PhD THESIS DECLARATION

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ABSTRACT

This dissertation comprises three chapters. The first chapter, which is joint work with Fabrizio Perretti, examines the responses of organizations to stakeholder disapproval of a category to which they belong. Drawing on the categorization, stigma, and identity literatures, we build a theory to predict whether firms that are involved in stigmatized activities will choose to reduce or terminate their involvement in them, as opposed to resorting to less drastic measures such as defensive practice adoption or impression management techniques. We find that organizational responses rest on three elements: (1) the intensity of stigma targeting the category, (2) the media exposure of the category, and (3) the extent to which an organization is a member of the category.

The second chapter, which is joint work with Dan Wang at Columbia University, examines collective action against planned nuclear power plant sites in the U.S. to show that protests are more likely to succeed the more specialized their claims are. Moreover, we also argue that activists are more likely to be successful when they draw on a broader and more diverse repertoire of tactics. We also contend that protest success is a function of competition; that is, of the presence of other protests advancing alternative claims. We show that protest events are more likely to result in the cancellation of a planned nuclear unit when: 1) they articulate fewer claims; 2) they employ a more diverse range of tactics. Moreover, the positive effect of tactical diversity on a protest's success increases with greater claim specialization. Finally, our results suggest that protest success is less likely when the protest environment is characterized by a higher number of alternative claims or by a more concentrated set of claims.

The third chapter, which is once again joint work with Fabrizio Perretti, looks at the impact that firm actions might have on the emergence of mobilization. Conceptualizing the proposal, completion and cancellation of new nuclear units as critical events, we examine the emergence of mobilization across communities in response to such events. We find that a new unit being proposed within 100 miles of a given community is associated with a significant upsurge in anti-nuclear mobilization. Cancelled units—arguably victories for anti-nuclear activists—also appear to catalyze further antinuclear mobilization. On the other hand, we find completed units to be associated with an increase in mobilization towards other, non-nuclear issues, presumably because local activists are likely to channel their efforts on other goals once all attempts to halt the construction of a new nuclear unit have failed. Finally, we find this effect to be particularly prominent in more highly educated communities.

INTRODUCTION AND ACKNOWLEDGMENTS

This collection of essays represents the culmination of my research work on nuclear power in United States, which has now been in the making for about four years. It was perhaps late 2011 or early 2012 when I ventured into Fabrizio Perretti's office, looking for research ideas that would lead to the development of a dissertation. Despite holding two degrees (a Bachelor's and a Master's) in Nuclear Engineering and having research experience in the area, I had never given any serious thought to nuclear power as an empirical setting prior to that meeting. Having left my previous career behind—and happily so, I must add—at that point I considered nuclear energy as part of my past, and I had absolutely no intention to pursue anything related to it as a dissertation. And indeed, having fallen in love with organizational theory, I could not even remotely see how that could be the case.

That meeting, however, was transformative in that Fabrizio—who is now the chair of my dissertation committee—made me realize that the rise and fall of nuclear power in America had relevant and enduring implications that far went beyond the technical and economic aspects of it. In many ways, the development of nuclear power could be conceptualized as nexus of forces at play: the advances in physics that made it possible, the double-edged sword of nuclear fission as a wartime weapon vis-à-vis as an energy source, the electric utilities that sought to profit from it and the anti-nuclear activists that opposed nuclear power plants from the very beginning. Viewing all of the above through a sociological lens could result in a very interesting dissertation, we concluded; not to mention that my unique expertise and familiarity with the empirical context could make the data collection process and the interpretation of results remarkably easier. The following day, I began collecting data on all nuclear reactors in the United States, while simultaneously

starting to peruse the New York Times for examples of media coverage pertaining to nuclear power.

Many good things have happened since then. In 2013 I moved to New York City, thus beginning my extended stay at Columbia Business School where—among other things—I met Dan Wang, a Stanford-trained sociologist who had done some work on social movements and activism. We immediately began collaborating, and we eventually realized that combining my data on nuclear power with his dataset on collective action in the United States could potentially yield very interesting results. That intuition now forms the backbone of the second and third chapter of this dissertation, which both examine the interplay between nuclear power and activism in the United States. As for the first chapter, Fabrizio and I we were lucky enough to publish it in *Organization Science* fairly quickly and well before I was able to defend the completed dissertation. Despite my chronic tendencies towards ruthless self-criticism and understatement, I am proud of the dissertation I am filing today. I consider it to be solid, well-researched work, and in all honesty when I began my doctoral studies at Bocconi in 2010 I was not sure I would be able to produce something of this scope and quality. The fact that I ultimately succeeded stands as a testament to the quality of Bocconi's doctoral program. And even though I have spent the past two years away from Milan, there is no question that without the solid training I have received at Bocconi I would not have been able to complete it.

Throughout the years, I have consistently found academia to be a strange, quirky place populated by very interesting people, and I am proud to be a part of it. I am also extremely grateful to all of those who helped me along the way. First and foremost Fabrizio Perretti, for having been an insightful, supportive, kind, and developmental supervisor, especially in those moments when I most needed it. I can hardly conceive a better mentor-mentee relationship than the one we have had. Fabrizio Castellucci, for having been a

constant source of encouragement during my doctoral years, pushing me to pursue even my wildest research ideas and helping me out along the way. Dan Wang, for being an exceptionally prolific and smart coauthor, as well as a positive role model for a young researcher like me. Julien Jourdan, for flying in from Paris for the specific purpose of attending my dissertation defense, as well as for exploring the largely uncharted territory of scandals in organizations with me. Giacomo Negro, for kindly agreeing to sit on my committee (even though we only met once!). Arnaldo Camuffo, for all of his work to further improve the PhD program at Bocconi, and for supporting my decisions at a turning point of my doctoral studies. Alfonso Gambardella, for his stewardship of the PhD School at Bocconi and for generally pushing us all to write better empirical papers. Marialuisa Ambrosini, for tirelessly helping me in navigating the minutiae of the doctoral program. The fellow students in my cohort—Senem Aydin, Emanuele Bettinazzi, Hakan Ozalp, and Nikolaos Smyrlakis—for the endless hours spent together in the classroom, as well as in conferences, trying to make sense of research, academia, and our lives more generally. I am also grateful to the senior faculty at Columbia whose guidance and insight allowed me to develop into a better scholar, and particularly Damon Phillips, Paul Ingram, Eric Abrahamson, Sheena Iyengar and David Stark. Working with them in the past two years has been both an honor and a privilege. Lastly, this dissertation is dedicated to my parents, who are not academics and—luckily for them!—never will be, but without whose constant support and encouragement this dissertation might have never been completed.

New York, November 30th, 2015

CHAPTER ONE

Categorical Stigma and Firm Disengagement: Nuclear Power Generation in the United States, 1970-2000 [1]

Since the very onset of organization theory as a discipline, scholars have acknowledged that the environment in which many organizations operate is socially complex. Aside from obtaining the material resources they need to perform their functions, for many organizations gaining acceptance into their environment is just as critical for survival (Ruef & Scott, 1998). Institutional arguments hold that organizational legitimacy (Suchman, 1995; Tost, 2011) is typically achieved either through adherence to cultural norms, symbols, and beliefs that are typical of the field (Meyer & Rowan, 1977) or by conforming to audiences' expectations (Ruef & Patterson, 2009; Zuckerman, 1999). Yet, when organizations engage in activities that are morally questionable or socially contested, gaining and maintaining legitimacy might prove problematic. As a result, acts of organizational misconduct (Greve, Palmer, & Pozner, 2010), such as financial (Jonsson, Greve, & Fujiwara-Greve, 2009) and environmental (Hoffman & Ocasio, 2001) scandals frequently result in legitimacy loss. This is even more of an issue for organizations whose very existence requires them to routinely engage in contentious practices (Hudson, 2008), however, because such organizations might find legitimacy hard to achieve in the first place. Examples of such organizations include tobacco companies, arms producers (Vergne, 2012), HIV/AIDS treatment advocacy groups (Maguire, Hardy, & Lawrence, 2004), men's bathhouses (Hudson & Okhuysen, 2009), and even organizations involved in the commerce of cadavers for medical research (Anteby, 2010). These organizations are typically condemned by stakeholders because of their open involvement in one or more activities that

[1] This chapter is joint work with Fabrizio Perretti.

the audiences find morally objectionable. The idea that entire groups of organizations can be categorized as similar and become a target for disapproval due to their continued engagement in contentious practices has been referred to as *categorical stigma* in the literature (Vergne, 2012).

Stigma has long been acknowledged as harmful for individuals and organizations (Goffman, 1963; Hudson & Okhuysen, 2014), resulting in social and economic sanctions (Sutton & Callahan, 1987) as well as disidentification from stakeholders (Elsbach & Bhattacharya, 2001); as a result, social actors try to put strategies in place in order to limit the amount of disapproval they receive. While the management of stakeholder disapproval has long since been recognized as highly consequential (Elsbach & Sutton, 1992; Elsbach, 1994), attracting a large amount of scholarly attention in the process, to this day extant research on organizational responses to stigma has mainly focused on the role of coping strategies such as defensive practice adoption or impression management techniques (Carberry & King, 2012; Desai, 2011; McDonnell & King, 2013). Such strategies, however, are largely cosmetic in nature, since their goal is to influence how audiences perceive the organization, without altering the underlying pattern of activities that caused disapproval to emerge in the first place. In this respect, a far more radical and transformative way to address disapproval would consist in reducing the extent of the organization's involvement in stigmatized activities. By disengaging from a category that is under duress, organizations can potentially address stigma at its source. Yet this is not always a feasible course of action: for undiversified organizations whose core activities are targeted (Hudson & Okhuysen, 2009) reducing the level of exposure to a stigmatized category would be substantially equivalent to exiting the field. Furthermore, even organizations that have the option of disengaging in favor of less controversial activities might choose not to do so for a variety of reasons, including switching costs (Selznick, 1949), escalation of commitment (Ross & Staw, 1993;

Staw, 1976), path dependence (Vergne & Durand, 2010), inertia (Hannan & Freeman, 1984), and identity concerns (Phillips, Turco, & Zuckerman, 2013; Zuckerman, Kim, Ukanwa, & von Rittmann, 2003). In spite of all the above mechanisms holding them in place, however, organizations occasionally do produce such an extreme response. In this paper, therefore, we investigate the determinants of this choice. In other words, we ask: how will an organization respond to the stigmatization of a category to which it belongs? More specifically: what determines whether the organization will reduce its engagement in the category, instead of coping with stigma in other ways?

In the remainder of this paper, we build a theoretical framework to address this puzzle. Building on the categorization literature, we first conceptualize groups of organizations engaging in contentious practices as stigmatized categories in the eyes of the audience. Treating disengagement from a stigmatized category as an extreme response aimed at reducing disapproval, we then propose that an organization's reaction to categorical stigma will be a function of the intensity of disapproval targeting the category, the exposure of the stigmatized category in the media, and the focal organization's level of membership in the category. Below, we briefly discuss past work on categories, stigma and organizational identity, which we use to ground our theory and hypotheses. We then illustrate the details of our study of nuclear power generation in the United States between 1970 and 2000, which relies on a dataset of proposed new nuclear reactors and provides support for our hypotheses; in so doing, we also explain the variables and methods we used in our analysis. Following this, we report our results and several robustness checks before elaborating the implications of our findings in our conclusion.

THEORY AND HYPOTHESES

Conceptualizing categorical stigma. In organizational theory, the study of stigma stems directly from Goffman's (1963) seminal work in sociology. Stigmatization occurs when an individual possesses (or is believed to possess) some attribute or characteristic that conveys a devalued social identity within a particular context (Crocker et al. 1998). Stigmatizing marks may be linked to three different types of stigma (Goffman 1963; Major and O'Brien 2005): appearance (e.g., physical deformities), behavior (e.g., drug addiction), or group membership (e.g., African Americans). Even though the notion of stigma originally applied to individuals, it was later brought to bear on the study of organizations, which—as social actors—can also be targets for stigmatizing judgments. Devers et al. (2009: 155) define organizational stigma as a "label that evokes a collective perception that the organization is deeply flawed or discredited", highlighting the essence of stigma as a negative judgment rooted in labeling and social control.

Scholars have also acknowledged that stigma can arise because of manifold reasons and, as a result, multiple types of stigma can be identified. Similarly to individuals, organizations may be stigmatized because of their appearances, for example in the case of the illegitimacy suffered by the firms named "dot-com" after the bursting of the Internet bubble (Glynn and Marquis 2004); behavior, such as in the case of organizational misconduct (Greve et al., 2010), or group membership, for instance the case of the arms industry (Vergne 2012). Our work will focus on the third type of stigma, which Goffman (1963: 4) originally defined as *tribal stigma* because "it equally contaminates all members of a family". By bridging stigma with the well-established literature on categorization processes in organizational theory (see Negro, Kocak, & Hsu, 2010 for a review) we conceptualize stigma

as a macro, field-level phenomenon affecting all organizations that are members of a category, simply due to being associated with it.

Briefly, categories are cognitive structures (Rosch, 1978) that allow audiences to make sense of organizations by making them fit into a classification system. By drawing boundaries between what is expected of an organization and what is not, categorical schemas shape the social identity of organizations in the eyes of audiences (Hsu & Elsbach, 2013). A category can thus be any set of organizations structured around common elements such as being part of the same industry (Porac, Wade, & Pollock, 1999), offering similar products (Kennedy, 2005; Lounsbury & Rao, 2004), engaging in similar activities (Alexy & George, 2013), and so forth. After Vergne (2012: 1030), we thus conceptualize *stigmatized categories* as "groups of organizations, such as arms or tobacco producers, whose liability prompts out-group members to keep their distance to avoid a potentially harmful association". In this light, stigma arises due to audience disapproval of a specific organizational category, so that the entire family of organizations possessing these undesirable attributes will be collectively stigmatized. *Categorical stigma* can thus be defined as a negative evaluation arising from a social actor's association with a group that is recognized as engaging in contested practices. Differently from other types of organizational-level stigma (see Hudson 2008), categorical stigma does not target any individual organization in particular; rather, it applies to entire groups of organizations that are cognitively assimilated by virtue of their membership and it affects organizations vicariously as members of the category.

Theorizing organizational decisions in response to categorical stigma. After having defined what we mean by categorical stigma, we move on to the key theoretical puzzle motivating this paper, i.e. the behavior of organizations that are subjected to it. The sociological literature has shown that stigmatized individuals cope with stigma in a variety of ways. In Goffman's work (1963), for example, stigmatized persons often emerge not as

powerless victims, but as strategists and con artists (Anspach 1979). Examples of such strategies, which include amongst others "passing" and "covering" (Goffman 1963), "concealment" and "withdrawal" (Jones et al. 1984) "retreatism" and "disassociation" (Anspach 1979), can be characterized as engagement versus disengagement strategies (Major and O'Brien 2005). Similarly, the organizational literature has identified a variety of ways in which organizations attempt to cope with disapproval from stakeholders, such as impression management (McDonnell & King, 2013) and symbolic practice adoption (Westphal & Zajac, 1994, 1998). These techniques are generally enacted to restore the organization's legitimacy (Pfarrer, Decelles, Smith, & Taylor, 2008) repair its reputation (Rhee & Valdez, 2009), and ensure survival (Hudson & Okhuysen, 2009). More recently, scholars have also begun to tackle the question of what determines how organizations will react to disapproval. For instance, Desai (2011), in a study of the U.S. railroad industry, investigated how firms responded to threats to the legitimacy of their field due to traumatic events (i.e. railroad accidents), finding that firms are more likely to engage in defensive institutional work (Lawrence, Suddaby, & Leca, 2011) when they receive higher scrutiny of related issues or when their similarity with the accident-stricken organization is low. Carberry & King (2012) examined the adoption of a controversial accounting practice by firms following the Enron scandal: organizations facing federal investigations for corporate fraud or shareholder activism were found to be more likely to adopt the new practice, as were organizations that received higher levels of media exposure.

All of the above are examples of proactive, defensive responses which organizations put in place in an attempt to restore their public image (McDonnell & King, 2013; Zavyalova, Pfarrer, Reger, & Shapiro, 2012). On the other hand, similarly to stigmatized persons, organizations have also a different kind of option at their disposal to limit disapproval from stakeholders: more specifically, they have the option of *disengaging* from the

stigmatized activities, by reducing or withdrawing their involvement in them. In the case of diversified firms, for instance, stigma management can be accomplished either by diluting audience's attention through multiple category straddling (Vergne, 2012) or by divesting their assets in stigmatized areas of activity (Durand and Vergne *in-press*). The circumstances under which organizations might opt to disengage vis-à-vis adopt symbolic responses to stigma have not been thoroughly investigated. Therefore we ask: when a category to which the organization belongs becomes a target for stigma, what determines whether the organization will choose to disengage from it?

Stigma intensity. Our first, baseline hypothesis concerns whether the intensity of stakeholder disapproval targeting a category—which we label stigma intensity—will have an impact on the behavior of organizations affiliated with the category. Extant studies have recognized that stigma can vary in magnitude: Hudson (2008) discussed the degree or strength of stigma, while Hudson and Okhuysen (2009) indicated that the intensity of stigma can be markedly different across settings. Here, we argue that since disapproval can vary from quiet disapprobation to vocal condemnation, involving anything from a few isolated social actors to the plurality of an audience, the intensity of categorical stigma is likely to have a bearing on organizations' likelihood to disengage from the category. In particular, we would expect more intense stigma to result in stronger pressures on organizations to disengage, other things being equal. Thus:

Hypothesis 1. The greater the intensity of stigma experienced by a category, the higher the likelihood that organizations will disengage from it.

The role of the media and audience attention. Our second proposed contribution to the literature concerns the role of audience attention in stigmatization.

Stigma refers to an attribute that is deeply discrediting because of its deviance from social norms and legitimate social categories (Goffman, 1963). According to a loosely defined group of theorists whom Matza (1969) refers to as "the neo-Chicagoans" - such people as Edwin Lemert, Howard S. Becker, and Erving Goffman - and to the labeling theory they introduced, deviance is not a property inherent in certain attributes or forms of behavior; rather, it is a property conferred upon these forms by the audiences, which directly or indirectly witness them. As described by Malinowski's observations of Trobriand islanders, no organized social action is taken with respect to a behavior that is considered deviant from social norm, unless there is public announcement of the deviation (Malinowski, 1926). From this sociological perspective, the critical variable in the study of deviance is the social audience, which eventually decides whether or not any given action or attributes will become a visible case of deviation (Erikson, 1961).

In a mass society, this function of public exposure is institutionalized in the mass media of communication. Press, journals, radio and television have been peculiarly modern devices for bringing a public space into existence (Lazarsfeld & Merton, 1948). In media-saturated societies, such devices not only are "a site on which various social groups, institutions, and ideologies struggle over the definition and construction of social reality" (Gurevitch and Levy 1985 : 19), but mass media discourse also dominates public opinion, both reflecting it and contributing to its creation (Gamson, 1988). The power of the mass media on public opinion has been recognized since the Second World War, when mass communication entrenched itself as a field in its own right. To quote one of its founding fathers, "some kinds of communication on some kinds of issues, brought to the attention of some kinds of people under certain kinds of conditions have some kinds of effects" (Berelson 1948 : 172)

It was with the agenda-setting theory (McCombs & Shaw, 1972) – the successful transfer of salience from the media agenda to the public opinion – that such effects were better described and measured. The basic agenda-setting effect involves the impact of exposure to information about an issue in the media on the salience of that issue within the audience. The mass media force attention to certain issues, "constantly presenting objects suggesting what individuals in the mass should think about, know about, have feelings about" (Lang and Lang 1966 : 468). The audience will regard as more important the news items that are covered frequently and prominently. Higher levels of coverage will thus be associated with higher issue salience. Based on the issue-attention cycle (Downs 1972 : 39), according to which the public perception of domestic issues seems to pass through a cycle of "heightening public interest and then increasing boredom with major issues", several studies on the tradition of agenda-setting research noted that the agenda-setting effect might dissipate over time (Watt, Mazza, & Snyder, 1993; Watt & Van den Berg, 1981; Weaver, Graber, McCombs, & Eyal, 1981; Zucker, 1978).

