

4-2014

## Forms of corporate ownership and radical boundary spanning of multinational corporations: A multilevel study of the petroleum industry

A. Erin Bass

University of Nebraska at Omaha, aebass@unomaha.edu

Follow this and additional works at: <https://digitalcommons.unomaha.edu/managementfacpub>

Please take our feedback survey at: [https://unomaha.az1.qualtrics.com/jfe/form/SV\\_8cchtFmpDyGfBLE](https://unomaha.az1.qualtrics.com/jfe/form/SV_8cchtFmpDyGfBLE)

---

### Recommended Citation

Bass, A. Erin, "Forms of corporate ownership and radical boundary spanning of multinational corporations: A multilevel study of the petroleum industry" (2014). *Management Faculty Publications*. 20. <https://digitalcommons.unomaha.edu/managementfacpub/20>

This Dissertation is brought to you for free and open access by the Department of Management at DigitalCommons@UNO. It has been accepted for inclusion in Management Faculty Publications by an authorized administrator of DigitalCommons@UNO. For more information, please contact [unodigitalcommons@unomaha.edu](mailto:unodigitalcommons@unomaha.edu).

FORMS OF CORPORATE OWNERSHIP AND RADICAL BOUNDARY SPANNING OF  
MULTINATIONAL CORPORATIONS: A MULTILEVEL STUDY OF THE PETROLEUM  
INDUSTRY

by

A. Erin Bass

A DISSERTATION

Presented to the Faculty of  
The Graduate College at the University of Nebraska  
In Partial Fulfillment of Requirements  
For the Degree of Doctor of Philosophy

Major: Business  
(Management)

Under the Supervision of Professor Subrata Chakrabarty

Lincoln, Nebraska

April, 2014

UMI Number: 3616790

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



UMI 3616790

Published by ProQuest LLC (2014). Copyright in the Dissertation held by the Author.

Microform Edition © ProQuest LLC.

All rights reserved. This work is protected against unauthorized copying under Title 17, United States Code



ProQuest LLC.  
789 East Eisenhower Parkway  
P.O. Box 1346  
Ann Arbor, MI 48106 - 1346

FORMS OF CORPORATE OWNERSHIP AND RADICAL BOUNDARY SPANNING OF  
MULTINATIONAL CORPORATIONS: A MULTILEVEL STUDY OF THE PETROLEUM  
INDUSTRY

A. Erin Bass, PhD

University of Nebraska, 2014

Adviser: Subrata Chakrabarty

This research examines the relationship between corporate ownership and radical boundary spanning of multinational corporations (MNCs). Hypotheses are developed based on a multi-theoretic approach that uses the concepts of boundary spanning exploration, resource dependence theory (RDT), and corporate ownership from the management literature with the resource triangle from the field of geology. It is hypothesized that the form of corporate ownership is associated with radical boundary spanning. Corporate ownership is also proposed to be associated with the firm's commitment to radical boundary spanning. Finally, the location's resource attractiveness is hypothesized to moderate the relationship between the form of corporate ownership and commitment to radical boundary spanning. A multilevel, two-part model is used to test the hypotheses. The data for this study are collected from international market-based transactions of petroleum resource deposits including buyers and sellers from the petroleum industry from the years 2005-2012, inclusively. The results of this study suggest family or individual owned buyer MNCs are significantly less likely to radically boundary span, corporate owned buyer MNCs are significantly less committed to radical boundary spanning than both state and financial owned buyer MNCs, and that miscellaneous owned MNCs are less committed to radical boundary spanning in target countries that are more resource attractive. This study offers three theoretical contributions. First, this study adds to RDT by suggesting that more progressive evaluation of external resources is needed. Second, in existing RDT, dependence is assumed to stem from a simple reliance on more powerful firms. The findings from this study suggest that

dependence also stems from reliance on a functioning market in which external resources can be bought and sold. Finally, this study adds a fifth type of resource constraint, the availability of natural resources, and suggests that resource constraints can actually become greater because of firm activities.

## DEDICATION

I dedicate this dissertation to my family for their unending support and understanding. To ZJB, for believing in me and pushing me to do things I did not think were possible. To DCL and BAL, for giving me roots to grow and wings so I can fly. And, to Ollie.

## ACKNOWLEDGEMENTS

This dissertation would not have been possible without the support and commitment from my committee, including Mary Uhl-Bien, Subrata Chakrabarty, Chris Tuggle, and Lesa Hoffman. Additionally, I would like to thank all the other faculty that contributed to my development as a researcher throughout my doctoral studies. I am indebted to the industry professionals that helped me with this research, especially Derek Longfield, Stephen Longfield, John Essex, Don Verdonck, Ali Rizvi, and Yashodeep Deodehar. I would also like to thank the University of Nebraska-Lincoln for allowing me to pursue my Ph.D. and providing me funding throughout my doctoral studies. Finally, a special thank you to my cohort, Ivana Milosevic, Ted Paterson, Lei Huang, and Wonho Jeung, for their continued support and friendship.

## TABLE OF CONTENTS

|   | Page # |
|---|--------|
| COVER PAGE .....  | i      |
| ABSTRACT.....   | ii     |
| LIST OF MULTIMEDIA OBJECTS .....  | vi     |
| CHAPTER ONE - OVERVIEW OF THE STUDY .....                                   | 1      |
| Introduction.....   | 1      |
| The Primary Research Questions.....   | 5      |
| Proposed Research Model.....  | 6      |
| Methodology of the Study .....  | 12     |
| Contributions of the Study.....   | 12     |
| Structure of the Dissertation .....   | 14     |
| CHAPTER TWO – LITERATURE REVIEW, THEORY, AND HYPOTHESES<br>DEVELOPMENT..... | 16     |
| Literature Review .....   | 16     |
| Theory Development and Hypotheses.....                                      | 36     |
| Summary.....  | 42     |
| CHAPTER THREE - METHODOLOGY .....   | 43     |
| Setting.....  | 43     |
| Sample and Procedure .....  | 47     |
| Variables .....   | 48     |
| Analytic Rationale .....  | 52     |
| Analysis Methods .....  | 61     |
| Summary.....  | 64     |



|   |     |
|---|-----|
| CHAPTER FOUR - RESULTS .....                            | 65  |
| Descriptive Statistics and Correlations .....           | 65  |
| Results of Unconditional (Empty) Multilevel Models..... | 71  |
| Results of Conditional Multilevel Models.....           | 77  |
| Summary of Hypotheses .....                             | 112 |
| CHAPTER FIVE - CONCLUSION .....                         | 117 |
| General Discussion .....                                | 117 |
| Theoretical Contributions .....                         | 119 |
| Implications for Practice .....                         | 122 |
| Limitations and Directions for Future Research.....     | 124 |
| Summary .....   | 125 |
| REFERENCES .....  | 127 |

## LIST OF MULTIMEDIA OBJECTS

### CHAPTER ONE

- Figure 1.1 – The proposed research model (constructs)
- Figure 1.2 – Operationalization of the proposed research model (variables)
- Table 1.1 – Constructs and variables for the proposed research model

### CHAPTER TWO

- Figure 2.1 – Rosenkopf and Nerkar's (2001) four types of boundary spanning exploration
- Figure 2.2 – The resource pyramid
- Figure 2.3 – Boundary spanning exploration for external resources
- Table 2.1 – The various forms of corporate ownership

### CHAPTER THREE

- Table 3.1 – Examples of financial and institutional ownership in the petroleum industry
- Table 3.2 – Examples of firms in the petroleum industry that are fully-owned by the State
- Figure 3.1 – A graphical depiction of the nesting and crossing of levels in the proposed research model

### CHAPTER FOUR

- Table 4.1. – Sample characteristics: Market-based transactions for petroleum resources by multinational corporations (MNCs)

- Table 4.2. – Descriptive statistics and correlations: Transactions by multinational corporations (MNCs)
- Table 4.3. – Fit statistics and model comparisons for buyer and seller ownership as predictors of buying/selling unconventional resource deposits
- Table 4.4. – Fit statistics and model comparisons for buyer and seller ownership as predictors of the purchase/sale price of unconventional resource deposits bought/sold
- Table 4.5. – Results for crossed countries, buyers, and sellers for forms of firm ownership for buyers and sellers and buying/selling of unconventional resource deposits
- Table 4.6. – Least square mean differences among buyers for buying unconventional resource deposits
- Figure 4.1. – The conditional means for each of the forms of buyer ownership for buying unconventional resource deposits in logits and probabilities (corresponding to Model A2)
- Table 4.7. – Least square mean differences among sellers for selling unconventional resource deposits
- Figure 4.2. – The conditional means for each of the forms of seller ownership for selling unconventional resource deposits in logits and probabilities (corresponding to Model B2)
- Table 4.8. – Results for a random intercept for buyers for forms of corporate ownership of buyers and the purchase price of unconventional resource deposits bought
- Table 4.9. – Least square mean differences among buyer firms and the purchase price of unconventional resource deposits bought

- Figure 4.3. – The conditional means for each of the forms of buyer ownership and the price paid for unconventional resource deposits in logs and USD in millions (corresponding to Model C2)
- Table 4.10. – Results for crossed countries and sellers for corporate ownership of sellers and the sale price of unconventional resource deposits sold
- Table 4.11. – Least square mean differences among sellers for the sale price of unconventional resource deposits sold
- Figure 4.4. – The conditional means for each of the forms of seller ownership and the sale price of unconventional resource deposits sold in logs and USD in millions (corresponding to Model D2)
- Table 4.12. – Simple slopes of within target country's petroleum resource deposits (level 1) on the relationship between buyer's ownership and the purchase price of unconventional resource deposits bought
- Table 4.13. – Simple slopes of between target country's petroleum resource deposits (level 2) on the relationship between buyer's ownership and the purchase price of unconventional resource deposits bought
- Figure 4.5. – Simple slopes for the influence of within target country's petroleum deposits (level 1) on each of the forms of buyer ownership and the purchase price of unconventional resource deposits bought in logs and USD in millions (corresponding to Model C4)
- Figure 4.6. – Simple slopes for the influence of between target country's petroleum deposits (level 2) on each of the forms of buyer ownership and the purchase price of unconventional resource deposits bought in logs and USD in millions (corresponding to Model C4)

- Table 4.14. – Simple slopes of within target country’s petroleum resource deposits (level 1) on the relationship between seller’s ownership and the sale price of unconventional resource deposits sold
- Table 4.15. – Simple slopes of between target country’s petroleum resource deposits (level 2) on the relationship between seller’s ownership and the sale price of unconventional resource deposits sold
- Figure 4.7. – Simple slopes for the influence of within target country’s petroleum deposits (level 1) on each of the forms of seller ownership and the sale price of unconventional resource deposits sold in logs and USD in millions (corresponding to Model D4)
- Figure 4.8. – The conditional simple slopes for the influence of between target country’s petroleum deposits (level 2) on each of the forms of seller ownership and the sale price of unconventional resource deposits sold in logs and USD in millions (corresponding to Model D4)
- Table 4.16. – A summary of the results for the hypotheses

## CHAPTER ONE - OVERVIEW OF THE STUDY

### Introduction

“The oil and gas industry is preparing for radical change in the [petroleum] industry driven by macro trends out of its control. This forces oil and gas companies to look for reserves in increasingly unconventional locations and using unconventional methods. This requires entirely new assets that are complex to build and operate.” –Business Transformation Academy, 2013

Boundary spanning is an important firm activity that contributes to firm performance and innovation (Fleming & Waguespack, 2007; Rao & Sivakumar, 1999; Rosenkopf & Nerkar, 2001). Boundary spanning is a type of exploration activity involving search, discovery, or experimentation (Rosenkopf & Nerkar, 2001; Tushman & Scanlan, 1981). Boundary spanning occurs when, through this exploration, one or more firm boundaries are crossed. When a single boundary is crossed, boundary spanning exploration creates relatively lesser change, such as modified products or processes. When multiple boundaries are crossed, however, radical boundary spanning occurs. Radical boundary spanning often creates radical change. This radical change not only impacts firm performance, it can also create industry-wide shifts in terms of technologies, prices, and measures of performance (Carlile, 2002; Levina & Vaast, 2005; Rosenkopf & Nerkar, 2001).

Although radical boundary spanning can affect firm performance and create industry-wide change, little is known about the antecedents of this important exploration activity. Previous research suggests that characteristics or determinants both internal and external to the firm can influence firm activities (Demsetz, 1983; Dess, Ireland, & Hitt, 1990). For example, corporate ownership, as an internal determinant, is useful for understanding how ownership shapes the domain and activities of a firm in product and factor markets (Mascarenhas, 1989). Corporate ownership has been linked to various firm activities, such as: the firm’s ability to successfully promote and engage in corporate entrepreneurship (Zahra, 1996), the firm’s decision to engage in activities that are more (less) competitive and collusive (Lemmon & Lins, 2003), and the firm’s

innovative ability (Hoskisson, Hitt, Johnson, & Grossman, 2002)—all of which influence firm performance (Demsetz & Villalonga, 2001; Frydman, Gray, Hessel, & Rapaczynski, 1999). Thus, corporate ownership is an internal determinant of the firm that may influence firm exploration activities such as radical boundary spanning.

In addition, boundary spanning can also be influenced by the firm's external environment, or "context with respect to organizational functioning, indicating the mechanism by which an organization interacts with its task environment" (Leifer & Delbecq, 1978, p. 48). External determinants include contextual considerations such as built-in dependencies between the firm and its environment (Pfeffer & Salancik, 1978) and environmental uncertainty (At-Twajjri & Montanari, 1987). These determinants contribute to the overall attractiveness of the external environment. As such, external determinants are important considerations when examining what leads firms to participate in exploration activities such as radical boundary spanning.

In this study, internal and external determinants are tested as predictors of radical boundary spanning. The relationship between corporate ownership (internal determinant) and radical boundary spanning is examined in light of the availability of resources in the external environment, or the location's resource attractiveness (external determinant). Concepts from management research, including resource dependence theory (RDT) and boundary spanning exploration are used with a concept from geology and petroleum studies—the resource pyramid. This is aimed to gain insight into the strategic activities of firms in the petroleum industry. Because petroleum resource deposits exist unevenly across the globe, many firms in this industry, regardless of ownership structure, have foreign operations. These firms are multinational corporations (MNCs) operating in a highly complex environment. In this industry, environmental complexity is created from increases in demand paired with decreases in supply, the rise of unconventional petroleum resources including tight sands, coalbed, and shale, and competition with other firms that vary in terms of corporate ownership, size, and location.

The global petroleum industry offers an appropriate setting to examine the relationships between corporate ownership, resource attractiveness of the external environment, and radical boundary spanning. This is for three reasons: 1) firms in this industry pursue both conventional and unconventional sources of petroleum, 2) there are multiple forms of corporate ownership in this industry, and 3) petroleum resource deposits are dispersed across the globe, making the industry and its players inherently global.

As related to the pursuit of conventional and unconventional sources of petroleum, the upstream sector<sup>1</sup> of the petroleum industry (herein referred to as the petroleum industry) describes exploration and extraction of petroleum resource deposits<sup>2</sup> by firms across the globe. Firms belonging to this industry operate under the primary SIC 1311 - Crude Petroleum and Natural Gas. Firms operating in this industry are:

“[e]stablishments primarily engaged in operating oil and gas field properties. Such activities may include exploration for crude petroleum and natural gas; drilling, completing, and equipping wells; operation of separators, emulsion breakers, desilting equipment, and field gathering lines for crude petroleum; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property. This industry includes the production of oil through the mining and extraction of oil from oil shale and oil sands and the production of gas and hydrocarbon liquids through gasification, liquid fraction, and pyrolysis of coal at the mine site” (OSHA, 2013).

Current estimates of supply and demand of petroleum resource deposits are largely based on conventional sources of petroleum such as oil, and natural gas (Holditch & Ayers, 2009; Masters, 1979). They require “conventional” geological and engineering practices and technological capabilities to extract petroleum resource deposits and sell them in the global market. However, more recently, unconventional sources of petroleum resource deposits have become a more central focus of this industry. Unconventional petroleum resource deposits have

---

<sup>1</sup> The petroleum industry is divided into three sectors: the upstream, midstream, and downstream sectors. The focus of this study is on the upstream sector, which specifically focuses on the exploration and production of petroleum resources.

<sup>2</sup> Petroleum resource deposits are referred to, using industry nomenclature, as petroleum resource accumulations. The difference between deposits and accumulations are that deposits represent solid form natural resources, such as minerals. Accumulations represent liquid forms of natural resources, such as crude oil and gas (Tuyl, Parker, & Skeeters, 1945). However, for linguistic clarity, these are referred to as deposits throughout this paper.



only recently become feasible sources of petroleum. This is due to advances in technological capabilities and economic shifts that make these once too costly resource deposits now economically viable. Unconventional petroleum resource deposits require firms to develop and employ new, more costly, technological capabilities. The application of these technological capabilities to gain unconventional resource deposits could largely shift the landscape of the petroleum industry. Instead of being reliant solely on conventional sources of petroleum, the industry can use both conventional and unconventional resource deposits to satisfy increasing demand. As an example of the potential industry-wide shift that could radically affect the petroleum landscape, recent reports have suggested that unconventional resource deposits could transform petroleum-dependent countries, such as the US, into petroleum-independent countries (Gordon & Poulin, 2012; Hughes, 2013).

In addition to this industry's attention on unconventional sources of petroleum, a second major topic of concern for this industry is related to corporate ownership. The petroleum industry is not just comprised of privately-held and publicly-traded firms. There is a proliferation of state owned enterprises (termed national oil companies, or NOCs) in the petroleum industry. NOCs control an estimated 90% of the world's oil and gas reserves and are responsible for approximately 75% of the world's oil and gas reserves production (Tordo, Tracy, & Arfaa, 2011). Moreover, 14 of the top 20 petroleum firms in terms of rights to, and production of, petroleum resource deposits are NOCs (Jaffe & Soligo, 2007). Previous research highlights strategic differences in firms with differing types of ownership in the petroleum industry. These strategic differences include dissimilarities in cross-border operations (Dechert, 1962), domestic market dominance and customer orientation (Mascarenhas, 1989), and inclusion in market-based transactions of petroleum resource deposits (Gaille, 2010). A common thread across this stream of research on the petroleum industry is that varied forms of corporate ownership exist and influence firm activities.

Lastly, the dependence of firms on petroleum resource deposits may play a large part in explaining and predicting firm activities. Petroleum resource deposits are a type of natural resource deposit. Natural resource deposits are material sources of wealth holding economic value and occurring in a natural state as accumulations in the environment. Only a few non-OPEC countries are petroleum-independent based on petroleum resource deposits held in reserves—among them are Russia, Canada, and Australia (Katusa, 2012). For every other country that is not petroleum-independent, however, securing imports in countries with more petroleum resource deposits is necessary to ensure supply to satisfy future resource needs (EIA, 2012). Countries that have larger quantities of petroleum resource deposits are more attractive to firms seeking access to these resource deposits than countries with smaller quantities of petroleum resource deposits. Thus, the location's attractiveness in terms of petroleum resource deposits is an external determinant that can influence a firm's desire and/or ability to gain access to petroleum resource deposits. Firms around the world and their host countries, whether plentiful in petroleum resource deposits or not, seek to secure petroleum resource deposits for future supply and benefit.

### **The Primary Research Questions**

The preceding discussion highlights internal and external determinants of radical boundary spanning, as well as justification for this study's setting. Though many studies have researched these topics separately, use of corporate ownership as an antecedent to radical boundary spanning is yet to be proposed empirically or theoretically. As such, the primary research question this study seeks to address is: "What is the relationship between the form of corporate ownership and the radical boundary spanning of firms?"

In addition to radical boundary spanning, firms may also make choices about their commitment to this activity in terms of the magnitude to which the firm directs financial resources to radical boundary spanning. A highly-committed firm would be willing to direct more financial resources to radical boundary spanning than a less-committed firm. Thus, this study

raises the following subquestion: “What is the relationship between the form of corporate ownership and the firm’s commitment to radical boundary spanning?”

Finally, external determinants may influence the commitment of the firm to radical boundary spanning. As highlighted above, some locations may be more or less attractive in terms of the estimated quantity of petroleum resource deposits. For firms operating in this industry, the location’s resource attractiveness may influence the relationship between the form of corporate ownership and commitment to radical boundary spanning. This study can empirically test the following subquestion: “Does the location’s resource attractiveness influence the relationship between the form of corporate ownership and the firm’s commitment to radical boundary spanning?”

### **Proposed Research Model**

Related models for the constructs included in this study, and how these constructs are operationalized in terms of variables, are described below. In terms of constructs, the proposed research model suggests that the form of corporate ownership is associated with a) radical boundary spanning and b) commitment to radical boundary spanning, and that c) the location’s resource attractiveness influences the relationship between the form of corporate ownership and commitment to radical boundary spanning. Corporate ownership is defined as the lawful relationship between the firm and individuals, institutions, or states that hold and can exercise voting rights related to the firm’s activities (Demsetz, 1983). Radical boundary spanning is defined as the decision of the firm to cross both organizational and technological boundaries (Rosenkopf & Nerkar, 2001) and use market-based transactions to buy/sell external resources that require technologically unconventional capabilities. Commitment to radical boundary spanning is defined as the magnitude to which the firm directs financial resources to radical boundary spanning. Finally, the location’s resource attractiveness is defined as the quantity of natural resource deposits available in a country. The relationships proposed among these constructs are outlined in Figure 1.1 and discussed in more depth in Chapter Two.

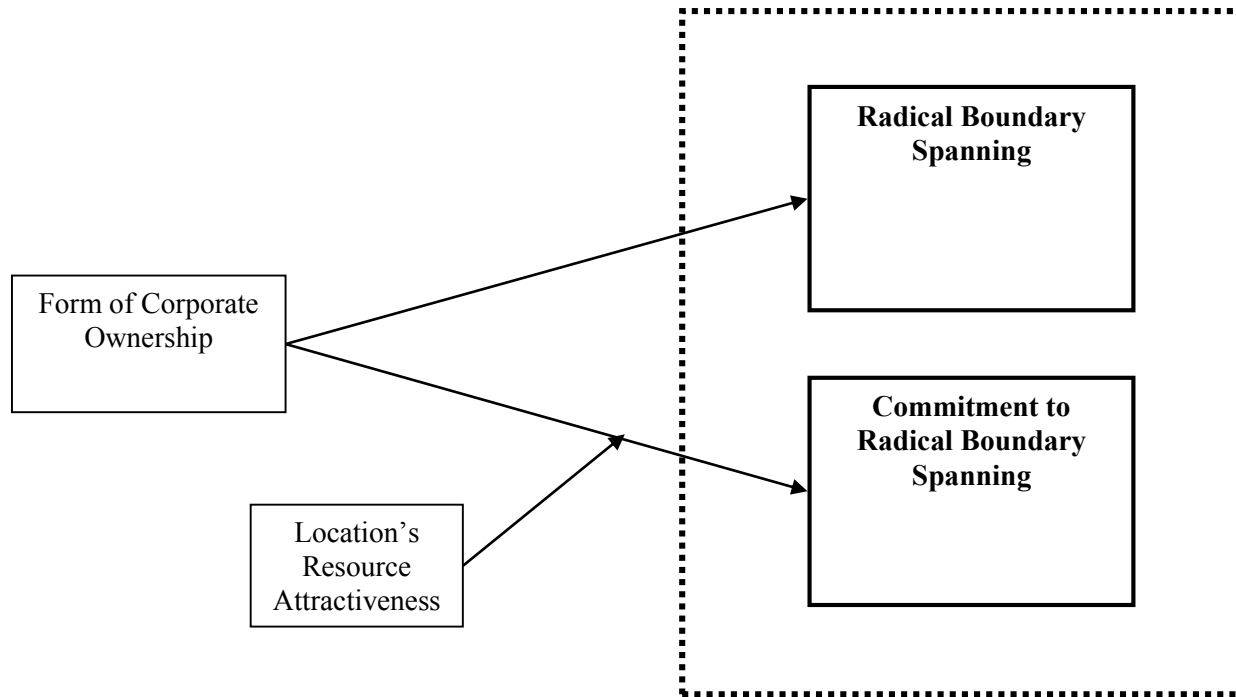


Figure 1.1

The proposed research model (constructs)

For this study, the above-mentioned constructs are operationalized in the setting of the petroleum industry. The construct of form of corporate ownership is operationalized using LaPorta and colleagues' (1999) five types of corporate owners: "1) a family or an individual, 2) the State, 3) a widely-held financial institution such as a bank or an insurance company, 4) a widely-held corporation, or 5) miscellaneous, such as a cooperative, a voting trust, or a group with no single controlling investor" (p. 476). When radically boundary spanning, firms cross the organizational boundary and use market-based transactions to buy/sell external resources. Thus, ownership is operationalized for both buyers and sellers of market-based transactions. Buyer's ownership is defined as ownership of the entity that acts as the buyer in the market-based transaction. Seller's ownership is defined as ownership of the entity that acts as the seller in the market-based transaction.

Radical boundary spanning is defined as a firm's use of market-based transactions to buy/sell external resources that require technologically unconventional capabilities. Following the distinction proposed by Rosenkopf and Nerkar (2001), radical boundary spanning occurs when firms cross organizational and technological boundaries and use market-based transactions to gain access to resource deposits that require unconventional technologies. The construct of radical boundary spanning is operationalized as the firm activity of buying/selling unconventional resource deposits. Buying unconventional resource deposits is defined as petroleum resource deposits bought in a market-based transaction that are indicated as unconventional. Selling unconventional resource deposits is defined as petroleum resource deposits sold in a market-based transaction that are indicated as unconventional.

Firms can choose to be more or less committed to radical boundary spanning. Commitment to radical boundary spanning is operationalized as the buyer's purchase price of unconventional resource deposits bought and the seller's sale price of unconventional resources deposits sold. Buyer's purchase price of unconventional resource deposits bought is defined as the purchase price paid by the buyer to buy petroleum resource deposits indicated as

unconventional. Seller's sale price of unconventional resources deposits sold is defined as the sale price of the seller to sell petroleum resource deposits indicated as unconventional.

Finally, the construct of the location's attractiveness suggests that some geographic locations may be more attractive because they have more natural resource deposits available. Thus, this construct is operationalized as the target country's (i.e. the geographic location's) petroleum resource deposits. The target country's petroleum resource deposits is defined as the value of petroleum resource deposits estimated to exist in that country in terms of how much is being produced in relation to how much is estimated to be remaining in the earth.

The research model is presented in terms of operationalizations of constructs in Figure 1.2. Each of these relationships will be discussed and formal hypotheses will be developed in Chapter Two. Table 1.1 demonstrates the correspondence of the constructs in the proposed research model and the operationalizations of these constructs.

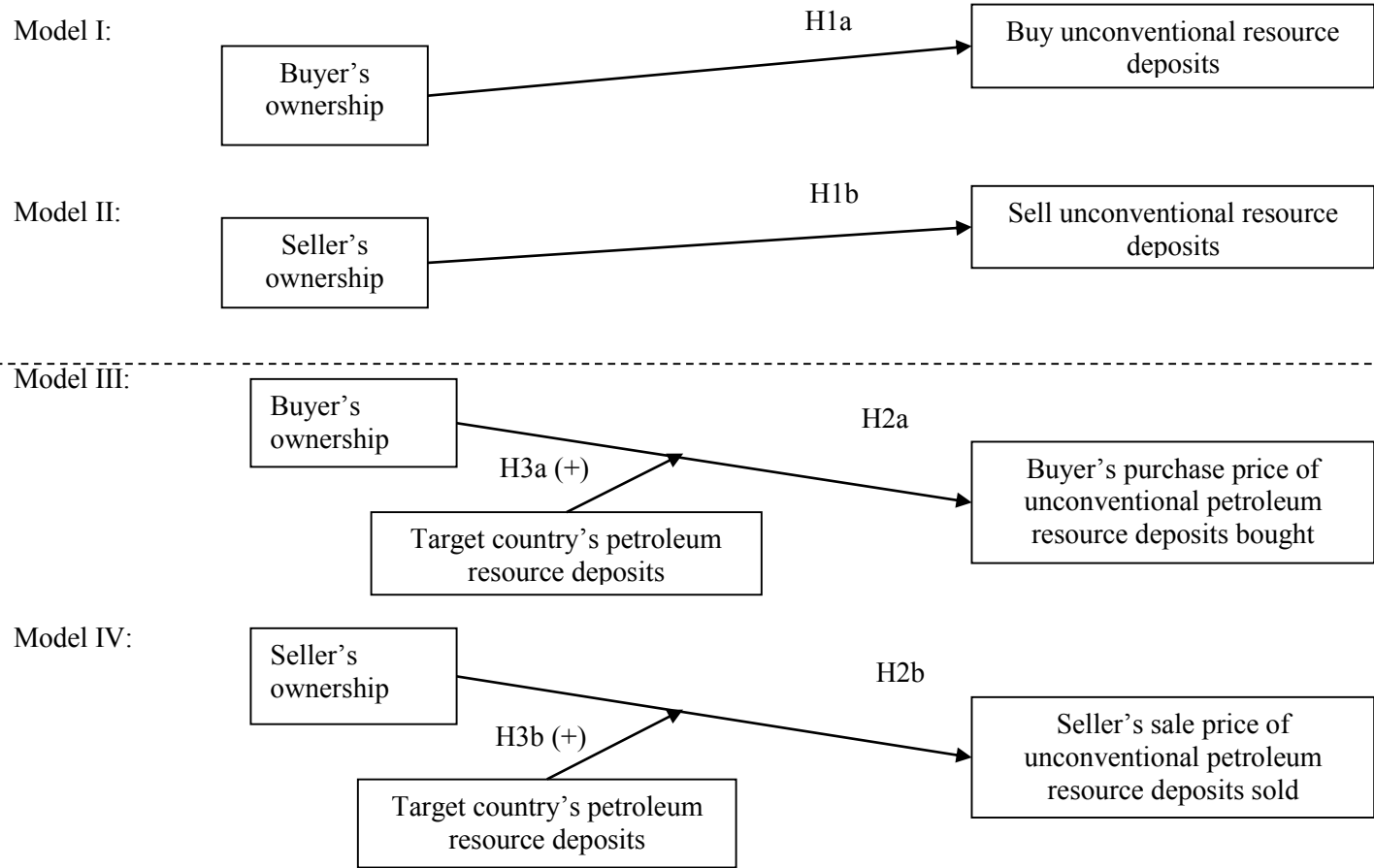


Figure 1.2

Operationalization of the proposed research model (variables)

Table 1.1

## Constructs and variables for the proposed research model

| <b>Generalizable construct</b>          | <b>Definition</b>   | <b>Variable</b>   | <b>Definition</b>  |
|---|---|---|--|
| Form of corporate ownership             | The lawful relationship between the firm and individuals, institutions, or states that hold and can exercise voting rights related to the firm's activities (Demsetz, 1983). There are five types of corporate owners: "1) a family or an individual, 2) the State, 3) a widely-held financial institution such as a bank or an insurance company, 4) a widely-held corporation, or 5) miscellaneous, such as a cooperative, a voting trust, or a group with no single controlling investor" (La Porta, et al., 1999, p. 476) | Buyer's ownership   | Ownership of the entity that is the buyer in the market-based transaction  |
|   |   | Seller's ownership  | Ownership of the entity that is the seller in the market-based transaction   |
| Radical boundary spanning               | The firm crosses both organizational and technological boundaries (Rosenkopf & Nerkar, 2001) and uses market-based transactions to buy/sell external resources that require technologically unconventional capabilities   | Buy unconventional resource deposits                              | Petroleum resource deposits bought in a market-based transaction that are indicated as unconventional  |
|   |   | Sell unconventional resource deposits                             | Petroleum resource deposits sold in a market-based transaction that are indicated as unconventional  |
| Commitment to radical boundary spanning | The magnitude of financial resources the firm directs to radical boundary spanning  | Buyer's purchase price of unconventional resource deposits bought | Price paid by the buyer to buy petroleum resource deposits indicated as unconventional   |
|   |   | Seller's sale price of unconventional resources deposits sold     | Sale price of the seller to sell petroleum resource deposits indicated as unconventional   |
| Location's resource attractiveness      | The quantity of natural resource deposits available in a country  | Target country's petroleum resource deposits                      | The value of petroleum resource deposits estimated to exist in that country in terms of how much is being produced in relation to how much is estimated to be remaining in the earth |



### **Methodology of the Study**

In order to study the relationships of interest, a sample that has varying forms of corporate ownership is necessary. Further, the firms in the sample must radically boundary span and be willing to commit to such an activity because it is necessary, or at a minimum extremely important, for the firm's survival and long-term profitability. Finally, external determinants may influence a firm's commitment to radical boundary spanning. In light of these criteria, and as stated above, the petroleum industry offers a unique setting to study the proposed relationships.

Given the involvement of buyers, sellers, and countries in a single market-based transaction, multilevel modeling (MLM) techniques are employed. MLM can simultaneously take into account the nesting of buyers, sellers, and country within a single market-based transaction (Raudenbush & Bryk, 2002). These market-based transactions occur around the world between many buyers and sellers. Therefore, the level of analysis for this study is the market-based transaction. Data are collected from industry databases and company websites and reports. The data span multiple years and include buyers and sellers of differing forms of corporate ownership participating in market-based transactions of petroleum resource deposits located across the globe.

### **Contributions of the Study**

The proposed research has theoretical, empirical, and methodological contributions to the field of management. Theoretically, this research has three contributions for expanding resource dependence theory (RDT). First, existing conceptualizations of RDT are present-oriented (Pfeffer & Salancik, 1978; Wry, Cobb, & Aldrich, 2013). The theory suggests that firms with ownership of scarce resources are powerful at present. This study adds to RDT by suggesting that forward-looking valuation of external resources is needed. External resources that grant power in the future may differ from external resources that grant power in the present. As related to this study, conventional resource deposits ensure power in the present and unconventional resource deposits

ensure power for the future. It is too simplistic to argue that firms with the most external resources in the present have the most power. Instead, the most powerful firms are those that have access to external resources in the present, and external resources that will be needed in the future.

The second contribution is that, in existing RDT, dependence is assumed to be a simple reliance on more powerful firms. This study suggests that dependence stems from reliance on more powerful firms (i.e. firms with more external resources), but also reliance on a functioning market in which external resources can be bought and sold. Therefore, dependence is more multidimensional than previously theorized or empirically tested. For RDT, dependence stems from how many external resources a firm has access to, but also how the firm uses market-based transactions to access those resources.

