

PATH-DEPENDENT AND PATH-BREAKING CHANGE: RECONFIGURING BUSINESS RESOURCES FOLLOWING ACQUISITIONS IN THE U.S. MEDICAL SECTOR, 1978–1995

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This paper studies how firms use acquisitions to achieve long-term business reconfiguration. We base the study in a routine-based perspective on business dynamics. We develop and test hypotheses concerning the relative extent of change by acquiring and non-acquiring businesses, focusing on product line addition, retention, and deletion as forms of changing resources. We develop and test hypotheses that compare and contrast resource-deepening and resource extension arguments. We test the hypotheses with data from more than 3000 firms that offered more than 200 product lines in the U.S. medical sector between 1978 and 1995. We find that acquisitions play a major role in business reconfiguration, offering opportunities for firms to both build on existing resources and obtain substantially different resources. Copyright © 2000 John Wiley & Sons, Ltd.

This paper studies how firms use acquisitions to reconfigure their business resources. Reconfiguration involves the retention, deletion, and addition of resources (Capron, Dussauge, and Mitchell, 1998). We view acquisitions as a key mechanism through which firms attempt to change their businesses (Capron and Mitchell, 1999). Our immediate conceptual goal is to study acquisitions as means of attempting to change both targets and acquirers. This study is a step towards understanding the broader issues surrounding successful and failed business change.

The conceptual base for the study derives from what we refer to as a routine-based perspective on strategy, drawing on Williamson (1999). As we describe below, this perspective views firms as bundles of routines, which both provide firm value and create constraints on how businesses

change their resources (Mitchell, Dussauge, and Garrette, 1999). Recent research in the strategy field has focused on how acquisitions provide a means by which firms attempt to overcome the constraints on change that existing routines create (Singh and Zollo, 1997; Capron and Mitchell, 1998; Capron, Mitchell, and Swaminathan, 1999). The research suggests that acquisitions help firms to overcome failures of discrete resource exchange that arise due to opportunism and coordination issues surrounding tacit resources. Key open issues remain in this perspective. First, it is not clear whether acquisitions tend to provide greater opportunities for changing resources than other modes of change. Second, the research has not yet determined whether acquisitions serve primarily to deepen firms' existing resource bases or whether acquisitions also provide a means by which firms can extend their activities into areas that require substantially different resources.

This study examines reconfiguration of product lines as a form of resource change, using a sample of more than 3000 U.S. health sector firms that operated during the 1978–95 period.

Key words: acquisitions; business change; resource reconfiguration; routine-based perspective on strategy

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We test several sets of hypotheses. First, we compare product line retention and addition by acquirers and by target businesses. We expect targets to change more than acquirers. Second, we compare product line change of acquirers to those businesses that do not undertake acquisitions. We expect acquirers to change more than firms that do not participate in acquisitions. Third, we attempt to determine whether acquisitions tend to lead primarily to changes in which firms retain target resources that are similar to their own, or whether acquisitions also provide common means by which firms retain new types of resources and thereby undertake resource extension. We expect path-dependent resource deepening to be more common than path-breaking resource extension, but also identify situations in which acquisitions provide a means of undertaking path-breaking change.

The paper proceeds as follows. The first section outlines the conceptual basis and reviews relevant literature. We next develop specific hypotheses concerning acquisitions and business change. We then describe the data and methods that we use in the study. The following sections report the results and conclude the paper.

MOTIVATION

Conceptual basis

Our conceptual goal is to help understand causes and processes of business change. Research in strategy, economics, and organizational theory during the past 20 years and more has identified barriers to change. Nonetheless, many businesses do change successfully. Firms use multiple methods to attempt to change. Some changes involve focused methods such as internal development and discrete market exchange, particularly when firms seek specific new resources. Other changes involve interorganizational methods, such as alliances or acquisitions, which require further interaction with other organizations (Capron, Mitchell, and Oxley, 1999). This paper focuses on acquisitions as a mode of changing business resources.

We begin by briefly outlining a framework for a theory of the firm with which we can study these changes. Table 1 reviews the basic assumptions concerning this framework.

Williamson (1999) argues that a theory of the

Table 1. Routine-based perspective assumptions

Elements of theory	Assumptions
1. Behavioral assumptions	Bounded rationality, with firm-specific foresight; potential self-interest
2. Units of analysis	Routines (tacit, co-specialized, organizationally embedded), which combine to form resources. Use of resources generates value. Production costs are outcomes of resources
3. Description of the firm	Structure for governing routines and resources. Governance includes coordination, creation, and protection
4. Purposes served	Economizing on the sum of production costs and governance costs. Multifaceted cost dimensions create substantial ambiguity concerning economizing choices and scope for self-interested choices
5. Efficiency criterion	Relative efficiency of current and future use of overall set of firm resources, based on feasible alternatives

firm must specify five conceptual elements, including behavioral assumptions, units of analysis, description of the firm, purpose of the firm, and efficiency criteria. Our behavioral assumptions include potential self-interest plus bounded rationality with firm-specific foresight. We assume that economic actors have the capacity to look ahead and recognize opportunities and risks, but that a firm's experience shapes its foresight. This assumption of firm-specific foresight suggests that firms commonly recognize potential opportunities to gain efficiencies with existing resources or create new resources via acquisitions or divestitures, but that different firms will have different expectations about the potential outcome of acquisition activity.

Our fundamental unit of analysis is the routine, which in turn closely relates to the concept of resources. Routines are identifiable patterns of activity embodied in human or capital assets (Nelson and Winter, 1982; Winter, 1990; Dosi, Marengo, and Fagiolo, 1996). 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; Grant, 1996a; Amit and Schoemaker, 1993). Resources tend to be only semi-decomposable into their underlying routines, so that resources provide relevant units of analysis as well as their underlying routines. We will use product lines as the operational measure of resources in our discussion of acquisitions, as we discuss later in the paper, with the assumption that different product lines require different sets of routines.

We will discuss routines and resources in additional detail later in the paper. For the moment, we will note here that routines contain much of the knowledge of what a firm is able to accomplish (Hannan and Freeman, 1989). 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. Routines also tend to be co-specialized with other routines and to be embedded in broader organizational contexts. Routines and the resources that they create are often firm-specific and imperfectly tradable, owing to their tacitness, co-specialization, and organizational embeddedness.

The need for acquisitions arises from the imperfect tradability of routine and resources. That is, firms often need to acquire other businesses in order to extract value from underutilized resources the firms possess, either through more efficient use of existing resources or through the creation of new resources. By merging, firms may pool similar resources in order to gain greater efficiency, so long as increased economies of scale more than outweigh the governance costs of acquisitions. In addition, acquisitions may allow firms to combine the routines that underlie different types of resources in order to create valuable new resources, again including governance costs.

Our description of the firm and our view of the purpose of the firm both involve assumptions concerning the role of the firm in governing resources. We describe a firm as a governance structure, where governance includes coordinating the use of existing resources, creating new resources, and protecting the value of resources. This view closely follows Coriat and Dosi (1998),

who argue that a firm is a particular set of routines that result from the co-evolution between corporate patterns of knowledge distribution and mechanisms of governance. Governance mechanisms include formal and informal incentive and control systems, legal regimes, organizational structures, and corporate cultures. Governance mechanisms will often be shaped by path dependency and local search, which arise from the tacitness, co-specialization, and organizational embeddedness of routines (Kogut and Zander, 1992; Capron and Mitchell, 1999). In turn, the purpose of the firm is to economize on the combination of production costs and governance costs. A key implication of our approach is that production costs are partly an endogenous outcome of firm-specific resources and governance mechanisms. That is, production costs vary depending on the nature of a firm's resources and the effectiveness with which a firm governs the use and creation of resources.

