Promoting Inertia:
How Executive Movement Influences Market Entry and Exit in Medical Firms

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Abstract: Theory says that executive movement through a firm promotes strategic change by spreading knowledge and information. We explore whether certain paths of executive movement actually strengthen barriers to change, creating strategic inertia. Our analysis of medical firms finds that executive movement between business units, and between business units and the corporate office, is most often followed by less strategic change. We conclude that certain types of executive movement inhibit the spread of knowledge and information in a firm by solidifying the firm's dominant coalitions. Instead of encouraging strategic change, these paths of promotion encourage strategic inertia.

In order to better understand how paths of promotion impact a firm's strategic decision-making, we need to explore two opposing theories of knowledge. On the one hand, it is generally accepted that introducing executives with novel experiences will enrich a firm's understanding of the marketplace, thereby leading to strategic and organizational change (Fligstein, 1987;Boeker, 1997;Almeida, and Kogut, 1999;Kraatz, and Moore, 2002). On the other hand, there is persuasive evidence that over time firms evolve a collective, or dominant, logic: a set of shared mental maps drawn from prior knowledge and applied to the business of the firm by its top decision makers (Prahalad and Bettis, 1986). This dominant logic can improve performance in a diversified firm by reducing the complexity of information from different markets, but only when it focuses attention on the most relevant signals (Ocasio, 1997). A dominant logic can also create an information filter by conditioning executives to pay more attention to some signals than to others. Executives may then be slower to perceive and act on unexpected signals, constraining the flow of information that might otherwise lead to strategic change (Cyert, and March, 1992;Burton, and Beckman, 2007).

We examine how different paths of executive movement increase or decrease strategic change in a sample of medical firms operating between 1978 and 1997. We propose that certain paths of executive movement will strengthen a firm's dominant logic to the point that it becomes a dominating logic. Executives engaging the marketplace through such a filter may be less likely to recognize unexpected signals, and less likely to advocate for unconventional ideas based on the signals they receive. In this way, certain paths of executive movement may ultimately strengthen a firm's dominant coalitions and reduce its diversity of information. Instead of encouraging strategic change, these paths of promotion encourage strategic inertia.

Strategic Change in the Medical Industry

The U.S. medical industry, which is composed of pharmaceutical, medical device, and health services firms, was characterized by changing science, technology, and institutional arrangements through the period examined by this study (1978-1997). On the scientific side, the rise of biotechnology was widely anticipated as a potentially disruptive force that could radically change the nature and sources of new products (Smith,

1990;Walton, 1998). On the technology side, the advent of information technology (IT) changed how health providers managed patient care and how data could drive strategy and pricing. Finally, institutional changes included both expanding insurance coverage, especially for drug benefits, as well as new managed care arrangements to tackle rapidly rising costs. Taken together, these changes created strong environmental pressure for experimentation among firms competing in the medical industry.

With this constant pressure for learning and change, successful medical firms have managed an ongoing process of experimentation, some of which is evident in the patterns of new market entry and exit. For example, Figure 1 shows the evolution of the medical market portfolio of The BOC Group, a UK-based company that is the largest producer of industrial gases for the U.S. market. In the rapidly evolving medical markets of the 1980s and 1990s, BOC group entered markets in cardiopulmonary diagnostic equipment, home health care services, and infusion devices, and exited markets for physicians' testing equipment, neonatal incubators, and blood collection supplies. This pattern of rapid entry and exit was common as medical firms like BOC Group grappled with the demands for strategic change.

*** *Figure 1 about here* ***

The medical industry's strategic evolution matches our growing theoretical understanding of the evolution of firms in dynamic markets (Helfat, 2003a). Firms confront new problems with an existing set of organizational capabilities. Firms also leverage existing resources and capabilities to enter new markets, as in the classic diversification process for growing firms (Rumelt, 1974). As a firm applies existing resources and capabilities to new problems and opportunities, executives confront the limitations of the organization's capabilities. They may respond by developing new ones, which may encourage additional market entry, through which the firm develops still more capabilities, and so on (Wernerfelt, 1984;Helfat, and Lieberman, 2002).

Firms also evolve by exiting markets, particularly when those markets distract from the development of new capabilities (Burgelman, 1994), share few resources with new areas of competitive strength (Helfat, 2003b), or represent resources that would have more value to other firms or as independent entities (Capron, et al., 2001). In this way, executives navigating a firm through dynamic markets like those in the medical industry

have ample opportunity to choose or reject strategic changes through market entry and exit. What these executives choose will depend, in part, on whom and what they know, and where they learned it.

Executive Movement and the Decision-Making Landscape

As executives advance along various career paths at a firm, they build a unique set of decision rules, attend to and share different information, and commit to different political coalitions that influence strategic decisions (Cyert, and March, 1992). Over time, then, variations in executive movement shape the decisions firms make. Paths of promotion vary widely between firms. Some are guided by explicit policies, others by informal routine. Some reward front-line operational experience; others encourage an array of diverse experiences. Still others choose executives for transfer and promotion based on their informal ties to corporate leaders. In addition, executives themselves drive promotion paths by advocating for opportunities to acquire new skills and increase their own responsibility and power. Much research remains to be done about how firms choose executives for new opportunities, and how these choices interact with the informal networks of the firm (Granovetter, 1974;Burt, 1992;Podolny, and Baron, 1997). This study looks at the impact executives make after they move to new assignments, asking how the accumulation of relationships and experience might, over time, shape the personal commitments and flow of information in a firm and thereby increase or dampen the firm's appetite for strategic change.

The behavioral theory of the firm describes how the interaction of people, perspectives, and political commitments in a firm combine to create a decision-making landscape populated by a shifting set of coalitions, which are activated to influence different decisions (Cyert, and March, 1992). This decision-making landscape emerges from three fundamentals: imperfect environmental matching, bounded rationality, and unresolved conflict (Cyert, and March, 1992: pp.214-215). The first, imperfect environmental matching, establishes the need for ongoing experimentation and strategic change in complex industries. The second, bounded rationality, implies that individual decision makers rely on a patchwork of past experience and conventional wisdom – sometimes incomplete -- to assess market threats and opportunities. The third,

unresolved conflict, creates opportunities for shifting coalitions of interest groups and decision makers to dominate a firm's decisions.

This decision-making dynamic plays out at three levels: the information environment (Simon, 1947;Ocasio, 1997), the knowledge of decision makers (Sutcliffe, 1994;Tripsas, and Gavetti, 2000), and the interpersonal commitments between decision makers (Burgelman, 1996;Mizruchi, and Stearn, 2001). These aspects of decision-making are in turn shaped by the prior experiences and relationships of those in the top general and functional roles in a unit or corporate office (Dearborn, and Simon, 1958;Higgins, 2005).

Horizontal Executive Movement and Strategic Change

We observe two types of units at the companies in this study, and we consider two types of executive movement between those units. The top-level unit that we observe is the corporate office, which contains the highest-level executives with responsibility spanning all the activities of the firm. We also observe the organizational units one level down in the hierarchy from the corporate office. Theoretically, these next-level units may be grouped around different functional, geographic, customer, or product responsibilities (Gulick, 1954 [1937];Donaldson, 2001;Williams, and Mitchell, 2004). In this study, however, the next level of organizational units is entirely composed of product-market units with responsibility for selling a subset of the firm's products and services. We designate this level of the organization as business units, and when executives move between business units and the corporate office (in either direction) we call it *vertical movement*. When executives move between various business units, we call it *horizontal movement*.

