

**PROPERTY RIGHTS THEORY AND OWNERSHIP OF FIRM-SPECIFIC
ADVANTAGES: THE IMPLICATIONS OF CONTRACTING AND LICENSING
WITHIN THE MULTINATIONAL FIRM**

by

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ABSTRACT OF THE DISSERTATION

Property Rights Theory and Ownership of Firm-Specific Advantages: The Implications of Contracting and Licensing within the Multinational Firm

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Firm-specific advantages (FSAs) play a critical role in the theory of the multinational firm. Firms establish foreign operations when their FSAs are not suitable to outsource or license in the market. However, the same assets deemed unsuitable for external contracting and licensing are extensively contracted and licensed within the multinational firm. The parent and/or subsidiaries that are the economic owners of the assets contract other entities within the firm to perform activities such as R&D, manufacturing, and distribution and pay them a guaranteed return for their activities. Internal ownership of FSAs has implications on the risks borne, incentives, resource allocation, and power distribution within the firm. Using a unique, confidential dataset on the internal transactions of multinational firms, including intra-firm product flows, economic ownership of FSAs, financials, and detailed specifications of the activities of subsidiaries within the firm, I examine the determinants of the structure of economic ownership of FSAs as well as the impact of FSA ownership on innovation within the multinational firm.

Dedication

To my husband, Hans, and to my family. Thank you for your love, encouragement, help, and support.

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1. Introduction

The ownership of firm-specific advantages (FSA) is central to the theory of the multinational firm (Dunning, 1977) and firms in general (Drucker, 1995; Grant, 1996; Kogut and Zander, 1992; Penrose, 1959). FSAs, also referred to as knowledge assets and competencies in the management literature, are the proprietary assets that provide the firm with a competitive advantage (e.g. Rugman and Verbeke, 2001). Firms establish foreign operations in order to capitalize on the ownership of firm-specific advantages, which can be transferred across the firm at a relatively low cost (Hymer, 1960; Caves, 1971). Although the theory of the multinational firm (MNC) suggests that firms establish foreign subsidiaries when their FSAs are *not* suitable to contract or license in foreign markets, MNCs contract and license the same FSAs *within* the firm to their subsidiaries in those same foreign markets. The parent and/or subsidiaries (entities) that own the FSAs (FSA owners) internally contract other entities (FSA users) within the firm to perform activities such as research and development, manufacturing, and distribution and pay the FSA users a guaranteed return for their activities. The FSA ownership structure has implications on the risks borne by the various affiliates, incentives, resource allocation, and power distribution within the MNC. While many researchers have studied the external licensing and contracting relationships of the MNC, the internal licensing and contracting relationships amongst affiliates have thus far been unexplored. The lack of research in this area is no doubt due to the lack of publicly available data.

This dissertation contributes to the international business literature by examining three questions related to MNC internal FSA ownership (or simply “FSA ownership”). First, how do MNCs internally organize ownership of their most important value-

generating assets? Second, how do FSA characteristics affect MNC choice of FSA ownership structure? Third, how does FSA ownership affect affiliate innovation? I also explore the role of tax haven FSA ownership.

A natural question arises as to whether the internal structure of FSA ownership is simply an artifact of tax avoidance. Recent U.S. Senate hearings on Apple and other multinational companies, and U.K. Parliamentary hearings on Starbucks, Amazon, and Google, have captured the public's attention and highlighted the role of shifting ownership of FSAs offshore as a means of avoiding taxes. While some companies have tax haven affiliates that perform research and development, manufacturing, or distribution activities, others have tax havens that are no more than a mailbox (Drucker, 2010). Clearly, tax avoidance plays a role in FSA ownership structures. However, very little is known about MNC FSA internal ownership outside of what is reported in the media due to alleged tax avoidance.

Transfer pricing research focuses on predicting the appropriate transfer price of goods within a MNC (e.g. Tsay, 1999) and examines whether MNCs shift profits from high to low tax jurisdictions (Grubert and Mutti, 1991; Grubert, 2003; Mutti and Grubert, 2008; Dischinger and Riedel, 2010). Recent research recognizes that some MNCs engage in extensive profit shifting whereas others do not (Grubert, 2003; Overesch and Schreiber, 2008). The research on transfer pricing examines *where* profits are shifted, it does not examine the differences in MNC internal FSA ownership structures. It also fails to examine how the ownership of FSAs influences MNC real operations.

Chapter 2 provides the theoretical background for understanding the internal contracting and licensing of FSAs that occurs within the MNC. Consistent with resource

and knowledge-based perspectives of the firm (e.g. Barney, 1991; Amit and Schoemaker, 1993; Grant, 1996; Kogut and Zander, 1992), the firm is viewed as a heterogeneous bundle of assets. Firm-specific advantages are considered the most important assets for the firm. I build on property rights theory, which assumes that a set of rights can be attributed to each asset or resource and lays the groundwork for predictions on the allocation of those rights to parties in an exchange relationship. The MNC has an internal network of exchange relationships. I argue that property rights theory compliments the resource based perspective by enabling predictions on how the rights to the MNC's key value generating assets are allocated across its network of subsidiaries.

Chapter 3 provides a contextual background and an overview of the data.

Particularly since the dataset is new and relatively little is known about MNC internal ownership of FSAs, it is worth providing some descriptive statistics. To conduct my research, I assembled a unique confidential panel dataset obtained from a consulting firm that advises MNCs on transfer prices. My dataset consists of the intra-firm transactions of 102 MNCs and their parent and subsidiaries in an unbalanced, panel dataset from 1997 to 2012. The dataset includes detailed data on the economic ownership of FSAs within the firm, contracts between the FSA owners and FSA users that clearly delineate the rights and responsibilities of each party, mergers and acquisitions (M&As), changes in ownership structure, tax haven ownership, financials, and product flows. I combined this data with data from Bureau Van Dijk's Orbis database, Thomson Financial M&A database, and United States Patent Trademark Office. I used the combined data to construct multinational firm-level and subsidiary-level datasets. MNCs vary by whether FSA ownership is centralized into one entity or dispersed across many entities. Similar

to the types of ownership structures that emerge in markets, I identify four different types of FSA ownership structures that MNCs use: 1) sole ownership, 2) shared ownership, 3) separate ownership, and 4) mixed ownership. I examine descriptive statistics associated with each structure and with tax haven ownership.

Chapter 4 builds on property rights theory to understand how MNCs allocate the economic ownership of FSAs to different units within the firm. This chapter investigates the FSA characteristics that influence the choice of ownership structure. Property rights theory suggests that in an exchange relationship, the party whose activity makes the largest contribution to the creation and maintenance of the asset should own the asset. However, MNCs must balance these considerations against other potential advantages such as reduced administrative and monitoring costs, reduced bargaining problems, tax minimization, and greater internal knowledge sharing. This chapter argues that MNCs with knowledge-intensive, tacit knowledge assets are more likely to have shared FSA ownership structures, whereas MNCs with independent FSAs and FSAs that require local, downstream inputs are more likely to have separate FSA ownership structures. The empirical results strongly support property rights theory predictions.

Chapter 5 investigates whether and to what extent FSA ownership affects innovation. Although FSAs have long held a central role in the theory of the MNC, the effects of *internal* ownership on innovation remains unexamined. Innovation is inherently difficult to monitor and control. Property rights theory suggests that ownership provides two incentives for investing in the creation of the asset: 1) the ability to appropriate income from the innovations created, and 2) the ability to control both the asset and its future direction of development. I find that subsidiary FSA ownership is

positively associated with innovation, and that transferring ownership away from the subsidiaries that create the FSAs has a negative effect on innovation.

This research makes several contributions. First, I contribute to the theory of the MNC by shedding new light on how FSAs are internally organized, developed, and managed within MNCs. Due to the lack of publicly available data, previous research has not been able to open up the black box of internal MNC transactions. FSA ownership is important because through the contractual relationships risk is shifted from the FSA users to the FSA owners, and the FSA owners are centrally positioned in the firm's internal network of financial, knowledge, and product flows. Therefore the FSA owners can have a significant effect on MNC investment and innovation. Second, I extend property rights theory to inside the firm and identify the types of FSAs that are more likely to be solely owned by one entity, co-owned by two or more entities, or separately owned by different entities within the MNC. This research suggests that internalization is not sufficient for resolving the problems associated with contracting for knowledge and provides insight into the ability of property rights theory to explain internal firm behavior. Third, I investigate how the internal governance of FSAs affects the creation of new FSAs by analyzing how subsidiary FSA ownership influences subsidiary technological innovation. Finally, I explore the role of tax havens and FSA ownership.

2. Theoretical Background

2.1 FSAs and the MNC

The management of firm-specific advantages (FSA) is at the core of theorizing about the existence of MNCs and firms in general (Buckley and Casson, 1976; Dunning, 1977; Rugman, 1980; Barney, 1991; Grant, 1996; Kogut and Zander, 1992). The firm is conceptualized as a bundle of heterogeneous resources and assets (Amit and Shoemaker, 1993; Penrose, 1959), of which firm-specific advantages are considered the most important (Barney, 1991; Rugman and Verbeke, 2001). FSAs provide firms with competitive advantages, enable them to generate profits, and expand abroad. FSAs are the reason why multinational firms exist. The literature on MNCs suggests that firms internalize transactions when FSAs are not suitable to contract or license in the market (Buckley and Casson, 1976; Rugman, 1980). Market failures and uncertainties create bargaining problems and agency costs, which make it more efficient to transact inside the boundaries of the firm than in markets. However, these same FSAs deemed unsuitable for external contracting and licensing are extensively contracted and licensed between subsidiaries and/or the parent within the MNC.

Referred to as competencies, knowledge assets, and firm-specific advantages in the management and international business literature, FSAs are considered by many as the most important source of above normal returns (e.g. Rugman and Verbeke, 2001; Drucker, 1995; Spender and Grant, 1996). FSAs include technologies, patents, brands, know-how, and organizational routines (Birkinshaw, Nobel and Riddensdale, 2002). Rugman and Verbeke (2001) explain that FSAs are the unique company strengths, which include a broad range of functional, technological, and organizational proprietary assets

and know-how. FSAs include technological and/or marketing knowledge, and superior managerial capabilities to control and coordinate international transactions (Buckley and Hashai, 2009). FSAs provide the firm with a competitive advantage and are thus a key source of above normal profits.

This research applies property rights theory (e.g. Grossman and Hart, 1986; Hart and Moore, 1990) to the internal structure of the MNC. Although property rights theory is typically applied to external exchange relationships, extending it to the internal contracting structure and relationships between entities within the MNC can enhance our understanding of the firm. In contrast to transaction cost economics which focuses on the characteristics of transactions, property rights theory focuses on the characteristics of assets and asserts that ownership of an asset can be broken into sets of rights to the asset. Taking the view that the firm is a bundle of heterogeneous assets, property rights theory allows us to ask how the rights to the MNC's key value-driving assets are allocated across its network of subsidiaries.

2.2 Property Rights Theory and the Firm

The Theory of the Firm (Coase, 1937) spawned a large literature on the internalization of transactions within the boundaries of the firm. One stream of research that developed from Coase (1937) is property rights theory (Grossman and Hart, 1986; Hart and Moore, 1990). Property rights theory focuses on the question of who owns the property rights of the assets in an exchange relationship (Foss and Foss, 2001). Property rights are defined as “any sanctioned behavioral relations among decision makers in the use of potentially valuable resources; such sanctioned behaviors allow people the right to use resources within the class of non-prohibited uses” (Asher et al, 2005: pp. 7).

Property rights may include the right to use, exclude others from use, appropriate income, and transfer or invest in the resource (Foss and Foss, 2001). The multidimensionality of rights to an asset means that different entities can hold different rights to the asset. In the case of the MNC, this means that different subsidiaries can hold different rights to the MNC's key assets. For example, a subsidiary may have the right to manufacture a product, but not the right to sell the product in particular markets. Viewing a firm as a bundle of assets, the rights of subsidiaries to the MNC's FSAs can affect their role, appropriation of income, incentives, and formal linkages to other subsidiaries within the firm (operational structure).

A fundamental assumption in property rights theory is that contracts are incomplete - it is impossible to specify all terms and contingencies in advance. Unforeseen contingencies and the costs of writing and enforcing contracts make contracts incomplete (Tirole, 1999). Internal transactions of goods, services, and knowledge assets between MNC entities face similar challenges as external market transactions. FSAs, by nature, are incomplete. Foss and Foss (1998) claim that intangible assets are a source of incomplete contracts that lead to imperfectly specified rights. Moreover, MNCs are faced with diverse risks and uncertainties from their global operations. Shifts in global demand, prices, and costs create large risks within the MNC causing incomplete internal contracts.

Incompleteness gives rise to two types of entities in an exchange relationship: 1) specific rights owner, and 2) residual rights owner. The specific rights owner performs activities as specified in a contract in return for a guaranteed income. Because the specific rights owner is guaranteed a return, its exposure to risk is mitigated. The

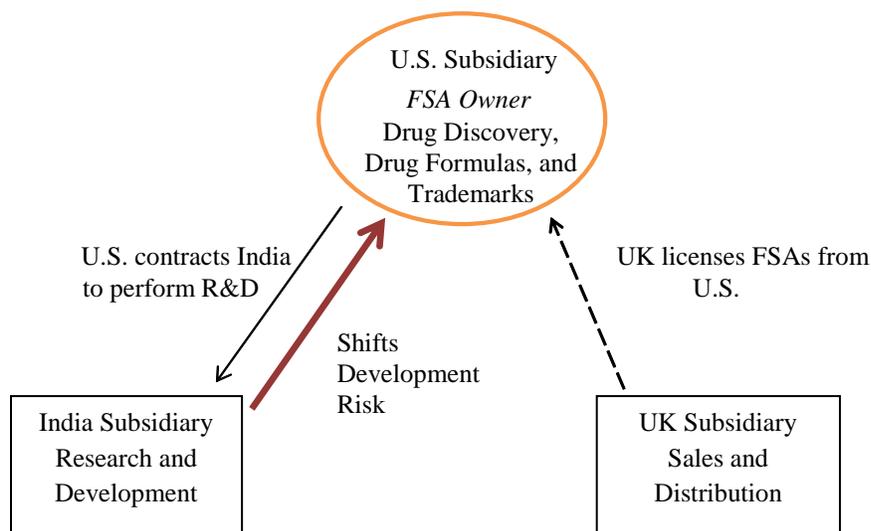
residual rights owner bears the risk associated with the exchange relationship. It receives the profit or loss based on the difference between the total income and the payments promised to the specific rights owner (Jensen, 1986). The classical example of a specific-residual relationship is the employment contract where individuals prefer to be hired as employees directed to perform tasks in return for a guaranteed wage (Coase, 1937). The entrepreneur (residual rights owner) takes the residual, fluctuating income (or loss) above the amount promised to the employees (Coase, 1937).

Extending this concept to MNC and the contractual relationships between entities, the FSA owners within the MNC are the residual rights owners. The affiliates that license the FSAs, or are contracted to perform various functional activities (FSA users), are the specific rights owners. The FSA owners contract the FSA users within the firm to perform various functions in return for a guaranteed return. The FSA owners bear the risk of the fluctuating income. By allocating various rights between the related affiliates, MNCs are able to shift the effects of risk and uncertainties to various units within the firm.

The concept of residual ownership is equivalent to economic ownership (Barzel, 1997). Economic ownership, which is conceptually distinct from equity and legal ownership (Barzel, 1997), is based on ultimately bearing the costs and risks associated with the activities. Fama and Jensen (1983) note that most organizational forms have contract structures that limit the risks undertaken by most agents through specifying fixed

or incentive payoffs.¹ The following provides an example of residual-specific rights ownership within the MNC.

Figure 1: Example of FSA Ownership and Contracting and Licensing Arrangements



The FSA owners are the entities that bear the risk and not necessarily the entities that physically create the MNC FSAs. For example, a pharmaceutical MNC has an R&D affiliate located in India. The FSA owner, which is a U.S. affiliate, contracts the Indian affiliate to perform R&D activities. The FSA owner agrees to reimburse the Indian R&D affiliate for all of its R&D costs, plus a 15% mark-up on its R&D costs for the R&D

¹ While economic ownership may overlap with equity and legal ownership, it is conceptually distinct. Alchian and Demsetz (1973) explain that property rights deal with the right to use the resource, and not legal ownership per se. Barzel (1997) distinguishes between economic and legal rights, viewing economic rights as the more relevant concept of property rights. Barzel (1997) argues that economic rights, or the right to residual income, are the ends that agents seek whereas legal rights are the means to achieve the ends. While legal rights are recognized by governments and enhance economic rights, they are neither necessary nor sufficient for economic rights (Barzel, 1997). Under property rights theory, the concept of residual rights ownership can be detached from equity ownership (Fama and Jensen, 1983). Zingales (2000) argues that viewing the shareholders of the firm as residual claimants is a narrow view of the residual claimant. Fama (1980) goes so far as to suggest that ownership of the firm is “an irrelevant concept” (p 290). The view held in this paper is that, within the MNC, the economic owners of the MNC FSAs are the residual claimants within the MNC.

services. The Indian affiliate is a specific rights owner as it is guaranteed to earn a return (markup on its R&D expenses), regardless of the outcome of its activities. If the R&D affiliate is not able to successfully develop a new drug, or if it takes it an extra five years to do so, the U.S. affiliate is responsible for the losses associated with the Indian affiliate's R&D activities and the Indian R&D affiliate continues to earn the stable 15% return on its R&D activities. If, however, the Indian affiliate successfully develops a new product, the U.S. affiliate, as the FSA owner, receives any profit that is above the 15% return given to the Indian R&D affiliate. In other words, it receives the above normal returns (residual income) for any newly created FSAs.

Thus, the entities within the MNC can be categorized into two groups: 1) FSA owners, and 2) FSA users. The FSA owners can be the parent and/or affiliates within the MNC. Some FSA owners may perform operational activities, such as R&D, manufacturing, or distribution, whereas others may be tax haven entities with no operational activities. MNCs may have one, several, or many FSA owners. FSA users are the affiliates and/or parent that do not own the economic rights to the MNC FSAs. These entities are either contracted by the FSA owner(s) to perform specific activities such as R&D, manufacturing or distribution, or they license the rights to use the MNC FSAs from the FSA owner.

The concept of residual income is equivalent to the strategy concept of above average returns. Residual income is the income in excess of normal (market) returns for the activity performed. Above normal returns are attributed to firm-specific advantages (e.g. Rugman and Verbeke, 2001). Thus, FSAs are the important value-drivers of

multinational firms. Firm-specific advantages are dynamic; firms must continuously work to develop and maintain their competitive advantage (Buckley and Casson, 1976).

The development of FSAs is risky. The separation of specific rights from residual rights facilitates the risk sharing between the agents in an exchange and the allocation of economic rents. It is important to note that there are downsides to FSA ownership. Fama (1980) states that the asset owner, as residual claimant, receives the “uncertain and possibly negative difference between total revenues and costs at the end of each production period” (pp. 290). The residual rights owner (Alchian and Demsetz, 1972) is also called residual claimant (Klein, 1983), residual risk bearer (Fama, 1980; Fama and Jensen, 1983), and economic rights owner (Barzel, 1997) in the literature. In terms of the MNC, the affiliates that take on the risks of developing FSAs are the residual rights owners. These entities bear the consequence of failure to achieve above normal returns.

The role of the residual rights owners is to insulate the other entities within the MNC from risk. Through guaranteeing FSA users a specified return on their activities, risk is shifted across globally dispersed locations. This has several important implications. First, it determines the risk exposure of the MNC entities. Different contractual terms may shift different levels of risks to or from the FSA users and FSA owners. Second, FSA ownership determines the entities’ investment incentives. While FSA owners are motivated to make investments that increase the value of the FSAs, non-owners have reduced incentives for investment. As a result, the structure affects economic behavior and outcomes (Kim and Mahoney, 2005). Third, it determines which

entities control the financial resources of the firm.² In return for bearing the risk, the FSA owners are entitled to the residual income from the FSAs. This empowers the FSA owners in resource allocation. Property rights theorists note that asset ownership provides the owner with power and control over the operations (Hart and Moore 1990; Rajan and Zingales, 2000). The residual rights owners have the ability to coordinate and allocate tasks to the non-owning users and the power to punish the users by withholding resource allocations, re-directing tasks, and exiting businesses (Rajan and Zingales, 2000). Grossman and Hart (1986) argue that residual rights ownership is important because the owner can influence the solutions to problems and the strategic direction of future intangible assets. As a result, I expect that FSA ownership will have a significant effect on MNC incentives, resource allocation, and strategic decisions.

The relationship between the FSA owners and FSA users within the firm is aligned with Teece's (1986) observation of the need to own complimentary activities in order to capture the returns from innovation. The purpose of property rights is to maximize value and transfer resources to their best uses. Different ownership structures emerge in response to "economic problem of allocating scarce resources" (Kim and Mahoney, 2005). Allocation of property rights is viewed as an efficient means of dividing economic rents and avoiding inefficient expropriation and underinvestment (Asher et al, 2005; Rajan and Zingales, 2000). Property rights facilitate implementing value-creating activities so that resources are channeled to high yield uses (Kim and Mahoney, 2002). The contractual relationships with FSA users prevent bargaining problems within the MNC over which entities control the FSAs and the allocation of income from the FSAs

² Although the parent can repatriate income, tax consequences and the bargaining power of the FSA owner may discourage repatriation.

within the firm. It also prevents future conflicts as to whether an affiliate created a particular MNC FSA. By contracting the FSA users within the firm to perform various functional activities, the FSA owner is entitled to the ownership of any FSAs that the FSA user creates while under the contractual relationship. Therefore the FSA owner will continue to own any future developed FSAs.

From the ownership of FSAs emerges the internal MNC network of exchange relationships. As noted by Grant (1996) the drive towards specialization within the firm creates a need for coordination mechanisms. In markets, the coordinator is the entrepreneur. Within the MNC, it is the FSA owners which contract and license the FSA user entities. Through contracting and licensing affiliates, the FSA owners coordinate MNC activities.

The internal ownership of FSAs is important for several reasons. First, ownership of FSAs is central to the theory of the multinational firm. Although an extensive amount of research has been conducted on FSA ownership at the MNC-level, FSA ownership within the MNC is unexplored. Through exploring questions such as how internal contracting and licensing is similar to or distinct from external market contracting and licensing, we can advance the theory of the multinational firm. Second, research on internal FSA ownership can deepen our understanding of the internal organization and network structure of the firm (e.g. Bartlett and Ghoshal, 1989; Gupta and Govindarajan, 1991). FSA owners, as the entities that contract and license FSAs to other entities within the MNC, are centrally positioned in the MNC internal network of financial, knowledge, and product flows. Third, internal licensing and contracting separates ownership from control of real operations. The economics literature suggests that various adverse

incentive effects arise from the separation of ownership and control. It is important to understand its impact on organizational outcomes. Fourth, FSA ownership affects the power distribution and decision making authority within the MNC. The FSA owners are legally entitled to the residual profits of the MNC (e.g. Internal Revenue Code Section 1.482; OECD Guidelines).³ Once established, transferring FSA ownership can be prohibitively costly. Their contracting and licensing activities combined with entitlement to profits means that FSA owners may play a significant role in determining MNC resource allocation and strategy. Research on affiliate-level FSA ownership has the potential to make many contributions to the international business literature.

³ OECD Guidelines as well as local country regulations require that entities pay for the FSAs that they acquire from other entities within the MNC.

3. Data

In order to test the predictions, I compiled a novel dataset of MNC FSA ownership. The primary source of data was MNC transfer pricing reports from a consulting firm. Transfer pricing is the intercompany pricing of goods, services, and intangible assets between MNC entities. According to U.S. Treasury Regulations Section 1.482, Organization for Cooperation and Development (OECD) Transfer Pricing Guidelines, and various other local country requirements, MNCs must document their intra-company transactions in transfer pricing reports each year. Although documentation requirements are country-specific, many countries follow the OECD Guidelines for transfer pricing and most countries require that all material related-party activities are documented contemporaneous with the firm's tax filing.

MNCs hire consulting firms to document their intra-company transactions. The consulting firms collect for the reports the MNC financials, organizational charts, headcount by function, and intra-company agreements. The intra-company agreements describe the transactional relationships, risks, economic owners of the intangible property, payments, and contractual terms for the intra-firm transactions. The consultants conduct interviews with senior managers and C-level executives to confirm whether the activities were in accordance with the intra-company agreements. Any discrepancies are documented in the reports. Since the reports document multi-year averages, MNCs usually provide three years of consolidating income statement and balance sheet data.

The data for this research was put together under strict confidentiality. For this reason, no company names or company-specific information can be identified. All

summary statistics show means, standard deviations, or other statistical measures, and any descriptions are redacted or have the names changed to maintain anonymity.

Two datasets were compiled from the transfer pricing data: a MNC-level dataset and a subsidiary-level dataset. The dataset is an unbalanced, longitudinal dataset since the transfer pricing reports typically cover multiple years of data in order to take into account business cycle and many of the MNCs repeatedly use the consulting firm for services, making longer periods of time available. The sample is composed of 102 MNCs over the 1997-2012 time period on which the consulting firm had the most comprehensive data. The sample contains a diverse group of MNCs, operating in a broad range of industries and headquartered in a number of countries. The MNCs in the sample had a combined total of 7,156 subsidiaries.