The third contribution is that existing conceptualizations of RDT (regarding external resources) and the resource-based view (RBV) (regarding internal resources) suggest four types of resource constraints: “1) shortage of labor or physical inputs, 2) shortage of finance, 3) lack of suitable investment opportunities, and 4) lack of sufficient managerial capacity,” (Mahoney & Pandian, 1992, p. 365-366). This study adds a fifth type of resource constraint: the availability of natural resources. This conceptual implication includes both the financial commitment to and location of natural resources. RDT and RBV suggest that resource constraints either 1) enable strategic activities or 2) can be lessened through firm activities (Rao & Drazin, 2002). Because this study focuses on external resources, it adds to RDT by suggesting that resource constraints can also 3) become greater because of firm activities. External resources come from a finite pool. Therefore, when firms gain access to these resources, they can actually enhance the global resource constraint. These external resources become more valuable as they become scarcer, contributing to increased power and decreased dependence for firms with access to them.

Empirically, this study contributes to the field of management because it demonstrates the relationship between corporate ownership and a particular firm activity—radical boundary

spanning. First, this is important because studies of corporate ownership examine its effect on firm performance and activities. However, corporate ownership has yet to be empirically linked to boundary spanning, and specifically radical boundary spanning. This study attempts to associate a firm activity that is crucial for organizational and even industry innovation—radical boundary spanning—with corporate ownership. Second, following the literature on boundary spanning, both internal and external determinants may be associated with radical boundary spanning. This study combines corporate ownership as an internal determinant with the location's resource attractiveness as an external determinant of commitment to radical boundary spanning in a single model.

Methodologically, this study incorporates novelty for the field of management in both design and approach. The design of this study is a multilevel model, with two levels. Though multilevel modeling on its own is not necessarily new to the management literature (Hitt, Beamish, Jackson, & Mathieu, 2007; Klein & Kozlowski, 2000; Mathieu & Chen, 2011), it is integrated with a two-part model approach. In integrating the multilevel design with a two-part model approach this study presents new avenues for management researchers interested in testing phenomena using methodologies appropriate for more complex data structures in which variables are both nested and crossed and outcomes are both binary and continuous.

### **Structure of the Dissertation**

The preceding paragraphs present the topic for this study including the research questions and proposed research model. The importance of this research to the area of management is highlighted. The following chapter provides a more detailed review of the literature on boundary spanning exploration, resource dependence theory, the resource pyramid, and corporate ownership. Formal hypotheses regarding the relationships outlined in the research model above are developed immediately following the literature review in Chapter Two. Chapter Three focuses on the research design, measures, sample, and methodology. Chapter Four presents

results from the empirical tests suggested in Chapter Two. Chapter Five concludes with a discussion of the findings and contributions for theory and practice.

## **CHAPTER TWO - LITERATURE REVIEW, THEORY, AND HYPOTHESES DEVELOPMENT**

The following literature review uses several theories and concepts in the management field and beyond. The section begins by defining and discussing boundary spanning of firms with a focus on boundary spanning exploration. The discussion then reviews resource dependence theory and the resource pyramid. It incorporates the two theories with the previous discussion of boundary spanning exploration. This serves as the rationale for many of the proposed relationships in the study. The final subsection of the literature review defines and discusses the various forms of corporate ownership. This includes discussion of the determinants of corporate ownership and how these determinants influence firm activities. Completion of this literature review leads into the development of three formal hypotheses related to the concepts indicated above. The chapter ends with a summary of the theories and concepts utilized for this study and the related hypotheses to be tested.

### **Literature Review**

#### **Boundary Spanning of Firms**

##### **What is Boundary Spanning?**

Boundary spanning is a necessary firm activity that connects the firm to its external environment (Leifer & Huber, 1977). Initial research on boundary spanning focused on the role of individuals that linked the organization to its external environment (Leifer & Delbecq, 1978; Leifer & Huber, 1977). This gave rise to research on boundary spanning roles of individuals in organizations (Aldrich & Herker, 1977; Starbuck, 1976). A separate stream of research focused on boundary spanning activities of firms (Leifer & Delbecq, 1978). This research stream examined how firms expand and move past existing boundaries, whether technological, organizational, or otherwise, through exploration activities (Hazy, Tivnan, & Schwandt, 2003; Rosenkopf & Nerkar, 2001; Sidhu, Volberda, & Commandeur, 2004).

March's (1991) exploration-exploitation describes fundamental strategic activities of all firms. March (1991) classifies exploration as involving "search, variation, risk-taking, experimentation, play, flexibility, discovery, and innovation" and contrasts it with exploitation, defined as "refinement, choice, production, efficiency, selection, implementation, and execution" (p. 71). Whereas exploration drives search and experimentation in firms, exploitation enhances efficiency and variance reduction (Lavie, Stettner, & Tushman, 2010). Given this dichotomy, exploration is characterized by the "boundary spanning search for discovery of new approaches to technologies, businesses, processes or products" (Sidhu, et al., 2004, p. 916).

Both exploration and exploitation are important for firm performance. Exploitation activities contribute to short-term performance by increasing efficiency. Exploration activities impact long-term returns by increasing adaptability and innovation (Uotila, Maula, Keil, & Zahra, 2009). Thus, exploration activities are associated with adaptability and much less certain returns (March, 1991), but can drive long-term effectiveness, performance, and organizational viability. Further, exploration is a necessary precursor to exploitation (He & Wong, 2004; Lavie, et al., 2010). That is, exploration activities can eventually become exploitation activities (Raisch, Birkinshaw, Probst, & Tushman, 2009). From this perspective, engaging in boundary spanning exploration is important for firms to pursue opportunities that may ensure long-term profitability and survival. Also, these activities can eventually become exploitative in nature, which contribute to short-term profitability.

### **Boundary Spanning Exploration**

Boundary spanning exploration is a firm activity involving search, experimentation, and discovery, in which one or more firm boundaries are crossed. Rosenkopf and Nerkar (2001) suggest two firm boundaries: organizational and technological. Given these two boundaries, a total of four different types of boundary spanning can occur: local, internal, external, and radical (Rosenkopf & Nerkar, 2001). All four types of boundary spanning exploration contribute

differently to industry change and firm performance. The four types of boundary spanning exploration are depicted in Figure 2.1, which is sourced from the research of Rosenkopf and Nerkar (2001) on the optical disk industry. A brief description of each of the four types of boundary spanning exploration is provided below.

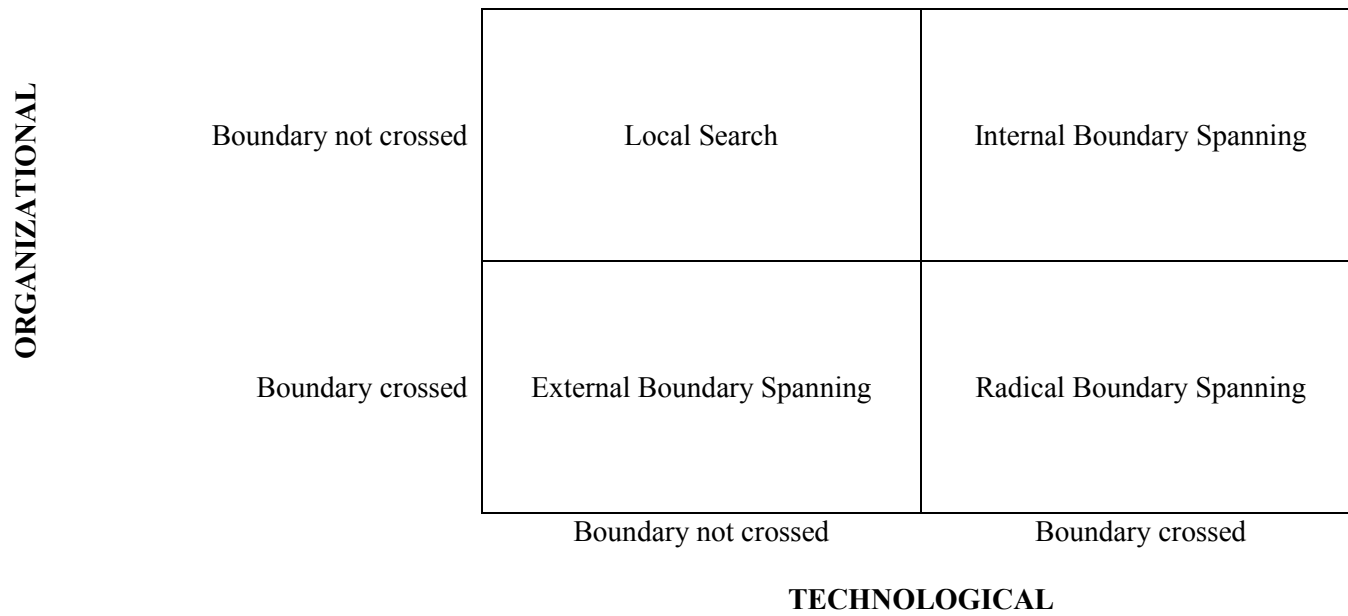


Figure 2.1

Rosenkopf and Nerkar's (2001) four types of boundary spanning exploration



**Local exploration.** This type of exploration does not span any organizational or technological boundaries. It is local because all exploration activities remain within the firm using existing resources and known technological capabilities (Rosenkopf & Nerkar, 2001). Firms may build upon existing resources and capabilities, but all of these activities remain within the boundaries of the firm. Exploration occurs because the firm looks for new ways of doing things or extends existing resources or technological capabilities. Though exploration occurs, boundary spanning is weak because the firm predominantly searches for new resources and technological capabilities that already exist within the boundaries of the firm.

**Internal boundary spanning.** This type of boundary spanning exploration uses distant or unknown technological capabilities with resources that exist within the boundaries of the firm (Rosenkopf & Nerkar, 2001). Technological boundaries are crossed, but organizational boundaries are not. Within a single firm there may be multiple units employing differing technological capabilities. When one unit explores for and discovers a technological capability used in a different part of the firm and adapts that capability to its unit's operations, internal boundary spanning occurs. A new or distant technological capability may be introduced to a particular unit or process. However, that "new" technological capability in fact exists and is discovered inside the boundary of the firm. In this scenario, boundary spanning exploration occurs because the firm searches for new technological capabilities and integrates these new capabilities with resources existing inside the boundaries of the firm.

**External boundary spanning.** This type of boundary spanning exploration occurs when a firm uses resources that exist outside of the firm with a currently employed technological capability (Rosenkopf & Nerkar, 2001). Technological boundaries are not crossed, but organizational boundaries are. The firm integrates this new resource with existing resources. This should improve existing, or create new, activities using technological capabilities that are currently deployed by the firm. In this scenario, boundary spanning exploration occurs because

the firm searches for new resources external to the firm and integrates these new resources with technological capabilities existing inside the boundaries of the firm.

**Radical boundary spanning.** This type of boundary spanning exploration results when firms cross both organizational and technological boundaries. Radical boundary spanning occurs when firms utilize technological capabilities residing outside the firm or create and use technological capabilities that do not yet exist. Additionally, these firms search for resources that exist outside the firm. Technological capabilities along with resources may be borrowed or acquired from an outside source and imported into the boundary of the firm. The firm employs unknown or distant technological capabilities residing outside of the boundaries of the firm with resources that also exist outside of the firm. As a result, the search and discovery of a combination of new resources and technological capabilities is quite radical. In this scenario, boundary spanning exploration occurs because the firm searches for new resources and new technological capabilities external to the firm. The firm integrates these new resources and technological capabilities with existing resources and technological capabilities internal to the firm. This type of boundary spanning exploration is most likely to create radical changes for the firm and the industry in which it operates (Rosenkopf & Nerkar, 2001) because both new resources and technological capabilities are discovered and put to use.

Rosenkopf and Nerkar (2001) examined the effects of boundary spanning on firm performance, specified as patenting, in the optical disk industry. They found that internal exploration has the least impact on performance, followed by organizational, then technological, boundary spanning. The most impactful form of boundary spanning exploration on performance was radical boundary spanning (Rosenkopf & Nerkar, 2001). In sum, firms that span organizational and technological boundaries engage in an activity that has the greatest effect on firm performance and has the ability to create radical change.

## **Resource Dependence Theory and the Resource Pyramid**

### **Resource Dependence Theory**

Resource dependence theory (RDT) suggests that firms operating in the same environment vie for resources from a finite resource pool. Firms with the most resources have the most power and the least dependence on other firms, and firms with the least resources and power have the most dependence on other firms (Pfeffer & Salancik, 1978). As applied to MNCs, RDT focuses on the relationship and built dependence between multiple MNCs and markets in the competition to obtain scarce, external resources (Elg, 2000; Luo, 2003).

External resources are defined as resources that are created or exist outside of the boundaries of the firm and in which the firm has little control over their existence (Jarillo, 1989). External resources may range from advice to financing or natural resources (Birley, 1985; Hart, 1995). In the case of natural resources, external resources can be located in a multitude of geographic locations, and may be dispersed unevenly. The relationship between MNCs and external resources is perhaps more complex than for domestic firms. MNCs, like domestic firms, are concerned with securing the rights to, or acquiring, external resources. However, unlike domestic firms, MNCs are also concerned with securing access to multiple markets in which these external resources exist (Luo, 2003). For MNCs, the idea of “cross-border resource dependence” is about gaining the most external resources from multiple markets to increase power and decrease dependence on other firms.

### **The Resource Pyramid**

The concept of the resource triangle (herein referred to as the resource pyramid) was first introduced into the field of geology, and specifically petroleum studies, by Gray (1977), and further developed by Masters (1979). The concept of the resource pyramid applies to natural resource deposits worldwide (Holditch & Ayers, 2009). The concept suggests that “most natural resource [deposits] are distributed as in a [pyramid]” (Masters, 1979, p. 152). As suggested by the

pyramid concept, “limited quantities [of the resource] are shown at the apex of the [pyramid]” (Holditch & Ayers, 2009, p. 152). See Figure 2.2 for an adaptation of the resource pyramid as presented by Masters (1979).

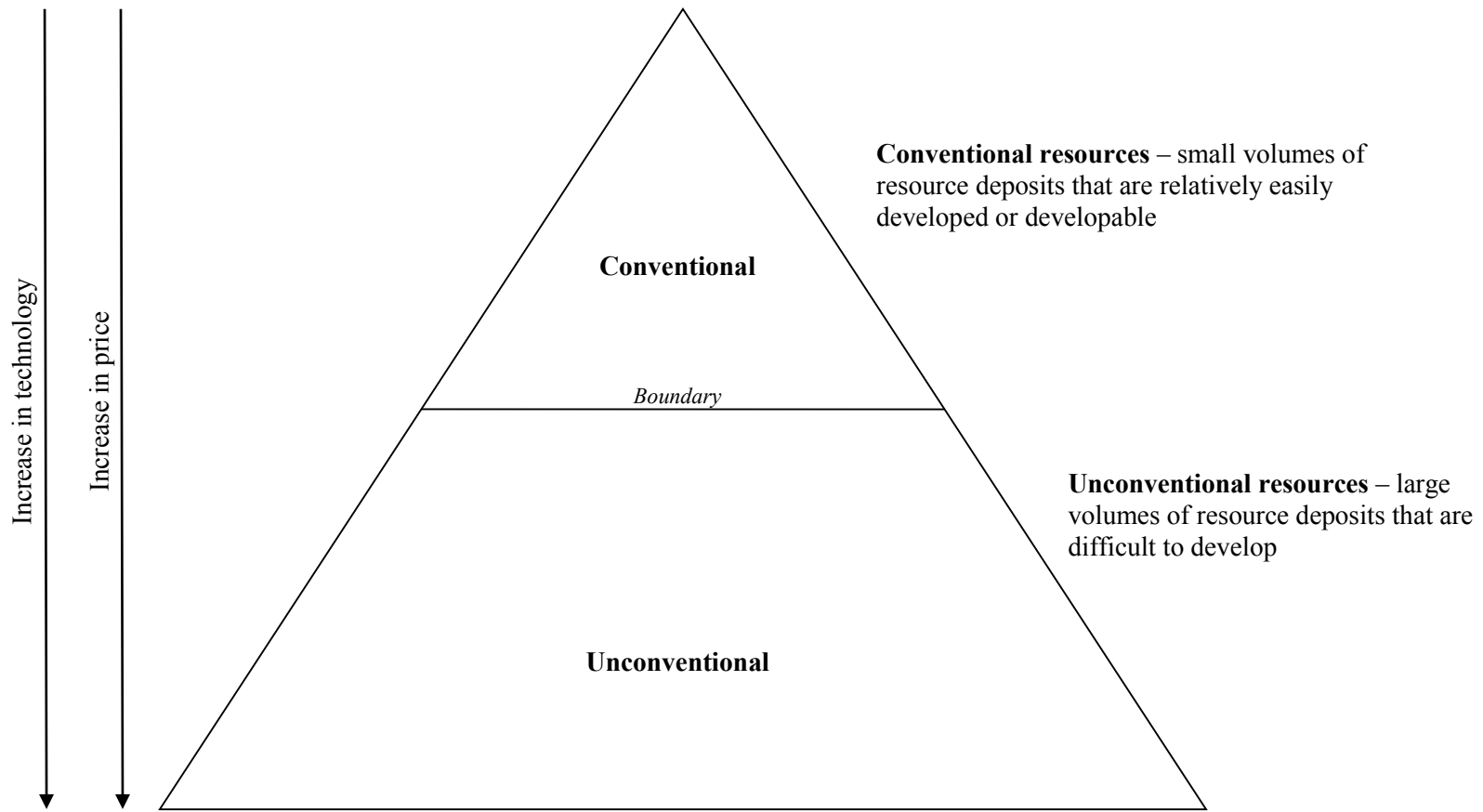
There are much larger quantities of the natural resource deposits at lower-grade, than higher-grade deposits<sup>3</sup>. Following work in geology on the resource pyramid, resources that are considered higher-grade are termed “conventional resources [deposits]”<sup>4</sup>, and resources that are considered lower-grade are termed “unconventional resources [deposits]”<sup>5</sup> (Holditch & Ayers, 2009; Masters, 1979; SPE, 2007). Conventional resource deposits include oil, gas, and coal. Unconventional resource deposits include tight sands, coalbed, and shale (Holditch & Ayers, 2009; SPE, 2012). To gain access to these unconventional resource deposits requires advanced technological capabilities. This is because extraction is relatively more difficult and less straightforward than with conventional resource deposits. Additionally, demand needs to be present such that prices are high enough to make production of these unconventional resource deposits economically feasible (Masters, 1979).

---

<sup>3</sup> Higher grade petroleum resource deposits have a higher percentage of lighter hydrocarbon components. Lower grade petroleum resource deposits have a lower percentage of lighter hydrocarbon components (SPE, 2007). For example, higher grade natural gas has lower percentages of acid gas such as carbon dioxide and hydrogen sulfide.

<sup>4</sup> Conventional resource deposits, as a form of petroleum resource deposits, are defined by the Society of Petroleum Engineers as “discrete petroleum accumulations related to a localized geological structural feature and/or stratigraphic condition, typically with each accumulation bounded by a downdip contact with an aquifer, and which is significantly affected by hydrodynamic influences such as buoyancy of petroleum in water. The petroleum is recovered through wellbores and typically requires minimal processing prior to sale.” (SPE, 2007, p. 12)

<sup>5</sup> Unconventional resource deposits, as a form of petroleum resource deposits, are defined by the Society of Petroleum Engineers as “petroleum accumulations that are pervasive throughout a large area and that are not significantly affected by hydrodynamic influences (also called ‘continuous-type deposits’)... Typically, such accumulations require specialized extraction technology (e.g., dewatering of CBM, massive fracturing programs for shale gas, steam and/or solvents to mobilize bitumen for in-situ recovery, and, in some cases, mining activities). Moreover, the extracted petroleum may require significant processing prior to sale (e.g., bitumen upgraders).” (SPE, 2007, p. 13)



Adapted from Gray (1977); Masters (1979); and Holditch and Ayers (2009)

Figure 2.2

The resource pyramid

The resource pyramid makes distinctions between conventional and unconventional resource deposits based on two factors: technology and price. Unconventional resource deposits tend to be more complex than conventional resource deposits. For example, with regards to petroleum resource deposits, unconventional gas reservoirs “may be deep or shallow, high pressure or low pressures, high temperature or low temperature, blanket or lenticular geometry, homogeneous or heterogeneous, naturally fractured or not, single layered or multilayered, water productive or not, and [may] contain thermogenic or biogenic gas” (Holditch & Ayers, 2009, p. 152). Because of this complexity, unconventional resource deposits tend to require development of new technological capabilities to “facilitate discovery and economic resource development” (Holditch & Ayers, 2009, p. 152).

As demand for natural resource deposits increases, firms face the reality of having to pursue unconventional resource deposits as conventional resource deposits are depleted. Increases in demand for petroleum resource deposits coupled with the uneven distribution of petroleum resource deposits worldwide has implications for firms, especially MNCs, operating in multiple geographies. Thus, “as the price of a resource increases and technology improves, [the] industry should be able to dip deeper into the resource [pyramid] and produce more of the unconventional resources” (Holditch & Ayers, 2009, p. 154). Given that the resource pyramid is a global concept, the volume of unconventional resource deposits that could be made available, given appropriate technological capabilities and prices, should be more than what is currently available in terms of conventional resource deposits (Holditch & Ayers, 2009).

### **Using Resource Dependence Theory with the Resource Pyramid**

The idea of radical boundary spanning emanated from Rosenkopf and Nerkar’s (2001) examination of the optical disk industry. For this industry, examining the different types of boundary spanning exploration using two axes, organizational and technological, is appropriate.

However, when applied to other industries, these two axes may not represent the most appropriate boundaries to determine different types of boundary spanning exploration. This is because boundaries may be defined differently across industries. As such, alternate axes may be more fitting to understand the degrees to which firms participate in boundary spanning exploration (Dess, et al., 1990).

Rosenkopf and Nerkar (2001) argue that the organizational axis is appropriate because it suggests that organizational boundaries matter when considering boundary spanning. The resource that is important to the optical disk industry is knowledge (Rosenkopf & Nerkar, 2001). This is because knowledge is a key component of R&D, and thus boundary spanning, in this industry. Therefore, the authors suggest that the organizational boundary is not crossed when the firm uses “current” knowledge—or knowledge that is already owned by the firm. However, the organizational boundary is crossed when the firm uses “imported” knowledge—or knowledge imported from beyond the firm’s boundary. Simply, a boundary is not crossed when firms search for internal knowledge resources and is crossed when firms search for external knowledge resources.

RDT suggests that firms compete to gain access to external resources. It also suggests that firms can be more or less dependent on other firms to gain access to external resources. One way that firms gain access to external resources is through market-based transactions. As such, there are two ways that firms can gain access to external resources. The first way is for firms not to use market-based transactions as a means to gain access to external resources. These firms do not cross the organizational boundary and use a market-based transaction of external resources involving other firms. The second way is if for firms to use market-based transactions to gain access to external resources. In this scenario, firms cross the organizational boundary and uses a market-based transaction of external resources involving other firms. Thus, the organizational boundary may be better understood as separating whether or not firms gain access to external resources through market-based transactions.

Similarly, Rosenkopf and Nerkar (2001) suggest that the technological axis is suitable because technological advancements are essential to the performance of firms in the optical disk industry. As such, it should be considered when contemplating the type of boundary spanning participated in by the firm. The authors suggest that technological boundaries are not crossed when similar technological capabilities are employed and relatively lesser innovations are produced. As a corollary, technological boundaries are crossed when a new technological capability is employed.

Using the resource pyramid, this boundary could be more generalizable across industries. The technological axes can be adapted to describe whether the external resource sought by the firm requires technological unconventional capabilities. Technological capabilities are “a collection of skills, knowledge, aptitudes, and attitudes which confer the ability to operate, to understand, and to change production processes” (Marcelle, 2004, p. 180). Technologically unconventional capabilities describe newly created or adapted skills, knowledge, aptitudes, and attitudes needed to operate, understand, and change production processes. If the external resource does not require technologically unconventional capabilities (i.e. technologically conventional capabilities are required), then the firm would not have to cross the technological boundary and develop a new technological capability. That is, it could use existing technological capabilities for that external resource. However, if the external resource does require technologically unconventional capabilities, then the firm would cross the technological boundary and develop a new technological capability.

Boundary spanning may differ across industries, therefore generalizing Rosenkopf and Nerkar’s (2001) typology of boundary spanning exploration is warranted. The authors suggest axes based on two types of boundaries—organizational and technological—because these are important boundaries for the optical disk industry. Though these axes may not be appropriate across all industries, arguments from RDT and the resource pyramid can generalize the



information provided by Rosenkopf and Nerkar's (2001) typology. This creates a modified, more generalizable typology of boundary spanning exploration for external resources.

Based on this modification, *local search* occurs when market-based transactions are not used to gain access to natural resource deposits. Natural resource deposits are accessed via means within the firm (internal). The technological capabilities required based on the natural resource deposits are not technologically unconventional, and as such, are conventional. These technologically conventional capabilities describe technological capabilities existing within the firm. *Internal boundary spanning* occurs when market-based transactions are not used to gain access to natural resource deposits. Natural resource deposits are accessed via means within the firm (internal). The technological capabilities required based on the natural resource deposits are technologically unconventional. These technologically unconventional capabilities describe technological capabilities that either do not exist or exist in a different context and need adaptation. *External boundary spanning* occurs when market-based transactions are used to gain access to natural resource deposits. Natural resource deposits are accessed via means outside the firm (external). The technological capabilities required based on the natural resource deposits are not technologically unconventional, and as such, are conventional. These technologically conventional capabilities describe technological capabilities existing within the firm. Finally, and most important to this study, *radical boundary spanning* occurs when market-based transactions are used to gain access to natural resource deposits. Natural resource deposits are accessed via means outside the firm (external). The technological capabilities required based on the natural resource deposits are technologically unconventional. These technologically unconventional capabilities describe technological capabilities that either do not exist or exist in a different context and need adaptation. This modified typology of boundary spanning exploration for external resources is presented in Figure 2.3 below.

|                                       | <b>Organizational<br/>boundary crossed</b><br><i>(use of market-<br/>based transactions<br/>to access natural<br/>resource deposits)</i> | <b>Technological<br/>capability<br/>boundary crossed</b><br><i>(the natural<br/>resource deposit<br/>requires a<br/>technologically<br/>unconventional<br/>capability)</i> | <b>Description</b>  |
|---------------------------------------|--|--|---|
| <b>Local search</b>                   | No   | No   | Market-based transactions are not used to gain access to natural resource deposits. Natural resource deposits are accessed via means within the firm (internal). The technological capabilities required based on the natural resource deposits are not technologically unconventional, and as such, are conventional. These technologically conventional capabilities describe technological capabilities existing within the firm.                    |
| <b>Internal boundary<br/>spanning</b> | No   | <b>Yes</b>   | Market-based transactions are not used to gain access to natural resource deposits. Natural resource deposits are accessed via means within the firm (internal). The technological capabilities required based on the natural resource deposits are technologically unconventional. These technologically unconventional capabilities describe technological capabilities that either do not exist or exist in a different context and need adaptation. |
| <b>External boundary<br/>spanning</b> | <b>Yes</b>   | No   | Market-based transactions are used to gain access to natural resource deposits. Natural resource deposits are accessed via means outside the firm (external). The technological capabilities required based on the natural resource deposits are not technologically unconventional, and as such, are conventional. These technologically conventional capabilities describe technological capabilities existing within the firm.                       |
| <b>Radical boundary<br/>spanning</b>  | <b>Yes</b>   | <b>Yes</b>   | Market-based transactions are used to gain access to natural resource deposits. Natural resource deposits are accessed via means outside the firm (external). The technological capabilities required based on the natural resource deposits are technologically unconventional. These technologically unconventional capabilities describe technological capabilities that either do not exist or exist in a different context and need adaptation.    |

Figure 2.3

Boundary spanning exploration for external resources

## Corporate Ownership

### What is Corporate Ownership?

A long-standing field of inquiry within the finance, entrepreneurship, strategy, and international business literatures is related to corporate ownership. Corporate ownership is defined as the lawful relationship between the firm and individuals, institutions, or states that hold and can exercise voting rights related to the firm's activities (Demsetz, 1983). Corporate ownership largely stems from the theory of the firm (Jensen & Meckling, 1976). The theory of the firm seeks to uncover the nature of the firm from its existence and behavior to its structure and relationship to the market based on description, explanation, and prediction (Kantarelis, 2007). Research on corporate ownership examines the interests and controls of owners and managers and the potential conflict between them. It also studies the influence of the form of ownership on the ability of managers (and owners) to obtain important resources from external markets (Mascarenhas, 1989).

Berle and Means (1932) first examined corporate ownership from the field of finance. They studied the incongruence of the dispersion of capital among shareholders and the concentration of control among managers in widely-held firms. This work has since given rise to research on the influence of geographic differences on corporate ownership (La Porta, et al., 1999; Prowse, 1992). Further, outcomes of differences in corporate ownership, such as profits and bankruptcy (Demsetz & Lehn, 1985; Gilson, 1990), have been studied in this field.

In entrepreneurship research, corporate ownership is associated with positive organizational activities and outcomes, such as corporate entrepreneurship. These are essential for organizational renewal, creation of new businesses, and performance (Zahra, 1996; Zahra, Neubaum, & Huse). A larger field of inquiry in the entrepreneurship literature investigates the influence of demographics and composition of owners of entrepreneurial firms on properties of the organization, such as culture (Zahra, Hayton, & Salvato, 2004) and performance (Randøy & Goel, 2003).

The strategy and international business literatures also focus on the effects of geography on corporate ownership and how forms of corporate ownership affect firm profits. However, these literatures go into depth on the implications of different forms of corporate ownership on firm performance. This includes investigation of the relationship between the owner and the firm (Chaganti & Damanpour, 1991). Also, this literature examines the impact that owner identity and group affiliation have on ownership and subsequent firm performance (Douma, George, & Kabir, 2006; Thomsen & Pedersen, 2000). The international business literature provides evidence of corporate ownership patterns as related to geography (Pedersen & Thomsen, 1997). It also studies the effect of corporate ownership on entry modes and cooperative strategies (Makino & Beamish, 1998; Woodcock, Beamish, & Makino, 1994). A commonality shared across these literatures is the focus on the varying forms of corporate ownership and the relationship between corporate ownership and the activities and/or performance of the firm.

### **Forms of Corporate Ownership**

The dispersion of corporate ownership can generally be defined on two separate dimensions. The first dimension examines the dispersion of ownership (and thus, control) of the firm. In widely-held firms, firm ownership is dispersed among many owners (La Porta, et al., 1999). As such, there is no single controlling owner (as measured by the owner's direct and indirect voting rights). In ultimate ownership, firm ownership may be held by a single owner, or dispersed among many owners. However, there is a single controlling owner (i.e. one owner with direct and/or indirect voting rights that give that owner ultimate control over the firm) (La Porta, et al., 1999).

In addition to the dispersion of ownership, corporate ownership can also be defined by the type of owner, or form of ownership. This facet of corporate ownership is the focus of this paper. Broadly, there are five types of corporate owners: "1) a family or an individual, 2) the State, 3) a widely-held financial institution such as a bank or an insurance company, 4) a widely-

held corporation, or 5) miscellaneous, such as a cooperative, a voting trust, or a group with no single controlling investor” (La Porta, et al., 1999, p. 476). Alternatively, these categories may be aggregated and parsed to make distinctions between institutional and non-institutional owners (Johnson & Greening, 1999; Useem, 1996). Institutional owners may include a widely-held financial institution or owners from the miscellaneous category including pension funds, investment management funds (mutual fund, bank, investment bank), and/or foundations, universities, or churches (Johnson & Greening, 1999). Non-institutional owners include families or individuals, States, and those non-institutional owners from the miscellaneous category. See Table 2.1 for information on the forms of corporate ownership.

Table 2.1

The various forms of corporate ownership

| <b>Form of Ownership</b>          | <b>Definition</b>   |
|-----------------------------------|---|
| Family or individual              | A single person is the controlling shareholder (La Porta, et al., 1999, p. 478)   |
| State                             | A domestic or foreign government is the controlling shareholder (La Porta, et al., 1999, p. 478)  |
| Widely-held financial institution | A financial company is the controlling shareholder (La Porta, et al., 1999, p. 478)   |
| Widely-held corporate             | A nonfinancial company is the controlling shareholder (La Porta, et al., 1999, p. 478)  |
| Miscellaneous                     | The controlling shareholder is a pension fund, mutual fund, voting trust, management trust, group, subsidiary, nonprofit organizations, or employee(s) (La Porta, et al., 1999, p. 478)       |
| Institutional                     | The controlling shareholder is a pension fund, investment management fund (mutual fund, bank, investment bank), and/or a foundation, university, or church (Johnson & Greening, 1999, p. 570) |
| Non-institutional                 | The controlling shareholder is a family, an individual, the State, a group, a firm, a subsidiary, or employee(s)  |

As highlighted above, corporate ownership can be distinguished in many ways. For example, differences can be studied between state owners and non-state owners. State owners often use corporate ownership as a mechanism to pursue political objectives while transferring firm losses to the public (La Porta, et al., 1999; Shleifer & Vishny, 1994). Alternatively, when considering non-state owners, differences can be considered in whether the owner invests their own money in the firm (a family or an individual, a widely-held financial institution, or a widely-held corporation) or if the owner invests the money of others (institutional owners). These differing dimensions offer a variety of ways to examine disparities in firm ownership. Further, the impact of these disparities can help describe, explain, and predict the firm's activities. For the purpose of this study, La Porta and colleagues' (1999) five categories of corporate ownership is used.

### **Determinants of Corporate Ownership**

In addition to understanding differences in corporate ownership in terms of the form of ownership, much research has been dedicated to understanding the determinants of corporate ownership. That is, what gives rise to prevalence or patterns of ownership based on industry (Gaille, 2010; Mascarenhas, 1989), geography (La Porta, et al., 1999), or relations between corporate ownership and the objectives of the firm (Demsetz & Lehn, 1985)? Demsetz and Lehn (1985) highlight four determinants of corporate ownership. This research illustrates how these determinants of corporate ownership influence the existence and behavior of firms. These four determinants—value-maximizing size, control potential, regulation, and amenity potential—are discussed in the proceeding paragraphs.