Our efficiency criterion is of the best available value of current and future use of routines, by which we mean that a firm seeks the best available mechanisms to jointly protect, coordinate, and create resources. In this paper, our emphasis will be on factors that differentiate the types of resources that firms use from acquisitions that create either efficiency or expansion opportunities, along with the protection mechanisms that the firms use to protect the value of the resources.

Overall, our conceptual approach combines the protection emphasis of governance perspectives such as transaction cost economics (Williamson, 1999) with the coordination emphasis of routine-based research. The fundamental difference between our approach and protection perspectives is that we focus on routines rather than individual transactions. In turn, this leads us to emphasize firms' coordination and creation governance roles in addition to their protection role. This combined emphasis on protection, coordination, and creation credits the firm with a critical role in both enhancing the value of existing resources and creating new resources. Our focus on routines as the fundamental units brings our approach close to that of evolutionary economics (Nelson and Winter, 1982). Our immediate goal is to study acquisitions as means of changing the capabilities of targets and acquirers, that is, of reconfiguring the resources that firms must create, coordinate, and protect.

Literature review

Many studies in economics, organizational theory, and strategic management address the subjects of acquisition and change. Despite the extensive study, though, there is little consensus between theories and empirical works. Below we highlight several perspectives and their insights into acquisitions and change.

Acquisition causes and effects

Economic theories addressing acquisitions highlight market power, efficiency, and risk as factors leading to a diversification strategy. Industrial organization economic theory focuses on environmental factors influencing firms and proposes that firms may pursue acquisitions in order to increase their current market power, consolidate an industry's businesses, avoid high barriers to entry, or change supply chain relationships (Bain, 1956; Caves, 1981). Transaction cost economics highlights internal efficiencies of scope and scale, and hypothesizes that related diversification can improve allocative efficiency in the sense that diversification establishes an internal capital market (Williamson, 1975; Teece, 1982). The financial economics literature hypothesizes that diversification may stem from 'free cash flow' (Jensen, 1986), from managers' assumptions that compensation is a function of organizational size instead of profits (Teece, 1982), or as a mechanism in the market for corporate control to replace inefficient management with more competent managers (Jensen and Ruback, 1983). Diversification may have positive outcomes including lowering of systematic risk (Jensen and Ruback, 1983; Lubatkin, 1987; Chatterjee and Lubatkin, 1990), increasing leveraging potential, and creating more stable cash flows (Amit and Livnat, 1988), but may also result negatively in the cross-subsidization of low-performing, unrelated segments (Jensen, 1986; Berger and Ofek, 1995). Therefore, there is no consensus about acquisitions in the economic literature.

In the organizational literature, the resource dependence perspective and institutional theory focus on organizations' influences upon one another. From a resource dependence perspective, which views the environment as full of resource exchange relationships and dependencies which distribute social power and create business con-

straints, acquisitions may allow organizations to change their relationships and, in turn, their environment (Pfeffer and Salancik, 1978). Institutional theory hypothesizes that organizations become similar due to institutional pressures of legitimacy and isomorphism, a process that makes organizations resemble other units facing similar environmental conditions (DiMaggio and Powell, 1983). In times of uncertainty or change, an organization may mimic another firm's acquisition strategy if it views that firm to be more legitimate or successful. The population ecology perspective highlights the strong environmental influences upon organizations and stresses that different organizational forms arise more from environmental selection than from organizational adaptation (Hannan and Freeman, 1984, 1989). Ecological studies have studied divestitures and show that they differ empirically from dissolutions, but without providing a clear conceptual rationale for the differences.

Although literature from economics and organizational theory provide insight into reasons that firms pursue acquisitions, they tend to focus rearward, emphasizing use of acquisitions to correct past mistakes or to increase the efficiency of existing operations. In addition to such rearward activities, though, organizations must engage in ongoing changes of their operations and strategic positions due to changing competitive environments. In this forward-looking view, acquisitions are a means of pursuing potential future competitive advantages. We continue with a review of the literature from the field of strategic management that has addressed this outlook.

The traditional strategy literature emphasized understanding the process of economic efficiency. This work focuses on resource-based causes of acquisition activity and studies acquisition performance outcomes. Penrose (1959) hypothesized that a business's resource base influences its diversification pattern. Related and unrelated diversification may depend on the types of excess resources that are available (Chatterjee and Wernerfelt, 1991). Studies on performance outcomes of acquisitions have mixed results. Some studies find that target shareholders tend to fare better than acquirer shareholders (Bradley, Desai, and Kim, 1988). Studies have found gains from related diversification (Singh and Montgomery, 1987; Wernerfelt and Montgomery, 1988), gains from unrelated acquisitions (Chatterjee, 1986),

and no significant differences in returns to the bidding firm between related and unrelated acquisitions (Lubatkin, 1987; Lubatkin and O'Neill, 1988). Research on acquisition process and performance has highlighted the importance of targeting and integration (Porter, 1987; Hunt, 1990; Datta, 1991), including the value of employee retention (Walsh, 1988; Cannella and Hambrick, 1993) and knowledge transfer (Ranft, 1997). Capron (1999) shows that performance tends to increase with postacquisition reconfiguration of targets and acquirers. Overall, there is no empirical consensus on the expected returns from acquisitions. One reason for the lack of consensus stems from the need to understand more about the role of acquisitions in obtaining new resources, as opposed to emphasizing gains from more efficient use of existing resources.

The market for firms

Increasingly, the strategy literature has begun to consider how firms restructure to maintain a competitive advantage in changing environments. Researchers have spent much time developing the concept of intangible assets and their failure in markets for discrete resource exchange. Market failure in the exchange of tacit resources stems partly from potential opportunism and partly from knowledge and learning limitations within organizations. Theorists have developed a theory of economic organization that argues that in the case of tacit resources the market for firms is often more robust than the market for resources.

Obtaining tacit resources is often a goal of acquisitions. The evolutionary perspective on strategy theorizes that tacit resources such as knowledge and organizational memory reside in an organization's structure via the routines that the organization maintains (Cyert and March, 1963; Nelson and Winter, 1982). Routines include norms, procedures, and conventions around which an organization functions (Levitt and March, 1988). The embeddedness of routines supports acquisition; routines may remain intact and personnel with critical experience may transfer to the new organization. Acquisitions may serve to minimize issues of bounded rationality and time compression diseconomies that constrain the content and speed at which people learn (Simon, 1945; Dierickx and Cool, 1989), making acquisitions preferred to internal development.

Exchange of information, which tends to be a tacit resource, often fails in the market for discrete exchange. Not only is information often tacit and uncodifiable, it also suffers from appropriability issues: first, exchange opportunities may be limited due to protecting the knowledge resource, and second, information acts as a public good and has severe impactedness problems (Teece, 1980, 1986; Grant, 1996b). These arguments all suggest that acquisition of tacit resources through the buying and selling of firms or business units may be more robust than the market for discrete exchange.

Studies on restructuring and postacquisition change of targets and acquirers have provided empirical evidence of the market for firms. In their study of Swedish firms, Granstrand and Sjolander (1990) showed that large firms developed and exploited their technological capabilities by trading small firms. More recently, Capron *et al.* (1998) studied the redeployment of resources between target and acquiring businesses following horizontal acquisitions and confirmed that redeployment was more intense for resources that faced greater market failure. Thus, recent focus has turned to view acquisitions as mechanisms of change used to reconfigure targets and acquirers. Much of this research now emphasizes postacquisition analysis and the redeployment of resources between organizations.