****Figure 2 about here****

There is considerable theoretical and empirical evidence suggesting that executive movement between firms encourages market entry and innovation (Boeker, 1997;Kraatz, and Moore, 2002;Rosenkopf, and Almeida, 2003). Horizontal movement between different businesses builds diversity of information, knowledge, and decision coalitions, and these aspects of the decision landscape increase the likelihood of market entry. Diverse information and perspectives, in turn, may create more opportunities for

innovation as decision-makers generate novel insights using contrasting or even conflicting information (Haunschild, and Sullivan, 2002;Schilling, et al., 2003).

Similarly, executive movement between business units within the firm extends and reinforces information sharing across the different parts of the company, such as between different business units or between business units and the corporate office. As executives move between different units, they bring information from their old setting and include it in their consideration set for new decisions (Eisenhardt, and Tabrizi, 1995;Tsai, and Ghoshal, 1998). Thus, horizontal movement allows managers to build a wider array of perspectives into their own judgment and decision-making (Ancona, and Caldwell, 1992).

In addition to expanding the knowledge and decision rules available to the executive who is transferred, horizontal movement can increase the information and perspectives available to other executives in the organization. Informal relationships across units are built as executives move but maintain relationships and social networks with old colleagues (Rao, and Drazin, 2002;Rosenkopf, and Almeida, 2003). Information is likely to flow through these relationships so that more information about alternative competitive environments is available to decision-makers in both locations. This information sharing broadens the perspective of executives and can help bring key market opportunities or threats to light. It can also create fresh perspectives as people with contrasting judgment and information processing profiles learn from one another as they share and compare information (Boeker, 1997;Kane, et al., 2005). As executives collectively expand the diversity of information, perspectives, and knowledge available to the firm, they become more likely to identify opportunities and develop the capabilities to pursue them. This leads to our first hypothesis.

H1: Higher levels of horizontal executive movement will be associated with increased subsequent market entry.

On the other hand, horizontal executive movement may inhibit market exit by reducing the diversity of knowledge and opinions shared in the firm. Even when market exit is necessary, it involves a high cost for some individuals and groups at the firm.

Some executives and workers will lose their connection to the organization, as their unit is sold or liquidated, with high potential cost to their career and livelihood. In addition, exit requires dominant decision-makers to acknowledge the firm's, and their own, limitations. Even if the firm has learned from its experience in a given market, exit signals that the firm does not have the resources – organizational, managerial or financial – to succeed in the market at acceptable cost to the organization. Exit from a market, then, involves substantial cost not only to those who are forced to leave but also to the executives who remain at the company.

Horizontal movement extends the voice and influence of these groups hurt by exit. Executives who move between units build ties to multiple decision coalitions within old units, new units, and the corporate unit, which may be involved in selecting and supporting executive promotions. If exiting an established business requires laying off friends and colleagues at their old unit, they will be likely to highlight the cost of this in their new decision groups and may help build opposition to the change. Since horizontal movement often requires the ongoing support of dominant decision makers in the corporate office, it may increase the identification of business unit executives with the strategic rationale for the current set of markets. Thus executives who move between units have access to multiple decision coalitions and are more likely to be aware of the costs of exit and advocate against it.

In addition, horizontal movement may promote an echo chamber effect in the firm. As executives move through the organization they have more opportunity to share information and perspectives across units and levels of the firm, but if they must seek the approval of dominant decision makers to win promotions, then their communication may repeat and amplify preferred interpretations and decision-making perspectives (Janis, 1982). As firms develop an accepted strategic rationale for their activities (Prahalad, and Bettis, 1986), they become less likely to perceive the threats and opportunities that create the need for strategic change through market exit (Staw, 1981). The combined effect of reduced diversity of perspectives and political reinforcement may strengthen the firm's commitment to the status quo.

H2: Higher levels of horizontal movement will be associated with decreased subsequent market exit.

Vertical Executive Movement and Strategic Inertia

While working at the pinnacle of a corporation ought to offer a broad perspective on strategic threats and opportunities, executive movement through the corporate office is particularly likely to reduce the diversity of viewpoints in a firm. When an executive moves into the corporate office, he strengthens his ties to the most senior and powerful members of the management team (Pfeffer, and Salancik, 1978). The effect of vertical movement is especially significant in group decisions because association with the top management team in the corporate office confers status and influence on an executive. In addition, once an executive has moved into or out of the corporate office, ties to the dominant coalition at the corporate level are essential to her future career success because these relationships are the best opportunity for future advancement. Since relationships with managers in the corporate office have a large effect on current performance and future career prospects, managers who move through the corporate office are more likely to adopt the perspectives of top decision makers there and maintain strong personal ties to these decision makers.

Experience in the corporate office, then, exposes executives to the rationales and interpretations of those leaders who developed the current strategy and encourages executives to adopt and internalize this perspective. This repeated exposure and personal socialization reinforces the dominant perspective on the firm's strategy. Since executives in the corporate office possess limited information about the activities and events at the operational level of the firm, they will tend to apply a more uniform corporate perspective to problems and opportunities they perceive (Peterson, et al., 1998). As they share information through their ties to other levels of the organization, they will tend to repeat and amplify this corporate perspective.

Research has also found that executives at more centralized organizations are less likely to perceive changes in their environment (Sutcliffe, 1994). As executives move into and out of the corporate office, they integrate and more tightly couple the goals and perceptions of senior executives around the company. This may lead to a less accurate

perception of the environment (Weick, 1976) and reduce the chance that executives will perceive and pursue opportunities for market entry. The combination of selective information processing and personal constraints that arise from vertical movement leads to our third hypothesis.

H3: Higher levels of vertical movement will be associated with decreased subsequent market entry.

Political coalitions built or reinforced through vertical executive movement are particularly likely to reduce market exit. Experience in the corporate office will build relationships with executives who have chosen the current strategic portfolio and who hold ultimate control over resource assignment in the corporation. Resource dependence makes groups and individuals more inclined to support the interests of powerful groups (Pfeffer, and Salancik, 1978), and has been shown to have a powerful effect on communication and consensus between organizational entities (Van de Ven, and Walker, 1984). As a result, vertical executive movement may reduce the influence of organization members who are natural advocates for strategic change. Even if executives have no strong personal stake in the cost of market exit, experiences in the corporate office may increase their commitment to individuals and groups that view exit as a threat.

Since experience in the corporate office tends to strengthen the dominant logic in a firm, and since exit is a particularly costly strategic change, vertical movement is quite likely to reduce exit from markets. Consider an executive in a firm where the dominant strategic rationale is to compete in hospital services on the basis of strong relationships with customers. This executive moves from the corporate office to a business unit providing diagnostic imaging services. The executive finds that the unit's imaging capabilities are weak compared to competitors, which are mostly medical device firms specializing in imaging technology, and the unit's prospects are poor given consolidation in the market. Still, it may be difficult for him to advocate for exit given the internal logic that defines this as one more service market where the company has experience and valuable relationships with hospitals.

Alternatively, executive movement into and out of the corporate office can reinforce a firm's commitments to the current set of markets through an escalation of commitment. Individuals who are responsible for failures tend to process information to favor the earlier decision (Staw, and Ross, 1978) and manipulate information presented to others (Caldwell, and O'Reilly, 1982). As more executives are exposed to and committed to these rationalizations through ties to corporate executives, it will be increasingly unlikely that decision coalitions will arise to support market exit.

Thus vertical movement is likely to increase a firm's dominant logic and strengthen political coalitions resistant to exiting existing markets. This leads to our final hypothesis.

H4: Higher levels of vertical movement will be associated with decreased subsequent market exit.