In addition to data on internal FSA ownership and contracting and licensing arrangements, I collected patent data from the United States Patent and Trademark Office (USPTO). I searched for all granted patents assigned to each MNC or to any subsidiary within the MNC's group. Following standard practice, the patents were matched to years based on the filing date. I used the inventor city, state, and country information to match each inventor location to a MNC subsidiary. Matching patents to inventor location provides a much closer measure of subsidiary innovation than matching by assignees, which can be biased by the intellectual property strategies of the MNCs. The MNCs in the sample patented 50,934 patents over the sample period. 29,028 of the patents had only one inventor and 10,711 patents had multiple inventors from the same subsidiary location and therefore were coded to only one subsidiary. The remaining 11,195 patents

had inventors from more than one subsidiary location and were therefore coded to multiple subsidiaries.

3.1 Coding of Data

Intangible Asset Definition. Transfer pricing reports discuss the MNC's "intangible assets" or "intellectual property." The OECD defines an intangible asset as:

"not a physical asset or a financial asset, which is capable of being owned or controlled for use in commercial activities, and whose use or transfer would be compensated had it occurred in a transaction between independent parties in comparable circumstances" (OECD 2013: 14).

Moreover, unique and valuable intangibles are:

"those intangibles (i) that are not comparable to intangibles used by or available to parties to potentially comparable transactions, and (ii) whose use in business operations (e.g. manufacturing, provision of services, marketing, sales or administration) is expected to yield greater future economic benefits than would be expected in the absence of the intangible" (OECD 2013).

OECD guidelines give several examples of the types of assets classified as intangibles, including patents, know-how and trade secrets, trademarks and trade names (OECD 2013). The definition of valuable intangible assets is closely aligned with the strategy concept of core competencies and international business literature concept of FSAs.

MNCs have different types of FSAs, ranging from product innovations to know-how and formulas. The following table shows the different categories of intangible assets listed in the transfer pricing reports for the MNCs in the sample.

Table 1: Coding of FSAs

FSA Category	Example Description of FSA
Product	[MNC's] intangible assets relate to its products. [MNC] has X product families. [MNC] engages in developing and marketing products for [industry]. [MNC]'s products include cutting edge [technology], are highly integrated and offer high-quality performance. [MNC] expects that its continued R&D efforts for [product line], which represents next-generation technology based on the persisting legacy technology, will lead to large sales growth.
Drug Discovery	The profitability of [MNC] is determined by the successfulness of its drug discovery, development, and commercialization capabilities. Drug discovery activities include molecular discovery research.
Manufacturing Process	[MNC] has proprietary manufacturing processes that provide it with competitive advantages. Its manufacturing processes enable it to produce high-quality products at prices lower than its competitors.
Procurement Know-How	[MNC] Procurement Intangibles: [FSA owner] owns the rights to a number of processes, procedures and proprietary tools used to optimize the procurement of materials used in [MNC]'s operations. In order to ensure high quality and consistency of suppliers, [FSA owner] has set standards for all third parties that supply materials to affiliates located worldwide, and developed a proprietary system for affiliates to evaluate, select, monitor, and change suppliers.
Trademark and Marketing	The brands owned by [MNC] are a significant source of value. [FSA owner X] owns the worldwide rights to the valuable [Brand X] and related trademarks.... [FSA owner Y] owns the rights to [Brand Y]. [Brand Y] is a highly regarded domestic and international brand in the X industry. Third parties pay a considerable premium for the [Brand] products due to the brand name.
Blends and Recipes	[MNC]-owned intangible property is related to the blend formula and recipes for creating the products sold by [MNC]. Primary processing consists of blending chemicals in a batch run. Trade secrets and know-how related to the blend formula and mixing procedures are also important to the production process. The blends and formulas of [MNC]'s products are proprietary to [FSA owner].
Retail Store Design Layout	[MNC] Store Design Intangibles: [MNC] has specialized retail store designs and layouts which [MNC] considers crucial for its brand image and the ability of [MNC] to attract and retain customers.

Table 1: Coding of FSAs Continued.

FSA Category	Example Description of FSA
Expertise and Know-How	The services and know-how provided by the local subsidiaries drive [MNC]'s profits. [MNC's] business requires highly skilled technical experts. The local subsidiaries provide unique services, due to their functional or geographic (depending on the entity) expertise. Because of their unique skill and expertise, they are largely able to dictate the prices to customers.
Customer Relationships	Local customer relationships are important. [MNC's] trademark has no value in a new market and therefore each local sales subsidiary must create all customer relationships through its own intensive selling and marketing activities. The sales subsidiaries make substantial investments in relationship building and in the subsequent customer maintenance process. The required time to build customer relationships varies by geographic region, meaning that some sales subsidiaries incur losses for some time while going through initial market penetration activities. The sales subsidiaries have established loyal customer bases in their markets. These relationships are valuable, locally developed intangible assets that are owned by each local sales subsidiary.
Services	[MNC]'s core strength is its service capabilities. [MNC] has the biggest service network of any of the [industry] manufacturers. Customers in the [X and Y industry sectors] seek [MNC]'s products due to its vast service network, which provides [MNC] the ability to provide services anywhere in the world.
Counter Example: MNC has No Product Innovation FSA	[MNC] technology is relatively old and has not been updated or further developed since [year]. Therefore, [MNC] currently incurs few to no costs associated with developing, maintaining, or defending this technology. Moreover, there is no market for the technology. The products are considered standardized products.

Figure 2: Types of FSAs

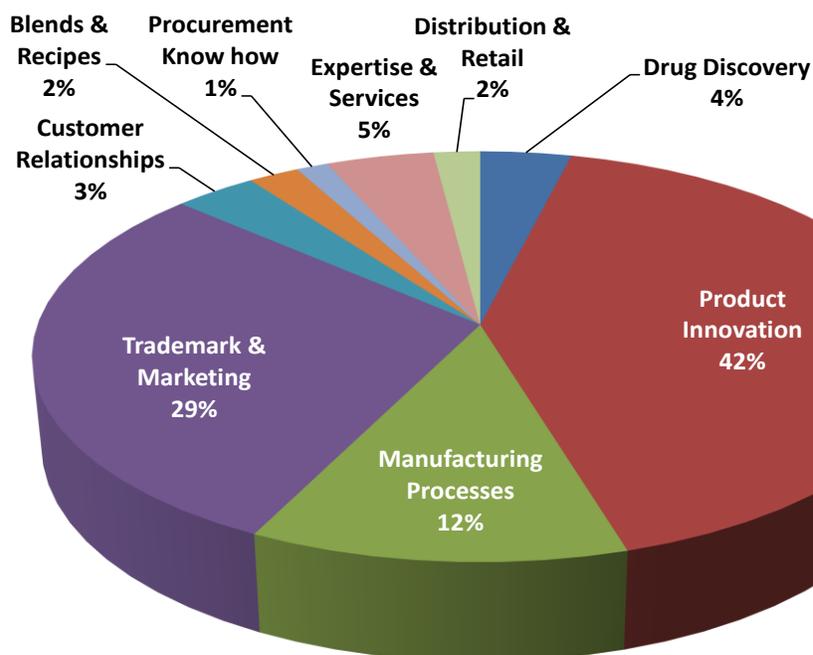


Figure 2 provides a breakdown of the different types of FSAs owned by MNCs in the sample. As shown in the pie chart, 42% of observations in the sample had product innovation FSAs, 29% had trademark and marketing FSAs, 12% had manufacturing processes, and the remaining had various other FSAs including distribution and retail, drug discovery, and expertise and services, etc. MNCs sometimes indicate that they own multiple FSAs. The most common overlap of FSA types was product innovation and trademark intangibles.

Intangible Asset Owner Definition. I used the detailed information provided in the transfer pricing reports to identify and code the intangible asset owners within the MNC. The transfer pricing reports identify the intangible asset owners associated with each intercompany transaction in order to determine which entity should receive any profits or losses from the intra-company transactions. Intangible asset ownership under transfer

pricing guidelines is based on economic ownership. The intangible asset owners bear the risk of intangible asset development or purchase previously developed intangible assets from affiliates.

Intangible asset owners for each MNC were explicitly identified in the transfer pricing reports. Ownership is also supported with the written legal contracts between MNC entities and real flows within the firm. All transfer pricing reports for each MNC were carefully reviewed and each intangible asset owner for each MNC was recorded, its country of incorporation, and the functions performed by the intangible asset owner.

Tax haven Ownership. I code tax haven ownership as a binary indicator variable, set equal to 0 if the country of incorporation of at least one of the MNC's intangible asset owners is a tax haven country. Tax haven countries were identified based on the OECD's list of tax havens (OECD, 2000). Some MNCs have FSA owners in tax haven countries that perform substantial operational activities and significantly contribute to the development of MNC FSAs. For this reason, I code two separate tax haven variables. *Operational Tax Haven* is a binary indicator set equal to one if the FSA owner is located in a tax haven country and performs R&D, distribution, manufacturing, or service activities. *Pure Tax Haven* is a binary indicator set equal to one if the FSA owner is located in a tax haven country and does not perform R&D, manufacturing, distribution, sales and marketing activities, or financial trading (for banking firms).

3.2 FSA Ownership Structures

FSA Ownership Structures. MNC intangible asset ownership structures differ along three dimensions: 1) the extent to which the ownership of their intangible assets is centralized into one entity or dispersed across many entities, 2) whether ownership is

shared between entities or owned separately by entities, 3) whether the ownership is located in tax havens.

From the information contained in the reports, I identified four types of intangible asset ownership structures and coded each MNC according to its structure: 1) sole ownership, where one entity owns all of the MNC's intangible assets, 2) shared ownership, where two or more entities share ownership of the intangible assets, and 3) separate ownership where different intangible assets are separately owned by different entities within the MNC, and 4) mixed ownership where some entities share ownership of certain intangible assets and other entities own separate and distinct intangible assets. Overlapping all of these types of structures is tax haven ownership, where one or more of the intangible asset owners are located in tax haven locations.

Table 2: Coding of FSA Ownership Structures

Ownership Structure	Definition	Examples of Phrases Used in Reports
Sole*	<ul style="list-style-type: none"> All FSAs owned by the MNC are owned by one entity. 	<ul style="list-style-type: none"> [Entity] is the owner of all intangible assets owned by [the MNC]. [Entity] owns, manages, and maintains [MNC's] portfolio of intangible assets. These assets include, but are not limited to, trademarks, process and information technology, know-how, patents, industrial models, and all other intellectual capital.
Shared	<ul style="list-style-type: none"> Two or more entities within the firm share ownership of the MNC's FSAs. 	<ul style="list-style-type: none"> [Entity] and [Entity] share ownership of the rights to all of the technologies and trademarks associated with the products owned by [MNC]. Pursuant to the Cost Share Agreement, [Entity] and [Entity] share all costs, risks, and rights to all of the Company's intellectual property.
Separate	<ul style="list-style-type: none"> Two or more entities within the MNC own the rights to separate and distinct MNC FSAs. 	<ul style="list-style-type: none"> [Entity A] owns the rights to [FSA 1]... [Entity B] owns the rights to [FSA 2],... and [Entity C] owns the rights to [FSA 3]. Each [distribution entities] own the rights to their local market intangibles.
Mixed	<ul style="list-style-type: none"> Two or more entities share ownership of at least one FSA and at least one other entity owns a separate and distinct FSA. 	<ul style="list-style-type: none"> [Entity A] and [Entity B] share ownership of [X FSAs]...[Entity C] owns the rights to [Y FSAs]. [Entity A] is the economic owner and bears all costs and risks of [MNC's] activities associated with [X FSAs]. Under the terms of a Cost Share Agreement, [Entity A] and [Entity B] share the rights, risks and costs associated with [FSAs]. [Entity D] owns the rights to [X FSAs].

* For MNCs that did not explicitly state that one entity owns all the FSAs, a MNC was also coded as having a sole ownership structure if only one entity was named as the owner of FSAs in all of the MNC's transfer pricing reports.

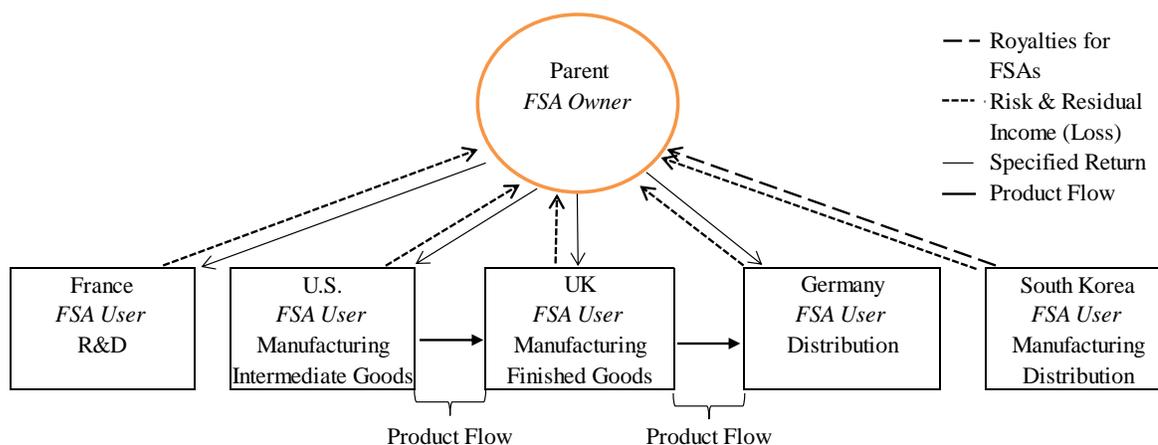
Each structure has its advantages and disadvantages. The following provides an overview of each structure.

3.2.1 Sole Ownership

Sole ownership occurs when one entity within the MNC owns the rights to all of the MNC's FSAs, regardless of where R&D, manufacturing, distribution, or marketing

activities occur within the firm. Figure 3 shows an example of a sole ownership structure.

Figure 3: Sole Ownership Structure



In the above example, the parent is the only FSA owner of the MNC. The parent owns all FSAs and contracts all other entities within the MNC to perform activities such as R&D, manufacturing, and distribution. The FSA owner acts as a financial intermediary in the trade relationships within the firm. Even though product flows directly from the U.S. intermediate goods manufacturer to the U.K. finished goods manufacturer, and from the U.K. finished goods manufacturer to the German distributor, the FSA owner handles the financial flows by directly paying each entity for the services performed and/or charging them for the goods received.

Sole ownership structures generate limited incentives within the firm since all but one entity do not own FSAs (FSA users). FSA users earn a guaranteed income on their activities, but do not have rights to residual profits earned from the FSA. Sole ownership structures centralize operational risks such as development, market penetration, manufacturing, and warranty risks into one entity. They also allow for centralized

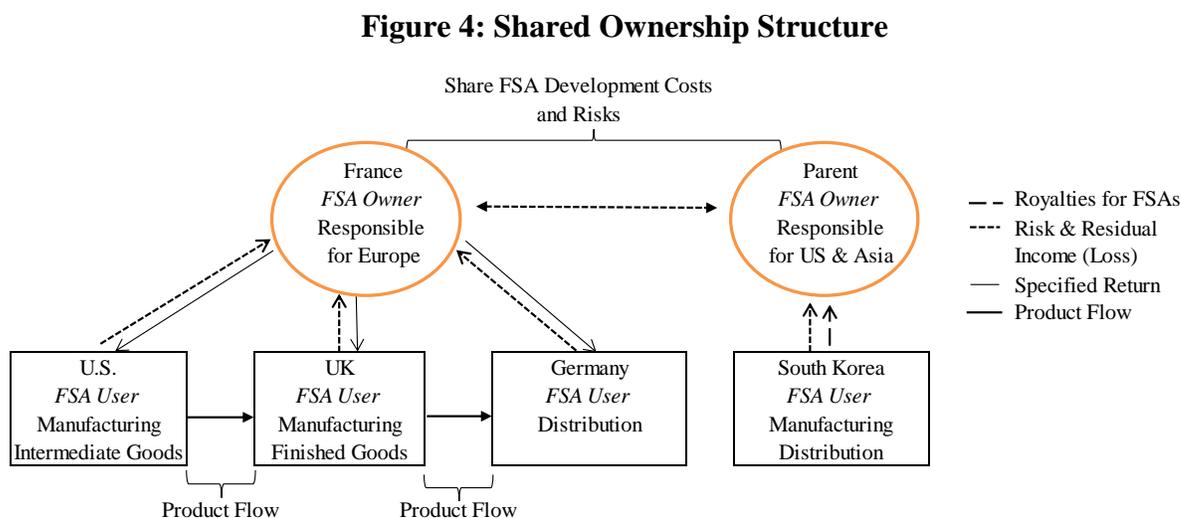
coordination and control. Information flows from the FSA users to the one FSA owner and from the one FSA owner to the FSA users. The information flows and connections enable the FSA owner to direct the implementation of a new technology or innovation across the group and to disseminate best practices learned from FSA users throughout the firm. However, since all FSA users report to the one FSA owner, bounded rationality can limit the FSA owner's ability to identify the best investment opportunities. Therefore, sole ownership should be particularly advantageous for small firms.

Sole ownership structures are administratively simple, easy to manage, and create efficiency gains by having only one FSA-owning entity – usually the parent – contract with the FSA users throughout the firm. Having a single FSA owner facilitates monitoring the performance of FSA users and reduces the administrative complexity associated with extensive intra-firm flows of FSA cross-licenses and royalties. Sole ownership structures limit disputes and bargaining problems between MNC entities regarding the allocation of returns since there is only one FSA owner within the firm. The ease of management, low levels of bargaining problems, and ability to control and leverage best practices make this structure also beneficial for very large firms that want to reduce administrative complexity and have greater integration and control of their operations.

3.2.2 Shared Ownership

Shared ownership of FSAs occurs when two or more entities co-own all of the MNC's FSAs. Under a shared ownership structure, the costs, risks, and benefits of the FSA are shared between owners based on the relative contribution to the FSA,

geographical region, or field of use. Figure 4 provides an example of a shared ownership structure based on geographical region.



In the above example, the French entity owns the European rights to the FSAs and the parent firm owns the U.S. and Asian rights to the FSAs. The FSA owners are responsible for licensing the FSAs and contracting the FSA users for products or services distributed within their region. Therefore, the French FSA owner contracts the U.S. and U.K. entities to manufacture products and the German entity to distribute those products in Europe. The U.S. contracts the South Korean entity to manufacture and distribute product in Asia. The FSA owners share the costs of developing the FSAs and share the risks and returns based on geographical regions. Thus, if the U.S. and Asian revenues combined represent 65 percent of the total revenues of the MNC, the U.S. FSA owner pays 65 percent of the development costs.

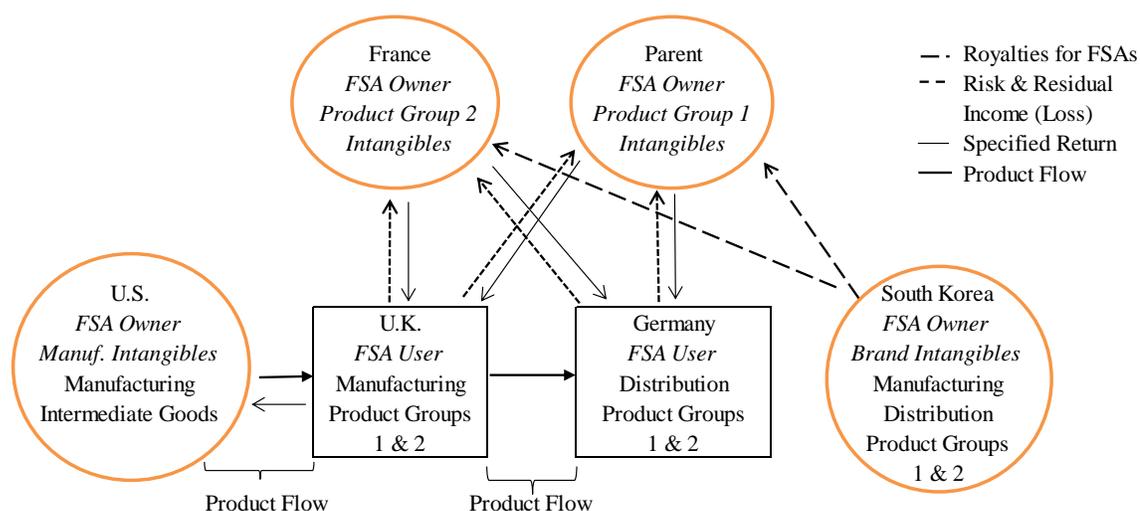
In shared ownership structures, the co-owners share incentives, control, and risks, which can increase the MNC's ability to expand geographically and engage in more risky investment projects in the hopes of furthering growth. Shared ownership structures are

the used by the most R&D intensive firms. For these firms, joint ownership incentivizes sharing knowledge and collaborating to increase total FSA value. Shared ownership structures offer the greatest potential to coordinate within the firm in that different FSA owners can manage regions, divisions or units, and work with other FSA owners to decide the best strategic actions to take. Since different affiliates report to specific FSA owners, information flows are more manageable and the problems of information overload that can occur with only one FSA owner are mitigated.

An important disadvantage of shared ownership is that FSA co-owners share power over decisions related to the FSA. Bargaining problems may arise between the co-owners and differences of opinion can lead to non-optimal decision making. Shared ownership structures are administratively more complex than sole ownership structures. The co-owners contract different FSA users, so there is some duplication of efforts as each FSA owner manages internal relationships.

3.2.3 Separate Ownership

Separate ownership occurs when two or more entities within the MNC own different FSAs. For example, the Singapore affiliate of a consumer goods company may own the rights to a technology and the UK affiliate may own the rights to a brand. Alternatively, FSA ownership may be separated based on technologies, products, localized relationships, brand names, or a mix of the above. The FSA owners license the FSAs or contract the FSA users to perform activities. If the FSA owners want to use each other's FSAs, they cross license the rights to their FSAs. Figure 5 provides an example of a separate ownership structure.

Figure 5: Separate Ownership Structure

In the above example of separate FSA ownership, there are four FSA owners. Each FSA owner owns a distinct FSA. The parent firm owns the FSAs associated with product group 1 and the French entity owns the FSAs associated with product group 2. The U.S. entity owns the FSAs associated with its manufacturing processes. The U.S. entity sells its intermediate goods directly to the U.K. manufacturing entity. The U.K. manufacturing entity pays the U.S. intermediate manufacturer directly. Since the U.S. manufacturing entity is an FSA owner, it is able to keep the profits associated with its manufacturing activities. The South Korean entity owns the rights to the brand name and marketing intangibles for the South Korean market. The South Korean entity sells products from product groups 1 and 2. As a result, it pays both FSA owners royalties for the products that it sells. Since the South Korean entity owns the rights to the brand intangibles, it bears the risks associated with market penetration and brand development in its region and is able to keep any profits from the brand intangibles. This incentivizes the South Korean entity to create brand value in its region. The parent and French entities are responsible for developing their own product groups and bear the risks as well

as returns from their efforts. The U.K. manufacturer and German distributor do not own the rights to any FSAs. Instead they earn set returns on their manufacturing costs.

By dispersing risk and control rights to FSA units throughout the firm, separate ownership structures create market-like incentives. In comparison to sole ownership structures, separate ownership structures can improve MNC investment decisions since the entities that are best positioned to make decisions about the FSAs own and control them. Separate ownership tends to create fewer bargaining problems than shared ownership since each FSA owner has full control over an FSA and does not need another party's approval to make a decision.

Despite their advantages, separate ownership structures can increase the difficulty of leveraging innovations and best practices across the firm. Information flows between the FSA users and the particular FSA owner(s) with which they contract. If an FSA owner were to use an innovation from another FSA owner, it would have to pay the other FSA owner a royalty for the innovation. Therefore, separate FSA owners have the incentive to develop innovations themselves and not to source knowledge from other FSA owners. When information is shared, cross licenses need to be negotiated within the firm. This can create bargaining problems and increase internal contracting costs. Additionally, separate structures can make it difficult to inventory the kinds of knowledge that reside with different FSA owners throughout the firm.

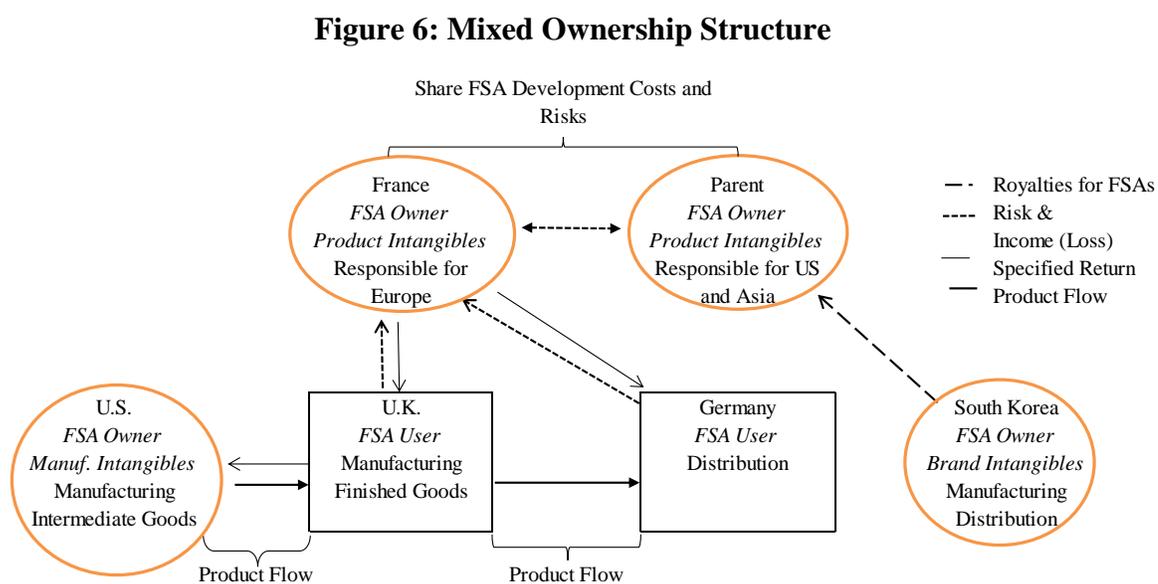
Separate ownership structures are more administratively complex than sole and shared ownership structures since the different FSA owners act as "mini firms" within the MNC. To the extent that there is operational overlap from having FSA users perform activities for multiple FSA owners, it can become complex to track the internal

transactions and the royalties due to each FSA owner. The MNC may experience reduced efficiency from duplication of efforts and administrative complexity.

