The Persistent Effect of Geographic Distance in Acquisition Target Selection

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Valuable resources often exist at distant points from a firm’s current locations, with the result that strategic decisions such as growth have a spatial dimension in which firms seek information and choose between geographically distributed alternatives. Studies show that geographic proximity facilitates the flow of resources, but there is limited understanding of factors that exacerbate or ease the impact of geographic distance when firms seek new resources. This paper argues that the difficulty of search increases with distance, particularly when search involves greater information processing, but that firms can partially overcome the constraints of distance with direct, contextual, and vicarious learning. We study 2,070 domestic acquisition announcements by U.S. chemical manufacturers founded after 1979. The results demonstrate the persistent effect of spatial geography on organizational search processes.

Key words: mergers and acquisitions; target selection; geographic distance; business relatedness

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Introduction

Firms searching for new resources face variation in the spatial distribution of potential sources. The geographic strategy literature has shown that geographic proximity facilitates resource flows, influencing location decisions for venture capital (Sorenson and Stuart 2001), financial investment (Coval and Moskowitz 1999), and business units (Audia et al. 2001, Landier et al. 2007). In turn, firms gain from their proximity to consumers (Cadwallader 1975, Eaton and Lipsey 1979) and competitors (Petersaf and Shanley 1997) and from region-level agglomeration economies when they locate in close proximity to other firms (Dudley 1990, Jaffe et al. 1993, Krugman 1991). Nonetheless, desirable resources often exist at distant points from a firm’s current locations; decisions such as growth, innovation, operational changes, and divestiture have a spatial dimension (Dicken 1971) whereby firms seek information from distant sources and choose between geographically distributed alternatives. To date, though, there is limited understanding of factors that exacerbate or ease the impact of geographic distance when firms seek new resources (see Maskell 2001). We argue here that the difficulty of search increases with geographic distance, particularly when firms seek resources that require greater information processing to assess, but that the impact of geography decreases as firms gain relevant direct, contextual, or vicarious experience.

This study draws from the spatial geography and acquisition strategy literatures to develop predictions concerning how geographic distance affects firms’ domestic acquisition decisions. By geographic distance, we mean distance in relevant units of space such as miles. Acquisition is one of the major means by which firms search for new resources (Capron et al. 1998). The spatial geography literature highlights that, despite recent advances in technology (Sorenson and Baum 2003), decision makers face information and access constraints that lead to spatially biased decisions (Duerloo et al. 1990, Golledge 2002). This is particularly true when decision makers lack resources (Rossi 1995) or when they attempt to access information in new environmental contexts (Golledge and Stimson 1997). Although initial choice is experimental, decision makers can learn and make informed decisions as they gain experience in the search process (Clark 1993). We extend these arguments to the context of acquisitions and argue that the search for acquisition targets is a spatial decision problem such that firms choose from a set of geographically dispersed potential targets. Using a revealed preference approach, we define the set of potential targets as other firms that could also have been acquired at the time. We argue that the acquirers will prefer targets that are geographically proximate relative to the set of potential targets, especially when acquiring related targets. In addition, though, we expect that the effect of distance
will decline as acquirers gain direct learning with distant search, contextual learning with acquisitions in distant states, and vicarious learning through other business units in their organizations.

We examine 2,070 domestic acquisitions announced between 1980 and 2003 by 767 U.S. chemical manufacturing firms that were founded after 1979. Chemical industry acquisitions have been driven by the need for consolidation and the consequent efficiency increase from combining similar businesses (e.g., O’Reilly 2005). Almost three quarters of U.S. chemical acquisitions during this period were related, meaning that acquirers had less need for industry information but substantial need for organizational information that could be distorted by distance (Coval and Moskowitz 1999). The size distribution of chemical manufacturing firms is highly skewed (U.S. Bureau of Labor Statistics 2006), with most firms being small and privately held and for which little organization-level information is publicly available (Capron and Shen 2007). We restricted the sample to firms that were founded after 1979 to track target selection decisions from firm founding; this allowed us to explore how patterns changed as firms became more experienced with acquisition decisions and as advances in information technology over time facilitated information flow (Couclelis 2009). We focused on domestic acquisitions to help identify the set of alternatives that existed for announced acquisitions and to limit the effects of distance with the effects of more constrained transaction experience. Given the relative ease of travel within the United States, treating distance in miles rather than travel times is appropriate. The setting allows us to contrast the impact of the relevant experience that we expect to condition the effects of distance with the effects of more general forms of experience such as business age and distance-independent transaction experience.

Background: Resource Search and Spatial Decision Making

The strategic geography literature suggests three points: decisions about resources are often uncertain, firms have a limited spatial extent of information, and geographic proximity facilitates resource redeployment. Many decisions—such as locating establishments, investments, expansion, and divestiture—present spatial choice problems. This section establishes the need to examine how firms conduct spatial searches for resources and considers how decision makers overcome the constraints of distance.

The Search for Resources

The resource-based view of strategy considers the firm as a collection of tangible and intangible productive factors, including technological, human, financial, and physical assets (Barney 1986, Peteraf 1993, Wernerfelt 1984). These factors contribute to firm-level competitive advantage and superior returns when they are unique, durable, and not easily traded (Barney 1986, Wernerfelt 1984) and when used appropriately in market context (Andrews 1971, Grant 1991). However, such advantages are sustainable only when firms are able to regularly identify, develop, and deploy resources (Amit and Shoemaker 1993, Dierickx and Cool 1989, Helfat et al. 2007). Firms often need to obtain new resources (Caves 1982, Teece 1982) or employ existing resources in new business applications (Penrose 1959) to stay competitive. Building on this literature, studies of dynamic capability examine how firms are able to extend or modify their existing resource base (Helfat et al. 2007) while identifying acquisition-based growth as an important source of new capabilities (Capron et al. 1998).

Firms seek resources externally when they face constraints to internal development. Internal development emphasizes a firm’s existing operations (Nelson and Winter 1982) and technological base (Dosi 1982), such that firms are most likely to learn new skills in areas where they already have prior knowledge (Teece 1987). In addition, firms are limited in the extent of internal development they can achieve in any given period (Penrose 1959) and face difficulties with internal development when they need to respond rapidly to environmental changes (Stalk and Hout 1990). Firms can overcome such constraints by seeking resources externally, such as by exchanging discrete resources through permanent sales agreements, rental contacts, and partnerships (Rugman 1981, Tushman and Romanelli 1985) or by buying businesses and then redeploying resources among the target and acquirer (Capron et al. 1998, Helfat et al. 2007, Wernerfelt 1984).

When seeking resources externally, firms face valuation difficulties and opportunistic behavior by contracting parties, which can reduce their ability to buy, sell, and license discrete resources. Resource valuation is difficult when development activities span functions within the firm, where it becomes difficult even to discern discrete resources (Conner and Prahalad 1996, Itami and Roehl 1987, Mitchell 1994, Montgomery and Wernerfelt 1988, Peteraf 1993, Simoen 1969). Difficulties also arise when resources face asymmetric information (Arikan 2005, Reuer and Ragozzino 2008) and when appropriability mechanisms are weak (Chi 1994, Grossman and Hart 1986, Rumelt 1987, Williamson 1985). Potential opportunism may create market failures in exchanging discrete resources by sale or by license (Caves 1982, Rugman 1981, Williamson 1985).

The difficulty of acquiring resources from external sources increases when resources are geographically distributed, even as desirable resources are often geographically distant from decision makers. Hence, decisions about resources attain a spatial dimension, where firms
have to consider geographically distributed alternatives and choose among them (Dicken 1971). The next section considers economic and behavioral mechanisms that shape spatial choice.

**Spatial Decision Making**

Spatial decision making involves searching for spatially distributed information and choosing between spatially distributed alternatives. When information from accumulated knowledge is inadequate or inapplicable, decision makers scan external sources of information to facilitate their choice. Studies of spatial search have long considered personal choices such as migration (Brown and Holmes 1971), consumer behavior (Gaswirth 1976, Timmermans 1980), employment (Rogerson and MacKinnon 1981), and residential search (Clark 1993). In addition, spatial search arises with many business decisions, such as establishment and location (Stuart and Sorenson 2003a), financial investment (Coval and Moskowitz 1999), expansion (Baum et al. 2000), and divestiture (Landier et al. 2007). Studies consistently show that firms and other decision makers have a limited spatial extent of information even within national borders.

Neoclassical economic and behavioral decision-making arguments complement each other in explaining how decision makers evaluate spatially distributed alternatives and choose between them. Neoclassical economics treats search as a cost–benefit optimization problem in which decision makers minimize cost or maximize utility while recognizing the trade-off between the cost of continuing search and the opportunity cost of stopping search (Clark and Flowerdew 1982). Following this approach, decision makers search until observing a price lower than the price at which the expected marginal gain from search equals the marginal cost of search (Kohn and Shavell 1974, Miller and Finco 1995, Philips 1988, Ratchford 1982). Search is both an optimal routing problem in which decision makers pick alternatives from the population and an optimal stopping problem where decision makers choose which candidates to evaluate further (Maier 1993; Miller 1993, 1994; Narula et al. 1987; Rogerson 1990). Behavioral theory explores how decision makers create an effective set of alternatives from the population of potential alternatives (Desbarats 1983) and how these alternatives are evaluated (Slovic et al. 1977) using psychological mechanisms such as satisficing behavior (Simon 1957) that simplify complex decisions (Duhaime and Schwenk 1985).

Irrespective of approach, empirical findings consistently show that the spatial search process is limited in time (Ratchford 1980) and spatial extent (Clark 1982, Stimson 1982); both are significantly constrained when search is costly (Clark and Smith 1979, Kohn and Shavell 1974). Search processes are likely to be quicker when the gains are smaller and when the distribution of the variance of net gains across all alternatives is low (Huff 1984). In addition to such cost–benefit considerations, psychological processes also explain the short duration of search. When decision makers are risk averse in selecting from alternatives, they are likely to make satisficing choices, stopping a search when they find an alternative that satisfies their minimal conditions (Smith et al. 1979). Hence, decision makers are likely to consider only a fraction of potential available alternatives (Meyer 1980, Michelson 1979), particularly when they have limited access to resources (Cronin 1982).