Long-term reconfiguration

The empirical studies we reviewed above tend to focus on near-term acquisition activities and changes. At the same time, though, the theoretical perspectives, particularly those that focus on the presence of routines and resources, suggest that post-acquisition activities and implications will tend to take place over periods of years. Our interests lie in observing long-term effects of reconfiguration within acquirers and targets. This section addresses longer-term reconfiguration implications of acquisitions.

Longer-term reconfiguration requires changing businesses' resources. Resources have sometimes been defined as tangible and intangible assets that are tied semipermanently to the firm (Wernerfelt, 1984). Competitive pressures require that organizations change their mix of resources to create new opportunities (Penrose, 1959; Porter, 1979). Resources may provide many services to an

organization. Penrose noted that 'Services yielded by resources are a function of the way in which they are used...', so that resources consist of a bundle of potential services. She continues, 'it is largely in this distinction that we find the source of the uniqueness of each individual firm' (Penrose, 1959: 25).

In this study, we use product lines, including both physical goods and nonphysical services, as measures of resources. As we noted above, Penrose (1959) argues that firms may use resources in different ways and this ultimately provides firms with their uniqueness. We believe this difference in resource use is evident from the unique product lines and services that the firms offer. Recall that our theory states that routines combine together to create resources. Different resources may involve the use of different routines or a different combination of similar routines. Based on our theory, a firm producing two different product lines is either using two different sets of routines, where some of the routines may be common to both product lines, to create those product lines or similar sets of routines that are combined differently. In the latter case, routines may have different linkages between them that create the combinations. If two firms produce the same product line, we assume that there is substantial similarity in the routines that underlie the product line. We further assume that there is more similarity between routines of the same product lines from different firms as compared to different product lines from different firms. We believe that the product lines of business organizations are an appropriate measure of firms' resources.

Several studies that have studied the market for firms have used the terms restructuring and redeployment as forms of reconfiguration. Restructuring means the buying or selling of businesses within an organization (Porter, 1987; Bowman and Singh, 1993). Resource redeployment means 'the use by a target or acquiring business of the other business' resources' (Capron *et al.*, 1998: 635). At the most general level, we define reconfiguration to be the change of resources within an organization. In this study, we consider reconfiguration to be greater when organizations retain fewer product lines and/or add more product lines over time.

In studying how acquirers reconfigure, we develop resource retention arguments below that

differentiate between resource deepening and resource extension. We define resource deepening as the retention of product lines that overlap with current product lines. Conversely, resource extension involves retaining product lines that are distinct from a firm's current product lines. Resource deepening represents path-dependent change, while resource extension represents path-breaking change.

HYPOTHESES

Our hypotheses investigate two aspects of reconfiguration through acquisitions. First, we are interested in acquisitions as mechanisms for change. We hypothesize about the change of targets and acquirers vs. businesses that do not undergo or undertake acquisitions. Second, for businesses that participate in acquisitions, we predict the forms of change and resource retention an acquirer will achieve.

Baseline reconfiguration comparisons

Acquisitions behave as mechanisms for change in the sense that they provide a target and acquirer with new resources and opportunities. Penrose (1959) described a firm as basically a collection of resources. The evolutionary perspective and knowledge-based theories of firms have stressed the importance of tacit resources such as knowledge and memory that reside in routines in the structures of organizations (Nelson and Winter, 1982; Levitt and March, 1988). Organizations also hold values, norms, and culture that are difficult to imitate in different contexts. Barney describes such features as socially complex resources that contribute to competitive advantage. Barney states, 'understanding that ... an organizational culture with certain attributes ... can improve a firm's efficiency and effectiveness does not necessarily imply that firms without these attributes can engage in systematic efforts to create them... Such social engineering may be ... beyond the capabilities of most firms' (Barney, 1991: 110). If resources are tacit or socially complex, organizations may be unable to develop them internally and may procure them through acquisitions.

By obtaining resources through the process of acquisitions, organizations may open doors to

new opportunities. Strategists who studied restructuring have shown how firms created new opportunities because of changes in their business lines (Porter, 1987; Hoskisson and Johnson, 1992; Singh, 1993). Firms may use acquisitions to pursue opportunities that allow for shared activities or the transfer of skills (Porter, 1987). Post acquisition, recombination provides opportunities for change. Schumpeter (1934) viewed innovations as new combinations of knowledge and learning. In their dynamic perspective on learning, Kogut and Zander (1992) also view new opportunities and capabilities as the result of combining new skills and resources. Acquisitions also allow opportunities to enter new industries. Penrose summarized:

Acquisition can be a means of obtaining the productive services and knowledge that are necessary for a firm to establish itself in a new field, and the addition of new managerial and technical services to the firm's internal supply of productive services is often far more important than the elimination of competition and the reduction of the costs of entry. For this reason acquisition is often a peculiarly suitable means of becoming acquainted with the techniques and problems of a new field when a firm wants to decide whether expansion in that field is an appropriate use of its own resources. (Penrose, 1959: 126)

Organizations may revert to acquisition strategies because of impediments of internal development. Not only may internal growth require a long time for the accrual of returns, but also its incremental nature may be more expensive than purchasing an ongoing business (Singh and Montgomery, 1987). Huber (1991: 97) also noted that in cases of imperfect imitability or time pressures 'sometimes grafting-on of carriers of new knowledge is done on a large-scale basis, as in the case of an acquisition of a whole organization by another.' Empirical work has also shown that acquisitions can serve as an alternative to internal investment in R&D since they offer immediate entrance to a new market or a larger share of an existing market presence (Hitt, Hoskisson, and Ireland, 1990). They argue that 'the outcomes are more certain and can be estimated (or forecasted) more accurately with acquisitions than with internal development.' 'Therefore, acquisitions may serve as a substitute for innovations...' (Hitt *et al.*, 1990: 31). Capron *et al.* (1998: 631), meanwhile, found that 'firms

often use acquisitions in order to reconfigure the acquiring or target businesses as part of the process of commercial change.' In comparing targets to continuing businesses, Granstrand and Sjolander (1990) found that acquired firms grew faster after acquisition than nonacquired firms. We believe that participants in acquisitions will have more opportunities available to them because of the presence of new resources. These opportunities may result in organizational change. Thus, we hypothesize that acquisition participants will change more than non-participants.

Hypothesis 1a: Acquired businesses change more than continuing businesses.

Hypothesis 1b: Continuing businesses that acquire targets change more than continuing businesses that do not acquire targets.

Postacquisition resource retention: Alternatives

Firms participating in acquisitions face the issue of what to do with a target's resources. Acquirers may choose to retain the target's lines or divest them. We are interested in reconfiguration: the degree of retention as compared to addition of new lines. Acquirers may retain product lines that are similar to their own or distinct from their current collection. In the hypotheses below, we present resource retention questions that address resource deepening vs. resource extension.

Resource deepening: Path-dependent change

We view firms that retain resources that are similar to the firms' existing resources as pursuing path-dependent change. Firms accumulate resources as a result of path-dependent actions of learning, investments, and other organizational activities the firms take over time (Dierickx and Cool, 1989). Acquirers will commonly build on current capabilities instead of exploring new areas. Organizations may pursue a strategy to develop and effectively exploit a core competence (Andrews, 1987; Prahalad and Hamel, 1990). Prahalad and Hamel (1990) describe core competencies as the collective learning of the organization. Core competencies are the 'complex harmonization of individual technologies and production skills...' (Prahalad and Hamel, 1990: 83).

This harmonization and learning may be more effective if similar resources are retained.