From a cognitive perspective, the drop-off in public attention has been explained by the limits of a wide variety of sensory processes, including memory, selective attention and habituation. Research on memory - since Ebbinghaus (1913) - has generally indicated that memory decays exponentially, with most information forgotten soon after exposure (see Woodworth and Schlosberg 1954). However, the decreasing salience of issues is also generally linked to the limits of the public's resources, both in terms of selectivity and psychological capacity (Pashler, 1999), and to the audience adaptation or habituation to a repeated stimulus (Berlyne, 1951). Not only the resource of attention among the public is a very scarce one, with a tendency to shift attention to stimuli that are novel or unexpected, but - like many other organisms - people also decrease or cease to respond to a stimulus after repeated presentations (e.g. Mitchell 2014).

Based on such basic cognitive processes it is possible to explain the empirical results of several studies where agenda-setting declines progressively over the life of an issue as the news audience accumulates information about the topic. In terms of our argument, this means that stigmatized issues are subject to the same decay process and that, for a given level of stigma intensity, issues that have received much coverage should show less salience in the public opinion. Organizations that have been able to resist the initial wave of stigmatization will then be less exposed to scrutiny of the public opinion. Hence:

> **Hypothesis 2.** The effect of stigma intensity on the likelihood of disengagement is moderated by media exposure, so that the posited relationship will be weaker when media coverage is high.

Extent of categorical membership and identity. Our third—and final—proposed contribution concerns the extent of membership in a stigmatized category as a possible antecedent of organizational responses to stigma. Many modern organizations are not specialized, in the sense that they often engage in a large variety of activities. Since categories are based on shared understandings of what social actors are expected to do, and since generalist organizations typically span these taken-for-granted boundaries, audiences might perceive that such organizations hold partial memberships in multiple categories (Hannan, 2010; Hsu, Hannan, & Kocak, 2009). As a result, organizations that engage in a variety of different activities might be perceived by their audience as belonging to several different categories, some of which are likely unproblematic while others might be socially contested. This is the case of Vergne's (2012) study of defense sector, in which firms like Boeing are seen as engaging in both legitimate activities (building civilian aircraft) and stigmatized ones (arms production). In general terms, whether spanning multiple categories is beneficial or

harmful for organizations has been the object of a lively debate among scholars (Alexy & George, 2013; Hannan, 2010; Hsu, 2006; Vergne, 2012). For our purposes, however, it is worth noting that organizations whose involvement in a stigmatized category represents a significant portion of their activities are more likely to see the stigmatized category as a "central, enduring and distinctive" part of their identity (Gioia, Patvardhan, Hamilton, & Corley, 2013; Whetten, 2006), even if the category is stigmatized by stakeholders. That of identity ("who we are as an organization") is a key idea in organization studies (Gioia et al., 2013) and the argument that identity concerns might drive –at least in part– this kind of choices is not new in the literature: Phillips et al. (2013) in a study of corporate law firms in Silicon Valley recently found that identity acts as a barrier to diversification, as corporate law firms were willing to diversify into low-status areas such as family law but not into other areas, such as personal injury law, because of identity constraints and potential backlash from customers. In a similar fashion, we argue that identity-based dynamics are at play when it comes to choosing whether to disengage from a stigmatized category: if the involvement in a certain category, however stigmatized, is considered "core" and integral to the purpose of the organization, it stands to reason that the organization will be less likely to disengage from it and more likely to tackle stigma by other means, such as impression management (McDonnell & King, 2013) or symbolic practice adoption (Carberry & King, 2012). Conversely, when membership in a stigmatized category is marginal organizations will be less likely to perceive stigma as a threat to their identity (Elsbach & Kramer, 1996); disengagement then becomes a much more viable option to limit the social and economic sanctions deriving from stigmatization. Thus:

Hypothesis 3. The greater the extent of an organization's membership in a stigmatized category, the lower the likelihood that the organization will disengage from it.

NUCLEAR POWER GENERATION IN THE UNITED STATES

We propose to test the foregoing considerations in the context of nuclear power generation in the United States, a practice whose legitimacy was challenged in the final quarter of the 20th century, first by environmental activists and then by the general public. After a succinct introduction to the industry, we conceptualize nuclear power as a stigmatized category and we elaborate on how stigmatization was reflected in the media.

Industry background.

Nuclear power generation involves the use of nuclear reactions to generate electricity and heat. While most conventional power stations—such as oil-fired, coal-fired or gas-fired ones—rely on combustion processes to generate electricity, nuclear power is grounded in scientific discoveries which occurred in the 20th century, mostly in the field of physics.

The first man-made nuclear reactor was assembled in 1942 at the University of Chicago, under the supervision of Italian physicist Enrico Fermi. This was part of a larger research and development project known as the Manhattan Project, whose aim was to create weapons based on nuclear fission technology to be employed during and after World War II; notably, the project produced the two nuclear devices detonated in Hiroshima and Nagasaki, Japan, in 1945. The project also resulted in the establishment of several national research laboratories, now overseen by the U.S. Department of Energy (DOE); one of them, the Argonne National Laboratory, was assigned the lead role in developing commercial nuclear energy technology. In fact, by the early 1950s, the high costs of developing nuclear technology for military purposes had pushed scientists and government officials to find civilian uses for it, in order to justify the government's sizeable expenditures. This led to the passing of the Atomic Energy Act of 1954, which encouraged private entities to build nuclear power facilities and allowed companies to gain access

to restricted government information about nuclear energy production and the production of fissile materials. The first commercial nuclear power plant, Shippingport, was opened by President Eisenhower in 1958. Electric utilities readily embraced the new technology, and many other plants followed: in 1970, 20 utilities were already operating 20 plants—each with one or more units— in 11 states, but by 1980 these numbers had grown to 42 utilities operating 52 plants in 27 states. Optimism ran rampant in the early days of nuclear power, with the atom being touted as a safe, affordable, and sustainable energy source for the future, which led some—such as U.S. Navy Admiral Lewis Strauss, Chairman of the Atomic Energy Commission, in what is now an infamous quote—to state that nuclear power would eventually result in "electrical energy too cheap to meter".

Things took a rather different turn in the 1970s, however. In his 2009 book *Our Choice*, former U.S. Vice-President and current environmentalist opinion leader Al Gore observed that "of the 253 nuclear power reactors originally ordered in the United States from 1953 to 2008, 48 percent were canceled, 11 percent were prematurely shut down, 14 percent experienced at least a one-year-or-more outage, and 27 percent are operating without having a year-plus outage". Figures 1.1 and 1.2 provide a visual overview of the temporal evolution of nuclear reactors in the United States between 1970 and 2000.

[Figure 1.1 - Nuclear power units ordered, connected, shut down and cancelled in the U.S. by year]

[Figure 1.2 - Cumulative number of nuclear units in the U.S. by stage of development, by year]

These trends warrant a few considerations. On purely technical and economic grounds, that about half of the proposed nuclear reactors—i.e., reactors for which the Nuclear Regulatory Commission (NRC) granted approval—were never completed is quite remarkable, and such a

high rate of project cancellations is all the more surprising for a variety of reasons. First of all, in the vast majority of occurrences they were proposed by utility companies with extensive experience in producing electricity, and in some cases even operating existing nuclear reactors. Secondly, before the U.S. electricity market was deregulated, starting in the late Nineties, utility companies produced, distributed and sold energy in a regime of substantial monopoly (Hirsh, 1999); the electric power industry, therefore, was not particularly subject to competitive pressures. Third, once nuclear units start operating they are very rarely shut down, unless they reach the end of life or they encounter serious technical difficulties. As a result, while the total number of nuclear reactors in operation has been growing for decades—largely because of their reliability and long lifespan—the decline of nuclear as an electricity source is most evident when one looks at the orders for new nuclear units, which have been stagnant for years. Traditional explanations for this phenomenon include slower rate of growth in electricity demand, significant cost and time overruns, more complex regulatory requirements, the nuclear accident at Three Mile Island, and the 1973 oil crisis. Most of these arguments, however, apply to all nuclear reactors that had not been completed at a given point in time, and they are thus largely unable to explain their variance in outcomes. For instance, many argue that the Three Mile Island accident in 1979 spurred a wave of cancellations which substantially marked the end of the nuclear industry. Yet, in the ten years immediately following the accident (1980-1989), only 39 reactors were cancelled, while 67 were completed. The same line of reasoning applies to the 1973 oil crisis, which lowered energy demand growth forecasts for the following decades and indirectly stymied the development of the nuclear industry: between 1974 and 1977 only 22 units were cancelled, while 30 were completed. These trends suggest that, while economic, technical, or political arguments might be adequate to justify the downturn of nuclear power generation at the sector level, they fall short when it comes to explaining individual outcomes. To understand what drove individual utilities to complete their nuclear units while other utilities were cancelling them,

we bring in the theoretical framework outlined in the previous section and, more specifically, we look at the stigmatization of nuclear power (Horlick-Jones, Prades, & Espluga, 2012) first by environmental activists and then by the general public.

Nuclear power as a stigmatized category.

In a way, nuclear power generation and the anti-nuclear movement have evolved in parallel: since nuclear fission was originally developed for military applications, testing of nuclear weapons became a major topic of discussion already in the Forties and Fifties. Nuclear military technology stirred controversy and sparked debate, eventually leading to the formation of associations of concerned citizens and, later, to the conferral of the Nobel Peace Prize to Linus Pauling for his opposition to nuclear device testing in 1962. Eventually, above-ground tests were stopped in 1962 and replaced with underground testing. A few years later, however, the opposition to nuclear weapons testing gradually morphed into opposition to nuclear power. Pacific Gas & Electric, the first electric utility that attempted to build a commercially viable nuclear power plant in the United States at Bodega Bay, faced considerable opposition by local citizens starting in 1958, garnering the support of the Sierra Club, among others. Plans for construction at Bodega Bay power plant were eventually abandoned in 1964. Today, historians trace the birth of the anti-nuclear movement in the United States to this episode (Wellock, 1998). During the following decades, hundreds of sit-ins and marches took place all over the country to protest the construction and operation of nuclear power plants. Protests reached a peak in the 1970s, and previously isolated anti-nuclear activists managed to form a national coalition including prominent environmentalist groups such as the Sierra Club, Friends of the Earth, Natural Resources Defense Council, Union of Concerned Scientists, and Critical Mass. The level of activism increased dramatically, pushing for initiatives to control or halt the growth of nuclear power, often by introducing more complex safety requirements. This widespread popular ferment kept the issue before the public and contributed to growing public skepticism about

nuclear power. Even before the accident at the Three Mile Island Nuclear Power Plant in Pennsylvania took place on March 28, 1979, anti-nuclear activists had gained the support of prominent experts, moving beyond local protests and politics to gain a wider appeal and influence, as well as a great deal of national attention (Walker, 2006). Reinforced by the more recent accidents at Chernobyl, USSR (1986) and Fukushima, Japan (2011), the stigma surrounding everything nuclear persists to this day. In an illuminating study, Horlick-Jones et al. (2012) investigate the degree of stigma associated with nuclear energy technologies by having laypersons discuss a related issue, fusion power. Their results show that the nuclear label is able to generate a sense of stigma even for technologies previously unknown to the general public, such as nuclear fusion. What is even more relevant for the purposes of our study is that "group participants displayed an orientation towards the cultural norm of nuclear stigma, whilst tending to argue, in pragmatic ways, for the benefits of nuclear power technologies" (Horlick-Jones et al., 2012 : 528-529). This suggests that perhaps the role of the media in shaping processes of stigmatization is more prominent than previously envisioned. If this is the case, adding the last piece to our empirical puzzle will thus require us to delve more deeply into the role played by the media in the social construction of the stigma surrounding nuclear power (Gamson & Modigliani, 1989).

DATA AND METHODS

In the empirical section of this paper, we take an ecological approach to the problem by studying a population of proposed new nuclear reactors which were approved by the Nuclear Regulatory Commission (NRC). We match information on each reactor with data about its electric utility owners and we attempt to explain the variance in outcomes—about half of the units in our sample were completed, while the remainder were cancelled—based on categorical membership and media-based arguments.

Nuclear and conventional power generation data. We assembled our dataset from three main sources: 1) the PRIS (Power Reactor Information System) online database maintained by the International Atomic Energy Agency (IAEA); 2) historical electric generation data collected by the Energy Information Administration (EIA) for each plant operated by electric utility companies through Forms EIA-906, EIA-920 and EIA-923; and 3) the Nuclear Regulatory Commission's (NRC) Agency-wide Documents Access and Management System (ADAMS). By triangulating these sources, we were able to construct our core dataset containing the following information for each proposed new nuclear unit approved by the NRC: unit name, plant name, year of order, year of cancellation/completion, utilities owning shares in the unit, shares owned by each utility, plant location (nearest town and geographic coordinates), county and state.

We then used this information to create a list of all electric utilities which owned shares in a nuclear plant at any point in time, and we looked for information about each of these, particularly to check whether they were bought by other companies or they changed name within our observation window (1970-2000). Each utility was traced back to the highest level of ownership, under the assumption that decision-making capabilities reside at that level (Marquis & Huang, 2010; Zollo & Singh, 2004); in so doing, we grouped all electric utilities owned by same holding company by means of a unique identifier. Finally, for each year in our observation window, we calculated the annual electricity generation in MWh—both by nuclear sources and by other sources—based on the generation data, grouping together those utilities that were owned by a common holding company[2]. Similarly, for every year between 1970 and 2000, we calculated the number of nuclear and nonnuclear generating units controlled by each utility and holding company. While most units have been typically owned by more than one company, a majority owner can usually be identified; therefore, for

[2] Generation data was not available for years prior to 1970, a fact which restricted our observation window.

units that are owned by more than one utility, we made the assumption that the majority owner would be responsible for taking decisions regarding completion and cancellation of the unit. Accordingly, each proposed unit in our sample was matched with its majority owner and its characteristics. To compensate for the slight oversimplification introduced by this assumption, for each unit in our dataset we included a variable for the number of owners as well as one for whether any of the utilities involved were publicly-owned, which we used as controls.

Our initial sample thus included 253 NRC-approved reactor units, with 133 utilities (public and private) owning shares in them. We then researched each of these units in detail, and proceeded to eliminate from the sample: 1) units whose construction was completed prior to 1970; 2) units whose eventual cancellation was decided not by the relevant electric utilities, but either by state governments or by courts of law.[3] Since we are interested in firm-level decisions, this latter choice was made to eliminate confounding effects from our data. This left us with 214 units which were cancelled or completed between 1970 and 2000; taken together, they constitute our final sample.

Media coverage of nuclear power. Our main source of textual data was the online repository ProQuest. We proceeded as follows: first, we downloaded from ProQuest all articles published in the New York Times from 1960 to 2000 on the topic of nuclear power by means of appropriately chosen search terms[4]; doing so yielded about 9000 articles. We then read these articles one by one to make sure that they actually dealt with, or had implications for, domestic civilian nuclear power; this meant excluding articles having to do exclusively with domestic/foreign policy and military technology, such as nuclear weapons.

[3] For instance, two units to be built at a site close to Jamesport, NY were rejected by the State of New York in 1980; as such, they are not included in our analysis. In a similar fashion we also excluded the Bailly, Somerset, Sundesert, and Zimmer power plants, among others.

[4] Typically the combination of either *atom*, *nuclear* or *atomic* coupled with one or more of the following: *plant, unit, reactor, industry, energy, power*.

These articles altogether comprised about a third of our sample. We were then left with a selection of about 5700 articles, which were then individually coded as either positive, negative, or neutral based on their content. Table 1.1 provides details on how the articles were coded, as well as examples of classified articles, while Figure 1.3 shows the temporal evolution of media coverage of nuclear power in our observation window. All articles were manually coded by the first author, but in order for us to verify the reliability of our media content measure, two additional coders were asked to reclassify a random subsample of 50 articles. Since we wanted to make sure that the classification of articles would be substantially independent of knowledge of nuclear issues, one of the coders was an undergraduate student while the other held a Ph.D. in Nuclear Engineering. The Fleiss' kappa value for the three raters was 0.77, which indicates excellent agreement (Fleiss, 1981).

[Table 1.1 – Coding guidelines]

[Figure 1.3. Coverage of nuclear power generation in the New York Times]

We chose the New York Times for our analysis due to it being arguably one of the most widely circulated national newspapers in the United States covering general topics; moreover, it was the only one whose full text availability on ProQuest spanned our entire observation window (1970-2000). This forced us to rely on a single source for this study, which in turn led us to check whether the data we collected would be reflective of actual trends. For this purpose, we used the same method described above to collect and code articles published in the Wall Street Journal and the Washington Post on the same topic, albeit in a shorter time

interval. In both cases, the results substantially mirrored the trends observed in the New York Times in terms of the amount and tenor of media coverage [5].

Miscellaneous data. The power generation data and the textual data described above represent the bulk of our dataset. We did however use Internet sources to code some control variables: the Energy Information Administration (EIA) website for coal and oil spot prices, as well as Wikipedia for data about the political affiliation of governors of each U.S. State in the 1970-2000 observation window of our study. For robustness checks, we also relied on cost data found in Komanoff (1982) and Koomey & Hultman (2007). Finally, to control for social movement pressure we used a database of protest events collected by researchers at Stanford University as part of the Collective Action Project to create a count variable of protest events that happened in the same state as the proposed new unit. Protest events are defined as any type of activity that involves more than one person and is carried out with the explicit purpose of articulating a claim against (or expressing support for) a target or issue. For a particular protest event to be included in the dataset, the event must have happened in the public sphere or have been open to the public. Thus, private or closed meetings by social movement actors are not included, but events within organizations (e.g., schools, churches, private organizations) are included if they were open to the public. Since antinuclear protests are identified by means of an unique claim code, we were able to create for each proposed nuclear unit in the dataset a simple count variable of all antinuclear protests to have occurred in the same state in the previous 2 years [6].

Measurement

[5] Following the suggestion of a reviewer, we also repeated our ProQuest search on other outlets such as the LA Times and the Chicago Tribune to check for evidence of geographical bias. Although we did not code the content of these latter articles, the number of articles covering issues related to nuclear power is similar across outlets, suggesting that geographic bias is unlikely to be a major concern.

[6] For robustness, we also used moving windows of 1 and 3 years; all three variables were found to perform similarly.

Dependent variable. Our hypotheses concern whether electric utility companies will elect to complete a new nuclear reactor unit or, conversely, to abandon the project. Accordingly, our main dependent variable for this study is binary, taking value 1 if the project was ultimately cancelled and 0 if it was completed. Given the general unavailability of data outside of our thirty-year observation window (1970-2000), only nuclear reactor units that were completed or cancelled between 1970 and 2000 are included in our sample. This excludes units whose construction was completed prior to 1970, but it includes reactors approved between 1970 and 1978. No new reactors were approved for construction between 1978 and 2000, and the last units to be cancelled or completed were Perry-2 (in 1994) and Watts Bar-1 (in 1996), respectively.

Independent variables. As far as Hypothesis 1 is concerned, the independent variable of interest is *stigma intensity*. After Devers, Dewett, Mishina, & Belsito (2009), we argue that stigma is rooted in discredit and disapproval from stakeholders. Since nuclear power is well-known issue with broad societal implications, disapproval is likely to be publicly expressed and reflected in the media. Therefore, we decided that a measure of stigma intensity based on media content would be most appropriate, as well as consistent with similar work being carried out in this area (Deephouse, 1996; Jonsson & Buhr, 2010; Zavyalova et al., 2012). Using the New York Times articles we collected, for every year in our observation window we modeled stigma intensity as the ratio of negative articles to the total number of articles. For each year in our observation window, we calculated the ratio based on articles published in the previous three years. For robustness, we also ran the study using moving windows of one year; the results were found to be qualitatively similar.

