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The Effects of Connectivity and Culture on Foreign Direct Investment Decisions: Empirical Evidence from the International Electricity Industry

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Abstract

With the significant growth in Foreign Direct Investment (FDI) in the past two decades, both investment managers and policy makers are keen to know the factors determining the location of FDI. The eclectic theory, while being the most popular and dominant theories in international investment, failed to fully capture the behavioral dynamics of international investment. For instance, FDI location decisions sometimes concern the certain social or political relationships between the home and host countries such as "cultural ties". And firms' international partners and competitors' investment decisions impact their decisions as well. FDI thus is thus progressively realized by researchers being a complex and multi-dimensional phenomenon and FDI theories also gradually moved from the economics domain towards the new interdisciplinary field of international business, which is more concerned with firm strategy.

Bandelj and Uzzi proposed a "relational approach" and "embeddedness view" respectively to explain the FDI location choice from a firm strategic perspective. The common point of the two views is that they see FDI as a dyadic relation between home and host parties, and assume that the formation of investment relation occurs through certain ways of *relationship* and *connectivity*.

Even though FDI has been recognized as a relational phenomenon, few studies have provided properly quantitative results mainly due to data scarcity and analysis tools constraints. In this study I interpret FDI as a linkage that firms in their home country establish with their host and aim to understand how a FDI linkage is formed through the effects of *relationship* and *connectivity*.

The study issues are addressed in the three chapters in the thesis by relying on Social Network Analysis (SNA). Cross-border M&A transaction data during the period of 1997 - 2001 in the international electricity industry among 38 countries are selected as data samples for the analysis. Analyses reported in these three papers provide empirical evidence in support of the view that the formation of FDI linkages is through *connectivity* and *cultural relationship* mechanisms.

Key words: Foreign Direct Investment, culture, connectivity, Social Network Analysis

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Contents

List of Figures

List of Tables

Chapter 1

General Introduction

1.1. Objectives of this Study

The flow of foreign direct investment (FDI) increased dramatically in the past decade (UNCTAD, 2008). With the significant FDI growth, studies on factors that determine the location of FDI also increased because this issue is one of the prime important questions for both investment managers and policy makers (Kang, & Lee, 2007). Eclectic theory, developed by Dunning, explains the FDI location choice as investment seeking resource, market, or efficiency in the investment host region (Dunning, 1981; 1988; 1994; 1995; 2000). Transaction Cost Economics (TCE) explains FDI location choice as investment seeking lower transaction cost abroad (Kogut, & Singh, 1988; Pan, & Tse, 2000; Brouthers, 2002). Both theories suggest that national cultural distance (cultural difference) is a significant determinant of FDI (Hofstede, 1983; Dunning, 1993; Shenkar, 2001). Similar cultures increase the likelihood of observing investment flows due to more efficient communication and lower managerial cost between similar cultures (Davidson, 1980; Edwards, & Buckley, 1998). Even though such eclectic theory and TCE provide the most popular and dominant explanations for FDI, they fail to fully capture the behavioral dynamics underlying international investment flows. For instance, literature has addressed the impact of cultural compatibility (DiMaggio, 1993) or knowledge about another culture (Bandelj, 2002) on FDI location choice. Some literature discussed that the extent of international investment is related to the form of the mutual interdependence among the players (Knickerbocker, 1973), the rush amongst rivals to enter emerging markets often triggers the bandwagon effect (Knickerbocker, 1973; Sethi et al., 2003) and rival countries compete to attract FDI (Bjorvatn, & Eckel, 2006). FDI is thus increasingly understood as a complex and multi-dimensional phenomenon (Sethi et al., 2003). As a consequence, theories of FDI are increasingly becoming the center of the new interdisciplinary field of international business, which are more concerned with firm strategy (Hosseini, 2008).

Bandelj (2002:412-413) proposed a "relational approach", according to which "FDI must be conceptualized and empirically analyzed as a relational phenomenon" and "the causes of FDI must likewise be traced to the relations between the involved transactors, rather than only to the attributes of each individual party". Uzzi (1999) proposed an "embeddedness view". He stated that the type of network in which an organization was embedded defined the opportunities potentially available and its position in that structure and the types of interfirm ties it maintained

defined its access to those opportunities. The common point of the two views is that they see FDI as a dyadic relation between home and host parties, and assume that the formation of investment relation occurs through certain ways of *relationship* and *connectivity*.