**Value-maximizing size.** The size of firms varies across industries. Value-maximizing size refers to the idea that “the larger is the competitively viable size, *ceteris paribus*, the larger is the firm's capital resources and, generally, the greater is the market value of a given fraction of ownership” (Demsetz & Lehn, 1985, p. 1158). Firms that are larger generally have less

concentrated ownership, as the ownership of large firms can be partitioned more than in small firms (Demsetz & Lehn, 1985). Thus, owners may have less control in larger firms (because ownership is less concentrated) than in small firms. As a result, “an attempt to preserve effective and concentrated ownership in the face of larger capital needs requires a small group of owners to commit more wealth to a single enterprise” (Demsetz & Lehn, 1985, p. 1158). In capital intensive industries, such as the petroleum industry, firms may be large, but also have more concentrated ownership than large firms in other industries. As such, there may be more instances of state ownership, miscellaneous ownership, or family and individual owners with relatively higher ownership than is typical in other industries. This concentrated ownership might allow the firm to pursue more capital intensive activities, such as radical boundary spanning.

**Control potential.** Control potential describes the relationship between the firm’s behaviors and activities in its broader external environment and the ability of managers to perform (for the owners) (Demsetz & Lehn, 1985). Firms operating in stable markets with stable prices, stable technology, stable market shares, etc. have “less noise” (Demsetz & Lehn, 1985) than firms operating in unstable, or somewhat stable, markets with unstable characteristics. These unstable characteristics include price fluctuations, diminishing supply with increasing demand, or other factors that contribute to the market’s instability. The stability of a market can be determined by technology and market shares. These are sources of instability more proximate to the firm. Market stability is also influenced by economy-wide issues including prices (as influenced by supply and demand), fluctuations in government tax expenditure, or terrorist attacks. These are less proximate to the firm (Demsetz & Lehn, 1985). Regardless of whether the source of instability is more or less proximate to the firm, the way in which the firm reacts to these instabilities, as identified for example, in the firm’s choice to participate in market-based transactions, can affect the activities and subsequent performance of the firm.

In the less noisy environment, managers can more easily foresee and react to changes in the external environment. In the noisier environment, it is much more difficult for managers to

predict and act in a state of instability and achieve high performance for corporate owners. In this more unstable environment, managerial activity may be more directly related to firm activities, and as such, firm performance (Demsetz & Lehn, 1985). Thus, in noisier environments, more concentrated ownership structures of state ownership, miscellaneous ownership, or individual and family ownership, should be more prominent. This is because with more concentrated ownership, “owners believe they can influence the success of their firms and that all outcomes are neither completely random nor completely foreseeable” (Demsetz & Lehn, 1985, p. 1159). In noisier environments, such as the petroleum industry, prices constantly fluctuate, technology changes, and demand nears supply. Firms with more concentrated ownership may be more likely to navigate this noise and participate in boundary spanning exploration supported by newer technology and higher prices.

**Regulation.** Regulation is associated with government or other regulatory body’s control over the exchanges of goods or services. As such, regulation can influence the activities of firms. Regulation “restricts the options available to owners” but “also provides some subsidized monitoring and disciplining of the management of regulated firms” (Demsetz & Lehn, 1985, p. 1161). In regulated markets firm ownership may be less concentrated. This is because the government or regulatory body is in fact doing some of the work of the owners (Demsetz & Lehn, 1985). Owners of firms in regulated industries have less desire to control management and influence firm activities. This is because the firm already has to comply with certain regulations. As a corollary, in non-regulated markets, ownership may be more concentrated because of in-existent or minimal regulations. Therefore, owners may have more desire to control management, firm activities, and performance in non-regulated markets. These owners opt for more concentrated ownership structures such as state ownership, miscellaneous ownership, or family and individual ownership in which ownership is higher (and less fractioned). Although there is regulation of the petroleum industry, this regulation varies across markets. Regulations in Canada are not similar in scope or detail to regulations in Nigeria. Thus, in countries in which



regulation is higher, there may be more diffuse forms of ownership. As a corollary, in countries in which regulation is lower, more concentrated forms of ownership may exist.

**Amenity potential.** Amenity potential is the relationship between the firm's value and the value received by owners. Amenity potential suggests that other benefits are gained by owners when the firm acts in their interests to maximize ownership value and achieves superior performance (Demsetz & Lehn, 1985). Amenity potential refers to the trickle-down effect in which the activities and performance of the firm somehow enable the owner to pursue other non-firm interests or goals. If the owner believes that this trickle-down effect is possible, the owner may be more likely to want to influence the activities of the firm. As a result, more concentrated forms of ownership may exist. For example, owners of a Major League Baseball team may believe that winning the World Series brings profits and notoriety to the team. However, the owner also gains other benefits from this championship. This may allow the owner to pursue goals or interests that are not related to the team (e.g., fame, ownership of other teams or firms, endorsements, etc.). Thus, "ownership should be more concentrated in firms for which this type of amenity potential is greater" (Demsetz & Lehn, 1985, p. 1162). In the petroleum industry, when amenity potential is greater, owners may be more concentrated. These concentrated owners influence the firm to pursue activities that increase firm performance and subsequent amenity received by the owners. Owners may influence the firm to pursue boundary spanning activities so that the firm can stay on the cutting-edge of the industry and create or contribute to radical industry change. From such activities, the owners may potentially gain more profits and experience greater amenity potential.

### **Theory Development and Hypotheses**

Based on the review above, radical boundary spanning occurs when firms 1) use market-based transactions to gain access to external resources and 2) these external resources require unconventional technological capabilities. Simply, radical boundary spanning requires

buying/selling of unconventional resources (external resources requiring unconventional technological capabilities) via market-based transactions. Market-based transactions are comprised of three facets: 1) what is bought/sold, 2) the purchase/sale price for what is bought/sold, and 3) how location affects the purchase/sale price for what is bought/sold. As such, hypotheses are developed based on these three facets of market-based transactions.

### **Corporate Ownership and Radical Boundary Spanning**

The first facet of a market-based transaction consists of what is bought and sold. For this study, this facet is examined in terms of the relationship between the form of corporate ownership and radical boundary spanning. In the petroleum industry, radical boundary spanning is operationalized as buying/selling unconventional resource deposits. Thus, this facet of the market-based transaction examines the relationship between buyer's/seller's ownership and buying/selling of unconventional resource deposits.

The review of the forms of corporate ownership highlights how ownership influences the activities the firm chooses to participate in. Radical boundary spanning describes the use of market-based transactions to access external resources that require unconventional technological capabilities. For buyers of market-based transactions, radical boundary spanning typically requires large investments in technological capabilities paired with higher prices to make this firm activity economically viable. When ownership resides in the hands of few, such as in state owned enterprises, some miscellaneous ownership types such as institutionally-owned enterprises, or family- and individual-held enterprises, firms may be better able to pursue capital intensive projects. This is because there are only few individuals or entities responsible for the ownership of the firm. These few individuals (entities) can commit a larger sum of wealth to this single enterprise (Demsetz & Lehn, 1985).

Additionally, because radical boundary spanning is a form of boundary spanning exploration, it may not provide immediate or stable returns. Rather, radical boundary spanning

may be an activity reserved for firms concerned with future viability. In the case of the petroleum industry, unconventional resource deposits require more technological capabilities and higher prices. These firms might not expect to see returns from buying unconventional resource deposits in the short-term. Thus, firms that are required to produce short-term results, such as firms with widely-held financial institutions or corporations as owners, may be less likely to buy unconventional resource deposits. For these forms of corporate ownership, maximizing owner value in the short-term cannot be overlooked in order to pursue activities that may produce long-term results (Sundaram & Inkpen, 2004).

Market-based transactions also consist of sellers seeking to sell unconventional resources. As highlighted above, unconventional resource deposits require capital and technological intensity. As a corollary to the argument above, when ownership is diffuse, such as in widely-held financial institutions or widely-held corporations, firms may be less able to pursue capital intensive projects. This is because many individuals or entities are responsible for the ownership of the firm. Because ownership is diffuse, each individual (entity) can commit a smaller sum of wealth to help fund capital intensive projects for the firm (Demsetz & Lehn, 1985).

Also noted above, unconventional resources produce long-term, rather than short-term, returns. For firms that cannot take on this capital intensity, or are focused on short-term profits, selling unconventional resource deposits is an appropriate strategy. The firm can rid itself of these low or non-existent return resources and increase cash. Firms that are concerned with gaining capital in the short-term, such as widely-held financial institutions, corporations, or even individual- or family-held firms, may view selling unconventional resource deposits as an attractive option.

Given these arguments regarding the relationship between corporate ownership and radical boundary spanning, the following hypotheses are offered:

*Hypothesis 1a: Buyer's ownership is related to radical boundary spanning*

*Hypothesis 1b: Seller's ownership is related to radical boundary spanning*

### **Corporate Ownership and Commitment to Radical Boundary Spanning**

The second facet of a market-based transaction consists of the purchase/sale price for what is bought/sold. For this study, this facet is examined in terms of the relationship between the form of corporate ownership and commitment to radical boundary spanning.

Radical boundary spanning requires capital intensity and technological investment. Examining the market-based transaction from the perspective of buyers suggests that firms that choose to buy unconventional resources must have the financial means to 1) fund such capital intensive, high-technological capabilities and 2) pursue these higher price projects, even if they are not viable given existing economic conditions. Heavy initial investment in the activity suggests that initial returns may be low or nonexistent. As a result, radical boundary spanning comes with a high price. However, the benefits of buying unconventional resources, even if not immediately recoverable, can be exponential in the future. Radical boundary spanning, especially in combination with resource scarcity, ensures that the firm will have viable future operations. When conventional resources and related activities become obsolete, unconventional resources and activities will be essential. Thus, depending on how committed the buying firm is to radical boundary spanning, it may be willing to pay more to buy unconventional resource deposits. Firms with wealthy owners that do not require immediate returns, such as perhaps state- or institutionally-owned firms, may be more willing to commit to radical boundary spanning to ensure such future viability. This is in contrast to firms that require immediate returns or have tighter capital budgets.

Sellers in market-based transactions of unconventional resources are driven by the firm's needs with regards to short-term gains. When the firm's needs are higher, they may be more committed to radical boundary spanning and ensuring a premium sale price is collected for the sale of unconventional resource deposits. These sellers may be more concerned with gaining capital and increasing cash. Firms that need cash to maximize short-term wealth, recover capital,

and increase returns, such as MNCS with widely-held financial institutions or widely-held corporations as owners, may be more committed to radical boundary spanning and as such demand a higher price when selling unconventional resource deposits than owners that are less concerned with accumulating capital for the short-term.

Given these arguments related to the relationship between corporate ownership and commitment to radical boundary spanning, the following hypotheses are suggested:

*Hypothesis 2a: Buyer's ownership is related to commitment to radical boundary spanning.*

*Hypothesis 2b: Seller's ownership is related to commitment to radical boundary spanning.*

### **The Influence of Location's Resource Attractiveness on Corporate Ownership and Commitment to Radical Boundary Spanning**

The third facet of a market-based transaction considers how location affects the purchase/sale price for what is bought/sold. Thus, the location's resource attractiveness is an external determinant that influences the relationship between the form of corporate ownership and commitment to radical boundary spanning. For the petroleum industry, this facet of the market-based transaction considers how the location's resource attractiveness in terms of petroleum resource deposits influences the relationship between buyer's ownership and buyer's purchase price of unconventional resource deposits bought or the seller's ownership and the seller's sale price of unconventional resources deposits sold.

Unconventional resource deposits exist disparately across the globe (Holditch & Ayers, 2009). Given the dispersion of unconventional resource deposits, some locations may have more petroleum resource deposits than others. Thus, the location's resource attractiveness in terms of the petroleum resource deposits of a country may influence the firm's commitment to radical boundary spanning, given its form of ownership. Countries with more petroleum resource

deposits have higher resource potential (Almeida & Phene, 2004) in both conventional and unconventional resource deposits. These countries with more petroleum resource deposits may be more attractive to firms buying and selling unconventional resources. As indicated by the resource pyramid, if the country currently has more petroleum resource deposits in terms of conventional resource deposits, it will most likely have more unconventional resource deposits, increasing the location's resource attractiveness. Given this heightened attractiveness of the location based on resource potential (Almeida & Phene, 2004), the unconventional resource deposits bought and sold via market-based transactions may demand higher prices. When countries have more petroleum resource deposits, buying firms expect to pay higher purchase prices for unconventional resource deposits bought, and selling firms expect to sell unconventional resource deposits for higher sale prices.

Given the influence of the attractiveness of location in terms of the target country's petroleum resource deposits, following hypotheses are put forward:

*Hypothesis 3a: The target country's resource attractiveness influences the relationship between the buyer's ownership and commitment to radical boundary spanning. When the target country's resource attractiveness is higher, the relationship is more positive.*

*Hypothesis 3b: The target country's resource attractiveness influences the relationship between the seller's ownership and commitment to radical boundary spanning. When the target country's resource attractiveness is higher, the relationship is more positive.*

### **Summary**

This chapter presented an overview of the theories and the previous empirical studies related to this research. The present research builds on theoretical concepts existing in the field of management including boundary spanning exploration, resource dependence theory, and

corporate ownership. It also uses a theory from geology, the resource pyramid, with these existing management concepts. This multi-theoretic approach allows for hypothesis building regarding the relationship between corporate ownership, radical boundary spanning, and location's resource attractiveness. Hypotheses are separated in terms of three facets of the market-based transaction 1) the relationship between the form of corporate ownership and radical boundary spanning, 2) the relationship between the form of corporate ownership and commitment to radical boundary spanning, and 3) the influence of location's resource attractiveness on the relationship between the form of corporate ownership and commitment to radical boundary spanning. Chapter Three presents an overview of the methodology used to test these hypotheses. The setting, sample and procedure, variables, analytic rationale, and analysis methods are detailed in the following chapter.

## CHAPTER THREE - METHODOLOGY

To empirically examine the hypotheses put forth in the previous chapter, details on the methods employed for this study are provided below. This chapter begins with a general discussion of the rationale behind the setting for the proposed study. Continuation of this discussion leads to a detailed description of the proposed sample for this study and how the data will be collected for this sample. The proceeding subsection defines and describes the measures of the variables used in this study. Lastly, the analytic rationale and analysis methods for this study are discussed. The subsection dedicated to the analytic rationale employed for this study describes multilevel modeling techniques and two-part models in detail. The analysis methods section indicates how the data will be analyzed using multilevel modeling of a two-part model. It also includes equations for the proposed model in this study.

### Setting

The setting for this study is the petroleum industry. This industry was chosen for several reasons. First, a requirement of the setting for this study is that a number of different forms of corporate ownership are present. Previous studies have used the petroleum industry to illustrate differences in corporate ownership. For example, Dechert (1962) used a single case study of ENI, a state owned petroleum company of Italy, to examine how a state owned enterprise (SOE) operates and competes in a mixed economy. Mascarenhas (1989) argued that corporate ownership of petroleum firms engaged in offshore drilling may enlighten our understanding of strategic choices and differences in firm activities. Further, the author suggests that including multiple forms of corporate ownership, rather than dichotomies (e.g., state owned versus non-state owned; widely-held versus ultimate) is important for understanding these differences (Mascarenhas, 1989). Most recently, Gaille (2010) highlights the emergence of powerful SOEs in the petroleum industry, the role that these SOEs play in the industry, and how this role differs from the roles of privately-owned or publicly-held firms. Following these and other studies, the petroleum industry



provides a setting in which numerous forms of corporate ownership exist. Examples of these different forms of ownership in this industry are provided in Tables 3.1 and 3.2.

Table 3.1

## Examples of financial and institutional ownership in the petroleum industry

| Firm           | Total shares<br><i>as of 12/31/2011</i> | Institutional Ownership<br><i>as of 12/31/2011</i> |        | Five Largest Owners<br><i>(as percent of total)</i> |               |         |
|----------------|---|--|--------|---|---------------|---------|
|                |   | Shares   | %      | Owner Name  | Owner Type    | % owned |
| Exxon Mobil    | 4,713,221,000                           | 2,310,263,765                                      | 49.02% | Vanguard Group Inc.                                 | Institutional | 4.25%   |
|                |   |  |        | State Street Corp                                   | Financial     | 3.95%   |
|                |   |  |        | Barclays Global Investors UK Holdings Ltd           | Institutional | 2.73%   |
|                |   |  |        | Bank of New York Mellon Corp                        | Financial     | 1.58%   |
| Chevron        | 1,976,967,000                           | 1,257,309,147                                      | 63.60% | State Street Corp                                   | Financial     | 4.97%   |
|                |   |  |        | Vanguard Group Inc.                                 | Institutional | 4.32%   |
|                |   |  |        | Capital World Investors                             | Institutional | 3.08%   |
|                |   |  |        | Barclays Global Investors UK Holdings Ltd           | Institutional | 2.69%   |
|                |   |  |        | FMR LLC   | Institutional | 2.60%   |
| ConocoPhillips | 1,279,693,000                           | 885,963,663  | 69.23% | Vanguard Group Inc                                  | Institutional | 4.65%   |
|                |   |  |        | Capital Research Global Investors                   | Institutional | 4.06%   |
|                |   |  |        | State Street Corp.                                  | Financial     | 3.95%   |
|                |   |  |        | Barclays Global Investors UK Holdings Ltd           | Institutional | 2.83%   |
|                |   |  |        | Berkshire Hathaway Inc                              | Institutional | 2.27%   |
| Occidental     | 810,941,000                             | 647,183,684  | 79.81% | FMR LLC   | Institutional | 4.42%   |
|                |   |  |        | Vanguard Group Inc                                  | Institutional | 4.08%   |
|                |   |  |        | State Street Corp                                   | Financial     | 3.80%   |
|                |   |  |        | Wellington Management Co LLP                        | Institutional | 3.77%   |
|                |   |  |        | Barclays Global Investors UK Holdings Ltd           | Institutional | 2.60%   |
| Andarko        | 505,593,000                             | 416,576,945  | 82.39% | FMR LLC   | Institutional | 5.53%   |
|                |   |  |        | Wellington Management Co LLP                        | Institutional | 5.38%   |
|                |   |  |        | State Street Corp                                   | Financial     | 3.98%   |
|                |   |  |        | Vanguard Group Inc                                  | Institutional | 3.93%   |
|                |   |  |        | Barclays Global Investors UK Holdings Ltd           | Institutional | 2.63%   |

Source: (Furchtgott-Roth, 2012)

Table 3.2

Examples of firms in the petroleum industry that are fully-owned by the state

| <b>Firm</b>                            | <b>Year Established</b> | <b>Location of State Owner</b> |
|--|-------------------------|--------------------------------|
| Abu Dhabi National Oil Company         | 1971                    | UAE                            |
| Bahrain Petroleum Company              | 1929                    | Bahrain                        |
| China National Offshore Oil Company    | 1982                    | China                          |
| China National Petroleum               | 1999                    | China                          |
| China Petrochemical Corporation        | 2000                    | China                          |
| Egyptian General Petroleum Corporation | 1976                    | Egypt                          |
| Emirates National Oil Company          | 1993                    | UAE                            |
| Empresa Estatal Petróleos del Ecuador  | 1989                    | Ecuador                        |
| Empresa Nacional de Hidrocarbonetos    | 1981                    | Mozambique                     |
| ENAP                                   | 1950                    | Chile                          |
| GEPetrol                               | 2002                    | Equatorial Guinea              |
| Ghana National Petroleum Corporation   | 1983                    | Ghana                          |
| Iraq National Oil Company              | 1966                    | Iraq                           |
| KazMunaiGas                            | 2002                    | Kazakhstan                     |
| Kuwait Gulf Oil Company                | 2002                    | Kuwait & Saudi Arabia          |
| Kuwait Oil Company                     | 1934                    | Kuwait                         |
| Kuwait Petroleum Corporation           | 1980                    | Kuwait                         |
| Missan Oil Company                     | 2008                    | Iraq                           |
| Mubadala Oil & Gas                     | 2002                    | UAE                            |
| NAMCOR                                 | 2008                    | Namibia                        |
| National Iranian Oil Company           | 1948                    | Iran                           |
| National Oil Corporation               | 1970                    | Libya                          |
| National Oil Corporation of Kenya      | 1981                    | Kenya                          |
| Nigerian National Petroleum Company    | 1977                    | Nigeria                        |
| North Oil Company                      | 1987                    | Iraq                           |
| PDVSA                                  | 1975                    | Venezuela                      |
| Pertamina                              | 1968                    | Indonesia                      |
| Petrobangla                            | 1972                    | Bangladesh                     |
| Petróleos del Perú                     | 1969                    | Peru                           |
| Petroleos Mexicanos                    | 1917                    | Mexico                         |
| Petróleos Paraguayos                   | 1981                    | Paraguay                       |
| Petronas                               | 1974                    | Malaysia                       |
| PetroSA                                | 2002                    | South Africa                   |
| Petrotrin                              | 1993                    | Trinidad and Tobago            |
| PetroVietnam                           | 1977                    | Vietnam                        |
| Philippine National Oil Company        | 1973                    | Philippines                    |
| Qatar Petroleum                        | 1974                    | Qatar                          |
| Saudi Arabian Oil Company              | 1933                    | Saudi Arabia                   |
| SOCAR                                  | 1992                    | Azerbaijan                     |
| Sonatrach                              | 1963                    | Algeria                        |
| Staatsolie                             | 1980                    | Surinam                        |
| Syrian Petroleum Company               | 1974                    | Syria                          |
| TPAO                                   | 1954                    | Turkey                         |
| Uzbekneftegaz                          | 1992                    | Uzbekistan                     |

Second, the setting requires that firms must have the choice to radically boundary span. That is, market-based transactions of external resources that require unconventional technological capabilities must exist. In order for firms in this industry, many of which are MNCs, to survive, they may need to reach out to multiple markets to assure the rights to global resources. MNCs and domestic firms alike participate in transactions of petroleum resource deposits. These transactions describe one or more firms (buyer) buying a property (e.g., oil well, area of land, etc.) from one or more other firms (seller). Like other market-based transactions, these petroleum transactions consist of what is bought and sold, the purchase/sale price of the transaction, and the location of the resource deposits bought/sold in the transaction.

Third, consumption of petroleum resource deposits is increasing more rapidly than production. As conventional resource deposits become depleted, firms in this industry are looking to unconventional resource deposits as a way to increase production (and supply). Firms in this industry may choose to pursue petroleum resource deposits that require conventional technological capabilities. Alternatively, they can choose to boundary span and pursue petroleum resource deposits that require unconventional technological capabilities. Keeping with the arguments above, the petroleum industry may effectively illustrate differences in radical boundary spanning of firms.

### **Sample and Procedure**

The primary sample for this study consists of petroleum transactions involving buyer firms and seller firms from across the globe. Much of the sample data is petroleum transaction data that include market values and benchmarks on global hydrocarbon deals (PLS, 2012; Derrick Petroleum, 2012). Information is made available through industry resource websites, company websites, annual reports, and finance portals. The sample of event data spans eight years from 2005-2012, inclusively.

In addition to petroleum transaction data, a dataset was created that indicates the form of corporate ownership for each firm. These data were hand-collected from a variety of online repositories including company websites, finance portals, trade journals, and industry websites.

Finally, information from the World Bank on Energy & Mining (<http://data.worldbank.org/topic/energy-and-mining>) were used to supplement both of these datasets. This dataset provides country-specific data related to transaction location. In sum, one database that includes the PLS/Derrick data, the hand-collected ownership data, and the World Bank Energy & Mining data constitute the data for this study.

## Variables

### Dependent Variables

**Buy/sell unconventional resource deposits (buyer and seller).** This dependent variable is measured as a binary variable. It has a value of 1 if the petroleum resource deposit requires unconventional technological capabilities (indicated as an unconventional resource). It has a value of 0 for petroleum resource deposits requiring conventional technological capabilities (indicated as a conventional resource).

**Buyer's purchase price of unconventional resource deposits bought (buyer).** This variable considers the purchase price paid by buyers in market-based transactions in which unconventional petroleum resource deposits are bought. This is measured as the market-based transaction value (amount in \$) minus the annual price per location. This measure incorporates how much was paid (in \$) minus the average price paid for transactions of unconventional resource deposits (in \$) in that year in the same geographic region. Transaction value is the actual value paid by the buyer in the transaction for the unconventional resource deposits. The second value, annual price per location, takes into account price differences occurring because of fluctuations in the price of the unconventional resource deposits, or because of price differences related to the location of the unconventional resource deposits. Annual price per location is the

average transaction value for unconventional resource deposits in a given year and location. This difference reflects the extent to which the buyer paid a premium price (difference is a positive value) or a discounted price (difference is a negative value). How much was paid in each location relative to other similar market-based transactions of unconventional resource deposits in the same geographic location takes into account externalities that contribute to value differentials in price. This variable is reported in dollars (\$); however the log value of this variable is used for the analyses to ensure estimation of the coefficients.

**Seller's sale price of unconventional resource deposits sold (seller).** This variable considers the seller's sale price of unconventional resource deposits sold. This is measured as the market-based transaction value (amount in \$) minus the annual price per location. This measure incorporates the sale price of the unconventional resources (in \$) minus the average price paid for transactions of unconventional resource deposits (in \$) in the same geographic region.

Transaction value is the actual value collected by the seller in the transaction for the unconventional resource deposits. The second value, annual price per location, takes into account price differences occurring because of fluctuations in the price of unconventional resource deposits, or because of price differences related to the location of the unconventional resource deposits. Annual price per location is the average transaction value for unconventional resource deposits in a given year and location. This difference reflects the extent to which the seller sold at a premium (difference is a positive value) or a discounted sale price (difference is a negative value). How much was collected in terms of sale prices in each location relative to other similar market-based transactions of unconventional resource deposits in the same geographic location takes into account externalities that contribute to value differentials in price. This variable is reported in dollars (\$); however the log value of this variable is used for the analyses to ensure estimation of the coefficients.

## **Independent Variables**

**Buyer/seller ownership.** This is a transaction-varying categorical variable that is descriptive of differences in forms of corporate ownership for both buyer and seller firms in the sample. Following La Porta et al (1999), firms can have one of five different forms of corporate ownership: 1) a family or an individual, 2) a state owner, 3) a widely-held financial institution 4) a widely-held corporation, or 5) miscellaneous. Because some forms of ownership may be mixed, the owner with the highest percentage of control determines the form of ownership for the firm.

***Target country's petroleum resource deposits.*** The target country's petroleum resource deposits is measured as the ratio of the value of the stock of petroleum resource deposits to the remaining reserve lifetime. This is a transaction-varying variable. It covers petroleum resource deposits including crude oil and natural gas. The value of the stock of petroleum resource deposits is the product of two variables: resource rents and physical quantities of petroleum extraction in the country. Resource rents are the difference between the price at which the resource is sold and its extraction and production costs (Sinner & Scherzer, 2007). Physical quantities of petroleum extraction in the country refers to the amount of petroleum that is extracted and sold, as kilotons of oil equivalent (World Bank, 2011). The remaining reserve lifetime is calculated as the amount of petroleum resource deposits known to exist and be recoverable divided by the rate of production, capped at 25 years (World Bank, 2011). Positive values indicate more petroleum resource deposits in the target country. Data are obtained from the World Bank, which collects the data from various sources such as the OECD, British Petroleum, IEA, International Petroleum Encyclopedia, UN, and national sources (World Bank, 2011). Inclusion of this variable in a linear model is appropriate as there are no distributional assumptions of predictors. This means that the predictor can have extremely low or extremely high values. On a related note, some countries may have more petroleum resource deposits than others (e.g. countries in the Middle East, countries in Africa). Extreme values for countries with

higher petroleum resource deposits may have undue leverage on the solution. Controls for these countries with higher petroleum resource deposits are described below.

### **Control Variables**

**Target country is in the Middle East.** Over the past decades, the Middle East has been a focal point of various geo-political controversies. These controversies stem from the pairing of high petroleum resource deposits with political unrest (BP, 2012). Given the geo-political concerns of this region, a binary variable controls for these matters. A value of 1 is assigned if the target country is in the Middle East, and a value of 0 is assigned otherwise. This is a transaction-invariant variable.

**Target country is in Africa.** Africa, like the Middle East, has high petroleum resource deposits but is also plagued with political unrest. Additionally, Africa is less developed in terms of hard and soft infrastructure. Relative to the Middle East where most of the natural resource deposits are under the control of the nation's governments (with less opportunity for outside participation), Africa has much less governmental control. The influence of terrorist and militia activity is coupled with ineffective or nonexistent governing systems. This can create difficulties for firms choosing to partake in transactions in this part of the world. Thus, a binary variable is created with a value of 1 if the target country is in Africa and a value of 0 otherwise. This is a transaction-invariant variable.

**Foreign direct investment.** This is measured as the ratio of the foreign direct investment (FDI) inflow to GDP (gross domestic product) of the target country. The numerator, FDI inflow, is an aggregate of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the country's balance of payments (World Bank, 2011). Inflow of FDI is both an indication of, and a contributor to, better investment climates. This is a transaction-varying variable. Similar to target country's petroleum resource deposits, inclusion of this variable in a



linear model is appropriate as there are no limits on the FDI/GDP in the target country per se. This means that the effect can have extremely low or extremely high values.

**Buyer/seller operation in alternative energy.** This control variable is measured as a binary variable. It has a value of 1 if the buyer or seller firm operates in the alternative energy industry (SIC 8742) in addition to the petroleum industry (SIC 1311). It has a value of 0 if the firm only operates in the petroleum industry.

## **Analytic Rationale**

### **Multilevel Models**

Multilevel models (MLM)<sup>6</sup> allow for modeling of multiple levels within a data structure. MLM provides flexibility in terms of including fixed and random effects (Raudenbush & Bryk, 2002). MLM is also appropriate when both categorical and continuous predictors are included in a single model.

MLM can account for nesting and crossing of variables. Nesting of variables refers to data structures in which units are nested in clusters. Nesting of data gives rise to multiple levels in the data structure. As such, MLM is appropriate to account for dependency that could arise from such units within clusters (Raudenbush & Bryk, 2002). In addition to the nesting of variables within a data structure, units of observation (such as firms, individuals, items, etc.) can also be crossed. That is, observational units can be nested in two or more clusters (Raudenbush, 1993). Multiple crossed variables can be included in a single MLM analysis by use of random effects to test for systematic variation across the multiple clusters present in the data structure (Locker Jr., Hoffman, & Bovaird, 2007). Thus, MLM has the ability to model dependency across observations and explore why dependency exists in the data (e.g. due to nesting, due to crossing, etc.). In the model proposed above, the market-based transaction of petroleum resource deposits is the unit of analysis. Each market-based transaction is nested within a buyer, a seller, and a

---

<sup>6</sup> Also referred to as a hierarchical linear model (HLM), random coefficient model (RCM) (Raudenbush & Bryk, 2002)

country. Thus, the market-based transaction of petroleum resource deposits represents Level 1 in the MLM. Buyer, seller, and country represent Level 2 in the MLM. Because there are three clusters at Level 2 (buyer, seller, country), the proposed model is a 2-level, 3-way crossed model. A graphical depiction of the nesting and crossing for the proposed model is included in Figure 3.1.

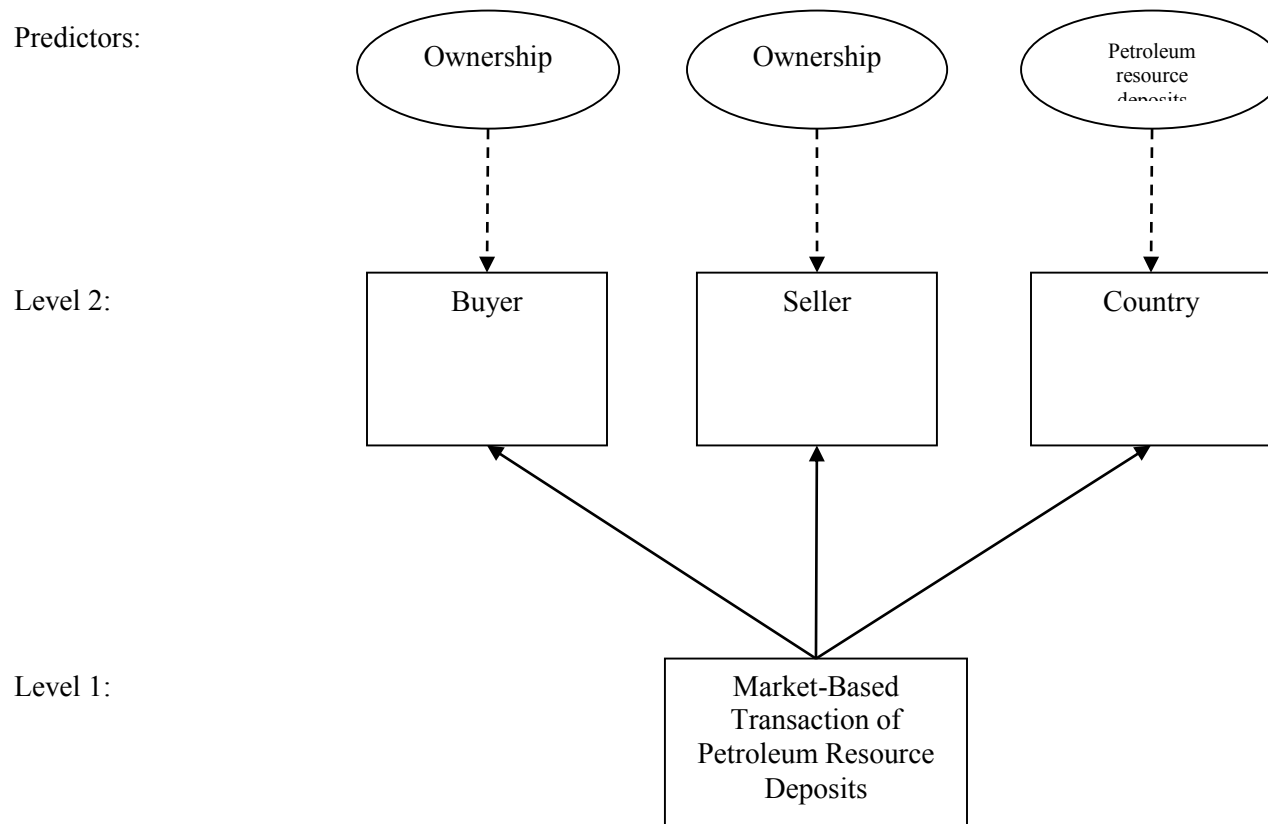


Figure 3.1

A graphical depiction of the nesting and crossing of levels in the proposed research model

MLM allows for inclusion of both fixed and random effects in a single model. Fixed effects, captured in the model for the means, predict the pattern of means in the data. Random effects, captured in the model for the variance, predict the pattern of variation and covariation in the data (Hoffman, in press). In MLM, each level in the data structure is a set of random effects. However, in crossed models, such as the one proposed in this study, each cluster at each level is a set of random effects. Explicitly, each of the three Level 2 clusters in this study (buyer, seller, and country) requires one or more effects. This results in three sets of uncorrelated random effects at Level 2. Within the proposed model, the inclusion of random effects accounts for the possibility that 1) some buyers will be more or less likely to buy unconventional resource deposits; 2) some sellers will be more or less likely to sell unconventional resource deposits; 3) some buyers will have higher purchase prices to buy unconventional resource deposits; 4) some sellers will have higher sale prices to sell unconventional resource deposits; and 5) some countries will demand higher premiums or greater discounts for buying/selling firms.