This section developed four hypotheses addressing the effect of executive movement on strategic change in the organization. We consider both horizontal movement between business units and vertical movement between business units and a firm's corporate office. We hypothesize that horizontal executive movement will increase the diversity of information and influence opportunities in ways that encourage market entry. On the other hand, we predict that horizontal movement will create bonds between units that inhibit market exit.

Additionally, we argue that vertical movement will inhibit both market entry and exit. Vertical movement reinforces the influence of the firm's dominant logic and reduces the diversity of information, heuristics, and individuals that might encourage the firm to enter new markets. Vertical movement also reduces the likelihood that a firm will exit from a market because it extends the influence and political connections of individuals and groups who created the firm's reigning strategy. In addition, the rationale for exit relies on information and judgments that are more likely to be dismissed as distractions from the firm's overriding strategic objectives.

Our predictions contradict the widely held belief that executive movement will inevitably increase the diversity of information and perspectives that a firm draws upon for strategic decision-making. We propose that executive movement can have a number

of effects that reduce the contours of a firm's decision landscape and inhibit strategic change. We test these hypotheses on a panel of medical firms in which we observe executive movement and strategic change from 1978-1997.

Data and Empirical Approach

We gathered 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 industry, which can be further divided into the categories of healthcare services, medical instruments and pharmaceutical drugs. For each firm, the guide provides a general description of key events that took place during the history of the firm. There is also information regarding product market activity[2] and the business units possessed each year. A business unit is a structural component whose identity is recognized by the firm with a unique address and some responsibility for one or more product markets. Note that several units of a firm may be involved with the same product market. The unit-level information includes the names and positions of top executives within the unit, how the unit came to be in the firm (whether it was internally developed or acquired), whether participation in certain product markets ceased (either by divestiture or dissolution), whether there was entry into new product markets (either by acquisition or internal innovation), and the number of employees in the unit. Information regarding the divestiture or liquidation of a unit is available at the firm-level description, which also provides general information for the entire organization about date of incorporation, nationality, financial performance, public or private status, key officials, and more.

For each firm, we trace movement of executives both between business units and between the corporate and unit levels. We note if personnel are new to a unit, and if so, whether they moved from another existing unit or to/from corporate headquarters. In this manner, we are able to observe paths of key officials through the organization over time.

[1] "The Medical & Healthcare Marketplace Guide" was published by International Bio-Medical Information Services, Inc. (Acton, MA, and Miami, FL; ed. 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] See Appendix A for a complete list of product markets within the medical sector.

The study sample consists of 69 firms which exist in the 1978 panel and are observed during the period 1978-1997[3]. Of the 69 firms, roughly two thirds (45 firms) are still operating in 1997; the remaining firms were either acquired or shut down. Roughly two-thirds of product market entries were initiated internally, a third were pursued via acquisition, and the remaining one percent were joint ventures. The sample consists mostly of firms that produce medical devices (56%) and have domestic parents (82%). Nearly ½ of the firms (43%) also have activities outside of the medical market.

We study strategic change as an outcome at the firm level, since executive movement can influence changes in other units through relationships and information sharing with other executives. Since our outcome variables are counts for each firm over time, we analyze the data using a negative binomial regression framework. This is a panel estimator that estimates non-negative, integer outcomes over time for each firm. We chose the negative binomial model because our data does not conform to the requirements of a poisson model for count outcomes, in which the mean and variance of the outcome variable are expected to be equal. We use random effects in our analysis to account for unobserved firm heterogeneity, but the Hausman specificatoin test for these models suggests that there is no systematic heterogeneity beyond that captured by our explanatory variables since it shows no significant improvement in model fit with the random effects. We use lagged explanatory and control variables to explain entry and exit that occur over the period that followed the panel. For instance, executive movement measured in 1983 is used to explain market entry that occurs in the period between 1983 and 1986.

Dependent and Explanatory Variables

Table 1 summarizes the variables used in our analysis. Appendix B provides descriptive statistics and the correlation matrix for the variables.

****Table 1 about here****

[3] An initial sample of 250 firms were chosen randomly from the beginning of the alphabet and range from letters starting with A, B, or C. Of these, 69 had multiple units through which we could track executive movement to develop our measures. Sampling from the beginning of the alphabet introduces two small sampling biases: an increased incidence of domestic firms (27 of 250 firms starting with the term "American") and a higher number firms practicing in the medical device category (23 of 250 firms starting with the term "Bio" of which 19 were medical device firms, and 10 firms starting with the term "Cardiac" of which nine were medical device firms).

We have two dependent variables, which capture the outcomes of market entry and market exit. The variable '*entry'* is a count of the markets entered since the last observed time period. The variable '*exit'* is a count of the markets exited since the last observed time period. These calculations gave us entry and exit dependent figures for the five periods between 1978-1983, 1983-1986, 1986-1989, 1989-1993, and 1993-1997.

Our two sets of hypotheses make the distinction between horizontal and vertical movement of executives. We have two variables to represent horizontal movement of executives. The variable '*b2b0'* represents a count of executives who hold positions in two business units in a single time period. The variable '*b2b'* represents a count of the number of other business units where current business unit executives have previously worked.

For vertical executive movement, it is important to note that we observe and measure movement between the corporate office and business units, including promotions upwards and transfers downwards. We develop arguments that treat these two directions of vertical moves as having symmetric effects on the decision ecology of the firm, but we measure the effect separately to analyze if the direction of vertical movement has different outcomes. In order to distinguish both the time and the direction of the movement, we have three variables that represent vertical movement of executives. The variable '*c2b0*' represents a count of executives who sit simultaneously in the corporate office and a business unit. The variable '*b2c*' is a count of the prior business units where current corporate executives used to work. The variable '*c2b*' is a count of the number of periods that current business unit executives who used to work in the corporate office. See Figure 1 for examples of the calculation of the variables for executive movement.

Control variables

We have a number of variables that control for aspects of the firm that might also affect market entry and exit. Four variables account for the nature of the senior executive teams reported by the firm. The variable '*execcount*' is a count of the senior executives listed for the firm in a time period. The variable '*execsame*' is a count of the executives who remain in the same unit and job since the last time period. The variable '*execchange*' is a count of the executives who remain in the same unit but have changed job titles since

the last time period. Job changing was coded if there was a substantive difference in the title attributed to the executive. For instance, if an executive's title changed from regional sales manager to VP marketing, or from VP marketing to general manager, this was coded as a change. Small changes in the level but not the substance of the title, for instance from VP to Senior VP, were not coded as changes. Finally, '*execnew*' is a count of executives who are new to the unit or corporate office since the last time period.

Two variables describe the market and administrative structure of the firm. The variable '*market*' is a count of the current market segments where the firm operates. The variable '*unit*' is a count of the business units in the administrative structure of the firm.

Three variables describe the size and growth of the firm. The variable '*logemp*' is the logarithm of the number of employees of the firm. The variable '*logmedsales*' is the logarithm of the firm's sales within the medical industry. To account for growth, the variable '*growth_med*' is the percentage growth in sales within the industry since the last time period.

Finally, one variable captures the competitive environment faced by the firm. The variable '*compinprod_av*' is the average of the number of competitors that the firm faces in each market segment where it operates. In the next section we examine how these variables influence the strategic changes undertaken by the firm.

Results and Discussion

Tables 2 and 3 present the results of four models studying market entry and exit. Table 4 presents models exploring innovation and sales growth. Models 1 & 2 in Table 2 predict a count of market entries for each firm, while models 3 & 4 in Table 3 predict a count of market exits for each firm. Model 1 includes all explanatory variables and controls except growth in medical sales, while model 2 adds growth in medical sales as a control. Similarly, model 3 includes all explanatory variables except growth in medical sales, and model 4 includes growth in medical sales.