Even though FDI has been recognized as a relational phenomenon, few studies have provided quantitative results, mainly due to data scarcity and analysis tools constraints (Mudambi, 1995; Sethi et al., 2003). In this study I interpret FDI as a linkage that firms in their home country establish with their host (Nohria, & Garcia-Pont, 1991) and aim to understand how a FDI linkage is formed through the effects of *cultural relationship* and *connectivity*. The goal of this study can be summarized as answering the following two research questions:

1. How do *cultural difference and cultural connection* (*cultural relationship*) between home and host parties influence the formation of their FDI linkage?

2. How does FDI linkage structure influence the formation of a new FDI linkage?

To address these questions I rely on methods of Social Network Analysis (SNA) (Van Duijn, & Vermunt, 2006) because of the correlations in data (Bandelj, 2002). Cross-border M&A transaction during the period of 1997 - 2001 in the international electricity industry among 38 countries are selected as data sample for the analysis. I focus on the country level of analysis because I am interested in the factors influencing FDI general trend instead of the corporate factors. Freeman states that shifts in foreign direct investment destinations over time can be analyzed at the country level because the determinants under investigation affect all multinational enterprises uniformly (Freeman, 1978). Sethi and his colleagues clarify that as any analysis of investment trends would indicate, multinational enterprises often invest in a particular country or region, although individual investment decisions might vary (Sethi et al., 2003).

The main body of the thesis encompasses three individual papers. Each paper makes a particular research contribution:

Chapter 2 raised a preliminary research question in this study: is FDI location choice dependent on the national cultural relationship? Are there other factors beside cultural relationship which might influence FDI location choice? Chapter 2 adopted a network-analytic clustering method in order to draw a graphic picture of the FDI network structure during the studied period and preliminarily analyze the determinants of the FDI linkage formation.

The second paper examined which social relationships between home and host countries influence the formation of the FDI linkage with a focus on cultural relationships between countries. Chapter 3 adopted a relational data analysis model and found the statistical evidence revealing the impact of national cultural relationship on FDI linkage formation.

Chapter 4 focused on "connectivity" factors of FDI network and adopted a network longitudinal analysis method to examine how FDI network connectivity factors influence the formation of FDI linkages. The results of the analysis in this chapter provided the statistical evidence that FDI formation is dependent on the certain FDI network connectivity factors by controlling cultural relationship in the model.

The chapter headings are as follows:

Chapter 2. FDI Linkages and Network Structure

Chapter 3. The Effects of Cultural Relationship on FDI Location Choice

Chapter 4. FDI Location Choice through the Lens of Connectivity

1.2. Background

The global FDI increased dramatically in the past two decades. According to the World Investment Report (UNCTAD, 1998; 2002; 2004; 2005; 2006; 2007; 2008; 2009), the total value of global FDI reached a new peak at1.83 trillion US dollars in 2007, which was nearly ten times the FDI value of 1992. During the time period from 1992 to 2003, global FDI experienced a complete wave. At the beginning of the 1990s, FDI started to increase and reached 1.39 trillion in 2000. Afterwards, it started to go down. The global FDI value went up again after 2004. Cross-border Merger and Acquisition (M&A) is the dominant form between the two main forms of FDI:

Greenfield and cross-border M&A. A large part of the upsurge in global FDI has been due to cross-border M&A. In 2000, cross-border M&A accounts for 82.4% of the FDI value, and this ratio increased to 89% in 2007. The average ratio of cross-border M&A in FDI value is nearly 70% during the past two decades.

In the electricity industry, a similar trend on cross-border M&A is observed on a global scale. An up and then down curve can be clearly seen from the annual value of cross-border M&A in the industry. The value of cross-border M&A soared to 59 billion US dollars in 2000 from a tiny number around 3 billion in 1994 and then the value went down to 15 billion in 2002. From 2004, the cross-border M&A was booming again in the industry. The total transaction values increased dramatically to 72 billion in 2007. The increase ratio from 2004 to 2007 is more than 40% every year. The value in 2007 is 1.2 times of the value 59 billion in 2000. The year 2008 witnessed a global economic downturn due to the sub-prime credit crisis. The value of cross-border M&A in the electricity industry has dropped nearly 35% compared to the value in 2007 (SDC database).

