Environmental Capabilities And Corporate Strategy: Exploring Acquisitions Among US Manufacturing Firms

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ENVIRONMENTAL CAPABILITIES AND CORPORATE STRATEGY: EXPLORING ACQUISITIONS AMONG US MANUFACTURING FIRMS

Abstract

In this article, we investigate whether environmental capabilities influence firms' corporate strategies, a topic that has received little attention to date. We hypothesize that firms are more likely to acquire facilities when ownership facilitates the transfer of capabilities either to or from the facility. Using a panel from the US government's Toxics Release Inventory program, we find firms with superior environmental capabilities are significantly more likely to acquire physically proximate facilities with inferior environmental capabilities and vice versa. Our results extend theories of both corporate and environmental strategy.

Introduction

In recent years, management scholars have become more interested in the sources and consequences of environmental capabilities. As evidence of this trend, the Academy of Management recently selected the theme ‘green management matters’ for its annual conference. Scholars have investigated several ways green management might matter. Some have explored how managers choose among various strategic options that could improve environmental and financial performance (Dowell, Hart, & Yeung, 2000; King & Lenox, 2002; Russo & Fouts, 1997). Others have investigated when managers elect to have their firms participate in various forms of self-regulation in order to improve green management practices (Berchicci & King, 2007). However, little environmental work has addressed a central issue of corporate strategy: does the presence or absence of environmental capabilities influence corporate strategy (Diestre & Rajagopolan, 2010)? In this article, we take an early step toward answering this question by investigating ownership changes in US manufacturing firms.

At first blush, it might seem unlikely that environmental capabilities would influence changes in ownership, but, in fact, both deductive logic and anecdotal evidence suggest it may be so. Deductive logic suggests the potential to acquire and transfer capabilities could motivate ownership changes. Wide differences in environmental performance capabilities remain among US companies, in part because there has been relatively little time for these capabilities to develop and diffuse. In the last 20 years, as environmental regulations have become more stringent, some firms have been unable to reach acceptable environmental performance goals, while others have found they can profitably go beyond regulatory requirements. The resulting heterogeneous distribution of abilities could allow gains from trade created by the transfer of capabilities to or from an acquiring firm. Anecdotal evidence suggests some firms conduct careful due diligence of target facilities' environmental performance before approving acquisitions. General Electric, for example, has a special unit of auditors who visit production facilities to evaluate their environmental management systems.[1]

In this paper, we investigate the degree to which environmental capabilities influence corporate strategy by examining ownership changes among US manufacturers. Our analysis provides an important test of the degree to which capabilities matter in acquisitions. We make three important contributions to the study of acquisition choices.

First, we bring attention to a new type of capability, specifically, environmental capability, as a determinant of acquisition choice. Second, we consider the importance of relative (rather than absolute) capabilities. Prior studies have examined how a facility's performance affects its likelihood of being acquired (Banaszak-Holl *et al.*, 2002) but have not considered the facility's capabilities relative to the acquiring firm. Our third contribution is to bring new attention to how firms choose among a set of similar alternatives (e.g., facilities in the same industry or geography, or using the same technology). This 'which one' decision has received less attention than it deserves, in part because the datum needed to analyze the decision is difficult to acquire. Lacking broad panels of data from sources such as the US Census of Manufactures, scholars usually cannot obtain temporal data on facility corporate affiliation, characteristics, or operational performance. Nor can scholars usually observe the set of facilities that might have represented reasonable alternatives for acquisition. Our use of facility-level US environmental regulatory data and our combination of these data with other facility-level information helps us to overcome this problem.

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[1] Personal communication with Stephen Ramsey, GE's former vice president for corporate environmental programs. November 11.

For the literature on business and the natural environment, we open a new research agenda for the field. To date, research has overlooked the question of how environmental capabilities might influence strategic decisions such as acquisitions. Yet, acquisitions can provide a tantalizing window on how a firm's 'green' capabilities influence its strategic decisions and how firms use, acquire, or transfer environmental capabilities. If environmental performance influences such strategic choices as ownership changes, it would suggest firm performance is driven by heterogeneous environmental capabilities rather than differing managerial preferences with respect to pollution. It also would show the degree to which green management matters—that is, capabilities for environmental management influence the boundary of the firm itself, which is a fundamental strategic decision.

We examine firms' acquisitions of production facilities over a 15-year period using a unique data set that combines data from the Environmental Protection Agency's Toxics Release Inventory program with the National Establishment Time-Series (NETS) Database. We test whether firms seek to acquire facilities with capabilities different from their own. Controlling for a number of measures of similarity, we find firms tend to acquire targets with differing levels of capabilities only if those facilities are geographically proximate to the firm.

To explore how environmental capabilities might affect acquisitions, we begin by reviewing some of the relevant theories of corporate ownership and ownership change. We form two sets of hypotheses predicting how firm and facility characteristics influence changes in ownership. We then describe our data and methods, test the hypotheses, and discuss the results of these tests.

Theoretical Framework

Acquisitions and Value Creation

The literature on corporate strategy suggests firms are likely to own facilities when ownership conveys value (Bowman & Singh, 1993). For example, a particular corporate owner may undertake an acquisition because it is better positioned to extend economies of scale or better use capabilities held by a target (Ravenscraft & Scherer, 1987). Creating value through acquisitions is a delicate undertaking, as not only must the new parent be able to extract value from the target, but the particular parent-target combination must be able to create value through cost reduction or output improvement. If an ownership change does not create value, competitive bidding should dissipate the value of an acquisition (Barney, 1988; Capron & Pistre, 2002). Indeed, if changes in ownership are governed by informed and rational managers seeking to maximize the value of their firms, such changes should occur only when they create value.

Real-world empirical evidence of the effect of acquisitions provides mixed evidence of value creation (Fowler & Schmidt, 1988; Moeller, Schlingemann, & Stulz, 2005; Ravenscraft & Scherer, 1987). Errors in perception or judgment may cause managers to acquire facilities that do not add value to the firm. These explanations supplement rational motivations for acquisitions in the sense that they help explain why many acquisitions may not provide value, but they do not refute the idea that the pursuit of value drives acquisitions.

Here we draw on theories that postulate firms acquire facilities to improve their competitive positions, and we test whether the predictions of these theories match observed acquisition patterns. We follow recent work in strategy that has characterized acquisitions as opportunities for firms to leverage their current capabilities or to acquire such capabilities from targets (Anand & Delios, 2002; Arikan & McGahan, 2010; Capron, Dussauge, &

Mitchell, 1998; Karim & Mitchell, 2000; Vermeulen & Barkema, 2001; Zollo & Singh, 2004). We build hypotheses that outline how relative acquirer- and target-performance levels affect acquisition choice and how distance moderates that relationship.

