Who Buys What? How Integration Capability Affects Acquisition Incidence and Target Choice

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Who buys what? How integration capability affects acquisition incidence and target choice

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Abstract

Firms differ in their integration capability, which is the ability to absorb and manage businesses on a continuing basis. We expect integration capability heterogeneity to influence acquisition strategy by profit-seeking firms, affecting both their propensity to acquire and the types of businesses that they target. We argue that a firm’s integration capability increases with its product line scope and test two hypotheses: (1) firms with greater existing product line scope are more likely to be acquirers; and (2) firms with greater product line scope are more likely to purchase product lines that they already operate. Data from the US medical sector between 1978 and 1995 support hypothesis 1. We then find that all firms tended to purchase product lines that they did not previously operate, but, consistent with hypothesis 2, that firms with greater product line scope made acquisitions that had greater overlap with their existing product lines. The results are analogous with the biological observation that the most successful predators are better able to target desirable prey as well as being better able to overpower the prey they target.

Key words • acquisitions • business dynamics • integration capability • routines

Recent research argues that firms differ in integration capability, which is the ability to absorb and manage business resources on a continuing basis (e.g. Jemison and Sitkin, 1986; Haspeslagh and Jemison, 1991; Collis and Montgomery, 1998; Helfat and Raubitschek, 2000). This idea, however, has received only initial conceptual development and little empirical attention. In this paper we argue that the concept of integration capability helps explain differences among firms’ acquisition strategies, because integration is an important component in the expected value of acquisition outcomes. We investigate two related issues that arise from differences in integration capability as it relates to acquisition strategy choices. The first issue is which firms become acquirers. The second is, given that firms become acquirers, do they purchase product lines that they already operate or product lines they do not operate?
Using a routine-based perspective and focusing on business-level acquisition activities, we argue that firms with greater numbers of product lines possess greater integration capabilities. We develop two hypotheses. First, we predict that firms with greater existing product line scope (i.e. operate more product lines within a business) are more likely to be acquirers than firms with fewer product lines, because they have greater ability to absorb and integrate acquired lines of business on an ongoing basis. Second, we hypothesize that acquirers that operate more product lines ex ante are more likely to purchase product lines that they currently operate. Our reasoning is that these firms have greater ability to undertake the intensive integration that such purchases often require.

Our research adds to the growing stream of research on how firm capabilities influence what firms do, which we need to examine if we want to understand how capabilities influence performance. For example, the existing literature argues that integration efforts are key in successfully determining the outcome of an acquisition (e.g. Haspeslagh and Jemison, 1991; Jemison and Sitkin, 1986). We agree with this relationship, but argue further that the ability to integrate operations influences whether or not a firm undertakes acquisitions; and, given that they do, what they choose to acquire, because integration ability affects their expected return from undertaking acquisitions. Understanding such self-selection of strategy choice is important when assessing strategy outcomes and providing guidance to managers (Masten, 1993; Shaver, 1998).

We test our hypotheses by examining almost 2600 firms operating in the US medical sector during the period 1978–1995. The data include 271 acquisitions, including a total of about 900 product lines at the target businesses. This empirical setting is particularly well suited to inform how firm differences affect acquisition strategy choices. The data capture a varied sample that is close to the population of firms and acquisition activities in this sector and allow us to measure the different product lines that firms offer with an unusually high degree of precision. The product lines represent a moderate degree of product–market relatedness, as most firms operate lines that fall within the equivalent of one to three two-digit SIC classifications (mainly those encompassing medical devices, medical services, or pharmaceuticals). Therefore, we can make detailed assessments of the businesses that each firm operates and acquires within a market sector. We believe that the results generalize to competitive market settings that have substantial diversity of customer demands and in which substantial technical variety underlies the goods and services that firms provide to meet those demands.

The analysis supports the hypothesis that firms with larger numbers of product lines ex ante are more likely to be acquirers. In turn, we find that all acquirers commonly purchase product lines that they did not previously operate. Pushing further, the results then show that although all acquirers tend to extend into new product lines, the extent to which they purchase firms that also tie into
their existing product offerings increases with product line scope. Thus, our results suggest that firms with greater integration capabilities make acquisitions that expand their product line offerings yet also provide more overlap with their existing product lines.

The paper proceeds as follows. The next section details our hypotheses. The following section describes the data and the empirical estimation approach. The subsequent section presents the results. The final section discusses the implications that our findings have for better understanding acquisition strategies and acquisition outcomes.

**Theory and hypotheses**

We use a routine-based perspective on business dynamics as the theoretical basis for our study (Karim and Mitchell, 2000). The routine-based perspective draws most directly on work from the resource-based view of strategy (Penrose, 1959) and behavioral and evolutionary views of the firm (Cyert and March, 1963; Nelson and Winter, 1982; Cohen and Levinthal, 1990), along with key ideas from ecological (Hannan and Freeman, 1984) and transaction cost theories (Williamson, 1999). Routines are identifiable patterns of activity embodied in human or capital assets (Nelson and Winter, 1982; Dosi, Marengo, and Fagiolo, 1996; Winter, 1990). Routines consist of multiple related transactions that take place over time either within a firm or via interaction with external parties. Routines are often tacit, either because they are intrinsically uncodifiable or because they require the interactive participation of multiple people. Several routines combine together to create particular resources. Resources, which we view as synonymous with the term capabilities, are stocks of knowledge, skills, financial assets, physical assets, human capital, and other tangible and intangible factors (Wernerfelt, 1984; Amit and Schoemaker, 1993).

Two important considerations arise when applying a routine-based perspective. The first relates to unit of analysis. The perspective argues that the sum of the components that comprise capabilities is greater than their individual effects. Therefore, it is important to choose a unit of analysis and manifestation of the theoretical construct that captures the aggregated capability. If we were to focus on components or processes that form a capability, we would not only be examining a different unit of analysis from which our theory is based, but we would also overlook important ways in which the components of a capability form an effect greater than their individual effects. Given our empirical setting, we will focus on product lines as indicators of integration capabilities, which we elaborate later.

The question of unit of analysis, in turn, gives rise to a second consideration. When we focus on the more aggregated construct of capabilities, it is possible that what we identify as a capability might reflect routines other than the ones that we argue drive the relationship. This highlights an important
implication when applying our theoretical perspective. We would mask an important aspect of the theoretical perspective (i.e. sum greater than the parts), if we focused on the components. Yet we introduce the possibility of alternative interpretations by focusing on capabilities. Therefore, to effectively apply this theoretical lens, we must explicitly consider alternative explanations, both theoretically and empirically. As a result, we hypothesize relationships between firm capabilities and acquisition strategy choices, yet we consider other factors that could drive the predicted results and identify ways in which the tests favor our interpretation.

Turning to our arguments, we expect that an important determinant of whether a firm engages in acquisitions is its ability to absorb and manage product lines on a continuing basis. This ability is becoming known in the literature as a firm’s integration capability. Integration is a firm-level or business sector-level capability because it involves the balancing of more than one product line on an ongoing basis. Therefore, in keeping with our previous description, this capability, rather than its components, is the focus of our hypothesis generation.

Integration capability is an important determinant of acquisition strategies that is distinct from the resources involved in the underlying creation, production, and sale of a product. The concept of an integration capability arises in the literature in disparate ways. Helfat and Raubitschek (2000: 964) argue that integrative knowledge, which they define as ‘knowledge that integrates, or knowledge of how to integrate, different activities, capabilities, and products in one or more vertical chains’, is an important element in the co-evolution of capabilities and products. Collis and Montgomery (1998) argue that important elements to corporate advantage include not only the resources that determine what products a corporation offers, but also the corporation’s coordination and control capabilities.

In the merger and acquisition context, Singh and Zollo (1997) argue that firms can develop post-acquisition management skills that facilitate their use of acquisitions. The conceptual literature on acquisition process, meanwhile, argues that firms differ in their abilities to plan and implement post-acquisition target integration, where integration requires momentum and inter-group coordination (Jemison and Sitkin, 1986). Moreover, judgment is required in matching the appropriate level or type of integration activities to a particular acquisition (e.g. Haspeslagh and Jemison, 1991). Recently, a few empirical working papers have focused on the mechanisms through which firms can attain integration capabilities. Zollo and Singh (2000) and Zollo and Leshchinskii (2000) argue that integration capability involves two mechanisms – tacit routinization for repetitive tasks and explicit codification for relatively infrequent and complex tasks. Similarly, Puranam (2001) finds that firms can develop an integration capability that facilitates acquisition transactions.

