Structure, Strategic Groups, and Competitive Advantage: A Study of Employee Entrepreneurship

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THESIS

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Summary

The strategy literature has traditionally studied large firms in oligopoly industries with rare assets to obtain a competitive advantage. In more structured and competitive industries, traditional strategy research observes firms competing on scale, differentiation and inter-firm cooperation. My research focuses on industries with little structure and many competitors, where the industry actors are autonomous individuals creating and appropriating value. In industries that are fragmented, entrepreneurs coalesce to form firms similar to the firm behavior of strategic groups in structured industries. The linkages of interaction observed in this study are on the individual firm with collaboration effects as they relate to performance. I utilize entrepreneurial and resource-based theories to understand the autonomous value creation and appropriation process. I also utilize strategic group theory to understand the strategic advantages for entrepreneurs operating within a firm. This framework creates a lens to view strategies for obtaining a competitive advantage in fragmented industries and provides insight for structured industries by integrating firm-level (resource-based theory) and industry-level (strategic group theory) thought with a multiple-level empirical investigation.

I developed a conceptual view of professional service providers to understand fragmented industries where stable rent-producing structures develop in the absence of institutional supports. I then discussed a theoretical framework where individuals make their own markets and gain a competitive advantage through collaboration. The framework also describes the intimate link between firms and individuals in fragmented industries, specifically professional services. These conceptual and theoretical foundations are used to develop hypotheses about how cooperation works at the individual and firm levels of analyses. At the individual level, market actors seek to

create value based on general market information using social capital. Professional service firms are groups of individuals utilizing temporal market information to develop customized, local service products. The firm provides an arena for individuals to collaborate at the individual level while competing with rival firms by creating performance differentials.

Context for this research is the search-consulting industry because of its fragmented nature. The database consists of 30,901 transactions nested within 3,050 professionals nested within 445 firms. The multivariate linear regression models support investment effects by individuals on performance. The multi-level mixed effects linear regression model advanced is partially supported to demonstrate a cross-level collaborative investment effect on performance. While group membership in itself does not have an effect on performance, certain investments in collaboration do impact performance across levels. The results and their implications are discussed.

CHAPTER 1 INTRODUCTION

1.1 The Research Question

The strategy literature has developed from basic questions such as, 'Why do firms exist?' (Coase, 1937) and 'Why do multi-person, multi-process firms exist?' (Malmgren, 1961). These questions are usually addressed with theory describing the firm as a system for inputs and outputs, endlessly referred to as a 'black box.' The allocation decisions for inputs and outputs are made by individuals, or managers, that plan and coordinate the economic activities for the firm. Firms competing in industries against non-cooperating rivals, compete for resources and talent to address the competitive environment. Sir Dennis Robertson described this firm-industry relationship as "islands of conscious power in this ocean of unconscious cooperation like lumps of butter coagulating in a pail of buttermilk" (1928: 85). This metaphorical view describes a dynamic understanding of the firm, which is used by Coase (1937) to describe internal firm organization to address a changing competitive environment. For example, an industry with economics of scale will experience firms making investments in vertical integration or others ways to gain scale.

The conventional strategy literature has been about systemic approaches to gain advantages over the market. Traditionally, strategy research has focused on resource advantages to obtain market power and restrict competition. But what happens when the competitive environment lacks any of the bases for restricted competition that are available to competitors elsewhere? What about strategy for firms in hyper-competitive markets without traditional

resource advantages to obtain market power? Do firms in these competitive fragmented environments have the ability to avoid being subjected to market forces by working with others to gain market power?

Robertson (1928) suggests the locus of advantage rests with the manager, where "In the main co-ordination of the efforts of the isolated business leaders is left to the play of impalpable forces – news and knowledge and habit and faith, and those twin elements, the Laws of Supply and Demand" (1928: 86). Thereby, the main firm effect is a manager's ability to use market information within some economic limits. In a competitive fragmented environment there is little-to-no industry structure of resource advantages and little-to-no industry supports of market power. So in the absence of structure and support, individuals and firms must cooperate to some degree and at some level just to survive. This is the overall conceptual understanding that guides my research to understand how cooperation works at various levels of fragmented industries?

So fragmented industries – analogous to the lawless Wild, Wild West – must have some type of informal support or structure that allows firms to compete. Thus, the specific research question for my dissertation is *how does a stable rent-producing structure develop in the absence of institutional supports*?

1.2 Purpose

The area of strategy I find interesting is the strategic decisions made to attract membership of a group – both in the sense of autonomous individuals working together as well as firms seeking membership among peers. My theoretical study of this research is based on publications from Mark Shanley's earlier work to develop a conceptual theoretical model. I then identified data and variables from the database to address hypotheses based on my research question.

The purpose of this dissertation is to address gaps in the strategy and entrepreneurship literature. There are gaps in the strategy literature to explain the structure of fragmented industries as well as the entrepreneurial strategies used to compete in these industries. The strategic group literature has generally focused on the commonalities of firms and differences among groups within an industry. While there is a research stream that has examined the unique characteristics of firms within strategic groups (e.g., Cool and Schendel, 1988; Lawless, Bergh, and Wilsted, 1989; Reger and Huff, 1993), there are currently only a few studies.

1.3 Context

The approaches to research that I find to be most interesting are those developed from business historian, Alfred D. Chandler (1962), who used reconstructive logic of multi-divisional organizations in oligopoly industries to explain firm strategy and industry structure. The fragmented industry context for this study is the search-consulting industry, examined though the

theoretical lenses of strategic groups and entrepreneurial market making. Following a similar approach, I propose a framework that captures the collaborative nature in fragmented industries.

Strategy researchers have primarily relied on the study of large manufacturing oligopoly firms to answer research questions. These devoted research efforts, typically seek to understand competitive advantage for firms in structured product industries. Relatively little attention has been focused on the unique aspects of gaining a competitive advantage in fragmented service industries. As a result, theories of firm behavior and performance based on Coase's (1937) theoretical work focus on the price mechanism (i.e., the costs of negotiating and writing enforceable contracts) and cost-minimization strategies (i.e., reducing bureaucratic costs), which are the foundations of transaction-costs theory. Building on these theoretical foundations, the research stream on firm behavior has developed a theory to understand routines and production capabilities. Again, these concepts are based mostly on large manufacturing firms, or where Nelson and Winter (1982) parametrically depict within their seminal work that "when we speak of production capabilities, we have manufacturing prominently in mind" (1982: 60). Another strategy research stream – and the most prominent – focuses on resource-based theories, which describe large dominate firms that maintain a competitive advantage by possessing superior assets. Contemporary strategy research persistently examines resource-based theories where the possession and deployment of unique resources are key to firm performance. There are limitations to a resource-based theoretical research stream, however, stemming from a static, non-predictive notion "that virtually anything associated with the firm can be a resource" (Priem and Butler, 2001: 32). Therefore, resource-based theories allow for broad generalizations without identifying aspects of firm heterogeneity, and thus create problems of measuring a resource's effects on performance.

The strategy research focus on extending generalizations from large oligopoly manufacturing firms can be seen in the literature streams of behavioral theory of the firm (Barnard, 1938; Simon, 1947, 1982; March and Simon, 1958; Cyert and March, 1963), property rights theory (Libecap, 1989; North, 1990; Hart, 1995) and agency theory (Berle and Means, 1932; Arrow, 1985). Overall, strategy research has not attended to the issues of fragmented industries. A reason more strategy researchers have not studied fragmented industries is the difficulty in researching these industries. Industries with many players force participants to continually change behavior with shifts in the environment, creating logistical difficulties for researchers looking to study firm behavior in fragmented industries.

My theoretical approach to studying fragmented industries, in an economic sense, is to observe the behavior of firms according to indicators that suggest profitable potential by cooperating with competitors. I observe individuals grouping together to form firms in a fashion that is not unlike firm behavior to form strategic groups. When individuals, who are fully capable of independent market activity, participate in a firm structure, they become an amalgamation of autonomous cooperating individuals. This form of coalescing independence is parallel to the logic of firm-forming strategic groups to gain market power. The definition of entrepreneurship used in this research is the process used by individuals to choose channels of information, the judgment process used to select the flows of information out of these channels, and the process to synthesize information to address market gaps; thereby understanding entrepreneurship as an intermediation, or "market-making" process. The theoretical concept of entrepreneurial market making provides insight into this individual-focused study of the process of value creation and appropriation in an ever-changing and coagulating competitive environment.

The empirical setting is franchising in the search-consulting industry, a fragmented industry. The top ten search consulting firms realize less than 18 percent of industry revenue, and the output is forecast to grow at an annual compounded rate of 5 percent between 2013 and 2017. (Hoovers, March 2013). I use one of the largest search-consulting firms (1 percent market share) with hundreds of offices. The use of franchises in professional service industries is not fully understood in the literature. I have found the offices within my sample to behave as individual firms competing with each other as though they were independent. A franchise structure usually has some form of shared resources in the form of advertising, branding or education. However, my sample does not enjoy these shared benefits; therefore I treat each office as a firm and refer to them as such. The offices of the franchise are assigned to one size group based on industry and type of placement (e.g., entry level, CEO level). The offices collaborate within groups, across groups, and outside the franchise network. Thus, the grouping of these offices seems to be nominal strategic groups.

1.4 Organization of this Dissertation

The dissertation will explain the effects of different types of service experience on performance outcomes for an overall conceptual understanding of how cooperation works in fragmented industries. The next chapter is a review of the pertinent literature on industry structure, competitive advantage and entrepreneurship. In chapter three, I present the theoretical concepts and testable hypotheses. The methodology is discussed in chapter four to describe the data and the variables used in my study, and the empirical methods used to test my hypotheses. Chapter five is data analysis and discussion, which will present the empirical

models, results and main statistical discussions. Finally, chapter six will discuss main findings, conclusions and limitations of my study.

CHAPTER 2 LITERATURE REVIEW

Two topic areas within strategy research – industry structure and competitive advantage – are reviewed below to motivate this study's consideration of cooperation-fragmented industries. The next three sections of this chapter will introduce how these ideas have been developed within different research streams. The first section on industry structure reviews the boundaries of the firm as it relates to the market and competitive landscape. The second discusses competition in terms of positioning and dynamics within the industry landscape. The final section of this chapter reviews the concept of entrepreneurial market making as an autonomous process of market participation.

2.1 Industry Structure

Industry as a unit of analysis is considered a 'system for ordering', or an overall distribution and allocation mechanism of industry resources among firms. The strategy literature has used this ordering system foundation (Mason, 1937) and is the main argument to the theory of industry structure determining firm behavior (Bain, 1956), or the 'structure-conduct-performance' (S-C-P) paradigm. Structure refers to a set of related elements to characterize industries allowing for assessment of competitiveness or attractiveness. As structure elements are contrasted by a variety of overall metrics then a profile can be formed to determine the conduct available to firms participating in the industry. The conduct of output and pricing strategy will be based on the industry structure that determines the performance, defined as profitability and efficiency, for individual firms as well as the industry as a whole. Thus, the S-

C-P approach suggests that highly competitive markets may be the most efficient structure for an industry. While the resource-based theories focus on resources and capabilities, the S-C-P paradigm is concerned with positioning. In this regard, the S-C-P paradigm can be considered a modern-day 'invisible hand', depicting structure-determining firm behavior due to firms reacting to the environment.

Industry structure limits the executable strategies used to gain rents. A consolidated industry (e.g., oligopolies or cartels) has one or two dominate firms with a clear value chain structure, which allow incumbent firms to benefit from the strong structural mechanisms of high entry and exit barriers. Consolidated industries will likely experience economies of scale and/or asset possession to ensure long-term performance. Firms in fragmented industries behave differently due to a different set of limitations of executable strategies. The general characteristics of fragmented industries are low entry barriers and hard-to-differentiate products. Low barriers to entry allow for a constant flow of competitor entry and exit, which maintains fragmentation and allows for unpredictable conduct. In addition, fragmented industries do not allow for scale economies as a strategy since value differentiation is based on a localized technology of customization. Therefore, fragmented industries are characterized with many competitors and no structural mechanisms requiring different strategies for rents.

Firm conduct for economic rents will be those executable strategies to best compete within a given industry structure, so oligopoly firms will use collusion within a clear value chain, for example the metal mining industry (Spar, 1994). Firms in structured industries will look to long-term performance with valuable assets and distribution channels. Firms in fragmented industries will create value from individuals using general industry knowledge and individual relationships.

The three industry structures (oligopoly, structured, fragmented) are delineating by the industry elements in **Table 1**. An industry's basic descriptive elements will define or limit the executable strategies of firms participating in a particular industry. However, the conduct will be determined by the abilities and judgment of the firm's entrepreneurs. The next subsection discusses the industry elements.

Table 1: Elements of Industry Structures

Industry Characteristics	Cartel/Oligopoly	Perfect/Structured	Fragmented
Number of Firms			
Firm size	Very large	Large to small	Small
# of competitors	Few	Many	Many
# of dominant firms	One	Few	None
# of buyers	Few to many	Many	Many
# of fringe firms	None to few	Few to many	Many
Output			
Level of output	Low	Low or High	High
Level of Substitution	None/Low	Low or High	High
Barriers			
Entry/Exit Barriers	High entry/exit	Varying entry/exit	Low entry/some exit
Structural Barriers	Coercion/fiat	Governmental (i.e., licensing)	Trade association certifications
Scale			
Scale Economies	Yes	Maybe	No
Groups			
Strategic Groups	One industry leader	Yes, with one or more industry leaders	Many
Specificity			
Transaction Costs	Commodity	Asset	Temporal
Firm Strategy and Structure			
Firm Structure	Agreements	Hierarchical	Flat/autonomous
Firm Strategies	Collaboration and entry threats	Absolute cost advantage and differentiation	Performance differentials and strategic groups
Examples of Collaboration	Diamond jewelry value network	Hotels or food trucks	Strategic groups: independent insurance agents or realtors

2.1.1 Industry Elements

Porter's five-forces for industry attractiveness and the concept of generic strategies (1980, 1985) provides a generally accepted framework to review the industry elements in **Table 1**. A fragmented industry reviewed by a five-forces framework will not be considered attractive. However, firms are competing in fragmented industries and they use strategies of limited market participation (i.e., geography) or investments in reputation, collusion or alliances. The five-forces framework is based on the structure-conduct-performance paradigm to assess overall profitability by analyzing industry rivalry, buyers, suppliers, new entrants, and substitutes.

Rivalry. The number and size of firms establish the boundaries of the industry. The number of the firms indicates the size of the industry, the concentration of the industry and its competitive potentials. The structure-conduct-performance paradigm suggests that when there are more firms in the industry,prices will be lower. In an industry with many firms, a low cost approach may be necessary if the competition is competing at low pricing. If there is one or few dominant firms, regardless of concentration, then an industry structure will form from the influence imposed from dominant firm conduct. As firms react to the activities of dominant firms, then informal conduct norms are developed to provide structure. The informal structural mechanism that can develop may be an industry price that is suitable to all industry participants. In a fragmented industry with many small firms and no dominant firm, there are also many firms on the fringe of the industry, which actually blend the industry boundaries with other firms in other industries. Industry blending makes informal industry mechanisms for structure difficult to create since there are incentives for firms to compete on price.