Relative Capabilities

In recent years, corporate strategy literature has focused on the importance of transfer of capabilities in motivating acquisitions. A capability is a routine or set of routines that determines what an organization is able to accomplish, and that often depends on tacit knowledge (Hannan & Freeman, 1989; Karim & Mitchell, 2000; Winter, 2003). Acquisitions are utilized to transfer capabilities for at least two reasons. First, routines, which capabilities are based on, are not easily replicated (Nelson & Winter, 1982). Thus, any attempt to gain proficiency at a given capability by simply observing firms with such capability is fraught with difficulty (Rivkin, 2000). Second, capabilities often are difficult to trade discretely, as they involve tacit knowledge and are embedded in the organization in which they reside (Karim & Mitchell, 2000; Williams, 2007). Firms with inferior capabilities may seek to acquire entities that possess useful knowledge, while those that have superior capabilities may look for targets that can best benefit from the transfer of the acquirer's capabilities (Ahuja & Katila, 2001; Rosenkopf & Almeida, 2003). Banaszak-Holl *et al.* (2002) label these two options 'cream-skimming' and 'turnaround' strategies respectively.

Firms acquiring facilities in order to improve them (i.e., the turnaround strategy) are motivated by the belief that they can transfer superior routines and capabilities to a target and thereby improve its performance. In order for a turnaround strategy to be economically viable, the acquiring firm must perceive that by extending its resources to the target, it will create sufficient value to offset the purchase price (Capron *et al.*, 1998). Since potential targets that lack valuable capabilities should have relatively low expectations of future cash flows (and thus lower valuations), the acquisition process resembles a matching process whereby firms may realize mutual gains by transferring capabilities from the firm that possesses them to a unit that needs them (Faria, 2008). Ford's acquisition of both Land Rover and Jaguar, for example, was motivated partly by the belief that Ford had the capabilities to produce high-quality cars that those firms were lacking and that by extending those capabilities to Land Rover and Jaguar, Ford could increase the sales of the two lines significantly (Kerwin, 2000).

In order to more fully understand how environmental performance plays a role in acquisitions, we held informal interviews with managers and performed an archival search for discussion of these issues. A more thorough discussion of our findings is available in Appendix A, which is published as an online accompaniment to this paper. At minimum, firms assess a potential target's environmental records as part of the due diligence process in order to minimize the possibility of acquiring a target that has significant potential for environmental liabilities. Discussions with managers who have been involved with numerous acquisitions indicate that environmental issues are commonly considered in the pre-acquisition phase. Environmental issues are not the primary driver of acquisition choices, as firms generally choose targets that fit their strategic needs (e.g., allow them to gain access to a product or service market). However, environmental due diligence can either alter the terms of a deal or cause the firm to cancel a planned acquisition altogether.

Increasingly, firms are assessing environmental performance to determine if a facility is undervalued and whether its performance can be improved through post-acquisition capability transfer. In 2000, for example, Kerr-McGee acquired a facility in Savannah, GA, that had been cited for environmental and safety concerns. In making the acquisition, Kerr-McGee explicitly cited its ability to fix the facility and bring it into line with the performance of its other facilities (Wood, 2000).

The Carlyle Group (a private equity firm), together with the Environmental Defense Fund, recently formalized this process by developing a tool that explicitly takes environmental opportunities into account in the due diligence process. The tool 'focuses on five environmental areas where Carlyle can identify changes that would improve operational and financial performance of prospective portfolio companies' (Kreutzer, 2010: 1). In this way, The Carlyle Group uses the environmental capabilities identified in companies already in its portfolio to assess how to make improvements in targets that it is considering.

A number of studies previously have argued that environmental capabilities are connected to both financial performance and other valuable capabilities. Hart (1995), for example, develops the "Natural Resource Based View of the Firm" and argues that pollution prevention is related to continuous improvement. Klassen and Whybark (1999) argue that waste prevention relies on tacit knowledge and is connected to operational improvement. Furthermore, a number of authors have argued that environmental capabilities lead to superior financial performance (Klassen & McLaughlin, 1996; Margolis & Walsh, 2001; Russo & Fouts, 1997). Research also indicates not all firms are equally positioned to enjoy financial benefits from pursuing improved environmental performance. Christmann (2000), for example, finds evidence that environmental capabilities are more likely to be associated with higher profit levels in the presence of complementary resources.

For firms that have invested in environmental capabilities, then, acquisitions present an opportunity to attempt a 'turnaround' acquisition. Since the ability to improve environmental performance is often built upon knowledge that is more readily transferred within the firm than across firm boundaries (Hart, 1995), firms that have strong environmental performance can bring new units within their boundaries and improve upon those units' environmental capabilities. This implies that targets with relatively weak environmental capabilities are attractive targets for firms with strong environmental capabilities.

Hypothesis 1a: An acquiring firm with strong environmental capabilities is likely to acquire a facility with weak environmental capabilities.

The above hypothesis assumes that capabilities move from the acquiring firm to the target. In contrast, cream-skimming acquisitions occur when an acquiring firm takes over a high-performing target with the intention of learning from the target or gaining benefits from the target's reputation (Banaszak-Holl *et al.*, 2002). In a cream-skimming scenario, the acquiring firm identifies a target with superior capabilities along a dimension the acquirer values. The acquisition has the potential to create value for the acquiring firm if the capabilities are difficult to build internally or acquire in a market transaction (Capron *et al.*, 1998). Analysts have argued, for example, that this was the reason General Motors entered into a joint venture agreement with Toyota for the management of the NUMMI plan in Freemont, CA. Managers at GM hoped to be able to transfer the capabilities in lean production learned at the NUMMI plant to the rest of the company (Womack, Jones, & Roos, 1991).

Most of the studies that have examined facility-level acquisitions (Banaszak-Holl *et al.*, 2002; Lichtenberg *et al.*, 1987; Siegel & Simons, 2010) have emphasized the role of the target's absolute performance.[2] In fact, the logic of value creation suggests that potential gains will be related to the *relative* level of capabilities between the target and the acquirer. There is evidence in a related setting that relative capabilities might matter more than absolute ones. Anand and Delios (2002) demonstrate the relative technological intensity

[2] This emphasis on absolute capabilities may help explain the stronger evidence in favor of turnaround rather than cream-skimming acquisitions in prior studies (see Balsvik and Haller [2010] for a discussion of this tendency). If, on average, stronger firms make acquisitions, then, on average, weaker targets may be preferred targets, but the average could mask the matching process we describe.

between the host country and the firm's home country might matter more than the absolute intensity in determining mode of international entry. Strong firms may gain from acquiring facilities with even higher capabilities, and lagging firms may gain from acquiring average ones.

For environmental capabilities, cream skimming occurs when a firm lagging in environmental performance acquires a better-performing target from which it can transfer capabilities. While the firm potentially could build the capabilities itself, the path to do so and the time required are uncertain; buying the capabilities may appear to be a better option. Thus, weak firms interested in becoming better are likely to buy targets with superior capabilities.