We highlight the ongoing and recurring nature of integration that is central to these arguments. In the Helfat and Raubitschek (2000) approach,
integrative knowledge works in a continuous feedback system with core knowledge, product sequencing, incremental learning, and step-function learning. Similarly, in other approaches, coordination and control are ongoing processes that help facilitate management of a system of interdependent parts. In a complementary discussion, meanwhile, Liebeskind (1996) notes that firms differ in their internal capabilities to safeguard their knowledge, which typically requires the ability to integrate various activities over time. Lubatkin et al. (2001: 353) note how it took 'at least three years' for performance differences to become apparent between the products in the Nestlé/Carnation merger versus the RJR/Nabisco merger and that these differences persisted over time. Thus, in our view, integration capabilities involve more than a one-time action related to a specific acquisition. Rather, integration capabilities facilitate actions immediately after an acquisition and then into the future.

We predict that integration capability is an important consideration for the acquisition of product lines, regardless of whether the acquired lines constitute existing or new products for the acquirer. Consider when a firm acquires a product line in which it already operates. Common profit-seeking motivations for making such an acquisition would be trying to increase market power and searching for efficiencies by combining acquired resources in order to achieve greater scale (e.g. Seth, 1990). In the market power case, integration efforts are necessary to coordinate the production, marketing, and pricing efforts of the two firms in order to realize any market power advantages. To achieve efficiency gains, meanwhile, the acquirer must integrate the operations of the original business and target firm. Therefore, under both motivations, integration efforts play an important role in facilitating acquisitions, both upon completion of the acquisition and on an ongoing basis. For instance, Capron et al. (1998) show that a significant redeployment of assets in both directions commonly occurs for several years following horizontal acquisitions, suggesting the importance of integration capabilities in horizontal combinations.

The importance of integration capabilities also arises with the acquisition of product lines that are new to a firm. Again, efficiency or market power motivations are relevant when acquisitions involve non-overlapping product lines. For example, firms might be trying to capture efficiencies in development, manufacturing, or marketing across shared portions of the value chain. Likewise, the goal of acquiring new product lines might be to capture monopoly rents at some point in the value chain. In addition, such acquisitions offer opportunities to innovate by recombining the acquired lines with other lines in order to produce new goods and services. Such recombination will require substantial integration and reshaping of existing and new product lines (Capron et al., 2001).

Operationally, we expect integration capabilities to associate with the number of product lines that a firm operates prior to making an acquisition. This association arises because firms that operate more product lines tend to have the organization structure, operating procedures, and skills to effectively integrate their multiple product offerings. Again, consistent with our theoretical
perspective, this operationalization has the benefit of being able to capture the culmination of many routines versus the reductionist problems that would arise had we focused on any one component. Moreover, we note how this relationship describes the ongoing nature of integration.

Theoretical and empirical arguments support this measure. For example, Chandler (1962) argues that multi-activity firms develop capabilities to manage their extensive operations. Such capabilities result from the combination of organization structure, operating systems, and managerial expertise (Penrose, 1959). Barnett and Freeman (1997) argue that the variety of a firm's production and coordinating routines will increase with the number of product lines it offers. Kekre and Srinivasan (1990) and Lancaster (1990) show that the ability to manage disparate activities increases with the number of product lines that a firm offers. Consistent with these arguments, Karim and Mitchell (2000) show that post-acquisition product line retention increases with the number of lines that an acquirer possesses. We discuss below how our data and variables make this operationalization especially relevant in our empirical setting.

In summary, we hypothesize that firms with higher levels of integration capabilities will be more likely to engage in acquisitions than firms lacking these capabilities. These firms are better able to assess the appropriate level of integration needed for a particular acquisition and then to implement the acquisition – immediately and into the future. In turn, the number of product lines that a firm operates manifests such integration capabilities.

HYPOTHESIS 1 The greater the number of product lines that a firm operates, the more likely the firm is to become an acquirer in a given period.

We consider three alternative explanations with respect to this hypothesis. The first is prior acquisition activity. We formulated the hypothesis on the argument that firms with greater integration capability will be more likely to engage in acquisitions. This argument differs from the predictions that firms engage in acquisitions because they have greater acquisition skills or because they have acquisition momentum. This distinction is important from both a theoretical and measurement perspective. Theoretically, we expect integration capabilities to create benefits for firm activities other than acquisitions. For example, we expect that internal development of new product lines also needs integration capability (e.g. Rind, 1981). Firms that successfully develop products internally have to integrate the development and launch of these products within the firm, sharing resources in some cases and potentially cannibalizing product lines in other cases. From a measurement perspective, this indicates that our focus on product lines versus previous merger activity is a more valid measure of the underlying construct. Nevertheless, because acquisition activity often associates with adding product lines, we must explicitly control for prior acquisition activity in order to test our hypothesis.
Second, we consider agency motivations for acquisitions. The assumption of profit-seeking managerial intended rationality underlies our arguments. That is, we expect managers to be more likely to undertake extensive acquisition activity if they believe that their firms have the integration skills needed to complete the acquisitions effectively. We recognize that acquisition activity sometimes stems from motivations that differ from the goal to increase firm profitability, such as empire building (e.g. Jensen, 1986), hubris (e.g. Roll, 1986), or other agency motivations (e.g. Amihud and Lev, 1981). Nonetheless, the existence of these motivations does not invalidate our arguments. First, even self-serving managers rarely ‘advertise’ that they are making acquisitions for agency reasons and, instead, have incentives to engage in actions that make it appear an acquisition did not occur solely for personal gain. These actions include efforts to integrate the acquired company. The ability to do so will depend on integration capabilities. Thus, even acquisitions that stem in part from agency motives will be more feasible in firms that have strong integration capabilities. Second, all else equal, we expect that analysts will scrutinize acquisitions more carefully when made by companies that lack integration capabilities, in order to verify that they are not made for agency reasons. Under this condition, our prediction will still hold. Namely, firms lacking integration capabilities will be less likely to make acquisitions compared to firms that possess such capabilities. Nevertheless, to the extent that these explanations for acquisition activity are pervasive and external monitoring does not pay heed to integration capabilities, the data will reject our hypotheses, so that any bias is conservative. We further discuss agency motivations when we interpret the results.

Third, we consider the literature on divestitures. This literature has introduced similar measures to our measure of integration capability, which is the number of product lines, as measures of over-diversification or high governance costs (e.g. Hitt et al., 1996). The argument of these studies is that firms with excess levels of diversification will be more likely to spin off business or see increased value when they spin off businesses. To the extent that greater numbers of product lines represent over-diversification, we will not find support for our hypothesis because the existing literature finds that over-diversified firms are more likely to contract than expand. Nonetheless, there is no one-to-one mapping between the over-diversification literature and our study because, as we discuss shortly, we measure product lines at a much more refined level than these studies, which tend to use business segments or four-digit SIC codes.

Moreover, even to the extent that our measures complement the over-diversification measures, we expect somewhat different results. The traditional value-producing divestiture arguments stem from the implicit or explicit assumption that firms have mistakenly over-expanded. By contrast, though, value-producing divestiture of unneeded product lines may actually result from acquisition activity and be a part of a firm’s integration capability. Capron et al. (2001) suggest that asset divestiture, especially post-acquisition, is part of an
active program of business reconfiguration in which firms often acquire resources that they do not need along with resources that they do need if they use acquisitions to make changes (in addition, a firm's traditional resources may become obsolete when it acquires new resources). In this way, firms use resource divestiture when they change their degree of diversification as a way of ensuring that they do not reach unmanageable levels of diversification. Therefore, our prediction is consistent with an argument that firms with many product lines will benefit from divesting excess lines, although for a different reason than the original argument that firms have over-expanded. Instead, our approach highlights the idea that firms can adjust their overall level of diversification by adding and subtracting product lines during the acquisition and integration processes.

Turning to the second hypothesis, we examine what determines whether firms tend to acquire product lines that they operated prior to the acquisition (existing lines) or product lines that they did not previously operate (new lines). Above, we argued that integration capabilities are important whether a firm acquires a new line or whether it acquires a product line it operated ex ante. The following arguments refine this position. We reason that integration capabilities will be most important when a firm acquires product lines that it already operated prior to the acquisition, due to the intensity of integration that is required for overlapping versus non-overlapping lines.

We start by considering the degree of overlap of an acquirer's existing business with acquired lines that it did or did not operate previously. It is useful to consider a commercialization value chain that includes development, production, marketing, distribution, and administrative activities. Typically, there will be more overlap in the marketing and distribution aspects of the value chain when an acquirer purchases a product line that it already operates than when it acquires a new product line. We cannot predict whether there will be more or less overlap in development or production capabilities when firms acquire product lines that they do and do not operate ex ante, however, because different products often rely on similar technologies and manufacturing processes, while substitutable product offerings can draw on different technologies and manufacturing processes. Nor can we predict whether administrative activities will have greater or lesser overlap in the two types of cases. Nonetheless, so long as there is on average no greater overlap of capabilities in development, production, and administrative functions for new product lines than for existing lines, then even a conservative argument suggests that acquisitions of new lines will have less overlap with the acquirer's existing capabilities owing to the lesser overlap in marketing and distribution.