Because the proposed study includes both fixed and random effects and test for crossed random effects, MLM is more appropriate than other modeling techniques. As an example, ordinary least square (OLS) regression as an alternative technique to MLM is not as appropriate for this study. First, multiple levels in data structures can only be controlled for in OLS regression using fixed effects. MLM allows for modeling of those multiple levels via fixed or random effects. Second, MLM can model multiple sources of variation simultaneously (i.e. transactions nested within buyers, sellers, and countries) because the variances are uncorrelated across levels. OLS regression allows for controlling these multiple sources of dependency simultaneously via fixed effects using dummy variables. However, OLS falls short of testing and predicting differences across buyers, sellers, and countries. MLM can consider heterogeneous sources of variance among buyers, sellers, and countries and allows for testing of both fixed and random effects in a single model. Using MLM, the significance of new fixed effects can be tested via Wald test p-values. The significance of new random effects can be tested using likelihood ratio

tests. Third, multilevel models can be applied to two-part models. The modeling techniques including estimation and fixed and random effects will be used for both processes in the two-part model.

### **Two-Part Models**

The proposed hypotheses can be separated into hypotheses for a binary outcome (Hypotheses 1a, 1b) and for a continuous outcome (Hypotheses 2a, 2b, 3a, 3b). Models that use both binary and continuous dependent variables to capture the relationships in question are referred to as two-part models.

Two-part models are appropriate for the integration of generalized and general models to test research questions. Two-part models are comprised of two sequential processes. The first process of the generalized model of a binary variable uses a logit function. The second process of the general model of a continuous variable uses a normal or log-normal distribution depending on the shape of the distribution. The strength of two-part models is that they can first answer a binary question (such as yes/no), then answer a second question that is contingent on the first question (if yes, then how much). A two-part model is appropriate for this study because the first hypothesis tests if buyer's/seller's ownership is associated with buying/selling unconventional resource deposits. If the answer to this hypothesis is "yes", then the secondary hypothesis of the relationship between buyer's/seller's ownership and the buyer's purchase price/seller's sale price of unconventional resource deposits bought/sold can be tested.

### **The Model**

There are two complementary proposed models for this study based on three hypotheses. The first two models use a binary outcome as a dependent variable. The second two models use a continuous outcome as a dependent variable.

**Model I.** This model corresponds to Model I in Figure 1.2. The first step in this model is to estimate a baseline model of buying unconventional resource deposits as the dependent

variable. Note that Level 1 residual variance is not estimated in logistic multilevel models because  $Var(\epsilon_{BSC}) = \frac{\pi^2}{3} = 3.29$ . The following equation illustrates the empty, three-way crossed model:

I.a.

Level 1:

$$\text{BuyUnconventional}_{TBSC} = \beta_{0BSC}$$

Level 2:

$$\beta_{0BSC} = \gamma_{0000} + U_{0B00} + U_{00S0} + U_{000C}$$

The focus of this model is on the activities of buyers. Adding an effect of buyer's ownership as a Level 2, transaction-invariant predictor with a fixed effect only is reflected in the model as following:

I.b.

Level 1:

$$\text{BuyUnconventional}_{TBSC} = \beta_{0BSC}$$

Level 2:

$$\beta_{0BSC} = \gamma_{0000} + \gamma_{0100}(\text{BuyerOwn}_B) + U_{0B00} + U_{00S0} + U_{000C}$$

This model also introduces several control variables, three of which are at the country level, and one control variable at the firm level. The following demonstrates how three of these variables, all transaction-invariant, would be included in the model:

I.c.

Level 1:

$$\text{BuyUnconventional}_{TBSC} = \beta_{0BSC}$$

Level 2:

$$\beta_{0BSC} = \gamma_{0000} + \gamma_{0100}(\text{BuyerOwn}_B) + \gamma_{0200}(\text{AlternateEnergy}_B) + \gamma_{0001}(\text{MiddleEast}_C) + \gamma_{0002}(\text{Africa}_C) + U_{0B00} + U_{00S0} + U_{000C}$$

A fourth control variable, foreign direct investment (FDI) is transaction-varying. The variance of this predictor needs to be represented in both levels of the model. Group-mean-centering can be used for FDI in which the  $\beta_1$  effect is tested if it is random over buyers. If so, it can be tested if buyer ownership predicts the variance of FDI. Including FDI in the model would be represented as such:

I.d.

Level 1:

$$\text{BuyUnconventional}_{TBSC} = \beta_{0BSC} + \beta_{1BSC}$$

Level 2:

$$\beta_{0BSC} = \gamma_{0000} + \gamma_{0100}(\text{BuyerOwn}_B) + \gamma_{0200}(\text{AlternateEnergy}_B) + \gamma_{0001}(\text{MiddleEast}_C) + \gamma_{0002}(\text{Africa}_C) + \gamma_{0003}(\overline{\text{FDI}}_C - \text{constant}) + U_{0B00} + U_{00S0} + U_{000C}$$

$$\beta_{1BSC} = \gamma_{1000} + \gamma_{1000}(\text{FDI}_{TC} - \overline{\text{FDI}}_C) + U_{100C}$$

**Model III.** This model corresponds to Model III in Figure 1.2. It will be similar to Model I above in terms of building the model. However, the dependent variable in this model is different. The dependent variable is the buyer's purchase price of unconventional resource deposits bought. Though the dependent variable has changed, the process remains the same. Note that only those firms that buy unconventional resources are used in this sample.

Similar to I.a., the following equation illustrates the empty, three-way crossed model:

III.a.

Level 1:

$$\text{PurchasePrice}_{\text{TBSC}} = \beta_{0\text{BSC}} + \varepsilon_{\text{TBSC}}$$

Level 2:

$$\beta_{0\text{BSC}} = \gamma_{0000} + U_{0\text{B}00} + U_{00\text{S}0} + U_{000\text{C}}$$

Similar to I.b., the focus of this model is on the activities of buyers. Therefore the predictor of buyer form of ownership is reflected in the model:

III.b.

Level 1:

$$\text{PurchasePrice}_{\text{TBSC}} = \beta_{0\text{BSC}} + \beta_{1\text{BSC}} + \varepsilon_{\text{TBSC}}$$

Level 2:

$$\beta_{0\text{BSC}} = \gamma_{0000} + \gamma_{0100}(\text{BuyerOwn}_\text{B}) + U_{0\text{B}00} + U_{00\text{S}0} + U_{000\text{C}}$$

$$\beta_{1\text{BSC}} = \gamma_{1000} + \gamma_{1000}(\text{Unconventional}_{\text{TBC}}) + \gamma_{1100}(\text{BuyerOwn}_\text{B})(\text{Unconventional}_{\text{TBC}}) + U_{000\text{C}}$$

Similar to I.c. and I.d., control variables are introduced:

III.c.

Level 1:

$$\text{PurchasePrice}_{\text{TBSC}} = \beta_{0\text{BSC}} + \beta_{1\text{BSC}} + \varepsilon_{\text{TBSC}}$$

Level 2:

$$\beta_{0\text{BSC}} = \gamma_{0000} + \gamma_{0100}(\text{BuyerOwn}_\text{B}) + \gamma_{0200}(\text{AlternateEnergy}_\text{B}) + \gamma_{0001}(\text{MiddleEast}_\text{C}) + \gamma_{0002}(\text{Africa}_\text{C}) + \gamma_{003}(\overline{\text{FDI}}_\text{C} - \text{constant}) + U_{0\text{B}00} + U_{00\text{S}0} + U_{000\text{C}}$$

$$\beta_{1\text{BSC}} = \gamma_{1000} + \gamma_{1000}(\text{Unconventional}_{\text{TBC}}) + \gamma_{1100}(\text{BuyerOwn}_\text{B})(\text{Unconventional}_{\text{TBC}}) + \gamma_{1000}(\text{FDI}_{\text{TC}} - \overline{\text{FDI}}_\text{C}) + U_{000\text{C}}$$



Similar to FDI, the variance of the transaction-varying predictor target country petroleum resource deposits needs to be represented in both levels of the model. Group-mean-centering is used for target country petroleum resource deposits in which the  $\beta_1$  effect is tested if it is random over buyers. If so, it can be tested if buyer ownership predicts the variance of target country petroleum resource deposits. Including target country petroleum resource deposits in the model along with its interaction with buyer ownership would be represented as such:

III.d.

Level 1:

$$\text{PurchasePrice}_{\text{TBSC}} = \beta_{0\text{BSC}} + \beta_{1\text{BSC}} + \beta_{2\text{BSC}} + \varepsilon_{\text{TBSC}}$$

Level 2:

$$\begin{aligned} \beta_{0\text{BSC}} = & \gamma_{0000} + \gamma_{0100}(\text{BuyerOwn}_B) + \gamma_{0200}(\text{AlternateEnergy}_B) + \\ & \gamma_{0001}(\overline{\text{TargetCountryResourceDeposits}_C} - \text{constant}) + \gamma_{0002}(\text{MiddleEast}_C) + \\ & \gamma_{0003}(\text{Africa}_C) + \gamma_{0004}(\overline{\text{FDI}_C} - \text{constant}) + U_{0B00} + U_{00S0} + U_{000C} \end{aligned}$$

$$\begin{aligned} \beta_{1\text{BSC}} = & \gamma_{1000} + \gamma_{1000}(\text{FDI}_{\text{TC}} - \overline{\text{FDI}_C}) + \gamma_{1000}(\text{TargetCountryResourceDeposits}_{\text{TC}} - \\ & \overline{\text{TargetCountryResourceDeposits}_C}) + \gamma_{1000}(\text{Unconventional}_{\text{TBSC}}) + \\ & \gamma_{1100}(\text{BuyerOwn}_B)(\text{Unconventional}_{\text{TBSC}}) + U_{000C} \end{aligned}$$

$$\begin{aligned} \beta_{2\text{BSC}} = & \gamma_{2100}(\text{BuyerOwn}_B)(\text{Unconventional}_{\text{TBSC}})(\text{TargetCountryResourceDeposits}_{\text{TC}} - \\ & \overline{\text{TargetCountryResourceDeposits}_C}) + \\ & \gamma_{2200}(\text{BuyerOwn}_B)(\text{Unconventional}_{\text{TBSC}})(\overline{\text{TargetCountryResourceDeposits}_C} - \\ & \text{constant}) \end{aligned}$$

Models II and IV as indicated in Figure 1.2 follow a similar pattern to Models I and III, except focus on the activities of sellers. Building these two models can be extrapolated from the equations included in Models I and III above.

## **Analysis Methods**

All of the hypotheses are tested using SAS PROC GLIMMIX. SAS is used because it allows for both general and generalized models. The proposed two-part model is tested using the same procedure (GLIMMIX) in the SAS software. The initial models for the binary dependent variable (Hypothesis 1a, Hypothesis 1b) are tested using SAS PROC GLIMMIX using a generalized MLM. The subsequent models for the continuous dependent variable (Hypothesis 2a, Hypothesis 2b, Hypothesis 3a, Hypothesis 3b) are also tested using SAS PROC GLIMMIX using a general MLM. The strength of SAS PROC GLIMMIX is that if the continuous dependent variable does not have a normal distribution, other distributions are available that can better estimate the actual distribution of the data. Some of these distributions include the lognormal distribution, the gamma distribution, the Gaussian distribution, and the Poisson distribution, among others (SAS, 2013).

SAS PROC GLIMMIX is also appropriate because it allows the researcher to perform MLM. This accounts for the 2-level, 3-way crossed model. Models 1a and 2a are estimated in maximum likelihood using the Laplace estimator. Laplace approximation is used to approximate likelihoods in “generalized linear models with nested random effects” (Raudenbush, Yang, & Yosef, 2000, p. 154). Laplace has been used when correcting bias associated with nested random effects (Breslow & Lin, 1995) and when there are multiple random effects in a single cluster (Lin & Breslow, 1996). Raudenbush and colleagues (2000) argue that Laplace approximation is advantageous in these scenarios because “1) integration per cluster is fully multivariate with arbitrary dimension; 2) the approximation is accurate to any degree required; 3) convergence is numerical rather than stochastic; and 4) computations are remarkably fast” (p. 144). Given that this study employs a 2-level, 3-way crossed generalized linear model with nested random effects, Laplace approximation is an appropriate estimator to use.

## **Potential Issues with Model Estimation**

When estimating multilevel models, there are considerations with regards to estimation that require attention. Because the proposed model is a 2-level, 3-way crossed model, there may be issues in estimating all three, or even two, of the crossings in a single model. There are several contingencies that can be made which modify the proposed model but still test the relationships in question.

As stated above, all models are estimated using maximum likelihood in SAS PROC GLIMMIX. If these models do not estimate using this procedure, an alternate procedure may be used. SAS PROC MCMC is one alternate procedure. According to the SAS user guide, “PROC MCMC assumes that all observations in the data set are independent” (SAS, 2013). PROC MCMC also has the capability to include random effects. This is similar to maximum likelihood, but the calculation of the PDF is different in PROC MCMC than in a Logit or Laplace distribution.

In addition to using a different procedure, fixed effects can be substituted for random effects to improve estimation. For example, in Model I, the random effect for seller,  $U_{00S0}$  and/or country  $U_{000C}$  can be substituted for fixed effects for these variables. To do this, these variables would be included in the CLASS statement, but not on the RANDOM statement. In doing so, these variables are no longer identifier variables for that particular dimension of the model. Instead, they become predictors in the CLASS and MODEL statements. This may be appropriate for Model I because the hypotheses related to this model focus on the relationship between the buyer ownership and the activities of the buyer. Thus, the buyer is still a random effect, even if the seller and country are fixed effects. Similar steps with regards to substitution of random effects for fixed effects can be taken for Model II, Model III, and Model IV. This would be done similarly using the CLASS statement as indicated above.

### **Potential Issues with Data Collection**

There are two potential issues with data collection. The first issue is collecting an adequate sample size from the primary dataset. The second issue is the availability of data to construct the secondary dataset on corporate ownership.

Collecting an adequate sample size from the primary dataset does not appear to be an issue. The total population of global market-based transactions from 1/1/2005–12/31/2012 is 5471. The total population of unconventional global market-based transactions from 1/1/2005–12/31/2012 is 1108. The total population of unconventional global market-based transactions from 1/1/2005–12/31/2012 that disclose the buyer is 974. The total population of unconventional global market-based transactions from 1/1/2005–12/31/2012 that were cancelled (were not completed) is 35. The total population of unconventional global market-based transactions from 1/1/2005–12/31/2012 that disclose the seller is 794. The total population of unconventional global market-based transactions from 1/1/2005–12/31/2012 that do not disclose the buyer or the seller is 12. Given these initial examinations, the maximum sample size is over 700 market-based transactions.

With regard to the second issue related to the availability of data to construct the secondary dataset on corporate ownership, these data are more difficult to collect. The University of Nebraska-Lincoln does not subscribe to three ownership datasets that would be helpful in identifying some forms of ownership. However, a listing of state owned firms is available through an industry resource, Gulf Oil & Gas. Therefore all state owned firms will be identified. Institutional (widely-held financial, widely-held corporations, and miscellaneous) and mutual fund (miscellaneous) ownership data are available through MSN Money. Initial Google searches for specific firms indicate that ownership data can be collected for many firms. Given that the maximum sample is over 700 market-based transactions, the missing ownership data should not reduce the sample size below 200, which is a guideline for a minimum sample size for MLM. However, if there is not enough ownership data available for an adequate sample size, and alternate solution could be possible. A previous study on ownership in the petroleum industry

contrasted publicly-traded, privately-held, and state owned firms (Mascarenhas, 1989). These three forms of ownership can be collected if the five forms as proposed by La Porta et al (1999) create too much missing data in the dataset.

### **Summary**

This chapter outlined the methodology for this research. Rationale behind the setting for this study was presented, as well as a description of how the sample is to be obtained. Definitions and measures of the variables presented in the research model were provided. In addition, the analytic rationale of employing a two-part multilevel method was presented in detail. The model to be estimated, including equations, was detailed for Model I, Model II, Model III, and Model IV. Finally, the analysis methods to be used in this proposed study as well as some potential issues with model estimation were suggested.

## CHAPTER FOUR - RESULTS

This chapter presents the results of the analysis described in Chapter Three. Sample descriptive statistics are presented in Table 4.1 followed by correlations for the variables of interest in Table 4.2. This is followed by a discussion of the results of tests of unconditional models in Tables 4.3-4.4. Following is a presentation of the results of tests of conditional models. The results of first set of hypothesis tests assessing the relationship between corporate ownership and radical boundary spanning are presented in Tables 4.5-4.7. The results of the second set of hypothesis tests assessing the relationship between corporate ownership and commitment to radical boundary spanning, and the influence of target country's resource attractiveness, are presented in Tables 4.8-4.15. A summary of the results of the hypothesis tests is then provided, along with an accompanying table (Table 4.16).

### **Descriptive Statistics and Correlations**

The descriptive statistics and correlations of the full sample in this study are shown in Table 4.1 and Table 4.2 below.

Table 4.1

Sample characteristics: Market-based transactions for petroleum resources by multinational corporations (MNCs)

|  |          |
|--|----------|
| <b>Average Financial Data of Transactions:</b>   | Mean     |
| Transaction Value, in millions of dollars  | 428.97   |
| <b>Distribution of Transactions by Calendar Year of Announcement:</b>                                    | Freq (%) |
| 2005   | 1.66     |
| 2006   | 6.72     |
| 2007   | 8.38     |
| 2008   | 9.89     |
| 2009   | 11.32    |
| 2010   | 17.28    |
| 2011   | 23.09    |
| 2012   | 21.66    |
| <b>Distribution of Transactions Based on Buyer Firm Ownership:</b>                                       | Freq (%) |
| • Family or Individual   | 8.82     |
| • State  | 14.80    |
| • Widely-held Financial  | 29.14    |
| • Widely-held Corporate  | 24.24    |
| • Miscellaneous  | 22.99    |
| <b>Distribution of Transactions Based on Seller Firm Ownership:</b>                                      | Freq (%) |
| • Family or Individual   | 7.77     |
| • State  | 4.56     |
| • Widely-held Financial  | 26.80    |
| • Widely-held Corporate  | 30.68    |
| • Miscellaneous  | 30.19    |
| <b>Average Financial Data of Countries:</b>  | Mean     |
| Foreign Direct Investment, in %  | 3.70%    |
| Target Country's Petroleum Resource Deposits, in billions of dollars                                     | 50.77    |
| <b>Distribution of Transactions by Hydrocarbon Category:</b>   | Freq (%) |
| Conventional   | 84.08    |
| Unconventional   | 15.92    |
| <b>Distribution of Transactions by Regions Where Petroleum Resource Deposit Being Bought is Located:</b> | Freq (%) |
| Africa   | 15.32    |
| Asia (Excluding Middle East and Former Soviet Regions)   | 8.00     |
| Australia  | 8.23     |
| Former Soviet Union  | 5.89     |
| Middle East  | 3.02     |
| North America's Gulf of Mexico   | 3.62     |
| North America (excluding Gulf of Mexico)   | 25.96    |

|  |                    |
|--|--------------------|
| North Sea  | 11.85              |
| Europe (excluding North Sea)   | 6.57               |
| South/Central America  | 11.55              |
| <b>Countries in which Transactions Occurred:</b>   | Total<br>Countries |
| Albania, Algeria, Angola, Argentina, Armenia, Australia, Azerbaijan, Bahamas, Bangladesh, Bolivia, Brazil, Brunei, Bulgaria, Cameroon, Canada, Chad, Chile, China, Colombia, Congo, Czech Republic, Democratic Republic of Congo, Denmark, Ecuador, Egypt, Equatorial Guinea, Ethiopia, Falkland Islands, France, French EEZ (Juan de Nova Island), French Guiana, Gabon, Gambia, Georgia, Germany, Ghana, Great Britain, Greenland, Guatemala, Guinea, Guyana, Hungary, India, Indonesia, Iraq, Ireland, Israel, Italy, Ivory Coast, Kazakhstan, Kenya, Liberia, Libya, Lithuania, Madagascar, Malaysia, Mali, Malta, Mauritania, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Netherlands, New Zealand, Nigeria, Nigeria-Pincipe-SaoTome JDZ, Norway, Oman, Pakistan, Papua New Guinea, Peru, Philippines, Poland, Qatar, Romania, Russia, Serbia, Seychelles, Sierra Leone, Slovenia, Somalia, Somaliland, South Africa, Spain, Sudan, Switzerland, Syria, Tajikistan, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United States, Uruguay, Venezuela, Vietnam, Yemen | 102                |
| Sample size: 1325 market-based transactions (events).  |                    |



Table 4.2

Descriptive statistics and correlations: Transactions by multinational corporations (MNCs)

| Variable  | Mean | Std Dev | 1        | 2        | 3        | 4      | 5        | 6       | 7     | 8     | 9    | 10    | 11      | 12   |
|---|------|---------|----------|----------|----------|--------|----------|---------|-------|-------|------|-------|---------|------|
| <i>Dependent Variables</i>  |      |         |          |          |          |        |          |         |       |       |      |       |         |      |
| 1 Buying/Selling Unconventional Resource Deposits                           | 0.16 | 0.37    | 1.00     |          |          |        |          |         |       |       |      |       |         |      |
| 2 Purchase/Sale Price of Unconventional Resource Deposits Bought/Sold (log) | 0.00 | 2.28    | 0.15***  | 1.00     |          |        |          |         |       |       |      |       |         |      |
| <i>Control Variables</i>  |      |         |          |          |          |        |          |         |       |       |      |       |         |      |
| 3 Foreign Direct Investment (%) – Level 2                                   | 0.10 | 4.98    | -0.07*   | 0.04     | 1.00     |        |          |         |       |       |      |       |         |      |
| 4 Foreign Direct Investment (%) – Level 1                                   | 0.00 | 2.97    | -0.06    | -0.02    | 0.44***  | 1.00   |          |         |       |       |      |       |         |      |
| 5 Africa (binary)   | 0.15 | 0.36    | -0.18*** | 0.00     | 0.14***  | 0.00   | 1.00     |         |       |       |      |       |         |      |
| 6 Middle East (binary)  | 0.03 | 0.17    | -0.08**  | 0.00     | -0.03    | 0.00   | -0.08**  | 1.00    |       |       |      |       |         |      |
| 7 Buyer Operates in Alternative Energy (binary)                             | 0.05 | 0.22    | 0.13***  | 0.14***  | 0.05     | 0.01   | -0.05    | 0.00    | 1.00  |       |      |       |         |      |
| 8 Seller Operates in Alternative Energy (binary)                            | 0.04 | 0.20    | -0.03    | 0.14***  | -0.02    | 0.02   | 0.00     | -0.01   | -0.01 | 1.00  |      |       |         |      |
| <i>Independent Variables</i>  |      |         |          |          |          |        |          |         |       |       |      |       |         |      |
| 9 Buyer Ownership (category)  | 2.38 | 1.23    | -0.02    | -0.13*** | -0.09**  | -0.04  | -0.03    | 0.03    | 0.02  | -0.03 | 1.00 |       |         |      |
| 10 Seller Ownership (category)  | 2.71 | 1.17    | 0.09**   | -0.03    | -0.09**  | -0.04  | -0.01*   | 0.00    | -0.02 | -0.01 | 0.05 | 1.00  |         |      |
| 11 Target Country's Petroleum Resource Deposits (\$) – Level 2              | 0.00 | 63.96   | 0.23***  | 0.00     | -0.19*** | 0.00   | -0.30*** | -0.08** | 0.02  | 0.01  | 0.01 | 0.07  | 1.00    |      |
| 12 Target Country's Petroleum Resource Deposits (\$) – Level 1              | 0.00 | 26.40   | -0.02    | 0.01     | -0.02    | 0.09** | 0.00     | 0.00    | -0.02 | 0.01  | 0.05 | -0.04 | 0.26*** | 1.00 |

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ .

As indicated in Table 4.1, the full sample consisted of 1325 market-based transactions (events). The mean transaction value was 428.97 million USD. For the analyses, this variable was log transformed as indicated in the previous chapter. The log transformed mean for this variable was 3.61 with a standard deviation of 2.44. Mean FDI across all countries for all years was 3.70% with a standard deviation of 5.85%. Mean country petroleum resource deposits across all countries for all years was 50.77 billion USD with a standard deviation of 6.74 billion USD.

The descriptive statistics support several of the assumptions from the previous chapters. First, all five forms of ownership were present in the sample used for the study. In terms of distribution for buyer MNCs, 8.82% of all transactions involved a family or individual owned MNC; 14.80% involved a state owned MNC; 29.14% were owned by a widely-held financial MNC; 24.24% were MNCs with a widely-held corporate owner; and 22.99% had a miscellaneous owner such as a pension or mutual fund, a private equity owner, or were employee owned, etc. The distribution for seller MNCs in the sample was similar: 7.77% of all transactions involved a family or individual owned MNC; 4.56% involved a state owned MNC; 26.80% were owned by a widely-held financial MNC; 30.68% were an MNC with a widely-held corporate owner; and 30.19% had a miscellaneous owner. Family or individual owned MNCs appeared more often as buyers than sellers (8.82% as buyers versus 7.77% as sellers), state owned MNCs appeared more often as buyers than sellers (14.80% as buyers, 4.57% as sellers). Widely-held financial owned MNCs appeared more as buyers than sellers (29.14% versus 26.80%). However, both widely-held corporate and miscellaneous owned MNCs appeared more often as sellers than buyers (30.68% versus 24.24%, and 30.19% versus 22.99%, respectively).

Second, transactions occurred in 102 countries, categorized by ten geographic regions from the most to least frequently occurring in the sample: North America (excluding Gulf of Mexico) (25.96%), Africa (15.32%), North Sea (11.85%), South/Central America (11.55%), Australia (8.23%), Asia (excluding Middle East and Former Soviet Regions) (8.00%), Europe

(excluding North Sea) (6.57%), Former Soviet Union (5.89%), North America's Gulf of Mexico (3.62%), and the Middle East (3.02%).

Also notable from the descriptive statistics was that the number of transactions increased over the time period in the sample. Broken down by year represented in the sample: 1.66% of all transactions in the sample occurred in 2005; 6.72% occurred in 2006; 8.38% occurred in 2007; 9.89% occurred in 2008; 11.32% occurred in 2009; 17.28% occurred in 2010; 23.09% occurred in 2011; and 21.66% occurred in 2012. There were steady increases from year to year, except for in 2012, where the number of transactions in the sample was 1.43% less than in 2011.

Third, the sample reflects the sentiment that radical boundary spanning was a less common strategic activity of MNCs. In terms of the distribution of transactions by hydrocarbon category, 15.92% of the sample were transactions involving unconventional petroleum resource deposits, and the remaining 84.08% of transactions in the sample were for conventional petroleum resource deposits. As argued in the previous chapters, unconventional petroleum resource deposits are indicative of radical boundary spanning whereas conventional petroleum resource deposits are not.

Table 4.2 exemplifies the correlations for the variables of interest. With regard to the dependent variables, there was a positive correlation between buying/selling unconventional resource deposits and the purchase/sale price of the unconventional resource deposits bought/sold (log transformed) ( $r = 0.15, p < 0.001$ ). With regard to control variables, there was a negative correlation between between-country (level 2) FDI and buying/selling unconventional resource deposits ( $r = -0.07, p < 0.05$ ) and a positive correlation between between-country (level 2) FDI and within-country (level 1) FDI ( $r = 0.44, p < 0.001$ ). There was a negative relationship of the transaction's location in Africa with buying/selling unconventional resource deposits ( $r = -0.18, p < 0.001$ ) and a positive correlation with between-country (level 2) FDI ( $r = 0.14, p < 0.001$ ). There was a negative correlation of the transaction's location in the Middle East with buying/selling unconventional resource deposits ( $r = -0.08, p < 0.01$ ) and a negative correlation

with Africa ( $r = -0.08, p < 0.01$ ). Additionally, there were positive correlations of the buyer firm operating in alternative energy with buying/selling of unconventional resource deposits ( $r = 0.13, p < 0.001$ ) as well as the purchase/sale price of the unconventional resource deposits bought/sold ( $r = 0.14, p < 0.001$ ). There was also a positive relationship between the seller firm operating in alternative energy and the purchase/sale price of the unconventional petroleum resource deposits bought/sold ( $r = 0.14, p < 0.001$ ).

In terms of independent variables, buyer ownership was negatively correlated with the purchase/sale price of the unconventional resource deposits bought/sold ( $r = -0.13, p < 0.001$ ) and between-country (level 2) FDI ( $r = -0.09, p < 0.01$ ). Seller ownership was positively correlated with the buying/selling unconventional resource deposits ( $r = 0.09, p < 0.01$ ) and negatively correlated with between-country (level 2) FDI ( $r = -0.09, p < 0.01$ ) and Africa ( $r = -0.01, p < 0.05$ ). Finally, the between-country (level 2) petroleum resource deposits was positively correlated with buying/selling unconventional resource deposits ( $r = 0.23, p < 0.001$ ) and negatively correlated with between-country (level 2) FDI ( $r = -0.19, p < 0.001$ ), Africa ( $r = -0.30, p < 0.001$ ), and the Middle East ( $r = -0.09, p < 0.01$ ). The within-country (level 1) petroleum resource deposits was positively correlated with within-country (level 1) foreign direct investment ( $r = 0.09, p < 0.01$ ) and between-country (level 2) petroleum resource deposits ( $r = 0.26, p < 0.001$ ).

### **Results of Unconditional (Empty) Multilevel Models**

All analyses were conducted using the GLIMMIX procedure in maximum likelihood (ML) in SAS 9.3. As indicated in the previous chapter, three clusters existed in the data: (1) country in which the petroleum resources are located (countries) for the market-based transaction, (2) the firm that acts at the buyer in the market-based transaction (buyers), and (3) the firm that acts as the seller in the market-based transaction (sellers).

To account for nesting in the data, a series of crossed mixed effects models (including both fixed and random effects) were tested to model multiple sources of variation simultaneously

(variables of interest nested in countries, buyers, and sellers). These were done separately for both dependent variables. The results of the process for the dependent variable that measures radical boundary spanning are shown in Table 4.3. The extent to which systematic variability (random effects) in the outcomes selected for study for each dimension of sampling (nesting within country, buyer, and seller) was first examined in a series of empty models (i.e., no predictors) for both sets of models with buyer- and seller- specific predictors for the outcomes of interest.

For the model for buyer-specific predictors, the addition of a random intercept for country significantly improved model fit. This indicated that some countries were more likely to host transactions in which unconventional resource deposits are bought than others. The addition of a random intercept for buyers also significantly improved model fit. This indicated that some buyers were more likely to buy unconventional resource deposits than others. A random intercept for sellers was then input into the model to test for systematic variation across sellers; however, the model was inestimable. The final model to test buyer-specific predictors of buying unconventional resource deposits included random intercepts for countries and buyers. A random intercept for countries was related to 41% of the variance. A random intercept for buyers was related to 49% of the total variance. Confidence intervals were calculated for the probability of each of the random intercepts, calculated as the fixed effect for the intercept  $\pm 1.96$  multiplied by the square root of the respective random intercept variance. Ninety-five percent of the countries had a probability of 0.00-37.29% of hosting a transaction in which unconventional resource deposits were bought. Similarly, 95% percent of the buyer MNCs had a probability of 0.00-52.97% of buying unconventional resource deposits.

For the model for seller-specific predictors of selling unconventional resource deposits, the addition of a random intercept for countries significantly improved model fit. The addition of a random intercept for sellers also significantly improved model fit. This indicated that some countries were more likely to host transactions of unconventional resource deposits and some sellers were more likely to sell unconventional resource deposits than others. Although a random

intercept for buyers was then input into the model to test for systematic variation across buyers, the model was inestimable. The final model to test seller-specific predictors of selling unconventional resource deposits included random intercepts for countries and sellers. The random intercept for country was related to 59% of the total variance, and the random intercept for sellers was related to 32% of the total variance. Using the same calculation for confidence intervals as mentioned above, 95% of the countries had a 0.00-80.46% probability of being host to a transaction in which unconventional resource deposits were sold. Similarly, 95% percent of the seller MNCs had a probability of 0.00-29.33% of selling unconventional resource deposits.