3.2.4 Mixed Ownership

Mixed ownership occurs when two or more entities within the MNC share ownership of at least one FSA and at least one entity within the MNC owns a separate and distinct FSA. For example, in a consumer product company, one entity may own the rights to old technology associated with the legacy product lines and two entities may share the rights to new technology, which is associated with the new product lines.

Figure 6 provides an example of mixed ownership structure.



The mixed structure is basically a combination of both the shared and separate structures. In the above example, the French entity and parent share ownership of the MNC's product intangibles based on geographical region. The U.S. manufacturer also separately owns the manufacturing process intangibles and South Korea owns the brand

intangibles. Since the US manufacturer owns the manufacturing process, it directly sells its manufactured goods to the UK manufacturer and keeps any profits from its activities. The French FSA owner contracts the UK entity to manufacture product and the German entity to distribute product within the European region. The parent licenses the product intangibles to South Korea. South Korea, as an FSA owner bears the risks of market penetration and brand development in its local market. It therefore keeps any residual profits above the royalty paid to the parent for the product FSAs.

Mixed ownership structures provide the ability customize ownership of the FSAs owned by the MNC. Mixed ownership structures provide market-like incentives for the separate FSA owners within the firm and incentives to collaborate on innovation for the FSA co-owners within the firm. Mixed ownership structures decentralize coordination as different FSA owners and co-owners are responsible for different FSAs and activities. Information flows between the FSA users and the particular FSA owner(s) with which they contract.

Mixed ownership structures are the most operationally complex. Having different FSA owners and co-owners means that the firm may experience problems with power struggles and bargaining. Mixed ownership structures can have operational overlap if multiple FSA owners contract with the same FSA users, which creates administrative complexity for managing the different FSAs, activities, transactions, and returns across the MNC. It is therefore not surprising that among the firms in the sample, very few choose this type of structure to organize internal ownership rights to FSAs.

3.2.5 Tax Haven FSA Ownership

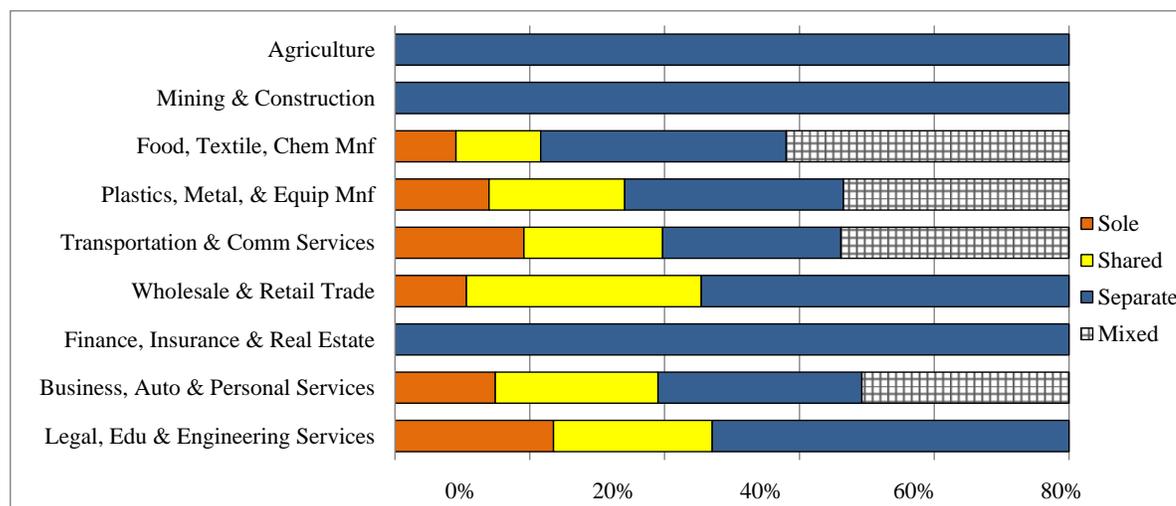
Tax haven FSA ownership occurs when MNCs locate all or part of their FSAs in low tax jurisdictions. Examples of tax haven locations include Ireland, Luxembourg, Hong Kong, Singapore, Bermuda, and Cayman Islands (OECD, 2000). Tax haven countries typically implement a combination of policies designed to attract MNCs, including low tax rates, minimal currency and banking controls, confidentiality, low interest rates on loans, and high interest rates on deposits. There is variation in the extent to which tax haven countries require that MNCs locate operations (“material substance”) within their country. Some countries, such as Cayman Islands, Luxemburg, and Barbados, have virtually no material substance requirements. Other countries, such as Ireland, require that MNCs establish material substance by locating real operations within the country.

Tax haven FSA ownership can occur in any of the FSA ownership structures. Not all MNCs use tax havens to own FSAs. In the sample, 42 percent of MNCs have tax haven FSA owners and 17 percent of the sample (38% of the tax haven FSA owners) have pure tax haven FSA owners. When a tax haven FSA owner has operational activities such as R&D, manufacturing, or distribution, the employees within the tax haven entity may make strategic and operational decisions regarding the FSAs. When tax haven FSA owners have no operational activities, the parent typically makes the strategic decisions regarding the development and use of the FSAs. In the latter case, the primary advantages of tax haven ownership are financial (reduced taxes or tax deferral) and/or growth related.

The following figure contains a breakdown of the types of FSA ownership

structures used by MNCs, by industry.

Figure 7: FSA Ownership Structure by Industry



As shown in the figure above, the structures used by MNCs vary by industry.

MNCs in services industries and raw materials industries are more likely to use separate structures than any other structures.

The MNCs that use the different types of structures vary greatly in characteristics.

The following table contains descriptive statistics on MNC characteristics, FSA

dimensions, and FSAs by FSA ownership structure. Superscripts denote significant

differences between structures. Each structure is numbered 1-4 (Sole, Shared, Separate,

and Mixed). Thus, the average R&D intensity for MNCs using a sole structure is 0.16.

The superscripts 2, 3, 4 indicate that the mean value of R&D intensity for sole ownership is significantly different from the values for the three other types of structures. The R&D

intensity for MNCs using a Shared structure is 0.19 and the superscripts 3 and 4 indicate this value is significantly different from the R&D intensity values of 0.08 and 0.10 for

Separate and Mixed ownership structures, respectively.

Table 3: Mean MNC Characteristics and FSAs by FSA Ownership Structure

	All	Sole	Shared	Separate	Mixed
<u>MNC Characteristics</u>		(1)	(2)	(3)	(4)
Revenue	13.92	12.62 ^{2,3,4}	13.41 ^{3,4}	14.70 ⁴	15.83
Assets	14.43	13.08 ^{2,3,4}	13.81 ^{3,4}	15.31 ⁴	16.31
Number of Subsidiaries	3.63	2.91 ^{2,3,4}	3.34 ^{3,4}	4.02 ⁴	4.94
R&D Intensity	0.13	0.16 ^{2,3,4}	0.19 ^{3,4}	0.08	0.10
Profitability	-0.05	-0.13 ^{3,4}	-0.23 ⁴	0.06	0.12
Effective Tax Rate	0.26	0.25	0.24	0.28	0.19
Tax Haven FSA Owner	0.51	0.07 ^{2,3,4}	0.84 ^{3,4}	0.58 ⁴	1.00
Pure Tax Haven FSA Owner	0.19	0.00 ^{2,3,4}	0.54 ³	0.11 ⁴	0.53
Age	41.66	32.46 ^{2,3,4}	24.92 ^{3,4}	57.56 ⁴	19.34
Diversification	0.32	0.21 ^{3,4}	0.20 ^{3,4}	0.36 ⁴	0.90
Number of M&As	1.14	0.47 ^{3,4}	0.63 ^{3,4}	1.68	2.06
US Country of Incorporation	0.75	0.85 ^{3,4}	0.81 ^{3,4}	0.68	0.59
EU Country of Incorporation	0.17	0.03 ^{2,3,4}	0.10 ^{3,4}	0.25	0.41
Other Countries of Incorporation	0.05	0.12 ^{2,3,4}	0.00 ^{3,4}	0.04 ⁴	0.00
<u>Contractibility</u>					
Tacit Scale	1.15	1.74 ^{2,3}	3.12 ^{3,4}	-0.14 ⁴	1.43
Tacit	31.59	33.14 ^{2,3,4}	46.96 ^{3,4}	24.75	23.75
Codifiable	19.43	14.21 ^{3,4}	14.13 ^{3,4}	26.50 ⁴	8.72
Independent Scale	-0.68	-0.84 ^{2,3,4}	-1.53 ^{3,4}	-0.23 ⁴	-0.48
Independent	6.02	4.73 ³	6.74 ⁴	6.80 ⁴	3.78
Complementary	13.41	13.71 ^{2,3,4}	22.97 ^{3,4}	9.53	8.78
<u>FSAs</u>					
Drug Discovery	0.08	0.02 ^{3,4}	0.03 ^{3,4}	0.10 ⁴	0.28
Product Innovation	0.68	0.71 ^{2,3,4}	0.93 ³	0.52 ⁴	0.91
Manufacturing Processes	0.19	0.23 ²	0.00 ^{3,4}	0.23	0.38
Procurement Know-how	0.02	0.02 ^{2,4}	0.00 ^{3,4}	0.04 ⁴	0.00
Distribution	0.04	0.07 ^{3,4}	0.07 ^{3,4}	0.01	0.00
Trademark and Marketing	0.51	0.55 ^{2,4}	0.30 ^{3,4}	0.54 ⁴	0.78
Blends and Recipes	0.04	0.00 ^{3,4}	0.00 ^{3,4}	0.08 ⁴	0.00
Expertise and Services	0.09	0.03 ^{2,3,4}	0.00 ^{3,4}	0.17 ⁴	0.00
Customer Relationships	0.05	0.03 ^{2,3,4}	0.00 ^{3,4}	0.09 ⁴	0.00
Intermediate Product	0.45	0.57 ^{2,3,4}	0.77 ^{3,4}	0.24	0.38
Consumer Product	0.22	0.09 ^{3,4}	0.16 ^{3,4}	0.28 ⁴	0.66
Software Programming	0.32	0.39 ^{2,3}	0.59 ^{3,4}	0.16 ⁴	0.31

3.3 MNC Entity-Level Data

The MNC entities (parent and subsidiaries) in the sample come from a broad range of countries. The following table shows the number of observations for each country and the mean values of FSA ownership, entity size, R&D intensity, and role. The table shows that FSA ownership is spread across a diverse set of countries.

Table 4: Subsidiary Descriptive Statistics by Country

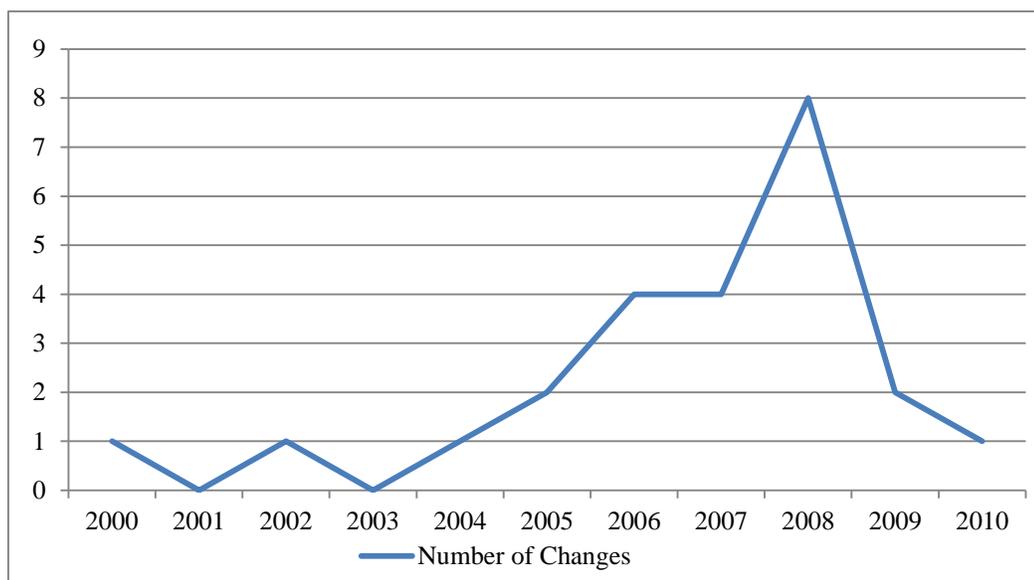
Country	Obs.	Tax Haven Country	FSA Owner	Parent	Role	R&D Intensity	Ln Revenue	Ln Assets
Argentina	148		0.09	0.00	1.22	0.00	5.27	5.10
Armenia	10		0.00	0.00	1.40	0.79	3.47	0.00
Australia	391		0.16	0.01	1.32	0.01	5.59	5.09
Austria	298		0.08	0.00	1.21	0.00	4.82	4.20
Bangladesh	4		0.00	0.00	1.00	0.00	5.69	5.27
Barbados	29	Yes	0.55	0.00	0.07	0.15	6.79	4.39
Belgium	535		0.03	0.00	1.26	0.01	5.37	5.48
Bermuda	52	Yes	0.37	0.00	0.17	0.00	7.44	3.06
Bolivia	1		0.00	0.00	1.00	0.00	0.34	0.00
Bosnia and Herzegovina	7		0.00	0.00	0.86	0.00	0.00	0.00
Brazil	231		0.04	0.00	1.22	0.01	4.96	4.44
Bulgaria	18		0.00	0.00	1.00	0.00	3.99	3.27
Canada	739		0.19	0.00	1.31	0.06	4.65	3.74
Cayman Islands	93	Yes	0.26	0.00	0.29	0.03	5.62	3.46
Channel Islands	12	Yes	0.00	0.00	0.00	0.00	-0.17	3.43
Chile	57		0.07	0.00	1.16	0.07	0.00	0.00
China	567		0.05	0.00	1.47	0.06	4.74	3.55
Colombia	87		0.07	0.00	1.23	0.00	5.28	4.93
Costa Rica	14		0.00	0.00	1.57	0.00	2.15	2.62
Croatia	62		0.00	0.00	0.98	0.03	3.75	4.13
Czech Republic	240		0.03	0.00	1.04	0.02	4.31	4.10
Denmark	239		0.13	0.03	1.27	0.03	4.31	4.28
Dominican Republic	7	Yes	0.00	0.00	1.00	0.00	1.22	0.00
Ecuador	12		0.00	0.00	1.00	0.00	0.18	2.50
Egypt	22		0.00	0.00	1.00	0.00	6.15	7.26
El Salvador	4		0.00	0.00	1.00	0.00	-1.25	0.00
Estonia	27		0.00	0.00	1.19	0.03	4.26	3.49
Ethiopia	2		0.00	0.00	1.00	0.00	5.73	0.00
Fiji	2		0.00	0.00	1.00	0.00	2.94	0.00
Finland	218		0.20	0.00	1.30	0.03	5.08	4.51
France	1,424		0.07	0.00	1.22	0.01	5.03	5.09
Germany	2,943		0.03	0.00	1.10	0.02	4.84	3.39
Ghana	7		0.00	0.00	1.57	0.00	5.09	5.64
Gibraltar	1	Yes	0.00	0.00	0.00	0.00	0.00	0.00
Greece	139		0.12	0.00	1.33	0.00	5.18	5.21
Guatemala	9		0.00	0.00	1.33	0.00	0.83	0.00
Honduras	7		0.00	0.00	1.00	0.00	1.06	3.52
Hong Kong	410	Yes	0.01	0.00	1.20	0.06	4.69	3.22
Hungary	194		0.03	0.00	1.30	0.00	3.88	3.81
Iceland	9		0.00	0.00	1.00	0.00	2.94	3.14
India	234		0.02	0.00	1.28	0.16	3.73	3.39
Indonesia	25		0.00	0.00	1.28	0.00	4.88	5.50
Ireland	799	Yes	0.12	0.01	0.83	0.03	4.70	4.91
Israel	85		0.15	0.02	1.54	0.17	3.85	3.19
Italy	651		0.10	0.00	1.29	0.00	5.16	4.73
Jamaica	10		0.00	0.00	1.00	0.00	3.92	6.55
Japan	365		0.05	0.01	1.47	0.04	5.51	3.97

Table 4: Subsidiaries by Country Continued

Country	Obs.	Tax Haven Country	FSA Owner	Parent	Role	R&D Intensity	Ln Revenue	Ln Assets
Kenya	10		0.00	0.00	1.70	0.00	5.91	7.44
Latvia	36		0.00	0.00	1.00	0.00	4.31	4.92
Lithuania	16		0.00	0.00	1.00	0.00	4.85	4.17
Luxembourg	135	Yes	0.16	0.00	0.90	0.04	5.09	6.48
Malaysia	170		0.00	0.00	1.32	0.03	4.35	3.69
Malta	17	Yes	0.00	0.00	0.65	0.00	3.91	3.93
Mauritius	10		0.00	0.00	0.10	0.00	4.78	1.82
Mexico	363		0.12	0.00	1.15	0.00	4.14	3.02
Morocco	2		0.00	0.00	1.00	0.00	6.35	0.00
Netherlands	1,315		0.02	0.00	1.00	0.04	4.84	5.17
Netherlands Antilles	3	Yes	0.00	0.00	0.00	0.00	0.00	0.00
New Zealand	95		0.09	0.00	1.11	0.00	4.09	4.12
Nicaragua	2		0.00	0.00	1.50	0.05	0.00	0.00
Nigeria	9		0.00	0.00	1.00	0.00	5.54	5.43
Norway	181		0.08	0.00	1.25	0.00	4.71	4.07
Pakistan	27		0.00	0.00	1.26	0.00	5.99	6.19
Panama	11	Yes	0.00	0.00	1.00	0.00	2.39	3.88
Paraguay	1		0.00	0.00	1.00	0.01	0.02	0.00
Peru	40		0.00	0.00	1.23	0.00	3.53	5.37
Philippines	63		0.08	0.00	1.27	0.00	4.57	4.28
Poland	433		0.05	0.00	1.10	0.00	4.39	4.10
Portugal	164		0.09	0.00	1.26	0.01	4.70	4.34
Romania	165		0.13	0.00	1.03	0.01	2.29	2.68
Russian Federation	165		0.07	0.00	1.17	0.03	2.90	3.06
Saudi Arabia	2		0.00	0.00	2.00	0.00	0.00	0.75
Serbia *	27		0.00	0.00	0.96	0.00	1.73	2.40
Singapore	317	Yes	0.05	0.00	1.22	0.01	5.15	4.40
Slovakia	44		0.00	0.00	1.00	0.00	2.43	2.92
Slovenia	28		0.00	0.00	1.21	0.01	5.16	3.66
South Africa	99		0.04	0.00	1.20	0.00	3.75	2.50
South Korea	309		0.00	0.00	1.36	0.05	4.23	3.92
Spain	785		0.08	0.00	1.18	0.00	4.88	4.47
Sri Lanka	10		0.00	0.00	1.40	0.00	5.94	4.16
Sweden	670		0.07	0.01	1.13	0.02	4.48	4.67
Switzerland	451	Yes	0.24	0.04	1.07	0.13	5.22	4.05
Taiwan	222		0.02	0.00	1.38	0.10	3.53	2.87
Thailand	154		0.00	0.00	1.34	0.00	4.26	3.76
Trinidad & Tobago	15		0.00	0.00	1.47	0.01	3.43	3.81
Turkey	48		0.00	0.00	1.10	0.05	2.00	2.24
Uganda	2		0.00	0.00	1.00	0.00	6.13	5.82
Ukraine	61		0.03	0.00	1.11	0.00	3.41	3.60
United Arab Emirates	22		0.00	0.00	1.27	0.01	2.72	1.05
United Kingdom	8,781		0.06	0.00	1.05	0.02	4.97	3.95
United States of America	2,670		0.16	0.09	1.27	0.07	5.24	5.10
of America (Puerto Rico)	76		0.28	0.00	0.97	0.03	4.65	5.19
Uruguay	17		0.00	0.00	1.24	0.00	2.26	4.67
Venezuela	38		0.11	0.00	1.16	0.00	4.39	3.44
Vietnam	8		0.25	0.00	1.00	0.22	1.98	0.95
Virgin Islands (British)	6	Yes	0.00	0.00	0.00	0.00	-0.93	3.93
Zambia	6		0.00	0.00	1.00	0.00	3.66	3.06
Total	29,741	0.8	0.08	0.01	1.14	0.03	4.78	4.19

In the dataset, there were only 24 changes in FSA ownership (less than one percent of observations). The following figure shows the number of changes by year.

Figure 8: Number of Changes in FSA Ownership by Year



The majority of changes in FSA ownership coincides with organizational restructurings and occurs around the 2008 financial crisis. The number of changes increases from four in 2006 and 2007 to eight in 2008, before dropping to two in 2009. Approximately 24% of the changes were transferring ownership to operational non-tax haven subsidiaries, another 24% transferred ownership to operational tax haven subsidiaries, 36% were transferred to pure tax haven subsidiaries, and 16% were transferred to the parent.

Table 5 contains the descriptive statistics on subsidiary, country, and MNC characteristics by FSA users versus FSA owners.

Table 5: Mean Value of Subsidiary Characteristics by FSA Ownership Type

<u>Subsidiary</u>	All	FSA User (1)	Shared FSA Owner (2)	Separate FSA Owner (3)
Patents	0.47	0.26 ^{2,3}	5.00 ³	2.93
Knowledge Sharing	0.20	0.14 ^{2,3}	2.53 ³	0.74
Sole-Invented Patents	0.08	0.04 ^{2,3}	0.98 ³	0.59
Pre-Sample Average Patents	0.09	0.07 ^{2,3}	0.82 ³	0.35
R&D Intensity	0.03	0.03 ^{2,3}	0.20 ³	0.05
Role	1.14	1.11 ^{2,3}	1.71 ³	1.49
Subsidiary Size	4.76	4.61 ^{2,3}	7.88 ³	5.91
M&A Dummy	0.26	0.26 ^{2,3}	0.07 ³	0.23
<u>Country</u>				
Country Effective Tax	0.22	0.22 ²	0.20 ³	0.22
Revealed Technological Advantage	0.85	0.84 ³	0.79 ³	0.93
Market Concentration	0.57	0.57 ²	0.54 ³	0.57
<u>MNC</u>				
MNC Subsidiaries	182.90	189.00 ^{2,3}	68.17 ³	102.19
MNC Ln Revenue	15.77	15.80 ^{2,3}	14.10 ³	15.51
MNC Average Subsidiary Revenue	0.31	0.28 ^{2,3}	1.41 ³	0.58
MNC Diversification	0.48	0.49 ^{2,3}	0.29 ³	0.40
MNC R&D Intensity	0.07	0.07 ^{2,3}	0.18 ³	0.06

The table contains the mean values of the various variables and the superscripts indicate significant differences between FSA users and FSA owners. For example, the mean number of patents produced by FSA users is .26 patents. The superscripts 2 and 3 indicate that .26 is significantly different from the patenting activity of the two FSA owner types (shared FSA owner versus separate FSA owner). There are remarkable differences between the FSA users and FSA owners. The FSA owners patent more inventions, take on more roles, are larger and are much less likely to have been acquired by the MNC. There are also large differences between FSA owners that share ownership of FSAs versus those that do not (separate FSA owners). Shared FSA owners have a

much higher mean patenting, are more likely to engage in knowledge sharing than separate FSA owners, have greater R&D intensity and subsidiary size. Interestingly, shared FSA owners come from smaller MNCs than separate FSA owners.

3.4 Summary

There is large variation in MNC internal FSA ownership. Some MNCs have FSA ownership centralized into one entity in the corporate group. Other MNCs have ownership dispersed to many MNC entities. The internal organization of FSAs is not just a question of centralization versus decentralization. MNCs choose whether to have MNC entities separately own FSAs versus share FSAs. A surprisingly small number of MNCs use mixed FSA ownership structures. The descriptive statistics show differences between the MNCs that select different types of FSA ownership structures and differences between FSA users and FSA owners. The purpose of this dissertation is to examine what determines the different structures used by MNCs and explore the implications of FSA ownership on subsidiary innovation

4. Inside the MNC: Structuring Ownership of Firm-Specific Advantages

By

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ABSTRACT

This study examines how multinational corporations (MNCs) organize internal ownership of their firm-specific advantages. Firm-specific advantages are the proprietary assets that provide the firm with a competitive advantage. In contrast to the assumption that firm-specific advantages are a public good within the firm, MNCs allocate economic ownership of their firm-specific advantages to affiliates and/or the parent within the firm. The MNC entities that own the firm-specific advantages internally contract or license them to other MNC entities. This study identifies four different ways in which MNCs choose to structure internal ownership of firm-specific advantages. Drawing on property rights theory, it is argued that these structures are important in creating incentives and facilitating coordination within the firm. The results suggest that MNCs with independent and easily codifiable firm-specific advantages, such as trademarks, are more likely to use ownership structures that provide market-like incentives. In contrast, MNCs with knowledge-intensive, tacit firm-specific advantages are more likely to use ownership structures that facilitate knowledge sharing and coordination within the firm.