When one considers the use of integration capabilities, it is necessary to consider both the difficulty of integrating newly acquired product lines and the intensity of integration that an acquirer will need to undertake. Integration of lines that the acquirer already offers and lines that the acquirer did not operate
before the acquisition will tend to vary on these two dimensions, of relative difficulty and intensity.

Consider acquiring lines that a firm did not operate before the acquisition. A firm would often face substantial difficulties if it were to undertake full-scale integration of such lines. Full integration often would require combining newly-acquired business units with existing business units that would tend to have highly different attributes and then adapting many types of business activities — including development, production, marketing, distribution, and administrative systems — in order to fully integrate the new lines into the existing business.

Nonetheless, adding new product lines typically does not require full-scale integration for the acquirer to obtain value. Although obtaining value from the acquisition will require some degree of business integration, the integration often occurs in more focused areas in the value chain compared to acquisitions of existing lines. For instance, if cross-selling products is the potential benefit of acquiring a new product line, then only limited business integration would be required. Similarly, if the expected benefit of acquiring a new line is the opportunity to learn about a new market segment or a new technology, then a firm may need to undertake only limited integration to obtain value from the target. In such cases, newly acquired business units may well continue to operate as stand-alone subsidiaries, with only partial integration of activities such as marketing or development into the acquirer's other businesses. Other business activities may not offer opportunities for more extensive integration, at least during the period in which a firm is simply cross-selling products and/or learning about the new business opportunity. Thus, although full-scale integration of new lines would be difficult, so that it might seem that firms would need greater prevalence of integration capabilities in order to undertake acquisitions that emphasized new lines, the need for immediate integration is often limited. Therefore, acquirers often have only to undertake light-handed integration of the new lines with their existing businesses and they may be able to undertake successful acquisitions even if they lack a high degree of integration capability.

By contrast, consider the integration of acquired lines that a firm already operates. When an acquirer buys a product line it already operates, there is by definition some overlap in the sales and marketing aspects of the value chain. Here, although the difficulty of integration might appear easier relative to new lines, the intensity of integration will tend to be greater. When a firm acquires lines that it already operates, much of the post-acquisition value will arise through increased economies of scale in development, production, marketing, distribution, and administration. In order to realize such scale economies, the acquirer will need to combine the acquired business unit with its existing business units and will need to consolidate many activities along the value chain. Moreover, the acquirer typically will need to undertake the integration quite quickly in order to recover the cost of the acquisition through increased
efficiencies. In turn, the acquirer typically will need to divest resources that have become obsolete owing to the consolidation, where the divestitures will involve resources of both the target and existing businesses (Capron et al., 2001). Such intense consolidation and rationalization require substantial integration skill. The announcement in 2001 that Hewlett-Packard intended to purchase Compaq, for instance, met substantial skepticism in the financial markets because of doubts that the firms had the integration skill that they would require in order to consolidate and rationalize their overlapping products lines effectively and quickly.

Thus, we expect that the ongoing integration of existing lines will require greater integration capabilities than the integration of new lines because the firm will need to undertake more intense integration in order to realize the value of the acquisition. This argument parallels arguments that firms need to undertake different levels or types of integration for different acquisitions (e.g. Haspeslagh and Jemison, 1991). We hypothesize that a firm’s expectation of being able to undertake the appropriate level of integration will influence the extent to which it undertakes a certain type of acquisition. The following hypothesis follows from the assumption that greater product line scope reflects greater integration capabilities.

**HYPOTHESIS 2** The larger an acquirer’s existing product line scope, the greater the firm’s tendency toward purchasing product lines it already operates.

Turning to alternative explanations, we recognize that there is an underlying probabilistic relationship that appears to generate predictions that are consistent with this hypothesis. Namely, should a firm randomly purchase a product line, there is a higher probability that it purchases a line that it already operates, the more lines that it operated *ex ante*. We assess this alternative explanation in the discussion of the empirical findings, showing that it does not hold.

In summary, the hypotheses address how an important source of firm heterogeneity – integration capability, which is the ability to integrate disparate business operations on an ongoing basis – affects the likelihood that profit-seeking firms will become acquirers and whether they will buy lines of business that they do or do not previously operate. We expect acquisition activity to increase with firms' product line scope, owing to greater ability to integrate and manage target businesses. In turn, given that a firm becomes an acquirer, we predict that greater product line scope will lead to greater propensity to purchase product lines that the firm already operates. Thus, we expect that firms with the greatest integration capabilities will be most likely to make acquisitions and also will be more systematic in making acquisitions where they can best leverage these skills. This reasoning is analogous with the biological observation that the most successful predators are not only better able to overpower their prey, but are also better able to target prey against which they can most successfully employ their capabilities.
Data and empirical approach

We test the hypotheses by examining a sample of firms that approaches the population of companies that participated in the US medical sector between 1978 and 1995. The data source that we use is *The Medical and Healthcare Marketplace Guide* (1975, 1978, 1983, 1986, 1989, and each year after until 1995). These guides identify virtually every firm of any appreciable size that was operating in the US medical sector, including US-owned and foreign-owned businesses. The data source provides operating information for many privately held companies, for which other sources do not provide comparable data, as well as for publicly held corporations. The guides provide extensive information regarding the firms’ medical sector product lines. The guides identify 258 product lines from five sub-sectors: medical devices (184 lines), dental devices (5 lines), ophthalmic devices (7 lines), pharmaceutical products (16 lines), and healthcare services (46 lines). These data provide unusually fine-grained information about firms’ acquisition activities. Karim and Mitchell (2000) use a related data set to examine a different set of issues.

The product line definitions are precise, typically at a five- to seven-digit level with the US Standard Industrial Classification (SIC) system. For example, several medical device product lines fall within one four-digit SIC classification (3845 – Electro-medical and Electro-therapeutic Apparatus). This precision is important given our arguments that product line scope measures integration capabilities. Our product definitions are able to pick up differences in markets, production technologies, and research base that are not identifiable in many other data.

Overall, as we noted earlier, the lines represent a moderate degree of relatedness. To the extent that SIC classifications accurately represent product-market diversification, most of the lines fall within a few four-digit categories, all involving goods and services in medical sector market segments. There is greater diversity at the technical end of the spectrum, because the goods draw on a wide variety of biological, chemical, engineering, and service-based technologies. This range of diversity is similar to that which arises in many businesses organized in terms of their focal product markets, such as auto, aerospace, consumer packaged goods, financial services, and telecommunications. In this way, the setting is comparable to many mature market settings in which there are some highly focused competitors and other competitors with sufficient integration capabilities that their product lines have evolved to include a substantial range of complementary goods and services in multiple market segments. The diversity in the medical sector is somewhat broader than in highly focused markets, such as traditional consumer banking and petroleum refining. Even in such settings, though, we would expect similar results to those that we predict in this study, as long as there is market space for more than a very small number of highly specific product lines, because firms will need to develop effective
Table 1. Correlation matrices and descriptive statistics

<table>
<thead>
<tr>
<th>Acquisition tendency (n = 2589)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ACQUIRER</td>
<td>1.00</td>
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<tr>
<td>2. NUMBER OF LINES</td>
<td>0.34</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. SIZE</td>
<td>0.19</td>
<td>0.24</td>
<td>1.00</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4. ENTER BY ACQUISITION</td>
<td>0.16</td>
<td>0.09</td>
<td>0.05</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. PREVIOUS ACQUISITIONS</td>
<td>0.38</td>
<td>0.67</td>
<td>0.21</td>
<td>0.14</td>
<td>1.00</td>
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<tr>
<td>6. FOREIGN</td>
<td>0.05</td>
<td>0.01</td>
<td>0.02</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
<td></td>
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<tr>
<td>7. COMPETITORS</td>
<td>0.01</td>
<td>-0.05</td>
<td>-0.01</td>
<td>0.00</td>
<td>-0.01</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>8. PRODUCT LINE GROWTH</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
<td>-0.03</td>
<td>-0.03</td>
<td>0.01</td>
<td>-0.06</td>
<td>1.00</td>
</tr>
</tbody>
</table>

| Mean                           | 0.08| 2.25| 7.74E+04| 0.03| 0.48| 0.08| 52.02| 2.72 |
| Std. dev.                     | 0.28| 2.80| 5.44E+05| 0.17| 1.62| 0.27| 39.84| 4.49 |
| Min.                          | 0.00| 1.00| 0.00| 0.00| 0.00| 0.00| 1.00| -0.75 |
| Max                           | 1.00| 43.00| 1.39E+07| 1.00| 25.00| 1.00| 182.00| 26.00 |