Table 4.3  
Fit statistics and model comparisons for buyer and seller ownership as predictors of  
buying/selling unconventional resource deposits

| <b>BUYER OWNERSHIP</b>  |                         |                                |       |       |
|---|-------------------------|--------------------------------|-------|-------|
|   | #Variance<br>Parameters | (-2LL)                         | AIC   | BIC   |
| <i>e</i> -only model  | 2                       | 783.1                          | 785.1 | 789.9 |
| Random intercept for Countries  | 3                       | 587.8                          | 582.8 | 587.8 |
| Random intercepts for Countries, Buyers                                     | 4                       | 527.3                          | 533.3 | 527.3 |
| Deviance Difference Tests   |                         |                                |       |       |
|   | $\Delta$ DF             | (-2 $\Delta$ LL)               | $p <$ |       |
| <i>e</i> -only model vs. Random intercept for Countries                     | 1                       | 204.3                          | 0.000 |       |
| Random intercept for Countries vs. Random intercepts for Countries, Buyers  | 1                       | 51.6                           | 0.000 |       |
| Variance for model with random intercepts for Countries, Buyers             |                         |                                |       |       |
|   | Variance                | Related Proportion of Variance |       |       |
| Random intercept for Countries  | 12.7                    | 41%                            |       |       |
| Random intercept for Buyers   | 15.2                    | 49%                            |       |       |
| Residual for Transactions   | 3.29                    | 11%                            |       |       |
| <b>SELLER OWNERSHIP</b>   |                         |                                |       |       |
|   | #Variance<br>Parameters | (-2LL)                         | AIC   | BIC   |
| <i>e</i> -only model  | 2                       | 783.1                          | 785.1 | 789.9 |
| Random intercept for Countries  | 3                       | 587.8                          | 582.8 | 587.8 |
| Random intercepts for Countries, Sellers                                    | 4                       | 547.0                          | 553.0 | 547.0 |
| Deviance Difference Tests   |                         |                                |       |       |
|   | $\Delta$ DF             | (-2 $\Delta$ LL)               | $p <$ |       |
| <i>e</i> -only model vs. Random intercept for Countries                     | 1                       | 204.3                          | 0.000 |       |
| Random intercept for Countries vs. Random intercepts for Countries, Sellers | 1                       | 31.8                           | 0.000 |       |
| Variance for model with random intercepts for Countries, Sellers            |                         |                                |       |       |
|   | Variance                | Related Proportion of Variance |       |       |
| Random intercept for Countries  | 19.3                    | 59%                            |       |       |
| Random intercept for Sellers  | 10.4                    | 32%                            |       |       |
| Residual for Transactions   | 3.29                    | 10%                            |       |       |

Table 4.4

Fit statistics and model comparisons for buyer and seller ownership as predictors of the purchase/sale price of unconventional resource deposits bought/sold

| <b>BUYER OWNERSHIP</b>  |                      |                                |        |        |
|---|----------------------|--------------------------------|--------|--------|
|   | #Variance Parameters | (-2LL)                         | AIC    | BIC    |
| <i>e</i> -only model  | 2                    | 3677.3                         | 3681.3 | 3690.7 |
| Random intercept for Countries  | 3                    | 3660.8                         | 3666.8 | 3674.2 |
| Random intercepts for Countries, Buyers                                     | 4                    | 3554.5                         | 3562.5 | 3554.5 |
| <i>*Random intercept for Buyer</i>  | 3                    | 3557.5                         | 3563.5 | 3575.3 |
| Deviance Difference Tests   |                      |                                |        |        |
|   | $\Delta DF$          | (-2 $\Delta LL$ )              | $p <$  |        |
| <i>e</i> -only model vs. Random intercept for Countries                     | 1                    | 16.5                           | 0.001  |        |
| Random intercept for Countries vs. Random intercepts for Countries, Buyers  | 1                    | 106.3                          | 0.000  |        |
| <i>*e-only model vs. Random intercept for Buyers</i>                        | 1                    | 103.3                          | 0.000  |        |
| Variance for model with random intercept for Buyers                         |                      |                                |        |        |
|   | Variance             | Related Proportion of Variance |        |        |
| Random intercept for Buyers   | 2.0                  | 40%                            |        |        |
| Residual for Transactions   | 3.0                  | 60%                            |        |        |
| <b>SELLER OWNERSHIP</b>   |                      |                                |        |        |
|   | #Variance Parameters | (-2LL)                         | AIC    | BIC    |
| <i>e</i> -only model  | 2                    | 3677.3                         | 3681.3 | 3690.7 |
| Random intercept for Countries  | 3                    | 3660.8                         | 3666.8 | 3674.2 |
| Random intercepts for Countries, Sellers                                    | 4                    | 3558.1                         | 3566.1 | 3558.1 |
| Deviance Difference Tests   |                      |                                |        |        |
|   | $\Delta DF$          | (-2 $\Delta LL$ )              | $p <$  |        |
| <i>e</i> -only model vs. Random intercept for Countries                     | 1                    | 16.5                           | 0.001  |        |
| Random intercept for Countries vs. Random intercepts for Countries, Sellers | 1                    | 102.7                          | 0.000  |        |
| Variance for model with random intercepts for Countries, Sellers            |                      |                                |        |        |
|   | Variance             | Related Proportion of Variance |        |        |
| Random intercept for Countries  | 0.3                  | 7%                             |        |        |
| Random intercept for Sellers  | 1.8                  | 36%                            |        |        |
| Residual for Transactions   | 2.9                  | 58%                            |        |        |

*\* used for Models C1-C4 in Table 4.8.*



A similar process was followed to test for systematic variability across predictors for the dependent variable measuring the purchase/sale price of unconventional resource deposits bought/sold. The results of this process are shown in Table 4.4.

For the model for buyer-specific predictors, the addition of a random intercept for countries significantly improved model fit. This indicated that some countries demand higher prices than other countries for the purchase of unconventional resource deposits. The addition of a random intercept for buyers also significantly improved model fit. This indicated that some buyers pay higher prices to buy unconventional resource deposits. The random intercept for sellers was inestimable. Similarly, once predictors were included in the model, the random intercept for countries was inestimable. Therefore, the final model to test buyer-specific predictors of commitment to radical boundary spanning included a random intercept for buyers. The proportion of the total variance due to the random intercept for buyers was 40%. Using the same calculation for confidence intervals as mentioned in the previous models, 95% percent of the buyer MNCs were expected to have a mean premium purchase price for resource deposits bought between 0.06 below and 16.49 million USD above the mean purchase price for that region and year.

For the model for seller-specific predictors of sale price of unconventional resource deposits sold, the addition of a random intercept variance for countries significantly improved model fit. The addition of a random intercept for sellers also significantly improved model fit. This indicated that some countries demanded higher prices than other countries for the purchase of unconventional resource deposits, and some sellers received higher prices for the sale of unconventional resource deposits than others. The random intercept for buyers was inestimable. The final model to test seller-specific predictors of the sale price of unconventional resource deposits sold included random intercepts for countries and sellers. The proportion of the total variance due to the random intercept for countries was 7% and due to the random intercept for sellers was 36%. Using the same calculation for confidence intervals as mentioned above, 95% of

the countries hosted transactions in which the expected sale price for resource deposits sold ranged from -1.03 below to 1.23 million USD above the mean sale price for that region and year. Similarly, 95% percent of the seller MNCs were expected to have a mean sale price for resource deposits sold between -2.54 below and 2.74 million USD above the mean sale price for that region and year.

### Results of Conditional Multilevel Models

#### Corporate Ownership and Radical Boundary Spanning

The results of the multilevel models related to the dependent variable measuring radical boundary spanning are shown in Table 4.5. It was hypothesized that the form of corporate ownership is related to buying/selling of unconventional resource deposits. The composite equation for hypothesis 1a is provided below. This equation corresponds to model A2 in Table 4.5.

$$\begin{aligned} \text{BuyUnconventional}_{\text{TBC}} = & \gamma_{000} + \gamma_{010}(\text{MiscellaneousVsFamily/Individual}_B) + \\ & \gamma_{020}(\text{MiscellaneousVsState}_B) + \gamma_{030}(\text{MiscellaneousVsCorporate}_B) + \\ & \gamma_{040}(\text{MiscellaneousVsFinancial}_B) + \gamma_{050}(\text{AlternateEnergy}_B) + \\ & \gamma_{001}(\text{MiddleEast}_C) + \gamma_{002}(\text{Africa}_C) + \gamma_{003}(\overline{\text{FDI}}_C - \text{constant}) + \gamma_{100}(\text{FDI}_{\text{TC}} - \\ & \overline{\text{FDI}}_C) + U_{0B0} + U_{00C} \end{aligned}$$

Hypothesis 1a was specific to the relationship between buyer form of ownership and buying unconventional resource deposits. The omnibus effect for the five forms of buyer ownership was not significant  $F(4, 318) = 1.85, p = 0.12$ , indicative that the form of buyer firm ownership was not significantly related to buying unconventional resource deposits. However, pairwise comparisons were used to examine if there are significant differences in buying unconventional resource deposits between the specific forms of buyer ownership. As demonstrated in Table 4.6, family or individual owned MNCs were significantly less likely to buy unconventional resource deposits (Probability = 0.00%) than state owned MNCs (Probability =

0.13%); financial owned MNCs (Probability = 0.04%); corporate owned MNCs (Probability = 0.04%); and miscellaneous owned buyer MNCs (Probability = 0.05%). There were no significant mean differences among the other pairwise comparisons. This indicated that, although each form of ownership was less likely to buy unconventional resource deposits than not, as indicated by the negative conditional logit means in Table 4.6, family or individual owned buyer MNCs were significantly less likely to do so than all other buyer MNCs. The probability of family or individual owned buyer MNCs of buying unconventional resource deposits was 0.00% as indicated in Table 4.6. Note that the probabilities in Table 4.6 are fractions of percentages.

Figure 4.1 illustrates the relationship between each form of firm ownership and buying unconventional resource deposits in logits and probabilities, and also indicates significant mean differences in the pairwise comparisons. In sum, although there was no significant omnibus effect for the relationship between buyer form of ownership and buying unconventional resource deposits, family or individual owned MNCs were significantly less likely than all other MNCs to buy unconventional resource deposits. Therefore there is partial support for hypothesis 1a.

Table 4.5

Results for crossed countries, buyers, and sellers for forms of firm ownership for buyers and sellers and buying/selling of unconventional resource deposits

| <b>Buying/Selling of Unconventional Resource Deposits</b><br>(as dependent variable for)<br><b>Radical Boundary Spanning</b><br>(construct) |                             |                   |                             |                   |                             |                   |                             |                   |  |
|---|-----------------------------|-------------------|-----------------------------|-------------------|-----------------------------|-------------------|-----------------------------|-------------------|--|
|   | MODEL A1<br>Covariates Only |                   | MODEL A2<br>Covariates Only |                   | MODEL B1<br>Covariates Only |                   | MODEL B2<br>Covariates Only |                   |  |
|   | Estimate<br>b               | Standard<br>Error | Estimate<br>b               | Standard<br>Error | Estimate<br>b               | Standard<br>Error | Estimate<br>b               | Standard<br>Error |  |
| Intercept   | -7.11***                    | 1.37              | -7.67***                    | 1.59              | -6.38***                    | 1.76              | -6.64***                    | 1.83              |  |
| <i>Covariates:</i>  |                             |                   |                             |                   |                             |                   |                             |                   |  |
| Africa  | -134.63***                  | 0.00              | -7.42                       | 13.49             | -156.66***                  | 0.00              | -6.37                       | 9.02              |  |
| Middle East   | -13.54                      | 2233.05           | -5.53                       | 44.32             | -14.06                      | 2266.61           | -5.52                       | 31.91             |  |
| Level 1 Foreign Direct<br>Investment (FDI) – Within<br>Country  | -0.04***                    | 0.00              | -0.06                       | 0.12              | -0.12***                    | 0.00              | -0.13                       | 0.13              |  |
| Level 2 Foreign Direct<br>Investment (FDI) –<br>Between Country   | 0.03***                     | 0.00              | 0.02                        | 0.12              | 0.13***                     | 0.00              | 0.12                        | 0.11              |  |
| Buyer Firm Operates in<br>Alternative Energy  | 4.15*                       | 1.63              | 4.52*                       | 1.79              |                             |                   |                             |                   |  |
| Seller Operates in<br>Alternative Energy  |                             |                   |                             |                   | -0.93                       | 1.04              | -0.99                       | 1.06              |  |
| <i>Covariance</i>   |                             |                   |                             |                   |                             |                   |                             |                   |  |
| Random Intercept - Country  | 15.56                       | 10.41             | 20.68                       | 14.23             | 24.73                       | 20.86             | 24.73                       | 20.86             |  |
| Random Intercept – Buyer<br>Firm  | 10.56                       | 5.66              | 12.90                       | 7.05              |                             |                   |                             |                   |  |

|                                  |       |         |       |      |       |      |
|----------------------------------|-------|---------|-------|------|-------|------|
| Random Intercept – Seller Firm   |       |         | 2.19  | 1.43 | 2.19  | 1.43 |
| <i>Omnibus Test</i>              |       |         |       |      |       |      |
| Buyer Form of Ownership          |       | 1.85    |       |      |       |      |
| Seller Form of Ownership         |       |         |       |      | 0.46  |      |
| Total Variance                   | 35.52 | 36.87   | 42.26 |      | 30.21 |      |
| Pseudo-R <sup>2</sup> Δ          |       | -3.80   |       |      | 28.51 |      |
| <i>Support</i>                   |       |         |       |      |       |      |
| Hypothesis 1a:                   |       | Partial |       |      |       |      |
| Hypothesis 1b:                   |       |         |       |      | No    |      |
| <i>Fit Statistics</i>            |       |         |       |      |       |      |
| Variance Parameters              | 8     | 12      | 8     |      | 12    |      |
| -2 Log Likelihood (-2LL)         | 464.3 | 454.1   | 485.6 |      | 490.1 |      |
| AIC                              | 480.3 | 478.1   | 509.6 |      | 512.1 |      |
| BIC                              | 464.3 | 454.1   | 485.6 |      | 490.1 |      |
| ΔVariance Parameters             | -     | 4       | -     |      | 4     |      |
| -2ΔLL                            | -     | 10.2    | -     |      | 1.9   |      |
| p-Value ( $\chi^2$ Distribution) | -     | 0.04    | -     |      | 0.75  |      |

---

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ , †  $p < 0.10$ . Each of the above models uses the total number of observations given the included variables. This results in lesser sample sizes for each model as compared with the full sample. The  $n$  for Models A1, A2, B1, B2 is 730.

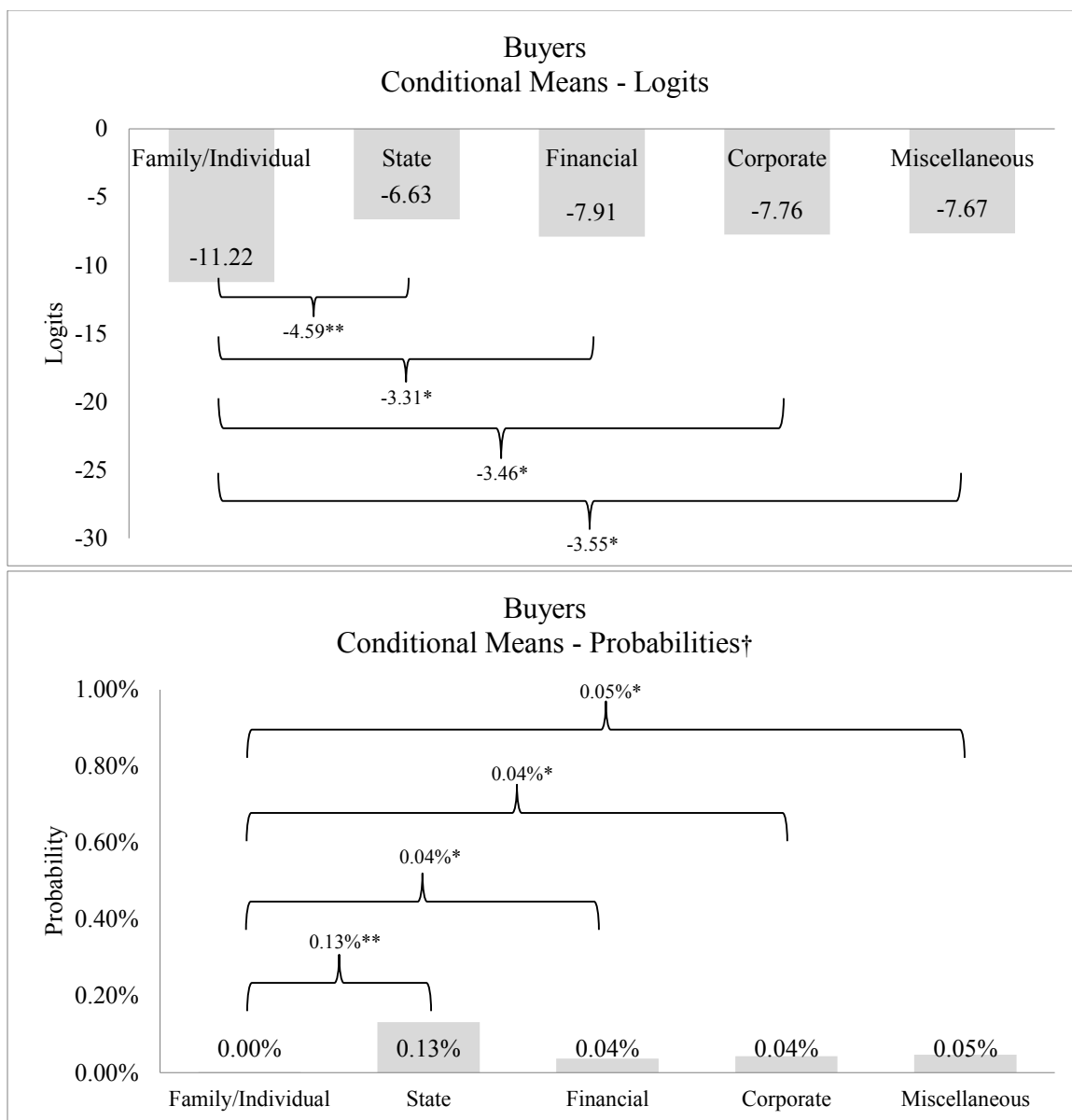
Table 4.6

Least square mean differences among buyers for buying unconventional resource deposits

| <b>MODEL A2 CONDITIONAL MEANS*</b>   |   |                       |                       |                    |  |
|--------------------------------------|---|-----------------------|-----------------------|--------------------|--|
| <b>Buyer Owner Category</b>          | <b>Estimate</b>                         | <b>Standard Error</b> | <b>Pr &gt;  t </b>    | <b>Probability</b> |  |
| Family/Individual                    | -11.2186                                | 2.4011                | <.0001                | 0.00%              |  |
| State                                | -6.6277                                 | 1.6563                | <.0001                | 0.13%              |  |
| Financial                            | -7.9083                                 | 1.6360                | <.0001                | 0.04%              |  |
| Corporate                            | -7.7553                                 | 1.6800                | <.0001                | 0.04%              |  |
| Miscellaneous                        | -7.6678                                 | 1.5915                | <.0001                | 0.05%              |  |
| <b>MODEL A2 PAIRWISE COMPARISONS</b> |   |                       |                       |                    |  |
| <b>Focal Buyer Owner Category</b>    | <b>Comparative Buyer Owner Category</b> | <b>Estimate</b>       | <b>Standard Error</b> | <b>Pr &gt;  t </b> |  |
| Family/Individual                    | Family/Individual                       | -                     | -                     | -                  |  |
| <b>Family/Individual</b>             | <b>State</b>                            | <b>-4.5909</b>        | <b>1.7489</b>         | <b>0.0091</b>      |  |
| <b>Family/Individual</b>             | <b>Financial</b>                        | <b>-3.3103</b>        | <b>1.4137</b>         | <b>0.0198</b>      |  |
| <b>Family/Individual</b>             | <b>Corporate</b>                        | <b>-3.4633</b>        | <b>1.4321</b>         | <b>0.0162</b>      |  |
| <b>Family/Individual</b>             | <b>Miscellaneous</b>                    | <b>-3.5508</b>        | <b>1.4833</b>         | <b>0.0173</b>      |  |
| <b>State</b>                         | <b>Family/Individual</b>                | <b>-4.5909</b>        | <b>1.7489</b>         | <b>0.0091</b>      |  |
| State                                | State                                   | -                     | -                     | -                  |  |
| State                                | Financial                               | 1.2806                | 1.1353                | 0.2602             |  |
| State                                | Corporate                               | 1.1275                | 1.1735                | 0.3373             |  |
| State                                | Miscellaneous                           | 1.0401                | 1.1330                | 0.3593             |  |
| <b>Financial</b>                     | <b>Family/Individual</b>                | <b>-3.3103</b>        | <b>1.4137</b>         | <b>0.0198</b>      |  |
| Financial                            | State                                   | 1.2806                | 1.1353                | 0.2602             |  |
| Financial                            | Financial                               | -                     | -                     | -                  |  |
| Financial                            | Corporate                               | -0.1531               | 0.7519                | 0.8388             |  |
| Financial                            | Miscellaneous                           | -0.2405               | 0.6681                | 0.7191             |  |
| <b>Corporate</b>                     | <b>Family/Individual</b>                | <b>-3.4633</b>        | <b>1.4321</b>         | <b>0.0162</b>      |  |
| Corporate                            | State                                   | 1.1275                | 1.1735                | 0.3373             |  |
| Corporate                            | Financial                               | -0.1531               | 0.7519                | 0.8388             |  |
| Corporate                            | Corporate                               | -                     | -                     | -                  |  |
| Corporate                            | Miscellaneous                           | -0.08746              | 0.7919                | 0.9121             |  |
| <b>Miscellaneous</b>                 | <b>Family/Individual</b>                | <b>-3.5733</b>        | <b>1.4809</b>         | <b>0.0164</b>      |  |
| Miscellaneous                        | State                                   | 1.0401                | 1.1330                | 0.3593             |  |
| Miscellaneous                        | Financial                               | -0.2405               | 0.6681                | 0.7191             |  |
| Miscellaneous                        | Corporate                               | -0.08746              | 0.7919                | 0.9121             |  |
| Miscellaneous                        | Miscellaneous                           | -                     | -                     | -                  |  |

Bolded rows highlight significant differences as indicated by the p value.

\*Conditional means are represented in which all other variables included in the model are held at 0.



\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

† Note the y-axis ranges from 0-1%.

Mean differences between the groups are shown via the horizontal brace

Figure 4.1

The conditional means for each of the forms of buyer ownership for buying unconventional resource deposits in logits and probabilities (corresponding to Model A2)

Hypothesis 1b was specific to the relationship between seller form of ownership and selling unconventional resource deposits. The equation for Hypothesis 1b is provided below. This equation corresponds to model B2 in Table 4.5.

$$\begin{aligned} \text{SellUnconventional}_{TSC} = & \gamma_{000} + \gamma_{010}(\text{MiscellaneousVsFamily/Individuals}_S) + \\ & \gamma_{020}(\text{MiscellaneousVsState}_S) + \gamma_{030}(\text{MiscellaneousVsCorporate}_S) + \\ & \gamma_{040}(\text{MiscellaneousVsFinancial}_S) + \gamma_{050}(\text{AlternateEnergy}_S) + \\ & \gamma_{001}(\text{MiddleEast}_C) + \gamma_{002}(\text{Africa}_C) + \gamma_{003}(\overline{\text{FDI}}_C - \text{constant}) + \gamma_{100}(\text{FDI}_{TC} - \\ & \overline{\text{FDI}}_C) + U_{0S0} + U_{00C} \end{aligned}$$

The omnibus effect for the five forms of seller ownership was not significant  $F(4,260) = 0.46, p = 0.76$ , indicative that the form of seller firm ownership was not significantly related to selling unconventional resource deposits. However, pairwise comparisons were used to examine if there were significant differences in selling unconventional resource deposits between the forms of seller ownership. As demonstrated in Table 4.7, there were no significant mean differences among the other pairwise comparisons of form of seller ownership and selling unconventional resource deposits. All forms of ownership were less likely to buy unconventional resource deposits as indicated by the negative conditional means in Table 4.7, but there were no significant mean differences among the groups.

Figure 4.2 illustrates the relationship between each form of seller firm ownership and selling unconventional resource deposits in logits and probabilities. In sum, seller ownership was not significantly related to selling unconventional resource deposits, and there were no mean differences in this relationship among the categories of seller ownership. Therefore there is no support for hypothesis 1b.



Table 4.7

Least square mean differences among sellers for selling unconventional resource deposits

| <b>MODEL B2 CONDITIONAL MEANS*</b>   |                       |                           |                       |                    |                    |
|--------------------------------------|-----------------------|---------------------------|-----------------------|--------------------|--------------------|
| <b>Seller Owner</b>                  |                       | <b>Estimate</b>           | <b>Standard Error</b> | <b>Pr &gt;  t </b> | <b>Probability</b> |
| <b>Category</b>                      |                       |                           |                       |                    |                    |
| Family/Individual                    |                       | -7.3076                   | 1.9815                | 0.0003             | 0.07%              |
| State                                |                       | -6.0391                   | 1.9661                | 0.0024             | 0.24%              |
| Financial                            |                       | -6.3946                   | 1.8147                | 0.0005             | 0.17%              |
| Corporate                            |                       | -6.3637                   | 1.8310                | 0.0006             | 0.17%              |
| Miscellaneous                        |                       | -6.6401                   | 1.8324                | 0.0003             | 0.13%              |
| <b>MODEL B2 PAIRWISE COMPARISONS</b> |                       |                           |                       |                    |                    |
| <b>Focal Seller Owner</b>            |                       | <b>Comparative Seller</b> |                       |                    |                    |
| <b>Category</b>                      | <b>Owner Category</b> | <b>Estimate</b>           | <b>Standard Error</b> | <b>Pr &gt;  t </b> |                    |
| Family/Individual                    | Family/Individual     | -                         | -                     | -                  | -                  |
| Family/Individual                    | State                 | -1.2685                   | 1.3332                | 0.3422             |                    |
| Family/Individual                    | Financial             | -0.9131                   | 0.8173                | 0.2649             |                    |
| Family/Individual                    | Corporate             | -0.9440                   | 0.7933                | 0.2352             |                    |
| Family/Individual                    | Miscellaneous         | -0.6676                   | 0.7890                | 0.3983             |                    |
| State                                | Family/Individual     | -1.2685                   | 1.3332                | 0.3422             |                    |
| State                                | State                 | -                         | -                     | -                  | -                  |
| State                                | Financial             | 0.3554                    | 1.1423                | 0.7559             |                    |
| State                                | Corporate             | 0.3246                    | 1.1354                | 0.7752             |                    |
| State                                | Miscellaneous         | 0.6009                    | 1.1428                | 0.5994             |                    |
| Financial                            | Family/Individual     | -0.9131                   | 0.8173                | 0.2649             |                    |
| Financial                            | State                 | 0.3554                    | 1.1423                | 0.7559             |                    |
| Financial                            | Financial             | -                         | -                     | -                  | -                  |
| Financial                            | Corporate             | -0.03089                  | 0.4733                | 0.9480             |                    |
| Financial                            | Miscellaneous         | 0.2455                    | 0.4389                | 0.5764             |                    |
| Corporate                            | Family/Individual     | -0.9440                   | 0.7933                | 0.2352             |                    |
| Corporate                            | State                 | 0.3246                    | 1.1354                | 0.7752             |                    |
| Corporate                            | Financial             | -0.03089                  | 0.4733                | 0.9480             |                    |
| Corporate                            | Corporate             | -                         | -                     | -                  | -                  |
| Corporate                            | Miscellaneous         | 0.2764                    | 0.4381                | 0.5287             |                    |
| Miscellaneous                        | Family/Individual     | -0.6676                   | 0.7890                | 0.3983             |                    |
| Miscellaneous                        | State                 | 0.6009                    | 1.1428                | 0.5994             |                    |
| Miscellaneous                        | Financial             | 0.2455                    | 0.4389                | 0.5764             |                    |
| Miscellaneous                        | Corporate             | 0.2764                    | 0.4381                | 0.5287             |                    |
| Miscellaneous                        | Miscellaneous         | -                         | -                     | -                  | -                  |

\*Conditional means are represented in which all other variables included in the model are held at 0.



\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

† Note the y-axis ranges from 0-1%

Figure 4.2

The conditional means for each of the forms of seller ownership for selling unconventional resource deposits in logits and probabilities (corresponding to Model B2)

### Corporate Ownership and Commitment to Radical Boundary Spanning

The results of the multilevel models related to the dependent variable measuring commitment radical boundary spanning are shown in Table 4.8 and Table 4.10. In conducting this set of analyses for buyer firms, the random intercept for country was estimated to be nearly zero (1.12E-12 in Model C1) with an inestimable standard error. Thus, for this set of buyer-specific analyses (Models C1-C4 in Table 4.8), only a random intercept for buyer was included in the models.

It was hypothesized that the form of corporate ownership is related to commitment to radical boundary spanning. Hypothesis 2a was specific to the relationship between buyer form of ownership and the purchase price (in log metric) for unconventional resource deposits bought. The equation for hypothesis 2a is provided below. This equation corresponds to Model C2 in Table 4.8.

$$\begin{aligned} \text{Log(PurchasePrice)}_{TBC} = & \gamma_{000} + \gamma_{010}(\text{MiscellaneousVsFamily/Individual}_B) + \\ & \gamma_{020}(\text{MiscellaneousVsState}_B) + \gamma_{030}(\text{MiscellaneousVsCorporate}_B) + \\ & \gamma_{040}(\text{MiscellaneousVsFinancial}_B) + \gamma_{060}(\text{AlternateEnergy}_B) + \\ & \gamma_{001}(\text{MiddleEast}_C) + \gamma_{002}(\text{Africa}_C) + \gamma_{003}(\overline{\text{FDI}}_C - \text{constant}) + \gamma_{100}(\text{FDI}_{TC} - \\ & \overline{\text{FDI}}_C) + \gamma_{100}(\text{Unconventional}_{TBC}) + \gamma_{110}(\text{MiscellaneousVsFamily/} \\ & \text{Individual}_B)(\text{Unconventional}_{TBC}) + \\ & \gamma_{120}(\text{MiscellaneousVsState}_B)(\text{Unconventional}_{TBC}) + \\ & \gamma_{130}(\text{MiscellaneousVsCorporate}_B)(\text{Unconventional}_{TBC}) + \\ & \gamma_{140}(\text{MiscellaneousVsFinancial}_B)(\text{Unconventional}_{TBC}) + U_{0B0} + \varepsilon_{TBC} \end{aligned}$$

Table 4.8 shows that buyer ownership was related to the purchase price of transactions of resource deposits  $F(4, 371) = 18.84, p < 0.001$ . Further investigation of pairwise comparisons revealed significant differences between buyer ownership and the purchase price of

unconventional resource deposits bought. Table 4.9 indicates the simple buyer effects specifically for the purchase price of unconventional resource deposits. There was a significant mean difference between corporate and state owned buyer MNCs and the purchase price of unconventional resource deposits bought (Estimate = -1.25,  $p < 0.05$ ). Further, there was a significant mean difference between corporate and financial owned MNCs and the purchase price of unconventional resource deposits bought (Estimate = -1.42,  $p < 0.01$ ). There were no significant mean differences among the other pairwise comparisons. Given this, corporate owned MNCs had significantly lower purchase prices of unconventional resource deposits than state and financial owned MNCs.

Figure 4.3 graphically depicts the relationship between each form of firm ownership and the conditional means of the purchase price of unconventional resource deposits bought in logs and USD in millions. This figure also indicates significant mean differences in the pairwise comparisons mentioned above. Although there was no significant omnibus effect for the relationship between buyer form of ownership and the purchase price of unconventional resource deposits bought, corporate owned MNCs had significantly lower purchase prices for unconventional resource deposits bought than state and financial owned MNCs. Therefore there is partial support for hypothesis 2a.

Table 4.8

Results for a random intercept for buyers for forms of corporate ownership of buyers and the purchase price of unconventional resource deposits bought

|   | <b>Purchase Price of Unconventional Resources Bought</b><br>(as dependent variable for)<br><b>Commitment to Radical Boundary Spanning</b><br>(construct) |                   |                             |                   |                             |                   |                             |                   |
|---|--|-------------------|-----------------------------|-------------------|-----------------------------|-------------------|-----------------------------|-------------------|
|   | MODEL C1<br>Covariates Only  |                   | MODEL C2<br>Covariates Only |                   | MODEL C3<br>Covariates Only |                   | MODEL C4<br>Covariates Only |                   |
|   | Estimate<br>b  | Standard<br>Error | Estimate<br>b               | Standard<br>Error | Estimate<br>b               | Standard<br>Error | Estimate<br>b               | Standard<br>Error |
| Intercept   | 0.07   | 0.12              | -0.62**                     | 0.19              | 0.09                        | 0.13              | -0.71***                    | 0.20              |
| <i>Covariates:</i>  |  |                   |                             |                   |                             |                   |                             |                   |
| Africa  | -0.43†   | 0.25              | -0.22                       | 0.23              | -0.38                       | 0.25              | -0.19                       | 0.24              |
| Middle East   | -0.96  | 0.59              | -0.66                       | 0.58              | -0.85                       | 0.59              | -0.58                       | 0.57              |
| Level 1 Foreign Direct Investment (FDI) – Within Country  | 0.01   | 0.03              | 0.03                        | 0.02              | 0.00                        | 0.03              | 0.01                        | 0.02              |
| Level 2 Foreign Direct Investment (FDI) – Between Country   | 0.01   | 0.02              | 0.02                        | 0.02              | 0.02                        | 0.02              | 0.02                        | 0.02              |
| Buyer Firm Operates in Alternative Energy   | 1.20†  | 0.63              | 0.92†                       | 0.52              | 1.04                        | 0.67              | 0.84                        | 0.55              |
| Buying Unconventional Resource Deposits   |  |                   | 0.85*                       | 0.40              |                             |                   | 1.16*                       | 0.52              |
| Level 1 Target Country Petroleum Deposits – Within Country  |  |                   |                             |                   | 0.05                        | 0.00              | 0.01                        | 0.01              |
| Level 2 Target Country Petroleum Deposits – Between Country   |  |                   |                             |                   | 0.00                        | 0.00              | 0.01†                       | 0.00              |
| Buying Unconventional Resource Deposits x Level 1 Target Country<br>Petroleum Deposits – Within Country                     |  |                   |                             |                   |                             |                   | -0.02                       | 0.03              |
| Buying Unconventional Resource Deposits x Level 2 Target Country<br>Petroleum Deposits – Between Country                    |  |                   |                             |                   |                             |                   | -0.02*                      | 0.01              |
| Level 1 Target Country Petroleum Deposits – Within Country x<br>Level 2 Target Country Petroleum Deposits – Between Country |  |                   |                             |                   |                             |                   | 0.00***                     | 0.00              |

Covariance

|                               |      |      |      |      |      |      |      |      |
|-------------------------------|------|------|------|------|------|------|------|------|
| Random Intercept – Buyer Firm | 2.24 | 0.33 | 1.18 | 0.25 | 2.27 | 0.36 | 1.18 | 0.27 |
| Residual Variance             | 2.79 | 0.20 | 2.85 | 0.20 | 2.63 | 0.21 | 2.64 | 0.21 |

Omnibus Test

|   |  |  |          |  |  |  |          |  |
|---|--|--|----------|--|--|--|----------|--|
| Buyer Form of Ownership   |  |  | 18.84*** |  |  |  | 18.23*** |  |
| Buying Unconventional Resource Deposits   |  |  | 10.42**  |  |  |  | 8.16**   |  |
| Buyer Form of Ownership x Buying Unconventional Resource Deposits   |  |  | 2.09†    |  |  |  | 2.49*    |  |
| Buyer Form of Ownership x Buying Unconventional Resource Deposits x Level 1 Target Country Petroleum Deposits – Within Country  |  |  |          |  |  |  | 0.56     |  |
| Buyer Form of Ownership x Buying Unconventional Resource Deposits x Level 2 Target Country Petroleum Deposits – Between Country |  |  |          |  |  |  | 1.18     |  |
| Total Variance  |  |  | 20.32    |  |  |  | 29.13    |  |
| Pseudo-R <sup>2</sup> Δ   |  |  |          |  |  |  | 8.82     |  |

Support

|                |  |  |         |  |  |  |         |  |
|----------------|--|--|---------|--|--|--|---------|--|
| Hypothesis 2a: |  |  | Partial |  |  |  |         |  |
| Hypothesis 3a: |  |  |         |  |  |  | Partial |  |

Fit Statistics

|                                  |        |        |        |        |
|----------------------------------|--------|--------|--------|--------|
| Variance Parameters              | 8      | 17     | 10     | 38     |
| -2 Log Likelihood (-2LL)         | 3119.4 | 3026.3 | 2639.5 | 2545.3 |
| AIC                              | 3135.4 | 3060.2 | 2659.5 | 2621.3 |
| BIC                              | 3166.2 | 3125.6 | 2696.8 | 2763.2 |
| Comparison Model                 | -      | C1     | C1     | C2     |
| ΔVariance Parameters             | -      | 9      | 1      | 21     |
| -2ΔLL                            | -      | 93.1   | 479.0  | 481.0  |
| p-Value ( $\chi^2$ Distribution) | -      | 0.000  | 0.000  | 0.000  |

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ , †  $p < 0.10$ . Each of the above models uses the total number of observations given the included variables. This results in lesser sample sizes for each model as compared with the full sample. The  $n$  for Models C1 and C2 is 730. The  $n$  for Model C3 and C4 is 622.