Theorists commonly argue that learning and the accumulation of knowledge possess path-dependent traits. Knowledge includes information (who knows what) and know-how (how to do something) (Kogut and Zander, 1992). von Hippel (1988) notes that know-how is the accumulated practical skill or expertise that allows one to do something smoothly and efficiently. Skills and experience condition the alternatives that management is able to perceive. 'Where a firm can go is a function of its current position and the paths ahead. Its current position is often shaped by the path it has traveled' (Teece, Pisano, and Shuen, 1997: 522). Positions and paths are affected by learning processes (Teece *et al.*, 1997). The absorptive capacity perspective highlights that the ability to learn is a function of what is already known (Cohen and Levinthal, 1990). Helfat (1994), for instance, shows that path-dependent routines shape firm investment. Similarly, the knowledge-based view of the firm acknowledges that the 'capacity for aggregation' is important for recipients to be able to add new knowledge to existing knowledge (Grant, 1996a).

Along with sheer resource accumulation, the relatedness or commonality of resources may determine whether firms observe opportunities for learning. 'Learning is cumulative, and learning performance is greatest when the object of learning is related to what is already known' (Cohen and Levinthal, 1990: 131). Prior knowledge enhances learning because memory is developed by associative learning (Fiol and Lyles, 1985; Huber, 1991). Kogut and Zander (1992) note that firms learn in areas closely related to their existing practice because the sharing of a common stock of knowledge facilitates the transfer of knowledge within groups.

Although related resources have benefits, several drawbacks also arise. First, the lack of balance between exploration and exploitation of current capabilities and resources can be self-destructive for an organization (March, 1991). Firms also need to be concerned about falling into competency traps where routines or actions that led to good performance in the past are used repeatedly even though they may be far from optimal (Levitt and March, 1988).

Based on the benefits and channels of related resources, we hypothesize that acquirers are more

likely to retain targets' resources that are common to their own and pursue path-dependent change than retain distinct resources.

Hypothesis 2a (Resource-deepening argument): The greater the overlap of acquirer and target resources, the more likely that acquirers will retain targets' resources and their own resources.

Resource extension: Path-breaking change

The previous hypothesis proposed that acquirers are most likely to pursue path-dependent change and retain targets' resources that overlap with their existing resources. Nonetheless, the resource retention argument further expects that path-breaking change may occur in cases where expansion incentives and competitive pressures outweigh path dependence. Path-breaking change occurs when acquirers retain targets' resources that are distinct from their own.

Acquirers often have incentives to retain distinct resources in changing environments. Earlier we noted that resources provide firms with new opportunities. Distinct resources may provide an organization with potential competitive advantages in the future. In times of change, firms can create new advantages by having innovative responses (Teece *et al.*, 1997). Theorists sometimes refer to this as a dynamic capabilities perspective. Prahalad and Hamel stress the importance of being a dynamic organization that builds core competencies. 'Core competencies are the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies' (Prahalad and Hamel, 1990: 81). They state that 'a company that has failed to invest in core competence building will find it very difficult to enter an emerging market...' (Prahalad and Hamel, 1990: 84). Retaining distinct resources forces an organization to pursue greater degrees of coordination and integration, and such an organization may thus develop greater core competencies and dynamic capabilities.

Firms may also retain distinct resources if they provide a unique competitive advantage. Teece (1986) notes the importance of complementary assets that can be utilized in conjunction with other capabilities or assets and may be needed for the successful commercialization of an inno-

vation. Complementary assets may come in the form of distinctive resources.

Resources have different value for different buyers depending on the potential synergy that they believe will come from owning the assets (Wernerfelt, 1984). Barney (1988) has stressed that acquisitions will create value when there are private and uniquely inimitable cash flows between the acquiring and target firm. By private and unique, he means that other buyers could not realize the potential synergies that may be created and, even if they did, they could not duplicate the synergy. Based on Barney's theories of unique synergies, Harrison, Hitt, and Ireland (1991) proposed that firms can create uniquely valuable synergy when differences exist in resources. They tested differences in resource allocations and found that differences did contribute significantly to performance.

Although dominant theories predict that similarities in resources create value and are most likely, acquirers may pursue path-breaking change and retain resources that are distinct from their own. These resources may help an organization further develop its core competencies and dynamic capabilities, or provide competitive advantage through unique synergies with existing resources. Wernerfelt (1984: 179; *italics in original*) reminds us that 'candidates for products or resource diversification must be evaluated ... in terms of their long-term capacity to function as *stepping stones* to further expansion.' Thus we hypothesize:

Hypothesis 2b (Resource extension argument): Acquirers tend to retain target resources that are distinct from the acquirer's preacquisition resources.

In summary, we have developed two sets of hypotheses. The first set of hypotheses compares targets, acquirers, and nonacquirers. We expect target businesses to change more than acquirers and also expect acquirers to change more than nonacquirers. The second set of hypotheses addresses the impact of resource overlap of targets and acquirers on resource retention. A resource-deepening argument suggests that greater similarity will lead to greater retention, while a path-breaking argument suggests that greater difference will lead to greater retention. We expect the resource-deepening result to be the more common than resource-extension, but we want to explore situations in which resource extension also occurs.

DATA AND METHODS

Data

The study uses data from several editions of the *Medical & Healthcare Marketplace Guide*, published in 1975, 1978, 1983, 1986, 1989, and each year thereafter.¹ The guides include information concerning U.S. and non-U.S. firms operating in the U.S. medical sector, including information concerning what product lines they offer each year. The guides include information about almost all medical sector firms of any appreciable size, including firms that focus on the medical sector (e.g., Medtronic, Inc.) and companies with extensive nonmedical activities (e.g., General Electric, Inc.), and also contain information about many smaller medical sector businesses. We gathered initial information concerning more than 2500 medical sector firms. We examined panel data for firms operating in 1978 and 1983. Of those firms operating in 1978 and 1983, we found which had pursued acquisitions, which had been acquired, and which continued onwards without acquisition activity by 1995. We chose the 1978 and 1983 panels as baselines for the study, using information from the 1975 guide to provide data concerning prior characteristics of the firms. The firms in the 1983 panel are companies that entered the guides after 1978, either because they were new entrants to the health sector or because the guide did not record information for them in 1978.

For each panel, we noted the product lines the firms offered in that year. We further categorized these product lines into broader sectors of more distinct sets of resources, including medical devices, dental devices, ophthalmic devices, pharmaceutical products, and healthcare services.² By tracking firms and their acquirers and then recording their product lines in 1995, we identified which product lines the firms had dropped, retained, or added. The data base also provided

¹ *The Medical & Healthcare Marketplace Guide* was published by International Bio-Medical Information Services, 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 published by MLR Publishing Company (Philadelphia, PA) and by Dorland's Biomedical Publications (Philadelphia, PA).

² A list of product lines used in this study is available from the authors.

data on firms' attributes such as public or private ownership, sales levels, founding date, site locations, profitability, top officers, subsidiaries, and a brief review of a firm's history. Overall, we had data on 1244 firms and 3387 firm-product line combinations in the 1978 panel, plus 2237 firms with 5421 firm-product line combinations in the 1983 panel. Of the firms in the 1978 panel, 853 also operated in 1983, so that we have a total of 2628 unique firms in the two panels. We also gathered product line and firm characteristic data for 437 firms that acquired participants of the 1978 and 1983 panels, gathering information from the time of acquisition and from the end of the sample periods for each of the acquirers.

To study the change in targets, acquirers, and nonacquirers, we compared the changes in product lines of the firms. We calculated the relative reconfiguration of targets, acquirers, nonacquirers, and continuing businesses from 1983 to 1995.