Buyers. The sophistication of the buyer and the product creates different challenges within an industry. A fragmented industry is often characterized to be commoditized with low

barriers to entry, a lack of scale economies, low capital requirements, easy-to-access distribution channels, low switching costs, little government policy, and no real cost disadvantages independent of scale (i.e., food trucks do not have to pay rent in high foot traffic locations). A frequently used commodity product without much strategic value does not provide much leverage in differentiation or cost-leadership strategies. However, as sophistication rises within the buyer or the product, then industry opportunities arise.

When buyers view a product with few differentiated features or capabilities, the purchase decision will be primarily based on price; however, when the buyer's decision is strategic (i.e., hiring a consulting firm to replace a CEO), then the slightest of differentiation can be critical. An example where the product and buyer are sophisticated and marginal differentiation matters is with management consulting firms, which provide advice for firms to gain a competitive advantage.

Suppliers. The overall consideration for suppliers in a five-forces analysis is similar to buyer concerns in that it focuses on the power of suppliers relative to the buyers in the downstream industry. In this regard, the factors considered are the number of input suppliers compared to the number of downstream buyers as well as the competitiveness for the input. The traditional approach is to assess the specificity of the input in the supplier relationship. However, in a fragmented industry the concern of specificity will be greater in the firm-buyer relationship. The next couple of paragraphs will review the literature on specificity.

Williamson (1975, 1985) developed a theory of market and institutional structure based on asset specificity, defined as "the degree to which an asset can be redeployed to alternative uses by alternative users without sacrifice of productive value" (Williamson, 1985: 95). The cost

of a specific asset can be quantified by the value of its "appropriable quasi-rents" (Klien, Crawford, and Alchian, 1978: 298) or the value of its next best use. Williamson distinguishes four types of asset specificity: human, physical, site, and dedicated (Williamson, 1983: 526). Subsequently, scholars have expanded the specificity concept with brand-name capital specificity (Williamson, 1985), temporal specificity (Malone, Yates, and Benjamin, 1987; Masten, Meehan, and Snyder, 1991) and procedural specificity (Zaheer and Venkatraman, 1995). The concept of asset specificity has been criticized for being loosely defined (Barthelemy and Quelin, 2002) and without agreed operationalizations (David and Han, 2004; Lohtia, Brooks, and Krapfel, 1994; Shelanski and Klein, 1995), mostly on the grounds that asset specificity is not directly observable and thus requires multiple indicators (Morill and Morill, 2003). However, the conceptual use of specificity does differ by industry and provides an element to delineate industries.

The specificity concept will differ by the structure of the industry. For instance, fragmented industries include a product or buyer dimension that is reliant on time. This dimension is the critical component of temporal specificity, which is concerned with the timing and coordination of activities for a specific asset (Masten, Meeham, and Snyder, 1991; Pirrong, 1993; Lamminmaki, 2005). One of the first literature examples of temporal specificity is the shipbuilding industry (Masten, Meeham, and Snyder, 1991; Lohtia, Brooks, and Krapfel, 1994) used to describe strategic hold-up (Williamson, 1985). In this example, the critical component of the manufacturing process is the timing and coordination of supplier parts. If there is a delay in the manufacturing of the ship due to a supplier part, then a temporal specificity exists and potential hold-up power is present. The shipbuilding example describes the supplier-buyer relationship where the timing of service delivery is more of a transaction costs concern to the

buyer (De Vita, Tekaya, and Wang, 2010). Temporal specificity has been operationalized with proxies, such as precise scheduling (Masten, Meeham, and Snyder, 1991), the timely delivery of hotel linen (Lamminmaki, 2005), and even a rating of service punctuality (Brown and Potoski, 2005). Among the few studies that have sought to operationalize temporal specificity, the focus has been on the buyer concerned with hold up.

Fragmented industries pose a concern for the buyer but also concern for the supplier; and the two are linked. With open access to inputs (lack of input specificity), the time component for production is the critical component for the supplier, while also managing the transaction costs with the buyer. So, when the unique bundling of inputs is the product and the product is customized for a buyer, then the time sensitive aspects of the inputs and the transaction costs of the product to the buyer need to be engineered. Therefore, the temporal specificity concept extended to fragmented industry production is fundamentally rooted in the relationship with the buyer**.**

Entrants. Entry barriers are not a concept familiar to fragmented industries because by definition there are low-to-no barriers of entry – allowing for easy access into the industry. The concept of new entrants in the Porter five-forces framework is based on the barriers in place that restrict the ability of new firms entering the industry. The effects of entry barriers are essentially an aggregation of productive inputs that create cost differentials between incumbent firms and new entrants. Entry barriers are an important advantage to oligopolies, so much so that the concept "cannot be constructed in isolation from a theory of oligopoly behavior" (Gilbert, 1989: 478). The descriptive element of an oligopoly is the low level of output with little to no substitute products and large sunk costs that serve as barriers to exit (Sutton, 1991).

The effect of low entry barriers in fragmented industries is competition on multi-dimensional pricing. When barriers are low, the industry takes on a cyclical nature of entry and exit that adds to the environmental complexity for incumbent firms. For instance, if there is strong demand and potential profits with low barriers then there will be large numbers of entrants likely resulting in excess capacity. When an industry reaches excess capacity, differentiation becomes even more difficult and competition will shift to pricing. Game theory suggests the best strategy in an industry with many players is a cost-position strategy because it will enable profitability at times of excess capacity. However, in fragmented industries, pricing is a structure mechanism reflecting the differentiatial dimensions of quality, brand and reputation.

The structural mechanisms, such as multi-dimensional pricing, within an industry to favor incumbent firms evolve from non-market forces or from individual firm investment. While these mechanisms do not restrict entry into the industry, they do create difficulties for mobility within the industry. A cartel industry experiences investments by a dominant firm to control the value network, thus creating its own structural mechanisms. In a structured industry, the development of structure mechanisms can be seen by the non-market coercion of government licensing. This is apparent in the legal industry where participants are required to obtain a license from state government and participate in the industry trade association. In this instance, the government coercion creates a barrier to entry as well as a structure mechanism enforcing trade association compliance. A fragmented industry does not have entry barriers or non-market coercion but may find advantages from investing in elements of the pricing mechanism.

The investments by firms to gain an advantage become sunk costs observable to potential new entrants. The barriers to entry and exit concepts are developed from the structure-conduct-performance paradigm suggesting a one-way chain of causation beginning with structure to

conduct and to performance. Sunk-costs theory (Sutton, 1995) extends the structure-conduct-performance paradigm by addressing a two-way link between structure and conduct. Understanding sunk costs in this way allows for predicting the way in which the market size/market structure relationship varies among industries. Caves and Porter (1977) argue sunk costs into specific assets impede capital mobility, thus limiting and suggesting executable strategies.

Substitutes. The concepts of substitutes and complements influence demand in the industry. The availability of close substitutes depending on the price of the substitutes may pose a threat. Traditional strategy considers an inverse effect for complements to increase demand. However, in fragmented industries with boundaries blending with other industries invites firms with complements to compete. For example, hospital will have a wide array of services offered to bundle the services in area that may not be specific to the hospital industry (i.e., pharmacy). So in this regard, complements in fragmented industries are not necessarily a boost to demand.

In summary, there are clearly industry structural differences limiting the executable strategies for firms. While an industry may not seem attractive – in terms of the five forces – firms will either seek to limit their market (i.e., geographic segmentation) or invest to create self-made structures. As I discussed, the traditional strategy concept of pricing in low-barrier industries does not consider behavior when pricing experienced in fragmented industries is multi-dimensional. So the industry elements will determine the competitive behavior for an unattractive industry, whether in the form of investments in reputation, branding collusion, alliance with complementary products or the like.

2.1.2 Strategic Groups

So industry structure will influence a firm's strategy that will determine the firm's structure. Thus, a strategy of value-chain dominance is not available for firms in fragmented industries because there are no scale economies available to them. However, in an oligopoly where there are scale economies and the strategy is collaboration then firm structures will take the form of coercible agreements. Similarly in structured industries where the strategies are to obtain cost or differentiation advantages then firm structures will adopt a hierarchical design to command assets. When the gathering of valuable assets and value chain control is not an option, then there must be ways to obtain economies and structure for reliable rents. Strategic approaches in fragmented industries are to create performance differentials and to collaborate with a firm structure that is flat in order to allow for autonomous individual production. The strategy literature stream on strategic groups has sketched out this strategic approach.

Industry structure (including industry size) will influence the size of the firm, since managerial choices to increase the size of the firm can be justified more in some industries than in others. The composition of the firm can also be influenced by industry, both in the diversification of units and the extent to which forward or backward integration may be justified. In fragmented industries, however, there will be fewer of the bases for large size and differentiated organization that is possible in oligopolies. Chandler (1977; 1990) shows how large firm size and articulated structures are associated with oligopolistic industries. In fragmented industries, however, synergies and scope economies may only be achievable by cooperation among smaller competitors and their suppliers and buyers. So these firms can only imitate large structured firms by informal associations, or strategic groups, rather than formal structures.

Industry groups can form naturally as efforts to cooperate to avoid the rigors of competition – i.e., little collusive groups within industries. The key issue is whether the "group" is a real collective or just a coincidental association of firms, in which case, the group does not cause performance at all, but rather the firms are all performing well by doing similar things (with no group effect). The early literature on strategic groups identified combinations of member-firm similarities based on scope and resource commitments (Cool and Schendel, 1987: 1106). Research does show that group membership can account for a significant portion of performance variance (Ketchen, et.al., 1997). For instance, firms in the pharmaceutical industry share the same risks with similar strategies, yet there is considerable variance in profitability (Cool and Schendel, 1988). A common economic principle is that "rent (i.e., advantage) commanded by a strategy declines with increases in the number of rivals that can replicate it" (Caves, 1984: 131) because rivals will mimic successful firm strategies.

The investments firms make in defining their collective strategies and limiting mimicking and new entry – what Caves and Porter (1977) call mobility barriers – are not easily identified and measured (Shanley and Peteraf, 2005). When the investments made by group members are observable costs, such as research and development or patents, then they are easily quantifiable. However, observable costs do not include the many intangible types of mobility barriers, for example, reputation and image (Peteraf and Shanley, 1997). Even when these unobservable barriers can be estimated, it is difficult linking them to performance. Mobility barriers are often the result of collusive efforts from members in a strategic group. The profitability for group members depends on the industry and the firm's characteristics. If industry rivalry is based on pricing dimensions of skill, preferences, information flow, or relative power among firms, then

the group investment for mobility barriers will be along one or more of these strategic differences.

Fragmented industries are especially sensitive to contextual dynamics and firms may not possess the capital for investments large enough to favorably impact the industry structure. Investments may not be "financial" capital; it can be in the form of shared reputation or through cooperative efforts of valuable professionals. Industries will experience several different strategic groups delineated by member investments and a variety of different benefits for members. For example, strategic groups may form to benefit from geographical proximity while other groups in the same industry seek to benefit from scale or scope economies. These benefit differences among firms, along with the difficulties of linking unobservable value-added to performance, highlight the complexities of industry and stress the importance of industry context (Mascarenhas, 1989).

2.2. Competitive Advantage

The previous section discussed industry structure and the strategies available to each structure. This section presents the schema and relevant thought on the elements of competitive advantage within each structure. There is little research investigating the competitive advantages used in fragmented industries. My theoretical examination of competitive advantage is a positive theoretical approach to the value creation and appropriation process, as depicted in **Table 2**, by the delineating elements of the primary form of capital, politics, price elasticity, value creation and appropriation, and mobility barriers.

Table 2: Dimensions of Competitive Advantage

Competitive Advantage Dimensions	Cartel/ Oligopoly	Perfect/Structured	Fragmented
Primary Form of Capital	Cultural	Economic	Social
Politics	No Collaboration	Economic Collaboration	Social Collaboration
Price Elasticity	No	Maybe	Yes
Information Asymmetry	No	Some	Yes
Value Creation	Collusion	Asset Specificity	Individual knowledge
Value Appropriation	Collusion	Asset Specificity	Individual relationships
Form of Competitive Advantage	Sustainable - Control of Value Chain	Temporary - Control of Rare/Valuable Resources	Transactional - Control of Asymmetrical Information

The three primary forms of capital used to gain a competitive advantage are economic, cultural, and social. Economic capital is immediately convertible to money. Cultural capital is the formal and informal norms instituted by a firm. Typically, cultural capital is a firm-level investment that is not easily transferrable. Social capital is an individual-level investment made up of social connections with 'credentials,' providing the individual to perceived credit. The amount of social capital that can be generated is limited to the size of the network of connections that can be effectively mobilized (Itami and Roehl, 1987). The network of the relationships is the product of investment strategies to establish and transform existing contingent relations into relationships of durable obligations (Bourdieu, 1986). The process of generating social capital is a continuous series of exchanges to establish trust. The individual investment is a significant expenditure of time and effort that requires a specific competence in acquiring and maintaining relationships. Social capital enhances a firm's competitive advantage by endearing trust with others for potential collaboration. The use of social capital to gain a competitive advantage will require a firm structured more as a political coalition than a hierarchy.

The theory of the firm as a political coalition (March, 1962) describes the process of selecting members of coalitions to maximize rents in relation to their demands, while maintaining a manageable number of coalitions at any particular time. This is similar to fragmented activity of many firms forming coalitions to gain an advantage.

The ways firms compete are determined by an industry structure and the capital available to them to gain an advantage. Oligopoly firms create and appropriate value by collusion as seen through the coercion approach used by DeBeers in the diamond industry (Spar, 1994). Firms in structured industries follow the traditional strategy approach to create and appropriate value by obtaining unique assets and distribution channels. Firms in fragmented industries create value with individuals using general industry knowledge and then appropriate the value with individual relationships through political coalitions that enhance their reputation or brand.

2.3. Entrepreneurial Market-Making

Individuals differ not only in their tastes, but also in their access to information and the judgments on the synthesis of information to recognize new opportunities, thereby understanding entrepreneurship as an intermediation, or "market-making" process (Casson, 1982, 2000). Entrepreneurs have exogenous knowledge of the industry and endogenous knowledge of the firm's abilities, and then bundle firm resources to address the market concerns (Penrose, 1959). The entrepreneurial process is to gain and sustain a competitive advantage, especially in the absence of value chain control or valuable resources. The strategy literature identifies individuals to have strategic value when they possess firm-specific knowledge contributing to a firm's competitive advantage. While the entrepreneurship literature has exhaustively researched

the attributes of individuals for unique indicators of business acumen, there is large body of multi-disciplinary research describing the differences of individuals within firms. Of course the talent and skills of individuals will differ due to background experience, prior knowledge, and risk tolerance. This is a concept Hayek observed where "The subjectivity of information explains the diversity of opinion between entrepreneurs and hence the nature of competition between them" (1937: 50). The observation of the individuals in firms has been and will continue to be thoroughly examined. This section is to understand the process of entrepreneurship as it relates to the search consulting industry and how that process relates to fragmented industries. This will offer a contextual background for the hypothetical relationships used in my research model introduced in the next chapter.