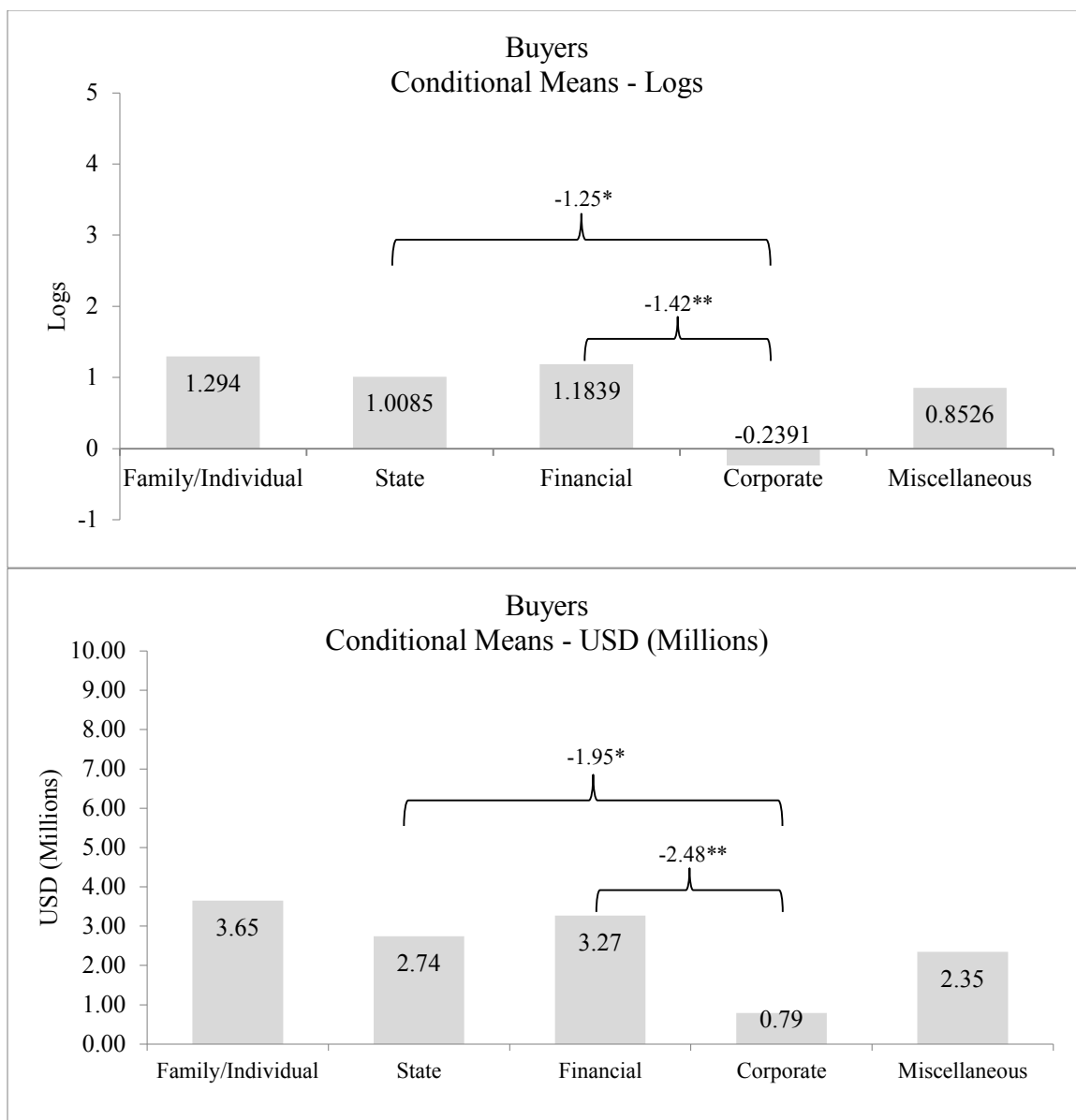
Table 4.9

Least square mean differences among buyer firms and the purchase price of unconventional resource deposits bought

| <b>MODEL C2 CONDITIONAL MEANS*</b>   |   |                 |                       |                    |
|--------------------------------------|---|-----------------|-----------------------|--------------------|
| <b>Buyer Owner Category</b>          |   | <b>Estimate</b> | <b>Standard Error</b> | <b>Pr &gt;  t </b> |
| Family/Individual                    |   | 1.2940          | 0.9702                | 0.1831             |
| State                                |   | 1.0085          | 0.4169                | 0.0161             |
| Financial                            |   | 1.1839          | 0.3331                | 0.0004             |
| Corporate                            |   | -0.2391         | 0.4143                | 0.5643             |
| Miscellaneous                        |   | 0.8526          | 0.4025                | 0.0348             |
| <b>MODEL C2 PAIRWISE COMPARISONS</b> |   |                 |                       |                    |
| <b>Focal Buyer Owner Category</b>    | <b>Comparative Buyer Owner Category</b> | <b>Estimate</b> | <b>Standard Error</b> | <b>Pr &gt;  t </b> |
| Family/Individual                    | Family/Individual                       | -               | -                     | -                  |
| Family/Individual                    | State                                   | -0.2856         | 1.0550                | 0.7868             |
| Family/Individual                    | Financial                               | -0.1102         | 1.0204                | 0.9141             |
| Family/Individual                    | Corporate                               | -1.5331         | 1.0540                | 0.1466             |
| Family/Individual                    | Miscellaneous                           | -0.4415         | 1.0467                | 0.6734             |
| State                                | Family/Individual                       | -0.2856         | 1.0550                | 0.7868             |
| State                                | State                                   | -               | -                     | -                  |
| State                                | Financial                               | 0.1754          | 0.5298                | 0.7408             |
| <b>State</b>                         | <b>Corporate</b>                        | <b>-1.2475</b>  | <b>0.5844</b>         | <b>0.0334</b>      |
| State                                | Miscellaneous                           | -0.1559         | 0.5780                | 0.7876             |
| Financial                            | Family/Individual                       | -0.1102         | 1.0204                | 0.9141             |
| Financial                            | State                                   | 0.1754          | 0.5298                | 0.7408             |
| Financial                            | Financial                               | -               | -                     | -                  |
| <b>Financial</b>                     | <b>Corporate</b>                        | <b>-1.4230</b>  | <b>0.5224</b>         | <b>0.0068</b>      |
| Financial                            | Miscellaneous                           | -0.3313         | 0.5168                | 0.5219             |
| Corporate                            | Family/Individual                       | -1.5331         | 1.0540                | 0.1466             |
| <b>Corporate</b>                     | <b>State</b>                            | <b>-1.2475</b>  | <b>0.5844</b>         | <b>0.0334</b>      |
| <b>Corporate</b>                     | <b>Financial</b>                        | <b>-1.4230</b>  | <b>0.5224</b>         | <b>0.0068</b>      |
| Corporate                            | Corporate                               | -               | -                     | -                  |
| Corporate                            | Miscellaneous                           | 1.0917          | 0.5739                | 0.0579             |
| Miscellaneous                        | Family/Individual                       | -0.2856         | 1.0550                | 0.7868             |
| Miscellaneous                        | State                                   | -0.1559         | 0.5780                | 0.7876             |
| Miscellaneous                        | Financial                               | -0.3313         | 0.5168                | 0.5219             |
| Miscellaneous                        | Corporate                               | 1.0917          | 0.5739                | 0.0579             |
| Miscellaneous                        | Miscellaneous                           | -               | -                     | -                  |

Bolded rows highlight significant differences as indicated by the p value.

\*Conditional means are represented in which all other variables included in the model are held at 0.



\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

Mean differences between the groups are shown via the horizontal brace

Figure 4.3

The conditional means for each of the forms of buyer ownership and the price paid for unconventional resource deposits in logs and USD in millions (corresponding to Model C2)



Hypothesis 2b was explicit to the relationship between seller form of ownership and commitment to radical boundary spanning. The equation for hypothesis 2b is provided below. This equation corresponds to model D2 in Table 4.10.

$$\begin{aligned} \text{Log}(\text{SalePrice})_{\text{TSC}} = & \gamma_{000} + \gamma_{010}(\text{MiscellaneousVsFamily/Individual}_S) + \\ & \gamma_{020}(\text{MiscellaneousVsState}_S) + \gamma_{030}(\text{MiscellaneousVsCorporate}_S) + \\ & \gamma_{040}(\text{MiscellaneousVsFinancial}_S) + \gamma_{060}(\text{AlternateEnergy}_S) + \\ & \gamma_{001}(\text{MiddleEast}_C) + \gamma_{002}(\text{Africa}_C) + \gamma_{003}(\overline{\text{FDI}}_C - \text{constant}) + \gamma_{100}(\text{FDI}_{\text{TC}} - \\ & \overline{\text{FDI}}_C) + \gamma_{100}(\text{Unconventional}_{\text{TSC}}) + \gamma_{110}(\text{MiscellaneousVsFamily/} \\ & \text{Individual}_S)(\text{Unconventional}_{\text{TSC}}) + \\ & \gamma_{120}(\text{MiscellaneousVsState}_S)(\text{Unconventional}_{\text{TSC}}) + \\ & \gamma_{130}(\text{MiscellaneousVsCorporate}_S)(\text{Unconventional}_{\text{TSC}}) + \\ & \gamma_{140}(\text{MiscellaneousVsFinancial}_S)(\text{Unconventional}_{\text{TSC}}) + U_{0S0} + U_{0C0} + \varepsilon_{\text{TSC}} \end{aligned}$$

Seller form of ownership was significantly related to the sale price of unconventional resources sold  $F(4, 256) = 3.82, p < 0.01$ . Pairwise comparisons of differences between seller ownership and the sale price of unconventional resource deposits sold were examined. The only significant mean difference in the sale price of unconventional resource deposits sold was for the pairwise comparison of family or individual and corporate owned seller MNCs (Estimate = 1.99,  $p < 0.05$ ). Table 4.11 shows this significant mean difference. There were no significant mean differences among the other pairwise comparisons. Given this, corporate owned MNCs had significantly higher sale prices of unconventional resource deposits than family or individual owned MNCs.

Figure 4.4 graphically depicts the relationship between each form of firm ownership and the sale price of unconventional resource deposits sold in logs and USD in millions. This figure also indicates significant mean differences in the pairwise comparison mentioned above. In sum, there was no significant relationship between seller form of ownership and sale price of

unconventional resource deposits sold as indicated by the omnibus effect. Yet, corporate owned seller MNCs had significantly higher sale prices for unconventional resource deposits sold than family or individual owned seller MNCs. Therefore there is partial support for hypothesis 2b.

Table 4.10

Results for crossed countries and sellers for corporate ownership of sellers and the sale price of unconventional resource deposits sold

|  | <b>Sale Price of Unconventional Resource Deposits Sold</b> |          |                 |          |                 |          |                 |          |
|--|--|----------|-----------------|----------|-----------------|----------|-----------------|----------|
|  | (as dependent variable for)                                |          |                 |          |                 |          |                 |          |
|  | <b>Commitment to Radical Boundary Spanning</b>             |          |                 |          |                 |          |                 |          |
|  | MODEL D1   |          | MODEL D2        |          | MODEL D3        |          | MODEL D4        |          |
|  | Covariates Only  |          | Covariates Only |          | Covariates Only |          | Covariates Only |          |
|  | Estimate   | Standard | Estimate        | Standard | Estimate        | Standard | Estimate        | Standard |
|  | b  | Error    | b               | Error    | b               | Error    | b               | Error    |
| Intercept  | 0.14   | 0.14     | -0.06           | 0.20     | 0.21            | 0.16     | 0.20            | 0.24     |
| <i>Covariates:</i>   |  |          |                 |          |                 |          |                 |          |
| Africa   | -0.17  | 0.28     | -0.01           | 0.27     | -0.05           | 0.30     | 0.11            | 0.31     |
| Middle East  | 0.04   | 0.66     | 0.37            | 0.64     | 0.11            | 0.66     | 0.28            | 0.66     |
| Level 1 Foreign Direct Investment (FDI) – Within Country   | -0.02  | 0.02     | -0.02           | 0.02     | -0.02           | 0.02     | -0.03           | 0.02     |
| Level 2 Foreign Direct Investment (FDI) – Between Country  | 0.03   | 0.02     | 0.02            | 0.02     | 0.03            | 0.02     | 0.03            | 0.02     |
| Seller Firm Operates in Alternative Energy   | 1.70*  | 0.72     | 1.73*           | 0.69     | 1.56*           | 0.74     | 1.28†           | 0.71     |
| Selling Unconventional Resource Deposits   |  |          | 1.24***         | 0.36     |                 |          | 1.13**          | 0.42     |
| Level 1 Target Country Petroleum Deposits – Within Country   |  |          |                 |          | 0.01            | 0.00     | 0.01            | 0.01     |
| Level 2 Target Country Petroleum Deposits – Between Country  |  |          |                 |          | 0.00            | 0.00     | 0.01**          | 0.00     |
| Selling Unconventional Resource Deposits x Level 1 Target Country Petroleum Deposits – Within Country                    |  |          |                 |          |                 |          | -0.01           | 0.01     |
| Selling Unconventional Resource Deposits x Level 2 Target Country Petroleum Deposits – Between Country                   |  |          |                 |          |                 |          | -0.01           | 0.01     |
| Level 1 Target Country Petroleum Deposits – Within Country x Level 2 Target Country Petroleum Deposits – Between Country |  |          |                 |          |                 |          | 0.00***         | 0.00     |
| <i>Covariance</i>  |  |          |                 |          |                 |          |                 |          |
| Random Intercept – Countries   | 0.16   | 0.12     | 0.14            | 0.12     | 0.21            | 0.15     | 0.31            | 0.18     |

|                                |      |      |      |      |      |      |      |      |
|--------------------------------|------|------|------|------|------|------|------|------|
| Random Intercept – Seller Firm | 1.76 | 0.30 | 1.57 | 0.29 | 1.85 | 0.33 | 1.65 | 0.32 |
| Residual Variance              | 3.00 | 0.24 | 2.87 | 0.23 | 2.79 | 0.25 | 2.58 | 0.23 |

Omnibus Test

|  |      |  |        |  |  |  |        |  |
|--|------|--|--------|--|--|--|--------|--|
| Seller Form of Ownership   |      |  | 3.82** |  |  |  | 3.39** |  |
| Selling Unconventional Resource Deposits   |      |  | 5.80*  |  |  |  | 3.09†  |  |
| Seller Form of Ownership x Selling Unconventional Resource Deposits  |      |  | 1.04   |  |  |  | 0.44   |  |
| Seller Form of Ownership x Selling Unconventional Resource Deposits<br>x Level 1 Target Country Petroleum Deposits – Within Country  |      |  |        |  |  |  | 0.21   |  |
| Seller Form of Ownership x Selling Unconventional Resource Deposits<br>x Level 2 Target Country Petroleum Deposits – Between Country |      |  |        |  |  |  | 0.47   |  |
| Total Variance   | 5.01 |  | 4.58   |  |  |  | 4.54   |  |
| Pseudo-R <sup>2</sup> Δ  |      |  | 8.58   |  |  |  | 9.38   |  |

Support

|                |  |  |         |  |  |  |    |  |
|----------------|--|--|---------|--|--|--|----|--|
| Hypothesis 2b: |  |  | Partial |  |  |  |    |  |
| Hypothesis 3b: |  |  |         |  |  |  | No |  |

Fit Statistics

|                                       |        |  |        |  |        |  |        |  |
|---------------------------------------|--------|--|--------|--|--------|--|--------|--|
| Variance Parameters                   | 9      |  | 18     |  | 11     |  | 39     |  |
| -2 Log Likelihood (-2LL)              | 3149.6 |  | 3103.1 |  | 2666.5 |  | 2616.1 |  |
| AIC                                   | 3167.6 |  | 3139.1 |  | 2688.5 |  | 2682.1 |  |
| BIC                                   | 3149.6 |  | 3103.1 |  | 2666.5 |  | 2616.1 |  |
| Comparison Model                      | -      |  | C1     |  | C1     |  | C2     |  |
| ΔVariance Parameters                  | -      |  | 9      |  | 2      |  | 21     |  |
| -2ΔLL                                 | -      |  | 46.5   |  | 483.1  |  | 487.0  |  |
| p-Value (χ <sup>2</sup> Distribution) | -      |  | 0.000  |  | 0.000  |  | 0.000  |  |

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ , †  $p < 0.10$ . Each of the above models uses the total number of observations given the included variables. This results in lesser sample sizes for each model as compared with the full sample. The  $n$  for Models C1 and C2 is 730. The  $n$  for Model C3 and C4 is 622.

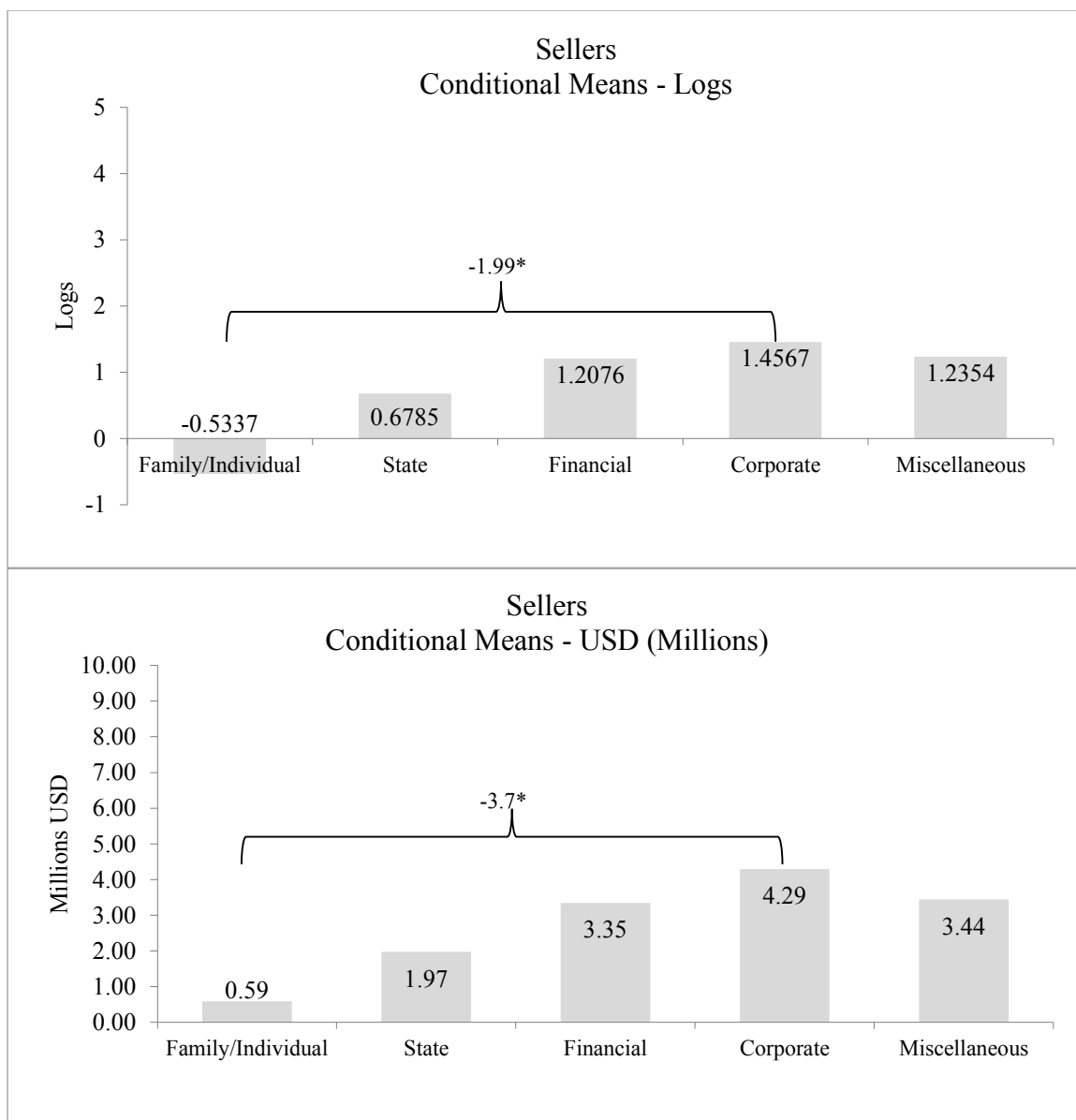
Table 4.11

Least square mean differences among sellers for the sale price of unconventional resource deposits sold

| <b>MODEL D2 CONDITIONAL MEANS*</b>   |  |                 |                       |                    |
|--------------------------------------|--|-----------------|-----------------------|--------------------|
| <b>Seller Owner Category</b>         |  | <b>Estimate</b> | <b>Standard Error</b> | <b>Pr &gt;  t </b> |
| Family/Individual                    |  | -0.5337         | 0.9350                | 0.5686             |
| State                                |  | 0.6785          | 1.1683                | 0.5619             |
| Financial                            |  | 1.2076          | 0.3732                | 0.0014             |
| Corporate                            |  | 1.4567          | 0.3829                | 0.0002             |
| Miscellaneous                        |  | 1.2354          | 0.3582                | 0.0007             |
| <b>MODEL D2 PAIRWISE COMPARISONS</b> |  |                 |                       |                    |
| <b>Focal Seller Owner Category</b>   | <b>Comparative Seller Owner Category</b> | <b>Estimate</b> | <b>Standard Error</b> | <b>Pr &gt;  t </b> |
| Family/Individual                    | Family/Individual                        | -               | -                     | -                  |
| Family/Individual                    | State                                    | 1.2122          | 1.4898                | 0.4166             |
| Family/Individual                    | Financial                                | 1.7413          | 0.9940                | 0.0810             |
| <b>Family/Individual</b>             | <b>Corporate</b>                         | <b>1.9904</b>   | <b>1.0024</b>         | <b>0.0482</b>      |
| Family/Individual                    | Miscellaneous                            | 1.7691          | 0.9936                | 0.0762             |
| State                                | Family/Individual                        | 1.2122          | 1.4898                | 0.4166             |
| State                                | State                                    | -               | -                     | -                  |
| State                                | Financial                                | 0.5291          | 1.2198                | 0.6648             |
| State                                | Corporate                                | 0.7782          | 1.2256                | 0.5260             |
| State                                | Miscellaneous                            | 0.5569          | 1.2163                | 0.6475             |
| Financial                            | Family/Individual                        | 1.7413          | 0.9940                | 0.0810             |
| Financial                            | State                                    | 0.5291          | 1.2198                | 0.6648             |
| Financial                            | Financial                                | -               | -                     | -                  |
| Financial                            | Corporate                                | 0.2491          | 0.5180                | 0.6311             |
| Financial                            | Miscellaneous                            | 0.02775         | 0.5033                | 0.9561             |
| <b>Corporate</b>                     | <b>Family/Individual</b>                 | <b>1.9904</b>   | <b>1.0024</b>         | <b>0.0482</b>      |
| Corporate                            | State                                    | 0.7782          | 1.2256                | 0.5260             |
| Corporate                            | Financial                                | 0.2491          | 0.5180                | 0.6311             |
| Corporate                            | Corporate                                | -               | -                     | -                  |
| Corporate                            | Miscellaneous                            | -0.2213         | 0.5064                | 0.6624             |
| Miscellaneous                        | Family/Individual                        | 1.7691          | 0.9936                | 0.0762             |
| Miscellaneous                        | State                                    | 0.5569          | 1.2163                | 0.6475             |
| Miscellaneous                        | Financial                                | 0.02775         | 0.5033                | 0.9561             |
| Miscellaneous                        | Corporate                                | -0.2213         | 0.5064                | 0.6624             |
| Miscellaneous                        | Miscellaneous                            | -               | -                     | -                  |

Bolded rows highlight significant differences as indicated by the p value.

\*Conditional means are represented in which all other variables included in the model are held at 0.



\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

Mean differences between the groups are shown via the horizontal brace

Figure 4.4

The conditional means for each of the forms of seller ownership and the sale price of unconventional resource deposits sold in logs and USD in millions (corresponding to Model D2)

### **The Influence of Location's Resource Attractiveness on Corporate Ownership and Commitment to Radical Boundary Spanning**

Finally, it was hypothesized that the target country's resource attractiveness moderates the relationship between the form of corporate ownership and commitment to radical boundary spanning. This influence is demonstrated in Tables 4.8 (buyers) and 4.10 (sellers). Hypothesis 3a was specific for the influence of target country's resource attractiveness on the relationship between buyer form of ownership and the purchase price of unconventional resource deposits bought. The equation for hypothesis 3a is provided below. This equation corresponds to model C4 in Table 4.8.

$$\begin{aligned}
 \text{Log(PurchasePrice)}_{\text{TBC}} = & \gamma_{000} + \gamma_{010}(\text{MiscellaneousVsFamily/Individual}_B) + \\
 & \gamma_{020}(\text{MiscellaneousVsState}_B) + \gamma_{030}(\text{MiscellaneousVsCorporate}_B) + \\
 & \gamma_{040}(\text{MiscellaneousVsFinancial}_B) + \gamma_{050}(\text{AlternateEnergy}_B) + \\
 & \gamma_{001}(\overline{\text{TargetCountryResourceDeposits}}_C - \text{constant}) + \gamma_{002}(\text{MiddleEast}_C) + \\
 & \gamma_{003}(\text{Africa}_C) + \gamma_{004}(\overline{\text{FDI}}_C - \text{constant}) + \gamma_{100}(\text{FDI}_{\text{TC}} - \overline{\text{FDI}}_C) + \\
 & \gamma_{100}(\text{TargetCountryResourceDeposits}_{\text{TC}} - \overline{\text{TargetCountryResourceDeposits}}_C) + \\
 & \gamma_{100}(\text{Unconventional}_{\text{TBC}}) + \gamma_{110}(\text{MiscellaneousVsFamily/} \\
 & \text{Individual}_B)(\text{Unconventional}_{\text{TBC}}) + \\
 & \gamma_{120}(\text{MiscellaneousVsState}_B)(\text{Unconventional}_{\text{TBC}}) + \\
 & \gamma_{130}(\text{MiscellaneousVsCorporate}_B)(\text{Unconventional}_{\text{TBC}}) + \\
 & \gamma_{140}(\text{MiscellaneousVsFinancial}_B)(\text{Unconventional}_{\text{TBC}}) + \\
 & \gamma_{210}(\text{MiscellaneousVsFamily/} \\
 & \text{Individual}_B)(\text{Unconventional}_{\text{TBC}})(\text{TargetCountryResourceDeposits}_{\text{TC}} - \\
 & \overline{\text{TargetCountryResourceDeposits}}_C) + \gamma_{220}(\text{MiscellaneousVsFamily/} \\
 & \text{Individual}_B)(\text{Unconventional}_{\text{TBC}})(\overline{\text{TargetCountryResourceDeposits}}_C - \text{constant}) + \\
 & \gamma_{230}(\text{MiscellaneousVsState}_B)(\text{Unconventional}_{\text{TBC}})(\text{TargetCountryResourceDeposits}_{\text{TC}} -
 \end{aligned}$$

$$\begin{aligned}
& \overline{\text{TargetCountryResourceDeposits}_C}) + \\
& \gamma_{240}(\text{MiscellaneousVsState}_B)(\text{Unconventional}_{TBC})(\overline{\text{TargetCountryResourceDeposits}_C} - \\
& \text{constant}) + \\
& \gamma_{250}(\text{MiscellaneousVsCorporate}_B)(\text{Unconventional}_{TBC})(\text{TargetCountryResourceDeposits}_{TC} - \\
& \overline{\text{TargetCountryResourceDeposits}_C}) + \\
& \gamma_{260}(\text{MiscellaneousVsCorporate}_B)(\text{Unconventional}_{TBC})(\overline{\text{TargetCountryResourceDeposits}_C} - \\
& \text{constant}) + \\
& \gamma_{270}(\text{MiscellaneousVsFinancial}_B)(\text{Unconventional}_{TBC})(\text{TargetCountryResourceDeposits}_{TC} - \\
& \overline{\text{TargetCountryResourceDeposits}_C}) + \\
& \gamma_{280}(\text{MiscellaneousVsFinancial}_B)(\text{Unconventional}_{TBC})(\overline{\text{TargetCountryResourceDeposits}_C} - \\
& \text{constant}) + U_{0B0} + U_{00C} + \varepsilon_{TSC}
\end{aligned}$$

The omnibus interaction effect for the within-country (level 1) influence of target country's petroleum resource deposits on the relationship between buyer firm form of ownership and the purchase price of unconventional resource deposits bought was not significant  $F(4, 279) = 0.56, p = 0.69$ . This indicated that, compared to the country's mean level of petroleum resource deposits, the amount of petroleum resource deposits did not significantly influence the how much each form of buyer firm pays to buy unconventional resource deposits. Although the omnibus effect was not significant, pairwise comparisons of differences of the influence of the within-country petroleum resource deposits on the relationship between buyer ownership and the purchase price of unconventional resource deposits bought were examined. There were no significant mean differences in the pairwise comparison among any of the forms of ownership. Table 4.12 and Figure 4.5 show the simple slope differences in the influence of the within-country petroleum resource deposits on the relationship between buyer ownership and the purchase price of unconventional resource deposits bought for all forms of ownership. Given this, the amount of petroleum resource deposits within a country, compared to the country's mean



petroleum resource deposits, did not significantly influence the relationship between buyer ownership and the purchase price of unconventional resource deposits bought. Nor were there significant slope differences in this influence for any of the different forms of ownership.

The omnibus effect for the between-country (level 2) influence of target country's petroleum resource deposits on the relationship between buyer firm form of ownership and the purchase price of unconventional resource deposits bought was not significant  $F(4, 279) = 1.18, p = 0.32$ . This indicated that, compared to the mean level of petroleum resource deposits across all countries, the mean level of petroleum resource deposits within a country did not significantly influence how much each form of buyer firm pays to buy unconventional resource deposits. Pairwise comparisons of differences of the influence of the between-country petroleum resource deposits on the relationship between buyer ownership and the purchase price of unconventional resource deposits bought were then examined. There was a significant simple slope difference in the influence of the between-country petroleum resource deposits on the relationship between buyer ownership and the purchase price of unconventional resource deposits bought for financial and miscellaneous owned MNCs (Estimate = -0.02 (log),  $p < 0.05$ ). Table 4.13 and Figure 4.6 show this significant simple slope difference. Thus, miscellaneous owned MNCs had purchase prices for unconventional resource deposits bought that were 20,000 USD less than miscellaneous owned MNCs when the unconventional resource deposits were bought in countries that had petroleum resource deposits that were valued at 1 billion USD more than other countries. In considering the within- and between-country influence of the target country petroleum resource deposits, there is partial support for hypothesis 3a.

Table 4.12

Simple slopes of within target country's petroleum resource deposits (level 1) on the relationship between buyer's ownership and the purchase price of unconventional resource deposits bought

| <b>MODEL C4 SIMPLE SLOPES*</b>                      |                   |                 |                       |                    |
|---|-------------------|-----------------|-----------------------|--------------------|
| <b>Buyer Owner Category</b>                         |                   | <b>Estimate</b> | <b>Standard Error</b> | <b>Pr &gt;  t </b> |
| Family/Individual                                   |                   | 0.06080         | 0.06238               | 0.3306             |
| State   |                   | 0.005548        | 0.01557               | 0.7219             |
| Financial   |                   | -0.01173        | 0.01055               | 0.2673             |
| Corporate   |                   | 0.000132        | 0.01437               | 0.9927             |
| Miscellaneous                                       |                   | -0.01552        | 0.02659               | 0.5598             |
| <b>MODEL C4 PAIRWISE COMPARISONS</b>                |                   |                 |                       |                    |
| <b>Focal Buyer Owner Comparative Buyer Category</b> |                   | <b>Estimate</b> | <b>Standard Error</b> | <b>Pr &gt;  t </b> |
| Family/Individual                                   | Family/Individual | -               | -                     | -                  |
| Family/Individual                                   | State             | -0.05525        | 0.06430               | 0.3910             |
| Family/Individual                                   | Financial         | -0.07252        | 0.06328               | 0.2527             |
| Family/Individual                                   | Corporate         | -0.06066        | 0.06392               | 0.3434             |
| Family/Individual                                   | Miscellaneous     | -0.07632        | 0.06777               | 0.2611             |
| State   | Family/Individual | -0.05525        | 0.06430               | 0.3910             |
| State   | State             | -               | -                     | -                  |
| State   | Financial         | -0.01727        | 0.01878               | 0.3583             |
| State   | Corporate         | -0.00542        | 0.02133               | 0.7998             |
| State   | Miscellaneous     | -0.02107        | 0.03086               | 0.4953             |
| Financial   | Family/Individual | -0.07252        | 0.06328               | 0.2527             |
| Financial   | State             | -0.01727        | 0.01878               | 0.3583             |
| Financial   | Financial         | -               | -                     | -                  |
| Financial   | Corporate         | 0.01186         | 0.01804               | 0.5116             |
| Financial   | Miscellaneous     | -0.00380        | 0.02870               | 0.8948             |
| Corporate   | Family/Individual | -0.06066        | 0.06392               | 0.3434             |
| Corporate   | State             | -0.00542        | 0.02133               | 0.7998             |
| Corporate   | Financial         | 0.01186         | 0.01804               | 0.5116             |
| Corporate   | Corporate         | -               | -                     | -                  |
| Corporate   | Miscellaneous     | -0.01566        | 0.03010               | 0.6033             |
| Miscellaneous                                       | Family/Individual | -0.07632        | 0.06777               | 0.2611             |
| Miscellaneous                                       | State             | -0.02107        | 0.03086               | 0.4953             |
| Miscellaneous                                       | Financial         | -0.00380        | 0.02870               | 0.8948             |
| Miscellaneous                                       | Corporate         | -0.01566        | 0.03010               | 0.6033             |
| Miscellaneous                                       | Miscellaneous     | -               | -                     | -                  |

\*Simple slopes are represented in which all other variables included in the model are held at 0.