Hypothesis 2 involves *media exposure* as a moderator of the relationship proposed in Hypothesis 2. After Fombrun & Shanley (1990), our measure is a simple count variable of articles published on nuclear power within a specified time frame. Like in the case of stigma

intensity, we used three-year moving windows, and once again results are found to be largely robust to the choice of time interval used (one or three years). Since media exposure and stigma intensity were found to be highly correlated, we made them orthogonal using a modified Gram-Schmidt orthogonalization procedure implemented through the *orthog* command in STATA 12, so as to partial out the common variance. Unless otherwise specified, all of the independent variables were lagged by one year.

Lastly, in Hypothesis 3 the main independent variable is the *extent of membership in the nuclear power generation category*. Following Vergne (2012), we conceptualize membership in a stigmatized category as the relative extent to which an organization engages in activities pertaining to that category. As far as our empirical setting is concerned, nuclear power generation constitutes the stigmatized category, but utility companies have a variety of other options available to them for generating the energy they need to meet local demand, such as coal-fired, oil-fired and gas-fired power plants.[7] Accordingly, we define the extent of membership as the ratio between the number of nuclear generating units operated by a utility and the total number of generating units (such as coal-, oil-, and gas-fired, plus nuclear) operated by the same utility. If a unit in our sample is jointly owned by more than one electric utility, we consider its majority owner only. Thus:

$$\text{Categorical membership} = \frac{\#\ of\ nuclear\ units\ operated\ by\ utility}{total\ \#\ of\ generating\ units\ operated\ by\ utility}$$

Although we did initially consider the yearly electricity generation by nuclear means over the total electricity generated in a year for each utility as an alternative measure for the same

[7] Although renewables have played an important role in the U.S. electric power industry since the late 1970s, they are not prominently featured in our analysis because—until recently—most utility companies did not directly engage in energy production from renewable sources; rather, after the passage of the Public Utility Regulatory Policies Act (PURPA), utilities typically purchased renewable energy from nonutility producers (Sine & Lee, 2009).

construct, we ultimately had to discard it as it was not as reflective of categorical membership as the one we ultimately chose [8]. This is because energy production constantly fluctuates to meet demand, and since nuclear power plants are typically used to cover the so-called base load—i.e. the minimum amount of power that must always be made available to customers—the measure would have likely been biased, as fossil-fueled plants are typically either turned off or set to operate at reduced power when demand is low, while nuclear plants are required to maintain constant power levels to avoid equipment damage (Davis & Wolfram, 2012).

Control variables. Because other factors can affect the decision to complete a planned unit or cancel it, we must include a set of controls in our study. To control for the fact that the chances of cancellation are likely to vary as time goes by, we include *years since approval* as a control variable. Moreover, it might be that technical considerations have a bearing in the decision, as well: to make sure that this is not an issue, we control for *unit nameplate power*, as well as the *type of reactor* (pressurized water reactor, boiled water reactor, or experimental). The *Three Mile Island accident*, which took place in Pennsylvania in 1979, had a substantial impact on strategic decisions made in the industry; as such, we control for it by means of a dummy variable which takes value 0 before 1979 and 1 afterwards. We also include dummies for whether there are: 1) other *units under construction at same site*; 2) other *units planned at the same site*; 3) other *units planned by the same utility*; 4) other *units under construction by the same utility*; 5) other *units under construction in the same state*; 6) other *units planned in the same state*; or 7) other *units operating in the same state*.[9] This is because cost and time overruns in one project might hinder the construction of other units by the same utility, possibly resulting in cancellation; moreover, the presence of units (either planned or operational) in the same

[8] This variable is retained as a control.
[9] Two more dummy variables concerning operating units had to be dropped due to multicollinearity, most likely because they are highly correlated with experience measures discussed below.

state might affect the local perception of nuclear power, as well as the perceived need for nuclear power in the state; and finally, the presence of other units (either operational or planned) at the same site has been found to affect projected costs (Komanoff, 1982) and, presumably, chances of completion. To control for the fact that utilities of different size might make different decisions regarding the completion and cancellation of units, for instance due to their higher financial capacity, we control for *utility size* proxied by the total amount of electricity (expressed in MWh) generated by the utility in a given year[10]. Political effects at the state level might have a bearing on the fate of nuclear units in that state, for instance because politicians of a given party oppose nuclear power at a given moment in time: to control for this, we include a dummy for whether the state in which the unit is located has a *Republican governor*. The extent to which nuclear power generation is advantageous also depends on the availability of cheaper alternatives: if coal and oil prices rise, building nuclear units becomes more convenient. We thus include in the regression historical *oil spot price* and *coal spot price* figures, lagged by one year. Although some nuclear units have a single owner, most are jointly owned, i.e. several electric utilities hold shares in the same generating unit. The resulting resource pooling and risk-sharing may increase the chances of unit completion, while at the same time making utility-level decision-making processes more complex; in our analysis, therefore, we control for *number of owners*, which we model as a count variable, as well as for whether any of the utilities involved have *public ownership*. *Experience* in operating nuclear reactors is also likely to have a bearing on firm decisions: in our empirical study we measure it in reactor-years, so as to account for both the number of reactors operated in the past and the number of years for which they were operated, which is consistent with previous studies of the nuclear industry (Davis & Wolfram, 2012; Lester & McCabe, 1993). Finally, as we discussed previously, we include a

[10] Most electric utilities are not public companies; finding financial information about them thus becomes a nearly impossible task.

control variable for social movement pressure at the state level, as well as a variable to track the share of nuclear energy generated by each utility (i.e. the ratio of nuclear energy generated to the total amount of energy generated by the utility). Table 1.2 reports descriptive statistics for most of the variables listed thus far, as well as the relevant correlation coefficients. Unless otherwise specified, all of the control variables were lagged by one year.

[Table 1.2 – Descriptive statistics]

Results

Since our dependent variable is binary, we employ logistic regression to estimate our models. The expression for the probability of unit cancellation is thus nonlinear and it takes the following form:

$$P = \frac{\exp(x_i\beta)}{1 + \exp(x_i\beta)}$$

where P is the probability of cancellation, x represents the set of covariates, and β is the set of coefficients (including the constant). Table 1.3 reports the coefficients of five logistic regression models estimated by maximum likelihood: while Model 1 is the baseline model with control variables only, Model 2 adds media exposure and stigma intensity and Model 3 adds their interaction. Finally, Model 4 includes all of the main independent variables—exposure, stigma intensity, and extent of membership—but without interaction terms, while Model 5 is our full model.

[Table 1.3 – Logistic regression analysis of the probability of unit cancellation]

As far as our independent variables are concerned, Model 2 shows that stigma intensity is negatively associated with the likelihood of unit cancellation, which provides support for

Hypothesis 1. Model 3 adds the interaction effect between stigma intensity and exposure for the full model, which is depicted in Figure 1.4: the negative association between the dependent variable and stigma intensity is strongest when media exposure is low, which provides support for Hypothesis 2. Given its initial plateau at low levels of media exposure and sharp decline at medium to high levels of media exposure, the plot is very suggestive of the habituation effects previously described.

[Figure 1.4 – Interaction effect between media exposure and stigma intensity for the full model]

Finally, Model 4 in Table 1.3 adds the extent of membership without the exposure-intensity interaction term, while Model 5 is our full model. The coefficient for the extent of membership is negative and significant in both models, in line with Hypothesis 3; moreover, all of the effects previously discussed remain significant when all independent variables and controls are included. As far as post-estimation is concerned, we calculated marginal effects for the two main independent variables in order to assess the size of the observed effects, and found that a one deviation increase in the extent of membership increases the odds of cancellation by approximately 13%. Similarly, a one standard deviation increase in stigma intensity also increases the odds of cancellation by about 13% on average, but the magnitude of the effect is contingent on media exposure and it varies from a minimum of 5% to a maximum of 20%.

The coefficients for some of the control variables are also worth discussing. Model 1 shows that planned reactors are less likely to be cancelled as time goes by; this suggests that most units which do not get cancelled within a few years of approval are ultimately completed, showing a tendency on the electric utilities' part to act early rather than late.

Boiling-water reactors (BWR) are also found to be more likely to be cancelled vis-à-vis pressurized-water reactors, an effect which is probably due to the latter being a more mature technology. Experimental reactors, on the other hand, are probably too few to yield any meaningful result. The occurrence of the Three Mile Island accident is positively associated with the decision to cancel, as is previous experience in operating nuclear reactors by the proposing utility company. While being relatively small in magnitude, this latter effect is nonetheless surprising, since we would expect experienced utilities to be less likely to cancel due to their accumulated expertise in nuclear power generation. A tentative explanation could be that by the time most cancellations occurred, the prospects for nuclear power had already grown bleak due to cost and time overruns, stricter regulatory requirements and availability of cheaper energy sources (Davis, 2012). If this is the case, then (other things being equal) utilities with experience in operating reactors might have been in a better position to evaluate the feasibility of their open projects, thereby increasing the likelihood of cancellations.

Robustness checks and alternative explanations

Choice of models. We ran several tests to check whether our results would prove robust to the choice of variables, model specification, and alternative explanations. First of all, to show that our results do not depend on the choice of a logit model, we ran our full model (Model 5) again using a probit model (Model 6) and a linear probability model (Model 7). To account for the fact that cancellations might not be entirely independent events, i.e. that multiple units at the same site might be simultaneously cancelled, we also ran another logit model with standard errors clustered at the plant level, rather than conventional robust standard errors (Model 8). This is because under conditions of non-independence regression

estimates are generally unbiased but the standard errors are likely to be wrong, possibly resulting in incorrect inference (Cameron & Trivedi, 2005).

[Table 1.4 – Alternative model specifications with probit regression, LPM and standard errors clustered at the plant level]

Table 1.4 shows that our results do not differ significantly across models, which eases concerns about their robustness.

Fixed effects. To control for possible omitted variable bias due to unobserved factors, we ran additional models with the addition of: 1) *state fixed effects*, to rule out confounding factors based on geography; and 2) *utility fixed effects*, because utilities might differ in time-invariant, unobserved ways, for instance in terms of managerial ability or financial resources. We used a linear probability model (LPM) with robust standard errors for this task because the inclusion of fixed effects results in a relatively large number of covariates (in excess of 60 in both cases) with a relatively small number of observations (N = 214). Under these conditions, logistic regression is almost guaranteed not to achieve convergence (Peduzzi, Concato, Kemper, Holford, & Feinstein, 1996). On the other hand, the linear probability model (LPM) provides unbiased and consistent estimates when certain conditions are met and after robust standard errors have been added to the model to account for the heteroskedasticity arising from the OLS estimation of a binary variable (Horrace & Oaxaca, 2006). The estimates for our complete LPM with fixed effects and robust standard errors are reported in Table 1.5. The pattern of results found in the previous model substantially holds and all of our hypotheses remain supported.

[Table 1.5 – Alternative LPM specifications with state fixed effects, utility fixed effects and robust standard errors]

Ruling out cost-based alternative explanations. Finally, we must address what we regard as perhaps the most appealing alternative explanation for our findings: it might be that the variance in outcomes we observe in our sample is entirely due to cost factors, which we did not account for in our model. Reactors that are more expensive to build might in fact be more likely to get cancelled, and thus the effect we observe could potentially have nothing to do with either category membership or stigma intensity, thereby invalidating our assertions. The reason why we did not include capital cost data for each proposed unit is that such data are typically not available to the public, and whatever information might be available typically does not cover cancelled units. To approach the problem, therefore, we gathered cost data collected by Komanoff (1982) and Koomey & Hultman (2007) to construct capital cost estimates for 84 proposed reactor units, about 39% of our sample. Our subsample is unbalanced in that 74 units were completed and only 10 were cancelled, but it does represent the best sample that could be assembled given the data at our disposal. To estimate capital cost for each unit, we used an empirical formula developed and tested by Komanoff (1982 : 199) on a sample of 46 reactors; the R-squared of the regression model based on the author's formula was found to be over 90%. The capital cost estimates as calculated by Komanoff's formula are based on: 1) location; 2) whether there are multiple units at the same site; 3) architect-engineer experience; 3) unit size (in MW); 4) presence of a cooling tower; 5) whether the unit was *dangling*, i.e. there were other incomplete units at the same site at the time of analysis, due to higher costs being allocated to the first unit; and 6) *cumulative nuclear capacity*, i.e. the total size of the nuclear energy sector. In line with the author's methodology, our cost data is mid-1979 dollars excluding interest.[11] After calculating a capital cost estimate for each of the 84 reactors in the subsample, we performed a t-test of the cancelled units (mean = 751.7, SD = 106.8) vis-à-vis the completed ones

[11] Further details about the methodology are available from the authors.

(mean = 697.0, SD = 206.2); the differences in average capital costs between the two groups turned out to be not significant [$t(82) = 0.82$, $p < .4142$]. This result suggests that, while cost issues are fully expected to play a role in firm decisions concerning the completion of planned units, the extent of their effect is likely not such to warrant a reconsideration of our findings.

Discussion

As a topic of inquiry, organizational stigma is enjoying an ever-increasing popularity in the organizational sciences (Devers et al., 2009; Hudson & Okhuysen, 2014; Link & Phelan, 2001). While considerable theoretical and empirical efforts have been devoted to clarifying how the negative consequences of stigma arise and diffuse across social actors (Jonsson et al., 2009; Pontikes, Negro, & Rao, 2010), the behavior of organizations that face stigma is not yet well understood. Specifically, while extant research has examined symbolic responses such as defensive practice adoption or impression management techniques (Carberry & King, 2012; Desai, 2011; McDonnell & King, 2013) as well as coping strategies such as concealment tactics or boundary management processes (Hudson & Okhuysen, 2009), more substantive responses such as disengagement or outright defection from controversial lines of activity have not been thoroughly investigated. Our paper thus adds to the literature by looking into the determinants of this decision, i.e. whether to reduce the organization's involvement in a contested practice. Drawing on data about all proposed new nuclear units to be built in the United States between 1970 and 2000, we found clear evidence that organizations are more likely to abandon their plans to construct a new unit—thereby disengaging from the category—when their membership in the nuclear power generation category is marginal. At the same time, higher stigma intensity also results in a higher likelihood of defection, and all the more so when the media exposure of the category is low.

Our findings contribute to the literature on organizational stigma (Devers et al., 2009) in several ways. First, we make the argument that when organizations are involved to a significant extent in a category that is socially disapproved, identity concerns will be triggered, making social actors less likely to disengage from identity-defining lines of activity. On one hand, this is somewhat counterintuitive in that organizations whose involvement in contested practices is substantial are likely to be the most stigmatized (Vergne, 2012); yet, as their extent of their involvement increases, identity considerations become more and more likely to keep them in place, making defection problematic. On the other hand, this result is in line with recent findings that highlight the crucial role played by organizational identity in shaping firm behavior: for instance, in a study of corporate law firms, Phillips, Turco, & Zuckerman (2013) found that identity considerations effectively create a barrier to diversification, preventing law firms from expanding into certain practice areas. Even though our own findings in this regard are specular—in that identity considerations prevent firms from *leaving* a stigmatized category, rather than entering it—they nonetheless corroborate the idea that identity-based dynamics are often at work to constrain organizational opportunities for action. While alternative explanations can be advanced for this finding, in our view none of them appears particularly compelling, given the specificities of our empirical setting. Escalation of commitment is unlikely to account for our findings, given that they hold even after controlling for experience. Inertia-based arguments (Hannan & Freeman, 1984), whereby organizations are too entrenched in their ways to disengage from activities they have been engaged in for a long time, in our view fall short because nuclear power is a relatively new technology compared to its main alternatives, i.e. fossil-fuel and hydroelectric power generation. Similarly, we contend that economic arguments concerning sunk costs have limited appeal because these do not vary significantly across projects.

Second, organizations are found to be quite responsive to varying level of stigma intensity—i.e. disapproval—targeting a category to which they belong, despite not being attacked directly. While the extant literature has acknowledged that stigma can vary in degree or strength (Hudson & Okhuysen, 2009; Hudson, 2008) and many empirical studies have investigated firm responses to media attacks that target them (Durand and Vergne *in-press*), we offer evidence that organizations take macro-level stakeholder disapproval of a practice just as seriously, even though stigma affects them only vicariously through their categorical affiliation. When the stigma targeting a category becomes more intense, organizational decision-makers face increasing pressure to take action, and therefore the likelihood of disengagement increases. This suggests that perhaps greater attention should be paid to the role played by the field-level processes of stigmatization in shaping organization-level behavior, which has been significantly underexplored so far.

Third, we show that media exposure plays a critical role in shaping firm responses to categorical stigma. Our results in fact suggest that organizations will choose whether to act on the disapproving signals conveyed to them through the media based on the volume of coverage a stigmatized category receives. More specifically, we show that as the amount of information available about the category in the media increases, the likelihood to disengage from it declines. This reflects both the cognitive limitations of humans, who are subject to information overload (Pashler, 1999), and the effects of habituation to a repeated stimulus (Berlyne, 1951). These findings run counter to much conventional wisdom regarding the expected effects of media exposure on organizational responses (Carberry and King 2012, Durand and Vergne *in-press*), which would predict that increased media coverage of a stigmatized practice would spur involved organizations into action. Yet our study shows that it is important to separate the content of coverage from the volume of coverage: while the impact of media coverage on organizational decisions and outcomes is relatively

uncontroversial, our findings specify the conditions under which stigma is most likely to induce a response. Along the same lines, our results also enhance scholarly understanding of the role that the media – and publicity more generally – play in broadcasting and reinforcing stigma (e.g. Clemente and Roulet *in-press*).

Although our findings carry potentially important implications for organizational theory, they must be viewed in light of their limitations. First of all, the empirical setting chosen severely limited our sample size: since the number of new nuclear reactor units proposed in the United States is relatively small, and an even smaller number of electric utility companies are involved in nuclear power generation, we had to rely on a sample of about 200 observations. While this does not constitute a problem *per se*, it inevitably restricts the range of hypotheses that can be tested simultaneously, thus limiting the scope of our theory. Another limitation of our study is that, due to the unavailability of reliable cost data for reactor projects that were abandoned, our treatment of cost-based alternative explanations was necessarily incomplete. Even though we are unable to provide an estimate of the magnitude of the effect that issues such as cost escalation have on the decision to abandon a particular project, our robustness checks suggest that this is most likely not a reason for concern with respect to our findings. Moreover, the nature of our study does not allow for a dynamic analysis of media effects, which prevents us from delving deeper into the empirical nuances of the interaction between media exposure and stigma intensity. While our results are fairly clear-cut, further scholarly efforts should be devoted to understanding the temporal dynamics of media attention. Finally, since our dependent variable of interest was the firm-level decision to abandon a particular project, we had to eliminate from the sample all projects whose cancellation was decided by local governments or by courts of law. Even though leaving them out was necessary to obtain a clean empirical setting, their presence reflects the fact that powerful political and institutional dynamics are most likely at

work, especially given the contentiousness of nuclear power—which persists to this day—and the prominent role that social movement organizations have played in its downfall (King & Pearce, 2010). We believe these dynamics are important and as such, further research should be devoted to modelling them explicitly and integrating them into a more comprehensive theoretical model of categorical stigma aimed at explaining what causes field-level stigmatization of certain activities and practices to occur in the first place.