The distance-decay effect (Curran et al. 1982, Golledge 2002, Perrings and Hannon 2001, Tobler 1970) manifests a ubiquitous constraint on information and access that leads to spatially biased search patterns. Distance decay occurs when the probability that a decision maker considers an alternative decreases with increasing distance between that alternative and the decision maker’s current location (Clark and Smith 1979, Huff 1986). Thus, location is an important factor in understanding and utilizing spatial information (Tobler 1970). The distance-decay effect is a preference in space that can be summarized by a spatial discount rate, just as preferences over time can be summarized in a time discount rate (Perrings and Hannon 2001). Empirically determined distance-decay curves are steep: exponential in the case of marriage partners, lognormal in the case of urban population density, and Pareto for urban land values (Golledge 2002). We now consider spatial decision making in the context of firms’ search for resources via selecting acquisition targets.

**Acquisition Target Selection**

We refer to the acquisition targets that firms select as **acquisition matches**. Determining acquisition matches requires two connected decisions: product line and geographic location. Firms first decide which product lines to expand—a simple categorization would be whether the expansion is in related or unrelated product lines. Unrelated acquisitions—such as General Electric’s acquisition of NBC—are similar to venture capital investments, providing little scope of knowledge transfer or sharing of other resources. Related acquisitions—such as Novartis’s acquisition of the pharmaceutical firm Chiron—provide firms with opportunities to benefit from economies of scale and scope, from operational synergies, and from improved competitive position. Related acquisitions allow firms to combine operations, reduce duplicative functions, integrate knowledge, integrate production and distribution systems, and cater to larger product and geographic markets. However, related acquisitions also require more complicated search activities and greater postacquisition integration, such that costs incurred in the process will weigh down the potential benefits (Trautwein 1990).
Second, firms decide which target firm to acquire along these product lines. This introduces a spatial expression with a cost–benefit implication. Some acquisitions have explicit spatial expression, such as acquisitions driven by the need to gain access to input and market resources or to engage in multipoint competition. Although firms do not aim to acquire geographically distant targets per se, they may require distant acquisitions in order to increase access to suppliers and buyers. The extent of spatial dispersion corresponding to these objectives depends on the locations of the firm, its targeted market, and its suppliers. It is difficult to directly predict the spatial dimension associated with certain objectives, such as gaining economies of scale and scope or achieving quick access to technology, but spatial location matters in acquisitions to the extent that it influences the target search process.

Target search includes screening firms during an investigation for strategic and organizational fit, performance, and the amount of investment that an acquisition would require. During this time, acquirers need extensive information to evaluate potential targets. This includes financial information such as size, profitability, debt, the strategic value of the target’s assets, and the investment the acquiring firm will need to provide in order to upgrade and reconfigure the target’s assets (Salter and Weinhold 1981, Weston et al. 2004). Acquirers also seek cultural knowledge that reflects the values and priorities within the target firm (Pritchett 1985), as well as detailed information on the manner in which targets organize their activities, including corporate responsibilities, financial systems, employment policies, job descriptions, performance evaluation systems, benefit plans, profit sharing plans, and purchase and marketing setups (Yunker 1983). Acquirers must judge how a target’s skills will fit their own activities (Haspeslagh and Jemison 1991) and what activities they will need to undertake in order to combine the target and acquirer skills (Capron et al. 1998, Pablo 1994).

The amount of information that acquirers possess about potential targets affects the search process. The effect of incomplete information on target selection is well established (Reuer and Ragozzino 2008, Shen and Reuer 2005): the less information that acquirers can collect about potential targets, the greater the associated transaction costs and the less likely that managers will engage in the acquisition. Studies have shown that a large proportion of acquisitions involve privately held targets, with little or no publicly available information (Capron and Shen 2007). Acquisitions of such targets involve a substantial price discount (Koeplin et al. 2000), reflecting the information discount that acquirers experience while evaluating such targets. Target selection can be influenced by signals in the form of initial public offering processes, public disclosures, ties to investment banks, and coverage by the press and business analysis (Arikan 2005, Reuer and Ragozzino 2008), highlighting both the importance of information and the limitations acquiring firms have in gathering information.

Hence, acquiring firms must overcome multiple constraints while searching spatially for targets. Acquirers and their executives have physical and cognitive constraints (Cyert and March 1963, Penrose 1959) and have limited resources for target search. This bounds the amount of time acquirers can spend in target search and the extent to which acquirers can evaluate multiple potential targets to reach a decision. The search process will typically assess only a fraction of the population of potential targets (reflecting arguments in Desbarats 1983) and will be influenced by cognitive factors such as the need to simplify complex decisions (Duhaime and Schwenk 1985, Tihanyi et al. 2003). Such factors will influence which targets are considered and evaluated in the process of decision making.

Such constraints on search lead to spatially biased decisions. Research suggests that subjective influences such as context familiarity, prior knowledge, and perceived competence have important influences in individual investment decisions (Brennan and Cao 1997, Grinblatt and Keloharju 2001, Heath and Tversky 1991, Huberman 2001, Kang and Stulz 1997) and that such influences shape the geography of investment decisions (Coval and Moskowitz 1999, 2001; Sorensen and Stuart 2001). Spatial decisions often involve the use of spatially limited personal information before secondary sources of information (MacLennon and Wood 1982), particularly when decision makers lack resources to support an extensive search (Rossi 1995). Such secondary sources include brokers, investment banks, and consulting companies that identify, gather information about, and carry out due diligence about targets. Several studies (Palm 1976a, b) have raised questions about whether intermediaries can provide spatially unbiased information, whereas others suggest that firms use both informal and formal information gathering, with informal subjective factors playing major roles even within formal objective processes (Daft et al. 1988, Green and Cromley 1984, Kierulf 1981, Weston et al. 2004). Summarizing these arguments of traditional spatial decision-making theory and the acquisitions strategy literature, we predict that firms will exhibit a preference for geographically proximate targets.

HYPOTHESIS 1 (H1). The greater the geographic distance between an acquirer and a potential target, the lower the probability of an acquisition match.

Spatial factors are likely to have greater influence on decisions that require extensive subjective information to process (Petersen 2004). More recent studies (Landier et al. 2007) have explored the effect of “hard” and “soft” information on business decisions. Hard information is
quantifiable; examples include a firm’s financial performance, stock returns, age, size, diversification, and the geography of its subunits. Such information is easy to collect, store, and transmit across long distances. Managers can delegate the collection of hard information and can automate decision-making processes that use hard information. By contrast, soft information is difficult to quantify, is context specific, and distorts at a distance; examples include vision, motivation, goals, expectations, ideas, opinions, and team dynamics. Geographic distance increases the difficulty of effective communication (Cummings 2008), as well as the cost of seeking and integrating knowledge (Borgatti and Cross 2003, Cummings and Ghosh 2005, Petersen 2004), which will be particularly relevant for soft information.

In the context of target selection, acquisitions that involve postpurchase integration of buyer and target firms have greater information requirements. Related acquisitions are likely to involve greater degrees of postacquisition integration and strategic interaction than unrelated acquisitions. In related acquisitions, firms acquire targets with similar business lines to capture synergistic benefits and scope economies, in path-dependent, resource-deepening expansion (Karim and Mitchell 2000). The benefits from such acquisitions commonly require strategic interchange of resources between the acquirer and target firm (Haspeslagh and Jemison 1991). By contrast, in unrelated acquisitions of targets with different business, targets often receive instructions about performance requirements, such as General Electric’s demands for performance levels in its NBC broadcasting subsidiary, but usually do not involve an extensive systematic interchange of resources between the acquirer and target. Unrelated acquisitions commonly allow substantial organizational autonomy (Haspeslagh and Jemison 1991), whereas relatedness in products and services between acquirers and targets creates a greater level of postacquisition integration effort (Howell 1970, Pablo 1994, Shrivastava 1986).

Acquirers require more extensive information during target selection for related acquisitions. Related acquisitions frequently involve redeployment of research and development (R&D), manufacturing, marketing, managerial, and/or financial resources (Capron et al. 1998). Some interactions involve a costless transmission of information, whereas others involve teams working together closely, even as part of the target selection process. Research indicates that managers may face significant obstacles while implementing such interactions over long distances (Hauptman and Hirji 1999, Kiesler and Cummings 2002). Given that acquirers need to collect more extensive soft information about related targets, firms are likely to exhibit a stronger preference for geographic proximity while acquiring such targets.

Hypothesis 2 (H2). The more related the acquirer and target, the more that geographic distance will reduce the probability of an acquisition match.

Studies have shown that the ability to make spatial decisions develops with experience in the decision-making process. Initial decisions often lack order, reflecting decision makers’ attempts to deal with uncertainty in new environmental contexts. After successive trials, though, decision makers often converge on a response sequence that reflects less experimentation and more incremental learning. Studies have found this pattern in a variety of contexts (see Golledge and Stimson 1997 for a synthesis), including job search (Rogerson and MacKinnon 1981), residential search (Clark 1993), immigration (Humphreys and Whitelaw 1979), and consumer behavior (Timmermans 1980).

We expect that acquirers can improve their target selection capabilities through routine-based experiential learning (March and Simon 1958)—that is, learning by direct experience. Direct experience with an activity such as distant search may help acquirers improve their ability to manage the acquisition process as a result of better information-gathering ability (Green and Cromley 1984) and target selection skills (Bruton et al. 1994, Mitchell and Shaver 2004). Inexperienced acquirers often inappropriately generalize their limited acquisition experience to subsequent dissimilar acquisitions; more experienced acquirers differentiate between their acquisitions, suggesting that experience plays an important role in acquisition success (Halebian and Finkelstein 1999). With experience in distant target search, acquiring firms generate routines that help them assess organizational information for distant targets, judge the value of targets’ resources, and assess how a target fits in with their own strategy. This logic suggests that acquirers face weaker spatial influences in target selection as they gain direct experience in distant search, that is, after they have acquired prior targets involving substantial cumulative distance.