In professional services, the sought after resource for input production is market information (industry-specific knowledge), which when bundled in a particular way becomes a unique form of valuable human capital. Market information is the general market knowledge of people, firms, and activities. The inherent limitation of market information is the time-sensitive nature of the asset due to the continual changing environment. Another limitation is the potential inaccuracies by an individual or firm to assimilating and interpreting several information flows. The value of human capital in professional services is the general knowledge and processing ability of market information. An individual possessing professional service human capital along with an entrepreneurial acumen provides for active participation in the industry. The entrepreneurial acumen required is the skill to establish trust – essential to economic exchanges – and an ability to establish a reputation to gain a competitive advantage.

The general question not being explained in the strategy or entrepreneurship literature is why entrepreneurial individuals, fully capable of independently organizing production,

participate in firms? The strategy literature values individuals with firm-specific information, but in professional services market information is more valuable which implies a different employee-firm relationship. Professional service-based firms are forced to entrust and rely on the skill of their employees with the human capital to create value. The value appropriation process is such that the action of the individual performing the service is *de facto* the action of the firm.

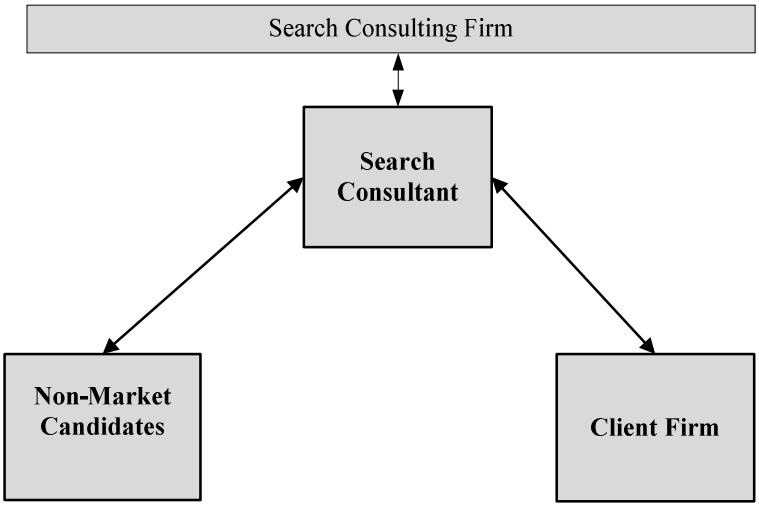
If the entrepreneurs of a professional services firm are valued for having market information over firm-specific information, then these individuals must centralize the information themselves. The processing of information requires judgment to attend to selected information flows along with social capital to gain access to new information channels. If these individuals are able to appropriate value by successful execution of contracts, then why do they need to participate in a firm?

So there must be tradeoffs for entrepreneurs participating in a firm. The professional services individual utilizes skillful judgment to identify opportunities currently being unaddressed by the market and then employs substantial organizational skills to address these opportunities on a regular basis. In the search consulting industry, the search consultant is an intermediary, as seen in **Figure 1**, with the consultant's firm, client firm and non-market candidates. Acting as an entrepreneur, the search consultant utilizes a market-making process to create value. Entrepreneurial market-making is the activity of developing valuable asymmetrical market information by marshaling information channels, then attending to selected information flows to generate valuable combinations of knowledge (Casson, 2000)[1]. Over time, the search

[1] Casson's economic theory of entrepreneurship is an easing of conventional economic theory, namely perfect information, autonomy of preferences and cost minimization. "Once these assumptions are relaxed, it becomes evident that theories of entrepreneurship are closely related to modern theories of the firm, such as transaction cost theories and resource-based theories.

consultant develops a craftsmanship ability (Sennet, 2004), which is an idiosyncratic, innate skill to develop and maintain business trust relationships.

Figure 1: The Relationships of a Search Consultant



The filtering, interpretation, and synthesis of continuous information require skills of improvisation which are not the same for every entrepreneur. In developing an evolutionary theory of the firm, Nelson and Winter (1982) dedicate chapter four of their book to individual skills, which may be applicable to professional services. Skills are a sequence of steps and an underlying tacit knowledge for desired outcomes. The utilization of a skill includes numerous choice selections automatically and without awareness that the choice is being made. While skills can be learned, the difference among entrepreneurial successes is an underlying innate ability, or craftsmanship.

The theory of entrepreneurship emerges as a powerful mechanism for synthesizing the insights of these modern theories of the firm" (Acs and Audretsch, 2003: 13).

Craftsmanship, in the professional services context, is similar to Kirzner's (1973) arbitrage theory of entrepreneurship where entrepreneurial rent is realized from adapting to and recognizing cues of market inconsistencies. Entrepreneurial craftsmanship (in a more Industrial Economics perspective) is a process of reducing information costs (Casson, 1982) in the production and appropriation of value. The information costs engineered by the entrepreneur involve an inter-temporal coordination of activities and information for each transaction. For example, the search consultant is engineering the cost of acquiring market information as well as the costs associated with service fulfillment (i.e., convincing a candidate to switch jobs). These costs are not fixed transaction costs rather they vary by transaction. Variable transaction costs are an expense to the service provider in the service production and an expense to the client in the service delivery. So the entrepreneurial engineering of transaction costs in professional services is focused on costs experienced by both potential clients and the service provider.

An advantage of professional service firms is that a large number of similar, albeit customized, transactions can be organized to minimize transaction costs clients. The initial sunk costs in this industry are those to create an expertise of general market information and to create trust with candidates and clients. Transaction costs are engineered professional services entrepreneurs to minimize costs for the client in four ways: 1) contact-making, to reduce the client's search costs; 2) specification, to reduce the negotiation costs by communicating how the client's needs will be addressed; 3) contracts, to reduce the negotiation costs by presenting a non-negotiable fee; and 4) enforcement, to reduce the agency costs through reputation of quality (Casson, 2000). The focus of reducing client transaction costs creates value for the service. **Figure 2** matches the engineering mechanisms used by the service entrepreneur with the different determinants of transaction costs.

Figure 2: Entrepreneurial Engineering of Transaction Costs in Professional Services

Type of Cost	Determinant	Engineered
Behavioral *(Agency)*	Bounded Rationality	Contact-making
	Opportunistic Behavior - *ex ante:* hidden information - *ex post:* hidden action	Reputation
Environmental	Uncertainty/Complexity	Reputation, Contact-making
Contractual	Information Asymmetry	Reputation
	Asset Specificity	N/A
	Small Numbers	Negotiation
	Measurement Uncertainty	Specificity of Knowledge
	Frequency	Contact-making
	Contractual Complexity	Specificity of Knowledge
	Internal Governance Sunk Costs	Negotiation

This chart applies the four ways an entrepreneur can reduce clients costs (Casson, 2000) to the determinants of transaction costs (Williamson, 1975; 1985; 1989; 1996).

In the traditional industrial economics perspective, client firms will internalize activities if the activity is cheaper for the firm than to use a search consulting firm. Client firms will also internalize activities from an asset-specificity perspective if the use of a search consulting firm exposes the client firm to opportunistic behavior, specifically moral hazard (Klein, 1978; Williamson, 1979). "Enterprises with intellectual research and capital, for example, …professional service firms…are especially plastic and susceptible to moral hazard" (Alchian and Woodward, 1988: 69).[2] The co-construction process of professional service arrangements control information 'plasticity' by negotiating service production through reiteration back and forth.

[2] The authors use the term "plastic" because of their criticism of Williamson (1979) for not clearly distinguishing between holdup and moral hazard. "We call resources or investments "plastic" to indicate that there is a wide range of discretionary, legitimate decisions within which the user may choose" (Alchian and Woodward, 1988: 69). This term has not been accepted into the mainstream literature on transaction costs probably because it is too similar to 'quasi-rents', but it does provide an interesting understanding for my purposes. They consider cash to be the most plastic of resources because it can be exchanged for nearly anything. To large degree general market information flows are plastic, but become very specific with the co-construction of the service.

The service provider experiences variable transaction costs in the service production process. The variable transaction costs for the service provider are 1) service complexity, 2) time to completion, 3) coordination of exogenous factors and 4) quality monitoring. The degree of complexity is engineered by collaborating with others to minimize the potential variance. Collaboration with others is most noticeable by membership to a firm. The time to service fulfillment is minimized by obtaining and maintaining a domain expertise of the industry through the market-making process. The coordination of exogenous variables is addressed with the craftsmanship ability of the service provider and the cost of monitoring service quality is engineered through firm membership. The individual processes of market-making and craftsmanship are associated with minimizing transaction costs, as well as membership to a firm. Therefore, there are benefits of transaction cost reduction for autonomous individuals to participate in firms, namely the reputation of the firm.

Reputation can be a competitive advantage (Grant, 1995) in the form of an intangible asset (Hall, 1992). A reputation can be produced from information flows (Itami and Roehl, 1987), purchased in the form of advertising (Keller and Kotler, 2012) or earned from third-party rankings (Fombrun and Shanley, 1990). The transaction cost literature considers reputation as a governance mechanism for informal arrangements (Williamson, 1985) because the short-term gains realized from opportunism are controlled by perceived long-term losses of a damaged reputation (Shelanski and Klein, 1999; Acheson, 1985; Wilson, 1980).

The economic locus of reputation in search consulting transactions lies in the search consultant's relationships with client firms and candidates. So reputation is providing a 'relational governance' (Zaheer and Venkatraman, 1995) where "the efficacy of reputation effects are subject to intertemporal limits" (Williamson, 1999: 1101). This means that there is a

continual effort by the individual to maintain and build reputation effects while the firm's reputation provides a concomitant element of support to those efforts.

So the overall purpose for why professional services firms exist is to facilitate coordination and allow entrepreneurs to create and appropriate value while they contribute to the coordination process. Similar to a production firm, the decisions on how to compete are made by the entrepreneurs within the professional services firm as a 'visible hand' (Chandler, 1977), where market conduct is determined by managers. The coordination activities of the firm include marketing, scope and aggregation. Therefore firms provide an incremental edge to individuals over them doing it by themselves and that edge in fragmented industries provides a distinctive advantage.

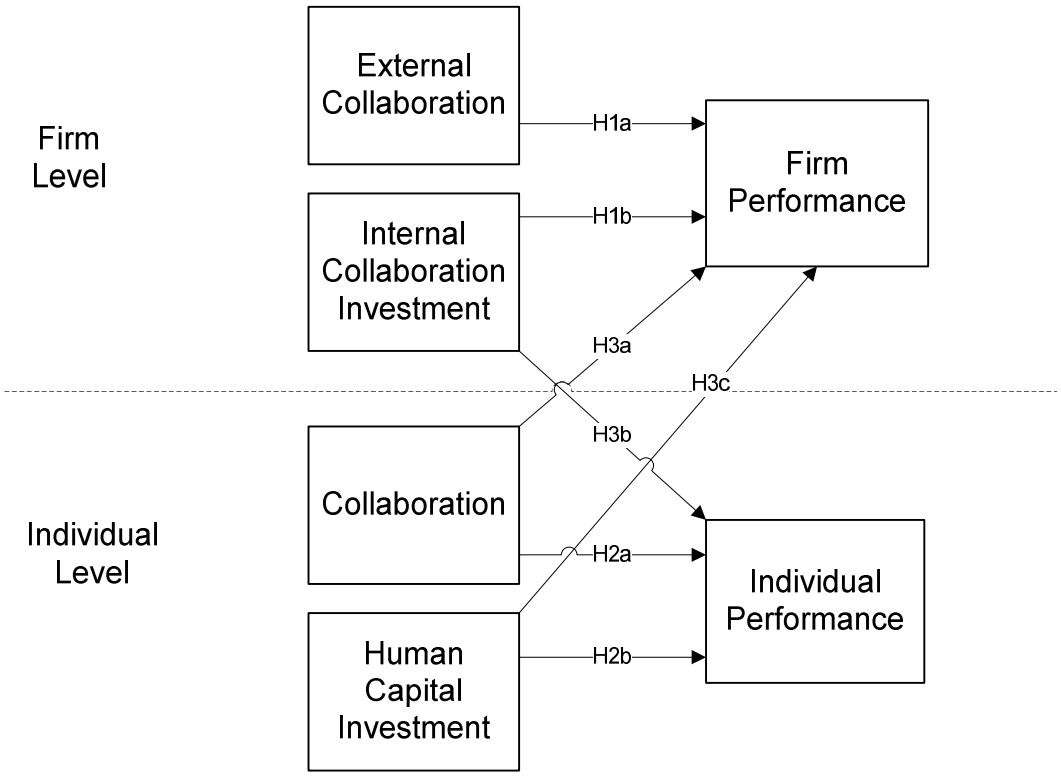
CHAPTER 3: MODEL

After reviewing the literature and discussing a fragmented industry schema in the previous section, I arrived on a two level model for the collaborative effects on performance. This chapter presents this model and introduces testable hypotheses. The overall hypothesis model is discussed, followed by the firm level, individual level, and then concludes with the multi-level effects.

3.1 Hypotheses Framework

What is derived from the literature on fragmented industries is a strategic approach of investment in collaborations, as depicted in **Figure 1**.

Figure 2: Hypothetical Relationships in the Research Models



The firm level strategy includes internal and external collaboration. The firm engages in collaborations with other firms in the form of strategic groups to increase firm performance. The firm also invests in internal collaboration to increase performance. The individual level strategy is similar to the firm in that the individual participates in collaboration to increase performance. The individual also invests in human capital to increase individual performance.

Table 3: Summary of Hypotheses

H 1a	Group membership with other firms increases firm performance
H 1b	Firm investment for internal group activity increases firm performance
H 2a	Collaboration within the firm increases individual performance
H 2b	Individual investments in human capital increases individual performance
H 3a	Firm Investment in Collaboration increases Individual Performance
H 3b	Individual Collaboration increases Firm Performance
H 3c	Individual Investment in Human Capital increases Firm Performance

3.2 Firm-Level Collaboration

When these groups involve an investment to provide member benefits they are considered strategic. Under conditions with no economies of scale, or even diseconomies of scale, there is little opportunity to earn superior profits (Peteraf, 1993). Therefore, firms in fragmented industries will participate in strategic groups to benefit from scale economies and diversification to obtain a competitive advantage and increase performance.

Thus,

Hypothesis 1a: Group membership with other firms increases firm performance

In fragmented industries there is limited information about competitors, unique client concerns, and firm success depends on its information advantage in the market. The challenge is utilizing information to achieve expectations consistent with clients and competitors. The process of exploiting information is similar to the division of labor with the costs of information assimilation differing for different people and the firm (Malmgren, 1961). So the relational aspect between collaboration and professional service professionals should include tradeoffs in expectation efforts and division of labor. The agency concerns of collaborative efforts with others should be addressed by the repeated nature of future activity and the industry's reliance on reputation. So the efforts of collaboration may result initially in lower revenue due to the sharing of profits by the division of labor. However, the division of labor should also allow for economies of scope and more volume of production.