<table>
<thead>
<tr>
<th>Acquired lines (n = 271)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. NET OVERLAP</td>
<td>1.00</td>
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<tr>
<td>2. EXISTING LINES</td>
<td>-0.06</td>
<td>1.00</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>3. NEW LINES</td>
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<td>0.45</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>4. NUMBER OF LINES</td>
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<td>0.27</td>
<td>0.04</td>
<td>1.00</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5. NUMBER OF LINES^2</td>
<td>0.06</td>
<td>0.19</td>
<td>0.02</td>
<td>0.93</td>
<td>1.00</td>
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</tr>
<tr>
<td>6. FOREIGN</td>
<td>0.05</td>
<td>-0.08</td>
<td>-0.08</td>
<td>-0.15</td>
<td>-0.13</td>
<td>1.00</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>7. SIZE</td>
<td>-0.03</td>
<td>-0.08</td>
<td>0.00</td>
<td>0.17</td>
<td>0.12</td>
<td>-0.13</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>8. TARGET – DOMESTIC</td>
<td>-0.02</td>
<td>0.03</td>
<td>0.03</td>
<td>0.17</td>
<td>0.13</td>
<td>-0.40</td>
<td>0.12</td>
<td>1.00</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9. TARGET – SIZE</td>
<td>0.06</td>
<td>0.29</td>
<td>0.06</td>
<td>0.22</td>
<td>0.17</td>
<td>-0.16</td>
<td>0.45</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. COMPETITORS</td>
<td>0.04</td>
<td>-0.02</td>
<td>-0.04</td>
<td>-0.14</td>
<td>-0.12</td>
<td>0.30</td>
<td>-0.07</td>
<td>-0.19</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. PRDT LINE GROWTH</td>
<td>-0.01</td>
<td>0.00</td>
<td>0.01</td>
<td>-0.03</td>
<td>-0.01</td>
<td>-0.14</td>
<td>0.02</td>
<td>0.11</td>
<td>0.03</td>
<td>-0.15</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. PREV ACQUISITIONS</td>
<td>0.01</td>
<td>0.08</td>
<td>0.03</td>
<td>0.66</td>
<td>0.61</td>
<td>-0.15</td>
<td>0.20</td>
<td>0.21</td>
<td>0.18</td>
<td>-0.05</td>
<td>-0.10</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>13. ENTER BY ACQ</td>
<td>0.02</td>
<td>0.02</td>
<td>-0.01</td>
<td>0.03</td>
<td>-0.01</td>
<td>-0.11</td>
<td>0.13</td>
<td>0.12</td>
<td>0.04</td>
<td>0.09</td>
<td>-0.01</td>
<td>0.08</td>
<td>1.00</td>
</tr>
</tbody>
</table>

| Mean                           | -1.47| 0.86| 2.32| 9.61| 206.48| 0.21| 2.6E+05| 0.88| 6.3E+05| 56.41| 2.81| 4.45| 0.10|
| Std. dev.                     | 3.34| 1.45| 3.72| 10.71| 468.86| 0.41| 7.1E+05| 0.32| 1.3E+06| 35.26| 3.36| 5.19| 0.30|
| Min.                          | -24.00| 0.00| 0.00| 1.00| 1.00| 0.00| 0.00| 0.00| 0.00| 8.00| -0.44| 0.00| 0.00|
| Max.                          | 5.00| 13.00| 28.00| 56.00| 3136.00| 1.00| 6.9E+06| 1.00| 1.4E+07| 182.00| 20.20| 27.00| 1.00|
integration capabilities in order to offer even a more limited set of goods and services than those available in the medical sector.

We construct the sample from all firms operating in 1978 and 1983 and then examine their acquisition activities through 1995. We focus on two years of baseline activity to increase the number of firms that we can examine. The sample includes 2589 firms, with 1211 firms that were operating in 1978 and an additional 1378 firms that entered the data set by 1983. We focus on these years for two reasons. First, we choose 1978 as the base year because we were then able to use information from the 1975 guide to calculate control variables for *ex ante* business activity and industry growth. Second, focusing on these two baseline years provides a more consistent window over which to examine firm actions than if we include a greater number of years.

**Focal variables**

The first dependent variable that we examine is whether or not a firm becomes an acquirer during the study period. The variable, which we label ACQUIRER, takes the value of 1 if a firm engaged in at least one acquisition from the beginning of the study period through 1995, zero otherwise. *The Medical and Healthcare Marketplace Guide* provided data to determine the value of this variable over various years. Of the 2589 firms that form the sample, 216 engaged in acquisitions during the study period. Because some firms in our sample engaged in multiple acquisitions, the total number of acquisitions that we examine in the second stage of the analysis includes 271 acquisitions. Table 1 presents descriptive statistics for all variables.

We define three related variables to evaluate the extent to which acquired product lines matched a firm's existing product lines. We label the variables NEW LINES, EXISTING LINES, and NET OVERLAP. NEW LINES records the number of acquired lines that do not match the existing product lines of the acquirer. EXISTING LINES records the number of acquired lines that match existing product lines of the acquirer. NET OVERLAP then subtracts NEW LINES from EXISTING LINES. Positive values of NET OVERLAP indicate that the acquirer purchased more product lines in which it operated than in which it did not operate. Negative values of NET OVERLAP indicate that the acquirer purchased more product lines in which it did not operate than in which it operated. The average value of NET OVERLAP is −1.47, which is significantly less than zero ($p < 0.0001$). That is, on average, firms are purchasing approximately one and a half product lines in which they did not operate with each acquisition. The range of the NET OVERLAP variable is large, with a maximum value of 5 (more existing lines than new lines) and a minimum value of −24 (more new lines than existing lines).

To measure the product line scope of a company, which is the focal independent variable, we count the number of product lines that it operated prior to the acquisition. We label this variable NUMBER OF LINES. The average num-
ber of lines in which a company operates is 2.25. The range is large. Some companies are very focused and operate only one line. By contrast, one company in our sample operated 43 lines in the baseline year.6

**Control variables**

As we previously discussed, it is important to control for plausible alternative explanations when examining how product line scope relates to the dependent variables of interest. First, we measure the size of the company. Size is an important control given that we measure integration capabilities as the number of product lines that a firm operates and this variable might capture the impact of firm size. The variable SIZE records the company’s sales in the medical sector (millions of 1982 dollars based on the Producer Price Index).7

We also control for whether a firm entered the medical sector initially by acquisition. The variable ENTER THE SECTOR BY ACQUISITION takes the value 1 under this circumstance, 0 otherwise. We include this control for three reasons. First, firms undoubtedly make acquisitions for reasons other than their integration capabilities. If a firm entered the sector by acquisition for one of these reasons and if the motivation still exists, then these firms will more likely be acquirers and this variable will capture this effect. In other words, this variable helps capture the existence of unobserved heterogeneity in determining the acquisition decision and provides additional confidence that the independent variables that we test capture their intended effect. Second, behavioral or inertial forces might create a momentum with respect to acquisition activity (Amburgey and Miner, 1992), which this control will also capture. Finally, to the extent that there is an experience effect that facilitates acquisitions (e.g. Fowler and Schmidt, 1989) controlling for entry into the sector by acquisition will help address this effect.

We defined the variable PREVIOUS ACQUISITIONS as the number of medical sector acquisitions that the firm made prior to the base analysis year (i.e. 1978 or 1983). We identified these acquisitions by reviewing reports in the medical sector trade guides, which were the primary data source. These reports somewhat understate acquisitions, because they do not report all historical acquisitions that a firm has made, but they do report most or all recent medical sector acquisitions (within about five years of the base year), as well as notable older acquisitions. Thus, the variable provides a useful measure of a firm’s most relevant acquisition history and will aid in measuring experience and acquisition capability. We find that this variable correlates with NUMBER OF LINES, which suggests the importance of including it as a control because number of lines could pick up this effect. Given the correlation of these two variables, we investigated if the results that we present were driven by collinearity between these two variables. Sensitivity analyses suggested that this was not the case, because the results for each variable were robust to dropping the other variable.8
The next control that we include is whether the firm is based in the US or in another country. We label this variable FOREIGN, which takes a value of 1 if the company is foreign-owned, 0 if US-owned. We include this control because the US enjoys a comparative advantage in the medical sector compared to other nations and there is empirical evidence that foreign firms often acquire firms in a foreign country in order to gain access to capabilities that they might lack (e.g. Kogut and Chang, 1991). We gather the nationality data from *The Medical and Healthcare Marketplace Guide* and other secondary sources. Of the 2589 observations, approximately 8% are foreign-owned.

We also include a variable to control for the effect of competition. To measure the variable COMPETITORS, we calculate the number of companies that operate in each firm's product lines. For companies that operate in more than one product line, we average the values across lines. Table 1 indicates that the companies in the sample faced as few as one competitor and as many as 182 competitors.