> *Hypothesis 1b*: *An acquiring firm with weak environmental capabilities is likely to acquire a facility with strong environmental capabilities.*

Geographic Proximity and the Transfer of Capabilities

The above hypotheses are based on the idea that firms often make acquisitions in order to transfer capabilities either to or from the target. We now consider the circumstances under which such transfers will be more or less likely, and we focus on the role geographic distance plays in moderating the turnaround and cream-skimming acquisition strategies. Several authors have documented the importance of physical proximity in influencing the transfer of capabilities. Adler (1990) argues that learning flows within a corporation from a 'primary' location to operations that need such information. Evidence suggests such information flow is strongly influenced by physical distance, as greater distance reduces the transfer of valuable technical information (Allen, 1977). In the high-tech sector, Galbraith finds geographic distance hampers the transference of complex productivity capabilities from the source unit to the recipient unit (Galbraith, 1990). Corporate reports also support the importance of business. When General Motors exited the NUMMI joint venture, Tesla bought the facility from Toyota, claiming one of the advantages it would have in managing the facility was that the proximity to its other facilities would allow a ‘tight feedback loop between engineering, manufacturing, and other divisions within the company’ (Wood, 2010).

One might think modern information technology has reduced to the point of insignificance the effect of physical proximity on the transfer of capabilities. Evidence suggests, however, that when information exchange entails unfamiliar knowledge and divergent routines, physical proximity continues to matter. In the hotel industry, for example, Ingram and Baum (1997) find that greater knowledge transfer occurs between different firms located in close proximity. In general, when exchange partners lack shared experience, information referents can be ambiguous, and high-bandwidth (e.g., face-to-face) communication often is required for effective information transfer (Daft & Lengel, 1986). In contrast, for well-codified or understood issues, lower-bandwidth media usually are sufficient. Acquiring firms and their targets usually will share relatively few experiences, and this makes high-bandwidth communication especially beneficial. Proximity can also facilitate social contacts with key individuals, and these can be critical to the acquisition of new knowledge (Fleming & Marx, 2006). As a result of these findings, several companies have created structures that attempt to increase information flow by locating groups with diverging capabilities under one roof (e.g., Steelcase’s corporate office building described by Becker and Steele [1995]).

We argue that proximity plays a significant role in the firm’s assessment of its likelihood of transferring environmental capabilities, for two reasons. First, environmental capabilities that go beyond simple pollution control procedures are built upon knowledge that is tacit and not easily observed or replicated (Hart, 1995; King & Lenox, 2002). Such capabilities are not easily transferred at a distance. Second, environmental performance often is the result of a complex interplay between the facility's capabilities and its institutional environment (Delmas & Toffel, 2004). Thus, the capabilities a facility has developed in environmental performance are context dependent, and transferring those capabilities to a different context becomes an uncertain process (Williams, 2007). As distance to a potential target increases, its institutional environment is more likely to differ from that of the acquiring firm. Such a difference may reduce the firm's confidence that environmental capabilities can be transferred to or from the target.

Managers familiar with environmental issues in acquisitions indicate that distance plays a role in the degree to which environmental capabilities can be transferred.[3] For example, in turnaround situations, acquiring firms often transfer their own people to the target to make the target more aware of environmental issues and to develop capabilities that will allow the target to improve its environmental performance. When a target is proximate, people easily can be moved back and forth, and the transfer of know-how is relatively easy. When a target is farther away, such transfers are more expensive and difficult, making it more daunting to bring a distant target's environmental capabilities up to the desired level.

In summary, both theory and anecdotal evidence suggest proximity should be important in moderating capability transfer in both the turnaround and cream-skimming cases. If, as we have hypothesized, firms choose targets based on the gains that can be obtained by capability transfer, they are likely to acquire plants that have differing capabilities *and* are geographically and operationally proximate to the existing firms' operations.

Hypothesis 2a: The greater the geographic proximity to existing operations, the

[3] Personal Communication with Ed Gomes, VICOR's EH&S manager and former Wang's EH&S manager. August 31, 2010.

higher the probability an acquiring firm with strong environmental capabilities will acquire a facility with weak environmental capabilities.

Hypothesis 2b: The greater the geographic proximity to existing operations, the higher the probability an acquiring firm with weak environmental capabilities will acquire a facility with strong environmental capabilities.

Data and Methods

Data Sources

Our sample is drawn from the US EPA's Toxics Release Inventory (TRI) and the National Establishment Time-Series (NETS) Database. The NETS Database collects establishment-level data from Dun & Bradstreet on most business activities in the United States. The TRI data include all facilities with 10 or more employees and that process or manufacture any listed chemical over the threshold amount established by the EPA. The TRI data have been used extensively in measuring environmental performance (Freudenberg, 2005; King & Lenox, 2002; King & Lenox, 2000; Klassen & Whybark, 1999; Konar & Cohen, 1997). The NETS sales data indicate the TRI data cover about 50 percent of US manufacturing ($1.1 trillion) and a higher percentage of manufacturing sectors that use toxic chemicals. Along with chemical production, use, and disposal data, the TRI data include facility characteristics, such as current firm owner, production changes, industry, and location. Though the TRI data have been collected since 1987, our panel begins in 1991 because that is the first year the data provide suitable information about chemical waste generation. Our panel ends in 2005.

Sample

The goal of our research is to better understand which facilities, among a set of reasonable alternatives, are likely to be chosen by a given firm making an acquisition. To do this, we first create ownership data for US manufacturing facilities, combining ownership data from NETS and the Toxics Release Inventory. We conclude that ownership changed when data from both sources agree that the ultimate parent of a facility had changed in a given year.

Since we are interested in modeling the 'which one' decision—that is, the choice of which facility to acquire among a set of alternatives—we need to construct a choice set for each observed acquisition. We form these sets of alternatives by including the facilities that are in the same four-digit standard industrial classification (SIC) as the facility that ultimately was chosen.[4] We call these sets of alternatives 'acquisition pools' because they represent the pool of similar facilities from which the acquirer firm can choose its target. For example, if acquirer firm Alpha chooses target facility Beta from the petroleum refinery industry, SIC 2911, in 1995, the acquisition pool we use in our analysis includes all facilities in 1994 in SIC 2911 for which we have data.

Our final sample includes 2,485 acquisitions over the 1991–2005 observation period, and we have a total of 229,186 plant-year observations. On average, the potential acquisition pool consists of 118 facilities. Because some acquisitions include multiple facilities, there are a total of 1,936 acquisition pools.

The Dependent Variable

Since we focus on the factors that influence whether a particular facility is chosen, we use as our dependent variable a dichotomous variable, *chosen target*, which takes a value of 1 if that facility was acquired in a given year and 0 otherwise. Across our analyzed sample, 73.4

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[4] In building these pools, we exclude all facilities already owned by the acquiring firm.

percent of the time (i.e., SIC code, year, firm-acquirer combinations) a single facility was acquired and 14.5 percent of the time two facilities were acquired. This pattern is consistent with the pattern of acquisitions noted elsewhere (Aldrich, 1999).

Main Independent Variables

Environmental capabilities

At the facility level, we measure environmental capabilities based on a facility's relative waste generation. We choose relative waste generation as our measure of capabilities for two reasons: because the ability to reduce waste production, rather than simply treat it after it is generated, is a critical determinant of both environmental treatment costs and pollution levels (King & Lenox, 2002), and because pollution prevention is commonly considered an example of tacit knowledge–based environmental capability (Hart, 1995). We sum the waste generation of the toxic chemicals and weigh each chemical by its toxicity to create a single waste generation total for each facility in each year.