Therefore,

Hypothesis 1b: Firm investment for internal group activity increases firm performance

3.3 Individual Level Collaboration

Individuals in a fragmented industry compete by "muddling through" (Lindblom, 1959) the hyper competitive environment. This method is akin to entrepreneurial market-making in that it accepts the fact that there is limited time and money for decision making and bases the approach on incremental steps to find acceptable solutions (Quinn, 1980; Allison, 1971), not just optimal solutions. To get to an acceptable solution the manager needs to be "muddling with a purpose" (Wrapp, 1967: 95) by coordinating with others through conscious action toward a specific goal. So when an industry is fragmented and the strategy is to collaborate then individuals will work in groups for purposes of division of labor, and of complement skills and experiences.

Therefore,

Hypothesis 2a: Collaboration within the firm increases individual performance

Individual efforts for collaboration will include individual investments to be attractive to peers. Individual investments to improve an individual's human capital are a way to complement the skills of others. Thus human capital investments in industry education and training will reflect a level of professionalism and knowledge that will be desirable for collaborations

Therefore,

Hypothesis 2b: Individual investments in human capital increases individual performance

3.4 Mixed Level Collaboration

The limitations of the market and how the firm functions in the market are determined by the structure of existing market information channels (Arrow, 1974: 37). The Penrose (1959) theory of the firm views the individual's ability to interpret the environment as a boundary to the firm by the firm's place in the market. Organizational theorists have unknowingly sought to address Penrose's insight. The scholars defining contingency theory (Lawrence and Lorsch, 1967) meshed Adam Smith's theory of efficiency and differentiation with Emile Durkheim's theory for integrated, effective human system. Together these theories explain the firm's need to differentiated and integrate given environmental uncertainty and change. The differences in the environment impact the structure of the organization. The Strategic Choice Model (Child, 1972) conflicted with contingency theory by recognizing the environment as the product of an individual's perception and evaluation. Now, contingency theory recognizes that the variables in the environment are different for each person, firm, and decision, because it is the manager who defines the environment. The manager chooses the environment and structural arrangements as opposed to accepting prescribed conditions. Interestingly, scholars of contingency theory have failed to endogenate the manager into the process of adaptation. This grave shortcoming has moved contingency theory to a basic description of the firm and its market (e.g., see Child, 1972). The overall organizational theorists perspective is that there is no one way to organize that is optimal (Galbraith, 1973) since "the nature of the firm is determined by the type of environment to which the organization must relate" (Scott, 1987: 104).

Firm success rests on the manager's ability to assess market transaction costs and analyze resources, "in particular the growth of knowledge, entrepreneurship and capabilities generally embodied in its personnel" (Penrose 1996: 1717). So a firm's investments for individuals to collaborate with others should expand the individual abilities to increase their performance.

Also, the individuals collaboration should increase the firm' performance, including the individual investment in human capital to gain knowledge, entrepreneurship and capabilities. Therefore,

Hypothesis 3a: Firm Investment in Collaboration increased Individual Performance

Hypothesis 3b: Individual Collaboration increases Firm Performance

Hypothesis 3c: Individual Investment in Human Capital increases Firm Performance

CHAPTER 4: METHODOLOGY

4.1 Data

The empirical setting is franchises in the search consulting industry. Search consulting differs from executive recruiting which focuses on C-level placements and from temporary worker services that provide worker relief of a generic nature. The search consulting business offers placement services and advice to client firms and provides search services to C-level, mid-level, and front line permanent workers. Their role is to be the most knowledgeable of trends and the workers in a particular industry. The function of a search consultant is to identify candidates to fill vacant positions. The unique aspect of this function is that the candidates being sourced are currently employed individuals who are considered the best in their position, which are likely to be employed by the client's competitors. The search consultant identifies these critical employees and convinces the candidates to switch jobs. A new search consultant will typically take eighteen months to develop the domain expertise and relationships before making the first placement. There is continual maintenance due to constantly changing market conditions and constant relationship management with current and potential clients, as well as with potential candidates. The overall cost of gathering and maintaining very specific market knowledge is the reason why firms hire search consultants.

The search consultant function is not a role for the client firm's human resources department. The human resources department has many responsibilities outside of placement and the idea of firms calling their competitor's employees and other employees of companies to work for them would create unnecessary tension and potentially to ignite a talent war that no one

would win. The human resources department may post advertisements for job opening and job seekers may apply. However, the strategic role of the search consultant is to identify gainfully and happily employed candidates that firms do not want to lose because they are considered their strategic human capital. Thereby the client is strengthening their firm with fully capable and successful human capital while possible weakening their competitors.

The search consulting industry, which was worth $7.9 billion in 2009 with expected growth to $19 billion by 2014. Search consulting differs from temporary worker services that provide commoditized provisional workers. This is a highly fragmented industry where the top ten firms realize under 18% of industry revenue. My subject for observation is one of the largest search consulting firms (1% market share) with hundreds of offices. The data includes over 52,000 transactions over a four year period (1/2008 to 1/2012), which include 13,114 team transactions, 2,348 failed placements in 93 industries and 23 countries. The placements include C-level, mid-level, and front line level placements. This data allows for observations between transactions, individuals, offices, levels of placement, and industry.

4.2 Data Validity

The data obtained was originally two levels of data in six excel spreadsheets linked either by the placement ID number or the employee ID number. The preparation began by cleaning up the fields into consistent units, including breaking up comprehensive field entries into two or more. The next step was to map the excel sheets and merge them into one multi-level STATA 12.1 database. Three validity test where used to assess the integrity, reasonableness, and correctness of the database – manual review, industry expert review, and statistical review. The first test was to check the integrity of the data after 'clean-up' and to ensure proper mapping

occurred in the merge. I randomly selected 50 entries and validate their consistency with the original excel spreadsheets. This approach required eight merge attempts for an acceptable 100% test result. I then reviewed the data to back-out entries which clearly did not have a purpose for being included in my analysis. For example, there were employee ID numbers that where not associated with an office or transaction and there were a number of transactions that did not have any billings, commissions, clients, or other fields to be considered to be a valid transaction.

The second was to assess the face validity with the means, ranges, and other descriptive database statistics with a long-term career professional familiar with the industry. This test was to assess the overall data for its consistency and reasonableness with the knowledge of an expert in the industry. The initial results of this test were excellent but did require an in-depth examination of firm billings and employee commissions. Clean-up was required in these two areas to remove those transactions that did not report any billings or commissions. However, it was determined for some transactions that the office is an individual not reporting commission so these entries are noted. After the clean-up, the test received an acceptable 100% result.

The last validity check the correctness of the data with Data Envelopment Analysis (DEA). The data in a DEA analysis compares and benchmarks inputs and outputs to obtain an efficiency score for each unit of measure.

Table 4: Data Envelopment Analysis Results

Office ID	Score	{I} ae {V}	{I} pc {V}	{I} bm {V}	{I} internet {V}	{I} admin {V}	{O} placement {V}	{O} retaine r {V}	{O} billing {V}	Benchmark
104	big	0	0	0	0	0	0	0	0	0
241	big	0	0	0	0	0	0	0	0	1
28	7205.26 %	0	0.29	0	0	0.71	0	72.05	0	16
243	872.22%	0.28	0	0.72	0	0	0	0	8.72	222
366	857.91%	0.67	0.17	0.17	0	0	8.29	0	0.29	170
258	419.89%	0	0.35	0.65	0	0	0.42	3.78	0	215
273	250.45%	0.92	0	0.07	0	0.01	1.23	0.76	0.52	8
76	238.21%	0	0	1	0	0	0	0.1	2.28	128
93	205.43%	0.1	0	0.9	0	0	0	2.05	0	24
225	203.84%	0.28	0.15	0.57	0	0	0	0.45	1.59	11
395	175.23%	0	0	1	0	0	0.84	0.91	0	173
336	174.44%	0.13	0.08	0.75	0	0.04	1.65	0	0.09	41
1	165.41%	0	0	0.75	0.25	0	0	1.65	0	0
250	147.86%	0	0	1	0	0	0.48	0	1	0
355	140.43%	0.31	0	0.69	0	0	0.86	0.54	0	4
445	139.61%	0.15	0.16	0.7	0	0	0	1.4	0	4
107	135.95%	0.69	0	0.31	0	0	0	0	1.36	30
367	134.57%	0.15	0.51	0.33	0.01	0	1.35	0	0	59
173	126.08%	0.99	0	0	0	0.01	1.26	0	0	3
182	124.58%	0.28	0.44	0.08	0	0.2	0	1.25	0	53
2	119.26%	0	0.03	0.24	0.01	0.71	0	1.19	0	0
378	116.67%	0.22	0	0.78	0	0	0	1.17	0	2
314	114.07%	0.48	0.22	0.3	0	0	1.14	0	0	12
444	110.29%	0	0	1	0	0	0	0.92	0.18	171
30	109.71%	1	0	0	0	0	0	0	1.1	0

Table 4 provides the DEA results with three output measures include placements, retainers and billing and using the five input measures for efficiency by employee type, where ae = account executive; pc = project coordinator; bm = business manager; internet = internet researcher; admin = administrative assistant. The score for the top 25 firms are included to indicate the efficient measure in relation to the population. The top 10 offices have an efficiency

score range to over 200% to being too big to calculate. Since the database is self-populated, there are expectations for some incomplete or inaccurate data points. Given the size of the data, isolated errors should absorbed by the overall data during analysis. However, efficiency scores of over 200% require closer inspection. After manual review of the data for the top 10 DEA score offices, it was clear the populated information was in error and these errors where beyond correction. Thus, the offices with efficiency scores of over 200% were removed and the DEA analysis was run again. The result of the second DEA analysis showed no outliers but variance in performance measures.

4.3 Measurements

There are different approaches to operationalizing variables for measuring performance. The approach to selecting variables is to respect the limitations within the data while respecting the research stream theoretical traditions. This section will describe the dependent, explanatory and control variable. For a summary of all measurements please refer to **Table 4**.

Table 5: Summary of Measurements

Variable Name	Level		Attributes
Firm Billings (dependent)	Firm	Definition	A firm performance measure of log billings
		Value	Numeric value with a range [7.6 to 17.46]
Firm Deal Ratio (dependent)	Firm	Definition	A firm performance measure of logbilling / number of deals
		Value	Numeric value with a range [0.009 to 10.66]
Firm Employ Ratio (dependent)	Firm	Definition	A firm performance measure of logbillings / number of employees
		Value	Numeric value with a range [0.15 to 13.55]
Firm Staff Ratio (explanatory)	Firm	Definition	A firm investment measure of number of recruiters / number of support staff
		Value	Numeric value with a range [0 to 30]
Group1-6 (explanatory)	Firm	Definition	Firm identification of six different external group memberships with other firms
		Value	Dummy; 1 (yes), 0 (no) with group2 as reference group
Industry1-7 (control)	Firm	Definition	The number of deals performed in a particular industry
		Value	Seven industries: 1 (construction); 2 (consumer products and services); 3 (financial); 4 (healthcare); 5 (industrial); 6 (professional services); 7 (technology); with frequency [0 to 1774]
Placement Level (control)	Firm	Definition	The number of deals performed in at a particular level of complexity
		Value	Four levels (c_level, mid_level, low_level, pro_level) with frequency [0 to 968]
Performance (dependent)	Individual	Definition	An individual performance measure of log total billings
		Value	Numeric value with a range [4.96 to 15.52]
Commissions (dependent)	Individual	Definition	An individual performance measure of log total commissions
		Value	Numeric value with a range [2.3 to 14.17]
Team Membership (explanatory)	Individual	Definition	If the recruiter has been assigned to group
		Value	Dummy; 1 (yes), 0 (no)
Consultant Education (explanatory)	Individual	Definition	Has the consultant received certified training?
		Value	1 (yes); 0 (no)
Staff Education (explanatory)	Individual	Definition	Has office support individual received certified training?
		Value	1 (yes); 0 (no)
Number of Collaborations (explanatory)	Individual	Definition	The number or transactions conducted with assistance
		Value	Number of transactions with a range [0 to 268]
Industry1-7 (control)	Individual	Definition	The number of deals performed in a particular industry
		Value	Seven industries: 1 (construction); 2 (consumer products and services); 3 (financial); 4 (healthcare); 5 (industrial); 6 (professional services); 7 (technology); with frequency [0 to 285]
Placement Level (control)	Individual	Definition	The number of deals performed in at a particular level of complexity
		Value	Four levels (c_level, mid_level, low_level, pro_level) with frequency [0 to 133]

4.3.1 Dependent Variables

There are a total of five dependent variables comprised of three firm level and two individual levels. After the data was checked for normality, the data became standardized after dependent variables where logged to reflect a curvilinear relationship. The three firm level dependent variables are *logbilling* which measures firm performance from the log of billings and a numeric value range of 7.6 to 17.46; *logdeal_ratio* which is a firm measure of performance by dividing the number of deals done by the firm into the log of billings by the firm with a value range of 0.0009 to 10.66; and *logemploy_ratio* which is a firm performance measure of the number of employees divided into the log of firm billings with a value range of 0.15 to 13.55.

The two individual-level dependent variables measure individual performance in billings and commissions. The first individual dependent variable is *indivlogbilling* which is an individual performance measure of log total billings with a value range of 4.96 to 15.52. The second individual dependent variable is *logcommission* which is an individual performance measure of log total commissions with a value range of 2.3 to 14.17.

4.3.2 Explanatory Variables

There are two firm-level and four individual-level explanatory variables. The first firm level explanatory variables are six self-identified groups that a firm can be a member. The variable *group1-6* is the firm identification of six different external group memberships with other firms by a dummy value of 1 (yes) or 0 (no) and with group2 used a the reference group. The second firm level variable is *recruit_staff_ratio* which is a firm investment measure of the

number of recruiters divided by the number of support staff with a numeric value range of 0 to 30.

The individual level explanatory variables include *num_collab* which is an individual measure of the number or transactions conducted with assistance with a numeric range of 0 to 268. The second explanatory variable is *teamid* which is an identifier to if the recruiter has been assigned to group by a dummy value of 1 (yes) or 0 (no). The third explanatory variable is *recruiter_training* which determines if the consultant received certified training by a dummy value of 1 (yes) or 0 (no). The last individual explanatory variable is *support_training* which determines if the support staff member has received certified training by a dummy value of 1 (yes) or 0 (no)

4.3.3 Control Variables

There are two main control variables for the study: *industry* and *level of placement*. The data is identified in seven different industries at both the firm and individual levels. The value for each industry is the frequency of transaction by the firm or individual, respectively. The firm level range is 0 to 1774 while the individual range is 0 to 285. The level of place for a transaction is to determine a degree of complexity associated with the placement. The data is identified in four different levels at both the firm and individual levels. The value for each level is the frequency of transaction by the firm or individual, respectively. The firm level range is 0 to 968 while the individual range is 0 to 133.