CHAPTER TWO

Goal Specialization, Tactical Diversity and the Role of the Protest Environment in Collective Action Success: Evidence from Anti-nuclear Activism in the United States [12]

Introduction

In many ways, the wave of anti-nuclear protest activity in the United States during the 1970s and 1980s took inspiration from the civil rights movement that began just two decades earlier, from adopting tactics related to civil disobedience to channeling activities and recruitment through formal social movement organizations. While the anti-nuclear movement in the U.S. has traditionally been seen as a unique entity by the general public, it must be noted that the social movement organizations (SMOs) opposing nuclear power were actually characterized by a substantial degree of variance, both in terms of outcomes and in terms of specific social movement features (Barkan, 1979). For instance, some social movement organizations such as the Clamshell Alliance decided to focus solely on opposing nuclear power and to refrain from championing other issues. Other anti-nuclear movement leaders opted instead to forge a large number of alliances with other movements, collaborating with peace movement groups, anti-Vietnam War protestors, NIMBY activists, and leaders from the women's movement, thereby traversing multiple claims to create hybrid identities (Heaney & Rojas, 2014; Meyer & Whittier, 1994). In a similar fashion, anti-nuclear activists also differed both in the choice and in the range of tactics employed during protest events. Some SMOs showed a high degree of tactical specialization, preferring to focus on just a handful of tactics, while others opted for more tactical diversity; analogously, certain activist groups systematically chose disruptive tactics such as trespassing, while others showed a preference for insider tactics such as lobbying or legal action.

[12] This chapter is joint work with Dan Wang.

Historically, the anti-nuclear movement in the United States has been regarded as quite effective at mobilizing for social change; the rapidly declining fortunes of nuclear power in the United States following the Three Mile Island accident undoubtedly reinforce this belief. Yet, this perception once again does not do justice to the extreme variance in outcomes that can be observed as far as the attainment of specific goals is concerned: certain instances of activism—such as the mobilization against nuclear power in California at Bodega Bay and Malibu, as well as that against the Black Fox plant in Oklahoma—were undoubtedly successful, while many others fell short of achieving their goals. Despite the vast literature on the anti-nuclear movement, little work has systematically examined why, *within* the movement itself, some protest activity was more successful than others. With this missing piece in research as our substantive motivation, we study protests aimed at nuclear sites in the U.S. to explain why certain features of protests targeted at organizations garner more favorable outcomes than others.

What makes some protests more successful than others? This question represents one of the most foundational and elusive quandaries in social movement research (Giugni, 1998). The success of a movement is related to its ability to achieve specific outcomes, which are often context-specific. For example, research has examined protest success in the form of policy change (Olzak & Soule, 2009), variation in stock returns (Soule and King 2006), the transformation of organizational practices (Ingram, Yue, and Rao 2010) and media attention (Oliver & Maney, 2000), among a variety of other outcomes. As such, because the measurement of movement outcomes is heterogeneous, it is difficult to establish a standard for social movement success across movement contexts.

Even for a specific protest, perceptions of a successful outcome can be heterogeneous. For example, are boycotts of apparel companies that work with sweatshops successful if the targeted companies simply reduce their reliance on sweatshops, or should they required to eliminate it altogether for the protest to be considered successful? As a result, from an empirical

standpoint, when the perception of movement success is variable, understanding what aspects of a protest factor into its success becomes even more challenging. In our study of anti-nuclear protests, we collect original data to address this problem by establishing a clear definition of protest success – the cancellation of a proposed nuclear power plant – to shift focus more on identifying and understanding the features related to protests that might contribute to their success.

In this paper, we develop a new perspective on the factors that contribute to successful protest outcomes by advancing an attention-based theory of protest success. Using a novel, dyad-based approach to match protest events to their intended targets based on their geographical location, we carry out a quantitative analysis of nuclear power plant cancellations in the United States. Specifically, we use hand-collected data on new nuclear power plants proposed for construction in the United States between 1960 and 1995 coupled with data about anti-nuclear protests drawn from the Dynamics of Collective Action dataset (McAdam, McCarthy, Olzak, and Soule 2010) and information about nuclear accidents collected by Sovacool (2008). We show that success is contingent on the following elements: 1) *claim specialization*, i.e. whether activists are able to project a clear, focused, and univocal message; 2) *tactical diversity*, i.e. the extent to which protestors employ a wide range of protest tactics; and 3) *protest competition*, i.e. the features of nearby protests that compete for the attention of the local community (Hilgartner & Bosk, 1988; Soule & King, 2008). In the remainder of the paper, we first review the literature on social movement outcomes, highlighting the main areas of inquiry as well as its extant strengths and weaknesses. We then proceed to discuss our empirical setting—anti-nuclear activism in the United States—and to lay out a testable theoretical framework. Finally, we present our results and we discuss their implications for social movement theory.

The debate on collective action success: foundational perspectives

In his review of the literature on social movement outcomes, Giugni (1998) stated that the problem of what makes social movements successful is a central concern of the literature since the 1970s, and that early work on this topic was predominantly concerned with the impact of mobilization resources on the outcomes of social protest. One side of the debate, exemplified by Gamson's (1975) book *The Strategy of Social Protest*, holds that better organized groups tend to be more successful; indeed, in his comparative analysis of 53 American social movement organizations that were active in the nineteenth and twentieth centuries, Gamson found that bureaucratization and centralization showed a tendency to correlate positively with social movement success. This line of argument, which holds that building an effective organizational structure is of key importance for social movements, became highly influential at the time but also drew criticism from other scholars, most notably Piven and Cloward (1977). Specifically, they argued that structured movements typically achieve little, while groups that lack a formal organization tend to do comparatively better. Despite subsequent studies on the topic (Goldstone, 1980; Steedly & Foley, 1979), and the collection of additional data, the debate appears to be all but settled.

A second stream of research has looked at whether certain tactical choices on the protestors' part are conducive to collective action success (e.g. Johnson, Agnone, and McCarthy 2010; McCammon et al. 2007; Morris 1993); within this tradition, scholars have focused in particular on the role of disruptiveness and violence (Walker, et al 2008, Martin, et al 2009, Wang and Piazza 2014). The literature, however, is similarly divided: several studies found benefits to using violent and disruptive tactics (Gamson, 1975; Shorter & Tilly, 1974) while others found them to be either not advantageous (Rojas, 2006) or outright harmful (Snyder & Kelly, 1976).

Finally, a third area of inquiry has to do with the political context of collective action; that is, with the boundary conditions of successful protests at the societal level (Walder, 2009). Indeed, scholars in this tradition have explicitly acknowledged that social movement research's

sustained emphasis on the organization and the mobilization of activists has come at the expense of a limited appreciation of the context in which collective action is embedded (McAdam & Boudet, 2012). This last point is particularly important as it opened up new research avenues concerning the role of public opinion (Burstein, 1979; Oberschall, 1973) and political opportunity structures (Goldstone, 1980; McAdam, 1982; Tarrow, 1998) in shaping collective action outcomes. We believe these to be important and understudied aspects, which therefore warrant further inquiry. In this respect, our paper touches upon them by theorizing when protests are particularly likely to elicit public attention, further specifying the contextual boundary conditions of successful collective action.

Recent perspectives: hybridity, identity, and learning

Building on the foundational debates outlined in the previous section, recent research on social movement outcomes has largely focused on expanding the scholarly understanding of the drivers of successful collective action. More specifically, an emerging stream of research has linked successful social movements to features like hybridity – or the propensity of single movement actors and groups to simultaneously adopt different identities and ideologies – and openness to external influences because these features enhance mobilization and expose SMOs to novel ideas, tactics, and strategies. For instance, in a study of the anti-war movement after 9/11, Heaney and Rojas (2014) found that organizations with hybrid identities—i.e. organizations that span multiple constituencies and champion multiple claims for change—enjoy unique advantages in terms of mobilizing support, occupying more central positions within the interorganizational network, and recruiting participants for demonstrations.

These arguments resonate with Goss and Heaney's (2010: 27) findings in the context of activism by women's groups: organizations such as the Million Mom March or Code Pink were effective at mobilizing supporters because—the authors argue—of their "hybrid forms that cut

across movements, constituencies, and political institutions". Protest events in particular have risen to prominence as the loci of social movement evolution, where ideas and tactics are shared: Jung, King, and Soule (2014) described the mechanism through which ideational linkages are formed between issues during protest events, while Wang and Soule (2012) found that social movement collaboration is the main channel through which new tactics are learned, acquired, and put into practice. Moreover, for what concerns social movement outcomes, scholars have increasingly looked into the effectiveness of social movements in terms of damaging the reputation of corporate targets (King & Soule, 2007) and obtaining concessions from them (King, 2008).

In all, the literature appears to have made substantial progress in terms of shedding light on the theoretical mechanisms underpinning social movement outcomes, as well as expanding the range of outcomes that can be classified as collective action success. In this paper, our contribution to this theoretical puzzle is twofold: 1) we introduce a novel way of linking collective action to clear, measurable outcomes; and 2) we propose a theory of broad applicability that traces success back to protest specialization, as well as to tactical diversity and the localized presence of other protests that advance competing claims.

The problem of measuring collective action success

A major criticism of the literature on the outcomes of collective action efforts concerns measurement. First, it is not always clear what constitutes social movement success (Giugni, 1998). While most of the extant studies seem to identify policy changes as the standard of collective achievement (e.g. Baumgartner and Jones 2013; Negro, Perretti, and Carroll 2013; Soule and King 2006; Soule and Olzak 2004; Soule and Zylan 1997), some scholars have defined success as garnering media attention (Andrews & Caren, 2010), causing economic damage to powerful incumbents (King & Soule, 2007), or forcing organizational targets to change their

plans (Ingram, Yue, & Rao, 2010). This issue is further complicated by the fact that collective action is often an open-ended push for social change—such as in the case of the Civil Rights movement—which makes the identification of specific, measurable goals a substantial challenge. This has led some scholars—such as Gamson (1975)—to conceptualize success as a set of desirable outcomes, and others, such as Amenta, Carruthers, and Zylan (1992), to theorize multiple levels of social movement achievement.

Second, even when success is clearly defined, two further problems arise. One is the widespread tendency—which is typical of social movement research—to sample on the dependent variable and favor successful examples of collective action upon selecting an empirical setting for analysis, which appears to be a problem especially in case-based, qualitative studies (McAdam & Boudet, 2012). Another, potentially more troubling issue has to do with the general dearth of implementable ways to link collective action and outcomes, especially when multiple movements pushing multiple issues are at play. In our view, therefore, a study designed to overcome these problems should primarily: 1) be focused on a single issue, so as to be internally consistent; 2) allow for the identification of a clear and unambiguous outcome variable; 3) devise an identification strategy to convincingly link collective action and outcomes; and 4) rely on a sample of sufficient size and quality, so as to enable researchers to draw statistically meaningful conclusions and construct a compelling causal explanation.

In this respect, our subject of study – protest against the construction of nuclear power plant sites – offers a unique opportunity to address the above points. Similar to the Walmart case described by Ingram et al. (2010), in which a corporation files a proposal for a new store with the relevant state authorities prior to actually opening it, in the case of nuclear power, electric utilities file a proposal with the Nuclear Regulatory Commission for the construction of a new nuclear unit at a well-defined location. Construction begins a few months to a few years later and ends five to ten years after that, even though it is not infrequent for nuclear units to experience

significant time overruns. Therefore, activists have ample time to make their voices heard, and since nuclear power generation units can reliably generate electricity for decades once they start operating, they have every incentive to do so before the new unit is connected to the grid. This allows us to identify a well-defined time window for collective action. Moreover, because the nature of the protest is typically local—due to the NIMBY effect (Gordon & Jasper, 1996)—we can reasonably assume that anti-nuclear opposition to a specific unit will be concentrated within a certain distance of the unit itself. This allows us to match proposed new nuclear units under development with nearby protest events. Finally, by controlling for the number of protests in the same area before and after the focal event, we can isolate the effect of each instance of activism. In all, our empirical setting provides us with: 1) a clearly defined outcome (i.e. the cancellation of a proposed nuclear unit), which in turn results in an unambiguous definition of collective action success; 2) a context for activism that is both geographically and temporally delimited.

Empirical setting

The United States has a long tradition of anti-nuclear activism (Giugni, 2004; Wellock, 1998) as well as a broader legacy of opposition to energy projects (McAdam & Boudet, 2012). Organized collective action against nuclear power first emerged in the 1960s as a spinoff of the movement against nuclear weapons, which in turn developed as a response to the nuclear arms race that took place during the Cold War years. In the late 1950s, Linus Pauling made headlines by publicly stating his disapproval of nuclear testing, and his work to stop this practice eventually resulted in him winning the Nobel Peace Prize in 1962. While opposition to nuclear technology originated within the scientific community, it quickly diffused to other populations; indeed, anti-nuclear activism even predated the establishment of the civilian nuclear power industry by a few years.

The first commercial power plant was inaugurated in Shippingport, Illinois by President Eisenhower in 1958, but protests against nuclear installations had already begun one year earlier, in 1957, when the United Auto Workers Union voiced its opposition to the prototype fast breeder reactor Fermi 1 in Newport, Michigan. Other early projected nuclear units were met with similar hostility by activists: a 1958 proposal by Pacific Gas & Electric for a new plant to be built at Bodega Bay, California, was eventually set aside in 1964 after a large public demonstration and the involvement of prominent environmentalist groups such as the Sierra Club; another proposed plant to be located in Malibu incurred the same fate a few years later (Wellock, 1998). In the following two decades the nuclear industry greatly expanded, with hundreds of new units being proposed, but so did opposition to nuclear power: between 1960 and 1995 the New York Times reported no fewer than 341 distinct anti-nuclear protest events that took place all over the country. Moreover, public opinion—once staunchly in support of the atom—began to drift (Rosa & Dunlap, 1994), and starting in the early 1980s the number of people opposing the construction of nuclear power plant began consistently outnumbering those in favor. As a result, the broader patterns of discourse surrounding nuclear power shifted: once touted as a cheap, safe and affordable energy source, it increasingly came to be depicted as unreliable and in the media (Gamson & Modigliani, 1989) resulting in increased skepticism among the general public (Horlick-Jones et al., 2012; Piazza & Perretti, 2015).

It is also worth noting that this perception of nuclear power as an unsafe, runaway technology was further reinforced by a number of accidents that took place at nuclear facilities (Sovacool, 2008), the most infamous of which occurred at the Three Mile Island plant, Pennsylvania, in 1979. Because of all of the above factors, after an initial peak in orders in the early 1970s, the number of proposed new nuclear units by year quickly dropped to near zero. At the same time, cancellations of previously ordered reactors went from virtually zero in the early 1970s to over ten per year in the early 1980s (Piazza and Perretti in-press). Eventually, almost half

of all nuclear reactor units ordered in the United States were cancelled. Historians (Walker, 2006) seem to agree that such a high rate of cancellations is due to a complex interplay of factors including (but not limited to): anti-nuclear activism, accidents, the 1973 oil crisis, as well as cost and time overruns and the demand for electricity growing more slowly than expected. Yet, exactly how much weight collective action and accidents had in determining the fate of each single unit under development is unclear.

---------- Insert Table 2.1 about here ----------

Some preliminary considerations can be made based on Table 2.1, which reports the number of proposed units broken down by whether they faced at least a protest within 100 miles of the site before they were completed or cancelled, as well as by whether any nuclear accidents happened within 100 miles in the same time window. The contingency tables—as well as the associated chi-square tests—suggest that proposed nuclear units were not more likely to be cancelled in the presence of nearby accidents. Conversely, the presence of at least one protest in the vicinity of the site is associated with a significant increase in the likelihood of cancellation. While these patterns do not constitute a causal argument, they do nonetheless provide some preliminary evidence that, when it comes to shaping the outcome of proposed new nuclear units, protests likely matter. In what follows, we articulate in further detail *how* they matter, i.e. what characteristics of protest events might be particularly conducive to collective action success.

The benefits of specialization

Although there are advantages to hybridity and boundary-spanning when it comes to mobilizing support for collective action (Heaney & Rojas, 2014), protests that convey a clear,

univocal message are ultimately more likely to succeed. Here, we adopt a public arenas framework (Hilgartner & Bosk, 1988) and conceptualize social problems as issues competing for public attention, which is however a limited resource (McCarthy & Zald, 1977). Viewed in this light, the issues at the forefront of the public arena at any given time are selected from a large population of potential problem claims that vie for attention; some of the factors that influence selection include the media (Andrews & Caren, 2010) as well as the institutional work of social movements. Because public arenas have a limited carrying capacity, however, the presence of competing claims necessarily implies that less attention will be allocated to any given issue. Therefore, when protest events stake multiple claims, we can expect their effectiveness in raising awareness to be reduced, as their main goal—i.e. opposing nuclear power—will be crowded out by the presence of additional, unrelated claims. In other words, when a protest articulates multiple claims, audience attention to any single claim will necessarily be diluted. Similar arguments have also been made in earlier work: Gamson (1975) was in fact the first to empirically observe that groups that center their demands around a single issue tend to do better than groups with multiple-issue demands (see also Steedly and Foley 1979). Furthermore, there is evidence that anti-nuclear activists actually experienced this dilemma upon devising an appropriate strategy for collective action (Barkan, 1979). While some activists were in favor of focusing their efforts on stopping the construction of nuclear power plants, fearing that acting otherwise would alienate the public and government officials, others felt that the cause should be linked to broader social change, thereby advocating socialism, the end of capitalism, workers' rights, gay rights, and myriad other issues. This latter strategy, however, typically led nuclear industry representatives to question the movement's true purpose as a way of delegitimizing activists, portraying them as idealists pushing for social change rather than as concerned citizens. For all of the above reasons, we argue that the number of non-nuclear claims made by activists at a protest event will be inversely correlated with the likelihood of success for the focal protest event. Otherwise stated:

Hypothesis 1. The more specialized a protest's claims are, the more likely the protest is to be successful.

Tactical diversity and protest success

Within the social movement literature, a sizeable body of work has examined the role that tactical choices play in shaping social movement outcomes (Giugni, 1998). The earliest and most well-known example of such scholarship is perhaps Gamson's (1975) *The Strategy of Social Protest*, which linked collective action success to the use of violence and disruptive tactics (see also Shorter and Tilly 1974). In subsequent decades, scholarly attention shifted from the effectiveness of particular types of tactics to the explanation of how new tactics are generated or adopted by social movements. For instance, McAdam (1983) explained the development of new protest tactics as a dialectic process through which activists try to offset their powerlessness. Olzak and Uhrig (2001) found that tactical overlap, or the degree to which protest tactics are shared across SMOs, correlates with the level of protest activity. Soule (1997) argued that "shantytown" protests were more likely to diffuse among college campuses that were more similar. Wang and Soule (2012) linked the diffusion of social movement tactics to being more prone to adoption of new tactics through collaboration, as well as to an overlap in tactical repertoires. A more recent study by the same authors (Wang & Soule, 2015) linked tactical innovation—i.e. the development of novel protest tactics—to certain structural positions in the wider network of social movement organizations, such as boundary-spanning and isolation. Finally, Jung et al. (2014) trace back the likelihood of issue co-occurrence (*issue bricolage*) in protest events to the degree of cultural similarity—i.e. tactical overlap—among the participating SMOs. In all, tactics have been seen in the literature in a dual manner: that is, as both strategic choices (Taylor & Van Dyke, 2004;

Taylor, Kimport, Van Dyke, & Andersen, 2009) and visible manifestations of social movement culture (Clemens, 1993).

Here, we will argue that greatest tactical diversity increases the odds of success of a given protest event. This is primarily because a protest taking manifold forms has a higher likelihood of generating attention, thereby connecting with its intended audience (McCarthy & Zald, 1977; Tilly, 2004). Additionally, choosing a broader array different tactics has a higher chance of resonating with different constituencies that share a common goal (Oberschall, 1973), thus aiding mobilization. Indeed, tactical diversity has been found to boost protest strength in extant literature: for instance, Olzak and Ryo (2007) found protest diversity to be correlated with both policy outcomes and the level of protest activity. Thus:

Hypothesis 2. The more diverse a protest's tactics are, the more likely the protest is to be successful.

Furthermore, we propose that the above effect will be stronger for protest events characterized by a relatively narrow range of claims. Highly specialized protests are in fact more likely to benefit from greater tactical diversity, because the attention-focusing effect of the latter is entirely to the benefit of the main goal of the protest, rather than being diluted across a number of claims. Conversely, protests that champion a large number of causes are less likely to benefit from tactical diversity, because its attention-enhancing effect on individual claims will be minimal. Thus:

Hypothesis 3. The positive effect of tactical diversity on a protest's success increases with greater claim specialization.