Since larger facilities obviously will have greater levels of waste generation, we need to create a standardized measure of a facility's environmental performance. We follow King and Lenox (2002) and regress the natural log of a facility's weighted waste generation on a quadratic specification of its size (number of employees) and its industry. We run separate regressions in each year so that the regression produces an expected level of waste for a facility of a given size in a given industry in a year.

$$\ln W_{it} = \alpha_{jt} + \beta_{1jt}(\ln s_{it}) + \beta_{2jt}(\ln s_{it})^2 + \varepsilon_{it} \qquad (1)$$

In the above, W_{it} is the waste generation from facility *i* in year *t*, α_{jt} is a constant for four-digit SIC sector *j* in year *t*, β_{1jt} and β_{2jt} are coefficients relating to the linear and quadratic specifications of the number of employees respectively, and ε_{it} is the error term of the regression. We use the regression in (1) above to generate predicted values of waste generated for each facility in a given year. We then use the standardized residuals from that prediction to generate our measure of *relative waste generation* for a facility in a given year. Thus, we measure a facility's environmental capabilities as the deviance from the waste generation we would expect it to create given its size and industry. In the analysis that follows, we use the value of the facility's *relative waste generation* in the year before itis acquired.

To create a firm-level measure of environmental capabilities, we take the average of the relative waste generation of the facilities owned by the acquiring firm. Some firms, of course, contain facilities from a variety of industries. Since we rate a facility's performance relative to other facilities within its industry, we have taken industry context out of the performance measure. This allows us to add facilities from different industries together to arrive at a firm score.

Although we compute a continuous measure of firm relative waste generation, the specification of our models (described below) requires that we dichotomize firms into those with higher and lower levels of capabilities. We divide firms by the level of firm relative waste generation, designating firms as 'clean' if they generate less than the median amount of waste and 'dirty' otherwise. In the following analysis, we model the effect of facility characteristics on the probability of acquisition by clean firms and dirty firms separately to assess how a firm's environmental capabilities interact with those of potential targets.

While the King and Lenox (KL [2002]) measure allows us to compare across facilities and time and weight emissions by toxicity, it has some weaknesses. First, it weights the chemicals in terms of a portion of their environmental influence; other weighting schemes may allow for more complete measures of toxicity. For example, the KL measure considers primarily acute toxicity (e.g., from a single exposure) while persistent toxicity (e.g., bioaccumulation) may be more important to human welfare (Toffel & Marshall, 2004). One such measure is the Risk-Screening Environmental Indicators (RSEI) model developed by the EPA. We use RSEI weighting to test our results and find them to be consistent; however, the RSEI scores cover only 69 percent of the chemicals for which we have data, which substantially reduces the coverage of the measure. Second, the KL measure is an ad hoc equation based on the Cobb-Douglass production function. A full Cobb-Douglass function would be superior, but capital input data for these companies are not available.

Geographic proximity

Hypotheses 2a and 2b argue that geographic distance interacts with facility environmental capabilities. Furthermore, previous research has demonstrated that geographic distance is a significant factor in acquisition choice (Baum, Li, & Usher, 2000). Therefore, in addition to the moderating effects we predict in H2a and H2b, we expect a direct effect of distance, with firms more likely to choose proximate facilities. In order to measure distance, we use the location (in latitude and longitude) of each facility as reported on their TRI forms. We then calculate the geodesic distance in kilometers between each facility currently owned by a firm and each potential target. We use the average distance so that our distance measure captures the average distance between each given potential target and the plants owned by the acquirer firm. We find robustness tests using the minimum distance instead of the average do not change the results.

Control Variables

Our goal is to investigate the extent to which environmental capabilities influence acquisition choice. To do so, we must be able to control for other factors that could affect the degree to which capabilities influence acquisition. Based on prior research, we focus on three specific constructs: operational similarity, target efficiency, and similarity in the environmental context.

Operational similarity

We control for operational similarity for two reasons. First, as we describe above, there is an inherent tension in acquiring facilities to transfer capabilities because operational similarity enhances capability transfer but is potentially correlated with the target having similar capabilities as the acquirer. Second, one of the main reasons to acquire a new facility is to benefit from scale economies. Since scale benefits require similarity in operations, firms seeking such benefits are more likely to choose facilities with operations that resemble their own. There are a number of dimensions on which similarity could be measured, including similarities of inputs, processes, and outputs (St. John & Harrison, 1999). Our empirical method, which we describe in detail below, allows us to partly control for output similarity, and our remaining measures capture three distinct dimensions of similarity. We describe each of these variables below.

Chemical use overlap. The TRI data give a detailed picture of the chemicals that facilities use as inputs/catalysts or create as products/byproducts of their production. These data, then, give us an opportunity to examine similarity in inputs and processes between the firm and potential targets. We measure *chemical use overlap* (CO) by calculating the angle between the two vectors representing each facility's chemical use. This method is used extensively to measure interorganizational overlaps (Dowell, 2006; Sohn, 2001) and also is commonly applied in physics and information science studies (Jones & Furnas, 1987). To create a variable with a range of (0:1), we take the arcsine of the angle between the two vectors. When two vectors are orthogonal (no chemical overlap), the measure will be equal to

0. When two vectors have the same direction (complete overlap), independent of their magnitude (or scalar dimension), the arcsine will equal Pi/2. Formally, this equation is:

chemical use overlap (CO) = arcsine ($|A_j$ dot $B_i| / ||A_j||*||B_i||$)/(Pi/2) (2)

In (2) above, A_j and B_i are the chemicals used by a firm's facility *j* and a potential target *i* respectively. Although our measure follows a classic method, we performed a set of robustness checks using alternative formulas. We used the maximum overlap (the overlap between the target and the most similar facility in the firm) and a measure that accounted for the dimensionality of the two vectors. The sign and significance of our results did not change.

Size discrepancy: Our second measure of operational similarity is the degree to which a potential target facility is similar in size to the firm's existing facilities. Larger facilities usually require more complex and formal structures (Haveman, 1993). Facilities experienced in managing small facilities might lack the capability to effectively manage large ones (and vice versa). Thus, we expect firms will tend to buy facilities similar in size to those with which they are familiar. We measure the converse of size similarity with the variable *size discrepancy*; this captures the difference between the average size of all the acquirer firm's plants and the size of a given potential target. The size calculation is based on the number of employees at a site in a given year. The value of a plant's size discrepancy is close to 0 when there is proximity in terms of size. The value increases as the absolute difference increases between the average size of the firm's plants and the size of the target. Again, we conduct a robustness test to ensure our use of average (rather than maximum or minimum overlap) does not provide misleading results.