CHAPTER 5: EMPIRICAL STUDY

5.1 Data Descriptive

The firm level data was checked for normality. The distributional diagnostic plots on the dependent variables (billing) became standardized after logging the variable. There are a few outliers; however there is minimal influence to the models when they are excluded. The regression models are each testing for normality using the Akaike's Information Criterion (AIC), the Bayesian Information Criterion (BIC), and the Likelihood Ratio Chi-Square (LR). These are the appropriate tests given the size of the sample.

The firm level data has some correlations. There is a strong relationship between groups 1 & 2 (-0.71). After a tabulation of groups 1 & 2 there are 25 firms of the 447 sample identified as being part of both groups. After dropping these 25 firms and correlating again, there was an actual increase in the relationship between groups 1 & 2 (-0.91). So I then ran a simple regression of each dependent variable with group1 and group2, respectively, and found significance with each group on each dependent variable. However, due to very low r-squared scores (i.e., 0.02 and 0.01) there are too many unexplained influences to be explanatory. Since the group variables are dummied, the reference group used in the regression models is group2 to lessen any confounding influence. The strongest correlations to report are the relationship between professional level and middle level placements (0.78); and each levels relation with industry 4, (0.82) and (0.81), respectively.

The firm level data has interactions. A three-way interactions model with *logbilling* as the dependent variable using groups (1, 3-6), industry (1-7), and the 4 levels of placement (c, mid, low, pro) was ran and then re-run to omit non-significant interactions until the model was

stable. The interaction model (r^2= 0.59) identified seven significant interactions with a constant coefficient of 11.72. These interactions are (g1i1c, -0.0009); (g1i2pro, -0.00015); (g1i3pro, -0.00012); (g1i5pro, -0.00006); (g3i1mid, 0.00003); (g6i2mid, 0.00123); and (g6i4mid, 0.00025). Two additional interaction models was run on *logbilling*. The first using groups (1, 3-6) and industry (1-7). This model (r^2= 0.42) identified one significant interaction (g6i4, 0.02764). The second model (r^2 = 0.38) using groups (1, 3-6) and levels of placement (c, mid, low, pro) identified two significant interactions (g2mid, 0.01269) and (g6mid, 0.03731). After review of the three interaction models, *group6* in *industry4* at the *mid-level* is significant within each model even though the coefficients may be small.

The individual level data was checked for normality. The same rules apply to the individual level data as the firm level data with the dependent variables being logged and the tests for fit with the regression models. As anticipated, the performance measures related to billings, commissions and deals are highly correlated. There is also the same interesting relationship seen at the firm level among *industry4* with *mid_level* (0.76) and *pro_level* (0.68).

The individual level data has interactions. A three-way interactions model with *logbilling* as the dependent variable using employee status (ae, pc, bm, admin, internet), industry (1-7), and the 4 levels of placement (c, mid, low, pro) was ran and then re-run to omit non-significant interactions until the model was stable. There are too many significant interactions to report. An interaction model using *logbilling* as a dependent variable using industry (1-7) and the 4 levels of placement (c, mid, low, pro) was run and then re-run to omit non-significant interactions until the model was stable.

5.2 Reliability and Robustness

Each regression model is checked for multicollinearity by using the criteria for tolerance of > 0.1 and the Variance Inflation Factor < 10. The regression models are run on the whole dataset and then the data is divided into two random datasets of equal size and run again on each. The results reported using the full dataset since the regression results from the two random datasets did not have significant difference from the main result.

5.4 Model Specifications and Econometric Results

5.4.1 Firm Level

Hypothesis 1a states that group membership with other firms will increases firm performance. Using three dependent variables to measure performance, the firm level estimation models for hypothesis 1a are as follows:

Model H1a-1 $\text{Log (Firm Billing)} = \alpha + \beta_1 (\text{group1}) + \beta_2 (\text{group3}) + \beta_3 (\text{group4}) + \beta_4 (\text{group5}) + \beta_5 (\text{group6}) + \beta_{6\text{-}16} (\text{Vector of Controls})$

Model H1a-2 $\text{Log (Firm Deal Ratio)} = \alpha + \beta_1 (\text{group1}) + \beta_2 (\text{group3}) + \beta_3 (\text{group4}) + \beta_4 (\text{group5}) + \beta_5 (\text{group6}) + \beta_{6\text{-}16} (\text{Vector of Controls})$

Model H1a-3 $\text{Log (Employee Ratio)} = \alpha + \beta_1 (\text{group1}) + \beta_2 (\text{group3}) + \beta_3 (\text{group4}) + \beta_4 (\text{group5}) + \beta_5 (\text{group6}) + \beta_{6\text{-}16} (\text{Vector of Controls})$

The vectors of control include seven different industries and four different types of contracts determined by the levels of placement. There are no items of significance to report in the above models using a sample of 445 firm, so hypothesis 1a is not supported. Model H1a-1 using the *logbillings* as a dependent variable had an r^2=0.44; Model H1a-2 used *logdeal_ratio* as dependent variable, r^2=0.13; and Model H1a-3 used *logemploy_ratio*, r^2=0.26. If the control

variables are removed on all models the drops to r^2=0.01, therefore the control variables are appropriate for this study. In summary, membership alone in a nominal strategic group does not increase performance.

Hypothesis 1b states that firm investment for internal group activity will increase firm performance. Using three dependent variables to measure performance, the firm level estimation models for hypothesis 1b are as follows:

Model H1b-1 Log (Firm Billing) = $\alpha + \beta_1$ (recruit_staff_ratio) + $\beta_{2\text{-}12}$ (Vector of Controls)

Model H1b-2 Log (Firm Deal Ratio) = $\alpha + \beta_1$ (recruit_staff_ratio) + $\beta_{2\text{-}12}$ (Vector of Controls)

Model H1b-3 Log (Employee Ratio) = $\alpha + \beta_1$ (recruit_staff_ratio) + $\beta_{2\text{-}12}$ (Vector of Controls)

The vectors of control include seven different industries and four different types of contracts determined by the levels of placement. There is significance of the explanatory variable on the dependent variable in all three models, however hypothesis 1b is not supported. The sample size falls to 414 firms due to some firms having zero support staff. Model H1b-1 (r^2=0.47) found the *recuit_staff_ratio* significant (p=0.000) and with a beta of 0.24. The coefficient is 0.11 with the constant of 12.14. The *recruit_staff_ratio* (number of recruiters to number of support staff) is a measure where a high number (i.e., 30) reflects less investment in support staff. Therefore, coefficient of 0.11 on *logbilling* indicates that more recruiters increase billings. Model H1b-2 (r^2=0.16) found the *recuit_staff_ratio* significant (p=0.000) and with a beta of -0.25. The coefficient is -0.16 with the constant of 2.39. The dependent variable of *logdeal_ratio* (logbilling to number of deals) is a measure of the deal average. Here the coefficient of is negative to indicate that the higher the *recruit_staff_ratio,* the negative effect it has on deal average. Model H1b-3 (r^2=0.39) found the *recuit_staff_ratio* significant (p=0.000)

and with a beta of -0.39. The coefficient is -0.38 with the constant of 6.33. The dependent variable of *logemploy_ratio* (logbilling to number of employees) is a measure of employee average. Here is the is negative to indicate that the higher the recruit_staff_ratio, the negative effect it has the employee average.

In summary, the more recruiters there are in a firm in relation to support staff then there will be higher billings with a lower deal average and lower employee average – indicating a higher deal flow. Therefore, investing in support staff for internal group activity will not increase performance but it may assist in higher quality deal flow or high impact deals.

Table 6: Econometric Results for H1a and H1b

	H1a Group membership with other firms increases firm performance						**H1b Firm investment for internal group activity increases firm performance**					
	Firm Billings		**Firm Deal Ratio**		**Firm Employ Ratio**		**Firm Billings**		**Firm Deal Ratio**		**Firm Employ Ratio**	
number of observations	445		445		445		414		414		414	
Explanatory Variables	coefficient	Beta	coefficient	Beta	coefficient	Beta	coefficient	Beta	coefficient	Beta	coefficient	Beta
Group1	-0.22	-0.04	0.46	0.05	-0.11	-0.01						
Group3	-0.46	-0.03	0.09	0-	-0.25	0						
Group4	0.61	0.05	-1.1	6	-2.43 *	-0.09						
Group5	0.94	0.02	-1.11	-0.02	-2.15	-0.02						
Group6	-0.67	-0.04	0.9	0.04	-1.73	-0.05						
Firm Staff Ratio							.11 **	0.24	-.16 **	-0.24	-.38 **	-0.39
Control Variables												
C-level Placement	.01 **	0.19	-0.01	-0.1	-0.02	-0.12	.01 **	0.16	0	-0.07	-0.01	-0.07
Mid-level Placement	0 *	0.21	0	-0.06	0	-0.11	0 *	0.2	0	-0.04	0	-0.1
Low-level Placement	0 *	0.1	0	-0.04	0	-0.07	0 *	0.11	0	-0.05	0	-0.08
Pro-level Placement	.01 **	0.45	-.01 **	-0.3	-.02 **	-0.45	.01 **	.35*	0	-0.19	-.01 **	-0.24
Industry1 (construction)	0	-0.03	0	0.01	0	0	0	-0.1	0	0.09	0.01	0.11
Industry2 (consumer	0	0.06	0	-0.05	0	-0.03	0	0.06	0	-	0	-

products)										0.05		0.04
Industry3 (financial)	0 *	0.1	0	-0.04	0	-0.08	0	0.1	0	-0.04	-0.01	-0.09
Industry4 (healthcare)	0 **	-0.34	0 *	0.24	.01 **	0.36	0 *	-0.29	0	0.18	0 *	0.24
Industry6 (professional services)	.01 *	0.07	-0.02	-0.06	-0.02	-0.06	.02 **	0.1	-0.02	-0.09	-0.04	-0.1
Industry7 (technology)	0.01	0.07	-0.01	-0.05	-0.01	-0.3	.01 *	0.07	-0.01	-0.06	-0.03	-0.08
Explained Variance												
Mean VIF	2.44		2.44		2.44		2.44		2.44		2.44	
R-Squared	0.44		0.13		0.25		0.47		0.14		0.35	

Group2 dummy is included but not reported

Significant at the * $p < 0.05$; ** $p < 0.01$

Hypothesis Determination	No Support	No Support	No Support	Partial Support	Partial Support	Partial Support

5.4.2 Individual Level

Hypothesis 2a states that collaboration within the firm will increase an individual's performance. Using two dependent variables to measure performance, the individual level estimation models for hypothesis 2a are as follows:

Model H2a-1 $\quad$ Log (Performance) = $\alpha + \beta_1$ (num_collab) + $\beta_{2\text{-}12}$ (Vector of Controls)

Model H2a-2 $\quad$ Log (Commissions) = $\alpha + \beta_1$ (num_collab) + $\beta_{2\text{-}12}$ (Vector of Controls)

The vectors of control include seven different industries and four different types of contracts determined by the levels of placement. There is significance of the explanatory variable on the dependent variable in both models to support Hypothesis 2a. Models H2a-1 and H2a-2 used a sample of only search consultants, excluding support staff for a sample of 2,029 search consultants for model 1 and 1,336 for model 2. Model H2a-1 (r^2=0.57) found the predictor *num_collab* significant (p=0.000) and with a beta of -0.29. The coefficient is -0.32 with the constant of 10.65. The *num_collab* variable is a measure where a high number reflects more shared work on deals billed. The negative coefficient indicates that collaborations lead to lower overall billings. Model H2a-2 (r^2=0.40) found the predictor *num_collab* significant (p=0.000) and with a beta of 0.37. The coefficient is 0.33 with the constant of 9.6. The *num_collab* positive coefficient indicates that collaborations lead to higher overall commissions. So, while the number of collaborations decreases overall billings, it increases commissions.

Hypothesis 2b states individuals investing in human capital will increase performance. Using two dependent variables to measure performance, the individual level estimation models for hypothesis 2b are as follows:

Model H2b-1 Log (Performance) = $\alpha + \beta_1$ (team membership) + β_2 (consultant education) + β_3 (staff education) + $\beta_{4\text{-}14}$ (Vector of Controls)

Model H2b-2 Log (Commissions) = $\alpha + \beta_1$ (team membership) + β_2 (consultant education) + β_3 (staff education) + $\beta_{4\text{-}14}$ (Vector of Controls)

Model H2b-3 (num_collab) = $\alpha + \beta_1$ (team membership) + β_2 (consultant education) + β_3 (staff education) + $\beta_{4\text{-}14}$ (Vector of Controls)

The vectors of control include seven different industries and four different types of contracts determined by the levels of placement. There is significance of the explanatory variable on the dependent variable in all three models for partial support of hypothesis 2b. Model H2b-1 (r^2=0.55, n=2998) found the predictors significant as follows: *csam* (p=0.00, beta=.06); *cspc* (p=0.05, beta = .02); and *teamid* (p=0.00, beta = .07). The respective coefficients of 0.27, 0.37, and 0.27 with the constant of 10.7. The overall report in this model is that individual investments lead to higher billings. Model H2b-2 (r^2=0.37, n=2098) found only the predictor *cspc* significant (p=0.005) and with a beta of 0.04. The coefficient is 0.67 with the constant of 9.6. The *cspc* positive coefficient indicates that support staff education leads to higher overall commissions. Model H2b-3 (r^2=0.82, n=3050) found only the predictor *csam* significant (p=0.000) and with a beta of -0.03. The coefficient is -1.38 with the constant of -1. The *csam* negative coefficient indicates that recruiter education leads to more solo transactions. In summary, individual investments lead to higher billings and support staff education leads to higher commissions but recruiter with education will collaborate less.