Taking the protest environment into account: the role of diversity and concentration

To further specify the boundary conditions under which collective action is likely to be successful, we present a final set of hypothesis that take the environment of social protest into account. Indeed, protests do not occur in a void; rather, they take place in a localized, well-defined socio-political environment. Any local community can be cognitively conceptualized as a public arena in which social problems compete for attention (Hilgartner & Bosk, 1988); because public attention is a scarce resource, and because the presence of protests articulating different claims is likely to divert attention away from the focal protest, we argue that protest effectiveness is a function of localized protest competition. More specifically, we contend that, when the protest environment is characterized by a variety of diverse claims, the attention given by the local community to each individual issue will necessarily be diluted. Under such conditions, protest success will be less likely because activists will have a harder time connecting with their intended audience and spurring change. Thus:

Hypothesis 4. Greater diversity of claims from nearby protests makes success for the focal anti-nuclear protest less likely.

A distinct but related line of argument concerns the role of *claim concentration*, i.e. the extent to which the protest environment tends to be focused predominantly on a few issues vis-à-vis evenly distributed among a number of issues attended more or less equally. As far as our case is concerned, we argue that when protest competition is concentrated around just one claim, or a few claims, it will be more difficult for activists to advance competing ones, as the public debate at the local level will be monopolized by the former. Conversely, when public attention is more evenly divided among a given number of issues and the debate at the local level is more diversified, it will be relatively easier for activists to gain the attention they seek and therefore to

connect with their relevant audiences. We therefore expect antinuclear activists to be more successful in contexts in which public attention is not highly concentrated around a few claims. More formally:

Hypothesis 5. Greater concentration of claims from nearby protests makes success for the focal anti-nuclear protest less likely.

Data and methods

To test the assertions laid out in the previous sections, we designed a quantitative study based on a dataset we assembled by combining data from several sources. All information concerning proposed nuclear reactor units were obtained either from the PRIS (Power Reactor Information System) online database maintained by the International Atomic Energy Agency (IAEA) or from historical documents included in the Nuclear Regulatory Commission's (N.R.C.) Agency-wide Documents Access and Management System (ADAMS). By triangulating these sources, we were able to construct our core dataset containing the following information for each proposed new nuclear unit approved by the NRC: unit name, plant name, year of order, date of cancellation or connection to the grid, plant location (nearest town and geographic coordinates), county and state. The database also includes technical information such as nameplate power (in MW), type of unit and manufacturer. After excluding research reactors, as well as those located in U.S. overseas territories such as Puerto Rico, we were left with a total of 241 reactor units. Additionally, a list of all 58 nuclear accidents that have occurred in the United States was obtained from Sovacool (2008), with information about: date, type of accident, fatalities, and cost (in dollars).

Finally, information about collective action was obtained from a database of protest events drawn from daily editions of the New York Times (NYT) between 1960 and 1995 as part

of the Dynamics of Collective Action Project [13]. The dataset includes information about events that happened in the public sphere or that were open to the public. To construct the dataset, researchers perused every page of all daily issues of the NYT from 1960 to 1995 looking for any mention of protest events. Each event was then content-coded for information about what happened, as well as about event size, location, targets, presence of social movement organizations (SMOs), police presence, and whether violence was observed. Most relevant for our project, coders also recorded information about the purpose of each protest event, by recording up to four claims from a list of 170 claims. Intercoder reliability was consistently at or above 90%. Collectively, over 23,000 distinct protest events were reported to have occurred between 1960 and 1995. To isolate protests opposing nuclear power, however, we only considered those that included the claim "Anti-Nuclear (Power) Movement", which yielded a subset of 341 protests in the same time interval. We compared these reported protest events from *The New York Times* to protest events reported by other local newspapers in the U.S. and found no significant differences in terms of coverage. In other words, in this broader search of other newspapers, we did not find protest events linked to our nuclear sites that were covered by other outlets but *not* covered by *The New York Times*.

Matching protests and proposed nuclear units poses distinct empirical challenges. A preliminary analysis revealed that very few of them occurred at (or very close to) proposed nuclear sites, with most taking place in urban areas. Since we are interested in exploring whether certain features of the protests have a bearing on the final outcome of a project while controlling for project characteristics, we adopt a dyad-based approach to exploring the success of anti-nuclear protests. Specifically, we construct protest-unit dyads by matching each protest with all active nuclear unit projects within a 100 miles from it. [14] By *active project* we mean a unit that has

[13] For more information, see http://www.dynamicsofcollectiveaction.com .
[14] While 100 miles is a rather substantive distance in certain areas of the country (such as the East), in the Southern and Western United States it is not uncommon to drive 100 miles to reach the nearest major city.

been: 1) ordered from the manufacturer; 2) approved by the N.R.C.; 3) not yet completed or cancelled. These units are either planned or under construction but they have not yet been connected to the power grid (i.e. begun operation). This is because once nuclear units are connected to the grid they are very rarely shut down, unless their license expires or they encounter serious technical difficulties. Conversely, about half (48%) of all nuclear reactor units ordered in the United States were cancelled after approval and before completion. Matching 241 proposed new nuclear units with 341 protest events resulted in 1,169 protest-unit dyads. To be clear, each dyad links together an active project with a protest that occurred within 100 miles of it. Therefore, a specific protest might appear in multiple dyads, and similarly, a specific nuclear unit might appear in multiple dyads as well.

To fully exploit of the longitudinal richness of our data, we decided to adopt an event-history approach. The peculiarities of our empirical setting, however, make survival analysis more challenging because each active project (and therefore each dyad) has two possible outcomes: *completion*, i.e. the unit is connected to the grid, and *cancellation*, i.e. the project is abandoned. Since a competing risk can preclude the event of interest—in this case, cancellation—from occurring, its presence requires a slight deviation from the conventional Cox proportional hazards for single-failure event history data. As such, we use *competing-risk regression* to model our data (Fine & Gray, 1999). This method allows researchers to model the sub-distributions of the competing risks directly. In other words, the model is suitable for examining the occurrence of different types of mutually-exclusive events while still allowing for right-censoring. For the purposes of our analysis, each dyad enters the observation window when the associated protest occurs and exits when one of the two competing events (cancellation or completion) takes place.

Variables

Because of our choice of models, in our analysis the hazard of cancellation of the nuclear project in each pair is the main dependent variable for all hypotheses, with completion as a competing risk event. *Claim specialization* is the main independent variable for Hypothesis 1; to operationalize this we use a simple count of the number of non-nuclear claims associated with each protest event, with a higher number signaling lower claim specialization. The types and number of claims associated with each protest event were coded as part of the Dynamics of Collective Action Project and they are therefore included in the original dataset. In the Dynamics of Collective Action dataset, coders could assign up to 4 claims (out of 170 possible claims) to a protest event. Because, by design, each of our protest events in our protest-unit dyads has been assigned an "Anti-Nuclear (Power) Movement" claim, we simply count the number of other claims assigned to the protest event. In a similar fashion, for Hypotheses 2 and 3 the main independent variable is *tactical specialization*, which is once again operationalized as the number of tactics associated with the focal protest; protests that adopt more tactics are considered to be less specialized. Coders could assign up to four distinct tactics to each protest, so our variable ranges from one to four. Hypothesis 4 considers the role of *claim diversity in the protest environment*, which we measure as the number of unique claims from nearby protest events (i.e. events within 100 miles of the focal protest and taking place in the previous 2 years). Finally, Hypothesis 5 looks at *claim concentration in the protest environment*: we operationalize this as the Herfindahl-Hirschman concentration index of claims made by nearby protests, or:

$$\sum_{i=1} s_i^2 \, , s = \frac{n_i}{n_{all}}$$

where n_i is the number of nearby protests events in which claim i is reported, and n_{all} is the number of all nearby protest events. Because these two latter variables were found to be highly correlated, we orthogonalized them by means of the *orthog* command in STATA 12.

Since other factors can affect the cancellation of a planned unit, we also included a set of controls in our study. To control for the fact that the chances of cancellation are likely to vary as time goes by, we include the logged number of months elapsed since approval as a control variable. Similarly, since protest events might vary in effectiveness depending on their distance from the proposed site, we also include the distance between the protest and its associated unit for each dyad in our models. The likelihood of protest success is also likely to be contingent on whether there are other completed nuclear reactors in operation, other nuclear sites that have been cancelled, and other nuclear sites that are being constructed in the vicinity. Because these factors might impact audience responses to activism as well as reflect the prior success of activists, we include count variables to control for all three. Finally, technical considerations might make certain units more likely to be cancelled, for instance because expression of a less mature technology; to control for this, we include dummies for the type of nuclear unit being constructed. Finally, we include regional dummies to account for geography-specific effects that might confound our findings.

Further controls drawn from the Dynamics of Collective Action dataset include a dummy for whether violence occurred, a dummy for the presence of counterdemonstrators, the number of SMOs involved, a categorical variable for the number of participants, the protest duration in days and the number of the page on which the protest was reported in *The New York Times*—this latter variable to control for the fact that some protests might receive more media attention than others. Finally, to account for the possibility that protests might be more successful when they build on a history of local activism or on prior traumatic events, we include variables for the number of protests and accidents to have occurred within 100 miles of the proposed nuclear site in the 2 years prior to the focal protest. Summary statistics for the variables in our dataset are reported in Table 2.2.

---------- Insert Table 2.2 about here ----------

Results

---------- Insert Table 2.3 about here ----------

Table 2.3 reports the results of our competing-risk regression models for the hazard of cancellation of the active project associated with each dyad. Model 1 includes just control variables, while Model 2 adds the variable for the logged number of non-nuclear claims, whose coefficient is negative and significant in both Model 2 and in subsequent models, indicating support for Hypothesis 1. Model 3 includes the variable for the logged number of protest tactics associated with each event, whose coefficient is positive and corroborates Hypothesis 2. Model 4 adds the interaction term for these latter two variables, which is negative and significant as predicted by Hypothesis 3. The remaining models add the number of unique claims in neighboring protests in the past 2 years (Model 5) and the Herfindahl index for them (Model 6) These two latter models support the tenets of Hypotheses 4 and 5.

---------- Insert Figure 2.1 about here ----------

Figure 2.1, reported above, provides a visual representation of the interaction effect described in Hypothesis 3: for a given number of tactics being used during the focal protest event, the likelihood of reactor cancellation is noticeably higher when there are few non-nuclear claims being advanced—or even better, none at all.

Discussion and Conclusion

We developed a set of arguments about how claim specialization can contribute to protest effectiveness in attaining a desirable social movement outcome. We focused on two factors in

particular in our analysis of activism against planned nuclear power plant sites in the U.S. First, we showed that when anti-nuclear protests articulate additional claims that are not directly related to anti-nuclear issues, they are less effective in obtaining cancellations of nearby nuclear power plant projects. Second, anti-nuclear protests are more effective when they employ a broad range of tactics, because in so doing they are more likely to elicit attention from local communities. We also showed how these effects are mutually reinforcing: the effect of tactical diversity is particularly prominent under conditions of strong protest specialization. Finally, our findings underscore the importance of the protest environment in shaping social movement outcomes: the presence of many unique claims, as well as public attention being concentrated on just a few claims, are detrimental factors when it comes to achieving social movement goals. Together, our findings show the importance of claim specialization and tactical diversity in achieving social movement success.

Although we have compiled a comprehensive dataset with attractive features for studying the contingencies of social movement success, several empirical issues might still stand in the way. First, because we study how features of certain protest events and their environment alter their effectiveness in shutting down nuclear sites, by design, we do not study the outcomes of nuclear plants which did not encounter opposition in the form of protest. As such, we cannot be sure whether the sample of nuclear plants we analyzed are simply more vulnerable to protest than those that did not have linked protests – in other words, we cannot rule out sample selection bias as being responsible for our results. To correct for this, we estimated a Heckman sample selection model by first modeling the probability that a nuclear site would be targeted by an anti-nuclear protest event within 100 miles of its location (and therefore be included in our sample). We then include that predicated probability in the form of an Inverse Mills Ratio as an additional control variable for each protest-site dyad in our models. This did not alter our results.

Second, our results for Hypothesis 1 might be a result of omitted variable bias. Specifically, it is possible that we do not observe some feature of the nuclear site that makes it simultaneously less likely to be cancelled and more likely to be targeted protestors articulating multiple claims. If this is the case, then our findings could be considered spurious. To address this concern, we conducted an instrumental variable analysis. Here, we used the length of the article associated with the protest event in a focal dyad as an instrumental variable in a first stage model to predict the number of claims reported at the protest event. We then used the two-stage least squares approach (2SLS) to estimate the effect of the predicted number of claims from the first stage model on the hazard of cancellation. Our results here were also consistent with our main findings in Table 2.3.

Together, our results contribute significantly to a clearer understanding of what makes protests with organizational targets successful. In addition, we show that despite the overall success of the anti-nuclear movement in curtailing the spread of nuclear power plants in the U.S., within the movement itself, protests garnered heterogeneous results. While scholarship attributes the demise of many planned nuclear power plant sites to the presence of protest activity, little work has systematically investigated their outcomes. Ours is the first study to link variables at the protest event level to observable indicators of success at the organizational level.

Our findings also reveal another dimension of the role of hybridity in social movement protest, which has attracted recent scholarly attention. Wang and Soule (2012), for example, find that social movement organizations that already span many tactical repertoires are likely to adopt new tactics from other SMOs. Heaney and Rojas (2014) further find that if a movement adopts a hybrid identity that cuts across movement claims and groups, they are likely to attract more supporters. However, our results show that there can be a trade-off with the benefits of hybridity. Specifically, spanning movement categories can also make a particular protest less

effective in attaining a desirable outcome. Thus, while recruitment might benefit from hybridity, when articulating grievances, protestors appear to be better served focusing on single issues.

By deliberately choosing a setting in which we can observe both protest success and failure, our study avoids the prevalent problem of sampling on the dependent variable in social movement research (Boudet and McAdam 2012). In terms of substantive contributions, we demonstrate that by focusing only the success of the anti-nuclear power movement in the U.S., we do not obtain a clear picture of what made it successful. Methodologically, we hope our work encourages future scholarship that is sensitive to the variable outcomes that social movements can produce.

CHAPTER THREE

Critical Events and the Emergence of Mobilization: County-Level Reactions to Nuclear Power Generation in the United States [15]

Introduction

Within the social movement literature (Amenta, Caren, Chiarello, & Su, 2010), a critical event can be defined as "a crucial turning point for a social movement that dramatically increases or decreases the level of mobilization" (Hess and Martin 2006: 249). Examples include accidents, major political events such as wars, natural disasters, as well as riots or other critical encounters (Armstrong & Crage, 2006). Such events are important because they affect the ability of social movement organizations (SMOs) to mobilize broader publics and precipitate changes in society, economics, and politics, occasionally laying the groundwork for revolutions (McAdam, Tarrow, & Tilly, 2001; Tilly, 1978, 2004). Critical events exert their action by altering expectations, creating perceptions of threat, as well as acting as attention-focusing devices that bring local communities and other constituencies closer to social movement issues (Staggenborg, 1993). On the other hand, critical events can also result in demobilization by distracting attention away from the issues championed by social movements. In all, critical events can either catalyze of hamper mobilization, and while they are often beyond the control of social movement organizations, they can nonetheless affect their ability to achieve their goals in a significant capacity.

While existing studies have done much to shed light on the mechanisms whereby critical events affect collective action, however, they have typically not examined the effects of different types of critical events on the unfolding of mobilization; moreover, the question of whether said effects might spill over across multiple issues has not been addressed, either. With these gaps in the literature in mind, in this paper we examine community-level reactions to critical events; more specifically, we examine the impact of three distinct types of critical events related to nuclear

[15] This chapter is joint work with Fabrizio Perretti.

power that can occur locally—the *proposal*, *completion*, and *cancellation* of a new nuclear unit—on the emergence of mobilization across issues. In so doing, we show that: 1) the proposal of a new nuclear unit is associated with a significant upsurge in anti-nuclear mobilization within 100 miles, in that it makes the issue of nuclear power salient in the eyes of the local community, thereby making mobilization more likely; 2) the cancellation of a new nuclear unit is also associated with a similar increase, likely because success positively reinforces the activists' efforts, paving the way for further mobilization; 3) cancelled nuclear units are associates with an increase in mobilization on other issues in neighboring areas; 4) communities that are more highly educated are more likely to channel collective action towards other goals once proposed nuclear units in their vicinity have been cancelled. In the remainder of the paper, we briefly review the role that critical events have been found to play in eliciting the emergence of mobilization (Hess & Martin, 2006; Rohlinger, 2009; Staggenborg, 1993). Before developing our theoretical framework, we delve into the specificities of our empirical setting, briefly touching upon the history of nuclear power in the United States as well as the opposition to it, both of which began in the late 1950s. We then discuss our data and the details of our empirical analyses, we present our results, and we elaborate on their implications for social movement theory and the dynamics of collective action.

Nuclear power in the United States

A 20th century technology grounded in then cutting-edge developments in particle physics, nuclear power generation involves the use of nuclear reactions to generate electricity and heat. The first man-made nuclear reactor was assembled in 1942 at the University of Chicago, under the supervision of Italian physicist Enrico Fermi. This was part of a larger governmental R&D project known as the Manhattan Project, whose main aim was to create weapons to be used during and after World War II. After the war, the United States government encouraged the development of nuclear energy for civilian purposes. Congress created the Atomic Energy

Commission (AEC) in 1946, which authorized the construction of Experimental Breeder Reactor I at a site in Idaho. The reactor generated the first electricity from nuclear energy on December 20, 1951. It was soon followed by the first commercial electricity-generating plant powered by nuclear energy, located in Shippingport, Pennsylvania, which reached its full design power in 1957. Private industry players then became more and more involved in developing other light-water reactors, while federal nuclear energy programs shifted their focus to developing other reactor technologies. The rapid growth experienced by the nuclear power sector in the 1960s was largely due to utility companies seeing this new form of electricity production as economical, clean and environmentally safe.

---------- Insert Figure 3.1 about here ----------

Figure 3.1 shows the number of nuclear units in the United States by stage of development as a function of time. Interest in nuclear power peaked in the early 1970s, with over 90 new units planned for construction; as a result, the number of operational units more than tripled between 1970 and 1980. The fortunes of nuclear power drastically changed starting in the late 1970s, however; while the number of operational units continued to rise, orders plummeted and cancellations boomed, so that approximately 48 percent of all nuclear units proposed by the mid-1990s were ultimately cancelled. The demise of nuclear power has been attributed to a variety of factors by historians: cost and time overruns, more stringent regulatory requirements, the 1973 oil crisis, as well as shifting public opinion (Rosa & Dunlap, 1994) and the growing clout of anti-nuclear activists, among others.

The emergence of anti-nuclear mobilization across American communities

The United States have a long history of local opposition to energy projects (McAdam & Boudet, 2012) and nuclear power is certainly no exception (Giugni, 2004; Wellock, 1998). Indeed,

despite widespread public support for nuclear power in the early days of the technology, mobilization against nuclear power began to emerge in the late 1950s. Protests against nuclear installations, which began when unions voiced their opposition to the Fermi-1 reactor prototype in Newport, Michigan in 1957, actually predated the opening of the first commercial power plant, which was in fact established in Pennsylvania in 1958. Other areas of the country, such as the West, experienced similar level of hostility against nuclear power plants: a proposal filed in the late 1950s by a utility company for a new plant to be built at Bodega Bay, California, was met with a large public demonstration and the involvement of prominent environmentalist groups; plans for construction were eventually set aside in 1964. Another proposed plant to be located in Malibu incurred the same fate a few years later (Wellock, 1998). Mirroring the booming expansion of nuclear power, anti-nuclear activism also grew in the following decades: between 1960 and 1995 the New York Times reported no fewer than 341 distinct anti-nuclear protest events that took place all over the country, and whose temporal evolution is reported in Figure 3.2.