Our first prediction was that horizontal movement between business units would enable entry into new markets (H1). Model 1 suggests that horizontal movement is weakly associated with increased market entry, since b2b0 has a positive and significant relationship to entry in model 1. This relationship, however, may be accounted for by the

growth strategy of the firm, since prior growth reduces the significance of the effect when it is included in the analysis (model 2). In addition, there is no effect of past horizontal movement on new market entry. The variable 'b2b', which represents a count of prior experiences in other units within the firm, has no effect on entry in either model 1 or model 2. The results suggest, then, that in this setting horizontal movement does not meaningfully affect market entry.

****Table 2 about here****

This result is surprising in view of prior results on diverse experience and strategic change. In studies of personnel movement between firms, Boeker (1997) found that top management movement between semiconductor firms increased the likelihood of market entry, and Almeida and Kogut (1999) found that movement of scientific workers between firms influences knowledge transfer. Looking within firms, Williams and Mitchell (2004) found that horizontal movement between units in telecom firms increased subsequent market entry. These earlier findings suggest strong priors that executive paths that increase the diversity of experiences should increase market entry. The lack of a relationship between horizontal movement and entry in this study suggests that there may be a number of important limits on the generality of these prior results. Since few studies have focused on diversity of experiences within the firm, experiences within the firm may generate less diversity than experiences outside the firm.

In addition, the industry context may influence the potential for horizontal movement to affect entry, since these results do not confirm the findings of prior findings in other industries. In the telecommunications industry, the firms were characterized by high interdependence, with units frequently offering service using the same shared platform, though it was movement between very different units that was most strongly associated with entry. In contrast, the medical industry is characterized by markets that rely deeply on scientific research and medical practice for innovation, and the scientific foundations can vary significantly between different market segments. As a result, information and perspectives acquired in different markets may be more difficult to leverage. The specialized scientific knowledge of many of the product markets in the medical industry may reduce the extent to which horizontal movement can carry knowledge from one arena to another.

The results are clearer for our third prediction, which was that vertical movement between business units and the corporate office would constrain market entry (H3). In the analysis, the variable ‘c2b’ has a negative impact on market entry in model 1 and 2. This effect is significant at the .05 level. In addition, while the other measures of vertical movement, variables ‘c2b0’ and ‘b2c’, do not significantly influence market entry, all of the coefficients are also negative. The analysis, then, is consistent with H3, which predicts that vertical movement will constrain entry into new markets.

In particular, it appears that when corporate officers move down into the business units, the firm is less likely to enter new markets. This is consistent with the idea that executives moving from the corporate office tend to reduce the variety of information and alternatives considered by decision makers, because they reduce the diversity of perspectives considered or they reinforce the interests of the dominant decision makers in the company. It is important to consider whether these results might be attributable to reverse causation, in which corporate executives move to troubled units that can not afford to enter new markets or to units with high growth prospects that do not need to enter new markets. If this growth effect drove results, we would expect vertical movement to be associated with a pattern of higher or lower growth. Table 4, model 7 shows this is not the case: none of the vertical movement variables have a significant impact on subsequent growth (or lack thereof). Movement from the corporate center into business units, then, appears to constrain strategic change by reducing market entry. This outcome is consistent with the strengthening of the dominant strategic perspective and decision coalitions through the movement of executives from the corporate office to business units.

For hypothesis 2 (H2), we predicted that horizontal movement could reduce future market exit. Models 3 and 4 (Table 3) analyze the effect of executive movement on market exit, and they suggest that horizontal movement does somewhat reduce market exit. As with market entry, it is when executives sit in two units at the same time that horizontal relationships influence market exit. The variable ‘b2b0’ is associated with lower levels of subsequent market exit, though the effect is only significant at the .10 level. When executives have prior experience in another business unit, as represented by variable ‘b2b’, there is no significant impact on market exit.

****Table 3 about here****

It is possible that the negative impact of b2b0 on exit could arise because executives sit in two locations when a unit is small but expected to grow later. In growth analysis, however, we find that b2b0 is not significantly associated with subsequent growth of the firm (see Table 4, model 7); nor does the prior growth of the firm change the impact of horizontal movement on exit. Thus, the growth trajectory of the firm does not appear to explain the finding. When executives sit in two business units simultaneously, then, firms are less inclined to exit from markets. This suggests that horizontal relationships across the firm may constrain market exit because they increase the commitment of executives to the interests of multiple units.

****Table 4 about here****

Finally, models 3 and 4, in Table 3, are consistent with H4, which predicted that vertical movement of executives would reduce subsequent market exit. This negative effect arises for movement both into the corporate office (variable 'b2c') as well as out of the corporate office (variable 'c2b'), since both variables have a negative impact on market exit. The negative relationship between vertical movement and market exit is significant at the .05 level and holds even when the prior growth of the firm is accounted for (model 4). In addition, since neither variable has a significant impact on subsequent growth (model 7), this effect does not appear to be driven by the growth trajectory of the firms that exhibit more vertical movement.

Executive movement in these health industry firms, then, appears to be much more strongly associated with constraints on strategic change. Vertical movement to and from the corporate level is associated with lower market exit. Vertical movement from the corporate office to a business unit is associated with reduced market entry. In addition, horizontal relationships in which executives sit simultaneously in the two different units are associated with lower market exit. While horizontal relationships are associated with subsequent market entry in model 1, the growth trajectory of the firm appears to explain this effect since it is not significant in model 2.

Other Variables

The analysis also includes a number of control variables, which could also potentially affect market entry and exit. Four variables account for the nature and dynamics of the executive ranks other than internal movement: ‘execcount’, ‘execsame’, ‘execchange’, and ‘execnew’. These variables have no impact on market entry but are associated with different patterns of market exit.

The variable ‘execcount’ measures the number of executives reported by each firm. To the extent that this variable actually describes the size of the executive ranks, it will also capture administrative intensity since size of the firm is also included in the analysis. This variable has a weakly positive impact on exit and a negative but non-significant impact on entry, suggesting that firms with larger executive ranks are more likely to exit businesses. This could arise if high administrative intensity compared to size represents shrinking operations (as in the longitudinal study of schools by Freeman and Hannan (1975)), and thus tends to be followed by exit.

The variable ‘execsame’ is negatively associated with subsequent market exit. When a firm has a higher proportion of executives that remain in their jobs since the last panel, it is less likely to exit markets. This could arise because the executives are committed to the current set of markets to preserve their jobs and the value of their skills, or both the retention and the lack of exit could arise because the firm is successful in those markets. On the other hand, the more executives who have changed jobs within the unit since the prior panel (indicated by the variable ‘execchange’), the more likely the firm is to exit markets. This result most likely represents the nature of the problems at the firm; that is, problems in current operations cause both changes in job titles and subsequent exit. This result is not large compared to some of the others, but it is highly significant. Finally, new executives are associated with significantly less market exit. Again, we believe this result is most likely to represent the business situation that draws new executives. Successful business lines will draw new executives more easily and are less likely to be closed down through exit.

The next set of controls characterize the size and complexity of the firm. The number of existing product lines, ‘market’, and the number of units at the firm, ‘unit’, do not have a significant impact on entry or exit. Nor does the size of the firm’s medical sales, ‘logmedsales’. On the other hand, the number of employees at the firm, ‘logemp’, is

positively associated with market entry. Thus, larger firms enter more markets, but the relevant measure of size is employees. So we might more accurately say that firms with more human capital resources enter more markets. In Table 4 model 7, we study the impact on sales growth and find that firms with more employees grow more quickly, as well. This is in direct contrast to the result that firms with larger sales ('logmedsales') grow more slowly. Thus increased funds do not appear to lead to increased growth. Instead the results highlight that investment in employees leads to growth.