SIC overlap. Our third variable of operational similarity controls for similarity in outputs. Our empirical approach provides a primary control for relatedness, as all facilities from which a firm ultimately chooses a target are in a single industry sector. However, it is still possible that among these facilities, some are more closely related than others to the firm's current operations, as the four-digit SIC level of aggregation still contains significant diversity. Thus, we control whether the firm already operates in other markets in which the facility operates. We do this by making use of the secondary industry affiliation (again, at the four-digit SIC level) that facilities report. We create a variable, *SIC overlap*, which is a cosine measure of overlap similar to that used in the chemical overlap variable described above. Higher SIC overlap suggests a greater similarity at the product level.

Target efficiency

Labor productivity. In addition to operational similarity, we control for the efficiency of the facility's operation by measuring its labor productivity. We do so for two reasons. First, research has demonstrated that efficiency is a major determinant of acquisition (Siegel & Simons, 2010). Second, prior research suggests environmental efficiency is related to overall firm efficiency (Hart, 1995; King & Lenox, 2000). If we find environmental performance affects acquisition choice, it is important to ensure the result is not driven by overall plant efficiency. Though we lack full productivity data, we have both employee and sales data for our facilities from the NETS data; thus, we follow prior research that has used sales/employee data as a measure of efficiency (Huselid, Jackson, & Schuler, 1997; Norburn & Birley, 1988). We normalize the productivity of each facility by its primary industry. Our measure, *labor productivity*, therefore controls in the best way available for the relative efficiency of potential targets.

Similarity in the environmental context

Our final three control variables account for differences in the institutional context between the focal firm and potential targets. All else equal, firms are likely to prefer facilities governed by similar regulations and in business contexts with regulatory requirements similar to those with which they are familiar (Williams, 2007). To help prevent these differences from creating spurious findings, especially with regard to the distance effects, we include three measures of local context: regulatory overlap, same state location, and relative regulatory stringency.

Regulatory overlap. To capture regulatory overlap, we compute a vector of the regulation covering each facility based on the permits listed for that facility by the US EPA (e.g., permit compliance system, Clean Water Act, etc.). We then compute the inner product of these vectors (the degree to which they overlap) between each potential target and each facility already owned by the acquiring firm. The variable we compute, *regulatory overlap,* represents the average inner product of these computed vectors. Higher values mean there is a greater overlap between the regulatory regimes in which a potential target facility operates and that to which the firm is accustomed. Our results are unchanged when we use the maximum overlap score instead of the mean.

Same state location. Since firms might be prone to purchasing targets within their own states due to both familiarity and regulatory similarity between the facility and the firm, we control for state location in addition to geographic distance. The variable *same state location* is equal to 1 if one of any acquirer firm's plants is in the same US state as a given potential target; it is equal to 0 otherwise. This variable also helps ensure that any effects we find for the distance measure are not simply capturing a firm's preference to acquire facilities within a given state with which the firm is familiar.

Relative regulatory stringency. Finally, since state regulation may change over time and this might influence trends in environmental capabilities within states, we compute the average score of environmental capabilities of the facilities in each state in each year. This creates a measure of *relative regulatory stringency*, allowing us to control for whether firms prefer to acquire facilities in relatively stringent or relatively lax jurisdictions.

The Model

We observe a firm making an acquisition in a particular industry and year. We assume that when this acquisition occurred, the firm considered other facilities in the same industry as well but chose not to acquire them.[5] We model the probability that a particular facility changes owners as a function of a set of firm and facility characteristics (discussed in the previous section). Since the firm is 'fixed' across the available options, we model each acquisition as a conditional choice: given the attributes of the firm, what facility attributes are more likely to be associated with acquisition? For this structure, a conditional logistic regression is particularly appropriate. Conditional logistic regressions model choice behavior when a firm or individual must choose among a discrete set of alternatives (Greve, 2000; Kalnins & Chung, 2004).

Our analysis, then, models the firm's choice of a facility as a function of the facility's environmental capabilities, the distance from the firm to the facility, and the interaction between these variables, as well as the controls discussed above. We consider the probability that firm *i* chooses facility *k*. Facility *k*, meanwhile, is in acquisition pool *g*, which contains *j* alternatives:

$$\Pr_{ik}(y_i = k \mid X_i) = \frac{\exp(X'_{ik}\beta)}{\sum_{j=1}^{J}\exp(X'_{ij}\beta)} \quad \text{for } k = 1 \text{ to } J \qquad (3)$$

where vector X'_{ik} contains values of the independent variables for outcome *k* for firm *i*.

One advantage of our approach is that it controls for one dimension of relatedness

[5] We recognize that ownership change is actually the result of a negotiation between the buyer and seller. We use the language of 'choice' for convenience and to emphasize that we are evaluating determinants of which facility, out of a set of alternatives, moves to the new firm.

between the firm and the targets from which it chooses. That is, since each facility in the pool is in the same primary SIC, the degree of product market relatedness is the same between the firm and each facility in the pool, and our secondary SIC overlap variable described above further controls for this dimension. This gives us confidence that our results are not affected by differences in this dimension of relatedness between the firm and the targets available.

The conditional logistic regression does not allow characteristics to vary among those for which the choice is conditioned (in our case, the attributes of the acquiring firm). This means the firm's characteristics are controlled for, since the analysis has a fixed effect at the firm level. To analyze the choice made by firms with different levels of environmental capabilities, we separate the sample according to firms' environmental performance and run separate analyses on two groups: 'clean' and 'dirty' firms. Thus, our variables capture the effect of a potential target's characteristics (e.g., the target's environmental performance) or the unique match between the firm and the potential target (e.g., the size discrepancy). A potential limitation of the conditional logistic model is the assumption of the homogeneous error variances that lead to the property of the independent irrelevant alternatives (IIA).[6] In our case, the IIA property is likely to hold given the high average number of alternatives and the relative heterogeneity of alternatives within the groups.

Results

Table 1 displays the sample's descriptive statistics. The average distance between an acquiring firm's existing plants and a given potential target is around 1,350 km (843 miles), and 25 percent of the potential targets share the same state with at least one of the acquiring

[6] The IIA property states that if A is preferred to B out of the alternative set {A, B}, then the introduction of additional alternative C must not make B preferable to A.

firm’s plants. The correlations between variables are modest. Not surprisingly, the strongest relationships are among distance, state overlap, and regulatory characteristics (regulatory stringency).

***** Please insert Table 1 about here *****

Table 2 shows the results of the conditional logistic analysis. Models with an odd number relate to cases where the acquiring firm had above-average environmental capabilities. Models with an even number relate to cases where the acquiring firm had below-average environmental capabilities.

***** Please insert Table 2 about here *****

Models 1 and 2 are the baseline models that include only the control variables. The results show that firms are significantly more likely to acquire facilities that are geographically and operationally similar to the firms’ existing facilities. All four measures of similarity (geographic proximity, chemical use overlap, size discrepancy, and SIC overlap) are significant in the expected direction. Interestingly, we do not find significant evidence that labor productivity influences acquisition target choice.