Table 4.13

Simple slopes of between target country's petroleum resource deposits (level 2) on the relationship between buyer's ownership and the purchase price of unconventional resource deposits bought

| MODEL C4 SIMPLE SLOPES*       |                                  |                 |                 |               |
|-------------------------------|----------------------------------|-----------------|-----------------|---------------|
| Buyer Owner Category          |                                  | Estimate        | Standard Error  | Pr >  t       |
| Family/Individual             |                                  | -0.00161        | 0.01794         | 0.9285        |
| State                         |                                  | 0.001878        | 0.007496        | 0.8023        |
| Financial                     |                                  | 0.002623        | 0.005113        | 0.6084        |
| Corporate                     |                                  | -0.00383        | 0.005978        | 0.5225        |
| Miscellaneous                 |                                  | -0.01694        | 0.007992        | 0.0349        |
| MODEL C4 PAIRWISE COMPARISONS |                                  |                 |                 |               |
| Focal Buyer Owner Category    | Comparative Buyer Owner Category | Estimate        | Standard Error  | Pr >  t       |
| Family/Individual             | Family/Individual                | -               | -               | -             |
| Family/Individual             | State                            | 0.003489        | 0.01944         | 0.8577        |
| Family/Individual             | Financial                        | 0.004234        | 0.01859         | 0.8200        |
| Family/Individual             | Corporate                        | -0.00222        | 0.01888         | 0.9066        |
| Family/Individual             | Miscellaneous                    | -0.01533        | 0.01964         | 0.4358        |
| State                         | Family/Individual                | 0.003489        | 0.01944         | 0.8577        |
| State                         | State                            | -               | -               | -             |
| State                         | Financial                        | 0.000744        | 0.009050        | 0.9345        |
| State                         | Corporate                        | -0.00571        | 0.009566        | 0.5514        |
| State                         | Miscellaneous                    | -0.01882        | 0.01093         | 0.0863        |
| Financial                     | Family/Individual                | 0.004234        | 0.01859         | 0.8200        |
| Financial                     | State                            | 0.000744        | 0.009050        | 0.9345        |
| Financial                     | Financial                        | -               | -               | -             |
| Financial                     | Corporate                        | -0.00645        | 0.007796        | 0.4087        |
| <b>Financial</b>              | <b>Miscellaneous</b>             | <b>-0.01956</b> | <b>0.009439</b> | <b>0.0391</b> |
| Corporate                     | Family/Individual                | -0.00222        | 0.01888         | 0.9066        |
| Corporate                     | State                            | -0.00571        | 0.009566        | 0.5514        |
| Corporate                     | Financial                        | -0.00645        | 0.007796        | 0.4087        |
| Corporate                     | Corporate                        | -               | -               | -             |
| Corporate                     | Miscellaneous                    | -0.01311        | 0.009955        | 0.1889        |
| Miscellaneous                 | Family/Individual                | -0.01533        | 0.01964         | 0.4358        |
| Miscellaneous                 | State                            | -0.01882        | 0.01093         | 0.0863        |
| <b>Miscellaneous</b>          | <b>Financial</b>                 | <b>-0.01956</b> | <b>0.009439</b> | <b>0.0391</b> |
| Miscellaneous                 | Corporate                        | -0.01311        | 0.009955        | 0.1889        |
| Miscellaneous                 | Miscellaneous                    | -               | -               | -             |

Bolded rows highlight significant differences as indicated by the p value.

\*Simple slopes are represented in which all other variables included in the model are held at 0.

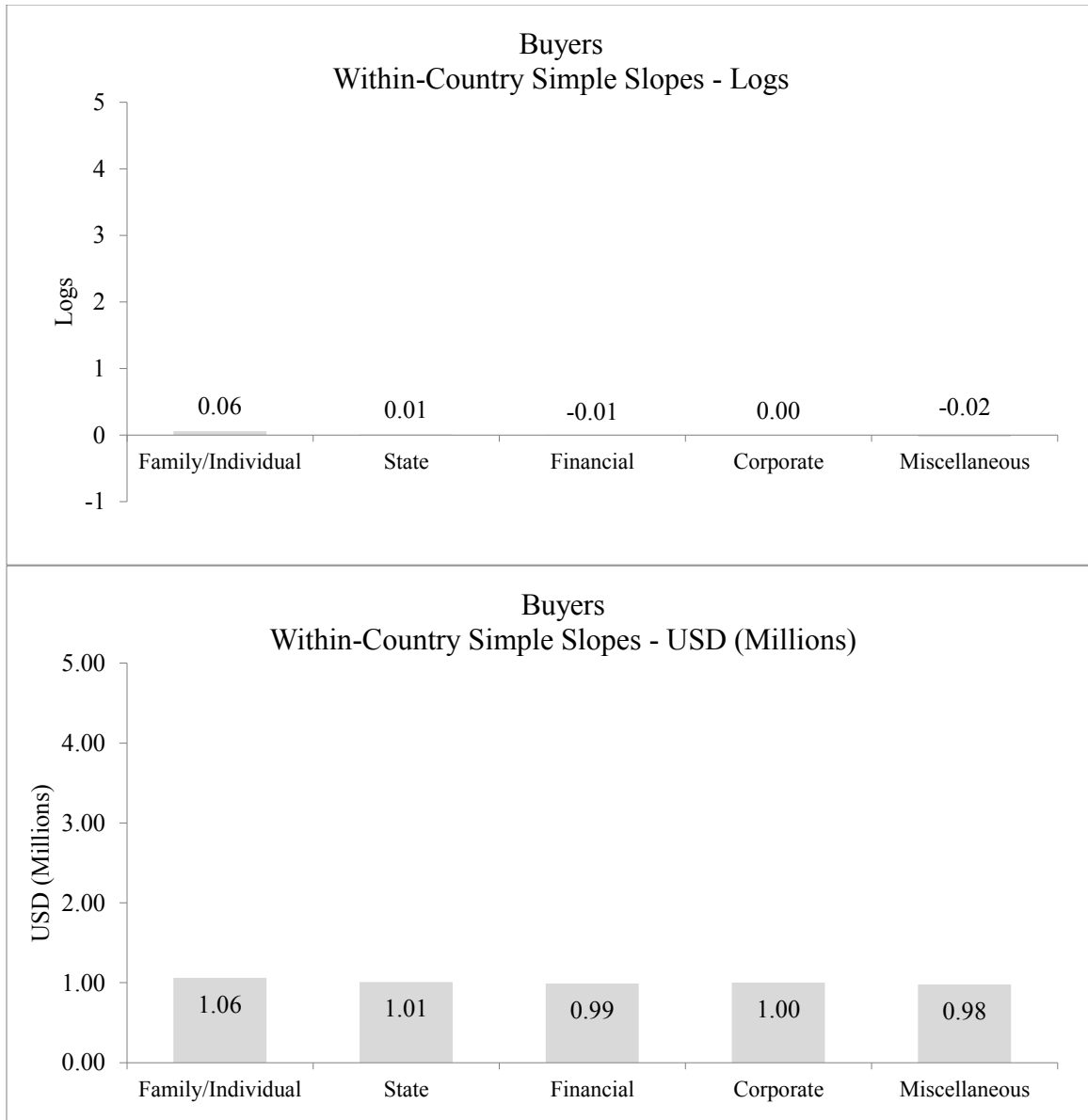
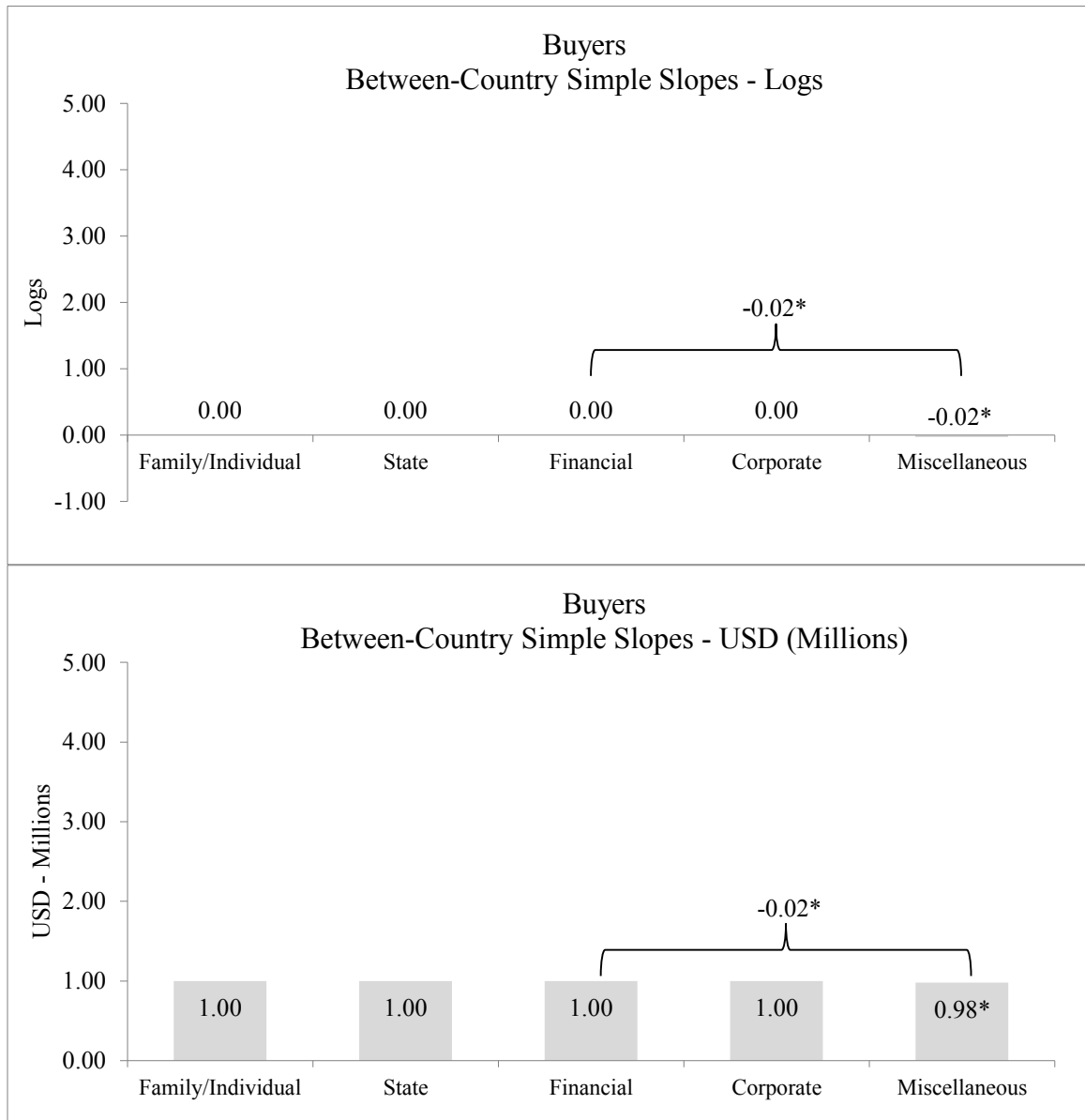


Figure 4.5

Simple slopes for the influence of within target country's petroleum deposits (level 1) on each of the forms of buyer ownership and the purchase price of unconventional resource deposits bought in logs and USD in millions (corresponding to Model C4)



\*  $p < 0.05$

Figure 4.6

Simple slopes for the influence of between target country's petroleum deposits (level 2) on each of the forms of buyer ownership and the purchase price of unconventional resource deposits bought in logs and USD in millions (corresponding to Model C4)

Hypothesis 3b was specific to the influence of target country's resource attractiveness on the relationship between seller form of ownership and the sale price of unconventional resource deposits sold. Below is the equation for hypothesis 3b, which corresponds to model D4 in Table 4.10.

$$\begin{aligned}
\text{Log}(\text{SalePrice})_{\text{TSC}} = & \gamma_{000} + \gamma_{010}(\text{MiscellaneousVsFamily/Individual}_S) + \\
& \gamma_{020}(\text{MiscellaneousVsState}_S) + \gamma_{030}(\text{MiscellaneousVsCorporate}_S) + \\
& \gamma_{040}(\text{MiscellaneousVsFinancial}_S) + \gamma_{050}(\text{AlternateEnergy}_S) + \\
& \gamma_{001}(\overline{\text{TargetCountryResourceDeposits}}_C - \text{constant}) + \gamma_{002}(\text{MiddleEast}_C) + \\
& \gamma_{003}(\text{Africa}_C) + \gamma_{004}(\overline{\text{FDI}}_C - \text{constant}) + \gamma_{100}(\text{Unconventional}_{\text{TSC}}) + \gamma_{100}(\text{FDI}_{\text{TC}} - \\
& \overline{\text{FDI}}_C) + \gamma_{100}(\text{TargetCountryResourceDeposits}_{\text{TC}} - \\
& \overline{\text{TargetCountryResourceDeposits}}_C) + \gamma_{110}(\text{MiscellaneousVsFamily/} \\
& \text{Individual}_S)(\text{Unconventional}_{\text{TSC}}) + \\
& \gamma_{120}(\text{MiscellaneousVsState}_S)(\text{Unconventional}_{\text{TSC}}) + \\
& \gamma_{130}(\text{MiscellaneousVsCorporate}_S)(\text{Unconventional}_{\text{TSC}}) + \\
& \gamma_{140}(\text{MiscellaneousVsFinancial}_S)(\text{Unconventional}_{\text{TSC}}) + \\
& \gamma_{210}(\text{MiscellaneousVsFamily/} \\
& \text{Individual}_S)(\text{Unconventional}_{\text{TSC}})(\text{TargetCountryResourceDeposits}_{\text{TC}} - \\
& \overline{\text{TargetCountryResourceDeposits}}_C) + \gamma_{220}(\text{MiscellaneousVsFamily/} \\
& \text{Individual}_S)(\text{Unconventional}_{\text{TSC}})(\overline{\text{TargetCountryResourceDeposits}}_C - \text{constant}) + \\
& \gamma_{230}(\text{MiscellaneousVsState}_S)(\text{Unconventional}_{\text{TSC}})(\text{TargetCountryResourceDeposits}_{\text{TC}} - \\
& \overline{\text{TargetCountryResourceDeposits}}_C) + \\
& \gamma_{240}(\text{MiscellaneousVsState}_S)(\text{Unconventional}_{\text{TSC}})(\overline{\text{TargetCountryResourceDeposits}}_C - \\
& \text{constant}) + \\
& \gamma_{250}(\text{MiscellaneousVsCorporate}_S)(\text{Unconventional}_{\text{TSC}})(\text{TargetCountryResourceDeposits}_{\text{TC}} - \\
& \overline{\text{TargetCountryResourceDeposits}}_C) +
\end{aligned}$$

$$\begin{aligned}
& \gamma_{260}(\text{MiscellaneousVsCorporate}_S)(\text{Unconventional}_{\text{TSC}})(\overline{\text{TargetCountryResourceDeposits}_C} - \\
& \text{constant}) + \\
& \gamma_{270}(\text{MiscellaneousVsFinancial}_S)(\text{Unconventional}_{\text{TSC}})(\text{TargetCountryResourceDeposits}_{\text{TC}} - \\
& \overline{\text{TargetCountryResourceDeposits}_C}) + \\
& \gamma_{280}(\text{MiscellaneousVsFinancial}_S)(\text{Unconventional}_{\text{TSC}})(\overline{\text{TargetCountryResourceDeposits}_C} - \\
& \text{constant}) + U_{00C} + U_{0S0} + \varepsilon_{\text{TSC}}
\end{aligned}$$

The omnibus effect for the within-country (level 1) influence of target country's petroleum resource deposits on the relationship between seller firm form of ownership and the sale price of unconventional resource deposits sold was not significant  $F(3, 185) = 0.21, p = 0.89$ . This indicated that, compared to the country's mean level of petroleum resource deposits, the amount of petroleum resource deposits did not significantly influence the sale price of unconventional resource deposits sold for each form of seller ownership. Similarly, pairwise comparisons of differences of the influence of the within-country petroleum resource deposits on the relationship between seller ownership and the sale price of unconventional resource deposits sold revealed no significant simple slope differences among any of the forms of ownership. It should be noted that simple slopes were not estimable for state owned seller MNCs. Table 4.14 and Figure 4.7 illustrate the simple slopes for each form of ownership and related pairwise comparisons. Thus, the amount of petroleum resource deposits within a country, with respect to the country's mean petroleum resource deposits, did not significantly influence the relationship between seller ownership and the sale price of unconventional resource deposits sold. Nor were there significant slope differences in this influence for any of the different forms of ownership for sellers.

The omnibus effect for the between-country (level 2) influence of target country's petroleum resource deposits on the relationship between seller firm form of ownership and the purchase price of unconventional resource deposits bought was not significant  $F(3, 185) = 0.47, p$

= 0.70. This indicated that, compared to the mean level of petroleum resource deposits across all countries, the mean level of petroleum resource deposits within a country did not significantly influence the sale price of unconventional resource deposits sold for each form of seller firm. Pairwise comparisons of differences of the influence of the between-country petroleum resource deposits on the relationship between seller ownership and the sale price of unconventional resource deposits sold also revealed no significant mean differences among seller firms. Table 4.15 and Figure 4.8 detail the simple slopes for each form of seller firm ownership and simple slope differences in pairwise comparisons. In considering the within- and between-country influence of the target country petroleum resource deposits, there is no support for hypothesis 3b.



Table 4.14

Simple slopes of within target country's petroleum resource deposits (level 1) on the relationship between seller's ownership and the sale price of unconventional resource deposits sold

| <b>MODEL D4 SIMPLE SLOPES*</b>       |  |                 |                       |                    |
|--------------------------------------|--|-----------------|-----------------------|--------------------|
| <b>Seller Owner Category</b>         |  | <b>Estimate</b> | <b>Standard Error</b> | <b>Pr &gt;  t </b> |
| Family/Individual                    |  | 0.08299         | 0.1110                | 0.4557             |
| State                                |  | Non-est         | .                     | .                  |
| Financial                            |  | -0.00443        | 0.02515               | 0.8604             |
| Corporate                            |  | -0.00638        | 0.01369               | 0.6417             |
| Miscellaneous                        |  | -0.00483        | 0.009587              | 0.6151             |
| <b>MODEL D4 PAIRWISE COMPARISONS</b> |  |                 |                       |                    |
| <b>Focal Seller Owner Category</b>   | <b>Comparative Seller Owner Category</b> | <b>Estimate</b> | <b>Standard Error</b> | <b>Pr &gt;  t </b> |
| Family/Individual                    | Family/Individual                        | -               | -                     | -                  |
| Family/Individual                    | State                                    | Non-est         | .                     | .                  |
| Family/Individual                    | Financial                                | -0.08742        | 0.1136                | 0.4427             |
| Family/Individual                    | Corporate                                | -0.08937        | 0.1120                | 0.4258             |
| Family/Individual                    | Miscellaneous                            | -0.08782        | 0.1114                | 0.4317             |
| State                                | Family/Individual                        | Non-est         | .                     | .                  |
| State                                | State                                    | -               | -                     | -                  |
| State                                | Financial                                | Non-est         | .                     | .                  |
| State                                | Corporate                                | Non-est         | .                     | .                  |
| State                                | Miscellaneous                            | Non-est         | .                     | .                  |
| Financial                            | Family/Individual                        | -0.08742        | 0.1136                | 0.4427             |
| Financial                            | State                                    | Non-est         | .                     | .                  |
| Financial                            | Financial                                | -               | -                     | -                  |
| Financial                            | Corporate                                | -0.00195        | 0.02831               | 0.9451             |
| Financial                            | Miscellaneous                            | -0.00040        | 0.02707               | 0.9882             |
| Corporate                            | Family/Individual                        | -0.08937        | 0.1120                | 0.4258             |
| Corporate                            | State                                    | Non-est         | .                     | .                  |
| Corporate                            | Financial                                | -0.00195        | 0.02831               | 0.9451             |
| Corporate                            | Corporate                                | -               | -                     | -                  |
| Corporate                            | Miscellaneous                            | 0.001550        | 0.01673               | 0.9263             |
| Miscellaneous                        | Family/Individual                        | -0.08782        | 0.1114                | 0.4317             |
| Miscellaneous                        | State                                    | Non-est         | .                     | .                  |
| Miscellaneous                        | Financial                                | -0.00040        | 0.02707               | 0.9882             |
| Miscellaneous                        | Corporate                                | 0.001550        | 0.01673               | 0.9263             |
| Miscellaneous                        | Miscellaneous                            | -               | -                     | -                  |

\*Simple slopes are represented in which all other variables included in the model are held at 0.

Table 4.15

Simple slopes of between target country's petroleum resource deposits (level 2) on the relationship between seller's ownership and the sale price of unconventional resource deposits sold

| <b>MODEL D4 SIMPLE SLOPES*</b>       |  |                       |                       |                    |
|--------------------------------------|--|-----------------------|-----------------------|--------------------|
| <b>Seller Owner Category</b>         | <b>Estimate</b>                          | <b>Standard Error</b> | <b>Pr &gt;  t </b>    |                    |
| Family/Individual                    | 0.02056                                  | 0.02462               | 0.4048                |                    |
| State                                | Non-est                                  | .                     | .                     |                    |
| Financial                            | -0.00460                                 | 0.007425              | 0.5361                |                    |
| Corporate                            | 0.000676                                 | 0.006303              | 0.9148                |                    |
| Miscellaneous                        | -0.00502                                 | 0.005974              | 0.4019                |                    |
| <b>MODEL D4 PAIRWISE COMPARISONS</b> |  |                       |                       |                    |
| <b>Focal Seller Owner Category</b>   | <b>Comparative Seller Owner Category</b> | <b>Estimate</b>       | <b>Standard Error</b> | <b>Pr &gt;  t </b> |
| Family/Individual                    | Family/Individual                        | -                     | -                     | -                  |
| Family/Individual                    | State                                    | Non-est               | .                     | .                  |
| Family/Individual                    | Financial                                | -0.02516              | 0.02556               | 0.3262             |
| Family/Individual                    | Corporate                                | -0.01989              | 0.02530               | 0.4330             |
| Family/Individual                    | Miscellaneous                            | -0.02558              | 0.02526               | 0.3126             |
| State                                | Family/Individual                        | Non-est               | .                     | .                  |
| State                                | State                                    | -                     | -                     | -                  |
| State                                | Financial                                | Non-est               | .                     | .                  |
| State                                | Corporate                                | Non-est               | .                     | .                  |
| State                                | Miscellaneous                            | Non-est               | .                     | .                  |
| Financial                            | Family/Individual                        | -0.02516              | 0.02556               | 0.3262             |
| Financial                            | State                                    | Non-est               | .                     | .                  |
| Financial                            | Financial                                | -                     | -                     | -                  |
| Financial                            | Corporate                                | 0.005278              | 0.009461              | 0.4087             |
| Financial                            | Miscellaneous                            | -0.00042              | 0.009235              | 0.9641             |
| Corporate                            | Family/Individual                        | -0.01989              | 0.02530               | 0.4330             |
| Corporate                            | State                                    | Non-est               | .                     | .                  |
| Corporate                            | Financial                                | -0.00645              | 0.007796              | 0.4087             |
| Corporate                            | Corporate                                | -                     | -                     | -                  |
| Corporate                            | Miscellaneous                            | -0.00569              | 0.008553              | 0.5064             |
| Miscellaneous                        | Family/Individual                        | -0.02558              | 0.02526               | 0.3126             |
| Miscellaneous                        | State                                    | Non-est               | .                     | .                  |
| Miscellaneous                        | Financial                                | -0.00042              | 0.009235              | 0.9641             |
| Miscellaneous                        | Corporate                                | -0.00569              | 0.008553              | 0.5064             |
| Miscellaneous                        | Miscellaneous                            | -                     | -                     | -                  |

\*Simple slopes are represented in which all other variables included in the model are held at 0.

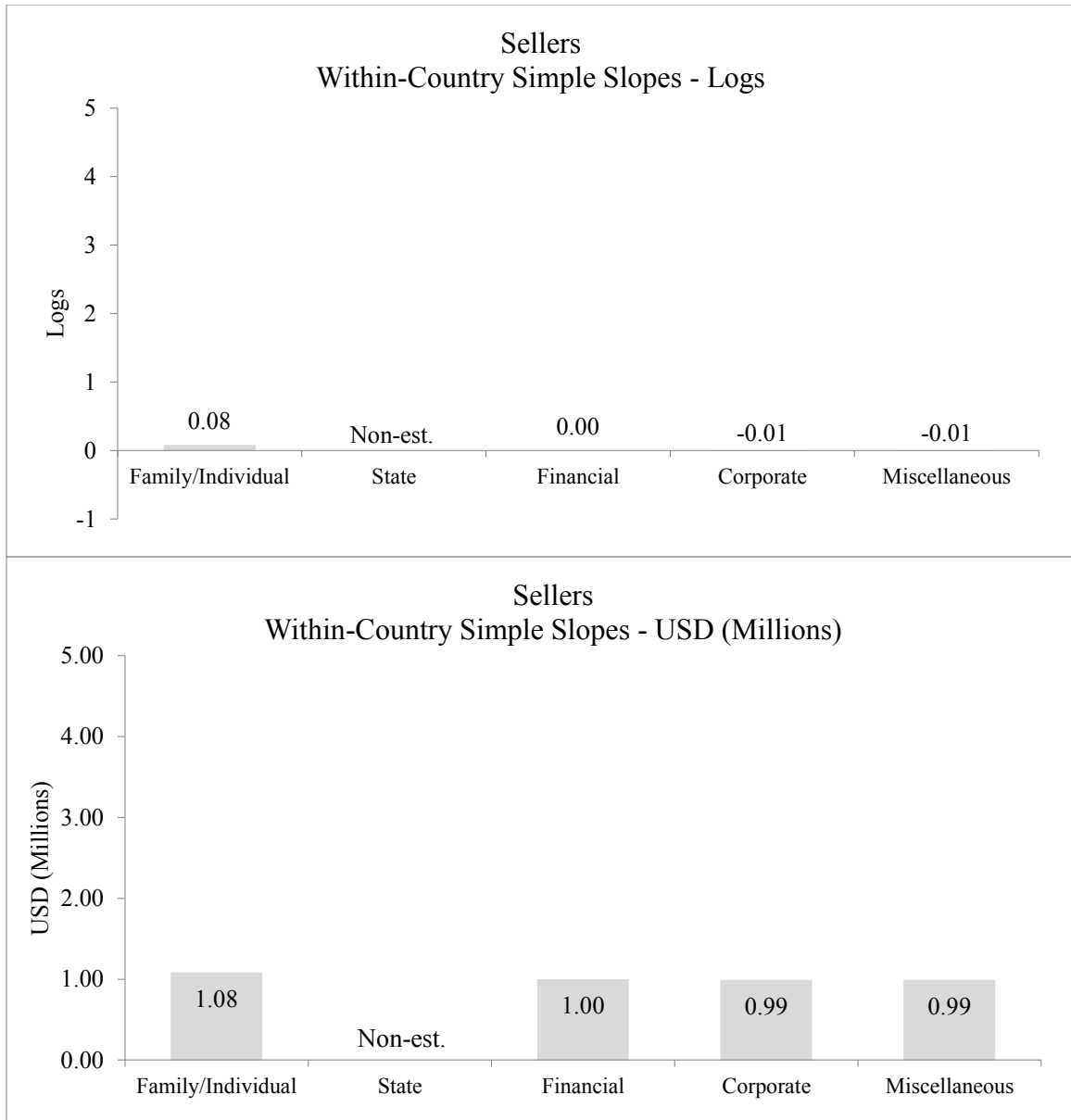


Figure 4.7

Simple slopes for the influence of within target country's petroleum deposits (level 1) on each of the forms of seller ownership and the sale price of unconventional resource deposits sold in logs and USD in millions (corresponding to Model D4)

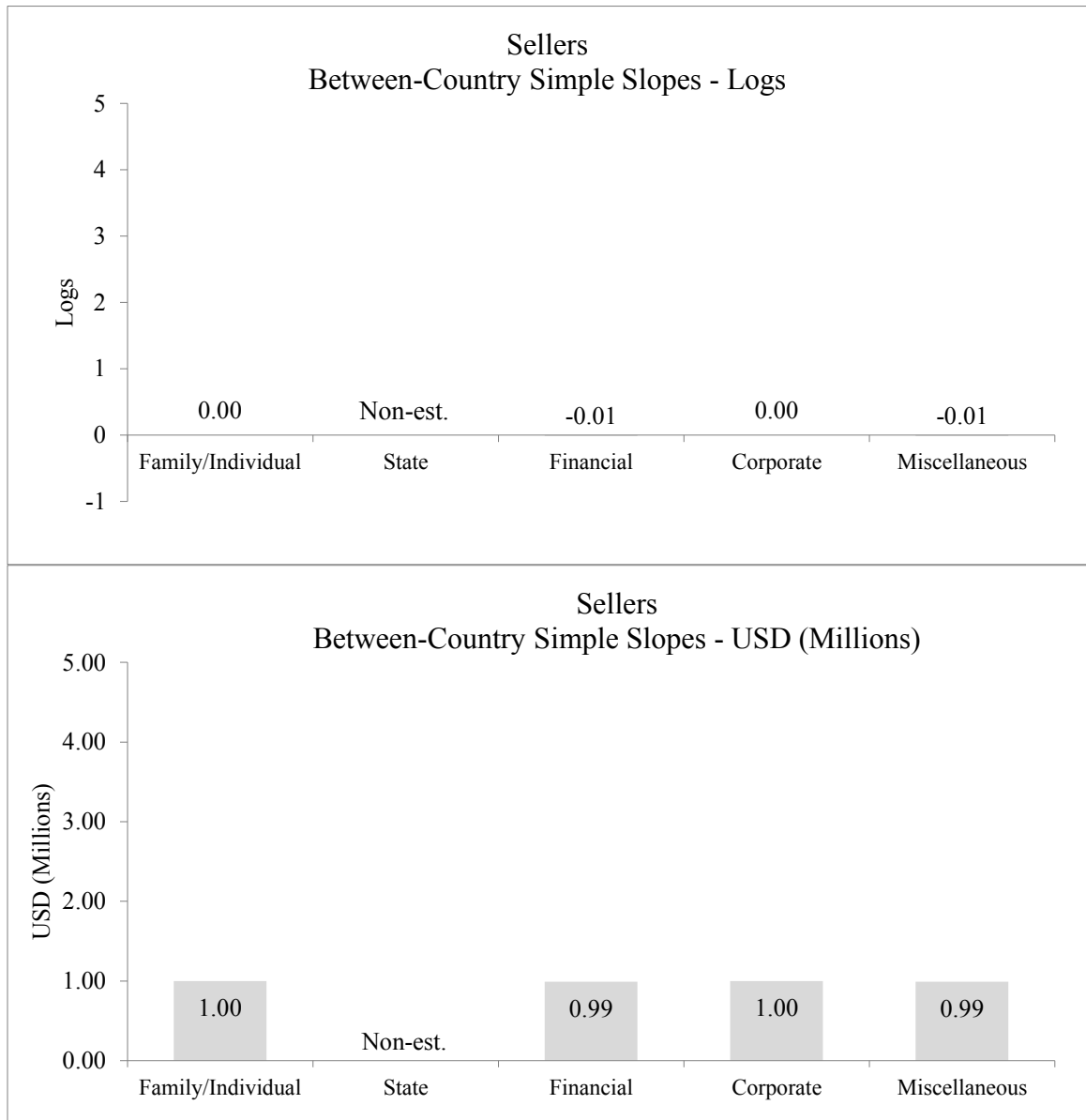


Figure 4.8

The conditional simple slopes for the influence of between target country's petroleum deposits (level 2) on each of the forms of seller ownership and the sale price of unconventional resource deposits sold in logs and USD in millions (corresponding to Model D4)

### Summary of Hypotheses

Overall, the results provide partial support for the full model shown in Figure 1.1. Firm ownership was not a significant predictor of radical boundary spanning, indicated by buying/selling unconventional resource deposits. However, there were significant mean differences among the different forms of buyer ownership and radical boundary spanning. Family or individual owned buyer MNCs were significantly less likely to radically boundary span than all other buyer MNCs. The probability of family or individual owned buyer MNCs radical boundary spanning was 0.0%. There were no significant differences in radical boundary spanning among sellers.

Firm ownership appeared to be a predictor of commitment to radical boundary spanning for buyers, as indicated by the buyer's purchase price of unconventional resource deposits bought. In examining the mean differences among buyer MNCs, corporate owned buyer MNCs were significantly less committed than both state and financial owned buyer MNCs to radical boundary spanning. On average, corporate owned buyer MNCs spent 1.95 million USD less than state owned MNCs, and 2.48 million less than financial in the purchase price of unconventional resources bought. Firm ownership was not significantly related to commitment to radical boundary spanning for sellers. The only significant mean difference in pairwise comparisons among seller MNCs was between corporate and family or individual owned seller MNCs. Corporate owned seller MNCs had sale prices for unconventional resource deposits that were 3.7 million USD than family or individual owned MNCs.

Finally the target country's resource attractiveness, measured in petroleum resource deposits, did not significantly influence the relationship between buyer ownership and commitment to radical boundary spanning. The only significant simple slope difference was between financial and miscellaneous owned MNCs in target countries that were relatively more resource attractive than other countries. In these countries, miscellaneous owned MNCs had

purchase prices of unconventional resource deposits bought that were 20, 000 USD less than financial owned MNCs. The target country's resource attractiveness did not significantly influence the relationship between buyer owners and commitment to radical boundary spanning for any seller MNCs. Further, there were no simple slope differences in this influence among pairwise comparisons. Table 4.16 illustrates the hypotheses proposed in Chapter Three, and the results for these hypotheses from this chapter.