We control for the nature of the competitive environment of each firm by averaging the number of competitors it faces in each market segment. This variable, 'compinprod', does not have a significant impact on exit or entry. Finally, the growth trajectory of the firm increases market entry (Table 2 model 2). The variable 'growth_med' is positively and significantly related to market entry. The effect is small, but it appears to account for a significant portion of the influence of horizontal executive movement.

Entry without Acquisition

The market entry measure includes entry either through innovative internal efforts or acquisition of other firms. Since market entry by acquisition is a considerably different process than entry through internal development, we explore the effect of these variables on entry through internally developed products and services. The variable 'innov' represents entry through internal development, and models 5 and 6 in Table 4 explore the relationship between our explanatory variables and this specific method of market entry. In these models, horizontal relationships have no effect on innovative entry. Movement from the corporate office to business units, however, does still significantly reduce market entry, though the effect is reduced when we control for growth in sales. This alternative analysis, then, remains consistent with H3, and further reduces the support for H1. Overall, it appears that horizontal relationships do not influence innovative entry, while movement from the corporate office to business units dampens innovative market entry.

It is interesting to note that the executive controls have significant impacts on internally-driven entry that are not present with the broader market entry measure. The more executives a firm reports, the less innovative market entry a firm exhibits, since the

count of executives is negatively associated with 'innov'. This relationship is significant at the .05 level in models 5 and 6. On the other hand, the more executives who remain in their position (execsame) and the more new executives added to the firm (execnew), the higher the levels of internally developed new products and services. These effects are significant at the .05 level, and are quite large compared to other variables in the analysis. It appears, then, that innovative market entry requires a balance between continuity from stable executives and new perspectives from new executives.[4]

In addition, the number of employees at the firm (logemp) and prior growth of the firm are positively associated with internal entry. In model 2 we found that the number of employees and the growth trajectory of the firm increased subsequent market entry. In model 6 we find that this is not just driven by acquisition decisions; firms with more employees and higher growth levels experience more innovative entry irrespective of acquisitions.

Alternative Explanations

The results in this analysis might be impacted by a number of alternative explanations, mostly arising from possible omitted variables. For instance, executive movement is partly driven by the career aspirations of the executives themselves. It might be the case that a corporate executive moves to a business unit to add operational responsibility to her skill set. In this scenario she would be inclined to choose a business where growth prospects were good, and there would be less entry to new markets when business is growing in existing markets. In this case, movement from the corporate office would be associated with less market entry, but the relationship would be caused by the career goals of the executive rather than the decision environment of the firm. While we cannot rule out some omitted variables related to career goals of the executives, this explanation seems less likely given the fact that executive movement is not significantly related to subsequent growth in the firm.

More broadly, we have mentioned that executive movement is likely to arise as part of a matching process between executive capabilities and the problems faced by business

[4] It is also reassuring that these effects are all in the opposite direction to that of their impact on market exit (as seen in Table 3).

units or the corporate office. Given that this is the case, it is possible that the nature of the problems that executives are moving to address may drive the relationship between movement and strategic change. Since we do not have direct measures of the nature of the perceived problems addressed by executive movement, we cannot entirely rule out this possibility. On the other hand, it would be natural to think that executives moving from the corporate office have a broader perspective on the firm and more of a portfolio perspective on the businesses in any unit. If this were the case, we would expect to see higher levels of entry and exit following vertical movement of executives. Instead we find the opposite. As a result, we believe it is less likely that the nature of the problems faced by transferred executives can account for the relationships uncovered in our analysis.

There is always the chance that some unobserved firm policy or characteristic accounts for both the executive movement and the strategic change. In this case we might observe a statistical relationship between the two (i.e. between executive movement and strategic change), but the relationship would not be causal because the omitted variable would account for both the explanatory variables and the outcome variables. We have attempted to rule out the most likely possibility: that the nature of the firm's growth trajectory accounts for both outcomes. We do this by controlling for past growth trajectories and examining the impact of our explanatory variables on future growth. This analysis suggests that our results are more consistent with changes to the decision landscape from executive movement than with the growth policy of the firm. Since we do not measure all the firm's strategic decisions and policies, we cannot completely rule out the possibility an unknown firm policy or dynamic influences our results.

Conclusion

Our evidence suggests, in the setting of the medical industry, that senior executive movement does much more to constrain strategic change than to encourage it. We find only weak evidence that horizontal movement is associated with subsequent market entry, and this relationship appears to be accounted for by the established growth trajectory of the firm. In contrast we find that vertical movement significantly dampens

market entry, both in general and also somewhat for innovative entry. In addition, both horizontal and vertical movements significantly reduce market exit.

While senior executives may contribute to the diversity of information and perspectives as they move through the firm, this diversity effect is not large enough to spur strategic change. The pattern of entry and exit among these firms is consistent with our predictions that emphasized the constraints that arise from executive movement through the firm. As executives move through the firm, and especially through the corporate office, they build relationships that strengthen their ties to the dominant decision makers in the firm. This reinforces the dominant decision coalitions, and reduces the likelihood of strategic change. In addition, the diversity of information and perspectives may diminish as these executives repeat and amplify the dominant strategic logic of the firm and affirm the previous judgments that led to the current strategy. This is consistent with recent research that has found that human capital inflows sometimes strengthen knowledge retention (Madsen, et al., 2003) and actually fall after product innovations (Madsen, et al., 2002). Thus, many paths of executive movement appear to strengthen the dominant logic to the point that it becomes a dominating logic: crowding out alternative voices and inhibiting strategic change.

Our findings suggest that policies and characteristics of the firm that shape the decision landscape can have a significant impact on the market evolution of the firm. Our theory suggests that executive movement influences the information, knowledge, and coalitions that affect strategic choices. We do not, however, directly measure these aspects of the decision landscape. Future research is required to better understand how changes to various elements of the decision landscape separately and jointly shape strategic decisions.

The results of this study suggest that there are important boundary conditions for the influence of horizontal movement on innovative market entry. Horizontal movement contributes to the diversity of information and judgment relating to market entry by sharing the rich information and decision heuristics that arise from experiences operating within the different market environments of the firm. This effect has been found strongly in top management teams (Wiersema, and Bantel, 1992;Boeker, 1997;Bigley, and Wiersema, 2002) and movement of knowledge workers between firms (Almeida, and

Kogut, 1999). One prior study found that horizontal movement within a set of telecommunications firms was significantly associated with market entry (Williams, and Mitchell, 2004). In the telecommunications industry, the firms were characterized by high interdependence, with units frequently offering service using the same shared platform, though it was movement between very different units that was most strongly associated with entry. In contrast, the medical industry is characterized by markets that rely deeply on scientific research and medical practice for innovation, and the scientific foundations can vary significantly between different market segments. As a result, information and perspectives acquired in different markets may be more difficult to leverage. Some common foundation or perspective between units' market segments may be necessary for horizontal movement to support market entry.

While the study of vertical movement is rather new, the pattern in this study does echo prior findings. Williams and Mitchell (2004) find that vertical movement in a sample of telecom firms dampens market entry. Sutcliffe (1994) found that executives at more centralized organizations are less aware of changes in their environment. These findings suggest that the strong inertial effects of corporate promotion paths may well generalize to other settings.