Hypothesis 3A (Direct Experience) (H3A). The greater the geographic distance of acquisitions an acquirer has undertaken in the past, the less that distance will reduce the probability of an acquisition match.

In addition, acquirers can accumulate contextual knowledge about distant markets that reduces the extent of information search that is necessary while searching for targets within those regions. Studies show that firms are likely to expand in distant environments in which they have prior experience (Baum et al. 2000, Greve 2000). Such findings reflect the effect of familiarity with the market and with firms operating in the market. In turn, this logic suggests that the likelihood of an acquirer selecting a distant target increases when the acquirer has a prior acquisition in the same geographic region as the target.

Hypothesis 3B (Contextual Experience) (H3B). The likelihood of choosing a target firm in a distant region is higher if the acquirer has previously acquired in that region.
A question arises concerning whether firms can accumulate knowledge about potential targets from interactions with competitors and partners, or from regular environmental scans, thereby reducing the need to search for targets. Acquiring managers are, however, unlikely to regularly scan the environment for information about other firms that might later become relevant during the target selection phase of an acquisition (Hambrick 1982). Instead, firms are more likely to initiate scanning activities once they need data on such external events (Daft et al. 1988). Given that acquisition decisions are based on specific resource requirements and opportunities created by underutilized productive resources present in firms at a given point in time (Penrose 1959), acquirers will need to scan the environment for target firms that fit their present expansion objectives as part of the target search process (Green and Cromley 1984, Leigh and North 1978). Accumulated knowledge depreciates quickly, though, limiting the persistence and applicability of direct experiential learning in organizations (Argote et al. 1990) while highlighting the potential for learning from secondary sources (Baum et al. 2000, Ingram and Baum 1997). These findings suggest that experiential learning is likely to be limited to target search routines (Levinthal and March 1993, March 1991) and is unlikely to lead to knowledge accumulation that substitutes for spatial information gathering during the target search process.

Instead, acquirers can utilize vicarious learning from secondary sources to help them gather information in unfamiliar contexts. The spatial geography literature shows that sources of information change over time (MacLennon and Wood 1982), extending from local and personal sources to geographically distributed and secondary sources. A potential secondary source of information that offers opportunities for vicarious learning is existing subsidiaries or parent units. Studies examining chain stores, for instance, demonstrate how localized search through distant units can influence expansion decisions (Baum et al. 2000, Graff and Ashton 1994, Greve 2000).

Firms that have ongoing relationships with other firms may exhibit a lower preference for proximate targets than stand-alone firms. Such ongoing relationships can exist in the presence of a parent firm, which is likely to dictate acquisitions strategy, or the existence of a subsidiary firm, which is likely to transmit information about targets that are close to the subsidiary but far from the parent headquarters. We therefore predict that firms can at least partly overcome the constraints of distance by accessing information from parent and subsidiary organizations. Such benefits will spread the information network that a firm possesses, in turn increasing the potential span of its acquisition activities.

**HYPOTHESIS 3C (VICARIOUS EXPERIENCE) (H3C).** *The preference for geographically proximate targets is lower for acquiring firms with parent or subsidiary firms.*

In sum, we argue that distance influences search activity (H1), especially when firms require extensive information to process decisions such as in the case of related acquisitions (H2), but distance may become less influential as firms gain experience with distant search via relevant direct (H3A), contextual (H3B), and vicarious (H3C) activity. The analysis will compare these factors to more general experiential influences such as overall acquisition experience and organizational age. Discriminating among these experience factors will help determine how actively firms tend to shape their spatial acquisition strategies and other geographic search strategies. The analysis will also assess other factors that might influence the ability of the acquiring firm to purchase geographically distant targets, such as acquirer size, acquirer geographic centrality, and recent developments in communication technology.

**Analysis**

**Sample**

The analysis studies U.S. chemical manufacturers. These firms use chemical processes to transform organic and inorganic raw materials into finished products. Such firms produce more than 70,000 different chemical substances, including basic chemicals such as carbon dioxide and hydrogen as well as end products such as fertilizers, drugs, paints, and soaps. The chemical industry is important in terms of its volume of output, accounting for about 25% of the worldwide production of chemicals, about 2% of U.S. gross domestic product, and about 12% of all U.S. manufacturing (O’Reilly 2005). The industry is a large employer, providing about a million jobs within the United States (U.S. Bureau of Labor Statistics 2006). About 55% of its output provides intermediate inputs for industries such as healthcare, education, textile, automobile, electrical, electronic, petroleum refining, paper, machinery and instruments, rubber and plastics, agriculture, mining, and construction, and about 25% of its output provides intermediate products in chemical manufacturing itself (see Lenz and Lafrance 1996).

We examine 2,070 domestic acquisitions announced between 1980 and 2003 by 767 U.S. chemical manufacturing firms that were founded after 1979. We identified acquirers from the SDC database using the 2007 North American Industry Classification System (NAICS) code of their primary industry subfield. Table 1 reports the primary subfields of the firms, the number of acquisitions the firms undertook during the 24-year period, and the number of acquisitions announced by all U.S. chemical manufacturing firms, irrespective of their year of founding. The sample includes 36% of all chemical manufacturing acquisitions that occurred during the period. The 2002 U.S. Economic Census reported that 9,660 firms were operational in 2002 (U.S. Census Bureau 2002).
SDC records show that 2,152 U.S. chemical firms implemented acquisitions during the observation period (24% of the population, assuming a stable population). The size distribution of chemical manufacturing firms is highly skewed. About 46% of firms are small, employing nine people or fewer, accounting for only 3.4% of the workforce employed in the chemical manufacturing industry. Only 3.5% of the firms employ more than 250 people, accounting for 44% of the chemical manufacturing work force (U.S. Bureau of Labor Statistics 2006). About 62% of the acquirers in the sample operate in pharmaceutical and medicine manufacturing, accounting for 57% of the acquisitions. Table 2 reports the primary industries of the target firms, showing that about 67% of acquisitions were of chemical manufacturing targets. Nonchemical industry targets included firms providing R&D services (8%) and wholesalers (5%). Our focus on domestic acquisitions facilitates the sampling design we outline below and also limits possible influences of political, technological, and travel time differences that might shape how geographic distance affects cross-border acquisitions.

Acquisitions have long played an important role in the development of the chemical industry. In addition to the general objective of achieving growth and quick access to resources, firms have used acquisitions to achieve economies of scale and operational efficiency in R&D, production, and marketing activities. The need for rapid changes—including greater economies and operational efficiencies—could arise from industry- or firm-level shocks (Danzon et al. 2007). Industry shocks could be driven by excess capacity resulting from demand shocks, which reflect fluctuating conditions in the health and other manufacturing sectors. Such contagion is reflected in the high utilization of the chemical manufacturing industry’s output by these sectors. Shocks can also arise from firm-level factors such as a low expected growth rate in the future. For pharmaceutical firms, for instance, this can arise from a setback caused by the U.S. Food and Drug Administration not approving the commercialization of a particular drug. Under such conditions, firms may perceive economies from acquiring and combining operations with other firms, removing duplicative functions, and reducing overhead while catering to a larger geographic market. Danzon et al. (2007) examined determinants and consequences of mergers in the pharmaceutical industry. They found that large firms merged in response to excess capacity and small firms merged as a result of financial trouble. Reports in the business press and industry analysis (e.g., O’Reilly 2005) describe many chemical acquisitions as opportunities to consolidate in a saturated environment, such that firms used acquisitions as a means to reduce overhead and increase efficiency.

**Focal Variables**

**Dependent Variable.** Acquisition is a 0-1 dummy variable that indicates whether any dyad of two firms (as we describe below) announced a deal in a given year. We do not restrict the sample to only those acquisitions that were completed, because the full sample better represents the process of target search and selection. The analysis controls for the number of prior incomplete acquisitions; we found no significant difference if the sample included only completed acquisitions.

**Acquisition distance** is the log of the miles between coordinates for the zip codes of the acquirer and target.

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**Table 1 Number of Firms and Acquisitions Across Industry Subfields, 1980–2003**

<table>
<thead>
<tr>
<th>Subfield</th>
<th>Total No. of firms</th>
<th>No. of firms founded after 1979</th>
<th>No. of acquisitions by chemical firms</th>
<th>No. of acquisitions by all mfg. firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing industry subfield</td>
<td>767</td>
<td>2,070</td>
<td>5,767</td>
<td></td>
</tr>
<tr>
<td>Basic chemical</td>
<td>3251</td>
<td>106</td>
<td>412</td>
<td>1,398</td>
</tr>
<tr>
<td>Resin, synthetic rubber and artificial fibers</td>
<td>3252</td>
<td>52</td>
<td>113</td>
<td>416</td>
</tr>
<tr>
<td>Pesticide, fertilizer, and other agricultural chemical</td>
<td>3253</td>
<td>34</td>
<td>107</td>
<td>318</td>
</tr>
<tr>
<td>Pharmaceutical and medicine</td>
<td>3254</td>
<td>480</td>
<td>1,180</td>
<td>2,355</td>
</tr>
<tr>
<td>Paint, coating, and adhesive</td>
<td>3255</td>
<td>25</td>
<td>56</td>
<td>333</td>
</tr>
<tr>
<td>Soap, cleaning and toilet preparation compounds</td>
<td>3256</td>
<td>48</td>
<td>152</td>
<td>558</td>
</tr>
<tr>
<td>Printing ink; explosives; photographic film, paper, plate, etc.</td>
<td>3259</td>
<td>22</td>
<td>50</td>
<td>389</td>
</tr>
<tr>
<td>Total</td>
<td>767</td>
<td>2,070</td>
<td>5,767</td>
<td></td>
</tr>
</tbody>
</table>