---------- Insert Figure 3.2 about here ----------

In the late 1970s, the discourse surrounding nuclear power shifted markedly: once touted as a cheap, safe and affordable source that would provide energy "too cheap to meter", it increasingly came to be depicted as a "runaway technology" capable of inflicting immense societal harm (Gamson & Modigliani, 1989), which resulted in increased opposition among the general public (Horlick-Jones et al., 2012; Piazza & Perretti, 2015). Figure 3.2 shows how anti-nuclear protests began gaining traction after 1975 and eventually peaked in correspondence of the Three Mile Island accident in 1979 (Nelkin, 1981; Walsh, 1986).

Critical events and mobilization across issues

In social movements, critical events refer to events that create sudden, often unexpected, attention to a movement's issues, such as a Supreme Court decision, an urban riot, or a natural disaster (Meyer & Staggenborg, 1996). Staggenborg (1993) distinguishes six types of critical events that can affect the fortunes of collective action: 1) large-scale socio-economic and political events; 2) natural disasters and epidemics; 3) accidents; 4) critical encounters; 5) strategic initiatives; 6) policy outcomes. Even though such events are often beyond activists' control, movements often exploit critical events as an opening in the political opportunity structure to advance their agendas. Commonly, critical events create perceptions of threat, which can aid mobilization within a community. For instance, Wright and Boudet (2012) recount how mobilization in the face of environmental risk typically tends to arise following an Environmental Impact Statement, i.e. a document that is released whenever a new project might be hazardous to the environment. In a similar fashion, for what concerns our empirical setting we contend that the proposal of a new nuclear unit will be perceived as a threat by neighboring communities, thereby favoring the emergence of anti-nuclear mobilization. Thus:

Hypothesis 1. Proposed new nuclear units will be associated with an increased likelihood of anti-nuclear protest activity in their vicinity.

Similarly, a recurring theme in the literature is that favorable critical events, such as the passage of legislation, are often seen as partial social movement successes and therefore spur mobilization and further growth. This is because they showcase activism as a viable opportunity for social change, so that, even though a substantial success might have been achieved, well-established SMOs can avoid demobilization and push further towards even more ambitious goals, especially in the presence of counter-mobilization (Staggenborg, 1988). Within our empirical context,

cancellations of proposed new nuclear unit represent the main outcome for anti-nuclear activists: because completed reactors are rarely shut down and tend to operate for decades, having a proposed new unit cancelled is often the only opportunity for activists to avoid having a nuclear reactor operate in their vicinity. For this reason, we would expect cancellations of nuclear unity in the proximity of a local community to have a positive effect on anti-nuclear mobilization in the community. Thus:

Hypothesis 2. Cancellations of proposed new nuclear units will be associated with an increased likelihood of anti-nuclear protest activity in their vicinity.

Conversely, we would expect critical events with a negative valence to be perceived as setbacks by activists, if not as outright defeats. When a major loss occurs, supporters are likely to lose faith in the movement and in its ability to promote change, resulting in demobilization. Further, we suggest that this demobilization process will likely result in different issues coming to the forefront of the public debate in the local community (Hilgartner & Bosk, 1988), thus creating room for activism on other themes by competing SMOs (Soule & King, 2008). If this is the case, we would expect the completion of a nuclear unit to be associated with an upsurge in mobilization on other themes in neighboring communities. Therefore:

Hypothesis 3. The completion of proposed new nuclear units will be associated with an increased likelihood of mobilization on other issues in their vicinity.

A fourth—and final—hypothesis concerns the scope conditions of the above statement: which counties will be more likely to experience increased activism on other issues once anti-nuclear mobilization has failed to produce a desired outcome? Here, we contend that communities

characterized by higher levels of education will be more likely to subsequently channel their collective action efforts towards other goals, and for several reasons. First of all, such communities are likely to have a higher density of SMOs capable of mobilizing towards other goals. Second, in the mobilization literature education levels have been linked to the degree of involvement in the community (Musick & Wilson, 2008); additionally, they can be a key factor in shaping attitudes towards issues facing the community (Freudenburg & Gramling, 1994). Highly-educated communities are in fact characterized by an increased civic capacity, defined as the capacity of individuals in a community to become active and work together to solve collective problems, factors which can favor the emergence of SMOs and mobilization (Wright & Boudet, 2012). For the two above reasons, we would expect highly educated communities to experience higher levels of mobilization on other themes in the wake of the completion of a new nuclear unit. Thus:

Hypothesis 4. The association between the completion of proposed new nuclear units and mobilization on other issues will be stronger in communities that are more highly educated.

Data and methods

To test our theory, we rely on a quantitative study based on data from several sources. County-level variables were coded based on several editions of the City and County Data Book, compiled by the U.S. Census Bureau. These include information about all U.S. counties at regular time intervals, which were then interpolated to provide yearly data. Additionally, all counties were individually geo-coded and assigned a pair of coordinates based on their approximate center.

All information concerning proposed nuclear reactor units were obtained either from the PRIS (Power Reactor Information System) online database maintained by the International Atomic Energy Agency (IAEA) or from historical documents included in the Nuclear Regulatory

Commission's (N.R.C.) Agency-wide Documents Access and Management System (ADAMS). By triangulating these sources, we were able to construct our core dataset containing the following information for each proposed new nuclear unit approved by the NRC: unit name, plant name, year of order, date of cancellation or connection to the grid, plant location (nearest town and geographic coordinates), county and state. Additionally, all nuclear units were matched to counties in their vicinity based on their respective geographical coordinates.

Finally, the mobilization variables were pulled from a database of protest events created at Stanford University and called "Dynamics of Collective Action Project" [16], based on all New York Times (NYT) issues released in the 1960-1995 time window and covering all protest events that happened in the public sphere. Most relevant for our analysis, the database includes information about the purpose of each protest event. Protests opposing nuclear power were identified as those including the claim "Anti-Nuclear (Power) Movement", which yielded a subset of 341 protests in the same time interval. Overall, the dataset includes information about approximately 23,000 protest events that took place all over the United States between 1960 and 1995.

Variables

For Hypotheses 1 and 2 the main independent variable is the logged level of anti-nuclear protest activity in county *i* at time *t*. This is obtained by a simple count of the protest events that occurred within the county borders and that were coded as targeting nuclear power in a given year. In a similar fashion, Hypotheses 3 and 4 have as a dependent variable the logged level of protest activity unrelated to nuclear power in county *i* at time *t*. Once again, this is essentially a count of every protest event occurring in the county that does not target nuclear power in a given year.

[16] For more information, see http://www.dynamicsofcollectiveaction.com .

The main independent variables are the number of proposed, completed and cancelled nuclear units within 100 miles of each local community, with distance measured as the law-of-cosines great circle distance ("as the crow flies") between the respective pairs of coordinates (county and nuclear unit). *Proposed units* are all units that have been formally announced by an electric utility and approved by the Nuclear Regulatory Commission, regardless of whether construction has begun or not. *Cancelled units* are those proposed units that were later abandoned and never reached the operational stage. Conversely, *completed units* are those reactors that were eventually connected to the grid and began operating. For the purposes of our study, our three main independent variables are coded as follows: 1) current number of proposed nuclear units within 100 miles of the focal county in year *t*; 2) number of cancelled nuclear units within 100 miles of the focal county up to year *t*; 3) number of completed nuclear units within 100 miles of the focal county up to year *t*.

Because other factors can affect the occurrence of mobilization, we also included a set of controls in our study. County-level variables with the potential to affect the development of activism include *unemployment*, *median income*, *total county population*, *percentage of African-Americans*, as well as the *percentage of college-educated individuals* and the *political leaning of the county*, measured as whether a majority of voters chose a Republican or a Democratic candidate in the most recent presidential election. In addition to the above, we control for past levels of anti-nuclear and unrelated activism in the county, as well as past mobilization on related themes, such as peace, environment, Not-In-My-Backyard (NIMBY), and atomic weapons, because a history of activism on these issues might be particularly conducive to the development of anti-nuclear mobilization. Summary statistics for all the variables in our dataset are reported in Table 3.1.

---------- Insert Table 3.1 about here ----------

Results

---------- Insert Table 3.2 about here ----------

Table 3.2 reports the results of ordinary least squares (OLS) regression models with the logged level of anti-nuclear protest activity as the dependent variable. Model 1 includes just basic control variables, while Model 2 adds the control variables related to previous protests on related themes. Model 3 adds state dummies, to control for unobserved, time-invariant heterogeneity at the geographical level. Model 4 includes the variable for the number of completed units within 100 miles, whose coefficient is nonsignificant, while Model 5 adds proposed units, whose coefficient—positive and significant—indicates support for Hypothesis 1. Finally, Model 6 is our full model; the number of cancelled units is found to have a positive and significant effect on nuclear protest activity, corroborating Hypothesis 2.

---------- Insert Table 3.3 about here ----------

The results of our OLS models for logged protest activity unrelated to nuclear power are reported in Table 3.3. Once again, Models 7, 8 and 9 include just control variables, while Models 10, 11 and 12 include our main independent variables separately. In particular, Model 10 shows that completed units are positively associated with mobilization on themes unrelated to nuclear power, providing support for Hypothesis 3. Model 13 includes an interaction term to test Hypothesis 4: its coefficient is positive and significant, indicating that more highly educated communities are more likely to mobilize on other themes once anti-nuclear activism has failed to stop the construction of a power plant, which supports our hypothesis.

Discussion and Conclusion

In this paper, we theorized on the role that critical events might play in shaping mobilization across issues. Through a study of proposed new nuclear reactors and the emergence of anti-nuclear mobilization in the United States, we found different types of critical events associated with nuclear units to have an impact on the levels of protest activity not only against nuclear power, but on other issues as well. More specifically, we found that a new nuclear unit being proposed was associated with a significant increase in anti-nuclear protest activity in neighboring communities. A similar increase was found to be associated with the cancellation of a power plant, likely because social movement success breeds more activism. Finally, we found that the completion of a nuclear power plant—broadly interpretable as a defeat for anti-nuclear activists—translates to an increase in mobilization on other issues, and all the more so in communities that are more highly educated, presumably because education allows for smoother transitions between issues when it comes to mobilizing for social change; moreover, highly educated community are likely to exhibit a higher SMO density and a broader civic capacity.

Taken together, our findings contribute to the social movement literature, and more specifically on extant scholarship concerning the effect of critical events on mobilization (Rohlinger, 2009; Staggenborg, 1993). To our knowledge, our study is the first to examine the impact of multiple types of critical events on the development of issue-specific forms of activism. While most of the existing scholarship on the topic tends to be qualitative, induction-oriented, and focused on a single critical event, our approach allows us to examine the influence of a set of different—albeit related—critical events related to nuclear power on the development of anti-nuclear mobilization and beyond. Additionally, in contrast to the case-based, geographically delimited approach typical of most studies in this area, we examine all U.S. counties in the time window between 1960 and 1995, which allows us to observe broadly and comprehensively the emergence of anti-nuclear activism and its coevolution with mobilization on other issues.

Additionally, we believe another major contribution of our study is the finding that even though some critical events are movement-specific—such as those related to nuclear units in our case—their effects on mobilization can spill over and catalyze collective action on other themes, as well.

While we consider our study to be a valuable addition to the literature on mobilization and critical events, some of its shortcomings must be addressed. Specifically, while our quantitative approach presents a distinct set of advantages, regrettably our analysis cannot boast the level of detail that is typical of the qualitative research that is predominant in the mobilization literature, with specific reference to extant studies on critical events. Nonetheless, we hope our study will foster further inquiry into this area, perhaps integrating qualitative and quantitative methods to fully gauge the extent to which collective action can be hindered or abetted by critical events, as well as to explore the variety of effects that such occurrences can produce. Further studies could also provide useful guidance

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Figure 1.1. Nuclear power units ordered, connected, decommissioned and cancelled in the U.S. by year.

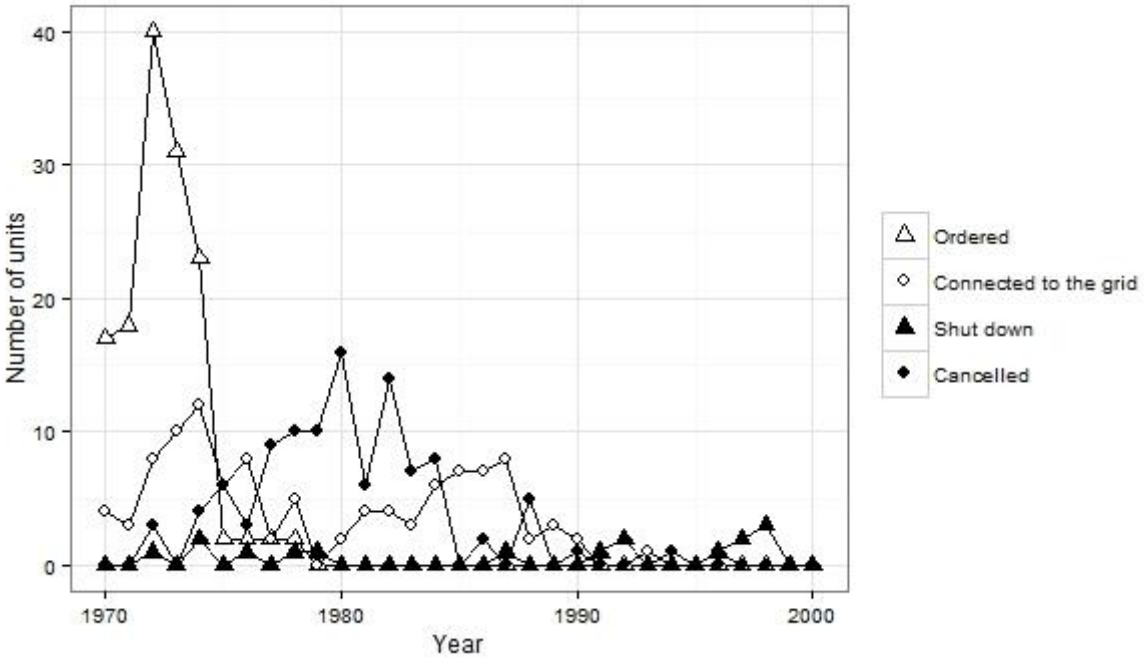

Figure 1.2. Cumulative number of nuclear units in the U.S. by stage of development and by year.

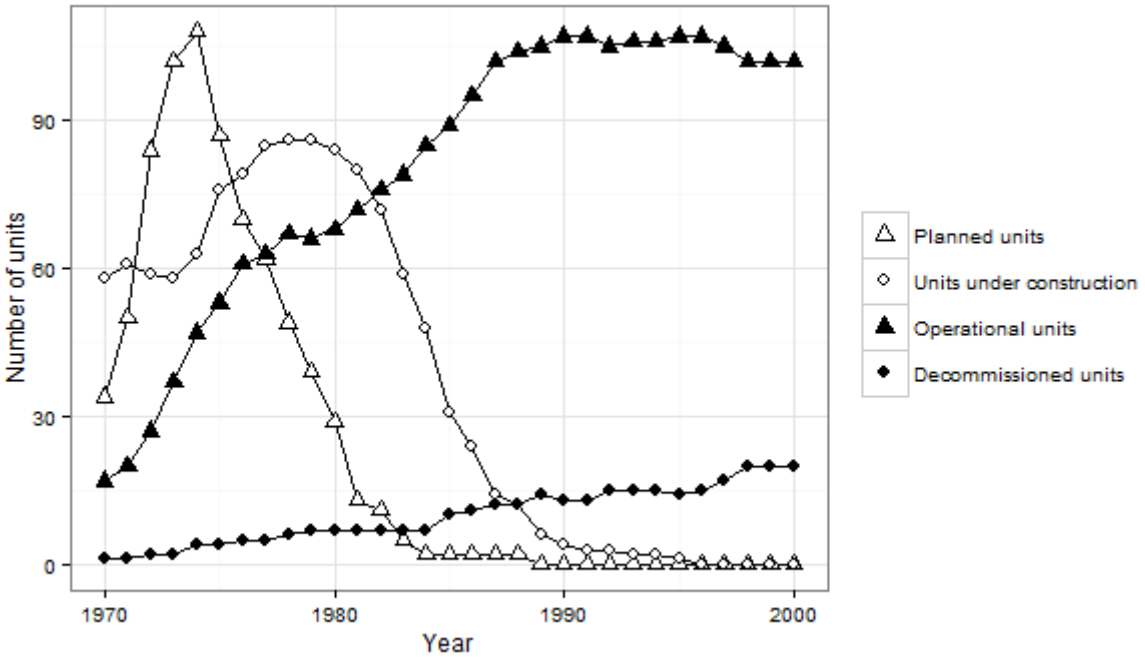

Figure 1.3. Number of New York Times articles about domestic nuclear energy issues, by type of coverage and by year.

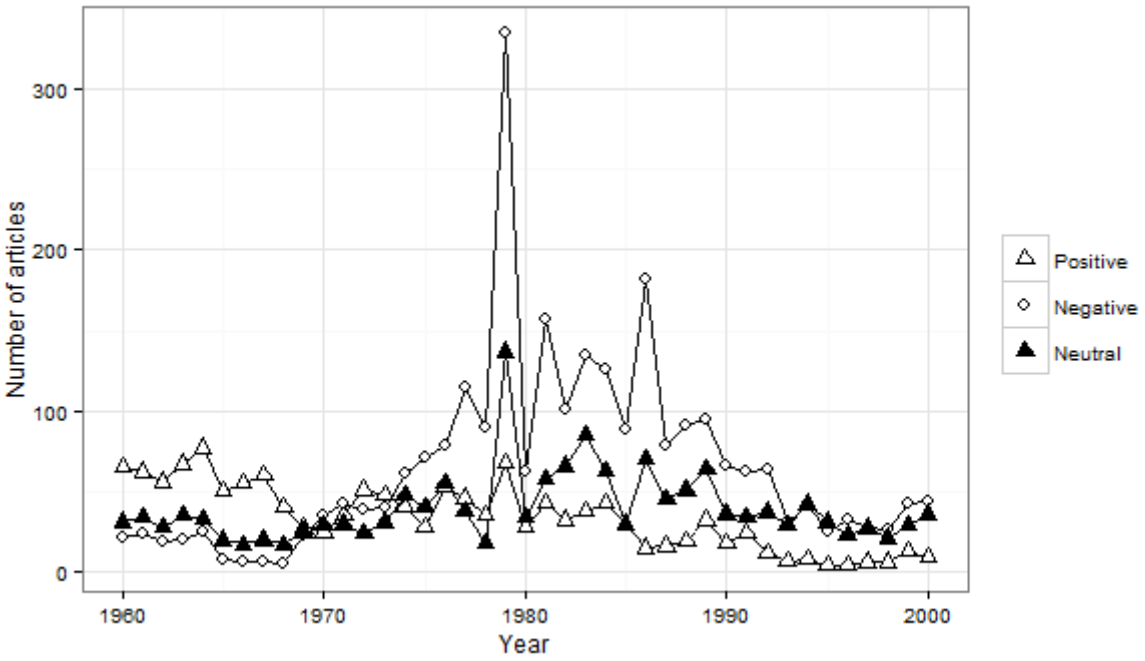

Figure 1.4. Interaction effect between media exposure and stigma intensity for the full logistic model.