Based on the facts and figures listed above, it can be observed that the trend on global cross-border M&A during the period of 1992 to 2008 can be represented by the one in the electricity industry. This gives a preliminary explanation for the selection of the studied industry. The values of the global FDI, cross-border M&A in all industries and in the electricity industry in the world are shown in the figure 1.1.
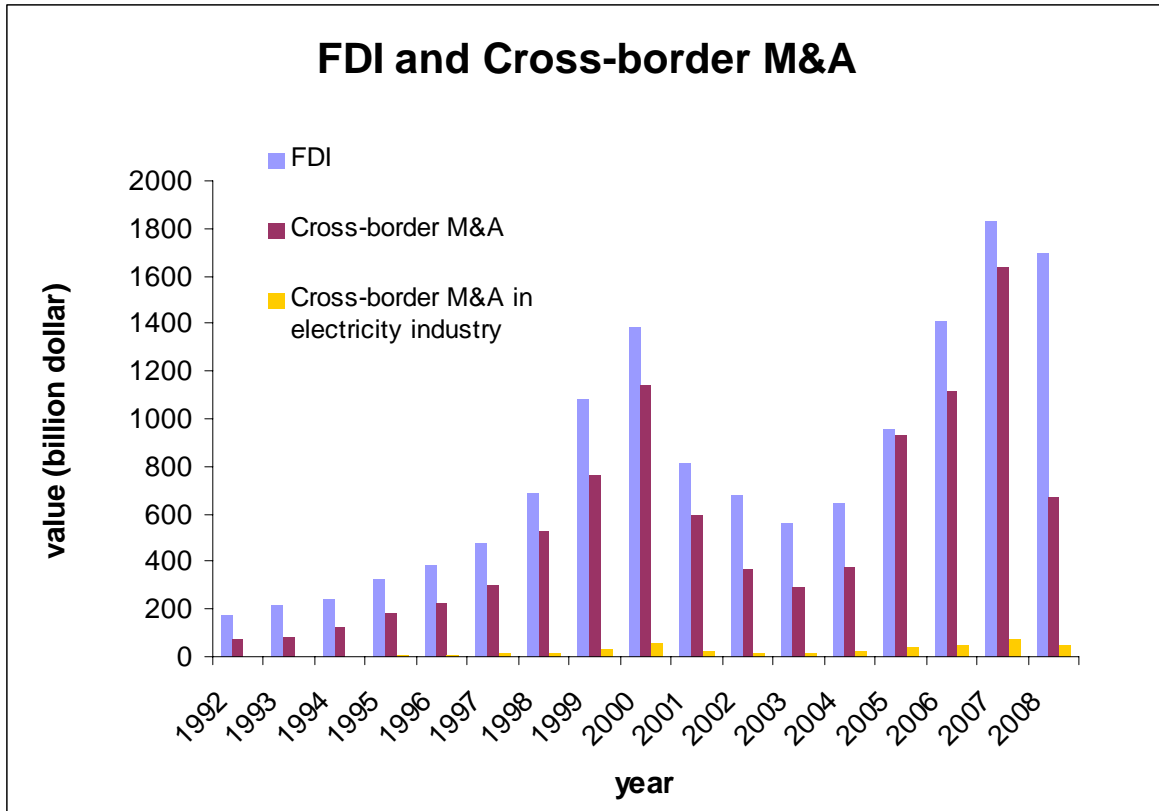
Figure 1.1. The value of FDI, cross-border M&A in all industries and cross-border M&A in the electricity industry in the world (data source: World Investment Report and SDC data)

With a closer look at cross-border M&A in the electricity industry between continents, some interesting trends were observed. Table 1.1 contains ratios of transaction times between any two continents against total transaction times in the year 2000 and table 1.2 contains ratios of transaction value between two continents against total transaction value in the year 2000. It can be seen that the transactions inside Asia, Europe, Oceania and South America in 2000 have relatively high transaction times but the transaction values are not high, which shows that these are relative small and frequent cross-border M&A transactions. In contrast, the transactions inside North and Central America account for only a small percentage in transaction times but a high percentage in transaction value, which means that the transactions inside North Central America are big value ones. The sums of the ratios on the diagonal lines in both tables account for nearly 80% of the cross-border M&A number and value. This means that most of the cross-border M&A in the electricity industry happened within the same continents. Between different continents, the remarkable transactions are between Europe and North Central America. A

notable fact is that the cross-border M&A from Europe to North Central America are of big value, however, the transactions from North Central America to Europe are of small value. Europe is the continent where firms most frequently merge or acquire firms abroad, while North Central America is the continent where firms did the most valuable cross-border M&A transaction in 2000.