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**Table 2 Primary Industries of Targets (for 767 Acquirers Founded After 1979)**

<table>
<thead>
<tr>
<th>Industry</th>
<th>NAICS code (2007)</th>
<th>No. of targets</th>
<th>% of targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical manufacturing</td>
<td>325</td>
<td>1,379</td>
<td>66.52</td>
</tr>
<tr>
<td>Scientific R&amp;D services</td>
<td>541</td>
<td>170</td>
<td>8.2</td>
</tr>
<tr>
<td>Nondurable goods wholesalers</td>
<td>424</td>
<td>111</td>
<td>5.35</td>
</tr>
<tr>
<td>Durable goods wholesalers</td>
<td>423</td>
<td>73</td>
<td>3.52</td>
</tr>
<tr>
<td>Computer and electronic product manufacturing</td>
<td>334</td>
<td>66</td>
<td>3.18</td>
</tr>
<tr>
<td>Medical equipment and supplies manufacturing</td>
<td>339</td>
<td>55</td>
<td>2.65</td>
</tr>
<tr>
<td>Ambulatory healthcare services</td>
<td>621</td>
<td>34</td>
<td>1.64</td>
</tr>
<tr>
<td>Plastics and rubber manufacturing</td>
<td>326</td>
<td>19</td>
<td>0.92</td>
</tr>
<tr>
<td>Machinery manufacturing</td>
<td>333</td>
<td>23</td>
<td>1.11</td>
</tr>
<tr>
<td>Administrative and support services</td>
<td>561</td>
<td>12</td>
<td>0.58</td>
</tr>
<tr>
<td>Others (spanning 80 industries)</td>
<td>128</td>
<td>6.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2,070</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

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Chakrabarti and Mitchell: *The Persistent Effect of Geographic Distance in Acquisition Target Selection* Organization Science, Articles in Advance, pp. 1–22, © 2013 INFORMS
firm headquarters (to test H1). The distance \(d_{ab}\) between two points \(a\) and \(b\) is given by

\[
d_{ab} = C \left\{ \arccos[\sin(lat_a) \sin(lat_b) + \cos(lat_a) \cos(lat_b) \cos(|\text{long}_a - \text{long}_b|)] \right\},
\]

where lat and long refer to the latitude and longitude, respectively, of locations \(a\) and \(b\). \(C\) is a constant that converts the result to miles on the surface of the earth; we used \(C = 3,437\). There were numerous typographical errors and missing data in the zip code and city information within the SDC database, which we corrected manually by referring to individual company websites, directories such as the Medical and Healthcare Marketplace Guide the U.S. Census Bureau website, and various real estate websites.

**Acquisition is related** is a 0-1 variable indicating relatedness (H2). We tested both narrow and broad definitions of relatedness. In the first definition, this variable was 1 when the target operated in the same four-digit NAICS code (1,212 cases were related) and 0 when the target operated in a different four-digit NAICS segment (858 cases). The broader definition also coded an acquisition as related if the acquirer had a prior acquisition in the focal target firm’s industry, even if the target was in a different four-digit segment from the primary NAICS code of the acquirer. Using this measure, 1,389 of 2,070 acquisitions were related. These measures produced materially equivalent results; we report these results using the broader definition of relatedness. An interaction term between relatedness and acquisition distance tests H2.

To test H3A (direct experience), we used the cumulative measure of distance from prior acquisitions (Prior acquisition distance), which distinguishes distant from proximate acquisitions without making an arbitrary distinction—such as state boundaries—between “distant” and “close” acquisitions. In addition, we conducted sensitivity tests using a measure of the count of Prior interstate acquisitions, which distinguishes distant acquisitions that crossed state boundaries (1,256 cases) from those that remained within state (814 cases). To test H3B (contextual experience), we used a 0-1 dummy variable (Prior acquisition in state) that was 1 when the acquirer had previously acquired in the same state (other than the firm’s headquarters state) as the focal acquisition. Interactions of these variables with acquisition distance test H3C (vicarious experience).

**Control Variables**

The analysis includes controls for industry subfield and acquisition year, as well as acquirer, target, and acquirer–target dyad characteristics. Dummy variables indicate the seven industry subfields that Table 1 listed. Year of acquisition addressed telecommunications progress that might facilitate the identification and eventual acquisition of geographically distant target firms (Peters 1997).

Acquirer characteristics include prior acquisition experience, age, size, diversification, urban location, public status, prior canceled acquisitions, and geographic centrality. Prior acquisition experience counts the number of acquisitions the firm announced from its founding to the year prior to the focal year. Among the 767 firms in the study, 392 (51%) implemented only 1 acquisition, 144 (19%) implemented more than 4 acquisitions, and 28 (4%) implemented more than 10 acquisitions. Acquirer age uses founding dates from company websites and the Factiva publications database. Acquirer size is the log of assets, with missing values imputed as a time-variant function of the firm’s age, diversification, number of prior acquisitions, and private versus public status. Acquirer diversification uses information from the SDC database about the number of industry segments in which the acquirer operated. This variable controls for unobserved heterogeneity of behavior across diversified and focused firms; for example, diversified firms may be more likely than focused firms to acquire related units (Mitchell and Shaver 2004). Acquirer is urban is a 0-1 variable indicating whether an acquirer was based in a designated metropolitan statistical area (MSA) or micropolitan statistical area; MSAs have at least one urban area inhabited by more than 50,000 people, whereas micropolitan statistical areas have at least one urban area inhabited by more than 10,000 people. Acquirer is public is a 0-1 dummy variable that indicates if the buyer was a publicly listed firm. Acquisition is canceled denotes whether an announced acquisition did not reach fruition, and Prior canceled acquisitions counted the number of acquisitions that a firm announced but did not complete as a measure of acquisition effectiveness.

Acquirer geographic centrality controls for the geographic location of an acquirer within a pool of potential targets. The acquirer geographic centrality variable reflects the fact that the U.S. chemical manufacturing industry is geographically concentrated. Firms locate in regions that have a high concentration of other manufacturing firms (e.g., near the automobile industry in the Great Lakes region, near electronics firms along the West Coast), that are near petroleum and natural gas manufacturing firms (explaining the high concentration on the Gulf Coast in Texas), and that are near major industrial ports, as chemicals used for production are often imported by sea (U.S. Bureau of Labor Statistics 2006). Firms from California, New Jersey,
New York, Massachusetts, Texas, Pennsylvania, and Florida accounted for more than 60% of the sample. Colocation helps firms gain agglomeration benefits and may also provide access to proximate potential targets. The location of the acquiring firm vis-à-vis the population of potential targets may influence how distance explains acquisition probability; the analysis includes a variable for centrality in case centrally located acquirers are more likely to search locally and acquire geographically proximate targets than firms located in peripheral regions. In the tests of H1–H3C, we are able to rule out the alternative explanation that firms search locally and choose proximate targets to gain agglomeration benefits. We included the number of potential targets within 150 miles of the acquirer as a measure of centrality; the more potential targets there are within 150 miles, the more central the location of the acquirer is. Figure 1 plots the geographic location of acquiring firms’ headquarters.

Target characteristics include business emphasis, public status, and urban location. Target is marketing is a 0-1 variable that indicates whether the target firm is primarily involved in marketing and distribution activities. The probability of acquiring a particular target is likely to be higher if the target is more visible than other potential targets, which we addressed with a 0-1 variable that indicated whether the target was a public firm (Target is public). Among the 2,070 target firms, 590 (29%) were public; the other cases included privately held firms (807, or 39%), subsidiary units (427; 21%), branch units (192, or 9%), and assets (57; 3%). Target is urban is a 0-1 variable indicating whether a target firm’s location was in an MSA or micropolitan statistical area, using the same criteria as acquirers.

Dyad characteristics include target relative size and similar-sized cities. Target is larger is a 0-1 dummy variable indicating whether the target firm is larger than the acquiring firm. To control for cultural and institutional differences, Target in similar city is a 0-1 dummy variable that indicates whether the target is in a city with similar size characteristics, based on metropolitan, micropolitan, or rural status.

Three other mechanisms might explain why some firms systematically acquire distant targets while others focus on proximate targets. First, acquiring managers with greater risk-taking propensity or those with a greater geographic expanse of social networks could exhibit low sensitivity to distance-related factors while selecting targets; we found no evidence to conclude that any fixed firm-specific factors systematically influenced target selection decisions over time. Second, target performance might override distance concerns. Target financial performance is not a binding determinant of acquisition, however—particularly if acquirers intend to dismantle and integrate target resources. As proof of this, poorly performing firms are often acquisition targets in many industries. More importantly, this question would only pose a problem for this study if mismanagement or poor performance is geographically clustered; there is no evidence that geographic clustering of mismanagement and/or performance exists in the U.S. chemical industry. Third, the motive of achieving market power could lead to geographically clustered acquisitions within regions, but this possibility is limited in our study because national and, increasingly, global competition determines chemical prices. Tables 3 and 4 report descriptive statistics.

**Methodology**

The study developed hypotheses concerning the direct effect of geographic distance on acquisition match and factors that may moderate the relationship between acquisition distance and the probability of acquisition match. Testing the hypotheses involves modeling the
probability that a firm acquires a particular target from a set of potential targets. This involves creating a dummy variable with a value of 1 for the dyads representing acquisitions that occur and 0 for acquisitions that could have occurred but did not. Using this matrix of ones and zeros, a logit model tests how acquisition distance explains the probability of acquisition. Logit interaction models then test the moderating hypotheses.

The first step is to define the set of potential acquisitions that could have occurred but did not. Firms must satisfy two conditions to be considered as a potential target. First, a potential target must operate primarily in the same industry as the target that was eventually acquired. This condition identifies which of the target firms match the focal acquirer’s revealed expansion objectives. Second, a potential target must be acquisition-worthy. By acquisition-worthy, we mean targets that provide strategic advantage to the acquiring firm by virtue of their resources while at the same time being available for takeover. This condition addresses the quality difference that exists across firms that were never acquired and those that were acquired by other chemical manufacturers in a proximate time period.