We conclude that when executives move to and from the corporate office, it acts as a significant barrier to strategic change. The decision landscape offers three levels at which this constraint can arise. It may arise through the individual knowledge that executives develop and share as they move through the corporate office. As executives gain experience in the corporate office, they participate in and reinforce the decision heuristics that led to the current strategy. As they move through the firm they spread these values, and this may lead decision makers to discount information that suggests a need for strategic change. The constraint on strategic change may also arise through the information landscape of the firm. It could be that information enabling firms to evaluate threats and opportunities in the environment is shared less when executives acquire corporate experience, and thus these signals never reach key decision makers. Finally, the political ties to other decision makers can reinforce coalitions that are resistant to change at the firm even when the information and judgments are available. Further research

could untangle which of these mechanisms most influences the constraints arising from vertical movement.

Our finding that vertical movement dampens strategic change flies in the face of conventional views of the portfolio management role of the corporate office. Some interview respondents in this study suggested that they expected executives with corporate experience would be more likely to enter or exit markets since they would bring a broader perspective to business units when they moved there. It appears that commitments accumulated in corporate career paths, however, limit the extent to which vertical movement enables firms to bring this perspective to bear within business units or the corporate office. Ultimately, the results of this study suggest that corporate-centered networks in firms are powerful sources of strategic inertia. As companies consider moving promising executives into new locations in the firm, they need to weigh the possibility that the associations and experiences that arise from this movement strengthen the dominant logic of the firm, transforming it into a dominating logic that blinds the firm to opportunities, or imperatives, for strategic change.

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FIGURES & TABLES

Figure 1, BOC Group Market Evolution, 1978-1997
(28 product markets represented by horizontal rows)

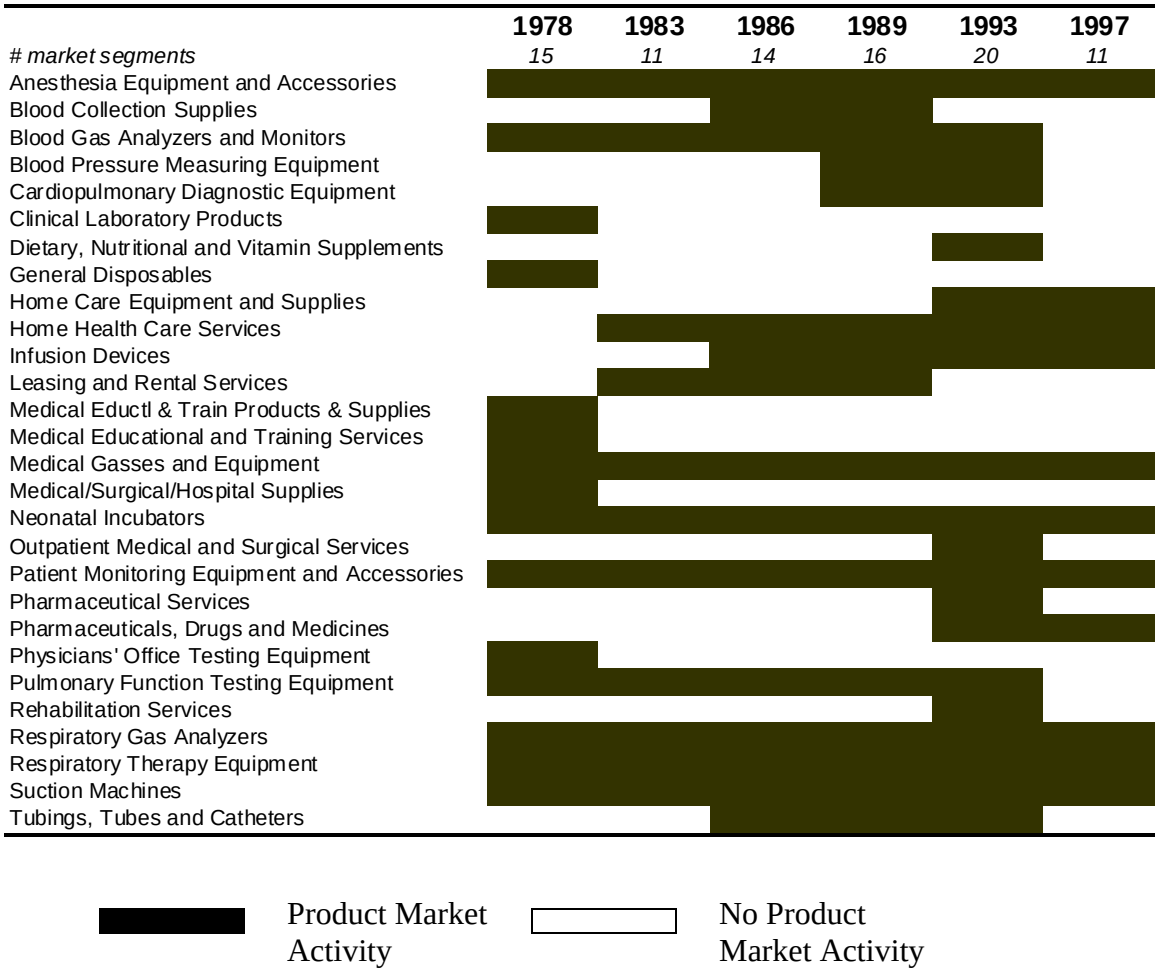
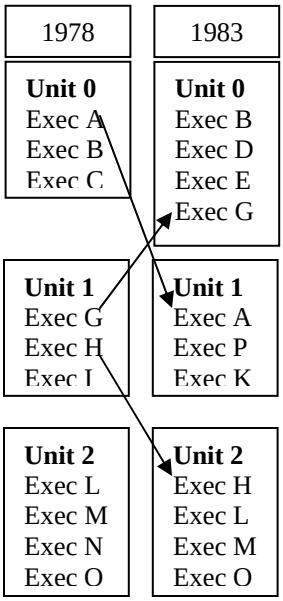


Figure 2
Example of Calculating Executive Movement (horizontal and vertical)



Vertical movement, 1983 (Unit 0 = corporate office)

C2B = sum in 1983 of prior periods where a business unit exec worked in the corporate office
C2B = Exec A = 1
B2C = sum in 1983 of prior periods where a corporate exec worked in a BU
B2C = Exec G = 1

Horizontal Movement, 1983

B2B = sum for each Executive **in 1983** the # of other units (s)he has worked in prior
B2B = # units where Exec A has worked + … + #units where Exec O has worked
= Exec A + Exec P + Exec K + Exec H + Exec L + Exec M + Exec O
= (0 + 0 + 0 + 1 + 0 + 0 + 0)
= 1

Table 1, Variable Descriptions

b2b0	Count of executives who sit simultaneously in two business units (BU).
c2b0	Count of executives who sit simultaneously in a BU and the corporate office.
b2b	Count of current BU executives' prior experiences in different business units.
b2c	Count of current corporate executives' prior experiences in BU's.
c2b	Count of current BU executives' prior experiences in the corporate office.
execcount	Count of current executives.
execsame	Count of executives in the same unit with the same job title as the last time period.
execchange	Count of executives in the same unit with a different job title as the last time period.
execnew	Count of executives that are new to their unit since the last time period.
market	Count of firm's existing markets.
unit	Count of firm's business units.
logemp	Logarithm of firm's employees.
logmedsales	Logarithm of firm's sales in medical industry.
compinprod_av	Number of competitors, averaged across each product segment.
growth_med	Percentage growth in firm's sales in medical industry.