Table 1.1. The ratios of cross-border M&A transaction number between two continents against total transaction number in 2000. (Data source: SDC data)

Transaction number / total transaction number (%)	Africa	Asia	Europe	N. C. AM	Oceania	South AM	Sum
Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asia	0.3	9.7	0.0	0.3	1.3	0.0	11.5
Europe	0.8	1.1	53.9	1.3	0.5	3.8	61.4
N. C. AM	0.3	1.1	2.4	2.1	2.9	3.2	12.1
Oceania	0.0	0.0	0.3	0.3	6.7	0.3	7.5
South AM	0.0	0.0	0.0	0.3	0.0	7.2	7.5
Sum	1.3	11.8	56.6	4.3	11.5	14.5	100.0

N. C. AM: North and Central America; South AM: South America

Table 1.2. The ratios of cross-border M&A transactions value between two continents against total transaction value in 2000. (Data source: SDC data)

Transaction value / total transaction value (%)	Africa	Asia	Europe	N. C. AM	Oceania	South AM	Sum
Africa	0.0	1.6	0.0	0.0	3.6	0.0	5.3
Asia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Europe	0.0	0.1	27.9	7.5	0.1	2.1	37.6
N. C. AM	0.0	0.7	2.0	47.3	0.3	2.2	52.4
Oceania	0.0	0.0	0.0	0.1	1.4	0.0	1.6
South AM	0.0	0.0	0.0	0.0	0.0	3.1	3.1
Sum	0.0	2.4	29.9	55.0	5.4	7.4	100.0

N. C. AM: North and Central America; South AM: South America

In the past two decades, the electricity industry in many countries was being run in a model of state-ownership and monopoly for a long time because of its unique role in any national economy of the modern world and all the life-supporting processes. Less competition became the cause of inefficient production and slow development in the electricity sector. In order to improve the efficiency of the electricity industry, the UK first started its electricity industry deregulation in 1980s. Subsequently, in the 1990s, more and more countries deregulated their domestic electricity sectors. This went along with the global investment environment liberalization trend: During 1991-1996, over 100 countries made only a total of 599 changes to liberalize FDI regulations; but in 1997 alone, 76 countries made 151 liberalization changes (United Nations, 1998). Up to today, there have been more than 50 countries in the world having performed the deregulation reform and introduced the market competition into their electricity sector.

The launch of the deregulation process in the electricity sector involving complete unbundling of vertically integrated electricity firms confined to their own region (country) caused a dramatic increase of competition in electricity market. The electricity energy firms were put under great pressure on electricity prices from consumers. The electricity markets faced the requirement of redistribution and crowding out the competitors from this market.

Based on this background, the cross-border M&A wave in the global electricity sectors, which started from the middle time of 1990s and reached the peak in the year of 2000, was expected to result in more and varied products and services, more efficient operations, and better electricity energy prices.

One major cross-border M&A example in the period is that E.ON of Germany acquiring PowerGen of UK in 2002. E.ON launched the take-over bid for PowerGen in April 2001. In June 2002, the US Securities and Exchange Commission (SEC) approved the acquisition. The total value of the transaction is 7.37 billion dollars (6.6 billion euros). E.ON is a German energy company whose business covers energy (electricity and natural gas), oil (Veba Oel), telecommunication (Connect Austria ONE, Bouygues Telecom) and real estate (Viterra). PowerGen is an Anglo-American vertically integrated energy company. In the UK, PowerGen owns and operates 7,836 MW of power plants in England and Wales, which accounts for around 10% of the country's electricity needs. Through East Midlands Electricity, PowerGen supplies electricity to around 2.3 million customers. PowerGen sells electricity, gas and other essential

services to residential, commercial and industrial customers. Energy trading is also one of its businesses. Furthermore, PowerGen focuses its activity on the UK and US markets. PowerGen entered the US through the acquisition of LG&E Energy, a vertically integrated energy group based in Kentucky.