In turn, one can identify acquisition-worthiness by limiting potential targets to only those firms that were eventually acquired by chemical manufacturing firms during a five-year window around the focal acquisition. Prior research has used a similar approach (Sorensen and Stuart 2001). However, it may be restrictive to assume that all acquirers focus on the same set of targets. Hence, we include nontargets in the sample and run tests for sampling designs using both strong and weak assumptions about what constitutes a potential target. The results differed only slightly between different sampling designs, with the core conclusions remaining consistent.

Two aspects of our sampling design are important to consider. First, it allows us to specify sets of potential...
targets in direct relation to the cost–benefit context of the focal acquisition. For example, the design allows us to consider unrelated potential targets for an unrelated focal acquisition. The spatial extent of search, whether it is local or regional or more geographically dispersed, is relevant to the context of the focal acquisition and is captured by the set of potential targets. Second, this design treats the spatial extent of actual search as unobserved. It is not possible to observe potential candidates that were actually chosen for evaluation because these data do not exist; instead, we can only observe the firm that was eventually chosen for acquisition. The sampling design in this study proceeds with no assumption about the spatial extent of the set of potential targets that were actually evaluated and rejected, and it allows the location of the potential targets that we identify (for each acquisition that took place) to reflect the spatial extent of search. The benefit of this approach is that it does not impose any general structure on the data based on assumptions about when firms are more likely to only conduct local or distant search. At the same time, the design allows us to incorporate conditions that proxy for whether firms tend to search only locally, such as when acquirers are centrally located.

Once the actual and potential acquirer–target dyads are defined, the estimation can proceed by either analyzing all possible dyads or using endogenous stratification to analyze a subset of the dyads (Cossette 1981, Manski and Lerman 1977). Endogenous stratification, in contrast with random and exogenous stratified sampling, involves splitting the observations into sets corresponding to whether the dependent variable is 1 or 0 and then randomly selecting observations from these two sets.

Endogenous stratification is common in binary dependent variable models where there is a much larger number of zeros than ones, such as predictions of wars, vetoes, epidemiological infections, and venture capital. A total of 5,767 acquisitions took place within the sector; 46,647,203 possible acquisitions did not occur. The number of acquisitions that did occur is very small compared with the total possibilities. It has been difficult to predict and explain probabilities in such cases, because the usual logit regression underestimates the probability of occurrences, and data collection methods are inefficient given the time and resources needed to collect information on the large number of nonoccurrences, many of which are irrelevant. When such a discrepancy between ones and zeros exists in the data, sampling by endogenous stratification provides better estimates of the probability of occurrence. This approach can also save time and resources in data collection (King and Zeng 2001).

When estimating using the endogenously stratified sample, it is necessary to include a weight-based correction. This is because the fraction of ones in the sample is different from the fraction of ones in the population. Manski and Lerman (1977) refer to the procedure as weighted exogenous sampling maximum likelihood estimation (WESML). This involves maximizing the weighted log likelihood

$\ln L_w(\beta | y) = -\sum w_i \ln [1 + \exp \{1 - 2y_i \beta \}], \quad y \text{ is the probability of a positive outcome},$ 

$w_i = w_i y_i + w_0 (1 - y_i),$ 

$w_i = \tau / \bar{y}, \quad w_0 = (1 - \tau) / (1 - \bar{y}), \quad \tau = 5,767 / 46,652,970$ 

(where the fraction of ones in the population, and $\bar{y} = 2,070 / 12,420$ (the fraction of ones in the sample)).

To interpret the interaction models, we use the following cross-derivative of the logit specification, where $x_1$ and $x_2$ are the interacting continuous variables and $P(x)$ refers to $P(Y = 1 | X)$:

$\frac{\partial^2 P(x)}{\partial x_1 \partial x_2} = \beta_{12} [P(x) (1 - P(x))] + (\beta_1 + \beta_{12} x_2) \times (\beta_2 + \beta_{12} x_1) \times [P(x) (1 - 2P(x))].$ 

To derive standard errors and t-values, we use Stata’s predictnl command. Because the marginal effect of the interaction term given by $\frac{\partial^2 P(x)}{\partial x_1 \partial x_2}$ does not represent the interaction effect in index models (Ai and Norton 2003, Wooldridge 2002), we calculate the z-values corresponding to the relevant cross-derivatives to interpret the interaction effect. In addition, we confirm that the results reported here are consistent with the simulation-based approach toward interpretation of logit results (Hoetker 2007, King et al. 2000, Zelner 2009).

We considered sample-selection issues in determining a sampling strategy. The concern is the possibility that a firm’s decision to acquire rather than expand by other means arises from knowledge of the existence of nearby targets. One approach would be to create a sample of potential acquirers, including firms that did and did not announce acquisitions during the period, and use a two-step approach that first estimated the likelihood that firms announce acquisitions and then, among the acquiring subset, examined how distance affected target choice (Heckman 1979). This procedure requires listing all chemical manufacturing firms operational after 1979. Our sample accounts for almost all public firms, because most of these firms announced at least one acquisition from 1980 to 2004. Although the COMPUSTAT and OSIRIS databases identified a few additional nonacquiring public firms, we were unable to gather detailed financial information on private nonacquiring firms. Instead, we address potential selection issues via variables for firm age, size, and diversification, which influence the mode of firm growth (e.g., Aldrich and Auster 1986, Barnett and Amburgey 1990, Penrose 1959), as well as acquirer geographic centrality to assess whether a firm’s tendency to grow and acquire reflects the existence of nearby targets. This conditional mean approach assumes that a firm’s decision to select a particular target is independent of its higher-level decisions to carry
out acquisition-based growth once we control for these factors.

In sum, we use weighted logit regression, corrected for nonindependence of observations. We draw observations from an endogenously stratified sample to test how distance between acquirer–target dyads affected the probability of match. We follow the practice of reporting logit coefficients and of deriving the odds as \(e^{\beta_n}\), where \(\beta_n\) is the logit coefficient for variable \(x_n\). The results reflect an endogenous stratified sample in which we match each acquisition that occurred with five other randomly drawn potential acquisitions that could have occurred but did not. The appendix compares the WESML method to other approaches.

### Results

Table 5 displays results of the tests of H1–H3C. The results in column (1) support H1 \((p < 0.01)\), showing that firms tend to prefer geographically proximate targets. The results show an 80% drop in the odds of an acquisition match between a target zip code and one that is 40 miles away. The corresponding percentage drops are 90% and 96.8% for targets located 200 miles away and 2,400 miles away, respectively. The predicted probability that an acquiring firm chooses a particular target—sampling five potential targets for each announced acquisition and fixing all independent variables at the mean—is 0.001. Hence, acquisitions are rare events. Using this as the baseline, we explore the effect of geographic distance on the probability that an acquiring firm chooses a particular target and how acquirer- and dyadic-level factors condition the effect of distance.

Columns (2)–(7) of Table 5 report logit interactions that correspond to H2, H3A, H3B, and H3C. The interactions are tested individually in columns (2)–(6). Column (7) tests all the interactions collectively, confirming the results in columns (2)–(6). As we noted earlier, the marginal effects of the logit interaction terms calculate incorrect partial derivatives because they calculate the change in probability per unit change in the multiplicative term, e.g., distance times relatedness \((\text{Acquisition distance} \times \text{Acquisition is related})\) in column (2)). Rather than simply assess the coefficients of the interaction terms in the regression equation, the correct way to calculate the interaction effect is to use a cross-derivative—this gives the change in the relationship between, for instance, relatedness and probability of match, per unit change in distance. We note the cross-derivative interaction effects and their corresponding \(z\)-values when they conflict with the partial derivatives from logit regression.

Column (2) of Table 5 supports H2 \((\text{Acquisition distance} \times \text{Acquisition is related}; p < 0.01)\). As expected, acquirers are less likely to undertake related acquisitions as distance increases. The results show that a distance of 200 miles, the odds of acquisition match decreased by 80.5% for unrelated acquisitions and by 92.6% for related acquisitions.

Columns (3) and (4) of Table 5 assess the effect of prior acquisition experience on focal target selection, based on prior experience with distant acquisitions (H3A) and prior experience with acquisitions in other states, excluding those in the state of the acquirer’s headquarters (H3B). Column (3) shows that firms that had previously implemented geographically distant acquisitions were less sensitive to distance while implementing the focal acquisition (H3A, \(\text{Acquisition distance} \times \text{Prior acquisition distance}; p < 0.05\)). Column (4) then shows that the location of previous acquisitions in repeat states reduced the impact of distance on target selection (H3B, \(\text{Acquisition distance} \times \text{Prior acquisition in state}; p < 0.01\)). Suppose the focal acquisition occurs in a distant state \(S\). Column (4) shows that if the acquiring firm had previously acquired in state \(S\), it had a significantly higher likelihood of acquiring again in this state even if targets in this state were geographically more distant compared with other potential targets available to the acquirer.

Columns (5) and (6) of Table 5 report the effect of the presence of parents or subsidiaries, to test H3C. As we argued previously, firms might be able to overcome the constraints of distance by accessing information from parent and subsidiary organizations. The interaction term in column (5) \((\text{Acquisition distance} \times \text{Acquirer is parent})\) shows that acquirers with subsidiaries did not display a lower preference for geographically proximate targets. By contrast, column (6) suggests that acquirers with parent firms \((\text{Acquisition distance} \times \text{Acquirer is subsidiary})\) were less sensitive to distance \((p < 0.10)\). A comparison of the logit coefficients shows that the odds of acquisition match over a distance of 200 miles decreased by 90.6% for acquirers with subsidiaries, compared with a decrease of 86.3% for acquirers with parents. In combination, the results in columns (5) and (6) indicate that knowledge about distant targets is at least somewhat more likely to flow from parent to subsidiary than from subsidiary to parent, which is consistent with the idea that corporate decisions are made at headquarters more than in subsidiaries.