Table 2, Effect of Firm Characteristics on Market Entry
(negative binomial regression of count of market entry since last time period)

		(1) ENTRY	(2) ENTRY
b2b0	H1: +	**0.128***	0.065
		(0.064)	(0.066)
b2b	H1: +	-0.057	-0.045
		(0.067)	(0.066)
c2b0	H3: -	-0.000	-0.013
		(0.061)	(0.064)
b2c	H3: -	-0.097	-0.080
		(0.114)	(0.114)
c2b	H3: -	**-0.301***	**-0.270***
		(0.133)	(0.134)
execcount		-0.069	-0.046
		(0.121)	(0.121)
execsame		0.095	0.072
		(0.121)	(0.121)
execchange		-0.028	-0.023
		(0.035)	(0.034)
execnew		0.070	0.051
		(0.119)	(0.118)
market		-0.010	-0.008
		(0.025)	(0.025)
unit		0.066	0.054
		(0.051)	(0.052)
logemp		**0.151+**	**0.200***
		(0.084)	(0.082)
logmedsales		-0.008	-0.074
		(0.084)	(0.082)
compinprod_av		0.003	0.004
		(0.003)	(0.003)
growth_med			**0.046****
			(0.017)
Constant		-2.533**	-2.265**
		(0.677)	(0.694)
Chi squared		95.59**	107.24**
Observations		201	199
Number of ID		65	65

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Table 3, Effect of Firm Characteristics on Market Exit
(negative binomial regression of count of market exit since last time period)

		(3) EXIT	(4) EXIT
b2b0	H2: -	**-0.188+**	**-0.193+**
		(0.100)	(0.107)
b2b	H2: -	0.015	0.014
		(0.069)	(0.070)
c2b0	H4: -	-0.045	-0.053
		(0.051)	(0.053)
b2c	H4: -	**-0.282***	**-0.279***
		(0.132)	(0.133)
c2b	H4: -	**-0.149***	**-0.141***
		(0.068)	(0.070)
execcount		**0.185+**	**0.187+**
		(0.094)	(0.096)
execsame		**-0.205***	**-0.205***
		(0.098)	(0.100)
execchange		**0.089****	**0.090****
		(0.026)	(0.026)
execnew		**-0.185***	**-0.186***
		(0.092)	(0.093)
market		0.031	0.034
		(0.024)	(0.025)
unit		0.082	0.074
		(0.055)	(0.059)
logemp		-0.001	0.008
		(0.094)	(0.096)
logmedsales		0.067	0.046
		(0.098)	(0.103)
compinprod_av		-0.002	-0.002
		(0.003)	(0.003)
growth_med			0.008
			(0.025)
Constant		-1.956**	-1.861*
		(0.708)	(0.730)
Chi squared		197.60**	182.23**
Observations		201	199
Number of ID		65	65

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Table 4, Effect of Firm Characteristics on Innovation and Sales Growth

	(5) INNOVATION	(6) INNOVATION	(7) SALES GROWTH
b2b0	0.024	-0.073	0.054
	(0.091)	(0.090)	(0.076)
b2b	0.005	0.022	-0.026
	(0.058)	(0.056)	(0.061)
c2b0	0.059	0.051	0.047
	(0.057)	(0.060)	(0.047)
b2c	-0.207	-0.187	0.082
	(0.140)	(0.145)	(0.075)
c2b	**-0.273***	**-0.227+**	0.012
	(0.123)	(0.122)	(0.069)
execcount	**-0.575***	**-0.628***	-0.069
	(0.263)	(0.275)	(0.095)
execsame	**0.590***	**0.644***	0.075
	(0.264)	(0.275)	(0.096)
execchange	0.013	0.032	0.003
	(0.040)	(0.040)	(0.030)
execnew	**0.567***	**0.626***	0.065
	(0.263)	(0.274)	(0.093)
market	0.027	0.032	0.011
	(0.027)	(0.027)	(0.021)
unit	0.020	0.001	-0.024
	(0.054)	(0.055)	(0.051)
logemp	0.164	**0.242***	**0.319****
	(0.101)	(0.096)	(0.080)
logmedsales	0.001	-0.110	**-0.380****
	(0.106)	(0.101)	(0.081)
compinprod_av	0.005	**0.006***	0.003
	(0.003)	(0.003)	(0.003)
growth_med		**0.059****	
		(0.018)	
Chi squared	68.52**	79.53**	24.91*
Constant	-2.389**	-1.945*	2.078**
	(0.809)	(0.833)	(0.608)
Observations	178	176	179
Number of ID	56	56	56

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Appendix A: Medical Sector Product Markets

A. Healthcare services

Ambulatory (Holter) Monitoring Services
Ambulatory Care Facility Management Services
Biomolecular Research and Development
Clinical Laboratory Testing Services
Consulting and Planning Services
Contract Research Services; Medical R&D Services
Dental Facility Management Services
Dental Laboratory Services
Diagnostic Imaging Services
Disinfection Services, Equipment and Supplies
Emergency Medical Services
Employment Services
Environmental Testing Services
Food Service and Catering Operations
Health Care Cost Management
Health Maintenance Organization (HMO) Management Services
Home Health Care Services
Hospital Department Management Services
Hospital Management Services
Hospital Supplies Distribution
Hospital/Medical Facility Financing, Planning and Construction
Housekeeping and Laundry Services
Instrument Refurbishing and Reconditioning Services
Instrument Repair and Maintenance Services
Laboratory Animals
Leasing and Rental Services
Medical and Health Insurance
Medical Clinic Management Services
Medical Data Processing Services
Medical Educational and Training Services
Nephrology Treatment Services
Nursing Home Management Services
Optometric Services
Other Medical Services
Outpatient Facility Management
Outpatient Medical and Surgical Services
Packaging Services
Pharmaceutical Services
Preferred Provider Organization (PPO) Management
Radiological Monitoring Services
Radiological Testing Services
Rehabilitation Services
Respiratory Therapy Services
Sterilization Services
Transtelephonic Electrocardiogram Analysis Services
Waste Disposal Services, Equipment and Supplies

B. Ophthalmic devices

Contact Lenses
Eyeglass Frames and Lenses
Intraocular Lenses
Ophthalmic Diagnostic Equipment
Ophthalmic Supplies and Accessories
Optical Products
Opticians' Apparatus

C. Pharmaceutical products

Animal Products
Biochemicals, Chemicals and Related Med Chem
Biologicals
Biomaterials
Blood and Blood Products
Consumable Products
Chemicals
Dietary, Nutritional and Vitamin Supplements
Drug Delivery Systems
Parenteral and Irrigating Solutions
Pharmaceutical Apparatus and Supplies
Pharmaceuticals, Drugs and Medicines
Radioisotopes
Radiopaque Contrast Media
Radiopharmaceuticals
Veterinary Products

D. Dental devices

Dental Equipment
Dental Products
Dental Prosthetics
Dental Supplies
Dental X-Ray Apparatus

