verhaal et al., 2015). It contends that movements organized around identities provoke resource partitioning, since they increase the resource space for specialists carrying those identities, such as craft brewers (Carroll and Swaminathan, 2000) and organic food producers (Sikavica and Pozner, 2013). We extend this research by transcending the traditional role of ideology in social movements, demonstrating how the agency of social movements can counteract the dominance of generalist firms and promote specialist entry. We posit that SMOs reach key audiences and help specialist firms expand into markets beyond scale- and scope-based competition. As such, we explore direct (SMO intervention) as opposed to diffuse (movement ideology) mechanisms, the latter which are more commonly depicted in the literature (Carroll and Swaminathan, 2000).

While researchers have recognized synergies between social movements and organizational ecologies during industry creation (e.g., Carroll and Swaminathan, 2000; King and Pearce, 2010; Rao et al., 2000), they have also criticized the ecological view for neglecting the role of collective action (Rao et al., 2000, p. 241). Our study addresses this gap by combining agency and structure to examine their joint effect on population dynamics. Future work should combine these elements to not only examine the structure of industries, but to also assess how the structure and development paths of social movements influence industry ecologies.

4.2. *Limitations and future directions*

While the results of this study reveal that the effectiveness of social movements on entrepreneurial entry is dependent upon local industry ecologies and trajectories, there are limits to the generalizability of these findings. We expect similar outcomes in industries that are bound by social movement activism and that are at a similar level of development as the solar energy industry (e.g., organic foods, post-consumer recycled goods, and biofuels).

We also expect that our findings are generalizable in broader populations of SMOs that have similar environmental goals (Pacheco et al., 2014). However, we chose to represent the social movement with a specific population of technology-focused SMOs, because these organizations—compared to environmental SMOs—have specialized knowledge in the industries that they support, and therefore, are more influential in creating and spreading public awareness around relevant technologies (Pacheco et al., 2014). Therefore, technology-focused SMOs are more directly tied to the reduction of uncertainties, as well as the advancement of renewable energy.

Since this study addresses variation in industry structure and evolution at the state-year level of analysis, our estimates are constrained by the extent to which variance is aptly estimated in differing state contexts. Nevertheless, we contend that the robustness of our results, as well as the consistency of our study with previous state-level research (Sine and Lee, 2009; York et al., 2018), overcomes this concern. Future work should consider alternative sources of variance, such as drivers at the firm-level, strategic choices of prospective entrants, and pace of technology development. We also recognize that we were unable to account for the entire U.S. solar industry using a state-year level of analysis; however, we did identify an important chapter in the emergence and growth of this industry.

While our chosen level of analysis enabled us to explore the evolution of the U.S. solar energy industry over a 14-years period, it also limited our ability to quantitatively explore the mechanisms that drove key relationships. We therefore discussed and assessed possible mechanisms in a series of interviews with managers at clean energy SMOs. While the outcomes of these interviews were not generalizable, they helped us to establish face validity for our results. Future studies should explore alternative mechanisms (i.e., beyond social movement size) that social movements can use to influence industry development, such as activist campaigns and collaborative relationships. While the extent to which SMOs use these strategies is correlated with their presence (Soule and King, 2008), understanding the direct effect of more nuanced mechanisms of influence would help clarify the relationship of SMOs with industry-level outcomes.

This study opens avenues for research at the intersection of social movements and industry development. Considering the value of breaking industries into sub-ecologies, future research should explore how successful tactics, as well as the use and organization of resources, spill over to SMOs operating in distinct sub-ecologies (Hess, 2016) or during sociotechnical transitions (i.e., Edmondson et al., 2019; Geels and Schot, 2007; Manning and Reinecke, 2016). Future research should also explore how SMOs learn from the knowledge and experience of other activists in related industries. Finally, our research also brings to light the different repertoires upon which social movements rely to advance their social agendas. It is apparent that when social movements seek to advance technologies, they move beyond confrontational tactics, such as protests, to more conciliatory and professional actions. We encourage researchers to continue to explore this underrepresented aspect of social movements and organizational dynamics.

5. Conclusion

Whether demanding the adoption of a new technology or responsible practice, social movements can be found at the center of industry development, and their interventions can trigger changes in competitive industry environments. Today, prospective entrants recognize that markets for socially responsible goods are increasingly being shaped by non-market actors. Social movements thus have the potential to significantly influence the strategic direction of certain industries, as well as the entry of entrepreneurs.

The boundaries between industries and activists are thus becoming more permeable (Briscoe and Gupta, 2016), opening opportunities for further operationalization of social movements within entrepreneurship and innovation-related scholarship. Given the varied repertoires of SMO actors, we contend that there is a myriad of research opportunities for exploring how entrepreneurial activity shapes industry development and how this activity can be enabled by the interventions of non-market forces.

CRediT authorship contribution statement

Desirée F. Pacheco: Writing – original draft, Writing – review & editing, Conceptualization, Methodology, Visualization, Formal analysis, Project administration, Data curation. **Theodore A. Khoury:** Writing – original draft, Writing – review & editing, Conceptualization, Methodology, Visualization, Formal analysis, Project administration.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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