4.1 Introduction

At the heart of the theory of the multinational firm is the idea that firms can exploit a proprietary knowledge or resource more successfully by directly investing in a foreign market than by licensing the asset to other firms. The inefficiencies associated with licensing the asset often stem from a common set of problems related to contracting for knowledge in conventional markets. Because markets for knowledge often fail, certain transactions are better accomplished when they are “internalized” by firms (Caves, 1971; Dunning, 1980; Rugman, 1981). Transaction cost economics and property rights theories of the firm reach similar conclusions.

Economic theories of the firm have generally considered how contracting difficulties affect whether transactions are conducted within or between firms. There is widespread agreement in the fields of strategy and economics regarding the benefits of “internalization” when contracts are difficult to write. However, once these transactions are brought inside of firms, very little is known about how they are structured. Property rights theory explicitly suggests that the same kinds of contracting difficulties that occur at the boundaries of the firm are also likely to occur inside of firms (Grossman and Hart, 1986; Hart and Moore, 1990; Holmstrom and Roberts, 1998). Thus, the difficulties inherent in contracting for knowledge in markets may not be resolved by internalization.

This paper examines how multinational corporations (MNCs) internally organize ownership of their most important value-generating assets. These assets correspond to what strategy and international business researchers variously call knowledge assets, resources, competencies, and firm-specific advantages (FSAs). Although the theory of the MNC suggests that firms establish foreign operations when their FSAs are not

suitable to contract or license in markets (Dunning, 1980), these same FSAs are extensively contracted and licensed *within* MNCs. MNCs use internal contracts between affiliates and/or the parent to assign economic ownership and control rights to FSAs inside the firm.¹ Since many MNCs grow by acquiring firms with existing FSAs or by internally developing FSAs in foreign affiliates, firms face the organizational problem of allocating FSA ownership and control rights across a diverse network of affiliates.

The need to create, maintain, and share FSAs within firms generates *internal* motivation and coordination problems similar to those that exist at the boundaries of the firm. To the extent that the FSAs involve tacit, incomplete, or shared knowledge and specific investments are required, the same kinds of hold-up problems that occur in market transactions are likely to occur within firms. This is particularly the case in MNCs, where a firm's network of foreign affiliates may be spread over many countries with different customs, cultures, languages, and institutions. MNCs face additional complications from the high costs of monitoring activities in a geographically dispersed global network.

At the boundaries of the firm, the critical choice variable when contracts are hard to write is whether to undertake a transaction within the firm, in markets, or through some hybrid arrangement. *Within* firms, the critical choice variable with regard to structuring internal transactions is whether to have all the FSAs owned by a single entity and controlled centrally, to have multiple entities separately own the FSAs, or to have multiple entities share ownership of the FSAs.

¹ This analysis focuses on economic ownership, which is based on ultimately bearing the costs and risks of the asset (Barzel, 1997).

Assigning economic ownership of FSAs to the parent and/or affiliate(s) reduces free-rider problems that would arise if no entity within the firm had ownership rights to the FSAs it created. If the FSAs were treated as pure public goods within the firm, there would be no incentive to innovate, since the affiliates that bore no costs of developing the FSAs would have access to the knowledge assets developed elsewhere within the firm. When MNC entities own FSAs, they typically can determine the desired level of investment in the FSAs and keep the profits earned from contracting or licensing the FSA to other divisions of the firm. FSA owners are assigned responsibility and control over decisions regarding the FSA and bear the operational risks associated with the development, maintenance, and exploitation of the FSA.

Drawing on property rights theory, this study examines MNCs' choices with regard to FSA ownership structures. In general, it is expected that MNCs will select the ownership structure that allocates FSA ownership and control rights to the division or divisions whose marginal effort is most important with regard to developing, maintaining, and reinvesting in the asset. For example, similar to Grossman and Hart's (1986) illustration of how client lists are owned in the insurance industry, FSAs, such as customer relations and procurement know-how, are typically owned by the MNC unit that deals directly with a particular set of customers or suppliers. However, in some cases, the need for central coordination or the inability to monitor the actions of affiliates will require greater involvement by the parent or headquarters in internal FSA transactions. This study predicts that MNCs will choose to own FSAs that are more "contractible" in the sense of being non-tacit, independent, and easy to describe, using structures that engender more market-like incentives, but have less capacity for central

coordination. In contrast, MNCs will choose to own FSAs that are tacit or complementary, and are therefore less “contractible,” using structures that allow for greater coordination and control.

Using a confidential new panel data set on the internal economic ownership of FSAs and transactions within MNCs, four different types of FSA ownership structures used by MNCs are identified: 1) sole, 2) shared, 3) separate, and 4) mixed. First, approximately 35% of MNCs in the sample choose “Sole” ownership structures in which a single entity (usually the parent or headquarters) owns all of the FSAs of the MNC. Second, 18% of MNCs choose “Shared” ownership structures in which two or more entities co-own all of the FSAs. In shared structures, it is often the case that the parent or headquarters shares ownership of all of the FSAs with an affiliate. A third structure chosen by approximately 42% of MNCs is “Separate” ownership in which different affiliates of the firm own different FSAs. Separate structures generate greater market-like incentives within the firm than shared or sole structures, but can be difficult to coordinate. Finally, about 5% of MNCs choose “Mixed” structures in which the ownership of some FSAs is shared and other FSAs is separate. While mixed structures are more customizable, they are also the most difficult to manage. As previously discussed, different FSA ownership structures not only trade off incentives and control, but they also necessitate very different patterns of knowledge and financial flows within the firm. Once a particular structure is chosen, it is costly and difficult to change, leading to a low incidence of switching observed in the data (less than 4% of observations).

The key contribution of this research is the ability to shed light on the structure of transactions for knowledge within firms. Due to data limitations, previous empirical

research in economics and strategy has not been able to open up the black box of internalized transactions. Although a great deal of research has examined the importance of firm FSAs, little is known about the economic ownership of FSAs *within* the MNC. This study identifies four ways in which MNCs structure ownership of their FSAs. The four modes have different implications for control, coordination, incentives, and knowledge sharing within the MNC. By examining how contracts for knowledge assets are written and structured *within* firms, we gain insight into the ability of “incomplete contracts” theories to explain internal firm behavior. Since contracts are so widely used to delineate ownership of FSAs within firms, it seems likely that internalization is not sufficient to deal with the difficulties inherent in contracting for knowledge.

From a policy standpoint, this research contributes to our understanding of the kinds of benefits that foreign affiliates can bring to a local market. Affiliates that own the MNC’s FSAs can accrue significant income from FSAs and have considerable strategic determination over how the MNC’s key assets are developed, maintained, and deployed. In this sense, ownership and control rights to FSAs are similar to subsidiary mandates (e.g. Birkinshaw, 1996; Rugman, 1981). Additionally, some MNCs do choose ownership structures as a way to minimize taxes. The results also shed light on the importance of this aspect of MNC organization.

The next section describes FSAs in greater detail. The subsequent section presents the literature review and predictions, followed by a description of the methods used to test the predictions. The final section discusses the results and conclusions.

4.2 FSAs and FSA Ownership Structures

FSAs are the MNC's proprietary assets that provide the firm with a competitive advantage. These assets are unique company strengths and include a broad range technological, manufacturing, marketing, human, and organizational competencies and know how (Rugman, 1981; Rugman and Verbeke, 1992, 2001). FSAs may originate from the parent or the network of affiliates of an MNC.

In order to gain and sustain a competitive advantage from the FSAs, firms need to continuously develop and maintain their FSAs (Peteraf, 1993). This requires a careful balance between the need to generate market-like incentives that encourage investment in FSAs with the need to coordinate knowledge-generating activities and allocate capital to the highest-return investments throughout the firm. To this end, MNCs use four different internal FSA ownership structures.

Section 3.2 provides a detailed description of the four different FSA ownership structures. As discussed in Section 3.2, each of the four types of structures used by MNCs to organize ownership of their FSAs has different advantages and disadvantages. The following table summarizes the important features of the four structures.

Table 6: Characteristics of FSA Ownership Structures

	Sole	Shared	Separate	Mixed
Control Over FSAs	Centralized	Shared	De-centralized	De-centralized
Risk	Centralized into one entity.	Shared by owners.	De-centralized - risks associated with different activities separately borne by different owners.	De-centralized - mix of shared and separately held risks.
Incentives for Value Creation	One entity has full incentive.	Co-owners are incentivized to contribute to the value creation process together.	Owners are incentivised to develop and create their own FSAs.	Co-owners incentivised to contribute together, separate owners incentivised to create their own FSAs.
Financial Returns of MNC	Centralized into one entity.	Shared between a few owners.	Dispersed to different owners.	Dispersed to different owners and co-owners.
Bargaining Problems	Low - one entity owns all FSAs.	High - hard to distinguish contribution of each co-owner and shared control can lead to conflict over future direction of FSAs.	Medium - separate owners within the MNC hold power.	High - mix of co-owners and separate owners may try to use power in bargaining.
Administrative Complexity	Low - efficiency from having one entity contact with all entities. Duplication of efforts low.	Medium - co-owners contract different entities, with simplicity of splitting any residual returns. Duplication of efforts medium.	High - complex to track all contracting relationships and that each entity receives its appropriate return. Duplication of efforts high.	High - complex to track all contracting relationships and that each entity receives its appropriate return. Duplication of efforts high.
Knowledge Flows	Moderate	Most Intensive	Least Intensive	Moderate
Information Connections to FSA Owners	High density - connections between all non-owners and one owner.	Moderate density - non-owner ties split amongst the co-owners. Two-way connections between co-owners.	Low density - non-owner ties to owners. No/limited connections between owners.	Moderate density - non-owner ties split amongst the owners and co-owners. Two-way connections between co-owners, no/limited connections between separate owners.
Frictions in Information/ Knowledge/Financial Flows	Low - primary problem bounded rationality. Information overload of owner and inability to keep tabs on operations.	Lowest - by sharing ownership, can delegate responsibility for portion of business to co-owner. Reduces information overload problem. Co-owners can then coordinate business operations together.	High - owners have limited incentives to share information or resources with other group members.	Moderate/High - While co-owners have incentives to share information and knowledge with other co-owners, separate owners do not have incentives to share.

As discussed later in this paper, the regression models are at the enterprise level of analysis, not at the affiliate level of analysis. Thus, it is beyond the scope of this investigation to combine an analysis of MNC FSA ownership structures with location choices. Therefore, the issue of locating ownership in a tax haven country is dealt with by simultaneously estimating a model of structure choice with a model of the decision to own FSAs in a tax haven. FSA characteristics are expected to be strongly associated with FSA ownership structure choices. However, if the choice of ownership structure is primarily motivated by the desire to minimize taxes, the simultaneous model that includes the tax haven choice and the simple model of ownership structure choice should have very different results.

4.3 Theoretical Background

To balance the need for motivation and coordination in FSA creation and maintenance, firms use a number of mechanisms including job design, employee stock ownership, and compensation (Holmstrom and Milgrom, 1991; Lambert, Larcker and Weigelt, 1993; Wang et al, 2009). However, since performance can be difficult to measure and monitoring is costly, Holmstrom and Milgrom (1994) argue that these mechanisms enable only a very limited set of activities to be effectively rewarded. In cases where these mechanisms fail to provide adequate incentives, Holmstrom and Milgrom (1994) maintain that asset ownership can be a “broader, more powerful incentive instrument” (p. 972) by enhancing the bargaining power of asset owners and rewarding their investments in the asset. Property rights theory draws the same

conclusions, suggesting that asset ownership provides control over and income from the asset and thus will be the most efficient way to incentivize investment.

As discussed in Chapter 3, FSA ownership structures vary in the degree of centralized coordination they enable by allocating all FSA ownership rights to a single unit versus the “market-like” incentives they create by assigning FSA ownership rights to dispersed units within the firm. Because sole ownership structures are particularly advantageous for small firms and the largest firms, the choice is likely to primarily be a function of firm size, rather than FSA type. Similarly, since firms with mixed structures choose to own their FSAs both separately and shared between units, this paper does not have strong theoretical predictions at the firm level as to why mixed structures would be chosen over shared or separate structures. Therefore the predictions focus on the choice to own FSAs separately, or in structures that allow two or more MNC entities to share FSA ownership.

4.3.1 Property Rights, FSA Contractibility, and Ownership Structure

Teece (1986) argues that firms exist to capture the returns from complementary activities. However, when different units of the firm work together, conflicts and bargaining problems can arise with regard to how to divide the returns – particularly when the complementary activities involve knowledge creation. Holmstrom and Roberts (1998) write, “Information and knowledge are at the heart of organizational design, because they result in contractual and incentive problems that challenge both markets and firms (p. 90).” Although integrated firms might be in a better position than independent organizations at capturing the returns from knowledge transfers, “the problem of knowledge transfers can be viewed as part of the more general problem of free-riding

when independent parties share a common asset” (Holmstrom and Roberts, 1998: p. 91). When free-rider problems arise, incentives to invest in knowledge creation are muted.

Investment distortions arise, in part, because the ownership of non-human assets affects the incentives to invest in human and other intangible assets such as marketing, relationships, and knowledge creation (Hart and Moore, 1990; Feenstra and Hanson, 2005; Holmstrom and Roberts, 1998). It is costly and difficult to measure and evaluate investments in intangibles, and frequently, it is not clear *ex ante* how much and what kinds of investments in these assets are the most appropriate. Thus, contracts for the provision of services related to human and intangible assets (FSAs) are nearly always incomplete – even within firms (e.g., Grossman and Hart, 1986; Hart and Moore, 1990). When it is not possible to write complete contracts and bargaining is costly, property rights theory suggests that assigning FSA ownership to the relevant entities within the firm will mitigate investment distortions. According to property rights theory, the “relevant” entity to which FSA ownership and control rights should be assigned is the entity that is in the best position to make important investments in the FSA (Grossman and Hart, 1986).

Although assigning property rights to FSAs can help resolve hold-up problems stemming from incomplete contracts, firms face several trade-offs related to using this mechanism internally. First, assigning property rights can potentially impede knowledge sharing within the firm to the extent that they serve as a “pay wall” to important firm know-how. In this sense, assigning property rights within firms clearly diminishes some of the potential benefits of internalization. For example, if a firm’s knowledge cannot flow freely within its own boundaries internal spillovers from knowledge creation will

surely be attenuated. As discussed in the previous section, some FSA ownership structures actually constrain the type and direction of knowledge sharing within firms. Second, some kinds of knowledge assets are more “contractible” than others. When complete contracts cannot be written that outline all possible rights and responsibilities of FSA owners, the same kinds of contracting problems that occur at the boundaries of the firm are likely to occur within firms.

The degree to which goods, services, and assets are “contractible” is related to how easily they can be observed, separated, measured, or evaluated, and whether they require relationship-specific investments and investments in intangibles. By definition, it is easier to write complete contracts for goods, services, and assets that are more “contractible.” Because markets provide stronger incentives for performance than firms, transaction cost theory predicts that when complete contracts *can* be written, transactions are more efficient when undertaken by independent parties in markets. In empirical research on transaction cost theory, there is considerable evidence that contractible goods or services are more likely to be exchanged in markets, rather than within firms (i.e., “bought” rather than “made”) (see, e.g. Anderson and Schmittlein, 1984; Masten, 1984; LaFontaine and Slade, 2007). Property rights theory and empirical research comes to analogous conclusions (see, e.g., Lerner and Malmendier, 2010; Elfenbein and Lerner, 2003; Kaplan and Stromberg, 2003). According to this literature, when complete contracts *cannot* be written, market-like incentives can be achieved by assigning “residual rights” ownership of important productive assets to the entity that is best positioned to decide how the assets should be used. The assumption that problems related to incomplete contracts can be resolved by exchange within firms is much

stronger in transaction cost theory than in property rights theory (Grossman and Hart, 1986).

Citing Kitch (1980), Burk and McDonnell (2007) suggest that the importance of assigning property rights is particularly relevant for knowledge-intensive goods for which complete contracts can almost never be written:

“[P]roperty rights in intangible information serve to solve the ‘disclosure paradox’ recognized by Kenneth Arrow: once the innovator discloses its idea to the would-be developer, there is no reason left for the latter to compensate the former, but before disclosure of the idea, the developer does not know what it is worth. This creates a potential stand-off, in which the innovator is unwilling to disclose without assurances of payment, but the developer is unwilling to give assurances until disclosure. This scenario can be identified as an extreme variation on the hold-up problem in transaction cost economics... (p. 584).”

The difficulties in contracting for FSAs are similar to those that arise in transactions for knowledge. Because FSAs are often intangible and are costly to develop and maintain, firms have an interest in creating *internal* structures that provide high-powered incentives to invest in FSAs. Separate FSA ownership structures share many of the same features as markets. They provide strong incentives for FSA-owning units within the MNC to create and maintain FSAs. These structures grant the FSA-owning units decision and control rights to the FSAs and require these units to undertake the associated risks. In return, FSA-owning units have the right to keep residual profits associated with their endeavors. Because ownership of FSAs is dispersed throughout the firm and control rights are disaggregated, separate structures trade off central control and

coordination for high-powered incentives to innovate. MNCs will be willing to make this trade-off when FSAs are more contractible. When FSAs are easy to measure, observe, and evaluate, structures that allocate FSA ownership and control rights to these entities will generate fewer investment distortions.

When FSAs are difficult to measure, observe, or evaluate, or when FSAs require knowledge inputs from more than one unit within the firm, structures that enable units to collaborate and monitor each other's inputs are likely to generate fewer investment distortions. In contrast to separate structures, shared structures allow the MNC to reap the maximum benefit from complementary assets. In this sense, shared structures trade off market-like incentives for coordination and control. In shared structures, costs, risks, and responsibilities for FSA creation and maintenance are shared by two or more units within the firm and these units share residual profits generated by the FSAs. Knowledge flows freely between units that co-create FSAs, and "pay walls" do not exist between entities that share FSA ownership rights. Although property rights theory argues that joint ownership of assets is never optimal in that it grants veto rights over assets to more than one entity (Hart and Moore, 1990; Holmstrom and Roberts, 1998), it also states that "assets that are worthless unless used together should never be separately owned" (Holmstrom and Roberts, 1998: p.78).

Applying this insight to asset ownership within firms, firms are expected not to use separate ownership structures when FSAs require inseparable contributions by more than one entity within the firm. Contributions may be inseparable due to problems of measurement and observability, or they may be inseparable in the sense of having no stand-alone value. In cases of nonseparability, contracts detailing FSA ownership rights

will be nearly impossible to design and, therefore, separate FSA ownership structures will distort incentives for investment.

Property rights theorists might argue that sole structures would be superior to shared structures in cases of extreme non-contractibility. In markets, shared owners such as alliance and joint venture partners can destroy a venture if conflicts arise with regard to value creation and profit sharing. These conflicts are important reasons why so many shared ownership arrangements like joint ventures ultimately fail (Park and Russo, 1996). However, within firms, using sole FSA ownership structures when non-contractible contributions are required by more than one division can be very costly with regard to the lack of incentives these structures give to non-FSA-owning units. Hierarchies facilitate the use of shared asset ownership in important ways that markets do not. First, the parent entity can intervene to resolve intra-firm disputes, making it possible to avoid worst-case scenarios that can occur when affiliates share ownership of intangibles. Second, MNC parents are often FSA co-owners in shared structures, which further reduces the potential for costly disputes (since one of the owners has the power of fiat). Indeed, recent literature on property rights theory questions the premise that joint ownership is never optimal and suggests that in some cases, the gains from sharing ownership outweigh the potential costs (e.g., Hart 1995; Matouschek, 2004). Since hierarchies resolve many of the potential hold-up costs related to sharing ownership, it is expected that firms will be more likely to use shared structures if the firms' FSAs are less contractible. Shared ownership of complementary assets creates incentives for the FSA co-owners to invest to increase the total value of the asset. Thus, Shared ownership structures are likely to be superior to Sole ownership structures.

4.4 Hypotheses

Two dimensions of FSA contractibility—the independence versus complementarity of the FSA and the codifiability versus tacitness of the FSA—are expected to be associated with MNC decisions with regard to FSA ownership structures. These are shown in the following matrix.

Table 7: FSA Contractibility

FSA Contractibility Dimension		Structure Choice	
		Shared Structure	Separate Structure
Continuum 1:	Independent FSAs		√
	Versus Complementary FSAs	√	
Continuum 2:	Tacit FSAs	√	
	Versus Codifiable FSAs		√

4.4.1 Independence versus Complementarity

Independent assets are non-synergistic assets (Hart and Moore, 1990). They are often idiosyncratic to different parties. When FSAs are “independent,” separate ownership structures will be superior to all other ownership structures. Separate ownership structures provide market-like incentives for developing and maintaining the FSAs to the entities within the firm that are best positioned to invest in the FSAs. Because no additional value is created from common ownership, the costs associated with shared control are expected to outweigh the benefits.

In MNCs, there are two potentially different reasons why some FSAs are more independent than others. First, some FSAs are clearly related to the local operations of individual foreign affiliates and are not related with FSAs developed by other units of the firm. This is often the case with FSAs like customer relationships and services. Second, some FSAs do not require the contributions of more than one entity within the firm. This is often the case with process-related FSAs that may be intentionally or accidentally discovered as a result of variation in routines within a particular unit of the firm (Nelson and Winter, 1982).

In contrast, complementary assets provide synergistic value. As discussed above, when FSAs are complementary, separate ownership structures are never optimal. Thus, the following hypothesis is advanced:

Hypothesis 1: MNCs with independent (complementary) FSAs will be more likely to have Separate (Shared) ownership structures and less likely to have Shared (Separate) ownership structures.

4.4.2 Tacitness versus Codifiability

Tacitness refers to the extent to which knowledge or some knowledge-based asset is non-codifiable and requires application to be observed. Research on the knowledge-based view of the firm (KBV) has given significant emphasis to the problems inherent in transferring tacit knowledge (e.g., Grant, 1996; Kogut and Zander, 1992, 1993; Teece, 1977; Martin and Solomon, 2003). Tacitness is perhaps the most important feature of knowledge contractibility. When knowledge is embedded in complex routines and decision rules, the cost of transferring it can become prohibitively high, effectively making it non-contractible. Tacit knowledge has been found to significantly increase the

costs of transferring knowledge abroad (Teece, 1977), to reduce the perceived ease of internally transferring specialized marketing know-how (Simonin, 1999), and to increase the time it takes to make new knowledge work well after it has been transferred (Galbraith, 1990).

When the knowledge underlying FSAs is more tacit, FSAs are less contractible. In such instances, MNCs will be less likely to use separate structures to allocate FSA ownership rights. Since separate structures create mini firms within the MNC, these structures enhance the difficulty of measuring and monitoring affiliates' contributions and the difficulty of transferring knowledge across the firm. To the extent that some FSAs are more difficult to measure and evaluate in the first place, the problems inherent in separate structures will be exacerbated.

Hypothesis 2: MNCs with tacit (codifiable) FSAs will be more likely to have Shared (Separate) ownership structures and less likely to have Separate (Shared) ownership structures.

4.5 Methods

4.5.1 Data

To examine the predicted relationships, a new confidential panel data set on internal FSA ownership and transactions within MNCs was used. The dataset was compiled from several sources. First, information on the types of FSAs owned by the MNCs and the FSA ownership structures were taken from transfer pricing reports from a consulting firm. MNCs are required by tax authorities to document their intra-firm transactions each year in transfer pricing reports that determine whether or not the intra-

firm transactions are at market price.² The transfer pricing reports discuss in detail the contractual relationships and transactions between MNC entities, the FSAs owned by the MNC entities, and the activities performed by each entity in the transactional relationship. Second, MNC financial data was gathered from Bureau Van Dijk's Orbis database. The Orbis database contains income statement, balance sheet, business segment, and industry information on public and private firms located worldwide. For every observation, the Orbis data was verified with the same financial information contained in the transfer pricing reports. In cases where data were missing or in the very few cases in which the Orbis data and the transfer pricing data contained different values for the same financial information, data from the transfer pricing reports was used. Third, merger and acquisition data for each MNC was collected from Thomson Financial Worldwide Merger and Acquisitions database. The database covers both public and private acquisitions.

4.5.2 Sample

Before discussing the construction of the panel, it is worth noting that there are obvious sample selection biases related to the data source. All MNCs in the sample sought the services of a consulting firm that specializes in advising MNCs with regard to

² According to U.S. Treasury Regulations Section 1.482, Organization for Cooperation and Development (OECD) Transfer Pricing Guidelines and various other local country requirements, MNCs must document each year their intra-firm transactions in transfer pricing reports. Although documentation requirements are country-specific, many countries follow the OECD Guidelines for transfer pricing and most countries require that all material related-party activities are documented contemporaneous with the firm's tax filing (E&Y, 2013). The purpose of transfer pricing reports is to test whether or not their intra-firm transactions are at market price and then document the analysis and results in the reports. In order to test that the internal transfer price for each transaction is consistent with the external market price, the activities performed by the MNC entities, their risks, and the economic ownership of intangible assets must be taken into account. Therefore, the transfer pricing reports provide detailed descriptions of the products and services, intangible assets owned, and activities performed by the entities. Intra-firm agreements are typically included as appendices to the reports.

transfer pricing strategies and other related activities. However, many MNCs seek the services of such firms and all MNCs with material intra-firm transactions have to compile transfer pricing reports. While many of the largest MNCs have well-staffed internal legal and tax departments, they still seek the advice of consulting firms on transfer pricing issues. Thus, the sample of firms is believed to not be unusual, given that they have all chosen to be multinational and to have networks of foreign affiliates.