Table 7: Econometric Results for H2a and H2b

	H2a Collaboration within the firm increases individual performance				**H2b Individual investments in human capital increases individual performance**					
	Performance		**Commissions**		**Performance**		**Commissions**		**Collaborations**	
number of observations	2998		2098		2029		1336		2063	
Explanatory Variables	coefficient	Beta	coefficient	Beta	coefficient	Beta	coefficient	Beta	coefficient	Beta
Number of Collaborations	-0.04 **	-0.41	.01 **	0.19						
Consultant Education					.22 **	0.05	-0.01	0	-0.52	-0.01
Team Membership					.33 **	0.09	-0.02	0	-2.14	-0.06
Control Variables										
C-level Placement	0.03 **	0.07	0.01	0.04	.02 **	0.06	.02 *	0.06	-0.01	0
Mid-level Placement	0 *	0.04	0 *	0	0	0	0	0.06	.21 **	0.14
Low-level Placement	-0.01 **	-0.04	-0.01	-0.04	-.01 *	-0.03	0	0.02	0.04	0.01
Pro-level Placement	-0.01 **	-0.07	-.01 **	-0.07	-.01 **	-0.08	-.02 **	-0.16	-.15 **	-0.1
Industry1 (construction)	0.09 **	0.29	.04 **	0.14	.07 **	0.22	.05 **	0.19	.58 **	0.18
Industry2 (consumer products)	0.07 **	0.43	.02 **	0.16	.06 **	0.28	.03 **	0.19	.50 **	0.23
Industry3 (financial)	0.09 **	0.42	.04 **	0.21	.07 **	0.34	.04 **	0.26	.44 **	0.21
Industry4 (healthcare)	0.07 **	0.77	.02 **	0.3	.05 **	0.52	.04 **	0.54	.70 **	0.7
Industry5 (industrial)	0.09 **	0.51	.04 **	0.23	.08 **	0.4	.04 **	0.25	.41 **	0.21
Industry6 (professional services)	0.07 **	0.12	.08 **	0.14	.10 **	0.07	.12 **	0.11	0.22	0.01
Industry7 (technology)	0.06 **	0.13	.06 **	0.17	.05 **	0.06	.06 **	0.1	0.1	0.01
Explained Variance										
Mean VIF	2.71		2.71		1.75		1.75		1.75	
R-Squared	0.56		0.37		0.55		0.37		0.78	
Significant at the * p < 0.05; ** p < 0.01										
Hypothesis Determination	Partial Support		Partial Support		Supported		Not Supported		Not Supported	

5.4.3 Multi-Level

The general model used for this multi-level study is:

$$Y_{ijk} = \pi_{0jk} + \pi_{1jk} + \pi_{2jk} + \ldots + \pi_{Pjk}a_{Pijk} + e_{ijk},$$

where

Y_{ijk} is the billing of transaction i and individual j at firm k;
π_{0jk} is the mean billing for individual j at firm k;
π_{Pjk} are the corresponding coefficients that indicate the direction and strength of association between each transaction element, a_P, and the outcome in individual$_{jk}$
a_{Pijk} are P = 1, … , P transaction elements that predict billing
e_{ijk} are the random effects for the transaction i, individual j, or firm k.

The indices i, j, and k denote transaction, individual, and firm where there are

$i = 1, 2, \ldots, n_{jk}$ transactions by individual j in firm k;
$j = 1, 2, \ldots, j_k$ individuals in firm k; and
$k = 1, 2, \ldots, K$ firms.

Level 1: Transaction Level

$$Y_{ijk} = \pi_{0jk} + e_{ijk},$$

where

π_{0jk} is the mean billing for individual j at firm k
e_{ijk} is the level-1 random effects for the individual, that is, the deviation of transaction ijk's score from the individual or firm mean. These effects are assumed normally distributed with a mean of 0 and variance σ^2

Level 2: Individual Level

$$\pi_{0jk} = \beta_{00k} + r_{0jk},$$

where

β_{00k} is the mean billing for firm k;
r_{0jk} is the random individual effect, that is, the deviation of individual jk's mean from the firm mean. These effects are assumed normally distributed with a mean of 0 and variance τ_π. Within each of the K firms, the variability among firms is assumed the same.

Level 3: Firm Level

$\beta_{00k} = Y_{000} + u_{00k}$

where

Y_{000} is the grand mean of billings across firms

u_{00k} is the random firm effects, that is, the deviation of firm k's mean from the grand mean. These effects are assumed normally distributed with a mean of 0 and variance τ_β.

Hypothesis 3a states firm investment in collaboration will increase individual performance. Using individual level billings as the dependent variable to measure performance, the multi-level random effects estimation model for predictor (recruit_staff_ratio) for hypothesis 3a is as follows:

Model H3a-1 $\pi_{0jk} = \beta_{00k} + \beta_{01k}$ (recruit_staff_ratio)$_k$ + β_{02k} (c_level)$_{ijk}$ + β_{03k} (mid_level)$_{ijk}$ + β_{04k} (low_level)$_{ijk}$+ r_{ojk}

The model indicates a good fit (X^2 = 3561.19, p = 0.00, n = 30901) for the variables but lacks significance for the *recruit_staff_ratio* to predict the individual performance. There is no support for Hypothesis H3a.

Hypothesis 3b states individual collaboration will increase firm performance. Using firm level billings as the dependent variable to measure performance, the multi-level mixed effects estimation model with firm level fixed and the predictor of collaboration random for hypothesis 3b is as follows:

Model H3b-1 $\beta_{00k} = Y_{000} + Y_{010}$ (solo) + Y_{020} (c_level) + Y_{030} (mid_level) + Y_{040} (low_level) + u_{00k}

The model indicates a good fit (X^2 = 3725.44, p = 0.0, n = 31815) for the variables. The predictor variable has a significant ($p < 0.05$) positive relationship to firm performance. There is support that individual collaboration has an effect on firm performance.

Hypothesis 3c states individual investment in human capital will increase firm performance. Using firm level billings as the dependent variable to measure performance, the multi-level mixed effects estimation model with firm level fixed and the predictor of education random for hypothesis 3c is as follows:

Model H3c-1 $\beta_{00k} = Y_{000} + Y_{010}$ (csam) + Y_{020} (c_level) + Y_{030} (mid_level) + Y_{040} (low_level) + u_{00k}

Model H3c-2 $\beta_{00k} = Y_{000} + Y_{010}$ (cspc) + Y_{020} (c_level) + Y_{030} (mid_level) + Y_{040} (low_level) + u_{00k}

Model H3c-1 indicates a good fit (X2 = 3775.07, p = 0.00, n = 31815) for the variables. The predictor variable has a significant ($p < 0.05$) positive relationship to firm performance. There is support that recruiter education has an effect on firm performance.

Model H3c-2 indicates a good fit ($X^2 = 3582.02$, p = 0.00, n = 31815) for the variables. The predictor variable is not significant in this relationship and does not provide support for support staff education having an effect on firm performance.

Table 8: Econometric Results for H3a, H3b, and H3c

	H3a Firm Investment in Collaboration increases Individual Performance		**H3b Individual Collaboration increases Firm Performance**		**H3c Individual Investment in Human Capital increases Firm Performance**			
	Individual Performance		**Firm Billings**		**Firm Billing**		**Firm Billings**	
number of observations	30,901		31,815		31,815		31,815	
Explanatory Variables	coefficient	conf. Interval	coefficient	conf. Interval	coefficient	conf. Interval	coefficient	conf. Interval
Firm Staff Ratio	-172.44	-531.87, 186.98						
Collaborations			508.05 **	849.034, 167.08				
Consultant Education					899.21 **	156.65, 1641.78		
Staff Education							241.55	-2017.09, 2500.21
Control Variables								
C-level Placement	11667.05 **	11199.93, 12134.17	11766.99 **	11306.06, 12227.77	11826.82 **	11366.46, 12287.17	11836.41 **	11376.08, 12296.75
Mid-level Placement	4602.11 **	4303.77, 4900.45	4659.25 **	4365.08, 4953.43	4644.90 **	4350.68, 4939.11	4646.99 **	4352.76, 4941.23
Low-level Placement	-2018.04 **	-2421.10, -1614.98	-2035.44 **	-2436.05, -1634.83	-2075.93 **	-2475.73, -1676.12	-2075.07 **	-2474.9 - 1675.233
Explained Variance								
Log-likelihood	-330040.5		-339857.99		-339913.34		-339916.12	
Chi-Squared	3561.19		3545.36		3588.88		3582.08	
Pro-level Placement dummy is included but not reported			Significant at the * p < 0.05; ** p < 0.01					
Hypothesis Determination	Not Supported		Supported, with variance		Supported, with variance		Not Supported	

CHAPTER 6: DISCUSSION AND CONCLUSION

6.1 Conclusions and Contributions

Entrepreneurial collaboration as a strategy is becoming increasingly important for effective performance outcomes, and the importance of this business phenomenon is reflected with the increased academic interest in professional service firms. Previous studies of entrepreneurs have demonstrated unique autonomous traits while strategic group studies have identified firm-level collaboration as a strategy to generate performance differentials.

In this dissertation, I examine the phenomenon of entrepreneurs collaborating to generate performance differentials. I believe this dissertation is timely and useful especially give change in the move of the economy from a manufacturing-based economy to a service-based economy, thus requiring different approaches to competition.

For example, Shanley and Peteraf (2005) define strategic groups to be more than nominal membership to a group. The first hypothesis in my study sought to challenge this notion by examining group membership as a condition of increased performance. The hypothesis was not supporting, thus supporting the Shanley and Peteraf (2005). The second part of this hypothesis then considered firm investment for the purpose of collaboration, where essentially group investment into collaboration will increase performance. This hypothesis stems from Dranove, Peteraf, and Shanley (1998) stressing the importance of members interacting and thus investments into the group will result in increased performance. The hypothesis was not supported indicating that group investment for collaboration does not in itself increase performance.

The second hypothesis developed in this dissertation examined the entrepreneur level for collaboration and subsequently investment in human capital for increased performance. The first part of the second hypothesis is empirically supported providing a causal relationship between collaboration and performance. The second part of the second hypothesis considers individual investments in human capital effects on performance. The empirical results from human capital investments are mixed, where human capital investments do increase performance those individuals will collaborate less. Potential reasons for this can be that some human capital investment may be more prevalent in some industries and not others, including more complex deals.

Finally, I posit that there is a multi-level effect of individual collaboration and human capital investment on the firm's performance. I first examine the investments of the firm for collaboration effects on the individual's performance and I do not find empirical support. I then find empirical support for individual collaborative effects on firm performance. An individual's investment in human capital positive effect on performance s also supported.

6.2 Limitations and Future Research

As with any study there are limitations to this research. The limitations of this research are as follows. First, this dissertation does not consider the structure of professional service firms that have strong institutional mechanisms, such as a Bar Association. Thereby, the results may pertain solely to the professional service industries without structural mechanisms. Secondly, the data are a franchise model to resemble competition in a fragmented market. While on the surface this may seem difficult to assume, however the source of the data had franchise

offices competing with one another – even for the same business. Third, the industry experience/network of contacts for each recruiter was not examined. The nature of the search consulting business is arguable a networking business, which I consider an ability to assimilate information. However, I do not explicitly consider networks of individuals. Fourth, the empirical study conducted here is a cross-sectional, albeit over a four-year period, analysis providing a snapshot of individual activity. Finally, the data and variables have measurement problems, where the data is a self-populated data set and the underlying data for measurement may be biased.

Overall, the strategic approach to capture scale economies in professional services by franchising is a gap in the literature that will be addressed next. From the perspective of strategic management, a research paths that can be pursued are the boundaries of the firm (Casson, 1997) and the competitive advantage from strategic groups (Shanley and Peteraf, 2005). From the perspective of entrepreneurship, research can be pursued can be in the area of individual collaborative strategies (Shanley and Peteraf, 2005). Research in these areas from this data set should use a longitudinal method, possible Bayesian approaches to capture individual change from year to year. In addition, future research using this data set should also include industry differences.

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APPENDIX: STATA Outputs

Table A-1: Descriptive Statistics for Transaction Level

Variable	Obs	Unique	Mean	Min	Max	Description
billing	31815	3167	19059.22	6.8	550000	billings
csam	34154	2	0.194736	0	1	search consult education
cspc	34154	2	0.018944	0	1	support staff education
solo	34154	2	0.528635	0	1	solo transaction
c_level	34154	2	0.10031	0	1	c-level placement
mid_level	34154	2	0.360075	0	1	mid-level placement
low_level	34154	2	0.149675	0	1	entry level placement
pro_level	34154	2	0.361539	0	1	professional level placement

Table A-2: Descriptive Statistics for Individual Level

Variable	Obs	Unique	Mean	Min	Max	Description
recruiter	3052	3052	1526.5	1	3052	user_id
c_level	3051	31	1.122911	0	37	(sum) c_level
mid_level	3051	63	4.03081	0	133	(sum) mid_level
low_level	3051	42	1.675516	0	62	(sum) low_level
pro_level	3051	59	4.047198	0	131	(sum) pro_level
csam	3051	2	0.105211	0	1	(sum) csam
cspc	3051	2	0.007211	0	1	(sum) cspc
industry1	3051	40	0.912488	0	66	(sum) industry1
industry2	3051	53	1.894133	0	145	(sum) industry2
industry3	3051	52	1.608653	0	87	(sum) industry3
industry4	3051	78	3.707965	0	285	(sum) industry4
industry5	3051	51	2.535234	0	97	(sum) industry5
industry6	3051	25	0.274009	0	53	(sum) industry6
industry7	3051	23	0.261881	0	97	(sum) industry7
teamid	3051	2	0.165192	0	1	(first) teamid
office	3051	447	550.4707	1	1942	(firstnm) office
num_collab	3051	78	5.276631	0	268	(sum) internal
num_solo	3051	60	5.917732	0	96	(sum) solo
logbilling	2999	2341	11.44309	4.969813	15.52317	log of billings
logcommiss~n	2098	1612	10.22495	2.302585	14.17205	log commissions

Table A-3: Descriptive Statistics for Firm Level

Variable	Obs	Unique	Mean	Min	Max	Description
group1	447	2	0.872483	0	1	(sum) group1
group2	447	2	0.165548	0	1	(sum) group2
group3	447	2	0.022371	0	1	(sum) group3
group4	447	2	0.020134	0	1	(sum) group4
group5	447	2	0.002237	0	1	(sum) group5
group6	447	2	0.013423	0	1	(sum) group6
c_level	445	51	7.698876	0	273	(sum) c_level
mid_level	445	94	27.63371	0	968	(sum) mid_level
low_level	445	63	11.4764	0	516	(sum) low_level
pro_level	445	95	27.74382	0	844	(sum) pro_level
industry1	445	44	6.25618	0	343	(sum) industry1
industry2	445	68	12.98652	0	464	(sum) industry2
industry3	445	63	11.02921	0	352	(sum) industry3
industry4	445	83	25.42022	0	1774	(sum) industry4
industry5	445	79	17.38202	0	942	(sum) industry5
industry6	445	30	1.878652	0	107	(sum) industry6
industry7	445	24	1.793258	0	122	(sum) industry7
recruit_staff_ratio	414	76	2.342243	0	30	num consult/support staff
logbilling	445	432	12.96726	7.600903	17.46147	log of billings
logdeal_ratio	445	437	1.659056	0.0092	10.65726	log billings/num deals
logemploy_ratio	445	436	4.71326	0.151105	13.54886	log billings/num employees

Table A-4: Correlation Matrix for Transaction Level

	place_~g	recrui~o	c_level	mid_le~l	low_le~l	pro_le~l	solo	csam	cspc
place_bill~g	1.0000								
recruit_st~o	-0.0075	1.0000							
c_level	0.2375	0.0741	1.0000						
mid_level	0.1701	-0.0007	-0.2554	1.0000					
low_level	-0.1727	-0.0161	-0.1427	-0.3146	1.0000				
pro_level	-0.1621	-0.0195	-0.2546	-0.5613	-0.3136	1.0000			
solo	-0.0262	-0.1192	-0.0060	-0.0323	-0.0324	0.0510	1.0000		
csam	0.0235	0.2252	0.0627	0.0256	-0.0160	-0.0440	-0.0303	1.0000	
cspc	-0.0216	-0.0491	-0.0216	-0.0189	0.0193	0.0233	-0.0082	-0.0462	1.0000