An important caveat in interpreting the results in Tables 5 and 6 is as follows. The dependent variable is an indicator that reveals the choice an acquiring firm made from a set of potential targets. Therefore, we cannot interpret the effects for acquirer- or target-specific variables. For example, it is not correct to interpret the coefficient on acquiree size as implying that larger firms were less likely to implement an acquisition; the appropriate test for such a prediction would model the probability that a particular firm implements an acquisition versus not acquiring at all. Instead, the acquiring and target firm variables play the vital role of partialling out
Table 5  Target Selection: Hypothesis Tests Based on WESML Estimates

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3) Prior acquisition distance (H3A)</th>
<th>(4) Prior acquisition in state (H3B)</th>
<th>(5) Acquirer is parent (H3C)</th>
<th>(6) Acquirer is subsidiary (H3C)</th>
<th>(7) All interactions</th>
</tr>
</thead>
<tbody>
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<td><strong>Acquisition distance (H1)</strong></td>
<td>-0.438***</td>
<td>-0.309***</td>
<td>-0.452***</td>
<td>-0.448***</td>
<td>-0.434***</td>
<td>-0.447***</td>
<td>-0.328***</td>
</tr>
<tr>
<td></td>
<td>(0.017)</td>
<td>(0.026)</td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.018)</td>
<td>(0.019)</td>
<td>(0.027)</td>
</tr>
<tr>
<td><strong>Target in similar city</strong></td>
<td>0.106**</td>
<td>0.100**</td>
<td>0.110**</td>
<td>0.090*</td>
<td>0.105**</td>
<td>0.104**</td>
<td>0.089*</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.051)</td>
<td>(0.051)</td>
<td>(0.051)</td>
<td>(0.050)</td>
<td>(0.051)</td>
<td>(0.052)</td>
</tr>
<tr>
<td><strong>Acquisition is related</strong></td>
<td>0.004</td>
<td>0.910***</td>
<td>0.013</td>
<td>-0.003</td>
<td>0.004</td>
<td>0.010</td>
<td>0.928***</td>
</tr>
<tr>
<td></td>
<td>(0.043)</td>
<td>(0.179)</td>
<td>(0.045)</td>
<td>(0.044)</td>
<td>(0.043)</td>
<td>(0.043)</td>
<td>(0.180)</td>
</tr>
<tr>
<td><strong>Prior acquisition in state</strong></td>
<td>0.325***</td>
<td>0.368***</td>
<td>0.197*</td>
<td>-2.500***</td>
<td>0.332***</td>
<td>0.328***</td>
<td>-1.876***</td>
</tr>
<tr>
<td></td>
<td>(0.122)</td>
<td>(0.127)</td>
<td>(0.104)</td>
<td>(0.571)</td>
<td>(0.118)</td>
<td>(0.123)</td>
<td>(0.527)</td>
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<tr>
<td><strong>Prior acquisition experience</strong></td>
<td>-0.001</td>
<td>-0.001</td>
<td>-0.001</td>
<td>-0.001</td>
<td>-0.001</td>
<td>-0.001</td>
<td>-0.012**</td>
</tr>
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<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.006)</td>
</tr>
<tr>
<td><strong>Prior acquisition distance</strong></td>
<td>-3.5e-5***</td>
<td></td>
<td>-1.6e-5***</td>
<td>(5.5e-6)</td>
<td></td>
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<td></td>
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<tr>
<td><strong>Acquirer age</strong></td>
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<td>-0.003</td>
<td>0.001</td>
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<td>-0.001</td>
<td>-0.001</td>
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<td>(0.004)</td>
<td>(0.004)</td>
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<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td><strong>Acquirer size</strong></td>
<td>0.008</td>
<td>0.002</td>
<td>0.008</td>
<td>0.008</td>
<td>0.009</td>
<td>0.009</td>
<td>0.004</td>
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<tr>
<td></td>
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<td>(0.013)</td>
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<td>(0.014)</td>
<td>(0.014)</td>
<td>(0.014)</td>
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</tr>
<tr>
<td><strong>Acquirer diversification</strong></td>
<td>-0.016</td>
<td>-0.013</td>
<td>-0.012</td>
<td>-0.017</td>
<td>-0.016</td>
<td>-0.014</td>
<td>0.001</td>
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<td></td>
<td>(0.020)</td>
<td>(0.020)</td>
<td>(0.020)</td>
<td>(0.020)</td>
<td>(0.020)</td>
<td>(0.020)</td>
<td>(0.021)</td>
</tr>
<tr>
<td><strong>Acquirer is parent</strong></td>
<td>0.081*</td>
<td>0.089*</td>
<td>0.076</td>
<td>0.068</td>
<td>0.166</td>
<td>0.088*</td>
<td>0.284</td>
</tr>
<tr>
<td></td>
<td>(0.049)</td>
<td>(0.050)</td>
<td>(0.054)</td>
<td>(0.050)</td>
<td>(0.252)</td>
<td>(0.048)</td>
<td>(0.197)</td>
</tr>
<tr>
<td><strong>Acquirer is subsidiary</strong></td>
<td>0.102*</td>
<td>0.080</td>
<td>0.099</td>
<td>0.097</td>
<td>0.099*</td>
<td>-0.233</td>
<td>-0.337</td>
</tr>
<tr>
<td></td>
<td>(0.059)</td>
<td>(0.063)</td>
<td>(0.063)</td>
<td>(0.060)</td>
<td>(0.059)</td>
<td>(0.236)</td>
<td>(0.259)</td>
</tr>
<tr>
<td><strong>Target is larger</strong></td>
<td>0.187**</td>
<td>0.170**</td>
<td>0.184**</td>
<td>0.184**</td>
<td>0.185**</td>
<td>0.192**</td>
<td>0.168**</td>
</tr>
<tr>
<td></td>
<td>(0.075)</td>
<td>(0.075)</td>
<td>(0.077)</td>
<td>(0.075)</td>
<td>(0.075)</td>
<td>(0.076)</td>
<td>(0.078)</td>
</tr>
<tr>
<td><strong>Acquirer geographic centrality</strong></td>
<td>-0.006***</td>
<td>-0.006***</td>
<td>-0.006***</td>
<td>-0.005***</td>
<td>-0.006***</td>
<td>-0.006***</td>
<td>-0.006***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td><strong>Target is urban</strong></td>
<td>0.003</td>
<td>-0.008</td>
<td>-0.012</td>
<td>-0.017</td>
<td>0.006</td>
<td>0.00002</td>
<td>-0.034</td>
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<td></td>
<td>(0.059)</td>
<td>(0.059)</td>
<td>(0.057)</td>
<td>(0.057)</td>
<td>(0.057)</td>
<td>(0.058)</td>
<td>(0.057)</td>
</tr>
<tr>
<td><strong>Target is public</strong></td>
<td>-0.158**</td>
<td>-0.182***</td>
<td>-0.158**</td>
<td>-0.165**</td>
<td>-0.158**</td>
<td>-0.161**</td>
<td>-0.191***</td>
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<tr>
<td></td>
<td>(0.066)</td>
<td>(0.067)</td>
<td>(0.067)</td>
<td>(0.067)</td>
<td>(0.066)</td>
<td>(0.067)</td>
<td>(0.069)</td>
</tr>
<tr>
<td><strong>Year of acquisition</strong></td>
<td>0.012**</td>
<td>0.012**</td>
<td>0.012**</td>
<td>0.013**</td>
<td>0.012**</td>
<td>0.012**</td>
<td>0.012**</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
</tr>
<tr>
<td><strong>Acquisition distance x Acquirer is related (H2)</strong></td>
<td>-0.181***</td>
<td></td>
<td>-0.183***</td>
<td>(0.031)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acquisition distance x Prior acquisition distance (H3A)</strong></td>
<td>5.9e-6***</td>
<td></td>
<td>5.9e-6***</td>
<td>(7.6e-7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acquisition distance x Prior acquisition in state (H3B)</strong></td>
<td>0.446***</td>
<td></td>
<td>0.340***</td>
<td>(0.088)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acquisition distance x Acquirer is parent (H3C)</strong></td>
<td>-0.019</td>
<td></td>
<td>-0.048</td>
<td>(0.052)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Acquisition distance x Acquirer is subsidiary (H3C)</strong></td>
<td>0.071*</td>
<td></td>
<td>0.084*</td>
<td>(0.043)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>-6.590***</td>
<td>-7.182***</td>
<td>-6.530***</td>
<td>-6.524***</td>
<td>-6.607***</td>
<td>-6.573***</td>
<td>-7.114***</td>
</tr>
<tr>
<td></td>
<td>(0.153)</td>
<td>(0.201)</td>
<td>(0.163)</td>
<td>(0.156)</td>
<td>(0.162)</td>
<td>(0.154)</td>
<td>(0.209)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>12,421</td>
<td>12,421</td>
<td>12,421</td>
<td>12,421</td>
<td>12,421</td>
<td>12,421</td>
<td>12,421</td>
</tr>
<tr>
<td><strong>Wald χ² (df)</strong></td>
<td>881.5 (21)</td>
<td>907.1 (22)</td>
<td>962.7 (22)</td>
<td>920.9 (22)</td>
<td>903.0 (22)</td>
<td>885.1 (22)</td>
<td>998.3 (27)</td>
</tr>
</tbody>
</table>

Notes. Negative coefficient indicates less likely to announce an acquisition among a set of potential targets. Robust standard errors are in parentheses.

* Relatedness is based on primary industry code; related targets have the same four-digit NAICS code as the acquirer’s primary segment and/or if the acquirer has a prior acquisition in the segment (1,389 of 2,070 acquisitions are related).

* p < 0.10; ** p < 0.05; *** p < 0.01.
confounding effects that may also influence choice, giving greater reliability in interpreting the effects of dyad-level variables.