The raw sample contains data on 102 MNCs over the 2000-2012 time window. Altogether there are 672 organization-year observations on the 102 MNCs. The number of years of data for each MNC ranges from three to 13 years. Orbis had financial information on 514 of the 672 MNC-year observations. In order to avoid unnecessary loss of observations in the sample, data were entered from the company consolidated financial statements used for the transfer pricing reports when Orbis data were missing. Consolidated financial data were missing for 80 observations, leading to a total of 592 MNC-year observations after merging the financial and FSA ownership data. Lagging the independent variables reduced the sample by 94 observations. The final sample contains 498 MNC-year observations on 93 MNCs.

The data was coded and compiled under strict confidentiality. For this reason, no company names or company-specific information can be identified. Therefore, only means, standard deviations, percentages, and other statistical measures are reported and all qualitative examples are redacted to disguise identity.

The sample comprises a diverse group of MNCs. The firms in the sample operate in a broad range of industries including consumer goods, pharmaceutical, semiconductor, retail, and financial service firms. Approximately 76 percent of the MNCs in the sample

were headquartered in the United States, 15 percent in Europe, two percent in Asia, and the remaining seven percent were headquartered in other regions. A total of 20 percent of the firms in the sample are private. There is large variation in the size of MNCs in the sample, with a heavily right-tailed distribution. The sample average MNC revenue is USD 11.0 billion, with a standard deviation of USD 37.9 billion.

4.5.3 Level of Analysis

The analyses are at the MNC-level, rather than the affiliate level. Thus, although the data contains information on whether the parent and/or particular affiliates own FSAs and the extent to which the FSAs are contracted out or licensed across the firm, all the financial data, FSA data and MNC structure data are at the MNC-level.

4.5.4 Variables

Dependent Variable

FSA Ownership Structure is operationalized as a categorical variable, coded 1 for a Sole ownership structure, 2 for a Shared ownership structure, 3 for a Separate ownership structure, and 4 for a Mixed ownership structure. Four binary indicators for each ownership type were also created. These mutually-exclusive categories were coded based on the detailed descriptions of FSA ownership provided in the transfer pricing reports. Chapter 3 contains the definitions used to code the ownership structures and examples of the qualitative descriptions of ownership that MNCs include in their transfer pricing reports.

Independent Variables

MNC FSAs and Contractibility Dimensions. The transfer pricing reports contain lengthy qualitative descriptions of the FSAs owned by the MNC. Underpinning these FSAs are flows of licensing revenues between MNC entities. Thus, transfer pricing reports describe the bundle of skills, knowledge, routines, processes, technologies, patents and other firm value-drivers that are owned or co-owned by one or more entities and contracted or licensed to other entities within the firm.

There are several ways to create the key explanatory variables from the data used in this research. First, one can identify the types of FSA(s) owned by each MNC using the detailed descriptions. The problem with this approach – although this study reports robustness results that use this approach – is that firms’ often identify more than one FSA. For example, a firm might indicate that its primary source of value is its ability to create new products as well as the brands and trademarks that it currently owns. In this simple case, it is not clear whether the firm’s primary FSA is product innovation or the brands and trademarks it owns or both. The initial version of this paper analyzed four FSA categories (1) Manufacturing Processes, (2) Expertise and Relationships, (3) Product Innovation, and (4) Brands. Chapter 3 Table 1 provides qualitative examples of MNCs’ FSA descriptions.³ Each MNC was assigned as many FSA categories as the descriptions conveyed. Thus, the firm above would have been categorized as having “Product Innovation” and “Brands” FSAs. This labeling scheme is problematic for two reasons. First, in some cases there may be only one identifiable revenue flow (from licensing or contracting) associated with the bundle of FSAs, thus naming more than one FSA

³ An alternative approach is assigning each firm to a unique FSA category based upon the description in the transfer price reports. A drawback to this approach is that it is often not straightforward which skill, asset, process, technology, etc. is the “primary” value-driver of the firm.

category causes identification problems. Second, from a theoretical standpoint, Product Innovation was considered to be more tacit and Brands to be more codifiable, so it is not clear which structure would be predicted from theory. Despite the problems with this approach, it is used here primarily for the sake of illustrating interesting properties of the data.

A second approach, used here, is to remain agnostic as to what the FSAs actually are and instead use the FSA descriptions to code the features of the MNC's bundle of FSAs. Word counts were used to construct the two hypothesized contractibility dimensions (tacit vs. codifiable and independent vs. complementary). A list of potential words was created for each end of the two dimensions (tacit and codifiable for Tacit Scale and independent and complementary for Independent Scale). The words and phrases were selected to be consistent with prior research (e.g., Zander and Kogut, 1995; Ambrosini and Bowman, 2001; etc.). Then the list of words was narrowed down through several iterations of reading FSA descriptions and adding and removing words from the lists. The lists were narrowed by eliminating duplicate words, words that were only used once or twice, or words that were often used to mean many different things. Once the word list was created, the relevant sections of the transfer pricing reports were searched for each of the listed words in the descriptions to form preliminary counts of "Tacit," "Codifiable," "Complementary," and "Independent" words. For example, in the phrase, "...these new innovations are fundamentally distinct from, and do not rely upon, the technologies used in the past..." the word "innovations" would be counted as tacit and the word "distinct" would be counted as independent. The count of words was then cleaned by reviewing the text again to ensure that, for example, words like "suite"

referred to a suite of products or applications rather than an address. In cases where the words were out of context, the count was changed to exclude the irrelevant observations.

The following table contains the final list of words.⁴

Table 8: Contractibility Dimension Word Counts

Tacit Scale			
Tacit	Total Count	Codifiable	Total Count
expertise	475	trademark	3021
experience	1039	trade name	704
know-how	340	logo	219
knowledge	441	blend	360
trade secret	115	formula	1778
explore	38	recipe	75
innovat	1089	compound	1379
technology	8717	manual	383
solutions	2906	patent	2257
complex	1584	schematic	120

Independent Scale			
Complementary Total Count		Independent	Total Count
collaborat	431	standalone	161
combin	2043	separate	905
integrat	2859	used only, used primarily in	35
common	497	distinct	220
cross-functional	78	specialized	473
bundle	64	custom	907
companion	29	differentiated	83
complement	349	diversified	85
unified	373	-specific	69
suite	383	business segment	320

After finalizing the word counts, scales were created from the word counts for the two contractibility dimensions (Jap, Robertson, and Hamilton, 2011). *Independence Scale*, was calculated as the total count of independent words minus the total count of

⁴ In robustness tests, words that could be tied to an organizational structure were removed from the scale such as cross-functional, different, business segment, and standalone. The results to the analyses did not change by removing the words.

complementary words divided by the natural log of total words searched. A positive value of Independence Scale indicates that the MNC's bundle of FSAs is independent, whereas a negative value indicates that the MNC's FSAs are complementary. Similarly, *Tacit Scale* is measured as the total count of tacit words minus the total count of codifiable words divided by the natural log of total words searched. A positive value of Tacit Scale indicates that the MNC's FSAs are tacit, whereas a negative value indicates that the MNC's FSAs are codifiable.

Control Variables

Firm Size. Firm Size is operationalized as the natural log of the total number of MNC subsidiaries, lagged by one year. Small MNCs are expected to be more likely to have a Sole ownership structure and larger MNCs are expected to be more likely to have Shared, Separate, or Mixed structures. The number of subsidiaries is used as a measure of size rather than assets or sales because the complexity of the MNC rises with affiliate network size. To show this, the squared number of MNC subsidiaries is also included. As complexity increases with network size, the administrative costs of the more complex structures rise dramatically. Therefore, the largest MNCs are expected to use sole ownership structures to reduce organizational costs. Thus, the number of subsidiaries is expected to be negatively associated with sole ownership, and the squared number of subsidiaries is expected to be positively associated with sole ownership. Firm Size and Size Squared are mean-centered in the regression estimates.

R&D Intensity. MNC R&D Intensity is included in order to take into account the relationship between innovation activities and structure choice. R&D Intensity is

measured as total MNC R&D expenditures in the prior year divided by MNC total revenue in the prior year. MNCs in the sample had an average R&D Intensity of 12 percent. This measure is expected to be positively associated with Shared and Mixed ownership structures.

Diversification. A one-year lagged total entropy diversification measure is used to capture the diversity of a firm's activities (e.g. Bowen and Wiersema, 2005; Palepu 1985). The variable is calculated as follows:

$$\text{Total Entropy} = \sum_{i=1}^N S_i \ln\left(\frac{1}{S_i}\right)$$

S_i represents the MNC's share of total sales in business segment i . N represents the total number of business segments in which the MNC operates. The measure is calculated using the business segment information from Orbis and, in the case where Orbis data was unavailable, from the consolidated financial data in the transfer pricing reports. This variable equals zero for single business firms and increases with greater levels of diversification. Diversification is expected to be positively associated with Separate ownership structures since diversified firms are more likely to have independent FSAs.

Number of M&As. An acquisition event is defined in this study as an MNC acquiring or merging 100 percent with a target firm.⁵ The variable is calculated as the sum of the total number of acquisitions and/or mergers that an MNC made in the prior year. On average, the MNCs in the sample engaged in one M&A in a given year, with a standard deviation of 2.38. The number of acquisitions made by the MNC each year is

⁵ In results not reported herein, the alternative definition of acquiring greater than 5% of a company was used. The alternative definition of acquisitions did not alter the results.

included as a control for reasons similar to diversification. Since post-merger integration is costly and complex, MNCs that undertake a greater number of acquisitions are expected to be more likely to allow acquired firms to manage their own FSAs. Thus, the Number of M&As should be positively associated with Separate or Mixed structures.

Tax Haven Ownership. Tax Haven ownership is a binary indicator variable, set equal to one if the MNC has at least one FSA owner incorporated in a tax haven. Tax Haven countries were identified based on the list of tax haven countries (Dharmapala and Hines, 2007). Additionally, the binary indicator *Pure Tax Haven* was created to indicate whether the MNC had a tax haven FSA owner with no real operational activities.⁶

All regressions include controls for time using a time trend and industry using dummy variables for Manufacturing, Service, and Other industries. All independent variables are lagged by one year.

4.5.5 Estimation

The hypotheses focus on the degree to which MNCs are more likely to own independent (versus complementary) FSAs in Separate or Shared structures and tacit (versus codifiable) FSAs in Separate or Shared structures. Therefore the main analyses focus on firms' decisions to use Separate or Shared ownership structures.

The analysis has three parts. First, a probit model of the choice between Shared and Separate structures is estimated, excluding firms that use Mixed or Sole structures.

⁶ The indicator for *Operational Tax Haven* is set equal to one if the tax haven FSA owner performed at least one of the following functional activities: R&D, manufacturing, distribution, sales and marketing activities, or financial trading (for banking firms). The binary indicator variable *Pure Tax Haven* is set equal to one if the firm's tax haven FSA owner did not physically perform operational activities, defined as R&D, manufacturing, distribution, sales and marketing activities, or financial trading (for banking firms).

Second, using the same sub-sample, a bivariate probit model is estimated that combines the choice between Shared versus Separate structures and the choice to have an FSA owner located in a Tax Haven. It is expected that these are endogenous and interrelated decisions. The bivariate probit, which is a variation of the standard Heckman model, allows for estimating the two decisions together. It is expected that there will be different results between the bivariate probit model that includes tax haven choice and the simple probit model if the choice of ownership structure is primarily motivated by the desire to minimize taxes.

Third, as an exploratory analysis, the multinomial logit is used to examine the choice set of FSA ownership structures.⁷ All of the models have the following general specification:

$$Y_{it} = \alpha_i + \beta_1 X_{i(t-1)} + \beta_2 Z_{i(t-1)} + \varphi_j + \tau_t + \varepsilon_{it}$$

Y_{it} is the discrete choice, either between Shared or Separate FSA ownership structures or between all four structures in the multinomial logit estimates. The bivariate probit model adds a second Y_{it} which is set equal to 1 if the MNC has Tax Haven FSA owner(s).

$\beta_1 X_{it}$ is a matrix containing each MNC's scores for the Independent Scale and the Complementary Scale, and $\beta_2 Z_{i(t-1)}$ is a matrix containing lagged MNC characteristics, in particular, Firm Size and Size Squared, R&D Intensity, Diversification, and the Number

⁷ The multinomial logit estimates are problematic due to the fact that (1) the choice processes for the different structures are not the same (e.g., firms do not go directly from Sole to Mixed) (2) some FSA ownership structures can be viewed as substitutes for each other (e.g., Mixed ownership structures might be used as a substitute firms choosing to change from Shared (Separate) to Separate (Shared) ownership structures). Thus, the inclusion of Mixed structures clearly violates IIA. Therefore this study reports multinomial logit results on a truncated sub-sample of MNCs that excludes 37 firm-year observations of Mixed ownership structures.

of M&As. φ_j and τ_t are industry and year controls, respectively. All errors are clustered to account for repeat observations on MNCs.

4.6 Results

4.6.1 Descriptive Statistics

Table 9: Mean MNC Characteristics and FSAs by FSA Ownership Structure

	All	Sole	Shared	Separate	Mixed
<u>MNC Characteristics</u>		(1)	(2)	(3)	(4)
Revenue	13.92	12.62 ^{2,3,4}	13.41 ^{3,4}	14.70 ⁴	15.83
Number of Subsidiaries	3.63	2.91 ^{2,3,4}	3.34 ^{3,4}	4.02 ⁴	4.94
R&D Intensity	0.13	0.16 ^{2,3,4}	0.19 ^{3,4}	0.08	0.10
Profitability	-0.05	-0.13 ^{3,4}	-0.23 ⁴	0.06	0.12
Effective Tax Rate	0.26	0.25	0.24	0.28	0.19
Diversification	0.32	0.21 ^{3,4}	0.20 ^{3,4}	0.36 ⁴	0.90
Age	41.66	32.46 ^{2,3,4}	24.92 ^{3,4}	57.56 ⁴	19.34

The table above contains the mean values of MNC characteristics by FSA ownership structure. Superscripts 1-4 denote significant differences between structures. Thus, the statistics for revenue can be interpreted as follows. The average of the natural log of revenue for MNCs using a sole structure is 12.62. The superscripts 2, 3, 4 indicate that 12.62 is significantly different from the corresponding values for all of the other structures. The average of the natural log of revenue for MNCs using a Shared structure is 13.41 and the superscripts 3 and 4 indicate that 13.41 is significantly different from the corresponding values in Separate and Mixed ownership structures. Looking down the table, there are large differences in some of the variables for each structure. For example, MNCs using Sole and Shared ownership structures are much more R&D intensive than

MNCs using Separate or Mixed structures. MNCs using Mixed ownership structures pay the lowest average effective tax rate, and they are also the most profitable on average.

Table 10: Descriptive Statistics and Correlations⁸

	Mean	s.d.	1	2	3	4	5	6	7	8	9
1 Shared	0.21	0.41									
2 Tacit Scale	1.19	3.48	0.25*								
3 Independent Scale	-0.70	1.24	-0.33*	-0.35*							
4 Firm Size	0.18	1.32	-0.15	-0.17	0.19						
5 R&D Intensity	0.12	0.19	0.10	0.14	-0.21	-0.35*					
6 Number of M&As	1.00	2.38	-0.08	0.02	0.10	0.44*	-0.10				
7 Diversification	0.29	0.45	-0.09	-0.01	0.08	0.28*	-0.10	0.08			
8 Manufacturing Dummy	0.66	0.48	-0.17	-0.05	0.00	0.09	0.09	-0.09	0.14		
9 Other Industry Dummy	0.09	0.29	0.10	-0.14	0.08	-0.07	-0.20	-0.11	-0.10	-0.43*	
10 Tax Haven Dummy	0.49	0.50	0.37*	-0.07	-0.07	0.34*	-0.22	0.18	-0.03	-0.11	0.00

* p<.05. Year=2007. Number of Observations 67.

Table 10 contains descriptive statistics and correlations for the full sample of MNCs. The highest correlation is between Firm Size and the Number of M&As ($r=0.44$). Therefore, M&As and diversification are entered into the regressions separately from Firm Size.⁹

Chapter 3 – Figure 7 shows the distribution of FSA ownership structures by industry. Interestingly, 100% of MNCs in the finance, insurance, and real estate industries use Separate ownership structures. Similarly, approximately 50% of MNCs in the wholesale trade and legal, education, and engineering services industries also use Separate ownership structures. The very high prevalence of Separate ownership structures in the services industries can be attributed to the fact that services are often

⁸ The correlation matrix is calculated using 2007 single-year data since standard cross-sectional correlations assume independence across observations. The correlation matrices for the pooled sample and for the other single years were consistent with those shown in the correlation table above.

⁹ Entering all variables into the equation does not change the results for the primary variables of interest.

independent and tied to local markets. Thus, Separate structures give FSA ownership rights to the affiliates that are best positioned to invest in these competencies.

Figure 9: Ownership Structure by Type

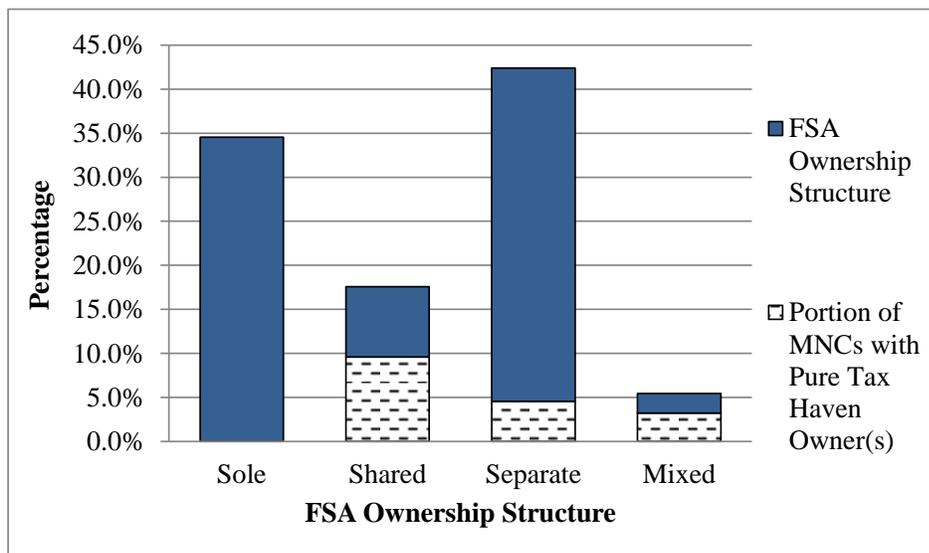


Figure 9 presents the distribution of FSA ownership structures in the sample and the proportion of firms using each structure that have a pure tax haven FSA owner. Not surprisingly, MNCs with Sole structures almost never allocate FSA ownership rights to pure tax haven affiliates. Pure tax haven use is much more prevalent in Shared ownership structures (55% of observations) as compared to Separate ownership structures (11% of observations). MNCs using Mixed ownership structures are the most prolific users of pure tax haven subsidiaries (59% of observations).

Figure 10: Percentage of FSA Types Shared vs. Separate

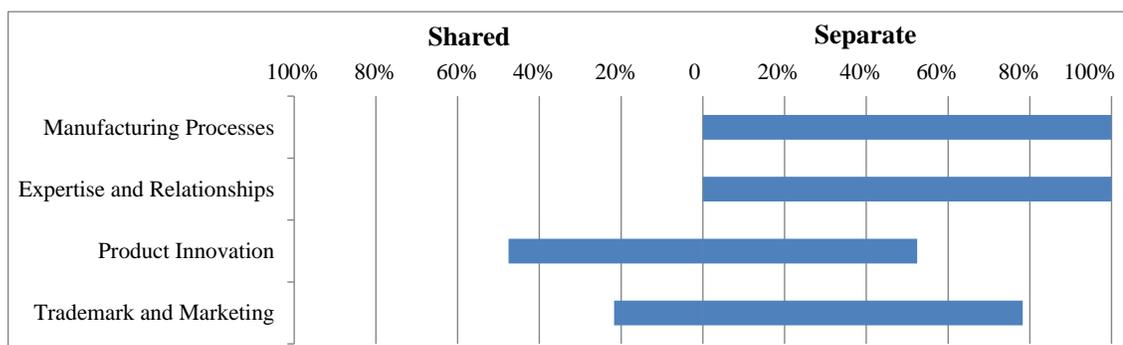


Figure 10 shows the FSA categories and the degree to which they are owned in Shared versus Separate structures. The bars on the chart represent the percentage of total observations that have Shared versus Separate ownership structures. Some fascinating results emerge. First, *100% of MNCs with Manufacturing Process or Expertise and Relationship FSAs use Separate ownership structures!* The FSAs with 100% Separate ownership fit with Hypothesis 1 in that these FSAs are typically independent. Thus, these FSAs are expected to be separately owned. Consistent with Hypothesis 2, MNCs with tacit FSAs like product innovation are much more likely to use Shared than Separate ownership structures.

As discussed above, three different estimation techniques were used to test the hypotheses. Table 11 reports the probit results with the dependent variable set equal to 1 for Shared ownership structure. MNCs with Sole and Mixed ownership structures are excluded from these estimates. Column 1 contains the control variables Firm Size, Size Squared, R&D Intensity, the time trend and dummies for Manufacturing and Other industries (Service industries is the referent category). Column 2 contains simple probit estimates of the base model with the Tacit and Independent scales added. The pseudo- R^2 more than doubles when the two FSA dimension scales are added. Column 3 shows the

estimates of the base model with Firm Size and Firm Size Squared removed and Number of M&As and Diversification added. Columns 4 and 5 contain the bivariate probit estimates with the same independent variables as Columns 2 and 3, respectively. Finally, Columns 6 and 7 show the bivariate probit estimates using FSA categories as explanatory variables rather than FSA dimensions. The last two regression models can only be estimated using two of the four FSA categories since 100% of MNCs with “Manufacturing Process” FSAs and “Expertise and Service” FSAs use Separate structures.

4.6.2 Regression Results

Table 11: Probit and Bivariate Probit Results Predicting Shared FSA Ownership

	Probit			Bivariate Probit			
	1	2	3	4	5	6	7
H1 (-) Independent Scale		-0.66** (0.25)	-0.73** (0.25)	-0.71** (0.26)	-0.80** (0.26)		
H2 (+) Tacit Scale		0.20* (0.09)	0.22* (0.09)	0.19* (0.09)	0.21* (0.09)		
H1 (-) Brand						-0.80* (0.39)	-0.60 (0.39)
H2 (+) Product						3.04*** (0.71)	2.76*** (0.61)
Firm Size	-0.31* (0.14)	-0.17 (0.14)		-0.19 (0.14)		-0.28† (0.15)	
Firm Size Squared	-0.16** (0.06)	-0.12† (0.06)		-0.12* (0.06)		-0.16* (0.07)	
R&D Intensity	0.27 (0.61)	-0.41 (0.50)	-0.38 (0.51)	-0.48 (0.50)	-0.44 (0.50)	-1.04† (0.60)	-0.68 (0.59)
M&As			-0.16† (0.09)		-0.17† (0.09)		-0.14† (0.08)
Diversification			-0.36 (0.40)		-0.47 (0.47)		-0.52 (0.39)
Trend	0.07† (0.04)	0.03 (0.04)	0.04 (0.04)	0.05 (0.04)	0.05 (0.04)	0.04 (0.04)	0.05 (0.04)
Manufacturing Industry Dummy	-0.69 (0.43)	-0.81 (0.56)	-0.81 (0.53)	-0.90 (0.56)	-0.82 (0.55)	-0.49 (0.48)	-0.16 (0.51)
Other Industry Dummy	-0.61 (0.64)	0.13 (0.70)	0.12 (0.68)	0.11 (0.66)	0.14 (0.63)	1.68* (0.67)	1.49* (0.65)
Constant	-0.43 (0.57)	-0.79 (0.63)	-0.85 (0.57)	-0.84 (0.64)	-0.93 (0.59)	-2.58** (0.93)	-2.72** (0.86)
Number of Observations	348	348	349	348	349	348	349
Pseudo R-Squared	0.15	0.37	0.37				
Wald Chi-Squared	24***	30***	31***	44***	43***	46***	39***
Log Pseudolikelihood	-184	-136	-136	-319	-324	-309	-327
Wald Test of rho=0 (Chi-Squared)				5.30*	5.81*	9.04**	6.59*

Robust, clustered standard errors are in parentheses. Two-tailed tests for variable coefficients.

†p<.10; * p<0.05; ** p<0.01; *** p<0.001

The estimates in Table 11 provide strong support for Hypotheses 1 and 2. In the probit estimates and bivariate probit estimates in Columns 2-5, MNCs with Independent FSAs are more likely to use Separate, rather than Shared ownership structures (p<.01) and MNCs with Tacit FSAs are more likely to use Shared rather than Separate ownership structures (p<.05). The estimated coefficients and standard errors for the two

hypothesized scales show remarkable stability across the different probit and biprobit regression estimates.