Statistical methods

We used logistic regression for the empirical analysis of the resource retention questions (Pindyck and Rubinfeld, 1981; Menard, 1995; Greene, 1997). We are interested in the likelihood that a business retains a product line from 1978 or 1983 in 1995. Because our dependent variable is a dichotomous variable, we were unable to use a linear probability model. A logit model ensures that the probabilities will be within the [0,1] range. We estimated the logit model using a maximum-likelihood estimation procedure which results in parameter estimates that are consistent and asymptotically efficient for large samples. We test the significance of the entire logit model with the model log likelihood chi-square, which is analogous to the multivariate *F*-test in linear regression testing the null hypothesis that all coefficients are zero. Further, for each estimate, we conduct a two-tailed significance test of the Wald statistic, which is the ratio of the estimated coefficient to its estimated standard error and follows a chi-square distribution.

Variables and expected outcomes

Our dichotomous dependent variable in this study was the retention or disposal of a target's product line by the acquirer. For every acquisition case in our sample of firms operating in 1978 and/or 1983,

we observed the product lines belonging to the target immediately prior to the acquisition and coded them 0 or 1 depending on whether the acquirer retained the lines in 1995. If the initial acquirer was acquired, in turn, we determined whether the ultimate acquirer retained the lines in 1995.

Table 2 lists the independent variables. We first discuss the focal variables, which we use to study the retention of product lines based on target and acquirer resource overlaps and distinctions. Table 2 lists these as variables for *Target-acquirer resource overlap and distinction*. Three variables address resource deepening. *Focal line overlap* captures whether or not an acquirer possessed the product line before the acquisition, *Complementary line overlap* is the number of lines shared by acquirer and target (excluding any focal overlap), and *Category overlap* records the number of overlapping categories (excluding the focal category). Our expectation, based on Hypothesis 2a, is that the overlap variables will result in positive relationship with line retention. Four variables address resource extension: *Target line distinction* and *Acquirer line distinction* record the number of nonoverlapping lines at the target and at the acquirer, while *Target category distinction* and *Acquirer category distinction* record the number of nonoverlapping categories at the target and acquirer. Although we expect resource extension to be less common than resource deepening, we do expect to find evidence of extension. Thus, based on Hypothesis 2b, we expect variables measuring distinction will have positive estimates but will be smaller relative to those of deepening.

The distinction between product lines and categories helps explore the different incentives and abilities to undertake resource deepening and extension. New product lines within existing categories represent incremental expansion, while new categories represent more path-breaking expansion. Firms can often undertake incremental expansion via internal development rather than through the more complex mode of acquisitions, but will tend to find internal path-breaking expansion into new categories to be much more difficult. Therefore, it is possible that postacquisition product line resource extension retention may be more common for new categories extension than for new lines within existing categories.

We also introduce control variables that may account for why firms retain certain product lines. As Table 2 notes, we include controls for industry

Table 2. Variables and expected relationship with resource retention

Variable	Expected
Industry factors	
1. No. of firms with product line before acquisition	+
2. No. of firms with line increased, post acquisition	+
3. Line was new to industry: introduced after 1978	?
Medical category dummies ('Medical devices' is the baseline category)	
4. Category: Healthcare services	-
5. Category: Dental devices	.
6. Category: Ophthalmic devices	.
7. Category: Pharmaceutical products	+
Target attributes	
8. Medical sales (ln \$ millions)	+
9. Non-medical corporate sales (ln \$ millions)	-
10. Target age (log years)	+
11. U.S. target	?
12. Target profitability (ROS)	+
13. Established line at target (exists in prior panel)	+
14. Target business has single product line	+
15. No. of product lines at target business	-
Target-acquirer resource overlap and distinction	
<i>Resource-deepening variables</i>	
16. Focal line overlap: acquirer had line before acquisition	+
17. Complementary line overlap: no. of nonfocal shared lines	+
18. Category overlap: no. of nonfocal shared categories	+
<i>Resource extension variables</i>	
19. Target line distinction: no. of non-overlapping lines at target	+
20. Acquirer line distinction: no. of non-overlapping lines at acquirer	+
21. Target category distinction: no. of non-overlapping categories at target	+
22. Acquirer category distinction: No. of non-overlapping categories at acquirer	+
Acquirer attributes	
23. Target was divested as a stand-alone business	-
24. Acquirer preacquisition sales (ln \$ millions)	+
25. Acquirer age	+
26. Acquirer was U.S. firm	+
27. Acquisition year	+
28. No. of times pursued acquisitions, 1983-95	-
29. Selection equation probability (see below)	-

Selection equation: logit using log age, log medical sales, and number of lines as independent variables and 1995 continuation or acquisition as the dependent variable

factors, medical category dummies, target attributes, and acquirer attributes.

Table 2 lists three industry factors. As industrial organization economics suggests, firms may base their strategies on competitors' actions. We control for the number of firms in the medical sector that possessed the product line prior to the acquisition and the number of firms that increased their product line after the year in which the acquisition occurred; we expect both coefficients to be positive. We also consider whether a line had only recently appeared in the healthcare sector, with introduction after 1978, but it is unclear in which direction it will have effect.

Table 2 lists the medical sector categories. We categorized product lines as belonging to five broad categories: medical devices (187 lines), healthcare services (46 lines), dental devices (5 lines), ophthalmic devices (7 lines), and pharmaceutical products (16 lines). In our analysis, we omitted the medical device category from the list of dummy variables to avoid perfect collinearity between categories. In comparing the other categories to the medical device category, we expect healthcare services may be easier to change and less likely to be retained whereas pharmaceuticals are less easily reconfigured and more likely to be retained. Owing to their common status as

devices, it is difficult to distinguish the attributes of dental, ophthalmic, and medical devices.

Table 2 also lists variables describing target and acquirer attributes. For both targets and acquirers, we recorded corporate age and whether the firms were based in the United States. Acquirers, as they age, gain experience and routines that may help them to integrate the target and retain product lines. We also expect older targets to be retained as a result of having greater experience and routines. We expect that U.S.-based acquirers will tend to possess wider ranges of U.S. market-specific routines than firms based in other countries, so that U.S. acquirers may be able to retain a greater variety of product lines. How U.S.-owned vs. foreign ownership of targets might influence the likelihood of an acquirer retaining a targets' lines is unclear.

Other attributes of targets in the model include their level of medical and nonmedical sales, their profitability measured as return on sales, if a product line is the only line that they possess, their total number of product lines, and whether a product line was an 'established' line. 'Established' line refers to a product line having been present at the firm in the former temporal panel. Having an established line, greater medical sales, greater profitability, and fewer lines reflect dedicated routines and we expect that retention is likely. Greater nonmedical sales and number of product lines implies greater fragmentation of investment and less likelihood of retention.

Under acquirers' attributes, we also include in the model their preacquisition level of total sales, the acquisition year, whether or not the target was later divested as a stand-alone business, and the number of times the acquirer undertook acquisitions between 1983 and 1995. Retention is less likely if the target was later divested as lines tend to move with the target, and also if an acquirer pursues many acquisitions and is pursuing a reconfiguration strategy. Retention is more likely for recent acquisitions having had less time for reconfiguration, and also for larger sales acquirers who may be more capable of maintaining and supporting a product line.

Finally, we include the output of a selection equation as an independent variable in our model. The selection equation refers to the likelihood that a firm will become acquired, which we modeled as a logistic regression based on a firm's age, medical sales, and number of product lines.

Recall that in our Hypotheses 1a and 1b we predict that acquisitions act as mechanisms for change and reconfiguration. Acquirers may pursue acquisitions to gain targets' resources and then reconfigure their product lines. Based on this theory, we expect that the greater the likelihood that a firm becomes a target, the less likely that its product lines will be retained.