Table 6 reports tests of additional factors that might shape the impact of distance. Three factors explore more general forms of experience: prior transaction experience with acquisitions (column (1)) and with canceled acquisitions (column (2)), and greater business age (column (3)). The Acquisition distance x Number of prior acquisitions interaction term (column (1)) appears to suggest that firms with greater prior acquisition experience were less sensitive to distance, but this result is not strongly supported by the calculation of the appropriate cross-derivatives and their corresponding standard errors: the average z-value was recorded as 1.99, but there was a substantially high standard error of 0.75. Sensitivity tests revealed that the effect of prior experience depended on whether the acquisitions were within state or interstate: the number of prior interstate acquisitions reduced the subsequent preference for geographically proximate targets, whereas the number of prior within-state acquisitions had no impact. These results partially explain the insignificant finding for the effect of prior acquisition experience and further confirm that prior experience in distant acquisitions reduced the preference for geographically proximate targets in subsequent acquisitions.

Column (2) of Table 6 examines negative prior experience in acquisitions, focusing on the failure to complete announced acquisitions; this is the second form of distance-independent transaction experience. The result suggests that prior the success or failure at completing

### Table 6 Target Selection: Corollary Tests

<table>
<thead>
<tr>
<th></th>
<th>(1) Number of prior acquisitions</th>
<th>(2) Prior canceled acquisitions</th>
<th>(3) Acquirer age</th>
<th>(4) Acquirer size</th>
<th>(5) Acquirer geographic centrality</th>
<th>(6) Year of acquisition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition distance</td>
<td>$-0.456^{***}$</td>
<td>$-0.428^{***}$</td>
<td>$-0.370^{***}$</td>
<td>$-0.472^{***}$</td>
<td>$-0.404^{***}$</td>
<td>$-0.379^{***}$</td>
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<tr>
<td></td>
<td>(0.017)</td>
<td>(0.017)</td>
<td>(0.028)</td>
<td>(0.043)</td>
<td>(0.023)</td>
<td>(0.050)</td>
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<tr>
<td>Number of prior acquisitions</td>
<td>$-0.023^{***}$</td>
<td>$0.001$</td>
<td>$-0.001$</td>
<td>$-0.001$</td>
<td>$0.001$</td>
<td>$-0.001$</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Prior canceled acquisitions</td>
<td>0.002</td>
<td>0.004</td>
<td>0.036$^{**}$</td>
<td>$-0.001$</td>
<td>$-0.000$</td>
<td>$-0.001$</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.005)</td>
<td>(0.017)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.004)</td>
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<tr>
<td>Acquirer age</td>
<td>0.010</td>
<td>0.009</td>
<td>0.006</td>
<td>$-0.019$</td>
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<tr>
<td></td>
<td>(0.014)</td>
<td>(0.014)</td>
<td>(0.013)</td>
<td>(0.042)</td>
<td>(0.014)</td>
<td>(0.014)</td>
</tr>
<tr>
<td>Acquirer size</td>
<td>$-0.006^{***}$</td>
<td>$-0.006^{***}$</td>
<td>$-0.005^{***}$</td>
<td>$-0.006^{***}$</td>
<td>0.003</td>
<td>$-0.006^{***}$</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.004)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Acquirer geographic centrality</td>
<td>$0.012^{**}$</td>
<td>$0.013^{**}$</td>
<td>$0.010^{**}$</td>
<td>$0.012^{**}$</td>
<td>$0.012^{**}$</td>
<td>0.027$^{*}$</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>Acquisition distance x</td>
<td>$0.004^{***}$</td>
<td>$-0.020$</td>
<td>$-0.008^{***}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of prior acquisitions$^a$</td>
<td>(0.001)</td>
<td>(0.013)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition distance x</td>
<td>$-0.020$</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Prior canceled acquisitions$^a$</td>
<td></td>
<td>(0.003)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition distance x</td>
<td>$-0.002^{**}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquirer age$^a$</td>
<td></td>
<td>(0.003)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition distance x</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquirer size$^a$</td>
<td></td>
<td>(0.007)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Acquisition distance x</td>
<td>$-0.002^{**}$</td>
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<td></td>
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<tr>
<td>Acquirer geographic centrality</td>
<td></td>
<td>(0.001)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition distance x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year of acquisition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Notes: Other control variables included in the analysis are industry subfields, acquirer diversification, the presence of parents or subsidiaries, prior acquisitions in state, whether the target is in a similar city, whether the target is urban, and whether the target is public. Robust standard errors are in parentheses.

$^a$General experience factors.

$^b$Not significant in the analysis of cross-derivatives.

*p < 0.10; **p < 0.05; ***p < 0.01.
acquisitions did not influence the sensitivity to distance in the focal acquisition.

Column (3) of Table 6 examines acquirer age. Older firms might have a better understanding of distant markets and competitors, diminishing the extent to which geographic factors influence target selection decisions (Green and Cromley 1984). However, firm age did not have a significant effect on the preference for geographically proximate target firms. Column (3) suggests that older acquirers had a greater preference for geographically proximate targets, but the cross-derivative calculations do not support this conclusion (average $z$-value $= -0.74$), showing that the preference for geographically proximate targets did not change with firm age. Overall, the results in columns (1)–(3) of Table 6 show that general experience has less effect than the direct and contextual experience in Table 5 in conditioning spatial preferences. This pattern of results provides strong evidence supporting the need for highly specific experience to overcome the barriers that geographic distance places on the search for new resources.

Columns (4)–(6) of Table 6 report three other corollary tests that investigate whether acquirer size, acquirer geographic centrality, and the year of announcement influence how distance affects acquisition tendencies. Studies suggest that reputations associated with greater size may decrease the influence of spatial factors in investment decisions (Coval and Moskowitz 1999, Dahlquist and Robertsson 2001, Kang and Stulz 1997), whereas larger firms may have greater information-gathering resources (Green and Cromley 1984). However, column (4) shows that acquirer size had no effect on the proximity preference, which cross-derivative calculations confirmed. In contrast, column (5) shows that acquirers that were centrally located had a greater preference for proximate targets ($p < 0.05$). This result follows from the greater availability of proximate targets compared with other acquirers operating in distributed areas.

Finally, recent developments have generated a greater prevalence of electronic forms of communication. Studies have discussed how such advances could lead to more expanded firm boundaries (Afuah 2003), facilitate geographic expansion (Berger and DeYoung 2002), and help managers coordinate functions across dispersed locations (Cohen 2000). Such developments could help acquirers overcome barriers of distance and seek geographically distant targets. However, column (6) shows that firms’ sensitivity to geographically distant acquisitions did not decrease with time; during the period of the study, the effect of distance persisted in spite of improvements in communications infrastructure. Among the corollary tests in Table 6, therefore, only acquirer geographic centrality within a pool of potential targets significantly affected distance.

Discussion
We set out to investigate how spatial geography shapes the organizational search process as reflected in firms’ choices of acquisition targets. We explored target choice by plotting the locations of all potential targets at any given point of time and examining which target acquirers selected. Acquirers preferred geographically proximate targets, especially when implementing related acquisitions. This effect was persistent: distance continued to influence target selection as firms grew in size, aged, and gained acquisition experience based on the number of prior completed and canceled acquisitions. Moreover, the effect persisted over the two decades of the observation period, from 1980 to 2003. In contrast, target selection decisions were significantly influenced by three forms of distance-relevant experience: direct experience gained from prior interstate acquisitions, contextual experience with prior acquisitions in distant locations, and vicarious information flows from parent units to subsidiaries.

Our study contributes to research on dynamic capabilities and on organizational search in spatial contexts. First, a firm’s dynamic capability is its ability to create, extend, or modify its resource base (Helfat et al. 2007); acquisition-based growth is an important mechanism of dynamic capabilities (Capron et al. 1998). A key aspect of this research stream is that it discerns organizational processes from strategic positions and outcomes, examining what allows firms to conduct their activities differently over time. Our study contributes to this literature by highlighting the importance of studying questions of process: firms were able to modify their behavior with direct experience in the search process. Second, several studies of organizational search and spatial choice show that distance constrains key elements of business strategy even within national borders, affecting intrafirm communication (DeSanctis and Monge 1999); financing decisions and returns on investment (Coval and Moskowitz 2001); relationship formation, interfirm interactions, and organizational evolution (Sorenson and Stuart 2001, Stuart and Sorenson 2003); chain expansion (Baum et al. 2000); and organizational failure (Kalnins et al. 2006). Such studies show that spatial decisions tend to reflect the decision maker’s existing resource base and prior experience with the search process.

Our findings show that organizational search behavior is consistent with the core arguments of spatial choice theory; they also highlight the differences that have implications for acquisitions strategy research. We found a steep distance-decay effect, consistent with findings of other studies of spatial choice (Golledge and Stimson 1997, Sorenson and Stuart 2001). This result, in conjunction with the finding that centrally located firms were most likely to acquire proximate targets, indicates that firms evaluate geographically proximate targets before considering those that are distant. This is
similar to behavior in residential search, employment, and investment decisions. However, we also found no time-constant unobserved factors affecting the choice of target firm. We interpret this as implying that factors such as financial resources, managerial ability, social networks, information technology, organizational visibility, and other factors that might generally apply from one acquisition to another did not play a systematic role in explaining the geography of target selection. Instead, the results show the strong effect of contextual factors that were directly relevant in focal acquisitions, and they raise questions about the role of general accumulated knowledge in organizational search processes.

The finding that distance had a persistent effect on target selection was reinforced by the results showing how related acquisitions shaped the preference for proximate targets. This pattern suggests that firms placed greater weight on expected costs relative to specific acquisitions than on their own general capabilities built with prior experience. A partial explanation for this contrast can be articulated as follows: it is less likely that firms will consider targets based on their prior experience and more likely that they will consider factors such as the need to interact with the target firm, integrate systems, and provide full management for the target while implementing related acquisitions; hence firms prefer targets that are geographically proximate in order to facilitate these activities. Overall, these findings parallel microlevel studies on strategic decision making (e.g., Duhaime and Schwenk 1985, Tihanyi et al. 2003) that provide evidence that managers place greater emphasis on the opportunities presented by focal activities rather than on their own prior personal experience (Tyler and Steensma 1998).