In general, smaller firms tend to have Shared rather than Separate ownership structures, and R&D Intensity is not related to the choice of Shared and Separate FSA ownership structures. MNCs that make a larger number of M&As are more likely to use Separate ownership structures ($p < .10$, Columns 3 and 5), but Diversification is unrelated to FSA ownership choice.

Turning to the estimates in Columns 6 and 7, MNCs with Product Innovation FSAs are more likely to use Shared, rather than Separate ownership structures ($p < .001$) and MNCs with Brand FSAs are somewhat less likely to use Shared ownership structures ($p < .05$, Column 6; $p > .10$, Column 7). These results are consistent with the estimates in Columns 2-5 in the sense that Product Innovation FSAs tend to be more tacit and less independent, and Brand FSAs tend to be more codifiable and independent. However, the estimates using FSA categories suffer from collinearity with the industry dummies, since many of the FSAs tend to be prevalent in particular industries, so these results should be interpreted with some caution.

The bivariate probit results in Columns 4 and 5 include a second set of regression estimates for which the choice to have a tax haven subsidiary is the dependent variable.¹⁰ Although the estimates are not reported in the table, in all cases there was only one significant association—a negative and significant relationship between the choice to have a tax haven subsidiary and the Independent Scale ($p < .05$). This relationship is

¹⁰ The estimates in Columns 7 and 8 use the same bivariate probit regressors in the tax haven model. A Likelihood Ratio Test for Independence of the two regressions was significant ($p < .05$), however the bivariate probit specifications need further refinement.

somewhat complex. The tax haven FSA owner bears the costs and risks of developing the complementary FSAs and earns revenues from licensing the FSAs throughout the MNC. In some cases, these tax haven FSA owners are in countries like Ireland and Switzerland in which subsidiaries perform real activities and have real strategic responsibilities. In other cases, tax haven FSA co-owners are in pure tax havens like Cayman Islands, and the MNC parent makes all strategic decisions. Perhaps complementary FSAs provide greater opportunities for taking advantage of tax havens since they can be leveraged across the MNC's assets. The results suggest that the choice to use Shared versus Separate structures and the choice to have a tax haven affiliate are interrelated. However, the results also show that *real* considerations, such as the features of an MNC's FSAs as well as Firm Size and M&A activity are important correlates of structure choice.

Table 12: Multinomial Logit Results

	Shared versus Separate 1	Shared versus Sole 2	Separate versus Sole 3
H1 (-) Independent Scale	-0.93† (0.50)	-0.12 (0.21)	0.80† (0.47)
H2 (+) Tacit Scale	0.21* (0.10)	0.11 (0.09)	-0.10 (0.08)
Firm Size	-0.30 (0.25)	0.33 (0.26)	0.62** (0.19)
Firm Size Squared	-0.18 (0.12)	-0.36** (0.12)	-0.18 (0.12)
R&D Intensity	-0.49 (0.68)	-0.55 (0.43)	-0.06 (0.42)
Trend	0.05 (0.08)	0.03 (0.09)	-0.02 (0.07)
Manufacturing Industry Dummy	-0.71 (0.85)	-0.41 (0.77)	0.31 (0.53)
Other Industry Dummy	0.14 (1.10)	1.01 (1.10)	0.87 (0.88)
Constant	-1.31 (1.13)	-0.12 (1.08)	1.19 (0.84)
Number of Observations			498
Wald Chi-Squared			56***
Pseudo R-Squared			0.21
Log Pseudolikelihood			-412

Robust, clustered standard errors are in parentheses. Two-tailed tests for variable coefficients.

†p<.10; * p<0.05; ** p<0.01; *** p<0.001

Table 12 reports the multinomial logit estimates. As discussed in footnote 7, these estimates are exploratory and the sample is truncated by removing MNCs that use Mixed FSA ownership structures. Despite this shortcoming, the multinomial logit results shed light on interesting differences between MNCs using Sole ownership structures with only one FSA-owning entity and MNCs using structures in which more than one entity owns FSAs (Shared or Separate ownership structures). The results in Column 1 of Table 12 are similar to the results in Table 11. Compared to MNCs that use Separate structures,

MNCs that choose Shared ownership structures have FSAs that are more Tacit ($p < .05$, Column 1) and less Independent ($p < .10$, Column 1). In Column 2, the only significant difference between MNCs that choose Shared versus Sole ownership structures is that the latter tend to be used by the largest MNCs in the sample. This is consistent with the idea that as firms grow to be extremely large, FSA ownership structures that allow for multiple FSA owners with joint control rights and their respective contracting arrangements simply become too complex and difficult to manage.

The estimates in Column 3 compare the choice of Sole and Separate FSA ownership structures. Interestingly, MNCs that choose Separate structures are larger, on average than MNCs that choose Sole structures ($p < .01$, Column 3). However, the very largest MNCs are equally likely to choose both structure types. Finally, consistent with property rights theory, MNCs with Independent FSAs are more likely to choose Separate, rather than Sole FSA ownership structures ($p < .10$, Column 3). This suggests that when FSAs have no synergistic value, firms choose disaggregated ownership structures that provide market-like incentives for FSA development and maintenance to individual affiliates throughout the MNC.

Several robustness tests were performed to check the sensitivity of the results. First, additional controls were included in the regressions such as a binary indicator for whether the firm is a public or a private firm, binary controls for whether the MNC is incorporated in the US, Europe, or elsewhere, and a control for host country effective tax rate. Second, alternative measures were applied for some of the controls in the regressions. For example, MNC number of subsidiaries was replaced with MNC revenues as well as MNC total assets, Diversification was replaced with the total number

of four-digit SIC codes in which the MNC operates and the Number of M&As was replaced with M&A activity defined as acquiring greater than 5% of the company. Third, highly correlated variables were entered into the regressions one at a time and also the regressions were run without Firm Size Squared. The results of these additional analyses on the theoretical variables of interest were consistent with the results reported herein.

4.7 Discussion

This study investigates how MNCs internally organize ownership of their FSAs. The findings suggest that the problems associated with incomplete contracts are not fully resolved by bringing an activity inside the firm. From the standpoint of property rights and transaction cost theory, a key result of this research is that the same features of FSAs that render them more or less contractible in markets also explain the internal ownership structures chosen by firms.

In contrast to the assumption that knowledge assets are public goods within MNCs (e.g., Ethier, 1986), firms establish internal economic ownership structures in which FSA owners contract or license the FSAs to other affiliates and/or the parent. Such structures allow firms to balance high-powered incentives that reward innovation with internal coordination and control. This creates internal market-like transactions and structures within the firm and, to some extent, limits the benefits of internalization, such as the ability to freely access spillovers from internally created knowledge. Even within firms, free rider problems disincentivize FSA creation and maintenance. Thus, some degree of excludability is necessary for successful FSA development within firms. To this end, MNCs choose different structures to delegate internal residual rights ownership of their most important knowledge assets—including assets for which contracts are extremely

difficult to write. Although these assets are considered to be non-contractible in markets (e.g., Dunning, 1980), they are extensively contracted and licensed within MNCs.

This study identifies four different types of FSA ownership structures: sole, shared, separate, and mixed. It is argued that the reason that these FSA ownership structures exist is to balance motivation and coordination problems associated with contracting for knowledge. This research draws on property rights theory to understand the decisions that MNCs make with regard to the internal ownership of FSAs. Consistent with the predictions, MNCs with independent and easily codifiable FSAs are more likely to use separate ownership structures that provide high-powered incentives. In contrast, firms with complementary and tacit FSAs are more likely to use shared ownership structures that facilitate knowledge flows and coordination within the firm.

When FSAs are highly contractible, MNCs use separate structures, or “mini firms within the firm,” to organize internal FSA ownership. In separate structures, individual units within the firm own and control the FSAs in which they are best positioned to invest. Separate structures are the most common choice of all the MNCs in the sample and have several interesting features. First, they are chosen by the vast majority of MNCs in service sector industries. Second, compared to Shared ownership structures, Separate structures are much less likely to be used by firms that make extensive use of pure tax haven FSA owners. Since Separate structures involve the delegation of ownership along with decision and control rights to MNC affiliates, it is perhaps not surprising that these rights are not often granted to pure tax haven units that perform no other functions for the MNC.

Third, Separate structures are chosen by 100% of MNCs with Manufacturing Process and Expertise and Service FSAs. In addition to being independent, these FSAs are likely to be organized in Separate structures because they tend to be localized. Future drafts of this research will examine the association between the “local versus global” dimension of FSAs and FSA ownership structure choices.

When FSAs are less contractible in the sense of being tacit or complementary, MNCs choose Shared ownership structures. These structures are not very widely used by firms in the sample – most likely due to the potential bargaining problems they create. Shared structures allocate FSA ownership and control rights to two or more entities within the firm, hypothetically giving all shared owners veto power over decisions related to the FSA. The theoretical link between internal shared structures and the predictions of property rights theory is complex. In general, property rights theory maintains that two independent entities should not share ownership of complementary assets (Hart and Moore, 1990).¹¹ Rather, one entity or the other should own the assets and divide the returns. Hart and Moore (1990) refer to this as “integration,” meaning only one entity owns the asset. “Integration” is analogous to ownership in hierarchies rather than markets. Within the firm, however, potential hold-up problems that arise due to the shared veto issue are mitigated by the fact that the parent entity can always resolve internal conflicts by fiat. Indeed, MNC parents are often FSA co-owners in the sample of

¹¹ More recent work in property rights theory has taken issue with Hart and Moore’s position that joint asset ownership is never optimal. Holmstrom and Roberts (1998) note that joint ownership may be more efficient when investments by more than one entity improve non-human assets (p79). Within firms, this is likely to be the case when investments are costly and capital intensive, requiring the participation of more than one unit within the firm.

firms, giving them even more power to settle disputes. Thus, *within firms*, many of the potential drawbacks of shared ownership in markets are no longer problematic.

A key finding in this research is that within firms, shared ownership structures are much more likely to be used when FSAs are tacit and complementary. In markets, shared structures have the potential to maximize conflicts, whereas within the firm, they allow for close coordination, knowledge transfers, and shared incentives to innovate. In this sense, the ability to manage joint ownership arrangements when FSAs are tacit or complementary or in cases where contributions of individual units within the firm are difficult to measure, is one of the most important advantages of organization in firms rather than markets.

Finally, in exploratory results this study examines the correlates of Sole ownership structures. Consistent with the idea that sole ownership structures can reduce complexity for very large firms, the results indicate that Sole ownership structures are chosen by the largest MNCs in the sample. Additionally, firms choose Separate structures rather than Sole structures when FSAs are independent. In such instances, Separate structures provide better disaggregated incentives to develop and maintain the MNC's FSAs.

It is important to note that all FSA ownership structures are the result of a two-step process. First, ownership is "integrated" in the sense of being internalized within firms. Second, the choice is made within the firm to integrate FSA ownership (Sole ownership), share ownership between various units (Shared ownership), distribute FSA ownership to "mini firms within the firm" (Separate ownership) or use some hybrid of the latter two structures (Mixed ownership).

The results indicate that the choice of Shared versus Separate ownership structures is interrelated with the choice to have tax haven subsidiaries. The majority of MNCs in the sample have tax haven subsidiaries, and many have tax haven FSA owners. MNCs with Shared ownership structures have a larger proportion of pure tax haven FSA owners than MNCs with any of the other three structures. It therefore is no surprise that the Internal Revenue Service classifies shared ownership between US and foreign MNC entities as a Tier 1 tax issue. The finding that MNCs with complementary FSAs are more likely to have tax haven FSA owners suggests that FSA characteristics may be associated with a firm's ability to take advantage of tax havens.

Although a detailed analysis of firm strategy and its relation to FSA ownership structure choice is beyond the scope of this paper, the results seem to suggest that Shared structures are used by relatively young, innovative MNCs in high growth industries. Compared to MNCs with Sole and Separate structures, MNCs that use Shared structures are significantly younger and less profitable. Compared only to MNCs that use Separate structures, MNCs that use Shared structures have fewer subsidiaries and undertake fewer M&As. MNCs with shared ownership structures are much more prevalent among MNCs with Product Innovation FSAs in areas such as software programming. These stylized facts, together with the much greater use of pure tax haven FSA owners suggests that MNCs with Shared structures may channel the revenues from FSA ownership to tax havens in order to fuel global growth.

FSA ownership has implications for policymakers and managers alike. For policymakers, internal FSA ownership and contract and licensing arrangements have been the subject of much scrutiny lately by legislatures and governments around the

globe (e.g. Levin and McCain, 2013; Bergin, 2012; Thompson, 2012). FSA ownership has a significant effect on government revenues. Understanding the purpose and the factors that drive the selection of FSA ownership structures can provide insight into the types of policies that can attract MNCs to locate FSA ownership within a country. While firms vary in the extent to which they locate FSA ownership in tax havens, it is important to understand the operational antecedents of this choice.

From a managerial standpoint, the results indicate a clear association between the characteristics of FSAs owned by the firm and the internal ownership structures used to manage them. The different types of FSA ownership structures create different linkages across the units of the firm in terms of knowledge flows and financial flows. The creation and maintenance of tacit, knowledge-intensive FSAs require diverse insights and collaboration. The finding that MNCs use shared ownership structures when their FSAs are tacit is consistent with the idea that shared ownership structures provide better mechanisms for coordination and knowledge transfer and are feasible to implement within firms.

As previously mentioned, future versions of this research will incorporate several refinements such as the “local versus global” dimension of FSAs. The present draft of this research is limited by the fact that Sole ownership structures were only examined in exploratory analyses. Sole structures are expected to be predictable by the *interactions* of different FSA characteristics. For example, Sole ownership structures are expected to be chosen when FSAs are codifiable and global. In such instances, Sole structures allow the MNC parent to more tightly coordinate activities associated with codifiable but global FSAs and transfer knowledge to diverse units within the firm. Testing this theory would

require creating an additional “local versus global” FSA dimension. Such an approach will be used in the refinement of this research.

A second important future refinement is to better estimate a joint model of FSA ownership structure and the choice to use a tax haven FSA owner. The results suggest that these two decisions are interrelated, but a much stronger set of predictors is needed for tax haven FSA ownership. The endogeneity of these decisions creates complex problems with regard to pinning down the underlying structural relationships between tax haven use and ownership structure choice.

In addition to refining the current preliminary draft of this research, there are a large number of related research questions to investigate, which should provide further insight into MNCs’ FSA ownership structure choices. First, future research will examine firms’ decisions to switch from one ownership structure to another. Although this is a relatively rare event, interesting patterns appear in the switching data such as the fact that MNCs with Shared ownership structures never switch to Separate ownership structures, but the reverse does not apply. An investigation of structure changes is beyond the scope of the present research.

Second, future research at the affiliate level will study the relationships between ownership structures and flows of goods and services within the firm. Previous research suggests that intra-firm trade is knowledge-intensive and complex to organize within firms (Feinberg and Keane, 2006); however detailed data on transactions within MNCs have not been previously available to researchers. Third, future research will investigate MNC structure choices at the affiliate level. A more disaggregated investigation of FSA ownership structures will allow for examination of the degree to which these are

associated with location choices. Such an analysis would contribute to both the product mandate literature and to the location choice literature. This unique data on ownership and related transactions within MNCs can shed light on basic questions related to the theory and management of multinational firms.

5. Subsidiary Ownership of FSAs and Innovation

ABSTRACT

This study examines the relationship between FSA ownership and subsidiary innovation. Innovation is inherently difficult to monitor and control. Property rights theory suggests that ownership provides two incentives for investing in the creation of the asset: 1) the ability to appropriate income from the innovations created, and 2) the ability to control both the asset and its future direction of development. The results suggest that subsidiary FSA ownership is positively associated with innovation, and that transferring ownership away from the subsidiaries that create the FSAs has a negative effect on innovation. I also explore the effects of having tax haven subsidiaries own the rights to MNC FSAs and find that subsidiaries that perform activities for pure tax havens innovate less than those contracted by the parent.

5.1 Introduction

It is estimated that the U.S. government loses over \$60 billion a year in tax revenue due to corporate tax evasion (Bloomberg, 2010). Tim Cook, the CEO of Apple, executives from Caterpillar, Inc., Starbucks, Amazon, etc., have all been called to testify before government bodies in the United States and abroad, regarding their companies' use of tax havens. As noted by a Wall Street Journal article, one key mechanism through which firms are able to avoid taxes is by transferring economic ownership of their intellectual property to subsidiaries located in tax havens (Wall Street Journal, 2002). For example, Starbucks' European subsidiaries license the rights to use Starbucks brands, products, and processes from their Netherlands subsidiary, Starbucks Coffee EMEA BV

(Reuters, 2012). Because the Starbucks Netherlands subsidiary owns the economic rights to Starbucks' intellectual property, it is legally entitled to the profits from the intellectual property. Management theorists have generally assumed that a firm's key value generating assets, or firm-specific advantages (FSAs) are public goods within the firm (e.g. Ethier, 1986; Kogut and Zander, 1992). However, multinational firms (MNCs) allocate ownership of their FSAs to subsidiaries and or the parent, who bear the risk of developing the FSAs, maintain control rights to the FSAs, extensively contract and license the FSAs to other entities within the firm, and receive the income or losses from the FSAs. Subsidiary ownership of FSAs not only affects where tax payments and profits reside within the MNC, it affects subsidiary-level control over assets and resources, and incentives for the maintenance and creation of future FSAs. The allocation of FSA ownership within the MNC can have important consequences for MNC innovation, growth, and profitability. Despite its importance, relatively little is known about the effects of the economic ownership of FSAs within the MNC. No doubt the absence of research on this topic is mainly due to the lack of available data.

Using a new, confidential dataset on 102 MNCs and their subsidiaries, I examine the ramifications of internal FSA ownership on subsidiary technological innovation. I explore whether firms like Starbucks that strip FSA ownership rights from value generating subsidiaries and give those rights to tax haven subsidiaries within the firm creates incentive problems with regard to future innovative activity.

Subsidiaries play a key role in innovation, and it is generally to the benefit of the MNC to allocate FSA ownership to the entity creating the FSA. Researchers have noted the importance of foreign subsidiaries in the creation of FSAs for MNCs (e.g. Cantwell

1995; Dunning and Narula 1995; Kuemmerle, 1997; von Zedtwitz and Gassmann, 2002). Subsidiaries are able to draw on their diverse local knowledge, skills, and expertise to create innovations. Subsidiaries are not just locations to tap into the local expertise, but are hubs for value creation within the firm (Birkinshaw et al, 1998).

The ability to share and leverage FSAs across complimentary activities and geographically dispersed locations is an advantage of the firm. With the advantage, however, comes the organizational problem of allocating control over the assets and structuring incentives for the ongoing creation and maintenance of the FSAs. Since the subsidiaries that create the FSAs may be different from those that use them, MNCs face the organizational problem of allocating the ownership rights and control to the various profit-generating FSAs within the firm.

In an exchange relationship, the party whose activity makes the largest contribution to the creation and maintenance of the asset should own the asset (Grossman and Hart, 1986; Hart and Moore, 1990). Transferring FSA ownership away from value generating subsidiaries means that the MNC is also transferring the risk and rewards of development away from the centers of innovation within the MNC. Chapter 4 suggested that MNCs form different internal market structures to manage the way knowledge is created and shared within the firm. Firms face tradeoffs in choosing both the FSA structures and FSA ownership. While reducing tax expenditures is one reason for assigning subsidiary FSA ownership, operational factors, such as innovation activities, subsidiary role, MNC growth, and administrative complexity are also important in determining FSA ownership. Transferring FSA ownership within the firm is costly and is heavily scrutinized by tax authorities. The structuring of FSA ownership involves large,

often one-time decisions about a subsidiary owning FSAs. Because the FSA ownership structures are long lasting and there are conflicting priorities that MNCs must balance, some MNCs may have sub-optimal structures in place or structures that have unintended consequences.

The purpose of this paper is to examine the effects of subsidiary-level FSA ownership on subsidiary technological innovation. Ownership provides two incentives for investing in the maintenance and creation of FSAs: 1) the ability to appropriate income from the innovations created, and 2) the ability to control both the asset and its future direction of development. Subsidiary FSA ownership is predicted to be positively associated with innovation. As the vast majority of subsidiaries within the firm are FSA users that are contracted by FSA owners to perform various activities, I further examine the contracting relationships within the firm. Subsidiaries that are contracted by the parent have increased incentives for advancement within the MNC and organizational identification, which will motivate them to innovate. Thus, subsidiaries that contract with the parent are predicted to be positively associated with innovation. In contrast, subsidiaries that are contracted by pure tax haven FSA owners may become disenchanted by having to give the fruits of their labor to another subsidiary whose activities do not directly contribute to the development of the FSAs. Therefore, it is expected that subsidiaries that are contracted by pure tax haven FSA owners will be associated with reduced innovation.

To test the predictions, I compiled a subsidiary-level dataset on the economic ownership of FSAs and subsidiary contracting and licensing relationships of 95 MNCs in an unbalanced, panel dataset from 1997 to 2011. I combined the data with data from

Bureau Van Dijk's Orbis database and patent data from United States Patent Trademark Office (USPTO). The dataset contains information on 7,156 subsidiaries and their 50,934 patents over the 1997-2011 time period. The results to the analyses suggest that FSA ownership is important for subsidiary innovation. Subsidiaries that own the rights to the FSAs they create are significantly more likely to produce technological innovations. Moreover, transferring ownership away from a subsidiary significantly reduces its innovation. While contracting with a parent is positively associated with innovation, contracting with a pure tax haven entity has a negative effect on subsidiary innovation.

This paper makes several important contributions to the literature on the MNC and subsidiary innovation. First, it contributes to the theory of the multinational firm by showing how the internal governance of FSAs affects the creation of future FSAs. The free-flow of knowledge within the firm has been held as a key advantage of the firm (Ethier, 1986; Hymer, 1960; Caves, 1971). However, within the MNC, knowledge is bought and sold amongst the subsidiaries and/or parent. Assigning FSA ownership within the MNC creates internal markets for knowledge, which can *enhance innovation* within the firm. Second, this research contributes to the subsidiary entrepreneurship literature by introducing economic ownership of FSAs as a means of establishing entrepreneurial subsidiaries within the MNC. The FSA owners bear the risk and rewards of not just their own operations, but also of other subsidiary operations. Third, I contribute to the literature on subsidiary innovation by examining the effects of FSA ownership on subsidiary innovation. Although FSAs have long held a central role in the theory of the MNC, the effects of FSA ownership on subsidiary innovation remains unexamined. Research on subsidiary innovation focuses primarily on subsidiary

capabilities and knowledge transfer and diffusion (e.g. Frost, Birkinshaw and Ensign, 2002; Almeida and Phene, 2004). Fourth, I go beyond transfer pricing research's focus on profit shifting and tax avoidance (e.g. Grubert, 2003; Mutti and Grubert, 2008; Dischinger and Riedel, 2010) by showing how tax haven subsidiaries and FSA ownership can affect real operations.

5.2 Contextual Background

Within the MNC, the parent and/or subsidiaries (entities) that own the FSAs (FSA owners) internally contract other entities (FSA users) within the firm to perform activities such as research and development, manufacturing, and distribution and pay the FSA users a guaranteed return for their activities. MNCs use legal, written contracts between the subsidiaries and/or parent to specify and solidify their intra-firm relationships. The internal contracts outline the activities to be performed, the rights, risks borne, and payment terms of the entities. Some MNCs have FSA owners that perform operational activities, whereas others have “pure tax havens” – subsidiaries that are located in tax haven countries, own the economic rights to FSAs, and do not perform operational activities. The FSA owners typically maintain rights control over the use and development of the FSAs. In the case of pure tax haven FSA owners, which tend to have minimal employees, the parent typically controls the FSAs while the tax haven subsidiary keeps the profits.

Before proceeding, it is useful to provide a brief example of the internal contracting and licensing arrangements. ABC Transmissions is a transmission company headquartered in the U.S. Its German subsidiary is the economic owner of the transmission technology. The Germany subsidiary contracts the UK subsidiary to

develop transmissions for small vehicles and promises to pay the UK subsidiary a 7% mark-up on its R&D expenses. If the UK subsidiary fails to create a new product or takes an extra two years to do so, the U.K. subsidiary still receives the 7% return on its R&D expenses and the German subsidiary incurs the loss associated with the R&D activities. If the UK subsidiary creates the latest and greatest new transmission, the U.K. subsidiary continues to receive the 7% mark-up on its R&D costs. The German subsidiary, as the economic owner, receives any income from the new transmission above what it promised to pay the contracted subsidiaries. Once a new transmission is developed by the U.K. subsidiary, the German FSA owner contracts the French subsidiary to manufacture the transmissions and other foreign subsidiaries to distribute it. In effect, FSA ownership shifts risk within the firm, in this case development risk, from the UK subsidiary to the German subsidiary. It also shifts the rewards from innovative efforts. This creates the classical principle agent problem within the context of the multinational firm.

Although the popular press has focused on internal contracting and licensing associated with tax haven subsidiaries, tax havens are a subset of MNC contract and licensing relationships. In reality, the majority of MNCs contract and license their FSAs between the parent and/or subsidiaries that are not tax havens. The following table shows the proportion of subsidiaries in the dataset that own the rights to FSAs.