In summary, we have operationalized the focal variables for our study, which emphasize target-acquirer resource overlap and distinction. We have also measured control variables concerning industry, product, target, and acquirer firm attributes that the economic, organizational theory, and strategy literatures suggest will influence postacquisition resource retention, along with a selection equation for acquisition likelihood. We next report the tests of our hypotheses.

RESULTS

Baseline reconfiguration comparisons

We predicted that targets would change more than continuing businesses, and also that continuing businesses that participated in acquisitions would change more than those that did not. To test our hypotheses, we examined product lines of firms operating in 1983 and compared them to their state in 1995. Table 3(a) reports the comparison of reconfiguration of targets, acquirers, and non-acquirers between 1983 and 1995.

Hypothesis 1a predicted that targets would change more than continuing firms. Table 3(a) reports that 2237 firms operated in 1983 with 5421 product lines, with about half (1117 firms) continuing in 1995. These firms that continued dropped 28 percent of their lines, retained 72 percent, and added 97 percent new lines. Thus, continuing firms reconfigured 134 percent (97% over 72%) of their businesses. Of the 2237 firms of 1983, 377 became targets before 1995. These targets had held 1171 lines in 1983. By 1995, acquirers had dropped 49 percent of the targets' lines and retained 51 percent. Moreover, when we consider the targets' preacquisition lines in concert with the 1995 lines of their acquirer, we find that the targets had gained access to line addition of 263 percent. Thus, targets' product lines had less retention (51% vs. 72%) and greater overall reconfiguration (520% vs. 134%) than continuing businesses, consistent with Hypothesis 1a.

Table 3. Resource reconfiguration

	Firms in 1983	Lines in 1983	Mean lines in 1983	Firms in 1995	Lines in 1995	Mean lines in 1995	Lines dropped, 1983-95	Lines retained, 1983-95	Lines added, 1983-95	Lines added/ retained
a. Resource reconfiguration: product line retention and addition, 1983-95										
Total firms and lines in 1983	2237	5421	2.4	3868	12,926	3.3				
A. Continue in 1995	1117	2964	2.7	1117	4,996	4.5	832 28%	2132 72%	2864 97%	134%
A1. Acquirers	98	641	6.5	98	1,235	12.6	210 33%	431 67%	804 125%	187%
A2. Non-acquirers	1019	2323	2.3	1019	3,761	3.7	622 27%	1701 73%	2060 89%	121%
B. Became targets before 1995	377	1171	3.1				579 49%	592 51%	3081 263%	520%
C. Shut before 1995	743	1286	1.7							
b. Resource reconfiguration: product line retention and addition, 1978-83										
	Firms in 1978	Lines in 1978	Mean lines in 1978	Firms in 1983	Lines in 1983	Mean lines in 1983	Lines dropped, 1978-83	Lines retained, 1978-83	Lines added, 1978-83	Lines added/ retained
Total firms and lines in 1978	1244	3387	2.7	2237	5421	2.4				
A. Continue in 1983	853	2468	2.9	853	2949	3.5	767 31%	1701 69%	1248 51%	73%
A1. Acquirers	73	502	6.9	73	790	10.8	134 27%	368 73%	422 84%	115%
A2. Non-acquirers	780	1966	2.5	780	2159	2.8	633 32%	1333 68%	826 42%	62%
B. Became targets before 1983	187	555	3.0				245 44%	310 56%	1801 325%	581%
C. Shut before 1983	202	364	1.8							

Hypothesis 1b predicted that acquirers would change more than nonacquirers. As Table 3(a) shows, of the 1117 firms from 1983 that remained in 1995, 98 (9%) pursued acquisitions and 1019 (91%) did not. The 98 acquirers had possessed 641 product lines prior to 1983. By 1995, these firms that were active in the acquisition market had dropped 33 percent of their 1983 lines, retained 67 percent, and added 125 percent new lines. Thus, acquirers reconfigured 187 percent (125% over 67%) of their businesses. The remaining 1019 continuing firms that did not partake in acquisitions held 2323 product lines in 1983. By 1995, they had dropped 27 percent of these lines, retained 73 percent, and added 89 percent. Thus, continuing firms that did not participate in acquisitions reconfigured 121 percent (89% over 73%). These results imply that acquirers change more than nonacquirers, both by adding more new lines and dropping more old lines, supporting Hypothesis 1b.

Table 3b reports similar figures for the 1978–83 period, which reinforce the conclusions that we draw from Table 3a for the comparison of targets and continuing firms. Targets both drop (44%) and add (325%) more lines. The comparison of new lines added by continuing firms that undertook acquisitions to those that did not undertake acquisitions also is similar, with acquirers adding more lines than nonacquirers (84% vs. 42%). The comparison of dropped lines by acquirers and nonacquirers differs somewhat, however, as acquirers drop fewer lines than nonacquirers in Table 3b (27% vs. 32%), opposite to the comparison in Table 3a. The difference in the comparison of dropped lines likely reflects the different time periods, with 12 years in Table 3a and only 5 years in Table 3b. This suggests that firms that are active in the acquisition market may pare their lines more actively than non-acquirers, but that the line paring tends to take place over a relatively long period. Overall, the results in Table 3b again are consistent with Hypotheses 1a and 2b, that targets change more than acquirers which change more than non-acquirers.

When we gathered the firm-level data for the study, we also found that the number of product lines in the medical sector is growing, as firms introduce new products to the market. The number of unique product lines increased from 230 in 1983 to 258 in 1995. We were curious about which companies offered these new industry

product lines in 1995. Such firms demonstrate evidence of being able to stay abreast of industry innovation.

Table 4 reports the distribution of the post-1983 new-to-industry lines. We first compared continuing 1983 firms to post-1983 entrants and found that on average they were responsible for roughly equal numbers of new lines per firm. Post-1983 firms (2751 firms) possessed 604 of the total 887 new product lines in 1995, and thus on average 0.22 lines per entrant. The 1117 continuing firms from 1983 into 1995 possessed 283 new lines, and thus on average 0.25 lines per continuing firm. These results imply that incumbents and entrants possess, on average, similar numbers of new product lines.

Table 4 next compares acquirers vs. nonacquirers within the 1117 continuing firms for possession of new product lines in the industry. Acquiring firms (98 firms) possessed 80 of the 283 new product lines, and thus on average 0.82 lines per acquirer. The 1019 nonacquirer firms possessed 203 new lines, and thus on average 0.20 lines per non-acquirer. These results indicate that acquirers possess more of the new product lines that are in the industry than do nonacquirers. This finding aligns with the earlier results that supported Hypotheses 1a and 1b, when we consider that acquisitions act as mechanisms for change, reconfiguration, recombination, and potential innovation. If innovation is often a recombinative process, as Schumpeter (1934) argued, it is reasonable that firms that attain new resources through acquisitions possess greater number of new lines in the industry.

Post-acquisition resource retention

Path-dependent change

Tables 5 and 6 report the results of the resource retention analysis. We coded the dependent variable for the logistic regression analysis as 0 or 1 depending on whether the ultimate acquirer retained the product line in 1995. The first set of models (Table 5) involves the product lines of all targets operating in 1978 or 1983, totaling 564 targets with 1843 product line cases. The second set of models (Table 6) involves recursively smaller subsets of the data, based on the degree of overlap of target and acquirer resources.