Finally, we control for market growth in the product lines that a firm operates. We measure the change in the number of firms that participated in a product line in the previous period (i.e. the change in the variable COMPETITORS). For firms that operate in multiple product lines, we average the number of competitors in each line to create the variable PRODUCT LINE GROWTH. In our sample, we observe that some companies operate in product lines where the number of participants is contracting; the minimum value of this variable is −0.44. We also observe that many companies are participating in product lines that are growing; the mean value for the PRODUCT LINE GROWTH variable is 2.81 and the maximum value is 20.2. This positive mean growth level is consistent with the overall growth of the healthcare sector during this period.

**Statistical approach**

We have two dependent variables of interest: whether or not a firm becomes an acquirer and the degree to which it purchases product lines that it already operated. Given that we only observe the latter dependent variable for the set of firms that chose to make acquisitions, we follow Heckman’s (1979) two-stage sample selection estimation approach. This approach explicitly recognizes the conditional nature of the comparison in the second stage, thus allowing for more meaningful interpretation of the coefficient estimates. Shaver (1998) provides a more complete description of the benefits in using such techniques in strategy research.

Conceptually, one can think of the investigation in the following manner. Firms assess the expected value of engaging or not engaging in acquisitions. We can define a variable ACQUIRER* as the difference in expected value of engaging in acquisitions versus not engaging in acquisitions. As researchers, we cannot observe or measure the value of ACQUIRER*, but we can infer that it is
greater than zero by observing whether or not firms undertake acquisitions. This is the standard formulation of a dichotomous choice model, which equation (1) represents.

\[
\text{ACQUIRER}_i = \gamma'w_i + u_i
\]

\[
\text{ACQUIRER}_i = 1 \text{ if } \text{ACQUIRER}_i^* > 0, 0 \text{ otherwise}
\] (1)

We expect that the underlying expected value of acquisitions is a function of several variables based on our hypothesis and controls that form the vector \(w\). Moreover, effects that we do not hypothesize or control for in \(w\) are captured by an error term, which we label \(u\) and assume has a normal distribution. The normality assumption results in a probit specification for the dichotomous choice model. Therefore, we test hypotheses 1 with a probit specification.

Hypothesis 2 examines how product line scope affects \(\text{NET OVERLAP}\). The standard one-stage approach would be to estimate a regression model of the following form.

\[
\text{NET OVERLAP} = \beta'x_i + \epsilon_i
\] (2)

Because we observe \(\text{NET OVERLAP}\) only for firms that make acquisitions, we are concerned that the conditionality of the relationship might lead to misleading estimates of \(\beta\) in the one-stage regression. In particular, this will occur if unmeasurable or unknown factors affect both decisions to become acquirers and the degree of overlap of the businesses that firms acquire. Under this condition, the estimates of \(\beta\) will not have desirable statistical properties because the error terms in equations (1) and (2) correlate and there exists the possibility that a measured variable in \(x_i\) correlates with an unmeasured variable. Therefore, \(\beta\) could possibly capture the effect of an unmeasured variable rather than the variable included in \(x_i\). Heckman’s approach is to control for the potential correlation of the error terms by adding a term into the model in equation (2) that accounts for the correlation in error terms across equations, and then to correct the standard errors to account for heteroskedasticity. This mitigates the possibility that \(\beta\) captures an unmeasured effect rather than the effect of \(x_i\). We estimate a model of the form:

\[
\text{NET OVERLAP} = \beta'x_i + \beta_\lambda \lambda + \eta
\] (3)

where \(\lambda = \phi(\gamma'/w_i)/\Phi(\gamma'w_i)\).

In equation (3), \(\phi\) and \(\Phi\) are the probability density function and cumulative distribution function of the standard normal distribution. \(\eta\) is an error term with zero mean, but it is heteroskedastic and not normally distributed. The correction of the standard errors accounts for the existence of heteroskedasticity in the error term to create asymptotically efficient standard errors (Heckman, 1979; Greene, 2000).
Results

Table 2 presents the results from the first stage probit specification. The results support hypothesis 1, which predicted that firms with greater product line scope are more likely to become acquirers. As we expected, the coefficient estimate of NUMBER OF LINES is positive and significant. Because probit is a non-linear estimator, the coefficient estimates do not convey marginal effects, which depend on the values of the independent variables. The table reports that the magnitude of the marginal effect at the mean of the independent variables is just over 1%. This indicates that for each additional product line, firms are 1% more likely to become acquirers. The standard deviation of NUMBER OF

Table 2 Probit results – influence of product line scope on the likelihood that a firm becomes an acquirer, 1978/1983–1995
(t-statistics in parentheses)
[marginal effects evaluated at the mean level of the independent variables in square brackets]
Positive coefficient estimates indicate increased probability of being an acquirer.

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-1.55***</td>
<td>(11.30)</td>
</tr>
<tr>
<td></td>
<td>[-0.16]</td>
<td></td>
</tr>
<tr>
<td>NUMBER OF LINES</td>
<td>0.07***</td>
<td>(4.17)</td>
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<td></td>
<td>[0.01]</td>
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</tr>
<tr>
<td>SIZE</td>
<td>1.67x10^{-7}***</td>
<td>(3.13)</td>
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<tr>
<td></td>
<td>[1.77x10^{-9}]</td>
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</tr>
<tr>
<td>ENTER THE SECTOR BY ACQUISITION</td>
<td>0.82***</td>
<td>(5.05)</td>
</tr>
<tr>
<td></td>
<td>[0.15]</td>
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</tr>
<tr>
<td>PREVIOUS ACQUISITIONS</td>
<td>0.21***</td>
<td>(7.49)</td>
</tr>
<tr>
<td></td>
<td>[0.02]</td>
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</tr>
<tr>
<td>FOREIGN</td>
<td>0.36***</td>
<td>(2.97)</td>
</tr>
<tr>
<td></td>
<td>[0.05]</td>
<td></td>
</tr>
<tr>
<td>COMPETITORS</td>
<td>0.001</td>
<td>(1.10)</td>
</tr>
<tr>
<td></td>
<td>[0.00]</td>
<td></td>
</tr>
<tr>
<td>PRODUCT LINE GROWTH</td>
<td>0.00</td>
<td>(0.52)</td>
</tr>
<tr>
<td></td>
<td>[0.00]</td>
<td></td>
</tr>
<tr>
<td>$\chi^2$(d.f.)</td>
<td>285.37 (7)***</td>
<td></td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.19</td>
<td></td>
</tr>
</tbody>
</table>

*** p < 0.01, ** p < 0.05, * p < 0.10 (one tailed tests)
n = 2589 (number of observations where dependent variable = 1 is 216).
LINES is approximately 3; therefore, a one standard deviation increase from the mean of the independent variable increases the chances that a firm engages in acquisitions by over 3%. The magnitude of this effect is meaningful, considering that just over 8% of the sample firms engage in acquisitions.

Turning to the control variables, we observe that four of the six coefficient estimates are significant. First, the positive and significant coefficient estimate of SIZE indicates that larger firms tend to become acquirers. Controlling for size provides us with additional confidence that the NUMBER OF LINES variable captures the scope of a firm’s activities, which is the foundation of our hypothesis, rather than simply being an effect of firm size. The magnitude of the marginal effect is quite small in that a firm of mean size is just over 0.1% more likely to become an acquirer compared to a firm with negligible sales.

Second, we found a positive and significant estimate of ENTER THE SECTOR BY ACQUISITION. The marginal effect is large. Firms that entered the medical sector by acquisition are 15% more likely to engage in acquisitions compared to firms that did not enter the sector by acquisition. Because this variable might proxy for the existence of unmeasured effects that increase the propensity to acquire, the positive and significant coefficient estimate is expected. Moreover, the inclusion of this control increases the confidence that NUMBER OF LINES captures the underlying hypothesized effect.

Third, the coefficient of PREVIOUS ACQUISITIONS is positive and significant. The marginal effect is such that for each acquisition prior to our time period, firms are 2% more likely to be an acquirer. Because the standard deviation of this variable is 1.62, a one standard deviation increase results in a 3% increase in the likelihood that a firm is an acquirer. Thus, while this effect is important, it is smaller than that of the predicted variable.

Fourth, we find that foreign-owned companies are more likely to engage in acquisitions than US-owned companies, as evidenced by the positive and significant coefficient estimate of FOREIGN. We find that at the mean level of the set of independent variables, foreign-owned firms are 5% more likely to engage in acquisitions compared to domestic firms. This is consistent with our expectation that the comparative advantage of the US medical sector leads foreign firms to engage in acquisitions in order to access capabilities that reside in firms that operate in the US.