Table 13: Breakout of FSA Ownership by Subsidiary Type

	FSA Owners	FSA Users	Total
Operational Non-Tax Haven Subsidiaries	4.9%	86.3%	91.1%
Operational Tax Haven Subsidiaries	0.5%	8.0%	8.5%
Pure Tax Haven Subsidiaries	0.3%		0.3%
Total	5.7%	94.3%	100%

As shown in Table 13, approximately 5.7% of subsidiaries own economic rights to MNC FSAs, and the remaining 94.3% percent either contract or license FSAs from FSA owners. Approximately 8.5% of subsidiaries are located in OECD-classified tax haven countries and perform operational activities, 0.5% are FSA owners. Finally, 0.3% of subsidiaries are pure tax haven FSA owners. This means that 1) relatively few subsidiaries within the firm own the economic rights to the FSAs they create, 2) most FSA owners are not located in tax haven countries, and 3) while all MNCs have internal FSA owners, the majority of MNCs do not have tax haven FSA owners.

Economic ownership of FSAs is a means of allocating authority and control within the organization. The entities within the MNC that bear the risks associated with creating the FSAs also receive the rewards. In a sense, the FSA owners are the “entrepreneurs” of the MNC. They bear risk associated with the MNCs activities while insulating other subsidiaries within the firm from risks. As owners of the MNC’s most important value generating resources, the FSA owners are responsible for generating future FSAs within the firm. Research on subsidiary mandates examines the determinants and consequences of allocating to a subsidiary the responsibility of a product line or division. Economic ownership within the firm goes one step further: FSA owners are the entrepreneurs of the firm that own the rights to the firm’s key value generating assets. FSA owners bear the risk of the MNCs operations and coordinate activity by licensing the knowledge assets and contracting activities by other subsidiaries and/or the parent within the firm.

5.3 Theoretical Background

5.3.1 MNCs and Innovation

MNC growth and profitability are based on the continuous process of generating, developing, and implementing innovation (Buckley and Casson, 1976). Innovation is the generation of a new idea, product, service, process, technology, or management practice by an organization (Damanpour, 1991). While innovation occurs at the individual level, subsidiary-level innovation is the aggregation of innovations of individuals employed at the subsidiary location. This paper focuses on technological innovation. The literature on the MNC broadly conceptualizes innovation to include technology, new products, new management practices, and commercial applications of new knowledge (Buckley and Casson, 2009). Research has shown innovation to be crucial for increasing firm market share, profitability, and growth (Banbury and Mitchell, 1995; Cottrell and Nault, 2004; Nerkar and Roberts, 2004; Morck and Yeung, 1991).

Early research on MNC innovation (e.g. Hymer 1976; Rugman 1981) viewed any foreign R&D activities as ‘home-base exploiting’ (Kuemmerle, 1999) or ‘competence exploiting’ (Cantwell, 1987), where foreign subsidiaries adapt FSAs developed by the parent to the local host market. In the 1990’s, researchers began to view the MNC as a network of subsidiaries that obtain and create knowledge in the local environment, and share the knowledge across the network of subsidiaries (e.g. Bartlett and Ghoshal, 1989; Nobel and Birkinshaw, 1998; Hedlund, 1994; Hakanson and Nobel, 1993). MNCs establish foreign subsidiaries to draw on the local skills, knowledge, and expertise necessary to generate FSAs. Subsidiary capabilities are generated based on the competitive advantage of the region (Frost et al, 2002). Empirical research has shown

that foreign subsidiaries hold an important role in product development through building technological capabilities and absorbing local technologies and knowledge (Pearce and Papanastassiou, 1999; Zander, 1997; Driffield and Love, 2003).

5.3.2 Difficulties of Managing Innovation

Although the MNC has access to a diverse pool of knowledge and capabilities from its foreign subsidiaries (Zhao, 2006; Birkinshaw, 1997; Kuemmerle, 1999; Lou, 2002), MNCs are faced with the challenge of fostering innovation across their geographically dispersed network. Innovation is inherently difficult to monitor and control since it involves combining implicit and explicit knowledge (Osterloh and Frey, 2000) and the outcome is uncertain. Innovation requires the investment of human capital. For innovative activities, it can be very difficult to determine whether new knowledge has been created or whether the effort has been invested for its creation. While new initiatives that fail are observable, the lack of action on new ideas, concepts, or solutions is unobservable. Consequently, it is difficult to distinguish between effort and luck. As a result, monitoring mechanisms are ill suited for innovation activities.

Investing in R&D projects can be risky and costly. Subsidiaries may not want to devote resources to developing the MNC's FSAs unless they are adequately compensated. Although the parent may finance R&D activities, in such cases the subsidiary lacks control. The incentive to invest in innovation is muted when the knowledge created is a public good (Holmstrom and Roberts, 1998). If FSAs are pure public goods within the firm, subsidiaries may free ride on the efforts of others, and conflicts can emerge over the use and control of the innovations created.

5.3.3 Property Rights Theory and Incentives

Grossman and Hart (1986) maintain that when activities are difficult to monitor and control, asset ownership should be allocated to the entity whose contribution has the largest marginal effect on the asset's value. Asset ownership affects the incentives to invest in human capital and knowledge creation (Wang et al, 2009). Because the owner receives the excess income from the asset, ownership affects ex-ante investment decisions (Grossman and Hart, 1986; Hart and Moore, 1990). When the asset owner is not the entity that develops the resource, the developer has less incentive to devote the full effort for maximizing value creation (Grossman and Hart, 1986).

Ownership provides the owners with power and control over the operations (Hart and Moore 1990; Rajan and Zingales, 2000). The FSA owners coordinate and allocate tasks to the non-owners. Rajan and Zingales (2000) maintain that the owners have the power to punish the non-owners by withholding resource allocations, re-directing tasks, and exiting businesses. The owners of the residual rights can also influence firm strategy. Grossman and Hart (1986) provide the example of a coal boiler that has difficulty processing impure coal. If the coal plant owner owns the coal mine, then it will direct that the coal mine obtain better coal. In contrast, if the coal mine owns the coal plant, it will direct that the plant technologically improve the boiler to handle the impure coal. Ownership allows control over the solutions to problems and over the strategic direction of future investments.

5.4 Hypotheses

FSA ownership provides a dual mechanism for incentivizing subsidiary innovation: 1) the ability to appropriate income from the innovations created, and 2) private benefits of control.

Ownership of MNC FSAs will determine the incentives of the subsidiaries to invest in MNC FSAs. Ownership encourages more relationship-specific investments (Grossman and Hart, 1986). Since the FSA owners bear the losses associated with failed attempts to innovate, the subsidiaries that own FSAs have a vested interest to ensure success. For subsidiaries, increased profitability from ownership of successful projects makes it easier to justify bonuses and salary increases. Budd, Konings, and Slaughter (2005) note that entity profitability can help to justify large wage payments to management and workers. By assigning FSA ownership to entities within the MNC that have the skills, knowledge, resources, expertise, and a better understanding of the risk, the MNC can leverage human and physical resources to enhance its ability to innovate.

The second benefit of ownership is that it confers control rights (Hart and Moore, 1990). The FSA owner has control over the strategic decisions and how to allocate the resources related to the asset. Research on subsidiary autonomy has long held that control increases incentives and initiative (Birkinshaw, Hood, and Jonsson, 1998). At the subsidiary level, Mudambi et al. (2007) examine the role of self-determination of sourcing, hiring, marketing, and product development, on knowledge generation and find that self-determination is positively associated with subsidiary innovation. Control of knowledge creates incentives to invest in R&D (Levin et al., 1987). In a study of market

contracting relationships, Leiponen (2008) finds that the ability to control intangible assets is positively associated with innovation.

In contrast, the control rights of the FSA owners blunt the entrepreneurial incentives of the subsidiaries that are FSA users. When entities do not bear the full effects of their decisions, they tend to underinvest due to the dissipation of benefits from their investment (Fama and Jensen, 1983; Hart and Moore, 1990). Although the FSA owner can delegate autonomy and decision making authority, the ability of the FSA owner to intervene in management decisions reduces manager incentives (Aghion and Tirole, 1997). Rotemberg and Saloner (1994) and Hart (2001) suggest that the ability of residual rights owners to choose which ideas are implemented and to capitalize on the benefits of the idea reduces managers' incentives to produce valuable ideas. Stein (2001) notes that it will discourage the entity from taking costly, non-contractible actions to increase firm value. When the residual rights owner intervenes too often, it can stifle the entity's initiative (Aghion and Tirole, 1997). The owners of the control rights cannot establish credible commitments to not intervene in delegated decision-making (Foss, 2003). Foss (2003) finds that the intervention by managers in decisions delegated to employees dramatically reduces employee motivation. In a study on the allocation of control rights in inter-firm exchanges of service firms, Leiponen (2008) finds that service firms that yield control rights to clients are 20-30 percent less likely to introduce new services.

Subsidiary FSA ownership, through the combination of the ability to appropriate the income and control rights to the innovations they create, provides a strong incentive for subsidiaries to innovate.

Hypothesis 1: Subsidiary FSA ownership will be positively associated with innovation.

5.4.1 Contracting Relationships

The vast majority of subsidiaries are FSA users contracted by FSA owners to perform activities within the firm. Moreover, many FSA owners contract and license FSAs with other FSA owners. This section examines the question of whether the contracting relationships matter for subsidiary innovation.

5.4.2 Tax Haven FSA Ownership, Contracting, and Subsidiary Innovation

The ownership of assets in an exchange relationship should be held by the entity whose investment is the most important to the generation of future value. Asset owners over invest in the asset because they receive all of the income from any assets created from the investment (Grossman and Hart, 1986). The non-owning entities are likely to underinvest since they do not receive any additional benefits, over the contractual return, from any assets or income created in the exchange. Firms will choose an optimal ownership structure that minimizes the overall loss in surplus due to investment distortions (Grossman and Hart, 1986). Foss and Foss (2001) propose that costly monitoring or verification will influence who will own an asset. Particularly when non-contractible relationship-specific investments are required, ownership should be assigned to the entities important to the development of the asset. Consequently, FSA ownership may be misaligned when an entity within the firm owns the FSAs but does not directly create the MNC FSAs.

The misalignment of ownership can reduce the incentives of the contracting subsidiaries to invest in the asset. Roth and O'Donnell (1996) suggest that the psychological identification of an agent with the principal is important in determining the agency problem for global operations. Similarity of functions and reciprocity of knowledge exchanges facilitate greater psychological identification between units. The incentive effect on innovation activities will be particularly strong if the FSA owner does not perform core activities. Gertner et al. (1994) note that assigning control rights to the capital providers in an internal capital market may be costly since it diminishes managerial incentives. Pure tax haven entities do not perform operational activities nor do they trade with other entities. If the FSA owner performs activities that contribute to the generation of the FSA, the FSA users may more readily concede that the cash flow to the FSA owner is warranted. In contrast, if the FSA owner does not perform core activities, FSA users may become disenchanted since the fruits of their labor are captured by an entity whose activities do not directly contribute to the development of the FSAs.

The literature on internal capital markets discusses the “dark side” of resource reallocation within the firm. Resource reallocation reduces incentives. When units differ in resources and investment potential, resources are reallocated despite manager efforts (Inderst and Laux, 2005). Brusco and Panunzi (2005) argue that removing the residual income generated by a unit reduces manager incentives to generate cash flows. This leads to smaller overall value creation and thus creates less residual income to reinvest (Brusco and Panunzi, 2005).

Hypothesis 2: Contracting with a Pure Tax Haven FSA owner will be negatively associated with subsidiary innovation.

5.4.3 FSA Ownership, Contracting with Parent, and Innovation

Research on headquarter-subsidary relations has long held that connections with headquarters are important. The subsidiaries that contract with parent FSA owners have direct, ongoing operational ties with the parent. These ties involve routine reporting, regular invoices sent to the parent for activities performed, communication about budgets, projects, and changes in operations. Managers of the contracting subsidiaries have higher visibility with corporate headquarters, which can provide incentives of career advancement and greater access to resources if the subsidiary performs well. Interunit communication is important for the creation of innovations (Burns and Stalker, 1961). Prior research has shown that communication and positive attention from the parent increases subsidiary initiative (Birkinshaw, 1999; Bouquet and Birkinshaw, 2008).

Additionally, interactions with the parent can foster shared identity, which has been considered necessary for motivating subsidiaries to innovate (Ghoshal and Bartlett, 1988). By sharing strategy, goals, and values with the corporate group, subsidiaries are more likely to better understand their role in the organization and may be more accommodating to the needs of other units, as well as motivated towards innovating for the group (Ghoshal and Bartlett, 1988). Moreover, shared organizational identity incentivizes knowledge sharing, which enhances innovation. Ghoshal and Bartlett (1988) find that high levels of headquarter-subsidary communications are positively associated with subsidiary creation, adoption and diffusion of innovations.

Incentives for recognition, shared identity with the corporate group, and knowledge sharing can work together to increase innovation.

Hypothesis 3: Contracting with the Parent will be positively associated with innovation.

5.5 Methods

The hypotheses were tested using a unique, confidential, subsidiary-level dataset constructed from several sources. Information on MNC internal FSA ownership was compiled from MNC transfer pricing reports from a consulting firm. In compliance with OECD guidelines and government regulations, MNCs are required to document their intra-firm transactions each year. The transfer pricing reports contain detailed information on the contractual relationships between subsidiaries, including the functions performed and risks borne by the affiliates, as well as the economic owner(s) of the FSAs in the exchange relationship. From the transfer pricing data, I coded each subsidiary's functions, whether or not the subsidiary was an FSA owner, and the FSA owners with which the subsidiary contracts. Subsidiary financial data was pulled from Bureau Van Dijk's Orbis database. Patent data was collected from the USPTO since it provides the location of each inventor on the patent, making it possible to match patents to inventor-subsidiary locations. Data for the revealed technological advantage index came from the OECD Patent database, based on the inventor's country location and patent industry. Finally, market concentration data came from Compustat's Global Vantage database.

For subsidiary patents, I searched for all granted patents assigned to each MNC or to any subsidiary within the MNC's group. Each patent was matched to subsidiary(ies) based on inventor city, state, and country information and to a year based on the filing date of the patent. A total of 50,934 patents were patented by the MNCs in the sample over the sample period, of which 29,028 had only one inventor and 10,711 patents had

multiple inventors from the same subsidiary location and therefore were coded to only one subsidiary. The remaining 11,195 patents had inventors from more than one subsidiary location and were therefore coded to multiple subsidiaries. On average, subsidiaries in the sample applied for 0.46 patents each year.

Relying on the USPTO for patent data can lead to a bias towards U.S. MNCs and U.S. subsidiaries. However, firms that are active in the U.S. have a strong incentive to file for intellectual property protection in the United States. As 72 percent of the MNCs in the dataset are U.S.-headquartered and all MNCs in the dataset have at least one location in the U.S., the bias should be somewhat mitigated by the fact that all MNCs in the sample have incentive to patent their innovations with the USPTO.

Although the sample size varies depending on the analysis, the following provides an overview of the construction of the base sample. The starting sample was composed of 28,837 subsidiary-year observations on 7,156 subsidiaries from 95 MNCs, over the 1997 through 2011 time period. The MNCs in the sample are large firms – the average number of subsidiaries per MNC is 183. However, the mean is skewed. The number of subsidiaries per MNC ranges from 1 to over 800 subsidiaries. All subsidiary types (e.g. R&D, distribution, manufacturing, financial, etc.) are included in the sample since FSA ownership may be allocated to any subsidiary and any subsidiary may patent an invention. Merging in the market concentration index reduced the sample by 4,496 observations to 24,341 subsidiary-year observations. Missing MNC diversification data further reduced the sample by 1,184 observations to 23,157 subsidiary-year observations on 5,919 subsidiaries. In order to make the regressions with two-digit SIC industry fixed effects estimable, subsidiaries in two digit industries with zero patenting were excluded

from the sample, which reduced the sample to 21,148 observations. The final starting sample was composed of 5,404 subsidiaries and 21,148 subsidiary-year observations.

For the regressions incorporating subsidiary-specific financial data, Orbis had financial information on 9,987 subsidiary-year observations. Missing data were entered from the company consolidating financial statements used for the transfer pricing reports to avoid the unnecessary loss of observations. Consolidating financial data were used for 9,579 observations, leading to a total of 19,566 subsidiary-year observations. Including lagged subsidiary-level financial variables reduces the sample by 6,657 observations on 4,274 subsidiaries and 14,491 subsidiary-year observations.

5.5.1 Variables

Dependent Variable

Subsidiary Innovation. Consistent with prior research (e.g. Phene and Alemeida, 2008; Ahuja, 2000; Rothaermel and Hess, 2007), total patents was used as a measure of innovation. *Total Patents* was measured as the total number of successful patent applications associated with the subsidiary's inventors in each year. The patent filing date was used to match the patents to years since it is closer to the timing of the invention than the patent grant date.

Independent Variables

FSA Owner is a binary indicator equal to one if the subsidiary owns the economic rights to the MNC's FSAs, and zero otherwise. This measure was coded based on the information contained in the transfer pricing reports. The transfer pricing reports

explicitly identify the subsidiaries that are the FSA owners (See Chapter 3 for a detailed description of the coding).¹

Contract with Pure Tax Haven FSA Owner is a binary indicator set equal to 1 if the subsidiary is contracted by or licenses FSAs from a pure tax haven FSA owner. An FSA owner was coded as a pure tax haven FSA owner if it was located in tax haven country and does not perform R&D, manufacturing, distribution, sales and marketing activities, or financial trading (for banking firms). Approximately 21 percent of the observations in the sample contract with pure tax haven FSA owners.

Contracts with Parent FSA Owner is a binary indicator set equal to one if the subsidiary is contracted by the parent or licenses FSAs from the parent. Approximately 25 percent of the observations in the sample contract with a parent FSA owner.

Control Variables

Revealed Technological Advantage. Host country specialization in industry domains affects the generation of new ideas and access to skilled and highly capable workforce (Kogut and Chang, 1991; Anand and Kogut, 1997). Subsidiaries assimilate knowledge from their host-country local environment (Kim, 1997; Kummerle, 1996; Westney, 1992). I controlled for country-industry specialization using the *Revealed Technological Advantage* index, calculated as the country's share of patents in the focal subsidiary's industry divided by the country's share of patents in all industries (OECD, 2011). The index equals zero when the country has no patents in the given industry, one if the country has no specialization, and is greater than one if the country is specialized in

¹ Ownership is also supported by real flows within the MNC, and legal, written contracts between MNC entities.

the industry. The mean value of this variable was 0.90. Revealed technological advantage is expected to be positively associated with innovation.

Market Concentration. Local market competition drives the need to innovate and is associated with high patenting activities. I control for each subsidiary's country-industry market competition using the market concentration index, calculated as the sum of the portion of total industry revenues earned by the four largest firms in the industry and country location of the subsidiary. This variable equals zero for highly competitive markets and increases for less competitive markets. Low values represent greater market competition, thus it is expected that this variable will be negatively associated with innovation.

Change in Country Effective Tax Rate. In an exploratory analysis of changes in ownership, the change in the host country effective tax rate is used as a control. The host country effective tax rate is calculated as the total taxes paid by firms in the country, divided by the total profit before tax of firms in the country. The change in country effective tax rate was calculated as the current period effective tax rate minus the prior period effective tax rate, and divided by the prior period effective tax rate. It is expected that MNCs will transfer FSA ownership away from a subsidiary if there is a large increase in the country effective tax rate.

GDP Growth. Since changes in FSA ownership may be due to economic conditions, *GDP Growth* is included as a control using the change in gross domestic product for each country. GDP growth is expected to be negatively associated with changes in ownership.

MNC Size. Innovation can be affected by the resources available for innovation activities. Large MNCs can draw on a large set of resources and exploit scale economies in R&D (Cohen, 2010). I control for MNC Size using as the natural log of total MNC revenues. I rely on revenues as it is less affected by MNC strategic decisions as investment in assets and R&D expenditures.² I expect MNC size to be positively associated with innovation.

*MNC Average Subsidiary Size.*³ It is expected that MNCs that have larger subsidiaries will be more likely to grant FSA ownership to their subsidiaries. MNC Subsidiary size is calculated as total MNC revenues divided by the total number of MNC subsidiaries.

MNC Diversification. By engaging in diverse business segments, MNCs can take advantage of economies of scope for their R&D activities (Cohen, 2010). A total entropy diversification measure is used to capture the diversity of a firm's activities (e.g. Bowen and Wiersema, 2005; Palepu 1985). The variable is calculated as follows:

$$\text{Total Entropy} = \sum_{i=1}^N S_i \ln\left(\frac{1}{S_i}\right)$$

S_i represents the MNC's share of total sales in business segment i . N represents the total number of business segments in which the MNC operates. The measure is calculated using the business segment information from Orbis and, in the case where Orbis data was unavailable, from the consolidated financial data in the transfer pricing

² In results not reported herein, I also estimated alternative specifications with MNC R&D intensity, calculated as MNC R&D expenditures divided by MNC total revenues, R&D stock, calculated using the perpetual inventory method of $R_t + (1-d)R_{t-1}$ where $d=.15$ (Hall et al 2005), and MNC assets. The alternative analyses yielded results consistent with those contained in Table 19.

³ Since subsidiary size is directly affected by FSA ownership and is highly correlated with other variables in the analysis, subsidiary size is excluded as a control.

reports. This variable equals zero for single business firms and increases with greater levels of diversification.

Subsidiary R&D Intensity. R&D expenditures represent inputs into the innovation process. Prior research suggests that R&D intensity is significantly associated with patents (Hall, Griliches, & Hausman, 1986; Mueller, 1966). Subsidiary R&D Intensity is measured as the focal subsidiary's total R&D expenditures divided by its total revenue. Subsidiaries in the sample had an average R&D Intensity of 4.0 percent.

Subsidiary Role. Subsidiaries that perform more activities tend to be more innovative. Consistent with prior research (e.g. Fey and Furu, 2008; Almeida and Phene, 2004), I control for subsidiary role using an index of the number of activities that the subsidiary performs. The index is a count variable, giving a weighting of one to each of the four functions: R&D, manufacturing, distribution, and service. The index has a value of one if the subsidiary only performs one function and a value of four if the subsidiary performs all four functions.

M&A. M&A is a dummy variable, equal to one if the subsidiary was acquired as part of a merger or acquisition, and 0 if otherwise. I expect this variable to be positively associated with FSA ownership as well as positively associated with innovation.

Industry and Year Effects. I control for industry using two-digit Standard Industrial Classification (SIC) code fixed effects and differences in time using year fixed effects. All independent variables are lagged by one year.

5.5.2 Estimation

A primary concern in conducting the analysis is whether the relationship between FSA ownership and innovation is reversed. MNCs theoretically should assign ownership

to their most capable, value generating subsidiaries. This would produce an upward bias in the coefficient for FSA ownership in the results. Disentangling the endogenous decision for a particular subsidiary to own an FSA from the effects of ownership on innovation can be very difficult. To tackle the endogeneity concerns, multiple approaches are used.

First, a negative binomial model is estimated with a pre-sample mean scaling fixed effect to control for subsidiary-level unobserved heterogeneity in innovation (Blundell, Griffith, and Van Reenen, 1999). Since there is a long history of pre-sample patenting available from the USPTO (from 1975 onwards), the pre-sample average number of patents produced by the subsidiary can be used as an initial condition to proxy for unobserved differences, such as subsidiary capabilities, that can affect innovation (Blundell et al. 1999; Aghion, Van Reenen, and Zingales, 2013). Second, I use propensity score matching and match each FSA owner to a non-owning subsidiary in the same country, two-digit SIC industry, and year, and with similar subsidiary-level and MNC-level characteristics. For robustness, I compare the results to an instrumental variables analysis. Finally, I explore the effects of removing ownership from a subsidiary on that subsidiary's innovation output. Each approach has its advantages and drawbacks.

For the baseline specification, I rely on a negative binomial model since the dependent variable is a count variable characterized by overdispersion. The baseline specification takes the following form:

$$E(P_{it} | X_{it}) = \exp \{ \beta_1 X_{i(t-1)} + \beta_2 Z_{i(t-1)} + \varphi_j + \tau_t \}, \quad (1)$$

Where X is the set of hypothesized independent variables lagged by one year, Z is a vector of lagged control variables, ϕ_j is a set of 2-digit industry controls, and τ_t is a set of year fixed effects.

For the initial conditions specification, I include the pre-sample average number of patents for each subsidiary (Blundell et al, 1999), calculated as the sum of successful patents applied for over the pre-sample period, divided by the total number of years from the first patent filing to 1996, the year before entering the sample. An advantage to using initial conditions is that it is able to control for time-invariant, unobserved differences in the innovative capabilities of subsidiaries. However, FSA ownership structures tend to be stable over time, with many subsidiaries holding ownership for decades (less than one percent of observations change in the sample). As a result, the pre-sample average measure may pick up part of the effect of FSA ownership and create a downward bias in the results.

The second analysis applies propensity score matching (Rosenbaum and Rubin, 1983), which has been used extensively in economics and management research. Propensity score matching attempts to uncover the effect of the “treatment” – in this case, FSA ownership – by comparing the group of treated firms to a control group of matched similar firms. I match each FSA owner to a non-FSA owning subsidiary with similar characteristics in the same country, two-digit industry, and year. Subsidiaries were matched based on whether they were located in the same continent as their parent, the average size of the MNC’s subsidiaries, whether or not the subsidiary was acquired, subsidiary R&D intensity, and subsidiary role. Matching within country, industry, and year removes the effects of unobserved country, industry and year-specific factors. The

first stage of the propensity score analysis relies on a logit to predict FSA ownership based on the subsidiary characteristics, and country, industry, and year matching criteria. An algorithm is then used to match FSA owners to FSA users based on their predicted probabilities from the logit regression. I used nearest neighbor matching, without replacement. Only those observations on common support were included in the analysis.