We start with Table 5, which reports the results

Table 4. Possession of new product lines in the medical industry, 1983–95^a

Firms	No. of firms	Post-1983 product lines (new-to-industry lines)	No. of new-to-industry lines (total for all firms)	Average new-to-industry lines per firm
a. All participants in 1995: Possession of new-to-industry lines in 1995				
No. of 1995 firms	3868 (100%)	No. of new-to-industry lines in 1995	887 (100%)	
No. of post-1983 entrants	2751 (71%)	No. of new-to-industry lines held by post-1983 entrants	604 (68%)	0.22
No. of 1983 continuing firms	1117 (29%)	No. of new-to-industry lines held by 1983 continuing firms	283 (32%)	0.25
b. Continuing 1983 participants: Possession of new-to-industry lines in 1995				
No. of continuing 1983 firms	1117 (100%)	No. of new-to-industry lines held by 1983 participants	283 (100%)	
No. of continuing acquirers	98 (9%)	No. of new-to-industry lines held by continuing acquirers	80 (28%)	0.82
No. of continuing non-acquirers	1019 (91%)	No. of new-to-industry lines held by continuing non-acquirers	203 (72%)	0.20

^aThere were 230 product lines in 1983 and 258 lines in 1995; i.e., firms introduced 28 new-to-industry lines in the industry between 1983 and 1995

for the full data set. Model 1 includes only the control variables for industry factors, category dummies, target attributes, and the selection equation. The second model adds the acquirers' attributes and the independent variables regarding product line overlap/nonoverlap. In regression three we added the independent variables regarding category overlap and distinction. We test the significance of each logit model and find each model log-likelihood ratio, following a chi-square distribution with *k* (number of variables in equation excluding the constant) degrees of freedom, to be statistically significant. In comparing the three models, we find that most results are similar in both magnitude and significance, and are highly robust.

The results in Models 2 and 3 of Table 5 provide strong support for the resource-deepening argument of Hypothesis 2a. Focal line overlap has a significant positive coefficient in both models. That is, acquirers that had the product line before the acquisition are likely to retain resources similar to their initial resources. Additional support for the hypothesis support arises from the significant positive impact of complementary overlap of non-focal product lines in Models 2 and 3, and

also by category overlap in Model 3. The greater the degree of commonality in lines and categories between the acquirer and target, the more likely that an acquirer will retain a given product line of the target. Thus, path-dependent resource deepening appears to be a common outcome of postacquisition reconfiguration.

Model 3 of Table 5 also sheds light on the resource extension argument of Hypothesis 2b. Three results are important here. First, greater target line distinction leads to lesser retention. That is, acquirers often shed targets' lines when there is substantial difference between the targets' sets of product lines and those of the acquirer. The likely cause of this result is that such targets possess very different routines from those of the acquirer, which create substantial integration difficulties. Instead, if a firm wishes to offer such lines, it will often be more feasible and efficient to do so internally. Second, though, in striking contrast, greater target category distinction leads to greater retention. Here, the likely cause is that acquirers could not undertake such path-breaking changes through internal development, so that it becomes increasingly worthwhile to undertake the investment of time and money that they need to



Table 5. Logistic regression estimates of resource deepening and extension influences on target product line retention by acquirers (all targets; positive coefficient indicates acquirer was more likely to retain line in 1995)

Variables	1	2	3
Industry factors			
1. No. of firms with product line before acquisition	0.005***	0.004**	0.004**
2. No. of firms with line increased, post-acquisition	0.51***	0.37**	0.31**
3. Line was new to industry: introduced after 1978	-0.55	-0.80*	-0.76*
Categories (omitted is 'medical devices')			
4. Category: Healthcare services	-0.36**	-0.45**	-0.61***
5. Category: Dental devices	-0.49	-0.35	-0.50
6. Category: Ophthalmic devices	0.06	-0.05	-0.19
7. Category: Pharmaceutical products	0.35***	0.18	0.06
Target attributes			
8. Medical sales (ln \$ millions)	0.13	0.10	0.08
9. Non-medical corporate sales (ln \$ millions)	-0.09***	-0.09***	-0.09***
10. Firm age (log years)	0.35***	0.23*	0.21
11. U.S. firm	-0.07	-0.01	0.03
12. Established line at target (exists in prior panel)	0.22**	0.15	0.22**
13. Target business has single product line	0.74***	0.61***	0.63***
14. No. of product lines at target business	-0.02***		
Target-acquirer resource overlap and distinction			
15. Focal line overlap: acquirer had line before acquisition		1.27***	1.29***
16. Complementary line overlap: no. of non-focal shared lines		0.10***	0.11***
17. Category overlap: no. of non-focal shared categories			0.49***
18. Target line distinction: no. of non-overlapping lines at target		-0.04***	-0.07***
19. Acquirer line distinction: no. of non-overlapping lines at acquirer		-0.002	0.00
20. Target category distinction: no. of non-overlapping categories at target		0.31***	
21. Acquirer category distinction: no. of non-overlapping categories at acquirer		-0.03	
Acquirer attributes			
22. Target was divested as a stand-alone business		-0.39*	-0.28
23. Acquirer preacquisition sales (ln \$ millions)		0.01	0.003
24. Acquirer age		-0.01	0.002
25. Acquirer was U.S. firm		0.27	0.19
26. Acquisition year (of first acquisition)		0.07***	0.07***
27. No. of times pursued acquisitions, 1983-95		-0.12	-0.13
28. Selection equation probability (see below)	-4.04	-2.23	-1.86
29. Intercept	-0.63***	-6.76***	-6.67***
Number of product line cases (53% retained in 1995)	1843	1843	1843
Number of target firms	564	564	564
Model log-likelihood chi-square	2363	2179	2146
Log-likelihood ratio	230.2	368.6	401.5

Selection equation: logit (log age, log medical sales, no. of lines) on acquisition prior to 1995
 Significant estimates (two-tailed tests): * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

retain such expansion opportunities. Third, neither acquirer line distinction nor acquirer category distinction affects retention, suggesting that most benefits and problems posed by disparate routines tend to arise from the new routines of the target firm, rather than from the routines that the acquirer already possesses and understands.

Thus, the resource extension argument of Hypothesis 2b also receives support, but for more substantial expansion into new product categories rather than for incremental changes into new

product lines. The most likely cause of this distinction is that acquisitions create sufficient post-acquisition costs and difficulties that undertaking integration of new resources is more worthwhile when the resources are far from a firm's existing set of resources and, therefore, tend to be beyond the firm's ability to undertake via internal development. This result suggests that acquisitions often provide means of undertaking substantial changes, while internal development is more likely to serve for incremental changes.

Table 6. Logistic regression estimates of resource-deepening and extension influences on target product line retention by acquirers (subsamples restricted in target-acquirer overlap; positive coefficient indicates acquirer was more likely to retain line in 1995)