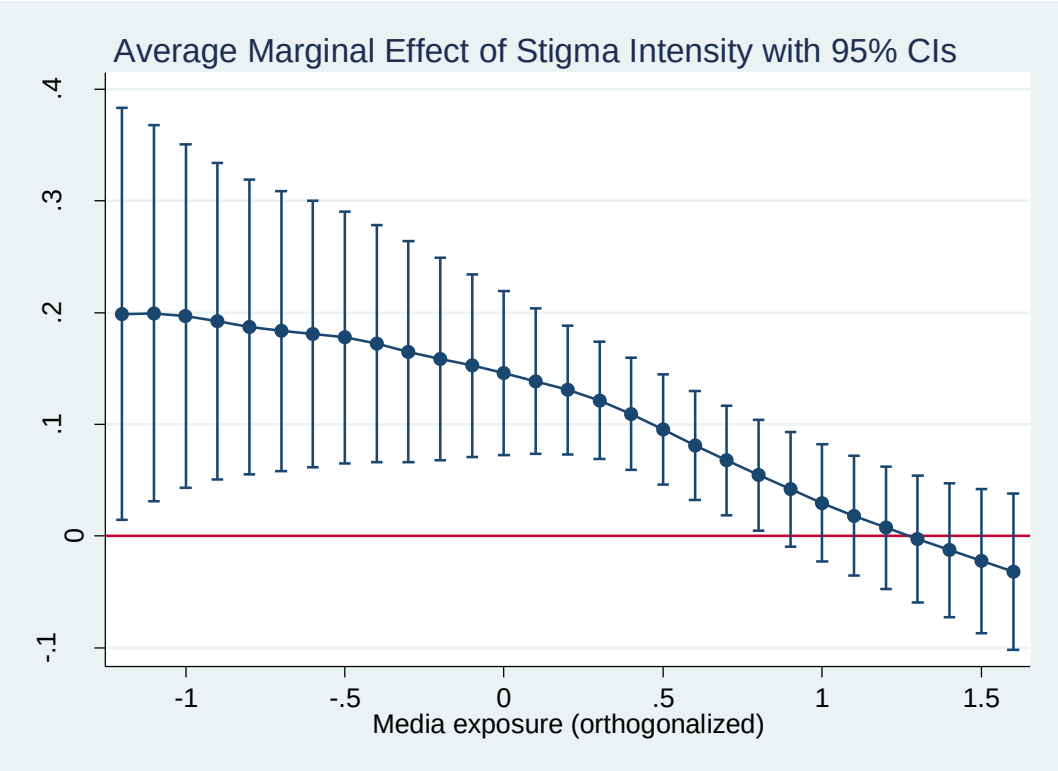

Table 1.1. Coding guidelines for newspaper articles.

Type of media coverage	Definition	Examples
Negative	The article challenges the legitimacy of nuclear power by reporting on public opposition, discussing technological pitfalls, covering accidents or generally presenting critical viewpoints.	"As it nears completion, the Shoreham Nuclear Power Station on Long Island is being cited as the local example of what industry experts say is the end of an era of reactor construction in the United States. The demise of nuclear reactors is in sight, these experts say, because of two factors: rising costs and a reduction in the growth of the demand for power." "Four employees at the Hanford Nuclear Reservation were found to have been contaminated with plutonium Thursday after radiation detection alarms were set off by one of the workers, a spokesman said today. Bill Klink, a spokesman for Rockwell Hanford Operations, said the source of the contamination at the Plutonium Finishing Plant was not known and that the incident was being investigated."
Positive	The article reinforces the legitimacy of nuclear power by painting it in a progressive light, highlighting technological accomplishments, and generally presenting supportive viewpoints.	"According to a soon-to-be-published survey of scientifically trained persons carried out under the auspices of Smith College and Columbia University's Research Institute of International Change, 90 percent of scientists would proceed with nuclear energy. Seven out of 10 energy experts, including 92 percent of scientists in disciplines related to nuclear energy, favor the rapid development of nuclear energy." "The moratorium that has prevented any new nuclear power plants in the United States from going into operation since the accident at Three Mile Island is approaching an end. Tomorrow, the Nuclear Regulatory Commission is scheduled to consider an application for a plant from the Virginia Electric and Power Company, and the commission is thought to be satisfied that safety procedures have been tightened sufficiently to resume licensing new plants for full power operations."
Neutral	The article either reports on nuclear-related facts that do not have any immediate connotation or offers a balanced perspective which allots equal space to positive and negative viewpoints.	"A simulated accident at the Indian Point 3 nuclear reactor produced a mock evacuation of Rockland County one night last week. Although no citizens left their homes and only a handful of buses and ambulances rolled, state and utility officials said they had learned enough to feel confident they could run a safe evacuation in an emergency." "The State Department of Public Utility Control has decided to hire a consultant to audit the construction of the $3.54 billion Millstone III nuclear power plant in Waterford. The department decided Thursday to study Northeast Utilities' construction of the plant, with the results of the audit to be used to determine which costs should be passed on to ratepayers. The plant is scheduled to go into service in 1986."

Table 1.2. Descriptive statistics and pairwise correlations.

		Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Duration of project	9.472	4.796	0	26	1														
2	Unit power	1045.6	198.64	330	1317	0.145	1													
3	Three Mile Island (dummy)	0.523	0.501	0	1	0.696	0.419	1												
4	Utility size in MWh (logged)	23.723	1.28	18.217	25.544	0.167	0.129	0.06	1											
5	Republican governor (dummy)	0.425	0.496	0	1	0.192	0.062	0.215	-0.13	1										
6	Oil price	55.298	24.793	20.04	105.84	0.148	0.362	0.593	-0.02	-0.02	1									
7	Coal price	44.734	10.124	23.07	57.6	-0.18	0.297	0.063	-0.04	-0.17	0.711	1								
8	Number of owners	1.701	1.743	1	11	0.139	0.045	0.03	-0.16	-0.02	-0.2	-0.21	1							
9	Public ownership (dummy)	0.136	0.343	0	1	0.089	0.14	0.104	-0.08	0.157	0.059	-0.05	-0.16	1						
10	Experience	13.121	19.729	0	96	0.514	0.252	0.449	0.208	0.14	0.044	-0.14	0.075	0.124	1					
11	Nuclear energy share	0.116	0.185	0	1	0.067	0.035	0.048	-0.26	0.008	0.053	0.104	-0.03	-0.03	0.189	1				
12	Social movement pressure	0.874	2.764	0	32	0.058	0.105	0.123	-0.04	-0.06	0.158	0.149	-0.02	-0.11	0.005	0.078	1			
13	Stigma intensity (orthogonalized)	0	1.002	-1.815	2.705	0.518	0.207	0.27	0.09	0.069	-0.18	-0.12	0.221	0.008	0.436	-0.01	0.063	1		
14	Media exposure (orthogonalized)	0	1.002	-1.626	1.644	0.347	0.45	0.807	0.052	0.085	0.861	0.486	-0.09	0.064	0.236	0.086	0.191	0	1	
15	Extent of membership	0.134	0.16	0	1	0.171	0.06	0.102	-0.09	0.152	-0.04	-0.02	0.038	-0.07	0.392	0.712	-0.04	0.156	0.057	1

Table 1.3. Logistic regression analysis of the probability of unit cancellation.

DV: unit cancellation	Model 1	Model 2	Model 3	Model 4	Model 5
Duration of project	-0.640	-0.950	-1.320	-1.004	-1.530
	(3.57)***	(4.75)***	(3.76)***	(4.28)***	(3.73)***
Unit power (MW)	-0.001	-0.002	-0.006	-0.003	-0.008
	(0.24)	(0.80)	(1.51)	(1.00)	(1.69)
Unit type: BWR	1.074	1.786	2.319	2.239	3.455
	(2.36)*	(2.53)*	(2.42)*	(2.51)*	(2.61)**
Unit type: experimental	0.183	0.710	0.566	0.115	-0.176
	(0.17)	(0.54)	(0.36)	(0.08)	(0.11)
Three Mile Island (dummy)	6.033	7.701	12.688	8.687	15.037
	(3.36)***	(3.63)***	(2.92)**	(3.47)***	(3.13)**
Units under construction, same plant (dummy)	0.514	0.570	0.501	1.329	2.123
	(0.73)	(0.77)	(0.66)	(1.28)	(1.70)
Units planned, same plant (dummy)	6.418	6.640	8.177	6.997	9.415
	(5.65)***	(5.31)***	(4.72)***	(4.78)***	(3.95)***
Units under construction, same utility (dummy)	-0.797	-0.904	-0.495	-1.120	-1.218
	(0.78)	(0.90)	(0.48)	(1.17)	(1.23)
Units planned, same utility (dummy)	-2.920	-1.818	-2.925	-1.686	-2.880
	(3.47)***	(1.87)	(2.77)**	(1.78)	(2.84)**
Units under construction, same state (dummy)	0.712	0.803	1.155	0.088	-0.147
	(0.66)	(0.75)	(0.73)	(0.09)	(0.08)
Units planned, same state (dummy)	-0.140	-1.155	-0.657	-0.383	0.531
	(0.26)	(1.05)	(0.53)	(0.29)	(0.38)
Operational units, same state (dummy)	0.245	0.617	0.918	0.687	1.328
	(0.38)	(0.95)	(1.20)	(1.06)	(1.58)
Utility size in MWh (logged)	-0.233	-0.292	-0.130	-0.321	-0.318
	(0.64)	(0.86)	(0.26)	(0.90)	(0.66)
Republican governor (dummy)	-0.453	-0.273	-0.257	-0.273	-0.205
	(0.88)	(0.45)	(0.43)	(0.43)	(0.35)
Oil price	-0.039	0.010	-0.026	0.000	-0.028
	(1.63)	(0.26)	(0.72)	(0.01)	(0.78)
Coal price	0.109	0.071	0.150	0.099	0.183
	(1.72)	(0.94)	(1.70)	(1.20)	(2.05)*
Number of owners	-0.252	-0.369	-0.334	-0.342	-0.282
	(0.97)	(1.52)	(1.30)	(1.62)	(1.26)
Public ownership (dummy)	1.030	0.818	1.334	0.830	1.394
	(1.08)	(0.82)	(1.08)	(0.75)	(1.10)
Experience	0.060	0.045	0.055	0.066	0.083
	(1.96)*	(1.95)	(2.64)**	(2.62)**	(3.99)***
Fraction of nuclear energy generated	-2.918	-0.805	-0.280	2.102	3.399
	(1.11)	(0.32)	(0.09)	(0.68)	(0.97)
Social movement pressure	-0.055	-0.102	-0.136	-0.155	-0.234
	(1.11)	(1.55)	(1.87)	(1.96)	(2.67)**
Stigma intensity (orthogonalized)		1.913	2.417	2.096	2.929
		(4.20)***	(4.08)***	(4.28)***	(4.10)***
Media exposure (orthogonalized)		-0.669	-1.952	-0.767	-2.447
		(0.64)	(1.95)	(0.67)	(1.96)
Stigma Intensity X Media Exposure			-2.006		-2.302
			(3.43)***		(3.43)***
Extent of membership				-11.119	-15.796
				(2.06)*	(2.94)**
Constant	5.424	9.247	7.584	10.774	13.658
	(0.67)	(1.25)	(0.77)	(1.34)	(1.47)
Pseudo-R^2	0.58	0.65	0.70	0.68	0.74
N	214	214	214	214	214

* $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 1.4. Alternative model specifications with probit regression, LPM, and logit with SE clustered at the plant level.

DV: unit cancellation	Model 6 (Probit)	Model 7 (LPM)	Model 8 (Logit with plant-clustered SE)
Duration of project	-0.748 (4.76)***	-0.085 (9.88)***	-1.419 (3.91)***
Unit power (MW)	-0.004 (2.21)*	-0.000 (0.07)	-0.007 (1.86)
Unit type: BWR	1.672 (3.09)**	0.104 (2.16)*	3.219 (2.72)**
Unit type: experimental	-0.193 (0.26)	0.077 (1.22)	-0.216 (0.12)
Three Mile Island (dummy)	7.075 (3.32)***	0.468 (2.94)**	13.805 (2.87)**
Units under construction, same plant (dummy)	0.972 (1.74)	0.056 (0.83)	1.786 (1.55)
Units planned, same plant (dummy)	4.786 (5.25)***	0.530 (5.52)***	8.691 (3.94)***
Units under construction, same utility (dummy)	-0.585 (1.07)	0.016 (0.22)	-1.025 (1.00)
Units planned, same utility (dummy)	-1.512 (2.91)**	-0.263 (3.33)**	-2.548 (2.35)*
Units under construction, same state (dummy)	0.099 (0.13)	0.032 (0.37)	-0.127 (0.08)
Units planned, same state (dummy)	0.185 (0.35)	-0.009 (0.12)	0.251 (0.19)
Operational units, same state (dummy)	0.498 (1.22)	0.057 (1.04)	1.000 (1.19)
Utility size in MWh (logged)	-0.191 (0.88)	-0.016 (0.80)	-0.264 (0.56)
Republican governor (dummy)	-0.116 (0.40)	-0.030 (0.62)	-0.174 (0.26)
Oil price	-0.015 (0.90)	0.004 (1.00)	-0.030 (0.84)
Coal price	0.085 (1.94)	0.001 (0.21)	0.169 (1.68)
Number of owners	-0.212 (1.84)	-0.039 (2.58)*	-0.330 (1.45)
Public ownership (dummy)	0.676 (1.28)	0.094 (1.15)	1.380 (1.15)
Experience	0.045 (4.20)***	0.005 (2.74)**	0.079 (3.86)***
Fraction of nuclear energy generated	1.525 (1.01)	0.256 (1.10)	2.828 (0.82)
Social movement pressure	-0.082 (1.80)	-0.003 (0.42)	-0.141 (1.07)
Stigma intensity (orthogonalized)	1.443 (4.86)***	0.155 (4.70)***	2.656 (4.33)***

Media exposure (orthogonalized)	-1.102 (1.59)	-0.088 (1.06)	-2.213 (1.37)
Stigma Intensity X Media Exposure	-1.174 (4.09)***	-0.113 (2.21)*	-2.176 (3.72)***
Extent of membership	-7.624 (3.56)***	-0.688 (2.87)**	-13.645 (2.92)**
Constant	7.872 (1.65)	1.118 (2.17)*	12.518 (1.36)
N	214	214	214

* $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 1.5. Alternative LPM specifications with state fixed effects, utility fixed effects and robust standard errors

DV: unit cancellation	Model 9	Model 10
Duration of project	-0.099 (8.33)***	-0.099 (7.54)***
Unit power (MW)	-0.000 (0.51)	0.000 (1.28)
Unit type: BWR	0.186 (2.87)**	0.180 (2.66)**
Unit type: experimental	0.021 (0.15)	0.103 (0.70)
Three Mile Island (dummy)	0.413 (2.11)*	0.809 (4.01)***
Units under construction, same plant (dummy)	0.051 (0.66)	0.109 (1.12)
Units planned, same plant (dummy)	0.424 (3.73)***	0.393 (3.17)**
Units under construction, same utility (dummy)	0.023 (0.24)	-0.033 (0.23)
Units planned, same utility (dummy)	-0.272 (2.71)**	-0.149 (1.29)
Units under construction, same state (dummy)	0.046 (0.37)	0.154 (1.07)
Units planned, same state (dummy)	0.002 (0.02)	-0.077 (0.77)
Operational units, same state (dummy)	0.193 (2.38)*	0.145 (1.63)
Utility size in MWh (logged)	-0.053 (1.25)	0.087 (0.47)
Republican governor (dummy)	-0.104 (1.34)	-0.172 (1.88)
Oil price	0.001 (0.30)	-0.002 (0.36)
Coal price	0.001 (0.11)	0.007 (0.97)
Number of owners	-0.064 (2.60)*	-0.059 (1.96)
Public ownership (dummy)	0.171 (1.38)	0.765 (0.83)
Experience	0.008 (3.32)**	0.006 (1.97)
Fraction of nuclear energy generated	0.232 (0.93)	0.397 (1.10)
Social movement pressure	-0.001 (0.13)	-0.035 (1.25)
Stigma intensity (orthogonalized)	0.189 (5.54)***	0.160 (3.78)***
Media exposure (orthogonalized)	-0.049 (0.57)	-0.140 (1.58)

Stigma Intensity X Media Exposure	-0.133 (2.49)*	-0.144 (2.38)*
Extent of membership	-0.808 (2.79)**	-1.820 (2.72)**
State fixed effects	Yes	No
Utility fixed effects	No	Yes
Constant	2.335 (2.19)*	-1.824 (0.43)
R^2	0.76	0.84
N	214	214

* $p<0.05$; ** $p<0.01$; *** $p<0.001$

Table 2.1. Contingency tables and chi-square tests of the correlation between nearby protests/accidents (< 100 miles) and the outcome of nuclear projects.

	No protest	**Protest**	
Completed	99	30	**129**
Cancelled	30	82	**112**
	129	**112**	**241**

Chi-square: 0.000000000

	No accident	**Accident**	
Completed	101	28	**129**
Cancelled	89	23	**112**
	190	**51**	**241**

Chi-square: 0.824522082

Table 2.2. Descriptive statistics for dyad-level dependent, independent, and control variables (with time-varying covariates computed at cancellation/completion of the associated unit).

		Mean	S.D.	Min	Max	1	2	3	4	5	6
1	Project duration	138.2	54.628	0	266	1					
2	Big city (dummy)	0.485	0.5	0	1	-0.07	1				
3	Active projects within 100 miles	3.39	3.185	0	19	-0.568	0.267	1			
4	Operational units within 100 miles	5.984	3.151	0	16	0.491	0.214	-0.076	1		
5	Previously cancelled units within 100 miles	3.463	2.403	0	14	0.54	0.04	-0.349	0.638	1	
6	Demonstrators' violence	0.011	0.105	0	1	0.015	-0.103	-0.069	-0.028	0.06	1
7	Presence of counterdemonstrators	0.031	0.174	0	1	-0.003	-0.174	-0.01	-0.032	-0.055	0.162
8	Number of disruptive tactics used	0.496	0.958	0	5	0.082	-0.194	-0.234	-0.129	0.038	0.263
9	Number of SMOs	0.717	0.948	0	6	-0.025	0.209	0.036	0	-0.021	0.03
10	Number of participants	3.266	1.447	1	6	0.137	-0.16	-0.237	0.01	0.031	0.03
11	Protest duration (days)	1.228	2.4	0	42	0.039	-0.132	-0.1	-0.045	0.036	0.025
12	Previous protests in the last 2 years and within 100 miles	9.16	8.767	0	33	0.333	-0.231	-0.344	0.236	0.41	0.098
13	Protest claim: environment (dummy)	0.029	0.169	0	1	-0.015	-0.063	0.101	0.047	0.037	-0.018
14	Protest claim: NIMBY (dummy)	0.017	0.131	0	1	0.032	-0.049	-0.033	0.058	0.068	-0.014
15	Protest claim: peace (dummy)	0.016	0.125	0	1	-0.017	0.106	0.06	-0.039	-0.026	-0.013
16	Protest claim: atomic weapons (dummy)	0.048	0.213	0	1	0.116	0.053	-0.032	0.067	0.077	-0.024
17	Unit type: BWR	0.006	0.079	0	1	-0.153	0.082	-0.023	-0.138	-0.113	-0.008
18	Unit type: experimental	0.476	0.499	0	1	-0.372	-0.11	0.031	-0.5	-0.304	0.04
19	Accidents in the previous 2 years and within 100 miles	0.206	0.404	0	1	0.265	-0.076	-0.156	0.289	0.241	0.057
20	Distance between protest site and nuclear unit	61.455	29.81	0.902	99.544	-0.076	0.445	0.271	0.421	0.12	-0.13
21	Herfindahl index of claims in neighboring protests, past 2 years (orthog.)	0	1	-0.659	2.334	-0.406	0.055	0.38	-0.215	-0.301	-0.008
22	Number of unique claims in neighboring protests, past 2 years (orthog.)	0	1	-3.324	6.769	0.023	-0.205	-0.117	-0.152	-0.151	0.007
23	Number of tactics (logged)	0.128	0.306	0	1.386	0.045	0.014	-0.001	0.06	0.08	-0.044
24	Number of non-nuclear claims (logged)	1.234	0.294	0.693	2.197	0.119	-0.09	-0.217	0.023	0.095	0.174

7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1																	
0.054	1																
0.088	-0.126	1															
0.12	0.062	0.108	1														
0.032	0.03	-0.007	0.092	1													
-0.122	0.28	-0.075	0.255	0.144	1												
-0.031	-0.087	-0.009	-0.155	-0.056	-0.051	1											
-0.024	-0.027	0.041	0.034	0.021	0.066	0.236	1										
-0.023	-0.066	0.025	0.036	-0.012	-0.119	-0.022	-0.017	1									
0.032	0.132	0.044	0.048	-0.024	0.128	0.007	-0.03	0.47	1								
-0.014	-0.041	0.024	-0.095	-0.019	-0.078	-0.014	-0.011	-0.01	-0.018	1							
0.048	0.05	0.021	-0.019	0.041	-0.218	-0.032	-0.036	-0.011	-0.085	-0.076	1						
-0.045	-0.031	-0.063	0.012	-0.034	0.296	0.019	0.134	-0.065	0.105	-0.04	-0.205	1					
-0.051	-0.202	0.067	-0.108	-0.04	-0.065	0.029	0.019	0.042	0.014	0.066	-0.254	-0.017	1				
-0.044	-0.023	0.036	-0.053	-0.034	-0.204	-0.064	-0.032	0.056	-0.014	0.072	0.125	-0.022	0.015	1			
0.04	0.117	-0.045	0.035	0.062	-0.042	-0.009	-0.007	-0.114	-0.063	-0.059	0.107	-0.017	-0.156	0	1		
-0.04	-0.023	0.037	-0.008	0.051	0.043	0.389	0.304	0.503	0.62	-0.033	-0.063	0.085	0.062	-0.071	-0.062	1	
0.079	0.425	0.096	0.436	0.036	0.209	-0.14	0.019	0.054	0.197	-0.079	-0.035	0.04	-0.073	-0.031	0.003	0.114	1

Table 2.3. Dyad-level competing-risk regression (CCR) of the hazard of cancellation, with completion as a competing risk event.