Finally, we find no evidence that greater number of competitors or greater entry into a firm’s product lines affected its propensity to engage in acquisitions. That is, the coefficient estimates of COMPETITORS and PRODUCT LINE GROWTH are insignificant (in sensitivity analyses, we also found that each effect was insignificant when we omitted the other variable).

Table 3 reports the results with respect to whether or not firms buy product lines that they operated ex ante (hypothesis 2). We estimate three models: first examining net overlap of new and existing lines, then individually examining the number of new lines and existing lines that the firms acquired.
Table 3 Regression results – influences on overlap of acquired product lines with the acquirer’s existing lines  
(t-statistics in parentheses; n=271)

<table>
<thead>
<tr>
<th>1. NET OVERLAP</th>
<th>2. NEW LINES</th>
<th>3. EXISTING LINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-2.01</td>
<td>3.24**</td>
</tr>
<tr>
<td></td>
<td>(1.19)</td>
<td>(1.71)</td>
</tr>
<tr>
<td>NUMBER OF LINES</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>(0.81)</td>
<td>(0.61)</td>
</tr>
<tr>
<td>NUMBER OF LINES$^2$</td>
<td>-0.00</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(0.81)</td>
<td>(0.60)</td>
</tr>
<tr>
<td>FOREIGN</td>
<td>0.53</td>
<td>-0.62</td>
</tr>
<tr>
<td></td>
<td>(0.35)</td>
<td>(0.33)</td>
</tr>
<tr>
<td>SIZE</td>
<td>-3.21\times10^{-7}</td>
<td>-3.09\times10^{-7}</td>
</tr>
<tr>
<td></td>
<td>(0.33)</td>
<td>(0.40)</td>
</tr>
<tr>
<td>TARGET – DOMESTIC</td>
<td>0.02</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>(0.98)</td>
<td>(0.85)</td>
</tr>
<tr>
<td>TARGET – SIZE</td>
<td>2.51\times10^{-7}</td>
<td>0.87\times10^{-7}</td>
</tr>
<tr>
<td></td>
<td>(0.22)</td>
<td>(0.70)</td>
</tr>
<tr>
<td>COMPETITORS</td>
<td>0.00</td>
<td>-0.00</td>
</tr>
<tr>
<td></td>
<td>(0.68)</td>
<td>(0.67)</td>
</tr>
<tr>
<td>PRODUCT LINE GROWTH</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(0.95)</td>
<td>(1.00)</td>
</tr>
<tr>
<td>PREVIOUS ACQUISITIONS</td>
<td>-0.02</td>
<td>-0.09</td>
</tr>
<tr>
<td></td>
<td>(0.86)</td>
<td>(0.38)</td>
</tr>
<tr>
<td>ENTER THE SECTOR</td>
<td>0.52</td>
<td>-0.68</td>
</tr>
<tr>
<td>BY ACQUISITION</td>
<td>(0.51)</td>
<td>(0.44)</td>
</tr>
<tr>
<td>$\lambda$ (Selection effect)</td>
<td>0.26</td>
<td>-0.84</td>
</tr>
<tr>
<td></td>
<td>(0.73)</td>
<td>(0.32)</td>
</tr>
</tbody>
</table>

R$^2$ 0.02 0.02 0.25  
F (11,259) 0.48 0.47 8.00***

*** p < 0.01, ** p < 0.05, * p < 0.10 (one tailed tests)  
Note: 'NET OVERLAP' = 'EXISTING LINES' – 'NEW LINES'

In column 1 of Table 3, NET OVERLAP serves as the dependent variable. We also include the square of NUMBER OF LINES as an independent variable, to check the possibility of a non-linear relationship. Overall, the fit of model 1 is poor. The R$^2$ is low (0.02) and the F-test is non-significant, indicating that the independent variables add little explanatory power beyond the intercept. Consistent with the variable means in Table 1, this suggests that, on average, all acquirers purchase product lines that they did not previously operate.

The results in column 1 of Table 3 do not support hypothesis 2, which predicted that firms with greater product line scope are more likely to purchase product lines that they already operate. The coefficient estimates of NUMBER OF LINES and its square are not significant. Sensitivity analyses that dropped the squared term also showed no significant effect with respect to NUMBER OF LINES (neither the raw value of the variable nor the log of the variable).
Together, these results suggest that product line scope does not provide a discriminating influence on the net extent to which firms purchase new and existing product lines.

In addition to the non-significant effect of the NUMBER OF LINES, none of the other control variables or the selection correction coefficient in column 1 of Table 3 has a significant coefficient estimate. Non-significant coefficient estimates of the selection correction are sometimes difficult to interpret. One interpretation is that a selection effect does not exist. Another possibility is that the effect exists, but the variable $\lambda$ correlates with other independent variables such that the resulting multicollinearity inflates the variance of the selection coefficient estimate and drives the non-significant finding. However, multicollinearity would not reduce the overall F-statistic. Because the overall F-test of model 1 is non-significant, we can rule out the multicollinearity explanation and interpret the non-significance of the coefficient estimate as the lack of a selection effect in column 1.

To further investigate which product lines firms acquire, we break NET OVERLAP into its components, NEW LINES and EXISTING LINES. As we noted earlier, NEW LINES measures the number of lines that a target possessed that the acquirer did not possess before the acquisition. In parallel, the EXISTING LINES variable records the number of lines that a firm and its target shared at the time of the acquisition. The value of this refined analysis is that it allows us to focus directly on firms’ choices to purchase product lines that they already operate and that they do not already operate, rather than pooling the choices into an aggregate tendency as the NET OVERLAP variable does. Again we use the sample selection approach to account for the fact that we only observe the dependent variables if a firm engages in an acquisition.10

NEW LINES is the dependent variable in column 2 of Table 3. As in the first column, the F-test is non-significant, indicating that, beyond the intercept, the independent variables add little explanatory power. The intercept, which takes the value of 3.24, is significantly different from zero. The overall non-significance of the model combined with the significance of the intercept and the empirical observation from the data that firms, on average, acquire about 2.3 lines of business that they do not previously operate, suggests that firms with many characteristics that undertake acquisitions often do so in order to add new product lines. The main discrimination, then, lies in which firms undertake acquisitions, which Table 2 showed to be firms with greater integration capabilities, rather than in which firms use acquisitions to acquire new lines.

None of the independent variables in column 2 of Table 3 is statistically significant. In particular, we find that the coefficient estimates of NUMBER OF LINES and its square have no effect on acquisition of NEW LINES. We also found that NUMBER OF LINES had no effect when we removed the squared term from the specification.

By contrast, significant influences do emerge in column 3 of Table 3, where EXISTING LINES is the dependent variable. Here, we find that the model is
statistically significant, based on the F-test. The coefficient estimate of NUMBER OF LINES is positive and significant. In addition, the coefficient estimate of NUMBER OF LINES\(^2\) is negative and significant (sensitivity analyses that omit the squared term indicate a positive and significant effect of NUMBER OF LINES, which is consistent with the positive correlation between NUMBER OF LINES and EXISTING LINES in Table 1). Together, these estimates indicate that EXISTING LINES increases with number of lines but at a decreasing rate.

An alternative explanation that might at first seem appealing is that the positive impact of NUMBER OF LINES on acquiring EXISTING LINES in column 3 simply reflects an underlying probabilistic arithmetic relationship, as we noted earlier. The concern is that because the number of product lines as defined by our data source is fixed, the more product lines that an acquirer operates, the greater the probability that it purchases one that overlaps by chance. However, two observations in Table 3 help rule out the probabilistic explanation.

First, the probabilistic relationship would be linear. Namely, if a firm operates one product line and randomly buys into a product line the chance of overlap is 1/258; if a firm operates two product lines, the chance of random overlap is 2/258; and so forth, until the extreme at which a firm that operates 257 product lines and randomly buys into a product line has a 257/258 chance of overlap (i.e. 257 times the chance when a firm has a single line). By contrast, we observe a non-linear relationship in column 3, because the non-monotonic relationship we observe between NUMBER OF LINES and EXISTING LINES is increasing, but at a decreasing rate.

Second, a probabilistic relationship should also hold for purchasing new lines. That is, the more product lines a firm has, the less likely by chance it would be to purchase into a product line that it does not currently operate. If an arithmetic relationship drove the results, then, we would expect NEW LINES to decrease as NUMBER OF LINES increases in column 2. Thus, the null results in column 2 provide further reassurance that the relationships are not simply arithmetic. Therefore, the evidence suggests that our results do not reflect an underlying arithmetic relationship.