Table A-5: Correlation Matrix for Individual Level

	logbil~g	logcom~n	num_co~b	num_solo	indust~1	indust~2	indust~3	indust~4	indust~5	indust~6	indust~7
logbilling	1.0000										
logcommiss~n	0.7610	1.0000									
num_collab	0.5148	0.5229	1.0000								
num_solo	0.6327	0.3660	0.2012	1.0000							
industry1	0.1938	0.1500	0.1488	0.1525	1.0000						
industry2	0.2708	0.2047	0.3465	0.2412	0.0201	1.0000					
industry3	0.2696	0.1972	0.1418	0.2539	-0.0449	-0.0355	1.0000				
industry4	0.3758	0.3409	0.7053	0.2712	-0.0648	-0.0619	-0.0688	1.0000			
industry5	0.3027	0.1810	0.1640	0.3235	0.0021	-0.0058	-0.0796	-0.0995	1.0000		
industry6	0.1221	0.1566	0.0327	0.2492	0.0131	0.0784	0.0057	-0.0083	-0.0383	1.0000	
industry7	0.0926	0.1381	-0.0247	0.2986	-0.0235	-0.0218	-0.0176	-0.0221	-0.0333	0.0574	1.0000
c_level	0.3806	0.2921	0.3015	0.2920	0.2219	0.1320	0.4066	0.1534	-0.0194	0.0414	0.0157
mid_level	0.5375	0.4562	0.7647	0.3664	0.0979	0.4490	0.0252	0.5592	0.2098	0.0732	0.0097
low_level	0.3076	0.2613	0.4171	0.2992	0.1498	0.1326	0.1506	0.2556	0.2549	0.0637	0.0391
pro_level	0.4541	0.3570	0.5397	0.5598	0.0737	0.1839	0.1174	0.5545	0.1734	0.1199	0.1826
teamid	0.1299	0.0235	-0.0242	0.1217	0.0034	0.0359	0.0490	0.0163	-0.0029	-0.0038	-0.0064
csam	0.1901	0.0796	0.0967	0.1454	0.0843	0.1059	0.1285	0.0348	0.0466	-0.0416	-0.0367
cspc	0.0497	0.0884	0.0368	0.0613	-0.0168	0.0159	0.0225	0.0269	-0.0171	0.0042	0.1886
recruiter	0.0011	0.0091	-0.0146	-0.0036	0.0244	0.0061	0.0228	-0.0516	0.0084	0.0027	0.0395
office	-0.0404	-0.0490	-0.0525	0.0343	-0.0810	0.0052	0.0171	-0.0324	0.0028	0.0543	0.0404

	c_level	mid_le~l	low_le~l	pro_le~l	teamid	csam	cspc	recrui~r	office
c_level	1.0000								
mid_level	0.2808	1.0000							
low_level	0.0957	0.2273	1.0000						
pro_level	0.1232	0.3984	0.2120	1.0000					
teamid	0.0897	0.0334	-0.0124	0.0310	1.0000				
csam	0.2006	0.1647	0.0835	0.1064	0.0698	1.0000			
cspc	0.0035	0.0349	0.0429	0.0872	-0.0139	-0.0200	1.0000		
recruiter	-0.0089	-0.0348	-0.0176	-0.0179	-0.0209	0.0264	0.0182	1.0000	
office	-0.0602	-0.0364	-0.0476	0.0166	-0.0954	-0.1440	-0.0291	-0.0081	1.0000

Table A-6: Correlation Matrix for Firm Level

	logbil~g	logdea~o	logemp~o	recrui~o	group1	group2	group3	group4	group5	group6	indust~1
logbilling	1.0000										
logdeal_ra~o	-0.8163	1.0000									
logemploy_~o	-0.7339	0.6168	1.0000								
recruit_st~o	0.4382	-0.3076	-0.4789	1.0000							
group1	-0.0426	0.0593	0.0067	0.0506	1.0000						
group2	0.1697	-0.1541	-0.1350	0.0868	-0.7079	1.0000					
group3	0.0902	-0.0520	-0.1003	0.0806	0.0075	-0.0678	1.0000				
group4	0.0345	-0.0491	-0.0614	0.0062	-0.1038	-0.0639	-0.0209	1.0000			
group5	0.0289	-0.0286	-0.0423	-0.0109	0.0189	-0.0224	0.3301	-0.0069	1.0000		
group6	-0.0602	0.0492	-0.0345	-0.0464	-0.1350	0.0521	-0.0181	-0.0170	-0.0060	1.0000	
industry1	0.2875	-0.1379	-0.2191	0.4406	-0.0250	0.0129	0.1186	-0.0316	-0.0066	-0.0202	1.0000
industry2	0.3472	-0.1915	-0.2492	0.1515	0.0244	-0.0061	0.0768	-0.0276	0.0841	-0.0147	0.0686
industry3	0.3690	-0.1917	-0.2881	0.1573	0.0462	0.0078	0.1158	0.0078	-0.0065	-0.0046	0.1284
industry4	0.3182	-0.1252	-0.1942	0.2520	0.0208	0.0090	0.2168	-0.0019	-0.0095	-0.0006	0.2345
industry5	0.3240	-0.1640	-0.2330	0.1894	-0.0241	0.0775	0.0325	-0.0159	0.0104	-0.0318	0.2328
industry6	0.2092	-0.1313	-0.1579	-0.0076	-0.0523	0.0673	0.0930	-0.0347	0.0240	-0.0003	0.1037
industry7	0.1437	-0.0983	-0.1273	-0.0177	0.0122	0.0673	0.0159	-0.0051	0.0016	-0.0005	-0.0092
c_level	0.4391	-0.2155	-0.3182	0.4191	0.0293	0.0100	0.1388	-0.0132	-0.0170	-0.0062	0.6803
mid_level	0.4891	-0.2171	-0.3229	0.3158	0.0192	-0.0059	0.2046	-0.0230	-0.0133	0.0018	0.3566
low_level	0.4015	-0.1869	-0.2883	0.2504	0.0367	0.0115	0.1238	0.0199	0.1288	-0.0344	0.3840
pro_level	0.5167	-0.2586	-0.3736	0.3777	-0.0155	0.1295	0.2250	-0.0262	-0.0040	-0.0255	0.2888

	indust~2	indust~3	indust~4	indust~5	indust~6	indust~7	c_level	mid_le~l	low_le~l	pro_le~l
industry2	1.0000									
industry3	0.1910	1.0000								
industry4	0.0813	0.0762	1.0000							
industry5	0.1014	0.0779	0.0243	1.0000						
industry6	0.0885	0.1281	0.1117	-0.0171	1.0000					
industry7	-0.0063	0.0253	0.0166	-0.0062	0.0713	1.0000				
c_level	0.2407	0.4153	0.3656	0.1791	0.1096	0.0181	1.0000			
mid_level	0.4439	0.2163	0.8061	0.3869	0.1554	0.0297	0.4904	1.0000		
low_level	0.2029	0.3284	0.3456	0.6937	0.0791	0.0277	0.3280	0.5551	1.0000	
pro_level	0.2765	0.2450	0.8233	0.2778	0.1869	0.1555	0.4210	0.7767	0.4048	1.0000

Table A-7: Collinearity Diagnostics of Coefficients on Firm Level Dependent Variables for Hypotheses 1a & 1b

Variable	VIF	SQRT VIF	Tolerance	R-Squared
recruit_staff_ratio	1.44	1.20	0.6964	0.3036
group1	1.06	1.03	0.9453	0.0547
group3	1.22	1.10	0.8203	0.1797
group4	1.02	1.01	0.9774	0.0226
group5	1.21	1.10	0.8281	0.1719
group6	1.03	1.01	0.9740	0.0260
c_level	2.84	1.68	0.3526	0.6474
mid_level	7.12	2.67	0.1404	0.8596
low_level	1.91	1.38	0.5238	0.4762
pro_level	4.79	2.19	0.2089	0.7911
industry1	2.47	1.57	0.4045	0.5955
industry2	2.05	1.43	0.4880	0.5120
industry3	1.57	1.25	0.6349	0.3651
industry4	7.15	2.67	0.1398	0.8602
industry6	1.08	1.04	0.9272	0.0728
industry7	1.10	1.05	0.9066	0.0934
Mean VIF	2.44			

Table A-8: Collinearity Diagnostics of Coefficients on Individual Level Dependent Variables for Hypothesis 2a

Variable	VIF	SQRT VIF	Tolerance	R-Squared
num_collab	5.25	2.29	0.1906	0.8094
c_level	1.50	1.22	0.6678	0.3322
mid_level	3.54	1.88	0.2826	0.7174
low_level	1.49	1.22	0.6700	0.3300
pro_level	2.52	1.59	0.3966	0.6034
industry1	1.52	1.23	0.6596	0.3404
industry2	2.85	1.69	0.3510	0.6490
industry3	2.02	1.42	0.4959	0.5041
industry4	7.34	2.71	0.1363	0.8637
industry5	2.25	1.50	0.4436	0.5564
industry6	1.08	1.04	0.9257	0.0743
industry7	1.16	1.08	0.8618	0.1382
Mean VIF	2.71			

Table A-9: Collinearity Diagnostics of Coefficients on Individual Level Dependent Variables for Hypothesis 2b

Variable	VIF	SQRT VIF	Tolerance	R-Squared
csam	1.18	1.09	0.8485	0.1515
cspc	1.06	1.03	0.9427	0.0573
teamid	1.02	1.01	0.9835	0.0165
c_level	1.52	1.23	0.6567	0.3433
mid_level	2.88	1.70	0.3468	0.6532
low_level	1.40	1.18	0.7147	0.2853
pro_level	2.41	1.55	0.4157	0.5843
industry1	1.31	1.14	0.7635	0.2365
industry2	1.67	1.29	0.6000	0.4000
industry3	1.70	1.30	0.5874	0.4126
industry4	4.71	2.17	0.2121	0.7879
industry5	1.65	1.29	0.6053	0.3947
industry6	1.02	1.01	0.9777	0.0223
industry7	1.01	1.00	0.9935	0.0065
Mean VIF	1.75			

Table A-10: Hypothesis 1a OLS Estimation of Group Membership influence on Billings

Source	SS	df	MS		
Model	590.25704	15	39.3504693	Number of obs	445
Residual	737.134818	429	1.71826298	F(15, 429)	22.90
				Prob > F	0.0000
				R-squared	0.4447
				Adj R-squared	0.4253
Total	1327.39186	444	2.9896213	Root MSE	1.3108

logbilling	Coef.	Std. Err.	t	P>|t|	Beta
group1	-.2225615	.1912372	-1.16	0.245	-.0430649
group3	-.4631156	.4578034	-1.01	0.312	-.0397424
group4	.6178386	.4483372	1.38	0.169	.050357
group5	.9484064	1.430876	0.66	0.508	.026002
group6	-.6742445	.5453689	-1.24	0.217	-.0450242
c_level	.0168138	.0052881	3.18	0.002	.1925513
mid_level	.005254	.002334	2.25	0.025	.2162991
low_level	.0052553	.0024467	2.15	0.032	.1069268
pro_level	.0133393	.0021896	6.09	0.000	.4597574
industry1	-.0022185	.0037399	-0.59	0.553	-.0327653
industry2	.0029894	.0024014	1.24	0.214	.0641189
industry3	.0056157	.002442	2.30	0.022	.1050254
industry4	-.005094	.0013854	-3.68	0.000	-.3499722
industry6	.0174971	.0081202	2.15	0.032	.0799634
industry7	.0126718	.0066366	1.91	0.057	.0711372
_cons	12.44817	.1854918	67.11	0.000	.

Table A-11: Hypothesis 1a OLS Estimation of Group Membership influence on Deals

Source	SS	df	MS		
Model	403.047295	15	26.8698196	Number of obs	445
Residual	2535.6572	429	5.91062284	F(15, 429)	4.55
				Prob > F	0.0000
				R-squared	0.1372
				Adj R-squared	0.1070
Total	2938.70449	444	6.61870382	Root MSE	2.4312

logdeal_ra~o	Coef.	Std. Err.	t	P>|t|	Beta
group1	.4601935	.354686	1.30	0.195	.0598461
group3	.0930259	.8490843	0.11	0.913	.0053653
group4	-1.103794	.8315273	-1.33	0.185	-.0604637
group5	-1.116579	2.653835	-0.42	0.674	-.0205742
group6	.9051534	1.011491	0.89	0.371	.040623
c_level	-.0137816	.0098077	-1.41	0.161	-.1060724
mid_level	-.0023276	.0043289	-0.54	0.591	-.0644019
low_level	-.0035392	.0045379	-0.78	0.436	-.0483961
pro_level	-.0132576	.0040611	-3.26	0.001	-.3070996
industry1	.0019521	.0069364	0.28	0.779	.0193765
industry2	-.0037777	.0044539	-0.85	0.397	-.0544576
industry3	-.0037116	.0045291	-0.82	0.413	-.0466522
industry4	.0052359	.0025695	2.04	0.042	.2417607
industry6	-.0201344	.0150606	-1.34	0.182	-.0618422
industry7	-.0148707	.0123088	-1.21	0.228	-.0561066
_cons	1.856382	.3440301	5.40	0.000	.

Table A-12: Hypothesis 1a OLS Estimation of Group Membership influence on Number of Employees

Source	SS	df	MS		
Model	1607.10212	15	107.140141	Number of obs =	445
Residual	4586.17891	429	10.6903937	F(15, 429) =	10.02
				Prob > F =	0.0000
Total	6193.28103	444	13.9488311	R-squared =	0.2595
				Adj R-squared =	0.2336
				Root MSE =	3.2696

logemploy_~o	Coef.	Std. Err.	t	P>|t|	Beta
group1	-.1142221	.4770065	-0.24	0.811	-.0102321
group3	-.2501361	1.141908	-0.22	0.827	-.0099376
group4	-2.436982	1.118296	-2.18	0.030	-.0919552
group5	-2.158134	3.569063	-0.60	0.546	-.0273924
group6	-1.735907	1.360324	-1.28	0.203	-.0536653
c_level	-.0241961	.0131901	-1.83	0.067	-.1282814
mid_level	-.0062304	.0058218	-1.07	0.285	-.1187468
low_level	-.0080426	.0061029	-1.32	0.188	-.0757571
pro_level	-.0283927	.0054616	-5.20	0.000	-.4530431
industry1	-.0001589	.0093285	-0.02	0.986	-.0010866
industry2	-.0037236	.00599	-0.62	0.535	-.0369751
industry3	-.0094647	.0060911	-1.55	0.121	-.0819483
industry4	.0114809	.0034556	3.32	0.001	.3651663
industry6	-.028688	.0202545	-1.42	0.157	-.0606965
industry7	-.0136116	.0165537	-0.82	0.411	-.0353758
_cons	6.074687	.4626757	13.13	0.000	.