Table 4.16

A summary of the results for the hypotheses

| <b>Hypothesis</b>  | <b>Supported?</b> | <b>Explanation</b>  |
|--|-------------------|---|
| Hypothesis 1a: Buyer's ownership influences whether the buyer firm buys unconventional resource deposits.  | Partial           | <ul style="list-style-type: none"> <li>• Buyer firm ownership was not a significant predictor of the firm buying unconventional resource deposits.</li> <li>• Family owned buyer MNCs were less likely than state, corporate, financial, and miscellaneous owned buyer MNCs to buy unconventional resource deposits.</li> </ul>   |
| Hypothesis 1b: Seller's ownership influences whether the seller firm sells unconventional resource deposits.   | No                | <ul style="list-style-type: none"> <li>• Seller firm ownership was not a significant predictor of the firm selling unconventional resource deposits.</li> <li>• There were no significant conditional mean differences among seller MNCs and selling unconventional resource deposits.</li> </ul>   |
| Hypothesis 2a: Buyer's ownership influences the buyer's purchase price of unconventional resource deposits bought.   | Partial           | <ul style="list-style-type: none"> <li>• Buyer firm ownership was a marginally significant predictor of the purchase price of unconventional resource deposits bought.</li> <li>• There were significant conditional mean differences in the purchase price of unconventional resource deposits bought between corporate and financial owned buyer MNCs (financial owned MNCs had higher purchase prices) and corporate and state owned buyer MNCs (state owned MNCs had higher purchase prices)</li> </ul> |
| Hypothesis 2b: Seller's ownership influences the seller's sale price of unconventional resources deposits sold.  | Partial           | <ul style="list-style-type: none"> <li>• Seller firm ownership was not significantly related to the sale price of unconventional resource deposits sold.</li> <li>• There was a significant conditional mean difference in the sale price of unconventional resource deposits sold between corporate and family or individual owned buyer MNCs (corporate owned MNCs had higher sale prices)</li> </ul>   |
| Hypothesis 3a: The target country's petroleum resource deposits influences the relationship between the buyer's ownership and the buyer's purchase price of unconventional resource deposits bought. When the target country's petroleum resource deposits | Partial           | <ul style="list-style-type: none"> <li>• The target country's petroleum resource deposits did not significantly influence the relationship between buyer firm ownership and the purchase price of unconventional resource deposits bought.</li> <li>• There was a significant simple slope difference in the influence of between-country petroleum resource deposits between buyer ownership and purchase price of unconventional resource deposits for miscellaneous and financial owned MNCs.</li> </ul> |

|   |    |   |
|---|----|---|
| are higher, the relationship is stronger.   |    | Miscellaneous owned MNCs had lower purchase prices than financial owned MNCs in countries that had more petroleum resource deposits.  |
| Hypothesis 3b: The target country's petroleum resource deposits influences the relationship between the seller's ownership and the seller's sale price of unconventional resources deposits sold. When the target country's petroleum resource deposits are higher, the relationship is stronger. | No | <ul style="list-style-type: none"> <li>• The target country's petroleum resource deposits did not significantly influence the relationship between seller firm ownership and the sale price of unconventional resource deposits sold.</li> <li>• There were no significant simple slope differences in the influence of between- or within-country petroleum resource deposits on the relationship between seller ownership and the sale price of unconventional resource deposits sold.</li> </ul> |



### **Summary**

In sum, all hypotheses received partial support except hypotheses 1b and 3b. These hypotheses suggest that (1b) seller firm ownership is related to radical boundary spanning and (3b) there is a stronger relationship between the form of seller ownership and the seller firm's sale price of unconventional resource deposits sold when the unconventional resource deposits are located in countries that have higher petroleum resource deposits. Chapter Five provides a more detailed discussion of the findings. The general findings are discussed first, followed by discussion of the contributions of the findings for research and practice. The chapter concludes with a discussion of this study's limitations as well as future avenues of research.

## CHAPTER FIVE - DISCUSSION

This chapter provides a discussion of the results presented in Chapter Four. It offers insight into theoretical and practical contributions of the results, in addition to discussion of the study's limitations and avenues for future research. Aside from two hypotheses, each proposed hypothesis received partial support. These findings provide greater understanding of the relationship between corporate ownership and radical boundary spanning, particularly for buyer MNCs with institutional owners. These insights are discussed in more detail below.

### General Discussion

The first set of hypotheses tested the relationship between buyer/seller firm forms of corporate ownership and radical boundary spanning. In terms of buyers, the findings show that family or individual owned MNCs are expected to be significantly less likely to radically boundary span. As indicated above, there are uncertain returns associated with radical boundary spanning (Rosenkopf & Nerkar, 2001). Family or individual owned firms tend to invest more conservatively and be more risk averse (Ward, 1997). This is especially true for family or individual owned MNCs because of the added risks associated with operating in foreign markets (Fernandez & Nieto, 2005). For family or individual owned MNCs, investing their own financial resources in an activity that produces uncertain returns may prove to be too risky of an investment (Fernandez & Nieto, 2005). This may be because the family or individual owner will have difficulty creating more equity to replace the lost equity if the uncertain activity, here radical boundary spanning, does not create returns.

The second set of hypotheses tested the relationship between buyer/seller firm forms of ownership and commitment to radical boundary spanning. In terms of buyers, the findings show that corporate owned buyer MNCs are expected to be significantly less committed to radical boundary spanning than state or financial owned MNCs. Radical boundary spanning requires capital intensive, technological capability-driven projects. As noted above, corporate owners may

face tighter capital budgets and need to invest in projects that will produce immediate returns. Therefore, the findings show that corporate owned MNCs are expected to be less committed to radical boundary spanning activities that require capital intensity and in which returns are more likely to be long-term. State owned buyers often have significant and stable financial backing from their home country governments (Bremmer, 2009; Pirog, 2007). Further, state owned MNCs are concerned with “wealth re-distribution, jobs creation, general economic development, [and] economic and energy security” (Pirog, 2007, p. 1). State owned MNCs operate as foreign-policy instruments of their government owners who are concerned with enhancing long-term viability, geopolitical position, and power of the home country government. Therefore, when state owned MNCs make the decision to radically boundary span, they may also have the financial resources to be more committed to this strategic activity. This is reflected in the premiums they pay to purchase these resources.

The difference between corporate and financial owned MNCs in the commitment to radical boundary spanning could possibly indicate differences between institutional and non-institutional owners. Financial owned firms, as a type of institutional owner, are focused on long-term investments. This is because they tend to hold larger amounts of firm equity that cannot be divested without negatively affecting stock price (Johnson & Greening, 1999). Thus, these firms are more selective in the strategic activities that they choose to engage in, and as such are likely more committed to these activities than firms without institutional owners.

In terms of sellers, corporate owned firms are more committed to radical boundary spanning than family or individual owned firms. This could be because these owners are focused on activities that will create the greatest returns (i.e., selling resources at the highest possible sale price). As noted above, corporate owners tend to invest in strategic activities that produce returns that can then be infused into the owner’s firm. Selling at a higher price provides the potential to reinvest these funds.

The third set of hypotheses tested the influence of the target country's resource attractiveness on the relationship between buyer/seller firm form of corporate ownership and commitment to radical boundary spanning. The results of these hypotheses were counterintuitive because the location's resources do not appear to matter substantively. The resource attractiveness of a context is not expected to influence a firm's commitment to radical boundary spanning for that resource. The only significant effect was the between-country difference of resource attractiveness on the relationship between financial and miscellaneous ownership and commitment to radical boundary spanning. Although this was a significant effect, the difference between financial and miscellaneous owned firms in the commitment to radical boundary spanning, measured as purchase price for unconventional resource deposits bought, was 20,000 USD. Although significant, this is not a substantive amount when the average purchase price across all transactions is 428 million USD.

The interesting finding from these hypotheses is that although MNCs must secure resources from locations across the world, the attractiveness of the location, in terms of both conventional and unconventional resource deposits, does not substantively matter. This has interesting implications for revealing the complexity of resource dependence theory (RDT). This study indicates that MNCs are not concerned with buying/selling resources in target countries that are more resource attractive. Thus, there may be other location-specific elements that attract MNCs that are looking to increase power by securing access to external resources.

### **Theoretical Contributions**

One of the key theoretical contributions from this research is that a more progressive valuation of external resources is needed to augment existing conceptualizations of RDT. Rather than suggesting that the future constrains firm behavior (Pfeffer & Nowak, 1976), this study suggests that the availability of external resources can enable firm behavior for the future. The value of resources must take into account both present and future value. By incorporating the concept of the resource pyramid with radical boundary spanning, resources can be categorized

based on whether they are in demand now (conventional resources), or will be in demand in the future (unconventional resources). While conventional resources are available, they are more valuable at present. However, in the future, unconventional resources will be more valuable because conventional resources will be depleted.

Firms that have conventional resources may be more powerful at present. This logic is supported by existing perspectives of RDT. However, the findings of this study indicate that firms that have unconventional resources at present may be in the best position to be powerful in the future. This reasoning augments existing conceptualizations of RDT. This theoretical implication suggests that, at present, conventional resources are a source of power. MNCs that have the most conventional resources at present may have the most power because these resources are currently in demand. However, when these conventional resources are depleted, unconventional resources will be the source of power.

MNCs that secure access to these unconventional resources now may also reap the benefits of having access to these unconventional resources in the future. The more unconventional resources a multinational acquires now, the less dependent the multinational will be on other firms to gain access to these resources in the future. The results suggest, preliminarily, that family or individual owned MNCs are less likely to buy unconventional resources. Given this, as conventional resource become scarcer, differentials may arise in the likelihood of buying unconventional resources for state, corporate, financial, or miscellaneous owned firms. This differential may become more apparent as the general trend of an increasing number of global, market-based transactions involving unconventional resources continues to rise.

A second theoretical contribution of this research is that in existing RDT, dependence is assumed to be a simple reliance on more powerful firms. That is, firms with the least resources are dependent on other firms to gain access to valuable, external resources. This is one form of dependence. However, RDT does not delve into how firms gain access to these resources to

increase power. This study presents a more nuanced approach to dependence among MNCs from a transaction perspective. The results seem to indicate that MNCs are 1) dependent on other firms to buy/sell resources, and 2) dependent on a functioning market to gain access to the resources that will be most valuable to the MNC.

This study demonstrates the multidimensionality of dependence. First, MNCs buy and sell resources from one another. This is confirmed in the sheer number of cross-border market based transactions. This is also indicated by the representation of MNCs with varied forms of ownership in the sample (family or individual owned firms; state owned; financial owned; corporate owned; and miscellaneous owned). Further, preferences among MNCs in terms of the external resources that are bought and sold are also apparent. For example, family or individual and miscellaneous owned MNCs are less likely to radically boundary span and buy unconventional resources. For RDT, dependence stems from how many external resources a firm has access to, but also how the firm uses market-based transactions to access those resources.

A third theoretical contribution of this research is the addition of a fifth type of resource constraint: the scarcity of natural resources. Existing conceptualizations of RDT (regarding external resources) and the resource-based view (RBV) (regarding internal resources) suggest four types of resource constraints: “1) shortage of labor or physical inputs, 2) shortage of finance, 3) lack of suitable investment opportunities, and 4) lack of sufficient managerial capacity,” (Mahoney & Pandian, 1992, p. 365-366). This study combines RDT and the resource pyramid to show that natural resource scarcity can be another source of resource constraint. Natural resource scarcity influences MNCs to engage in activities in locations that they may not want to operate in, but are forced to because the resources the MNCs need require a different set of activities or operation in a different locale.

The second facet of this contribution is that the resource constraint of resource scarcity increases with firm activities. RDT and RBV suggest that resource constraints either enable strategic activities or can be lessened through firm activities (Rao & Drazin, 2002). Because the

present study focuses on external resources, it adds to RDT by suggesting that resource constraints can also become greater because of firm activities. This is demonstrated in Model C4 of Table 4.8. Buyer form of ownership is significantly related to not just the purchase price of resources (conventional and unconventional), but also the purchase price of unconventional resources. Once conventional resources are depleted (by way of firm activities), unconventional resources will become more valuable. And, MNCs might need to pay premiums to gain access to these unconventional resources. Therefore, the more MNCs buy conventional resources and pay premiums for these resources now, the more the resource constraint of resource scarcity increases. This in turn shortens the timeline in which unconventional resources become valuable.

### **Implications for Practice**

This study has several implications that could be useful to practitioners. First, the form of corporate ownership does play a role in radical boundary spanning of firms. The findings highlight the dynamism of the form of ownership. That is, an MNC can operate as a financial owned firm in one transaction, and, following the purchase/sale of equity shares, operate as a miscellaneous owned firm in a following transaction. The implication of this change is that the firm might partake in a mix of strategic activities—some of which include radical boundary spanning—under financial firm ownership. However, these strategic activities could change significantly once the MNC operates under miscellaneous ownership. For managers, ambidexterity is needed between radical boundary spanning and other forms of boundary spanning exploration. It may be prudent for managers to straddle two forms of activities, for example radical boundary spanning and external search. This is so that the MNC can switch between the two strategic activities seamlessly as influenced by the ownership of the firm.

Second, for managers of MNCs operating in industry sectors based on natural resources, decisions related to location can have large consequences. This study highlights that MNCs have the choice to either operate in areas that are more resource attractive, or “known”—in which the

resource base has already been assessed and valued. Alternatively, MNCs can take a riskier route and operate in places that are less resource attractive, or “unknown”—in which the resource base is undiscovered or under-assessed. The findings suggest that the location of the resources—whether in a known or unknown locale—do not significantly influence the purchase/sale price of unconventional resource deposit bought/sold. This means that other elements tied to location influence the decision of where to locate operations for MNCs. These other elements could be more geological in nature, such as the proximity or complementarity to the existing resource portfolio, or the complexity of exploration or production of resources given the geological structure. Alternatively, these other elements could be tied to classic concepts in the international business literature, such as liability of foreignness (Zaheer, 1995) or presence of institutional voids (Khanna & Palepu, 1997). This study indicates to managers that resource attractiveness is not the only thing that matters when buying and selling resources. A target country may appear attractive because of its known existing resource deposits. However, managers need to marry geologic and management issues to gain a more holistic understanding of what makes a location attractive.

Third, though not related to a significant hypothesis tested, the influence of state ownership should be noted. There are many transactions that involve a state-owned buyer in this sample (14.80% buyer transactions) despite the relative small number of state owned enterprises in this industry. Yet, there are comparatively few transactions that involve a state owned seller (4.56% seller transactions). In terms of the industry in general, it appears that state owned MNCs are taking on a more dominant position—buying and holding (rather than selling) resources. The strategic activities of state owned MNCs have moved from domestic to international operations (Büge, Egeland, Kowalski, & Sztajerowska, 2013; Marcel, 2006). Further, MNCs are gaining a stronger hold of global resources (Karev, 2013). As long as conventional resources are in demand, state owned MNCs have power through access to, and the ability to dictate the prices of,



these resources. State owned MNCs could potentially demand premium prices for these resources while limiting the number of resources for sale in global, market-based transactions.

### **Limitations and Directions for Future Research**

This study provides an empirical test of the radical boundary spanning activities of firms based on the form of corporate ownership. The findings can be elaborated and extended in future research. A limitation of this study is the sample size. The present interest is radical boundary spanning, operationalized as the buying/selling of unconventional resource deposits. The occurrence of radical boundary spanning transactions in the sample increased over time. For the first year of the sample, 2005, only three transactions were categorized as radical boundary spanning. In the final two years of the sample (2011 and 2012) 57 and 49 of the transactions were categorized as radical boundary spanning, respectively. This indicates that radical boundary spanning among MNCs is increasing over time and that, as data become more available, this field of inquiry can be enhanced.

An additional issue related to sample size is model estimation. An issue with this proposed study is that random effects could not be estimated for all three crossed variables (buyer, seller, country) in all models tested. A larger sample size could improve the estimation and ability to assess random effects in addition to fixed effects. Further, some of the mean differences for the last tested hypothesis (3b) could not be estimated. Thus, future research could utilize more data as it becomes available to assess the relationships tested with both fixed and random effects. Moreover, a larger sample can potentially address other research questions associated with this line of inquiry such as how an MNC's familiarity with a geographic location (measured as the number of previous transactions in a location) influence the likelihood of, or commitment to, radical boundary spanning.

Another limitation of this study is its generalizability. The setting for this research is the global upstream petroleum industry. Although, as mentioned in previous chapters, the setting is appropriate, future research could address these same relationships in other contexts. For

example, do these relationships hold in other sectors related to natural resources, such as forest products or mining? Do the relationships remain in sectors not related to natural resources, but in which radical boundary spanning is likely to occur, such as technology industries including aerospace, biotechnology, and information technology? Future research can address these questions in both domestic and global settings to better understand the relationship between ownership and radical boundary spanning.

Additionally, a limitation of this study is related to the measurement of ownership. LaPorta et al's (1999) typology of ownership is adopted; however, other typologies of ownership exist. As related to the findings, in some instances comparing institutional (financial and some miscellaneous) owners to non-institutional owners creates interesting future research questions. Future research could differentiate between institutional and non-institutional owners, and examine differences in radical boundary spanning. Moreover, this study took a categorical approach to ownership. However, the relationship between extent of ownership or control and radical boundary spanning could also be assessed by examining the extent of ownership. Incorporating this more nuanced approach to ownership could better enlighten our understanding of the association between ownership and radical boundary spanning, especially for institutional owners.

### **Summary**

The present study aimed to advance our empirical understanding of radical boundary spanning as an activity influenced by resource scarcity and the pursuit of power. The study focused on the relationship between forms of corporate ownership and radical boundary spanning. Several relationships were empirically tested using the global petroleum industry as the study setting. First, the relationship between firm ownership and radical boundary spanning was tested. Second, the relationship between firm ownership and commitment to radical boundary

spanning was examined. Third, the influence of resource attractiveness on the relationship between firm ownership and commitment to radical boundary spanning was tested.

The results of this endeavor suggest that the interesting questions arise when firms act as buyers, rather than sellers, in market-based transactions. The form of buyer firm ownership is related to commitment to radical boundary spanning, and there are significant differences between buyer firms in radical boundary spanning, commitment to radical boundary spanning, and the influence of the target country's resource attractiveness on this relationship. Most significant mean differences involved buyer MNCs with financial or miscellaneous owners, indicating that the relationships in question could be parsed to examine differences in institutional and non-institutional owned firms.

Overall, the results suggest a complex relationship between ownership and radical boundary spanning. The pursuit of external resources among MNCs is one in which much is to be gained and lost. As conventional resources become scarcer, there will be increasing demand for unconventional resources, and radical boundary spanning has potential to be the norm rather than the anomaly. MNCs that can gain access to these unconventional resources now may be in a more powerful position in the future. This study makes an initial inquiry into the strategic activity of radical boundary spanning in natural resource-based industries. MNCs with stronger orientations toward the future demand for scarce resources can reap benefits from securing unconventional resources through radical boundary spanning.

## REFERENCES

- Aldrich, H. E., & Herker, D. (1977). Boundary Spanning Roles and Organization Structure. *The Academy of Management Review*, 2(2), 217-230.
- Almeida, P., & Phene, A. (2004). Subsidiaries and knowledge creation: the influence of the MNC and host country on innovation. *Strategic Management Journal*, 25(8-9), 847-864.
- At-Twajri, M. I. A., & Montanari, J. R. (1987). The Impact of Context and Choice on the Boundary-Spanning Process: An Empirical Extension. *Human Relations*, 40(12), 783-797.
- Berle, A., & Means, G. (1932). *The Modern Corporation and Private Property*. New York, NY: MacMillan.
- Birley, S. (1985). The role of networks in the entrepreneurial process. *Journal of Business Venturing*, 1(1), 107-117.
- BP. (2012). 2011 in review: Oil. *Statistical Review of World Energy 2012*.
- Bremmer, I. (2009). State Capitalism Comes of Age. *Foreign Affairs*, 88(3), 40-55.
- Breslow, N. E., & Lin, X. (1995). Bias Correction in Generalised Linear Mixed Models With a Single Component of Dispersion. *Biometrika*, 82, 81-91.
- Büge, M., Egeland, M., Kowalski, P., & Sztajerowska, M. (2013). State-owned enterprises in the global economy: Reason for concern? *VOX*, 2 May 2013, Retrieved from: <http://www.voxeu.org/article/state-owned-enterprises-global-economy-reason-concern>.
- Business Transformation Academy. (2013). *Oil and Gas*. Switzerland: Business Transformation Academy.
- Carlile, P. R. (2002). A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development. *Organization Science*, 13(4), 442-455.
- Chaganti, R., & Damanpour, F. (1991). Institutional ownership, capital structure, and firm performance. *Strategic Management Journal*, 12(7), 479-491.
- Dechert, C. R. (1962). Ente Nazionale Idrocarburi: A State Corporation in a Mixed Economy. *Administrative Science Quarterly*, 7(3), 322-348.
- Demsetz, H. (1983). The Structure of Ownership and the Theory of the Firm. *Journal of Law and Economics*, 26(2), 375-390.
- Demsetz, H., & Lehn, K. (1985). The Structure of Corporate Ownership: Causes and Consequences. *Journal of Political Economy*, 93(6), 1155-1177.
- Demsetz, H., & Villalonga, B. (2001). Ownership structure and corporate performance. *Journal of Corporate Finance*, 7(3), 209-233.
- Derrick Petroleum. (2012). *Derrick Petroleum Services*. Bangalore, India. Retrieved from: [www.derrickpetroleum.com](http://www.derrickpetroleum.com).

- Dess, G. G., Ireland, R. D., & Hitt, M. A. (1990). Industry Effects and Strategic Management Research. *Journal of Management*, 16(1), 7-27.
- Douma, S., George, R., & Kabir, R. (2006). Foreign and domestic ownership, business groups, and firm performance: evidence from a large emerging market. *Strategic Management Journal*, 27(7), 637-657.
- EIA. (2012). *Petroleum & Other Liquids*. Washington, DC: US Department of Energy.
- Elg, U. (2000). Firms' Home-Market Relationships: Their Role When Selecting International Alliance Partners. *Journal of International Business Studies*, 31(1), 169-177.
- Fernandez, Z., & Nieto, M. J. (2005). Internationalization Strategy of Small and Medium-Sized Family Businesses: Some Influential Factors. *Family Business Review*, 18(1), 77-89.
- Fleming, L., & Waguespack, D. M. (2007). Brokerage, Boundary Spanning, and Leadership in Open Innovation Communities. *Organization Science*, 18(2), 165-180.
- Frydman, R., Gray, C., Hessel, M., & Rapaczynski, A. (1999). When Does Privatization Work? The Impact of Private Ownership on Corporate Performance in the Transition Economies. *The Quarterly Journal of Economics*, 114(4), 1153-1191.
- Furchtgott-Roth, D. (2012). Who Really Owns the Oil Companies? *Manhattan Institute for Policy Research*(11), 1-6.
- Gaille, S. S. (2010). Allocation of International Petroleum Licenses to National Oil Companies: Insights from the Coase Theorem. *Energy Law Journal*, 31(1), 111-124.
- Gilson, S. C. (1990). Bankruptcy, boards, banks, and blockholders: Evidence on changes in corporate ownership and control when firms default. *Journal of Financial Economics*, 27(2), 355-387.
- Gordon, R., & Poulin, B. J. (2012). Quitting Cold Turkey: Rapid Oil Independence for the USA. In R. Gordon & J. Seckbach (Eds.), *The Science of Algal Fuels* (Vol. 25, pp. 3-20): Springer Netherlands.
- Gray, J. K. (1977). *Future gas reserve potential Western Canadian sedimentary basin*. 3rd National. Technology Conference: Canadian Gas Association.
- Hart, S. L. (1995). A Natural-Resource-Based View of the Firm. *The Academy of Management Review*, 20(4), 986-1014.
- Hazy, J. K., Tivnan, B. F., & Schwandt, D. R. (2003). The Impact of Boundary Spanning on Organizational Learning: Computational Explorations. *Emergence*, 5(4), 86-123.
- He, Z.-L., & Wong, P.-K. (2004). Exploration vs. Exploitation: An Empirical Test of the Ambidexterity Hypothesis. *Organization Science*, 15(4), 481-494.
- Hitt, M. A., Beamish, P. W., Jackson, S. E., & Mathieu, J. E. (2007). Building Theoretical and Empirical Bridges across Levels: Multilevel Research in Management. *The Academy of Management Journal*, 50(6), 1385-1399.
- Hoffman, L. (in press). *Longitudinal Analysis*. New York: Taylor & Francis Group.

- Holditch, S. A., & Ayers, W. B. (2009). *How technology transfer will expand the development of unconventional gas, worldwide*.
- Hoskisson, R. E., Hitt, M. A., Johnson, R. A., & Grossman, W. (2002). Conflicting voices: The effects of institutional ownership heterogeneity and internal governance on corporate innovation strategies. *Academy of Management Journal*, 45(4), 697–716.
- Hughes, J. D. (2013). Energy: A reality check on the shale revolution. *Nature*, 494(7437), 307-308.
- Jaffe, A. M., & Soligo, R. (2007). *The international oil companies*. Houston: James A. Baker III Institute for Public Policy of Rice University.
- Jarillo, J. C. (1989). Entrepreneurship and growth: the strategic use of external resources. *Journal of Business Venturing*, 4(2), 133-147.
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305-360.
- Johnson, R. A., & Greening, D. W. (1999). The Effects of Corporate Governance and Institutional Ownership Types on Corporate Social Performance. *The Academy of Management Journal*, 42(5), 564-576.
- Kantarelis, D. (2007). *Theories of the Firm* (2nd ed.). London, UK: Inderscience.
- Karev, A. (2013). *Oil and Gas Reality Check 2013*. Hong Kong: Deloitte Touche Tohmatsu Limited.
- Katusa, M. (2012). The Race for Energy Resources Gets Hotter. *Forbes*.
- Khanna, T., & Palepu, K. (1997). Why focused strategies may be wrong for emerging markets. *Harvard Business Review*, 75(4), 3-10.
- Klein, K. J., & Kozlowski, S. W. J. (2000). From Micro to Meso: Critical Steps in Conceptualizing and Conducting Multilevel Research. *Organizational Research Methods*, 3(3), 211-236.
- La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (1999). Corporate Ownership around the World. *The Journal of Finance*, 54(2), 471-517.
- Lavie, D., Stettner, U., & Tushman, M. L. (2010). Exploration and Exploitation Within and Across Organizations. *The Academy of Management Annals*, 4(1), 109-155.
- Leifer, R., & Delbecq, A. (1978). Organizational/Environmental Interchange: A Model of Boundary Spanning Activity. *The Academy of Management Review*, 3(1), 40-50.
- Leifer, R., & Huber, G. P. (1977). Relations Among Perceived Environmental Uncertainty, Organization Structure, and Boundary-Spanning Behavior. *Administrative Science Quarterly*, 22(2), 235-247.
- Lemmon, M. L., & Lins, K. V. (2003). Ownership Structure, Corporate Governance, and Firm Value: Evidence from the East Asian Financial Crisis. *The Journal of Finance*, 58(4), 1445-1468.

- Levina, N., & Vaast, E. (2005). The Emergence of Boundary Spanning Competence in Practice: Implications for Implementation and Use of Information Systems. *MIS Quarterly*, 29(2), 335-363.
- Lin, X., & Breslow, N. E. (1996). Bias Correction in Generalized Linear Mixed Models with Multiple Components of Dispersion. *Journal of the American Statistical Association*, 91, 1007-1016.
- Locker Jr., L., Hoffman, L., & Bovaird, J. A. (2007). On the use of multilevel modeling in the analysis of psycholinguistic data. *Behavior Research Methods*, 39(4), 723-730.
- Luo, Y. (2003). Market-Seeking MNEs in an Emerging Market: How Parent-Subsidiary Links Shape Overseas Success. *Journal of International Business Studies*, 34(3), 290-309.
- Mahoney, J. T., & Pandian, J. R. (1992). The resource-based view within the conversation of strategic management. *Strategic Management Journal*, 13(5), 363-380.
- Makino, S., & Beamish, P. W. (1998). Performance and Survival of Joint Ventures with Non-Conventional Ownership Structures. *Journal of International Business Studies*, 29(4), 797-818.
- Marcel, V. (2006). *Oil Titans: National Oil Companies in the Middle East*. Baltimore, MD: Brookings Institution Press.
- Marcelle, G. M. (2004). *Technological Learning*. Northampton, MA: Edward Elgar.
- March, J. G. (1991). Exploration and Exploitation in Organizational Learning. *Organization Science*, 2(1), 71-87.
- Mascarenhas, B. (1989). Domains of State-Owned, Privately Held, and Publicly Traded Firms in International Competition. *Administrative Science Quarterly*, 34(4), 582-597.
- Masters, J. A. (1979). Deep Basin gas trap, western Canada. *AAPG Bulletin*, 63(2), 152-181.
- Mathieu, J. E., & Chen, G. (2011). The Etiology of the Multilevel Paradigm in Management Research. *Journal of Management*, 37(2), 610-641.
- OSHA. (2013). *1311 Crude Petroleum and Natural Gas*. Washington: United States Department of Labor.
- Pedersen, T., & Thomsen, S. (1997). European Patterns of Corporate Ownership: A Twelve-Country Study. *Journal of International Business Studies*, 28(4), 759-778.
- Pfeffer, J., & Nowak, P. (1976). Joint Ventures and Interorganizational Interdependence. *Administrative Science Quarterly*, 21(3), 398-418.
- Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: A resource dependence approach*. New York: Harper & Row Publishers.
- Pirog, R. (2007). *The Role of National Oil Companies in the International Oil Market*. Washington, DC: Congressional Research Service.
- PLS. (2012). *PLS, inc*. Houston, TX. Retrieved from: [www.plsx.com](http://www.plsx.com).

- Prowse, S. D. (1992). The Structure of Corporate Ownership in Japan. *The Journal of Finance*, 47(3), 1121-1140.
- Raisch, S., Birkinshaw, J., Probst, G., & Tushman, M. L. (2009). Organizational Ambidexterity: Balancing Exploitation and Exploration for Sustained Performance. *Organization Science*, 20(4), 685-695.
- Randøy, T., & Goel, S. (2003). Ownership structure, founder leadership, and performance in Norwegian SMEs: implications for financing entrepreneurial opportunities. *Journal of Business Venturing*, 18(5), 619-637.
- Rao, H., & Drazin, R. (2002). Overcoming Resource Constraints on Product Innovation by Recruiting Talent from Rivals: A Study of the Mutual Fund Industry, 1986-94. *The Academy of Management Journal*, 45(3), 491-507.
- Rao, H., & Sivakumar, K. (1999). Institutional Sources of Boundary-Spanning Structures: The Establishment of Investor Relations Departments in the Fortune 500 Industrials. *Organization Science*, 10(1), 27-42.
- Raudenbush, S. W. (1993). A crossed random effects model for unbalanced data with applications in cross-sectional and longitudinal research. *Journal of Educational & Behavioral Statistics*, 18(4), 321-349.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, CA: Sage.
- Raudenbush, S. W., Yang, M.-L., & Yosef, M. (2000). Maximum Likelihood for Generalized Linear Models with Nested Random Effects via High-Order, Multivariate Laplace Approximation. *Journal of Computational and Graphical Statistics*, 9(1), 141-157.
- Rosenkopf, L., & Nerkar, A. (2001). Beyond local search: boundary-spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal*, 22(4), 287-306.
- SAS. (2013). *SAS/STAT(R) 9.2 User's Guide, Second Edition*. Cary, NC: SAS Institute Inc.
- Shleifer, A., & Vishny, R. W. (1994). Politicians and firms. *Quarterly Journal of Economics*, 109, 955-1025.
- Sidhu, J. S., Volberda, H. W., & Commandeur, H. R. (2004). Exploring Exploration Orientation and its Determinants: Some Empirical Evidence. *Journal of Management Studies*, 41(6), 913-932.
- Sinner, J., & Scherzer, J. (2007). The public interest in resource rent. *New Zealand Journal of Environmental Law*, 11, 279-295.
- SPE. (2007). *Petroleum Resources Management System*. Allen, TX: Society of Petroleum Engineers, American Association of Petroleum Geologists, World Petroleum Council, Society of Petroleum Evaluation Engineers.
- SPE. (2012). *SPE E&P Glossary*. Richardson, Texas: Society of Petroleum Engineers.
- Starbuck, W. H. (1976). Organizations and their environment. In M. Dunnette (Ed.), *Handbook of Industrial and Organizational Psychology*. Chicago: Rand-McNally.



- Sundaram, A. K., & Inkpen, A. C. (2004). The Corporate Objective Revisited. *Organization Science*, 15(3), 350-363.
- Thomsen, S., & Pedersen, T. (2000). Ownership structure and economic performance in the largest European companies. *Strategic Management Journal*, 21(6), 689-705.
- Tordo, S., Tracy, B., & Arfaa, N. (2011). *National Oil Companies and Value Creation, Volume I: The World Bank Group*.
- Tushman, M. L., & Scanlan, T. J. (1981). Characteristics and External Orientations of Boundary Spanning Individuals. *The Academy of Management Journal*, 24(1), 83-98.
- Tuyl, F. M. V., Parker, B. H., & Skeeters, W. W. (1945). *The migration and accumulation of petroleum and natural gas*. Golden, CO: Colorado school of mines.
- Uotila, J., Maula, M., Keil, T., & Zahra, S. A. (2009). Exploration, exploitation, and financial performance: analysis of S&P 500 corporations. *Strategic Management Journal*, 30(2), 221-231.
- Useem, M. (1996). *Investor capitalism: How money managers are changing the face of corporate America*. New York: Basic Books.
- Ward, J. L. (1997). Growing the Family Business: Special Challenges and Best Practices. *Family Business Review*, 10(4), 323-337.
- Woodcock, C. P., Beamish, P. W., & Makino, S. (1994). Ownership-Based Entry Mode Strategies and International Performance. *Journal of International Business Studies*, 25(2), 253-273.
- World Bank. (2011). World Development Indicators (WDI). Retrieved from <http://data.worldbank.org/indicator/all>, 2011
- Wry, T., Cobb, J. A., & Aldrich, H. E. (2013). More than a Metaphor: Assessing the Historical Legacy of Resource Dependence and its Contemporary Promise as a Theory of Environmental Complexity. *The Academy of Management Annals*, 439-486.
- Zaheer, S. (1995). Overcoming the liability of foreignness. *Academy of Management Journal*, 38(2), 341-363.
- Zahra, S. A. (1996). Governance, Ownership, and Corporate Entrepreneurship: The Moderating Impact of Industry Technological Opportunities. *The Academy of Management Journal*, 39(6), 1713-1735.
- Zahra, S. A., Hayton, J. C., & Salvato, C. (2004). Entrepreneurship in Family vs. Non-Family Firms: A Resource-Based Analysis of the Effect of Organizational Culture. *Entrepreneurship Theory and Practice*, 28(4), 363-381.
- Zahra, S. A., Neubaum, D. O., & Huse, M. (2000). Entrepreneurship in Medium-Size Companies: Exploring the Effects of Ownership and Governance Systems. *Journal of Management*, 26(5), 947-976.