We need to interpret the non-monotonic relationship in column 3 of Table 3 carefully. Given the magnitude of the coefficient estimates, the maximal impact of NUMBER OF LINES on acquiring EXISTING LINES is at 40 lines. Although the maximum occurs well within the empirical range of the values of acquirers' NUMBER OF LINES (56 lines), only 4% of the observations have values above 40 lines. For this reason, we hesitate to draw inferences regarding the portion of the curve after the maximum. In practice, the net effect of NUMBER OF LINES on the dependent variable remains positive, yet decreasing, within the observable range. Its value is 0.11 for a firm with one product line, 1.82 at the maximum, and 0.56 for a firm with 56 product lines. Therefore, we emphasize the positive, yet decreasing marginal effect of NUMBER OF LINES.
This pattern is consistent with the argument that firms reach limits in their ability to use integration capabilities intensively.

Two size-related control variables in column 3 have significant influences on product line overlap. The larger the acquirer (SIZE), the less likely it was to acquire existing lines. By contrast, the larger the target (TARGET SIZE), the greater the likelihood of overlap. These results suggest that existing-line acquisitions decline with acquirer size, possibly because larger firms have greater ability to generate similar new resources internally.

We also find that PREVIOUS ACQUISITIONS has a negative and significant effect on EXISTING LINES. In sensitivity analysis, we found that the number of acquisitions that a firm made within the sample period drives this effect. That is, if this variable is not updated from its value at the beginning of the sample period, so that it reflects only historical acquisitions, the effect of previous acquisitions is non-significant. Thus, the influence of previous acquisitions derives from a firm's recent experience, rather than longer-term history. That is, the more acquisitions that firms have made in the recent past, the less likely they are to make acquisitions that overlap with their existing operations. The negative impact of previous recent acquisitions again is consistent with firms reaching a limit in their ability to use integration capabilities intensively, at least within a moderate period of time.

Finally, we observe a negative and significant coefficient for the selection correction in column 3 of Table 3. This suggests a negative and significant correlation between the error in this equation and the probit model. That is, there exists some unmeasured effect that increases the likelihood of a firm becoming an acquirer and decreases the number of existing lines that a firm purchases. Again, the sample selection approach mitigates the possibility that our variables actually capture some unmeasured effect rather than the influences that we want to address.

As a whole, the results in Table 3 lead to the following interpretations. First, the lack of significance of the independent variables in columns 1 and 2 suggests an overall tendency for all acquirers to purchase product lines that they did not previously operate, as evidenced by the sign and magnitude of the intercept and by the mean values of the dependent variables. The high correlation between these two dependent variables provides further evidence of this conclusion. Moreover, the tendency to purchase product lines that firms did not previously operate does not systematically vary with the independent variables that we include in the specification, which include product line scope, nationality, size, and growth in the underlying product line. Therefore, acquirers with many characteristics commonly use acquisitions to extend their product lines.

Second, a more detailed examination of acquisition activity suggests that firms with greater product line scope are more systematic in making acquisitions that tie into their existing lines of business. The results when EXISTING LINES is the dependent variable (column 3) provide this implication. This relationship does not show up when NET OVERLAP is the dependent variable (column 1) because buying new product lines is so prevalent in all firms' acqui-
sitions. Instead, the result appears only when we disaggregate the new and existing product lines. Therefore, although all acquirers tend to purchase product lines that they did not operate \textit{ex ante}, acquirers with more product lines are more systematic in making acquisitions that add to their existing lines. This tendency increases with product line scope but it does so at a decreasing rate, which suggests that integration capability affects product line choice but the marginal impact of higher integration capability levels is smaller than lower capability levels.

In summary, we find contrasting acquisition tendencies for firms with differing product line scope. Acquirers with greater product line scope tend to purchase product lines that both extend and overlap their previous product offerings. By contrast, firms with smaller product line scope primarily tend to purchase product lines that extend their previous product offerings. Therefore, it appears that firms with fewer product lines emphasize acquisitions that graft new businesses onto the existing organization. Firms with larger product line offerings also graft on new activities but, in addition, may acquire greater scale for their current businesses.

Given the pattern of results that we observe, coupled with the implications of other research, we believe that the results are consistent with the integration capabilities argument that underlies the hypotheses. In particular, it appears that firms with greater integration capabilities pick targets that suit their capabilities.

The interpretation that integration capability affects what product lines a firm acquires is consistent with other research. Popular teaching cases on corporate strategy (e.g., Cooper Industries and Newell) highlight how companies that are adept at acquiring and continually integrating business are very systematic in the business that they acquire – especially with respect to how these businesses overlap with the existing corporation (Collis and Stuart, 1991; Collis and Johnson, 1994). In addition, the corporate finance literature has focused on how target choice is an indicator for acquirer characteristics. For example, Morck, Schleifer and Vishney (1990) argue that unrelated acquisitions reflect agency behavior. Our interpretation parallels this argument, in that we find that firms with greater integration capabilities are more likely to undertake acquisitions that tie directly to their existing businesses. We do not conclude, though, that acquisitions of new lines by firms with fewer integration capabilities necessarily reflect agency behavior. Instead, the firms might simply believe that the acquisitions represent their most feasible expansion alternatives, despite expected difficulties in post-acquisition integration. Finally, we reiterate that the research we cited earlier is consistent with the interpretation that product line scope associates with integration capabilities.

\textbf{Alternative explanations}

We consider and, where possible, test several possible alternative explanations of the results. First, as we discussed earlier, we do not believe that an underlying
arithmetic relationship drives the pattern of results with respect to whether acquirers purchase product lines that they previously operated. Both the non-linearity of the impact of NUMBER OF LINES in column 3 of Table 3 and the null results in column 2 are inconsistent with an arithmetic explanation.

A second alternative explanation is that product line scope captures firm size rather than integration capabilities. There are two reasons why we do not believe this to be the case. First, we include controls for size in all specifications. Second, if size alone affected the propensity to acquire, we would also expect the probabilistic arguments of the relationship between product line scope and whether or not the firm acquired new lines of business to hold, because increased size would affect the probability of overlap. It does not.

A third explanation that initially appealed to us was that firms with more product lines might tend to acquire targets with more product lines. If so, then, there would be greater chance of overlap. To examine this possibility, we created the dependent variable TARGET LINES (i.e. NEW LINES + EXISTING LINES) and regressed it on NUMBER OF LINES, but found no evidence of such a pattern.

Fourth, there is the possibility that a firm’s NUMBER OF LINES measures acquisition capability rather than integration capability. To aid in ruling out this interpretation, we included direct measures of acquisition history or capability (e.g. PREVIOUS ACQUISITIONS and ENTER BY ACQUISITION). These variables often show significant effects in the tables in the way that would be expected. For example, PREVIOUS ACQUISITIONS positively affects the likelihood that a firm is an acquirer in the sample period. Therefore, we are more confident that NUMBER OF LINES captures integration capabilities rather than acquisition momentum or capabilities.

Fifth, our arguments stem from the notion that firms enter acquisitions with the expectation of improving firm performance. However, there is the possibility that product line scope captures other underlying motivations rather than integration capabilities. One such possibility is that firms make acquisitions for reasons independent of expected profitability, so that the relationship between product line scope and the dependent variables is spurious. There are two factors that we believe mitigate this argument. First, the strength of the product line results in the probit estimation makes it unlikely to be spurious. Second, the results in the estimation of product line overlap do not appear spurious (i.e. driven by a probabilistic relationship), as we discussed.

Sixth, building on the notion of other motivations, we considered the possibility that greater product line scope reflects empire-building agency behavior rather than integration capability. If product line scope measures agency behavior and agency motivations were prevalent in the sample, this would be consistent with the probit results concerning acquisition likelihood (Table 2). However, the finding that firms with greater product line scope systematically make acquisitions that tied more into their existing businesses (Table 3) is not consistent with agency arguments. This is because some arguments expect such
agency-motivated acquisitions to focus on expansion into unrelated areas (e.g. Amihud and Lev, 1981; Morck et al., 1990; for an alternative view, see also Lane et al., 1998). We find no relationship between the number of product lines and the tendency to purchase new product lines and, moreover, do find evidence that firms with more product lines make acquisitions that better tie into their existing operations.

Finally, the issue of antitrust enforcement arises as a potential influence on the results, if US regulatory authorities inhibited the types of acquisitions that firms could undertake within a market sector. However, such an effect would be most likely to take the opposite direction to that which we found. That is, antitrust authorities would be most restrictive about acquisitions with overlapping product lines when they involved acquirers with greater numbers of lines. At the same time, though, antitrust enforcement might contribute to the general pattern that all acquirers tend to target product lines that they do not already operate.