Table A-13: Hypothesis 1b OLS Estimation of Investments for Collaboration influence on Billings

Source	SS	df	MS		
Model	588.829559	11	53.5299599	Number of obs =	414
Residual	653.615112	402	1.62590824	F(11, 402) =	32.92
				Prob > F =	0.0000
Total	1242.44467	413	3.00834061	R-squared =	0.4739
				Adj R-squared =	0.4595
				Root MSE =	1.2751

logbilling	Coef.	Std. Err.	t	P>|t|	Beta
recruit_staff_ratio	.1105519	.0197589	5.60	0.000	.2416136
c_level	.0137233	.0051785	2.65	0.008	.161253
mid_level	.0047437	.0022424	2.12	0.035	.2009772
low_level	.0057228	.0023239	2.46	0.014	.1197984
pro_level	.0100741	.0022208	4.54	0.000	.3560223
industry1	-.0070186	.0037156	-1.89	0.060	-.1068775
industry2	.0028492	.0023139	1.23	0.219	.062892
industry3	.0055433	.002428	2.28	0.023	.1029476
industry4	-.0042197	.0013499	-3.13	0.002	-.2991882
industry6	.0225947	.0079499	2.84	0.005	.1065106
industry7	.0142694	.007259	1.97	0.050	.0746005
_cons	12.1449	.0797993	152.19	0.000	.

Table A-14: Hypothesis 1b OLS Estimation of Investments for Collaboration influence on Number of Deals

Source	SS	df	MS		
Model	440.864327	11	40.0785752	Number of obs	414
Residual	2223.19932	402	5.53034658	F(11, 402)	7.25
				Prob > F	0.0000
				R-squared	0.1655
				Adj R-squared	0.1427
Total	2664.06365	413	6.45051732	Root MSE	2.3517

logdeal_ratio	Coef.	Std. Err.	t	P>|t|	Beta
recruit_staff_ratio	-.1643633	.036441	-4.51	0.000	-.2453162
c_level	-.0089861	.0095506	-0.94	0.347	-.0721082
mid_level	-.0016545	.0041356	-0.40	0.689	-.0478702
low_level	-.0040475	.0042859	-0.94	0.346	-.0578626
pro_level	-.0082649	.0040958	-2.02	0.044	-.1994677
industry1	.0088143	.0068525	1.29	0.199	.0916623
industry2	-.0035369	.0042674	-0.83	0.408	-.0533171
industry3	-.0037278	.004478	-0.83	0.406	-.0472787
industry4	.0037874	.0024895	1.52	0.129	.1833898
industry6	-.0281958	.014662	-1.92	0.055	-.0907689
industry7	-.0174167	.0133877	-1.30	0.194	-.0621824
_cons	2.391415	.1471726	16.25	0.000	.

Table A-15: Hypothesis 1b OLS Estimation of Investments for Collaboration influence on Number of Employees

Source	SS	df	MS		
Model	2030.55284	11	184.595713	Number of obs	414
Residual	3703.35927	402	9.2123365	F(11, 402)	20.04
				Prob > F	0.0000
				R-squared	0.3541
				Adj R-squared	0.3365
Total	5733.91211	413	13.8835644	Root MSE	3.0352

logemploy_ratio	Coef.	Std. Err.	t	P>|t|	Beta
recruit_staff_ratio	-.3861609	.0470326	-8.21	0.000	-.3928589
c_level	-.0141526	.0123265	-1.15	0.252	-.0774105
mid_level	-.005309	.0053376	-0.99	0.321	-.104702
low_level	-.008925	.0055317	-1.61	0.107	-.0869688
pro_level	-.0149954	.0052862	-2.84	0.005	-.2466847
industry1	.0162653	.0088442	1.84	0.067	.1152954
industry2	-.0039367	.0055077	-0.71	0.475	-.0404495
industry3	-.0107961	.0057795	-1.87	0.062	-.0933321
industry4	.0074754	.0032131	2.33	0.020	.2467247
industry6	-.0461229	.0189235	-2.44	0.015	-.1012082
industry7	-.0339576	.0172789	-1.97	0.050	-.082639
_cons	6.334631	.1899484	33.35	0.000	.

Table A-16: Hypothesis 2a OLS Estimation of Collaboration influence on Billing

Source	SS	df	MS		
Model	2876.76925	12	239.730771	Number of obs	= 2998
Residual	2231.92932	2985	.747715017	F(12, 2985)	= 320.62
				Prob > F	= 0.0000
				R-squared	= 0.5631
				Adj R-squared	= 0.5614
Total	5108.69857	2997	1.70460413	Root MSE	= .86471

logbilling	Coef.	Std. Err.	t	P>|t|	Beta
num_collab	-.0430044	.0028844	-14.91	0.000	-.4131957
c_level	.03049	.0064146	4.75	0.000	.070369
mid_level	.0076807	.0035698	2.15	0.032	.0489634
low_level	-.0148699	.004419	-3.36	0.001	-.0497343
pro_level	-.0120252	.0032176	-3.74	0.000	-.0717927
industry1	.094946	.0047874	19.83	0.000	.2954211
industry2	.0792423	.0037061	21.38	0.000	.436605
industry3	.0962474	.0038646	24.90	0.000	.4278722
industry4	.0789517	.003328	23.72	0.000	.7775235
industry5	.0973204	.0034617	28.11	0.000	.5106852
industry6	.0750077	.0077172	9.72	0.000	.1222156
industry7	.0624897	.0059755	10.46	0.000	.1362808
_cons	10.69997	.0201694	530.50	0.000	.

Table A-17: Hypothesis 2a OLS Estimation of Collaboration influence on Commissions

Source	SS	df	MS		
Model	1387.82583	12	115.652152	Number of obs	= 2098
Residual	2316.45667	2085	1.11101039	F(12, 2085)	= 104.10
				Prob > F	= 0.0000
				R-squared	= 0.3747
				Adj R-squared	= 0.3711
Total	3704.2825	2097	1.76646757	Root MSE	= 1.054

logcommiss~n	Coef.	Std. Err.	t	P>|t|	Beta
num_collab	.0182651	.0037702	4.84	0.000	.1970141
c_level	.0193745	.0083255	2.33	0.020	.0495644
mid_level	.0004113	.0046656	0.09	0.930	.0029508
low_level	-.0115291	.0059678	-1.93	0.054	-.041904
pro_level	-.0114339	.0042385	-2.70	0.007	-.0758259
industry1	.0419292	.0061521	6.82	0.000	.149461
industry2	.0265529	.0049155	5.40	0.000	.1657491
industry3	.043551	.0050135	8.69	0.000	.2189016
industry4	.0275793	.0044261	6.23	0.000	.3087246
industry5	.0400603	.004553	8.80	0.000	.2330766
industry6	.0819016	.0101617	8.06	0.000	.1449431
industry7	.0684896	.0074065	9.25	0.000	.1749182
_cons	9.642794	.0300671	320.71	0.000	.

Table A-18: Hypothesis 2b OLS Estimation of Investment in Human Capital on Billing

Source	SS	df	MS		
Model	1808.45559	13	139.111968	Number of obs	2029
Residual	1442.96596	2015	.716112138	F(13, 2015)	194.26
				Prob > F	0.0000
Total	3251.42154	2028	1.60326506	R-squared	0.5562
				Adj R-squared	0.5533
				Root MSE	.84623

logbilling	Coef.	Std. Err.	t	P>|t|	Beta
csam	.2201732	.0590749	3.73	0.000	.0599875
teamid	.3303083	.0542721	6.09	0.000	.091062
c_level	.0266438	.0077403	3.44	0.001	.0630098
mid_level	.0004181	.0041476	0.10	0.920	.0025335
low_level	-.0110316	.0055802	-1.98	0.048	-.0338429
pro_level	-.0136462	.0038318	-3.56	0.000	-.0816269
industry1	.0771936	.0058861	13.11	0.000	.2224013
industry2	.0652646	.0044427	14.69	0.000	.2805008
industry3	.0786496	.0043687	18.00	0.000	.3482666
industry4	.0513232	.0031115	16.49	0.000	.5287718
industry5	.0859599	.0040476	21.24	0.000	.4023267
industry6	.1075756	.0207626	5.18	0.000	.0777491
industry7	.0548293	.0117104	4.68	0.000	.069712
_cons	10.64584	.0249518	426.66	0.000	.

Table A-19: Hypothesis 2b OLS Estimation of Investment in Human Capital on Commissions

Source	SS	df	MS		
Model	749.742887	13	57.6725298	Number of obs	1336
Residual	1235.94624	1322	.934906387	F(13, 1322)	61.69
				Prob > F	0.0000
Total	1985.68913	1335	1.48740759	R-squared	0.3776
				Adj R-squared	0.3715
				Root MSE	.96691

logcommiss~n	Coef.	Std. Err.	t	P>|t|	Beta
csam	-.0135628	.0801415	-0.17	0.866	-.0040335
teamid	-.0254209	.0783814	-0.32	0.746	-.0071027
c_level	.0217525	.0095805	2.27	0.023	.0617827
mid_level	.0082005	.0051421	1.59	0.111	.0601627
low_level	.0063204	.0074068	0.85	0.394	.0217607
pro_level	-.0233629	.0047618	-4.91	0.000	-.1685185
industry1	.0547265	.0071281	7.68	0.000	.1947169
industry2	.0378966	.0055032	6.89	0.000	.1963401
industry3	.0481512	.0053832	8.94	0.000	.2623472
industry4	.0428532	.0039387	10.88	0.000	.5426043
industry5	.0457786	.0050504	9.06	0.000	.2576854
industry6	.1200038	.0238483	5.03	0.000	.1106701
industry7	.063772	.0134005	4.76	0.000	.1036681
_cons	9.579474	.0364789	262.60	0.000	.

Table A-20: Hypothesis 2b OLS Estimation of Investment in Human Capital on Collaborations

Source	SS	df	MS		
Model	213080.776	13	16390.8289	Number of obs	= 2063
Residual	60052.0548	2049	29.3079818	F(13, 2049)	= 559.26
				Prob > F	= 0.0000
				R-squared	= 0.7801
				Adj R-squared	= 0.7787
Total	273132.831	2062	132.460151	Root MSE	= 5.4137

num_collab	Coef.	Std. Err.	t	P>|t|	Beta
csam	-.5202621	.3777938	-1.38	0.169	-.015486
teamid	-2.14688	.345255	-6.22	0.000	-.0649456
c_level	-.0153824	.0495042	-0.31	0.756	-.0039732
mid_level	.2129361	.0265309	8.03	0.000	.1410074
low_level	.0493995	.0356925	1.38	0.167	.0165523
pro_level	-.1598149	.0245097	-6.52	0.000	-.1044682
industry1	.5889607	.0376444	15.65	0.000	.1852322
industry2	.501035	.0284166	17.63	0.000	.2350855
industry3	.4493943	.0279414	16.08	0.000	.2172293
industry4	.7078046	.019904	35.56	0.000	.7961269
industry5	.4152315	.0258815	16.04	0.000	.2122608
industry6	.2249307	.132816	1.69	0.091	.0177383
industry7	.1008878	.0749136	1.35	0.178	.0139956
_cons	-.8821571	.1576571	-5.60	0.000	.

Table A-21: Hypothesis 3a Multi-Level Random Effects Estimation of Firm Investments influence Individual Billing

Mixed-effects ML regression — Number of obs = 30901

Group Variable	No. of Groups	Observations per Group Minimum	Average	Maximum
office	414	1	74.6	1898
recruiter	2885	1	10.7	242

Log likelihood = -330040.5 — Wald chi2(5) = 3561.19; Prob > chi2 = 0.0000

place_billing	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
recruit_staff_ratio	-175.4838	183.5906	-0.96	0.339	-535.3149	184.3472
c_level	16606.35	469.2557	35.39	0.000	15686.63	17526.08
mid_level	9573.244	434.5714	22.03	0.000	8721.499	10424.99
low_level	2842.488	447.8832	6.35	0.000	1964.653	3720.323
pro_level	5331.137	436.5915	12.21	0.000	4475.433	6186.841
_cons	13360.61	941.1884	14.20	0.000	11515.92	15205.31

Table A-22: Hypothesis 3a Multi-Level Fixed Firm Effects and Random Collaboration Effects influence Firm Billing

Mixed-effects ML regression — Number of obs = 31815

Group Variable	No. of Groups	Observations per Group Minimum	Average	Maximum
office	445	1	71.5	1898
recruiter	2999	1	10.6	242

Log likelihood = -339777.69 — Wald chi2(5) = 3725.44; Prob > chi2 = 0.0000

place_billing	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
solo	-464.4284	173.2001	-2.68	0.007	-803.8943	-124.9625
c_level	16765.3	458.3449	36.58	0.000	15866.96	17663.64
mid_level	9687.848	423.6008	22.87	0.000	8857.605	10518.09
low_level	2886.378	438.2361	6.59	0.000	2027.451	3745.305
pro_level	5402.869	425.7736	12.69	0.000	4568.368	6237.37
_cons	13321.7	778.0895	17.12	0.000	11796.67	14846.73

Table A-23: Hypothesis 3a Multi-Level Fixed Firm Effects and Random Individual Investments influence Firm Billing

Group Variable	No. of Groups	Observations per Group Minimum	Average	Maximum
office	445	1	71.5	1898
recruiter	2999	1	10.6	242

Log likelihood = -339830.22 — Wald chi2(5) = 3775.07; Prob > chi2 = 0.0000

place_billing	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
csam	929.6535	378.1129	2.46	0.014	188.5659	1670.741
c_level	16911.93	458.205	36.91	0.000	16013.87	17810
mid_level	9761.119	423.5694	23.04	0.000	8930.938	10591.3
low_level	2932.839	438.0597	6.70	0.000	2074.257	3791.42
pro_level	5494.968	425.5913	12.91	0.000	4660.825	6329.112
_cons	12820.84	779.0641	16.46	0.000	11293.9	14347.77

VITA

JAMES A. DOWNING

Jim's research focuses on the strategies used in fragmented professional service businesses to obtain a competitive advantage. Fragmented professional service industries pose unique structural concerns for entrepreneurs to gain a competitive advantage, which have effects on individual and firm performance.

Jim is the Founding Executive Director of the Illinois Venture Capital Association, which is Illinois' premier trade organization for the venture capital and private equity industry. IVCA membership represents close to 500 private equity professionals with over $77 billion in assets under management. Before founding IVCA, Jim was administrator of the Illinois Development Finance Authority's $15 million Illinois Venture Investment Fund. Jim was the village manager of a Chicago suburb with over 80 employees and his efforts resulted in grants exceeding $1 million and annual operations ending 25% under budget. Jim served on the majority staff in the Illinois State Senate, managing business and human capital legislation for Senate committee chairmen and the Senate President. He also served the governmental affairs office of the Illinois Department of Central Management Services.

Jim received his Bachelors of Arts degree in the field of political science in 1993 from DePaul University in Chicago. Jim also received his Master of Business Administration in 1999 from the University of Illinois at Springfield.