In order to produce unbiased results, the characteristics of the control subsidiaries should not be significantly different from the characteristics of the treatment subsidiaries.

Table 14 contains the results of balancing tests, which indicate that the variables were balanced after matching. A t-test of the difference between the treated and control groups' patenting behavior was significant at $p < .001$.

Table 14: Balancing Test for Propensity Score Matched Sample

Variable		Mean		% Bias Reduction	t-test	
		Treated	Control		t	p>t
Same Continent	Unmatched	0.12	0.29		-14.19	0.000
	Matched	0.12	0.13	96.10	-0.55	0.583
MNC Avg Subsidiary Size	Unmatched	0.48	0.32		8.08	0.000
	Matched	0.48	0.48	97.10	0.13	0.900
M&A	Unmatched	0.20	0.23		-3.18	0.001
	Matched	0.20	0.20	90.90	-0.23	0.821
R&D Intensity	Unmatched	0.05	0.03		3.53	0.000
	Matched	0.05	0.05	90.20	0.17	0.862
Role	Unmatched	1.41	1.17		13.61	0.000
	Matched	1.41	1.41	99.70	0.02	0.981
Revealed Technological Advantage	Unmatched	0.86	0.82		2.85	0.004
	Matched	0.86	0.86	97.50	0.05	0.960
Country Effective Tax	Unmatched	0.22	0.23		-6.71	0.000
	Matched	0.22	0.22	85.90	0.73	0.468
Market Concentration	Unmatched	0.98	0.97		4.82	0.000
	Matched	0.98	0.98	74.80	-1.49	0.137

An advantage to the propensity score method is that it is able to control for unobserved heterogeneity based on observed characteristics. A limitation to this approach is that to the extent that there are unobserved factors uncorrelated with the controlled factors, the results can be biased. As robustness check, I also estimated instrumental variables analysis using generalized method of moments for negative binomial models and also a two stage least squares.

In an attempt to uncover the effects of a change in ownership, I exploit the 24 changes in FSA ownership in the sample. Two separate analyses are conducted. First, on the sample of subsidiaries that sold their FSAs, I estimate the change in innovation post-FSA ownership change. Second, I use a propensity score estimator to reweight subsidiaries in the matched sample for the probability of having ownership removed. Each FSA owner whose FSAs are sold to another MNC entity is matched to a “control” FSA owner with similar characteristics in the year of change. Once the matched FSA owner is identified, I pool all years of data on the matched control and treated observations and estimate the probability that the subsidiary has FSA ownership transferred away. The estimated probability is the propensity score. The characteristics used to obtain the propensity score are the change in country effective tax rate, lagged R&D intensity, lagged GDP growth, and country, 2-digit industry and year exact matching. The analysis is restricted to firms that fall within common support. The following table contains the t-tests for the differences in means of the unmatched and matched samples.

Table 15: Balancing Test for Change in FSA Ownership Matched Sample

Variable		Mean		% Bias Reduction	t-test	
		Treated	Control		t	p>t
Change in Country Effective Tax Rate	Unmatched	0.01	-0.01		1.48	0.141
	Matched	0.01	0.03	35.70	-0.55	0.584
GDP Growth	Unmatched	3.19	1.69		2.31	0.022
	Matched	3.19	2.95	83.70	0.26	0.796
Market Concentration Index	Unmatched	0.92	0.94		-0.45	0.651
	Matched	0.92	0.92	87.10	-0.03	0.974
Subsidiary Size	Unmatched	7.61	6.86		1.18	0.240
	Matched	7.61	7.16	40.30	0.46	0.646
MNC Size	Unmatched	13.12	13.72		-1.20	0.230
	Matched	13.12	13.18	88.90	-0.11	0.913
MNC Subsidiary Size	Unmatched	0.78	1.08		-0.66	0.510
	Matched	0.78	1.18	-33.00	-0.90	0.374
R&D Intensity	Unmatched	0.16	0.18		-0.27	0.787
	Matched	0.16	0.09	-128.70	1.01	0.321
Initial Patents	Unmatched	0.69	1.07		-1.31	0.190
	Matched	0.69	1.03	8.70	-1.22	0.231
Change in Patents Year Prior to Year of Treatment	Unmatched	-0.25	-0.11		-0.72	0.473
	Matched	-0.25	-0.12	5.40	-0.79	0.438
Lagged Change in Patents - Two Years Prior to Year Before Treatment	Unmatched	-0.12	-0.03		-0.45	0.652
	Matched	-0.12	0.01	-45.40	-0.66	0.512

Once the matched sample is obtained, the propensity score estimates are transformed into weights (Dehejia and Wahba, 1999; Busso, DiNardo, and McCrary, 2009), by weighting each treated firm by $1/\hat{p}$ and weighting each control by $1/(1-\hat{p})$. This creates an estimate of the Average Treatment Effect of transferring ownership away from the subsidiary.

Busso, DiNardo, and McCrary (2009) note that the reweighting technique has better small sample properties than using simple propensity score matching. The analysis

allows one to control not just based on time-invariant characteristics, but also for time varying characteristics that affect selection. I estimate a negative binomial model to test the effects of transferring ownership away from the subsidiary unit on the reweighted matched sample and cluster the standard errors by subsidiary. Since there are few observations of change, this analysis is considered exploratory.

5.6 Results

5.6.1 Descriptive Statistics

The following tables contain descriptive statistics and correlations for the variables used in the analyses.

Table 16: Descriptive Statistics and Correlations for Initial Conditions Analysis

Variables	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11
1 Total Patents	0.38	5.20											
2 FSA Owner Dummy	0.07	0.25	0.12										
3 Revealed Technological Advantage	0.90	0.50	0.05	0.07									
4 Market Concentration Index	0.58	0.07	-0.04	0.03	-0.05								
5 MNC Size	15.69	1.81	0.07	0.03	-0.04	0.20							
6 MNC Diversification	0.52	0.56	0.06	-0.07	0.04	0.09	0.39						
7 Initial Conditions	0.09	0.39	0.62	0.17	0.09	-0.03	0.09	0.07					
8 M&A	0.29	0.46	-0.01	0.01	0.06	0.02	0.05	0.17	0.01				
9 R&D Intensity	0.04	0.20	0.06	-0.02	0.04	-0.09	-0.11	-0.04	0.13	0.03			
10 Role	1.17	0.62	0.16	0.14	0.03	0.00	0.02	0.00	0.26	-0.04	0.20		
11 Contracts with Parent FSA Owner	0.25	0.43	0.01	-0.11	-0.03	-0.17	-0.57	-0.21	0.05	-0.17	0.12	0.08	
12 Contracts with Pure Tax FSA Owner	0.21	0.41	-0.05	-0.11	-0.03	-0.01	-0.16	0.01	-0.08	-0.08	0.02	-0.06	0.05

Number of observations=1621. Year=2006. Correlations greater than or less than 0.02 are significant at *p<.05.

Table 17: Descriptive Statistics and Correlations for Propensity Score Analysis

Variables	Mean	s.d.	1	2	3	4	5	6	7	8	9	10
1 Total Patents	1.17	6.52										
2 FSA Owner Dummy	0.49	0.50	0.14									
3 Revealed Technological Advantage	0.90	0.60	0.08	0.05								
4 Market Concentration Index	0.59	0.03	-0.13	-0.01	-0.22							
5 MNC Size	15.73	1.79	0.08	-0.07	-0.15	0.25						
6 MNC Diversification	0.46	0.50	0.04	-0.11	0.02	0.05	0.27					
7 M&A	0.22	0.42	-0.04	0.00	-0.01	0.00	0.01	0.25				
8 R&D Intensity	0.06	0.31	0.03	-0.10	0.07	-0.16	-0.05	0.02	0.08			
9 Role	1.48	0.78	0.22	0.02	0.05	-0.13	-0.15	0.05	-0.02	0.15		
10 Contracts with Parent FSA Owner	0.14	0.35	0.01	-0.12	-0.05	-0.03	-0.40	-0.08	-0.13	0.01	0.14	
11 Contracts with Pure Tax FSA Owner	0.09	0.29	-0.06	-0.13	-0.09	0.08	-0.21	0.01	-0.01	-0.01	-0.13	0.19

Number of observations=315. Year=2006.

On average, subsidiaries in the sample patent less than one patent a year. However, this variable is skewed, with a long right hand tail. Approximately seven percent of observations in the sample are FSA owners. One quarter of subsidiaries contract with parent FSA owners and 21 percent contract with pure tax haven FSA owners. MNC entities can contract with multiple FSA owners. Although not shown here, 55 percent of subsidiaries contract with operational subsidiary FSA owners and 15 percent contract with operational tax haven FSA owners. Turning to the correlations, as expected, the initial conditions control is highly correlated with patenting ($r=0.62$). The largest correlation between independent variables is between contracting with parent and MNC size ($r=-.57$). Smaller firms have a larger proportion of subsidiaries contracting with the parent. Because of the high correlation, the baseline specification for testing the hypotheses relies on MNC diversification instead of MNC size.

5.6.2 Changes in FSA Ownership

I explore the effects of change in FSA ownership on innovation. There were 24 observations of change in the sample. As summarized in the table below, one quarter of

the changes transferred FSA ownership away from the parent, a little less than half transferred FSA ownership away from operational subsidiaries, and approximately one third transferred it away from tax haven units.

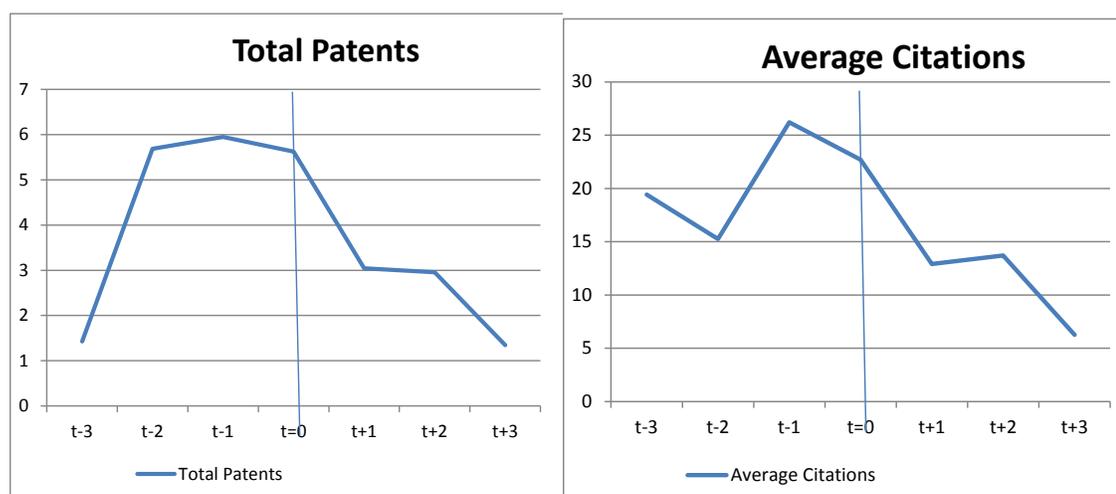
Table 18: Subsidiary FSA Ownership Change

	<u>Observations</u>	<u>% of Total</u>
Total Number of Changes	24	
FSA Ownership Transferred Away From:		
Parent	6	25%
Operational Subsidiary	11	46%
Operational Tax Haven	5	21%
Pure Tax Haven	2	8%

Approximately 24% of the changes were transferring ownership to operational non-tax haven subsidiaries, another 24% transferred ownership to operational tax haven subsidiaries, 36% were transferred to pure tax haven subsidiaries, and 16% were transferred to the parent.

The figures below display the mean number of patents and patent citations received on those patents, respectively, for the subsidiaries over the three years pre- and post-change.

Figure 11: Average Patenting and Citations of Patents for FSA Ownership Change



The data shows a marked change in the trend of patenting and patent quality in the years after ownership is transferred away from the subsidiary. The mean number of patents increases over time, but drops in the year that ownership is removed from the subsidiary and continues to drop after the change. The average number of citations on patents issued three years prior to and three years post change indicate a slight drop in quality of patents in the year of change before realizing a steep drop in the years after the change.

5.6.3 Regression Results

Table 19: Random Effects Negative Binomial Results

	Initial Conditions						Propensity Score Matched Sample		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FSA Owner Dummy	0.66*** (0.15)	0.64*** (0.15)	0.77*** (0.15)	0.75*** (0.15)	0.42** (0.16)	0.39* (0.15)	0.85*** (0.25)	0.83** (0.28)	0.85** (0.26)
Contract with Pure Tax Haven		-0.32* (0.15)		-0.31* (0.15)	-0.37* (0.16)	-0.39** (0.15)		-1.81** (0.56)	-1.03* (0.52)
Contract with Parent			0.55*** (0.11)	0.55*** (0.11)	0.22+ (0.12)	0.04 (0.12)		0.52 (0.34)	0.28 (0.33)
Revealed Tech. Advantage	-0.02 (0.09)	-0.02 (0.09)	0.01 (0.09)	0.01 (0.09)	0.08 (0.09)	0.09 (0.09)	1.06*** (0.26)	1.26*** (0.28)	1.09*** (0.26)
Market Concentration	-1.05*** (0.27)	-1.05*** (0.27)	-0.99*** (0.27)	-0.99*** (0.27)	-0.60* (0.31)	-0.60* (0.30)	-0.74 (0.76)	-1.29 (0.83)	-0.77 (0.77)
Initial Conditions	2.87*** (0.10)	2.86*** (0.10)	2.80*** (0.10)	2.78*** (0.10)	2.37*** (0.13)	2.47*** (0.14)			
MNC Diversification	0.04 (0.09)	0.05 (0.09)	0.13 (0.10)	0.15 (0.10)	0.11 (0.11)		0.60* (0.28)	0.56+ (0.30)	0.67* (0.29)
MNC Size						0.03 (0.04)			
M&A	-0.16 (0.11)	-0.18 (0.11)	-0.08 (0.11)	-0.09 (0.11)	-0.13 (0.13)	-0.15 (0.13)	-0.11 (0.29)	0.02 (0.30)	-0.09 (0.29)
R&D Intensity					0.41*** (0.10)	0.37*** (0.10)	0.31 (0.22)		0.28 (0.22)
Role					0.53*** (0.08)	0.49*** (0.08)	0.98*** (0.15)		0.90*** (0.16)
Industry Fixed Effects	Yes	Yes	Yes						
Year Fixed Effects	Yes	Yes	Yes						
Country Fixed Effects	No	No	No	No	No	No	Yes	Yes	Yes
Constant	-1.97*** (0.37)	-1.94*** (0.37)	-2.29*** (0.38)	-2.26*** (0.38)	-3.54*** (0.45)	-3.82*** (0.74)	-0.94 (1.86)	2.19 (1.89)	-0.95 (1.87)
Number of Observations	21148	21148	21148	21148	13744	14491	2490	2490	2490
Wald Chi Squared	1894***	1912***	1877***	1895***	1515***	1544***	208***	174***	211***
AIC	9321	9319	9299	9297	7528	7772	2428	2456	2427
Log Likelihood	-4618	-4615	-4606	-4603	-3717	-3839	-1157	-1171	-1155

Robust, clustered standard errors are in parentheses. Two-tailed tests for variable coefficients. †p<.10; *p<.05; **p<.01; ***p<.001.

Table 19 contains the results for the initial conditions and propensity score matching analyses. Column 1 contains the basic initial conditions model, Columns 2-3 add the independent variables Contract with Pure Tax Haven and Contract with Parent, respectively. Column 4 contains all three hypothesized independent variables. Column 5 adds the lagged endogenous subsidiary-level variables R&D Intensity and Role, which

can be affected by FSA ownership. Column 6 replaces MNC diversification with MNC size. Columns 7-9 contain the propensity score matched sample results. Because propensity score matching is based on a matched sample, the number of observations decreases from 21,148 to 2,490. Turning briefly to the model statistics, estimations including all independent variables have better model fits, as indicated by the lower AIC values.

For the control variables, as expected, the initial conditions control has a strong positive association with patenting ($p < .001$, Columns 1-6). Including the initial conditions control in the model causes Revealed Technological Advantage and MNC Diversification to become insignificant. Both Revealed Technological Advantage and MNC Diversification are positive and significant in the matched sample analysis ($p < .001$ and $p < .05$, Column 7). Since Revealed Technological Advantage and MNC Diversification tend to be relatively stable over time, the initial conditions control may be capturing part of the effect of these variables. Market concentration is negative and significantly associated with innovation, although this effect is reduced once R&D intensity and subsidiary role are added to the models. The negative and significant relationship indicates that when there is less local industry market competition, subsidiaries are less likely to innovate. Surprisingly, M&A is insignificant in both the initial conditions model and the propensity score matching model. After controlling for factors associated with innovation, it appears that acquired subsidiaries are no more likely to innovate than greenfield subsidiaries. As expected, subsidiary R&D intensity and role are positive and significantly associated with patenting ($p < .001$, Columns 5 and 6).

FSA ownership is positive and significantly associated with innovation across all estimations. All columns report coefficients on FSA ownership between .39 and .85. The results provide consistent support for Hypothesis 1. Hypothesis 2 is also supported: Contract with Pure Tax Haven FSA Owner is negative and significantly associated with innovation. For Hypothesis 3, the initial conditions and propensity score models provide mixed support. The coefficient for Contract with Parent FSA Owner is positive and significant in Columns 3-4 ($p < .001$). However, it becomes insignificant once Subsidiary R&D Intensity and Subsidiary Role are added to the model. Moreover, Contract with Parent FSA Owner is insignificant for the estimations using the propensity score matched sample (Columns 8-9, $p > .05$).

To further explore the effects of FSA ownership on innovation, I examine changes in FSA ownership. The results to the exploratory analysis of change in FSA ownership are shown in Table 20. There were 24 instances of change over the sample window. Lagged variables and missing data reduced the number of change observations to 21 in the initial conditions sample. The total subsidiary-year observations for subsidiaries that had ownership removed was 106 in the final sample. Lagged values in the first stage of the propensity score analysis reduced the number of change observations to 16 in the reweighted propensity score analysis. The pooled control and treated sample for the reweighted propensity score analysis was 159 subsidiary-year observations.

Table 20: Results for Transferring Ownership of FSAs Away from Subsidiary

	Subsidiaries with Change			Propensity Score Reweighted Matched Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Post Change	-0.96** (0.33)	-0.82* (0.32)	-1.44*** (0.36)	-1.32** (0.45)	-1.35** (0.46)	-1.32** (0.45)
Revealed Tech. Advantage	2.74 (1.99)	3.22+ (1.81)	2.69 (1.80)			0.34 (0.98)
Market Concentration	-0.79 (0.88)	-0.63 (0.90)	-0.10 (0.87)	-8.74 (7.70)	-9.09 (8.25)	-8.74 (7.71)
Initial Conditions	1.28+ (0.68)	1.02 (0.68)	1.40* (0.62)			
MNC Diversification			0.89 (0.70)	1.15* (0.51)	1.42*** (0.36)	1.15* (0.51)
MNC Size	0.33 (0.22)	0.30 (0.22)				
R&D Intensity		0.48 (1.14)	0.11 (0.98)		1.53 (1.30)	1.75 (1.78)
Role		0.86+ (0.45)	0.40 (0.34)	0.40 (0.41)	0.41+ (0.21)	0.43* (0.21)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	No	No	Yes	Yes	Yes
Constant	2.89 (435.11)	3.74 (553.44)	8.89 (667.53)	7.44 (6.84)	7.73 (7.28)	7.44 (6.83)
Number of Observations	106	102	100	159	157	159
Wald Chi Squared	171***	175***	141***	360***	469***	346***
AIC	288	285	262	344	346	342
Log Likelihood	-120	-118	-109	-150	-152	-150

Robust, clustered standard errors are in parentheses. Two-tailed tests for variable coefficients.

†p<.10; *p<.05; **p<.01; ***p<.001.

Columns 1-3 present the results for within-subsubsidiary change in patenting. A negative binomial model is estimated on the sample of subsidiaries whose rights to FSAs were sold to another unit within the MNC. The results to the reweighted propensity score analysis are shown in Columns 4-6. Both analyses provide clear evidence of a drop in innovation output. Across all six columns, the coefficient for post-change in ownership

is negative and significant ($p < .05$), suggesting that subsidiaries that have FSA ownership transferred away produce fewer innovations.

5.6.4 Robustness Tests

Several robustness tests were undertaken to check the sensitivity of the results. First, instrumental variables analysis was estimated on the full sample using generalized method of moments and two-stage least squares. Two variables were used as instruments: 1) the percentage of FSA owners in each subsidiary's one-digit SIC industry and country location (correlation with FSA Owner Dummy 0.44), and 2) a binary indicator for whether the subsidiary is located on the same continent as the parent (correlation with FSA Owner Dummy 0.12). The instrumental variables analyses yielded positive and significant results for FSA ownership ($p < .001$) and contracting with a parent FSA owner ($p < .001$), and negative and significant results for contracting with a pure tax haven FSA owner ($p < .001$). Second, alternative controls were included in the models such as the natural log of subsidiary revenue and MNC number of subsidiaries instead of MNC size. Third, variables were entered into the models one at a time. These alternative analyses yielded consistent results for the hypothesized variables as those shown in the tables above.

5.7 Discussion

The theory of the multinational firm emphasizes the role of firm-specific advantages in the existence of the firm and as a source of above normal returns (e.g. Dunning, 1977; Rugman and Verbeke, 2001). The free-flow of knowledge within the firm and the ability to leverage FSAs across the MNC's network of affiliates are held as

key advantages of the MNC. However, markets for knowledge exist inside MNCs. The parent and subsidiaries buy and sell rights to the MNC FSAs. The transactions that occur within the firm are not solely financial, they involve real activities and transfer risk, rewards, and control within the MNC. A key finding of this research is that markets for knowledge within the firm can enhance firm innovation.

This study draws on property rights theory to predict the effects of FSA ownership on subsidiary innovation. Firms select organizational designs to cope with information and knowledge problems (Holstrom and Roberts, 1998). Allocating ownership rights to FSAs within the firm distinguishes which subsidiaries have control over the FSAs and bear the risk and rewards of developing them. Ownership has a strong effect on the incentives for investing by influencing the distribution of profits and control over the asset and its future strategic uses (Grossman and Hart, 1986; Hart and Moore, 1990; Kim and Mahoney, 2005; Whinston, 2001). I predict that while FSA ownership provides incentives to invest in the creation of new FSAs, lack of ownership reduces such incentives.

The dynamics of innovation within the MNC are shaped by the FSA ownership and contracting and licensing arrangements. This research suggests that there can be significant operational ramifications for removing ownership rights away from value creating subsidiaries. Moreover, pure tax havens can have a negative impact on MNC innovation. When ownership is granted to pure tax haven entities, MNCs are challenged by not only the difficulties of managing innovation, but also the negative incentive effect from profits going to a non-value generating unit. Subsidiary ties within the firm are

important for knowledge sharing and innovation (O'Donnell, 2000). Pure tax haven entities may cause a breakdown the linkages between organizational units.

This paper makes several important contributions to the literature on the MNC, subsidiary entrepreneurship and innovation. First, it contributes to the literature on the multinational firm and innovation by examining the role of the internal ownership of FSAs on affiliate innovation, which has thus far been unexamined. The allocation of ownership of FSAs has strategic ramifications on the future development of MNC FSAs. The results provide strong support that subsidiary-level ownership of FSAs can be used to enhance value.

Second, I contribute to the subsidiary entrepreneurship literature by introducing economic ownership of FSAs as a means of establishing “entrepreneurial” subsidiaries within the firm. The economic owners are the “entrepreneurs of the firm” in that they bear the risks and reap the rewards from the MNC’s activities. In contrast to the centralized view of parent decision making and control, a number of researchers view the multinational firm as an interorganizational network (e.g. Ghoshal and Bartlett, 1990; Hedlund, 1986; Gupta and Govindarajan, 1991). The network perspective assumes that subsidiaries hold strategic roles in the development and maintenance of FSAs. Along these lines, researchers studying subsidiary world mandates suggest that subsidiaries can be granted global responsibility for a product line (e.g. Birkinshaw, 1996; Rugman, 1981). This study shares the view that subsidiaries can hold important roles in the development and maintenance of FSAs and in bearing global responsibilities. However, the activities of the FSA owner encompass contracting and licensing other entities within the firm. In contracting others subsidiaries to perform activities on their behalf, the FSA

owners insulate the contracted subsidiaries from risk. The FSA users do not gain from exerting extra efforts or bear the consequence of their actions. This research suggests that some subsidiaries may have power over others. That is, the FSA owner can influence the mandates that are gained and lost by the FSA users within the firm.

There are several limitations to this research. First, this study is limited in that it analyzes technological innovations using patents. Certain types of innovations are more suitable to patenting than others, which leads to industry and firm differences in patenting behavior. Additionally, patenting activities can be driven by firm strategies for intellectual property management. I attempt to control for industry-level differences in patenting behaviors using industry fixed effects. Second, this research studies technological innovations only. Future research using measures of different types of innovations can enhance our understanding of the effects of FSA ownership on innovation. Third, the analysis of ownership change is limited by the small number of observations. Care should be taken in interpreting the results until further analysis is done.

There are a number of potential areas for future research. First, an examination of how internal and external contract and licensing arrangements are similar to or different from each other can enhance our understanding of the theory of the MNC. Second, there are clear differences in knowledge sharing behaviors for FSA owners and users, as well as for the FSA ownership structures. Future research exploring the effects of FSA ownership on knowledge sharing within the firm can provide better insight into how contracting relationships affect innovation.

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Publications and Proceedings

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