In summary, we find systematic patterns that support hypothesis 1 and provide refined support for hypothesis 2. Firms with greater product line scope are more likely to become acquirers. We also find that firms in our sample most often use acquisitions to purchase product lines that they do not currently operate, and that the propensity to do so does not vary by product line scope, nationality, or firm size. Firms with greater product line scope, while exhibiting this tendency to acquire product lines they did not operate ex ante, also are more likely to make such acquisitions that tie into their existing product lines. This pattern of firm choices in acquisition activities implies that firms with greater integration capabilities, as measured by product line scope, have greater incentive to undertake acquisitions and, moreover, may be better able to undertake the intense integration required to gain economies of scale in existing product lines. At the same time, non-linearities in the results suggest that firms reach limits in their ability to use integration capabilities intensively.

Conclusion

Our contribution in this paper is the systematic analysis of which firms become acquirers and, contingent upon becoming an acquirer, what factors influence whether a firm purchases product lines it did or did not previously offer. We expected that firms with greater integration capability, as measured by product line scope, are more likely to become acquirers. We also examine whether they are more likely to purchase product lines that they did or did not operate.

The results support our hypothesis concerning acquisition likelihood. We find that firms with greater product line scope were more likely to be acquirers. Because of the nature of our sample, the pattern of results, and the control variables that we include, we believe that this relationship captures differences in ongoing integration capabilities.
With respect to whether or not acquirers purchased lines of business that they previously operated, we also find a systematic pattern. We find that with each acquisition companies, on average, acquired 2.3 product lines that they did not previously operate, whereas they acquired only one line that they already operated. Thus, acquirers more commonly used acquisitions to extend into new product areas, rather than to reinforce existing lines. In addition, we found that acquirers with greater product line scope were the most likely to use acquisitions to purchase product lines in which they already participated. This is consistent with the interpretation that firms with greater integration capabilities are systematic in the firms that they acquire, as well as being more likely to be acquirers.

We believe that the study generalizes to many settings of moderately related diversification within a market sector. The results suggest that acquisitions provide a means by which firms can expand the range of their offerings across technical and customer segments of a market, but it is mainly firms that have developed substantial integration capabilities that are able to employ the acquisition mechanism for expansion. By contrast, firms with limited integration capabilities are more likely to expand internally, if they expand at all, and only reach the ability to employ acquisitions once they have built an internal base of integration capabilities. Thus, the study helps us assess the underlying selection processes that occur with respect to acquisitions.

Moreover, although we do not examine acquisition performance in this study, the selection processes that we highlight suggest implications for understanding acquisition performance. First, examining which firms undertake acquisitions might help explain the great heterogeneity of acquisition outcomes that shows up in practice. In particular, it is possible that poor acquisition outcomes commonly arise when firms that lack integration capabilities undertake acquisitions despite the lack of skill.

Second, our findings regarding which firms acquire lines of business that they operate ex ante might help account for observed differences in the performance outcomes of ‘related’ versus ‘unrelated’ acquisitions, if we view acquisition of existing lines as a refined form of related acquisition. Rumelt (1974) and several subsequent studies sometimes find that acquisitions that relate to a firm’s existing capabilities often outperform acquisitions that primarily involve new capabilities (Palich et al., 2000). This result might arise if firms with stronger integration capabilities are systematically more likely to undertake more related acquisitions than firms with weaker integration capabilities, as we find here. If so, then the stronger performance of related acquisitions would flow more from the firms’ underlying capabilities than from the relatedness per se.

Indeed, this suggestion speaks to the ambiguity in the findings concerning the relative performance of related and unrelated acquisitions. Although some studies report positive relationships between acquisition performance and relatedness (e.g. Singh and Montgomery, 1987; Shelton, 1988; Anand and Singh, 1997), several others report no main effect of relatedness on
performance (e.g. Stillman, 1983; Eckbo, 1983; Chatterjee, 1986; You et al., 1986; Lubatkin, 1987; Fowler and Schmidt, 1989; Sirower, 1997). In reconciling this finding, part of the discourse in the literature has focused on the differences in measuring related versus unrelated expansion (e.g. Palich et al., 2000). Our findings suggest another possible interpretation. Relatedness reflects internal firm capabilities to integrate business activities as much or as more as it reflects external measures based on product markets, such as SIC-based measures (i.e. there is a firm-specific selection effect of relatedness, rather than a more general market-level effect). To the extent that studies directly or indirectly control for firms’ integration capabilities, externally defined relatedness might well exhibit no significant relationship with acquisition performance. Although conclusive evidence that selection drives the results is beyond the scope of this study, the implication provides fruitful ground for future research.

One last set of findings concerning foreign-based firms deserves comment. The finding that foreign firms are more likely to be acquirers, even controlling for integration capability, is consistent with research that argues that foreign firms often make acquisitions to acquire foreign-based capabilities (e.g. Kogut and Chang, 1991). In parallel, though, we find that foreign-owned firms purchase product lines that they did not operate at the same rate as US-owned firms. This result is interesting in light of recent discussion concerning asset-seeking foreign expansion in the international business literature. The result suggests that purchasing capabilities that acquirers do not possess is as common in domestic acquisitions as in cross-border acquisitions. Thus, both domestic and foreign-based firms appear to use acquisitions as asset-seeking strategies.

In conclusion, our findings highlight the existence of selection processes by which profit-seeking firms choose to undertake acquisitions and choose to acquire product lines that they did or did not previously operate. We focus on an element of selection process (i.e. integration capability as measured by product line scope) that varies in most industry settings. Obtaining insight into acquisition selection processes is key to understanding acquisition strategies. Because we demonstrate that certain firms undertake acquisitions, assessing acquisition strategy choice of overlap of existing and acquired businesses requires the insight that firms with certain characteristics are most likely to undertake acquisitions. Moreover, the nature of the acquisitions reflects the attributes of the companies.

Notes

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1 Business-level acquisitions are acquisitions either by single-business companies or by sector-specific business units of multi-business firms. That is, we focus on acquisitions that take
place within a single market sector (empirically, in our case, the medical sector), by single-
business firms and by multiple-business firms, rather than consider all acquisitions by firms
that operate in multiple business sectors.

2 Acquiring product lines with no attempt at integration will create little value; we discuss
our assumptions regarding such agency behavior below.

3 In the medical sector setting of our study, for instance, different medical specialists (i.e. cus-
tomers in different market segments, such as radiology and obstetrics) often purchase different
products from different sales channels, even if the products draw on similar technologies.
Hence, different product lines often require different marketing resources.

4 The Medical and Healthcare Marketplace Guide was published by International Bio-Medical
Information Systems, Inc. (Acton, MA, and Miami, FL; edited by Adeline B. Hale and
Arthur B. Hale) in 1975, 1978, 1983, 1986, and 1989. Subsequent editions have been pub-
lished by MRL Publishing Company (Philadelphia, PA) and by Dorland’s Biomedical
Publications (Philadelphia, PA).

5 Karim and Mitchell (2000) examined whether product line overlap at acquirers and targets
(independent variables) affected post-acquisition product line retention (outcome). By con-
trast, this paper asks why the acquisitions occurred in the first place (outcome one) and why
there was a particular degree of overlap (outcome two). Understanding the causes of strategy
choice, which this study addresses, aid in understanding subsequent firm performance and in
prescribing recommended actions.

6 When coding the values of the independent variables associated with ACQUIRER, we use
the values at the point the firm enters the sample, to restrict the sample to one observation
per firm. This helps assure that we have independence across observations, which is an
assumption of the multivariate technique that we employ. When coding the values of the
covariates associated with NET OVERLAP, we use the values at the year prior to the ac-
quisition. This provides an estimate of firm characteristics before the acquisition. It is for this
reason that the maximum value for NUMBER OF LINES is 43 in the data where we exam-
ine ACQUIRER, and 56 in the data where we examine NET OVERLAP; the firm with 43
lines at the time it entered the sample grew to 56 lines before it made an acquisition later in
the sample period.

7 Medical sector sales correlated highly with total corporate sales when data were available.
Due to the extensive coverage of private firms in the data set, we were unable to gather total
sales data for many firms. The descriptive statistics in Table 1 reveal that we assign some
companies zero values for sales. In most cases, zero sales reflect that a company exists with a
product line but with sales levels that are so low that the data sources do not record the sales.
In a few cases, zero sales represent companies that have products that are awaiting regulatory
approval and have not yet recorded sales.

8 We update the PREVIOUS ACQUISITIONS variable if firms made multiple acquisitions
within our sample period when we assess line overlap as the dependent variable.

9 Ideally, we would measure change in total product line sales in the market, but data do not
exist at that level of disaggregation. The growth in the number of firms is a reasonable alter-
native measure of whether a product area is growing or declining.

10 The dependent variables are counts, so that count regression models might provide more
efficient estimates, but least-squares estimates are unbiased and the error term corrects for
heteroskedasticity that can stem from count dependent variables. We also used an approxi-
mation of the Poisson model for sample selection suggested by Greene (1995), finding
results that are consistent with those presented.
References


Management Practices', paper presented at the Academy of Management Conference, Boston, MA.


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