More specifically, the study contributes to the growing body of research that examines spatial influences on growth strategy. Research on firm growth and acquisitions strategy has traditionally used the premise that firms expand in a spatially homogeneous environment. Indeed, the idea that geographic proximity facilitates acquisitions stands in opposition to arguments that industry structure, market opportunities, target capabilities, and organizational and strategic fit determine firms’ acquisition strategies. In such views, the distance between the acquirer and target is not important because the acquisition premium or discount will reflect the characteristics of target location (Friedman et al. 1996).

Some studies argue that acquirers commonly focus on the characteristics of geographic locations such as market concentration and future growth opportunities in identifying targets (e.g., Hannan and Rhoades 1987, Rose 1999); others suggest that improvements in communications and transportation infrastructures have reduced the economic significance of distance for acquisitions (Berger and DeYoung 2002). By contrast, a small set of studies in the economic geography literature has discussed acquirer–target distance. These studies observed that acquisitions commonly concentrate spatially close to the acquiring firm’s corporate headquarters, although the effect of geography declines with advances in information technology (Green 1987, Green and Cromley 1984). Other studies examined outcomes of spatial influences, including how acquisitions led to greater geographic concentration of economic activity (Rodriguez-Pose and Zademach 2003), facilitated the transfer of corporate control across geographic boundaries (Chapman and Edmond 2000), and generated social and economic tensions within local communities (Jonas 1992). Nonetheless, economic and corporate geography research provides a limited understanding about the underlying mechanisms of the spatial evolution of firms (see Maskell 2001), which this study helps advance.

This study has limitations that suggest further research. First, we were unable to study spatial choice in the context of international acquisitions—which accounted for 20% of the acquisitions implemented by firms in our sample—because it was not feasible to generate meaningful sets of potential targets in multiple countries. A study with a more focused sample could incorporate a larger playing field that includes multiple countries while attempting to discriminate the effects of space from those of national, political, cultural, and technological boundaries (Anand and Delios 1997, Delios and Henisz 2003, Harzing and Feely 2008, Hofstede 1980, Hymer 1976, Kogut and Singh 1988, Lakshmanan 1989, Morosini et al. 1998, Sleuwaegen 1998). Second, we based our hypotheses on assumptions that distance influences target search and postacquisition integration of target firms, but we do not distinguish between these activities, nor do we elaborate on which have greater influence on target selection. Further evaluation of these activities has potential implications for the strategic decision-making literature, particularly in studying the role of asymmetric information in decision making. Third, in tracking all acquisitions a firm implemented, data limitations constrained our sample to firms founded after 1979. An analysis of acquisitions by older firms (e.g., Dow Chemical) would be insightful.

The study demonstrates that the spatial distribution of opportunities has substantial impact on strategy, with some forms of experience moderating the effects. Given that location is a fundamental decision for all firms, it is important to continue to examine how firm-level goals and resources interact with spatial factors to influence the formulation, implementation, and consequences of business strategy. We believe our research provides a base for continuing this work.

Acknowledgments
The authors are grateful for suggestions from Linda Argote, Toby Stuart, and three anonymous reviewers.
Appendix. Methodology Options

It is useful to further discuss our choice of the WESML estimator rather than other analytic approaches. Several studies have examined relationship formation among dyads of potential relationships. These studies create dyads and use them to predict why certain relationships or linkages were formed while others were not. These dyads allow one to distinguish relationships that occur from potential relationships that could have occurred but did not. Some of these studies use logit regression on the full sample of dyads that were created, whereas other, more recent studies use a more refined matched-sample design (e.g., Sorenson and Stuart 2001).

Recent studies discuss two problems associated with using logit regression with matched samples. The first is the problem posed by the nonindependence of observations when a certain firm appears many times in the database. The second problem is a bias that exists when the number of positive outcomes (here, the number of acquisitions) in the sample differs greatly from the number of positive outcomes in the population. Given the index nature of logit regression (Wooldridge 2002), this bias can affect all coefficients. Recent papers have addressed these problems by using an endogenously stratified sampling design, estimating robust standard errors that are corrected for nonindependence of observations for the same firm, correcting for the “rare event” bias, and correcting a further finite sample bias that appears only if a few “relationships” or “linkages” are observed. King and Zeng (2001) describe this methodology, including how WESML is operationalized and how it compares with other estimators.

A question that arises is whether McFadden’s choice model or the standard conditional maximum-likelihood estimator (Manski and McFadden 1981, McFadden 1974) is more suited for the present analyses, rather than the WESML (Manski and Lerman 1977). The conditional logit specification involves setting a finite set of attributes of the different alternatives available, specifying the utility of an alternative as a linear function of these attributes, and estimating coefficients for each attribute.

Apart from the popularity of this approach among recent studies (WESML allows us to be consistent with the approach of) other researchers, the conditional logit model is also appropriate for selecting the most probable target. The conditional logit model is one of the most popular specifications for estimating the effects of covariates and their interactions on the probability of acquiring a target.

### Table A.1 Target Selection: Comparing Alternative Estimators

<table>
<thead>
<tr>
<th>Estimator</th>
<th>(1) Logit regression</th>
<th>(2) Conditional logit</th>
<th>(3) Random effects logit</th>
<th>(4) Logit corrected for nonindependence of observations</th>
<th>(5) WESML*</th>
</tr>
</thead>
<tbody>
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<td>Acquisition distance</td>
<td>−0.419**</td>
<td>−0.445**</td>
<td>−0.419**</td>
<td>−0.419**</td>
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<td>(0.013)</td>
<td>(0.012)</td>
<td>(0.019)</td>
<td>(0.019)</td>
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<tr>
<td>Acquisition is related</td>
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<td>(0.081)</td>
<td>(0.060)</td>
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<td>8.4e−6**</td>
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<td>(2.3e−6)</td>
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<td>−0.090**</td>
<td>−0.092**</td>
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<td>(0.039)</td>
<td>(0.022)</td>
<td>(0.021)</td>
<td>(0.024)</td>
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<td>0.004</td>
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<td>(0.068)</td>
<td>(0.006)</td>
<td>(0.003)</td>
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<td>Acquirer geographic centrality</td>
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<td>−0.004*</td>
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<td>(0.001)</td>
<td>(0.001)</td>
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<td>(0.072)</td>
<td>(0.064)</td>
<td>(0.069)</td>
<td>(0.077)</td>
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<td>(0.065)</td>
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<td>Target is urban</td>
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<td>0.061</td>
<td>−0.016</td>
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<td>(0.055)</td>
<td>(0.054)</td>
<td>(0.052)</td>
<td>(0.059)</td>
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<tr>
<td>Target is urban</td>
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<td>−0.435**</td>
<td>−0.394**</td>
<td>−0.394**</td>
<td>−0.127*</td>
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<td>(0.067)</td>
<td>(0.065)</td>
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<tr>
<td>Year of acquisition</td>
<td>0.018**</td>
<td>0.036</td>
<td>0.018**</td>
<td>0.018**</td>
<td>0.022**</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.067)</td>
<td>(0.006)</td>
<td>(0.003)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.490**</td>
<td>0.490**</td>
<td>0.490**</td>
<td>0.490**</td>
<td>−6.858**</td>
</tr>
<tr>
<td></td>
<td>(0.166)</td>
<td>(0.168)</td>
<td>(0.155)</td>
<td>(0.176)</td>
<td></td>
</tr>
<tr>
<td>Observations*</td>
<td>12,421</td>
<td>12,396</td>
<td>12,421</td>
<td>12,421</td>
<td>12,421</td>
</tr>
<tr>
<td>LR/Wald χ²(12)</td>
<td>1,379.0</td>
<td>1,444.5</td>
<td>1,272.33</td>
<td>857.19</td>
<td>692.14</td>
</tr>
</tbody>
</table>

Notes: For the dependent variable, 1 denotes target that was acquired; 0 denotes potential targets that were not acquired. Standard errors are in parentheses; effects are calculated keeping other variables at the mean.

*WESML corrected for finite sample bias.

*From 767 firms, 2,070 acquisitions, and 5 randomly selected potential targets for each acquisition.

* p < 0.05; ** p < 0.01; † p < 0.10.
used in prior research), we have two other reasons for using WESML. First, Hsieh et al. (1985) showed that the conditional maximum likelihood estimator is identical to the prior correction method, which involves computing logit estimates and correcting these estimates using prior knowledge about the fraction of ones in the population and the fraction of ones in the sample (Manski and Lerman 1977). WESML also uses the fraction of ones in the population and in the sample, but it uses these as weights rather than to correct estimates. Such weighing provides a more robust way of estimating coefficients than the prior correction method, which is more sensitive to misspecification (Xie and Manski 1989).

Second, WESML does not require the strict structure that the choice-based approach requires. In this study, the choice-based conditional logit approach would require generating a finite set of attributes (e.g., target size, performance, location, industry) that would be relevant in every acquisition and then assuming that the “value” of any alternative target to any acquirer is given by a linear function of these attributes. The linear function of attributes would define why targets are valuable and why acquirers choose particular targets over others. This would be a restrictive assumption. For example, although target performance is often cited as an important acquisition criterion, many bankrupt firms are acquired. Similarly, firms may choose proximate or distant targets, or those in any related or unrelated industry, depending on the objectives of the acquisition. The sampling and estimation strategy in this paper does not assume any attribute other than that the target operates in the same industry as the focal acquisition and that it is operational in a relevant time period.

We checked the robustness of the main effects of distance across five estimation techniques, including WESML and four variations of logit. Table A.1 shows that the five approaches produce similar effects for acquisition distance, including similar magnitude and significance ($p < 0.01$). The results support the decision to use WESML by showing that the results from this WESML approach are not confounded by firm-level unobserved heterogeneity.

References


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