The results also demonstrate that firms prefer to acquire facilities operating in contexts similar to those to which the firms are accustomed. We find firms are more likely to acquire facilities as the overlap between the regulatory regimes increases. Likewise, the probability of acquisition increases if facilities are located in the same state in which at least one of the existing firm’s facilities currently operates. Finally, it seems that relative regulatory stringency has an effect on ownership choice only for firms with poor environmental performance, and that such firms tend to acquire facilities in areas with lax regulatory enforcement.

Models 3 through 6 investigate the effect of environmental capabilities on ownership change. These results indicate that relative differences in environmental capabilities influence choice when the acquiring firm already owns a proximate facility, but that such capabilities have little or no influence when the facility is farther away. In Hypothesis 1a, we argue that a firm with strong environmental capabilities is likely to acquire a facility that lacks such capabilities (i.e., the turnaround strategy), and in Hypothesis 1b, we argue that firms lacking such capabilities are likely to acquire facilities that are strong environmental performers (i.e., the cream-skimming strategy). In Model 3, we find that, on average, a facility's environmental performance does not affect the likelihood of its acquisition by a clean firm, and thus, Hypothesis 1a is not supported. In Model 4, we find that dirty firms' choices are affected by a facility's environmental performance, but not in the direction predicted by Hypothesis 1b. Overall, it appears that dirty firms prefer to acquire relatively dirty facilities. We return to these results in the discussion section of the paper.

Hypotheses 2a and 2b suggest geographic distance influences the likelihood firms will attempt either turnaround or cream-skimming acquisitions. We test these hypotheses using the interactions shown in Models 5 and 6. We use mean-centered variables to simplify the interpretation of interaction coefficients and to decrease multicollinearity (Aiken, West, & Reno, 1991). The results provide significant support for both hypotheses. In Model 5, we find proximity increases the probability that firms with stronger environmental capabilities will acquire targets with weak environmental capabilities. Stated another way, as geographic distance increases between a firm and a potential target, the probability a clean firm will acquire a dirty facility decreases. In Model 6, we find that a similar dynamic holds for weak firms' acquisition of facilities with strong environmental capabilities. As the distance between the firm and the facility increases, an environmentally weak firm becomes less likely to acquire an environmentally strong facility.

In order to better interpret our results and test their robustness, we perform three additional pieces of analysis. First, we graph our results to aid interpretation of the effects of our conditional logistic estimations. It is difficult to interpret coefficients in logistic regressions, especially with interaction effects (Hoetker, 2007).[7] Thus, we follow Zelner (2010) and use a Monte Carlo simulation technique to evaluate the effect of important variables and explore them graphically. [8] To do this, we draw estimates from distributions corresponding to the mean, variance, and covariance of each coefficient and independent variable in Models 5 and 6. By repeated sampling, we can estimate the mean effect of distance on the acquisition of two prototypical facilities—one clean and one dirty.

Figure 1 shows that clean firms are more likely to choose dirty plants when they are proximate to the existing firms' plants. This probability decreases as the distance increases. Figure 2 illustrates that dirty firms are more likely to choose clean plants when they are proximate. At the greater distance, firms are indifferent to differences in capabilities. Our graphical results are consistent with our expectation that managers perceive it to be difficult to transfer capabilities from a distance.

Figure 1 also allows us to explore the economic importance of our result. In Figure 1, the distance between the two lines shows the relative probabilities of a clean firm choosing a clean facility (continuous line) or dirty facility (dashed line) at a given distance. Consider two facilities extremely close to a typical acquiring firm, one of which is an average 'clean' facility and the other an average 'dirty' one. The probability the clean facility will be acquired is 0.024, while the probability that the dirty facility will be acquired is 0.08. Thus, when choosing among very proximate facilities, clean firms are *three times* more likely to

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[7] In logistic regressions, the effect of the interaction is a function of the coefficient for the interaction, the coefficients for each interacted variable, and the values of all the variables.
[8] In order to make the distance measures in the graph easier to interpret, we first repeated the analysis in Table 2 using raw (i.e., not mean centered) variables.

choose a dirty facility than a clean one. Figure 2 demonstrates a similar effect for dirty firms. Very proximate clean facilities are more than twice as likely to be acquired as very proximate dirty ones. Of course, in both graphs the preference for proximate facilities is revealed as well. The probability of acquisition for both types of facilities falls with distance.

Figures 1 and 2 also help explain why we do not find support for Hypotheses 1a and 1b. Recall that the mean distance between a firm and a potential target facility is around 1,350 km (or 7.2 in a logarithmic scale, as shown in Figures 1and 2). The figures show that with distance at its mean value, the preference for a clean or dirty target for a clean firm (Figure 1) or for a dirty firm (Figure 2) is hard to differentiate. In Table 2, Model 4, we do find that dirty firms are, on average, more likely to acquire dirty facilities at the mean distance, but Figure 2 demonstrates that at that distance, the overall probability of acquisition is quite small and, thus, the difference between clean and dirty is economically minute.

***** Please insert Figures 1 and 2 about here *****

In our second piece of additional analysis, we re-analyze the data, limiting our analysis to those industries for which emissions are likely to be especially relevant. We use Cho and Patten's (2007) list of environmentally sensitive industries: metal mining (SIC 10), paper and allied products (SIC 26), chemicals and allied products (SIC 28), petroleum refining and allied products (SIC 29), primary metal industries (SIC 33), and electric, gas, and sanitary services (SIC 49).[9] Chatterij and Toffel (2010) recently demonstrated that firms in these industries are more responsive to environmental third-party ratings than are firms outside these industries. We would expect firms in these sensitive industries are especially likely to take environmental capabilities into account in their acquisition choices.

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[9] Cho and Patten's list includes oil and gas extraction (SIC 13) as well; however, our sample does not include any facility acquired within this specific industry sector.

Table 2, Models 7 and 8 show the results of our analysis of the acquisitions made by firms in environmentally sensitive industries by replicating Models 5 and 6. The results are very similar to those obtained with the broader sample. The results of the interaction of environmental capabilities with distance show distance again strongly moderates this tendency, and the same pattern found in the broader sample holds: firms only acquire facilities with different levels of capabilities if the facilities are proximate. While we cannot formally compare coefficients across the models, we note that for clean firms, the coefficient on the interaction between environmental performance and distance is higher in environmentally sensitive industries (-0.185 v. -0.135 across all industries).

Finally, we perform a simple test of the underlying mechanism we think influences acquisition choice: the ability of firms to transfer improving capabilities among proximate facilities. To do this, we perform an analysis of percent changes in waste generated by facilities post-acquisition. In Table 3, we report the average change (per year) in every chemical at the acquired facilities in the three years following their acquisition. We separate that into cases where the facility was bought by a firm dirtier or cleaner than its previous owner, and further separate this by proximity.

***** Please insert Table 3 about here *****

The results indicate that in the three years following acquisition, facilities acquired by clean firms tend to reduce their waste by a greater amount (-1.64 percent/year) than do those acquired by dirty firms (-0.82 percent/year), and that this effect is stronger for more proximate facilities (-4.51 percent/year). This distance effect is not seen in the case of a dirtier acquirer. Proximate facilities bought by dirtier firms improve less than those that are somewhat distant, and about the same as those very far away. These results are consistent with our claim that clean firms are able to transfer capabilities to proximate new acquisitions.