Variables	4 No focal overlap	5 No line overlap	6 No category overlap
Industry factors			
1. No. of firms with product line before acquisition	0.003**	0.002	-0.0005
2. No. of firms with line increased, post acquisition	0.29*	0.27	0.31
3. Line was new to industry: introduced after 1978	-0.94**	-0.84	-0.57
Categories (omitted is 'medical devices')			
4. Category: Healthcare services	-0.61***	-0.67***	-0.71***
5. Category: Dental devices	-0.56	-0.59	-0.30
6. Category: Ophthalmic devices	0.02	-0.15	0.22
7. Category: Pharmaceutical products	0.03	0.05	0.24
Target attributes			
8. Medical sales (ln \$ millions)	0.11	0.10	-0.05
9. Nonmedical corporate sales (ln \$ millions)	-0.09***	-0.06***	-0.03
10. Firm age (log years)	0.21	0.19	-0.02
11. U.S. firm	-0.04	-0.31	-0.49*
12. Established line at target (exists in prior panel)	0.22*	0.29**	0.52***
13. Target business has single product line	0.72***	0.66***	0.44**
14. No. of product lines at target business			
Target-acquirer resource overlap and distinction			
15. Focal line overlap: acquirer had line before acquisition			
16. Complementary line overlap: no. of non-focal shared lines	0.10***		
17. Category overlap: no. of non-focal shared categories	0.58***	0.65***	
18. Target line distinction: no. of non-overlapping lines at target	-0.07***	-0.09***	-0.10***
19. Acquirer line distinction: no. of non-overlapping lines at acquirer	-0.01	-0.02	-0.08
20. Target category distinction: no. of non-overlapping categories at target	0.31***	0.42***	0.34***
21. Acquirer category distinction: no. of non-overlapping categories at acquirer	-0.01	0.09	-0.20
Acquirer attributes			
22. Target was divested as a stand-alone business	-0.26	-0.15	-0.08
23. Acquirer preacquisition sales (ln \$ millions)	0.01	0.003	0.03
24. Acquirer age	-0.01	0.09*	0.06
25. Acquirer was U.S. firm	0.24	0.58**	1.13***
26. Acquisition year (of first acquisition)	0.06***	0.10***	0.11***
27. No. of times pursued acquisitions, 1983-95	-0.11	-0.01	0.19
28. Selection equation probability (see below)	-2.42	-1.96	1.30
29. Intercept	-6.38***	-10.28***	-11.04***
Number of product line cases (retained in 1995)	1560 (48%)	1203 (45%)	903 (43%)
Number of target firms	498	401	277
Model log-likelihood chi-square (log-likelihood ratio)	1926 (233.2)	1461 (195.9)	1077 (158.8)

Selection equation: logit (log age, log medical sales, no. of lines) on acquisition prior to 1995
 Significant estimates (two-tailed tests): **p* < 0.1; ***p* < 0.05; ****p* < 0.01

Most relationships between our control variables and product line retention emerge much as we expected. The number of firms that possessed a product line before an acquisition and the number of firms that increased their lines after the acquisition both increase the likelihood of retention in all three models. We conclude that indus-

try factors, particularly when other firms invest more into a product line, play significant roles in resource retention. Compared to the medical device category, the healthcare services category had a consistent significant influence on the likelihood of retention. This influence was negative and significant across all regressions, as we



expected. The result suggests that services are more fungible and reconfigurable than devices. As we expected, targets that invested highly in nonmedical industries are significantly less likely to retain their medical product lines. Also, acquirers tended to retain lines for targets that held only one product line. We found some support in the first model for our belief that acquirers will tend to retain lines of older targets. We also found weak support for established lines at the target having greater retention likelihood. The number of product lines at the targets negatively influenced retention. Acquirer attributes were mostly insignificant, except for year of acquisition, which had the expected positive influence on retention. The selection equation had no significant effect on the likelihood of product line retention.

Path-breaking change

The analyses in Table 5 included all targets from our sample. Although we found support in regressions two and three for both Hypotheses 2a and 2b, we conducted more stringent tests to gain further insight into the resource extension arguments for path-breaking change. Table 6 reports a second set of models, each involving a subsample of our original targets with diminishing amounts of overlap with acquirer resources, as we eliminate cases with focal line overlap, then with any line overlap period, and finally with category overlap. These subsamples focus attention on opportunities for resource extension.

Model 4 of Table 6 consists of 498 targets with 1560 product lines that did not have focal line overlap. That is, the acquirers did not already offer the observed product line of the target, although the acquirer and target may have other overlapping lines. We continue to find strong support for the resource-deepening argument, with complementary line overlap and category overlap both having positive influences on retention. The resource extension variables have similar impact on retention as in Model 3 of Table 5: nonoverlapping categories at the target are highly positive, while nonoverlapping lines at the target have a small negative effect.

The robustness of the results in Table 6 is striking. We find similar estimates in Model 5 (401 targets, 1203 lines) and Model 6 (277 targets, 903 lines), as the sample declines in the amount of overlap between the target and

acquirer. In Model 6, acquirers become more likely to retain a target's product line as the target's categories grow more distinct. Moreover, once again, distinction of target product lines within a category reduces the likelihood of retention. The results provide at least suggestive evidence that acquisitions provide opportunities for path-breaking changes that are well beyond an acquirer's existing resources.

The control variables in Table 6 have two main differences from Table 5. First, industry factors lose their significance in the final two models of Table 6, possibly due to the reduction in sample size. Second, whether or not the acquirer is a U.S. firm becomes significantly positive in the constrained sample. This result may indicate an interaction effect where the markets in which a firm operates affect the likelihood of retaining lines from distinct categories. A U.S. acquirer may be more likely to retain a distinct line than a foreign acquirer if the U.S. acquirer is more confident that there is a potential market demand in the United States for the distinct line.

Overall, we find strong and robust support for the resource-deepening arguments and also find robust support for resource extension arguments when resource extension opportunities offer opportunities for path-breaking change. The degree of overlap in resources between acquirers and targets makes retention of similar product lines most likely. However, if product lines are in categories that are highly distinct, there is also a possibility of retention. Path-breaking change reflects larger-scale adjustments in product categories than a finer-grained adjustment of product lines.

CONCLUSION

We set out to investigate how acquisitions affected business change. We wanted to determine whether firms participating in acquisitions changed more than firms that did not undertake acquisition activity. We also wanted to determine whether changes reflected resource deepening, in which firms followed path-dependent opportunities, or resource extension, in which firms use acquisition as a means of pursuing path-breaking opportunities.

As expected, we found that acquisition participants, including both targets and acquirers, tend to change substantially more than nonparticipants.

Over the course of several years, acquirers and targets tend both to add more new lines and drop more old lines than nonacquirers, resulting in major differences in business reconfiguration. We also observed that acquirers were more likely than nonacquirers to possess resources that have only recently entered the industry. The results support our argument that acquisition activity is a key mechanism by which firms change their mix of business resources.

We also found striking evidence of both resource deepening and resource extension. Resource deepening, as firms retained target resources that built on their existing set of capabilities, was the most common outcome. This result is highly consistent with arguments concerning the role of existing absorptive capacity in shaping a firm's ongoing changes. At the same time, though, the results show that acquisitions often provide means for undertaking path-breaking changes, by stretching beyond existing absorptive capacity and seeking targets that offer resources that differ markedly from a firm's existing skills. Together, the results imply that acquirers tend to use acquisitions either for close reinforcement of existing skills or for substantial jumps into new skills sets. By contrast, acquisitions may play less of a role for incremental movement away from existing skills, when internal development and discrete exchange of resources may be more prominent.

Several avenues for research seem fruitful. First, simply observing that acquisition-active firms are more likely to possess resources that are new to the industry, as we reported in Table 4, does not disclose how the firms obtained the resources, whether by acquisition or by internal development. That is, the firms may tend to expand into the new areas primarily by acquiring resources from other firms or might be using acquisitions to support active internal development efforts. Second, it would be useful to determine the causes of cases in which acquirers retain targets' product lines, even after divesting a target to a new buyer. In other words, under what conditions is an acquirer able to learn enough from its target to be able to integrate the target's skills in other organizational units? Third, we have considered only the retention and dropping of new resources, without addressing the implications of business changes on firm survival and financial performance. We believe that firms that

engage in acquisition activity will be more likely to survive than those that do not. Nonetheless, acquisitions may at least temporarily create risks of failure or divestiture. Moreover, resource deepening and resource extension may well involve different degrees of risk, with resource deepening seeming more likely to cause problems that could threaten business existence or independence.

We believe that this study helps show how acquisitions serve as means by which firms attempt to change their ability to create, coordinate, and protect resources. We hope the work leads to better understanding of the broader issues of successful and failed business change.

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