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5	(6) Model 6
Project duration	-0.030***	-0.030***	-0.030***	-0.031***	-0.031***	-0.031***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Big city (dummy)	0.656***	0.692***	0.682***	0.711***	0.688***	0.656***
	(0.116)	(0.116)	(0.116)	(0.120)	(0.120)	(0.121)
Active projects within 100 miles	-0.338***	-0.343***	-0.342***	-0.343***	-0.335***	-0.338***
	(0.028)	(0.028)	(0.028)	(0.028)	(0.029)	(0.029)
Operational units within 100 miles	-0.152***	-0.158***	-0.159***	-0.163***	-0.168***	-0.166***
	(0.044)	(0.044)	(0.044)	(0.045)	(0.045)	(0.044)
Previously cancelled units within 100 miles	-0.006	-0.001	-0.002	0.000	-0.002	-0.010
	(0.035)	(0.035)	(0.035)	(0.035)	(0.034)	(0.034)
Demonstrators' violence	0.035	0.039	-0.034	-0.063	-0.000	0.017
	(0.167)	(0.166)	(0.168)	(0.167)	(0.173)	(0.174)
Presence of counterdemonstrators	0.764*	0.745*	0.770*	0.793*	0.667*	0.668*
	(0.317)	(0.318)	(0.315)	(0.315)	(0.307)	(0.303)
Number of disruptive tactics used	-0.045	-0.050	-0.103**	-0.110**	-0.088*	-0.076*
	(0.031)	(0.031)	(0.036)	(0.036)	(0.036)	(0.036)
Number of SMOs	-0.064	-0.074	-0.088+	-0.108*	-0.088+	-0.089+
	(0.047)	(0.048)	(0.048)	(0.050)	(0.046)	(0.047)
Number of participants	0.019	0.016	-0.020	-0.027	-0.013	-0.010
	(0.029)	(0.030)	(0.030)	(0.030)	(0.030)	(0.029)
Protest duration (days)	-0.022	-0.019	-0.018	-0.019	-0.022	-0.021
	(0.017)	(0.017)	(0.017)	(0.017)	(0.018)	(0.018)
Previous protests in the last 2 years and within 100 miles	0.005	0.003	0.004	0.004	0.002	0.002
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Region dummies	-1.341***	-1.416***	-1.393***	-1.413***	-1.286***	-1.148***
	(0.276)	(0.280)	(0.280)	(0.281)	(0.281)	(0.296)
Protest claim: environment (dummy)	0.793*	1.145**	1.143**	1.049**	1.272***	1.294***
	(0.345)	(0.361)	(0.366)	(0.355)	(0.367)	(0.364)
Protest claim: NIMBY (dummy)	-0.341	0.003	0.075	0.075	0.125	0.121
	(0.315)	(0.340)	(0.347)	(0.327)	(0.333)	(0.328)

Protest claim: peace (dummy)	-0.545	-0.273	-0.197	-0.511	-0.091	-0.256
	(0.658)	(0.664)	(0.671)	(0.667)	(0.702)	(0.691)
Protest claim: atomic weapons (dummy)	-0.269	0.235	0.262	0.479	0.486	0.523+
	(0.261)	(0.311)	(0.306)	(0.321)	(0.303)	(0.299)
Unit type: BWR	3.766***	3.636***	3.662***	3.637***	3.493***	3.382**
	(1.055)	(1.050)	(1.050)	(1.051)	(1.044)	(1.050)
Unit type: experimental	-0.194*	-0.199*	-0.210*	-0.207*	-0.190*	-0.196*
	(0.085)	(0.085)	(0.085)	(0.085)	(0.084)	(0.085)
Accidents in the previous 2 years and within 100 miles	0.039	0.024	0.009	0.003	0.107	0.115
	(0.107)	(0.107)	(0.108)	(0.108)	(0.114)	(0.114)
Distance between protest site and nuclear unit	0.005**	0.005***	0.005**	0.005**	0.004**	0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Number of non-nuclear claims (logged)		-0.581**	-0.673***	0.901	-0.825***	-0.803***
		(0.193)	(0.199)	(0.799)	(0.199)	(0.197)
Number of tactics (logged)			0.385**	0.491***	0.327*	0.288*
			(0.134)	(0.140)	(0.130)	(0.130)
Non-nuclear claims x tactics				-1.194*		
				(0.600)		
Number of unique claims in neighboring protests, past 2 years (orthog.)					-0.199***	-0.201***
					(0.052)	(0.050)
Herfindahl index of claims in neighboring protests, past 2 years (orthog.)						-0.158*
						(0.068)
Observations	60,721	60,721	60,721	60,721	60,721	60,721
Chi-square	794.4	793.2	828.9	847.2	881.6	874.5
Log-likelihood	-3279	-3276	-3274	-3272	-3266	-3263
Degrees of freedom	23	24	25	26	26	27
Number of clusters	1178	1178	1178	1178	1178	1178

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Figure 2.1. Graphical depiction of the interaction effect between number of non-nuclear claims and number of tactics.

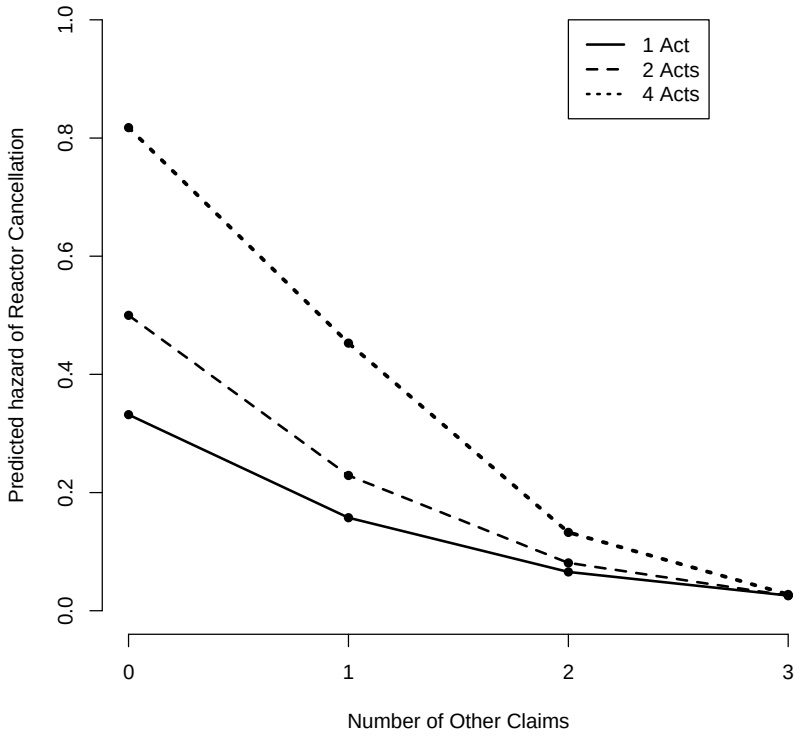

Table 3.1. Descriptive statistics for dependent, independent, and control variables.

		Mean	S.D.	Min	Max	1	2	3	4	5	6	7	8	9
1	Nuclear protest activity (logged)	0.002	0.041	0	2.485	1								
2	Non-nuclear protest activity (logged)	0.055	0.293	0	5.793	0.178	1							
3	Unemployment (percent)	7.056	3.74	0	39.163	0.002	-0.04	1						
4	African-American population (percent)	6.52	12.33	-3.3	86.368	-0.01	0.087	-0.03	1					
5	Total county population	70520	2.39E+05	0	9.19E+06	0.12	0.533	-0.03	0.038	1				
6	College-educated individuals (percent)	0.08	0.07	0	0.57	0.06	0.133	0.138	-0.13	0.193	1			
7	Median income	14538.27	9098.683	0	71064.25	0.026	0.059	0.194	-0.13	0.156	0.793	1		
8	Vote for president in the last election	1.726	0.576	0	3	-0.01	-0.05	-0.16	-0.19	-0.03	0.007	0.015	1	
9	Past nuclear protest activity (orthog.)	0	1	-0.058	50.734	0.283	0.276	-0.01	0.002	0.2	0.137	0.118	-0.02	1
10	Past non-nuclear protest activity (orthog.)	0	1	-23.231	76.343	0.073	0.326	0.005	0.038	0.162	0.049	-0	-0.03	0
11	Past protest activity: atomic weapons (orthog.)	0	1	-30.698	94.571	-0.01	-0.04	-0.01	-0.05	-0.1	-0.06	-0.04	0.015	0
12	Past protest activity: NIMBY (orthog.)	0	1	-46.528	64.3	-0.14	-0.13	-0.02	-0.05	-0.14	0	0.057	0.027	0
13	Past protest activity: peace (orthog.)	0	1	-46.883	55.413	0.135	0.003	-0.02	-0.08	-0.17	0.005	-0	0.009	0
14	Past protest activity: environment (orthog.)	0	1	-28.171	64.577	-0	-0.01	0	-0.05	-0.04	0.004	0.007	0.016	0
15	Number of completed nuclear units within 100 miles	0.865	1.838	0	16	0.02	0.143	-0.18	0.135	0.138	-0.24	-0.26	0.017	-0.01
16	Number of planned nuclear units within 100 miles	0.952	2.063	0	22	0.05	0.117	0.04	-0	0.122	-0.04	-0.08	0.059	0.004
17	Number of cancelled nuclear units within 100 miles	0.668	1.505	0	9	0.053	0.097	0.157	0.058	0.121	0.361	0.498	-0.03	0.131

		10	11	12	13	14	15	16	17
1	Nuclear protest activity (logged)								
2	Non-nuclear protest activity (logged)								
3	Unemployment (percent)								
4	African-American population (percent)								
5	Total county population								
6	College-educated individuals (percent)								
7	Median income								
8	Vote for president in the last election								
9	Past nuclear protest activity (orthog.)								
10	Past non-nuclear protest activity (orthog.)	1							
11	Past protest activity: atomic weapons (orthog.)	0	1						
12	Past protest activity: NIMBY (orthog.)	0	0	1					
13	Past protest activity: peace (orthog.)	0	0	0	1				
14	Past protest activity: environment (orthog.)	0	0	0	0	1			
15	Number of completed nuclear units within 100 miles	0.031	0.004	-0.02	0.016	-0.02	1		
16	Number of planned nuclear units within 100 miles	0.046	-0.04	-0.05	0.048	-0.02	0.567	1	
17	Number of cancelled nuclear units within 100 miles	0.03	-0.06	0.001	-0	0.016	-0.09	0.028	1

Table 3.2. OLS regression models for logged nuclear protest activity at the county level.

DV: nuclear protest activity at the county level (logged)	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4	(5) Model 5	(6) Model 6
Unemployment (percent)	0.0001**	0.0001**	0.0001***	0.0001***	0.0001**	0.0001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
African-American population (percent)	-0.0001***	-0.0000	-0.0001***	-0.0001***	-0.0000**	-0.0000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total county population	0.0000***	0.0000**	0.0000*	0.0000*	0.0000*	0.0000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
College-educated individuals (percent)	0.0719***	0.0176**	0.0167**	0.0167**	0.0146*	0.0151*
	(0.017)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Median income	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Vote for president in the last election	-0.0003	0.0001	-0.0000	-0.0000	-0.0002	-0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Past nuclear protest activity (orthog.)		0.0168***	0.0158***	0.0158***	0.0158***	0.0158***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Past non-nuclear protest activity (orthog.)		0.0026***	0.0025***	0.0025***	0.0025***	0.0025***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Past protest activity: atomic weapons (orthog.)		0.0003	0.0002	0.0002	0.0002	0.0003
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Past protest activity: NIMBY (orthog.)		-0.0100***	-0.0092***	-0.0092***	-0.0092***	-0.0092***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Past protest activity: peace (orthog.)		0.0048*	0.0039*	0.0039*	0.0038*	0.0038*
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Past protest activity: environment (orthog.)		0.0060*	0.0056*	0.0057*	0.0057*	0.0057*
		(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
State dummies	No	No	Yes	Yes	Yes	Yes
Number of completed nuclear units within 100 miles				0.0001	-0.0003+	-0.0002
				(0.000)	(0.000)	(0.000)
Number of planned nuclear units within 100 miles					0.0006***	0.0006***
					(0.000)	(0.000)
Number of cancelled nuclear units within 100 miles						0.0006**
						(0.000)
Constant	0.0013*	0.0015**	0.0023**	0.0021*	0.0019*	0.0015+

	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	109,965	109,965	109,965	109,965	109,965	109,965
Chi-square	37.27	1249	.	.	.	.
Degrees of freedom	6	12	59	60	61	62
Number of clusters	3080	3080	3080	3080	3080	3080

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Table 3.3. OLS regression models for logged non-nuclear protest activity at the county level.

DV: non-nuclear protest activity at the county level (logged)	(7) Model 7	(8) Model 8	(9) Model 9	(10) Model 10	(11) Model 11	(12) Model 12	(13) Model 13
Unemployment (percent)	0.0007*	0.0007*	0.0007*	0.0008*	0.0009*	0.0009*	0.0008*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
African-American population (percent)	0.0008***	0.0010***	0.0010***	0.0010***	0.0009***	0.0009***	0.0010***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Total county population	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
College-educated individuals (percent)	-0.0783	-0.0042	0.0094	0.0120	0.0173	0.0164	-0.0082
	(0.051)	(0.048)	(0.047)	(0.047)	(0.046)	(0.047)	(0.047)
Median income	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Vote for president in the last election	0.0007	0.0002	-0.0000	-0.0000	0.0002	0.0003	0.0003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Past nuclear protest activity (orthog.)		0.0149*	0.0127+	0.0133+	0.0132+	0.0133+	0.0131+
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Past non-nuclear protest activity (orthog.)		0.0294***	0.0298***	0.0298***	0.0299***	0.0299***	0.0298***
		(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Past protest activity: atomic weapons (orthog.)		0.0253***	0.0239***	0.0237***	0.0237***	0.0237***	0.0238***
		(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)
Past protest activity: NIMBY (orthog.)		0.0033	0.0043	0.0042	0.0041	0.0041	0.0045
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Past protest activity: peace (orthog.)		0.0260***	0.0216***	0.0216***	0.0217***	0.0217***	0.0216***
		(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
Past protest activity: environment (orthog.)		-0.0023	-0.0053	-0.0049	-0.0050	-0.0050	-0.0052
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)

State dummies	No	No	Yes	Yes	Yes	Yes	Yes
Number of completed nuclear units within 100 miles				0.0039***	0.0042***	0.0040**	0.0030*
				(0.001)	(0.001)	(0.001)	(0.001)
Number of planned nuclear units within 100 miles					-0.0008	-0.0009	-0.0025**
					(0.001)	(0.001)	(0.001)
Number of cancelled nuclear units within 100 miles						-0.0007	-0.0016
						(0.001)	(0.001)
Completed nuclear units x College education							0.0703**
							(0.022)
Constant	0.0252***	0.0210***	0.0500*	0.0428+	0.0434+	0.0444+	0.0462+
	(0.006)	(0.005)	(0.024)	(0.024)	(0.024)	(0.024)	(0.025)
Observations	109,965	109,965	109,965	109,965	109,965	109,965	109,965
Chi-squared	119.0	668.3	3.970e+07	3.930e+07	3.930e+07	3.930e+07	3.980e+07
Degrees of freedom	6	12	60	61	62	63	64
Number of clusters	3080	3080	3080	3080	3080	3080	3080

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Figure 3.1. Cumulative number of nuclear units in the U.S. by stage of development and by year.

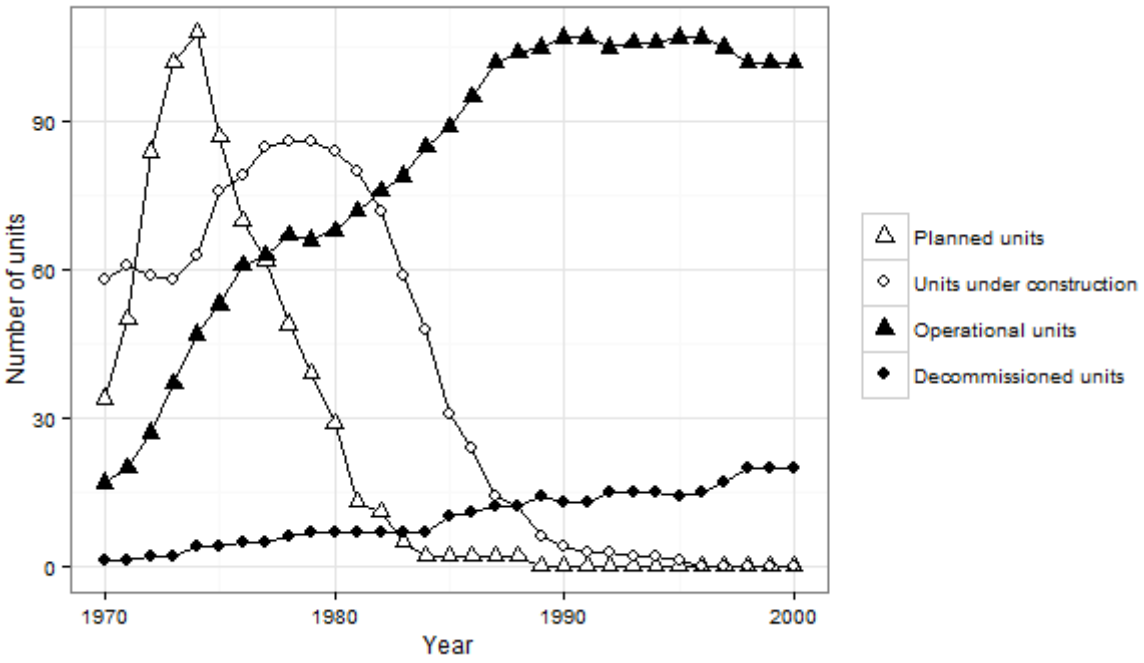

Figure 3.2. Number of anti-nuclear protests in the U.S. by year based on the NYT data.