The lack of a clear distance result is also consistent with our theory that in the ‘cream–skimming’ case, firms are transferring capabilities in the reverse direction (from the new acquisition to the firm).

We recognize the current analysis assumes any facility in a set is a potential target for a firm, including those acquired by other firms that year. We therefore perform a more conservative analysis where the facilities acquired by other firms in a given year are excluded from the pool of potential alternatives. The sign and significance of our results do not change.

Discussion and Conclusion

In this paper, we consider whether environmental capabilities affect corporate strategy. Specifically, we hypothesize and find that acquisition choices of manufacturing firms are affected by both their own and their targets’ degree of environmental capabilities. We also extend the broader literature on corporate strategy by evaluating the conditional acquisition decisions of firms. In doing so, we advance a previously neglected part of the literature on acquisition choice, something we call the ‘which one’ decision. Both the ‘turnaround’ and ‘cream–skimming’ cases show the effect of capabilities is contingent on two important factors. First, the relative difference between acquiring firm and target, not the absolute level of the target’s capabilities, predicts acquisition. This supports the view of acquisitions as a market-facilitated matching process between entities who can gain from exchange (Faria, 2008). Second, we show that the propensity for a change in ownership is still strongly influenced by geographic proximity. We infer that managers recognize the importance of proximate transfer, and we show preliminary evidence that this recognition is justified.

With regard to the literature on organizations and the natural environment, we provide evidence that environmental capabilities do, in fact, affect corporate strategy, an important topic that previously has been neglected (Diestre & Rajagopolan, 2010). Our research suggests a different dynamic than has been considered by the environmental management literature. Where most previous studies have assumed differences in strategy lead to different outcomes (including abilities), our research shows a firm's stock of abilities can influence its strategy.

Our research also demonstrates one way environmental capabilities may diffuse among firms. Given the growing importance of environmental capabilities, such diffusion is vital to achieving social goals of economic growth and environmental protection. Our research presents evidence that the pursuit of private gain may facilitate the transfer of needed abilities.

Most importantly, our results open up corporate strategy as a new area of research on green management. Future research could further explore how environmental capabilities influence other aspects of corporate ownership. For example, do environmental capabilities affect joint venture partners or new product line introductions? Our research also reveals the importance of research on post-acquisition changes in capabilities. Our results suggest those firms with strong capabilities are, in fact, able to infuse their newly acquired units with those capabilities. When and how such transfer occurs could be an important question for future research.

For the broader management literature on corporate strategy, we bring renewed attention to the determinants of the conditional acquisition choice, the aforementioned 'which one' decision. Prior research in acquisitions has found that, in general, acquiring firms tend to undertake turnaround acquisitions, as lower-performing targets are more likely to be acquired (Lichtenberg *et al.*, 1987; Banaszak-Holl *et al.*, 2002). Our results suggest that while low-performing facilities often are acquisition targets, it is important to consider the relative capabilities of the acquirer and the target, as well as factors that affect the ease of transferring capabilities between the new owner and the target.

Finally, our work provides evidence of the role physical distance plays in corporate strategy. Capabilities on which firms compete often are rooted in tacit knowledge (Kogut & Zander, 1992), and distance remains an important determinant of a firm's ability to manage capabilities. In theory, knowledge can be transferred in a relatively costless manner across distances. But to the degree that transferring capabilities requires dissemination of tacit knowledge, firms may need to develop a strong cooperative relationship between the parent and the newly acquired unit, as cooperation enhances trust, which, in turn, may enhance tacit knowledge transfer (Bresman, Birkinshaw, & Nobel, 1999; Szulanski, 1996). Moreover, cooperation and trust are enhanced by both physical proximity and similarity (Stuart & Sorenson, 2003).

Our findings provide implications for managers as well. We highlight the increasingly important role of environmental capabilities in managerial decisions and demonstrate that the propensity to transfer environmental capabilities influences the acquisition decision process. Given the tacit nature of environmental capabilities, managers involved in M&A activities need to trade off the ease of knowledge transfer to or from a target with similar capabilities and the difficult, yet potentially more valuable, transfer that involves a target with dissimilar capabilities. To relieve this tension, managers in our sample tended to choose dissimilar yet proximate targets. Proximity facilitates the transfer of complex know-how between an acquiring firm and its new target while reducing monitoring and coordinating costs.

Our work has important limitations. The TRI data have a number of strengths, but they include only those facilities that manufacture or use sufficient quantities of the pertinent chemicals, so we are not able to include acquisitions of non-TRI-reporting facilities. For our hypotheses regarding the role of environmental capabilities in acquisitions, however, including other facilities would only introduce additional alternatives, and these should not affect the preferences. Second, our use of conditional logistic analysis causes us to force firms to choose from among facilities that are in the same industry as the facility they ultimately acquired. We are unsure whether broadening the pool to include greater diversity among targets would change our results, but our modeling strategy allowed for a tractable set of alternatives from which firms could choose and broader choice sets would not do so.

There are three important benefits to our approach that offset the limitations noted above. First, the TRI data contain both publicly traded and privately held firms, so our analysis of acquisition choices does include private firms, which, by definition, are excluded from the majority of acquisition studies that focus on stock price reactions. Since most acquisitions involve private firms as either sellers or buyers, excluding such firms is problematic (Aldrich, 1999). Second, since the data are collected at the facility level, we are able to assess the degree to which establishment-level attributes affect the likelihood a particular establishment will occur; again, such acquisitions are commonplace and it is important to ensure they are included. Finally, the data allow us to consider how operation-level factors, such as the actual chemicals used and/or produced at a facility, affect the probability a firm will acquire a given facility.

In summary, our research provides important new evidence on the way differing environmental capabilities influence ownership changes. This evidence suggests environmental performance affects corporate strategy and that it does so in a different way for clean firms than for dirty firms. It appears green management matters not only within the firm but in deciding how to extend the very boundaries of the firm itself.