E. Medical devices

Ambulatory (Holter) Monitoring Equipment
Analytical Balances
Analytical Imaging Equipment
Analytical Instrument Data Systems
Analytical Instruments
Anesthesia Equipment and Accessories
Animal Equipment and Supplies
Anti-Embolism Devices
Appliances and Utility Equipment
Arterial Grafts
Artificial Voice Devices
Auditory Testing Equipment
Automated Cell Sorters
Automated Chemistry Analyzers
Automated Immunoassay Systems
Automated Liquid Chromatography Analyzers
Automated Microbiology Analyzers
Automatic Slide Stainers
Biofeedback Equipment
Blood Collection Supplies
Blood Flowmeters
Blood Gas Analyzers and Monitors
Blood Pressure Measuring Equipment
Blood Processing Equipment
Calibration and Test Equipment
Cardiac Assist Equipment
Cardiac Pacemakers
Cardiopulmonary Diagnostic Equipment
Cardiovascular Accessories
Cell Culturing Systems
Centrifuges
Clinical Laboratory Products
Coagulation Testing Equipment
Computed Tomography (CT) Scanners
Contraceptive Devices
Cryosurgical Equipment
Culture Media
Defibrillators
Diagnostic Imaging Products
Diagnostic Reagents and Test Kits
Digital Subtraction Radiography Equipment
Dilutors and Dispensers
Dressings and Bandages
Electrocardiographs
Electrochemical/Biochemical Sensors
Electrodes, Cables, Leads, and Gels
Electroencephalographs
Electrolyte Analysis Equipment
Electromedical Apparatus
Electromyographs
Electron Microscopes
Electronic Blood Cell Counters
Electronic Thermometers
Electrosurgical Instruments and Accessories
Emergency Medical Products
Endoscopes, Arthroscopes and Related Products
Enteral and Parenteral Hyperalimentation Products
Environmentally Controlled Enclosures
Evacuation and Filtration Equipment
Fermenters, Freeze-Dryers/ Processing Equipment
Fiberoptic Examining Scopes
Freezers and Refrigeration Equipment
Furniture and Casework
Gamma Cameras
Gas Chromatographs
General Disposables
Hearing Aid Accessories
Hearing Aids
Heart Valves
Heart/Lung Machines
Home Care Equipment and Supplies
Hyperbaric Chambers
Hypo/Hyperthermia Therapy Equipment
Image Recording Systems
Immunohematological Testing Instrumentation
Implantables
Incontinence Products
Infection Control Products
Infusion Devices
Injectors
Kits and Trays
Laboratory Data Processing Equipment
Laboratory Equipment/Supplies
Laboratory Glass and Plastic Ware
Laboratory Incubators
Laboratory Ware
Laminar Flow Stations
Lamps and Lighting Equipment
Lasers
Life Support Systems
Lithotripters
Lung Function Testing Equipment
Magnetic Resonance Imaging (MRI) Equipment
Manikins
Mass Spectrometers
Materials Handling Systems
Medical Communications Systems
Medical Data Processing Equipment

Medical Data Processing Software Systems
Medical Educational and Training Products and Supplies
Medical Electronic Diagnostic Equipment
Medical Equipment Power Sources
Medical Gasses and Equipment
Medical Linens and Apparel
Medical Transportation
Medical/Surgical Gloves
Medical/Surgical/Hospital Supplies
Microbiological and Serological Testing Equipment
Microporous Membrane and Other Filters
Microscopy Accessories
Microtomes
Neonatal Incubators
Neurostimulators
Nuclear Diagnostic Equipment
Nuclear Instruments
Nuclear Supplies and Accessories
Nucleic Acid/Peptide Synthesizers
Neonatal Care Products
Operating Tables
Optical Microscopes
Orthopedic Devices and Appliances
Orthopedic Instruments
Ostomy Appliances and Supplies
Other Medical Equipment
Oxygen Therapy Equipment
Pacemaker Accessories
Pathology Tissue Processors
Patient Comfort Aids and Appliances
Patient Identification Products and Services
Patient Monitoring Equipment and Accessories
Patient Restraint Products
Patient Transport Systems
Patient Weighing Equipment
Penile Prosthetic Devices
Physical Therapy and Rehabilitation Equipment
Physicians' Aids
Physicians' Office Testing Equipment
Physiological Testing Equipment and Recorders
Physiological Therapeutic Equipment
Prosthetic Devices
Pulmonary Function Testing Equipment
Pumps
Radiation Therapy Equipment
Radioimmunoassay Test Kits
Radiological and Nuclear Equipment
Radiology/Nuclear Laboratory Data Systems
Recorder Paper Charts and Records
Renal Dialysis Equipment
Renal Dialysis Supplies
Renal Dialyzer Reprocessing Equipment
Respiratory Gas Analyzers
Respiratory Therapy Equipment
Scintillation Counting Equipment
Separation Products; Chromatography & Electrophoresis Equip.
Special Medical Vehicles
Specialty Beds
Specialty Tables and Chairs
Spectrophotometers, Colorimeters, Fluorometers, Nephelometers
Sterile Packaging Materials
Sterilizing Equipment and Supplies
Suction Machines
Supply and Other Carts and Cabinets
Surgical and Obstetric Drapes
Sutures and Fasteners
Syringes and Needles
Staining Machines
Telemetry Equipment
Thermographic Diagnostic Equipment
Thermometers
Tubings, Tubes and Catheters
Ultrasonic and Other Transducers and Accessories
Ultrasonic Diagnostic Equipment
Ultrasonic Instrumentation
Urological Equipment
Water Treatment Equipment
Wheelchairs, Manual
Wheelchairs, Motorized
X-Ray Apparatus
X-Ray Developing Solutions Recovery Equipment
X-Ray Film
X-Ray Film Loading, Processing and Handling Equipment
X-Ray Record Storage and Retrieval Equipment
X-Ray Supplies and Accessories
X-Ray Tables

Appendix B: Descriptive Statistics and Correlation

		Mean	S.D.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(
(1)	entry	1.236	2.391	0	12	1						
(2)	exit	1.33	4	0	54	0.08	1					
(3)	innov	0.889	1.638	0	8	0.68	0.27	1				
(4)	b2b0	0.352	1.24	0	13	0.30	0.11	0.15	1			
(5)	c2b0	0.966	2.021	0	15	0.22	0.19	0.19	0.17	1		
(6)	b2b	0.446	1.474	0	14	0.21	0.27	0.30	0.37	0.09	1	
(7)	b2c	0.472	1.049	0	9	0.23	0.14	0.21	0.09	0.28	0.25	
(8)	c2b	0.356	1.146	0	13	0.06	0.16	0.03	0.30	0.08	0.30	
(9)	execcount	28.748	35.083	1	214	0.48	0.38	0.37	0.42	0.47	0.46	
(10)	execsame	10.816	13.781	0	119	0.45	0.22	0.33	0.15	0.34	0.43	
(11)	execchange	2.52	3.564	0	33	0.23	0.30	0.19	0.13	0.47	0.21	
(12)	execnew	17.946	25.042	0	177	0.43	0.41	0.34	0.51	0.48	0.41	
(13)	exist	7.693	11.773	0	84	0.40	0.52	0.39	0.47	0.37	0.65	
(14)	unit	4.473	5.103	1	36	0.40	0.51	0.40	0.46	0.43	0.58	
(15)	logemp	7.62	2.617	1.792	12.107	0.32	0.24	0.31	0.29	0.08	0.36	
(16)	logmedsales	11.31	2.594	6.215	16.249	0.27	0.26	0.27	0.28	0.15	0.36	
(17)	growth_med	1.182	4.11	-0.982	44.5	0.16	-0.01	0.17	0.30	-0.03	0.02	-
(18)	compinprod_av	76.255	40.448	19.4	239.8	0.02	-0.08	0.00	-0.05	-0.07	-0.06	-

	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(8)	1										
(9)	.28 0	1									
(10)	.22 0	.82 0	1								
(11)	.14 0	.61 0	.57 0	1							
(12)	.27 0	.95 0	.60 0	.53 0	1						
(13)	.45 0	.75 0	.55 0	.39 0	.75 0	1					
(	0	0	0	0	0	0	1				

14)	.43	.82	.60	.45	.82	.93					
(	0	0	0	0	0	0	0				
15)	.29	.61	.49	.48	.59	.47	.51	1			
(	0	0	0	0	0	0	0	0			
16)	.34	.63	.52	.52	.60	.51	.54	.86	1		
(	-	0	-	-	0	0	0	0	0		
17)	0.03	.00	0.06	0.03	.03	.06	.05	.02	.13	1	
(	-	-	-	-	-	-	-	-	-	-	
18)	0.03	0.10	0.08	0.04	0.08	0.10	0.17	0.16	0.06	0.04	1