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Table 1. Descriptive Statistics														
	Variable	**Mean**	**Std. Dev.**	**Min**	**Max**	1	2	3	4	5	6	7	8	9
1	Waste generation	0.00	1.00	-4.36	8.53	1								
2	Average distance	7.19	0.71	0	9.21	-0.03	1							
3	Chemical use overlap	0.36	0.32	0	1	0.03	0.03	1						
4	Plant's size discrepancy	1.38	1.10	0	8.06	-0.01	0.02	-0.07	1					
5	SIC overlap	0.36	0.35	0	1	0.00	-0.09	0.10	-0.08	1				
6	Labor productivity	0.00	0.56	-19.45	7.57	0.02	0.00	0.00	-0.01	0.00	1			
7	Regulatory overlap	1.00	0.29	0	1.5	0.07	-0.10	-0.02	-0.07	0.06	0.01	1		
8	Same state location	0.25	0.43	0	1	0.00	-0.20	0.21	0.00	-0.08	0.00	0.01	1	
9	Relative regulatory stringency	0.37	0.35	0	4.05	0.01	0.19	-0.05	0.01	0.03	0.01	-0.01	-0.18	1

Table 2. Conditional Choice Models.	**Full Sample**						**Environmentally Sensitive Industries Only**	
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
	Clean firm	**Dirty firm**	**Clean firm**	**Dirty firm**	**Clean firm**	**Dirty firm**	**Clean firm**	**Dirty firm**
Waste generation (H1a/H1b)			0.052 (0.033)	0.084*** (0.029)	0.037 (0.033)	0.099*** (0.029)	0.072 (0.062)	0.195*** (0.049)
Waste generation X average distance (H2a/H2b)					-0.135*** (0.043)	0.119*** (0.037)	-0.185** (0.082)	0.122** (0.060)
Controls								
Average distance	-0.150*** (0.043)	-0.229*** (0.038)	-0.152*** (0.043)	-0.223*** (0.038)	-0.186*** (0.045)	-0.271*** (0.041)	-0.185** (0.082)	-0.227*** (0.065)
Chemical use overlap	1.514*** (0.134)	1.769*** (0.127)	1.537*** (0.135)	1.759*** (0.127)	1.563*** (0.136)	1.794*** (0.128)	2.148*** (0.280)	2.282*** (0.252)
Plant's size discrepancy	-0.285*** (0.041)	-0.195*** (0.035)	-0.284*** (0.041)	-0.195*** (0.035)	-0.288*** (0.041)	-0.199*** (0.035)	-0.196*** (0.071)	-0.218*** (0.058)
SIC overlap	2.459*** (0.428)	1.638*** (0.371)	2.448*** (0.427)	1.591*** (0.371)	2.454*** (0.426)	1.622*** (0.371)	2.690*** (0.644)	1.185** (0.539)
Labor productivity	-0.039 (0.058)	0.091 (0.058)						
Regulatory overlap	0.354*** (0.133)	0.354*** (0.120)	0.347*** (0.134)	0.329*** (0.121)	0.363*** (0.134)	0.335*** (0.121)	0.740*** (0.256)	0.092 (0.200)
Same state location	0.231*** (0.087)	0.418*** (0.074)	0.233*** (0.087)	0.417*** (0.074)	0.222** (0.087)	0.408*** (0.074)	0.108 (0.160)	0.358*** (0.123)
Relative regulatory stringency	-0.088 (0.117)	0.205** (0.095)	-0.090 (0.117)	0.197** (0.095)	-0.091 (0.117)	0.202** (0.095)	-0.104 (0.180)	-0.052 (0.144)
Observations	98419	130766	98419	130766	98419	130766	31918	54223
Chi^2	308.7	437.5	311.2	446.0	321.2	456.4	123.0	183.4

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3: Average Waste Reduction in Three Years Following Acquisition		**Close**	**Typical**	**Far**
	Median distance	(Dist.<-1SD)	(-1SD<Dist<+1SD)	(Dist >+1SD)
Cleaner acquirer	-1.64*	-4.51	-1.25	-0.64
Dirtier acquirer	-0.82	-0.12	-1.75	0.00

* The reported values are $\ln(W_{i,t+1}/ W_{i,t})$ for *W* lbs of each chemical *i* in year *t* (which is approximately the percentage change in waste for the relevant range of changes in the data). For each facility, we average this value for each *i* chemical in year *t*. Thus, the values in the table approximate the average percentage change of all of the chemicals in a facility in a focal year.

Figure 1. Effect of Plant's Environmental Capabilities and Distance on the Probability of Being Acquired by a Firm with Strong Environmental Capabilities

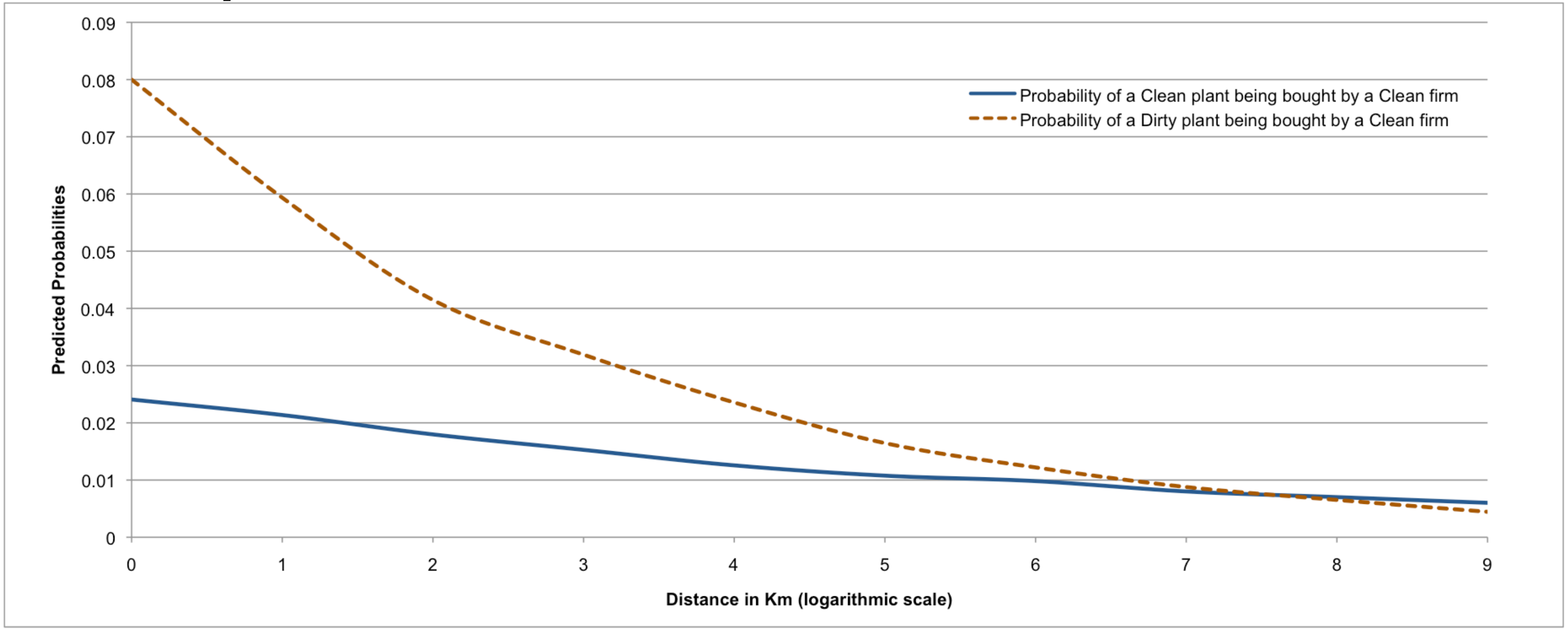

Figure 2. Effect of Plant's Environmental Capabilities and Distance on the Probability of Being Acquired by a Firm with Weak Environmental Capabilities