Since the merger of Veba and Viag, E.ON has generated proceeds of roughly Euro 21 billion from disposals. E.ON's strategy is to become a leading pure energy player. Acquiring PowerGen will create the world's second largest electricity and gas utility. The acquisition will provide E.ON with a leading position in the UK and a foothold in the US utilities market (the world's largest energy market), and reduce E.ON's reliance on the German market.

In the mid-1990s, the M&A was dominated by domestic M&A. With deregulation continuing, the M&A in the electricity sector accelerated and moved on to cross-border M&A. Cross-border M&A now account for almost half of total M&A deal value. The Accenture survey revealed that the majority of respondents expect their next M&A deal to be a cross-border one (Accenture, 2008). It can therefore be projected that in the future electricity market, cross-border M&A will deepen, and the competitors will only be a limited number of international electricity firms. Table 1.3 lists the top 10 cross-border M&A transactions from 1994 to 2008 in the electricity industry in the world.

Table 1.3. The top 10 cross-border M&A transactions from 1994 to 2008 in the electricity industry

Effective year	Transaction value ($mil)	Target name	Target short description	Target nation	Acquiror name	Acquiror short description	Acquiror nation
2007	23143.5	British Energy plc	Electric utility	U.K.	Electricite de France SA - EDF	Electric utility	France
1999	12599.6	PacifiCorp	Electric utility telecomm svc	U.S.A.	Scottish Power PLC	Electric utility	U.K.
1998	11049.6	Energy Group PLC	Electric utility Coal mining	U.K.	Texas Utilities Co	Pvd elect gas utility svcs	U.S.A.
2002	8047.7	Niagara Mohawk Holdings Inc	Electric utility gas utility	U.S.A.	National Grid Group PLC	Electric utility	U.K.
2002	7396.1	Innogy Holdings PLC	Electric utility gas utility	U.K.	RWE AG	Mnfr petro pvd electric svcs	Germany
2002	7371.9	PowerGen PLC	Electric utility	U.K.	E.ON AG	Electric utility	Germany
1998	7211.5	Empresa Nacional	Electric utility gas utility	Spain	Investors	Investors	Unknown
2000	5425.9	LG&E Energy Corp	Electric utility gas utility	U.S.A.	PowerGen PLC	Electric utility	U.K.
2007	4500.0	Constellation Energy Group Inc	Electric utility	U.S.A.	Electricite de France SA - EDF	Electric utility	France
2000	4216.5	New England Electric System	Electric utility	U.S.A.	National Grid Group PLC	Electric utility	U.K.

1.3. A Brief Literature Overview

1.3.1. An Overview of FDI Location Choice Literature

With the significant growth in FDI, top managers in firms and policy makers in governments are keen to understand FDI in international markets. One important aspect of understanding FDI is to examine the factors determining the location of the deals because where the investment goes is one of the prime important questions in FDI studies (Kang, & Lee, 2007; Hopkins, 1999). A wealth of studies has been made to examine the determinants of FDI location choice (Rolfe et al., 1993; Mudambi, 1995; Nachum, 2000; Ito, & Rose, 2002; Sethi et al., 2003; Hong, & Chin, 2007; Kang, & Lee, 2007).

Historically, economic perspectives such as transaction cost theory and eclectic theory (ownership-location-internalization) are the popular and dominant theories on which FDI research was based (Shimizu et al., 2004). Transaction cost theory was developed by Ronald Coase in 1932 as part of a lecture given to students, then turned into a paper entitled, "the nature of the firm" (Coase, 1937). The core of the theory is: When a company tries to determine whether to outsource or to produce goods or services itself, market prices are not the sole factor. There are also significant transaction costs, search costs, contracting costs and coordination costs. Those costs frequently determine whether a company uses internal or external resources for products or services.

The related studies based on transaction cost theory argue that reduction of transaction cost is the main motive of firms in FDI activity. Any factor which might reduce the transaction cost for firms after FDI will be the motives of FDI. For instance, Hennart and Reddy (1997) analyzed both firm-level factors such as firm size, divisionalized structure and experience in the U.S., and country-level factors such as cultural difference, target relatedness and parent relatedness by using 175 entries of Japanese firms in manufacturing industry in the U.S. during 1978-1989. Their finding is that joint ventures are preferred over acquisitions when the desired assets are "indigestible". Kogut and Singh (1988) studied cultural difference and uncertainty avoidance factors for foreign investment in the U.S. from 1981 to 1985. They concluded that higher cultural difference reduced the likelihood of acquisitions.

Eclectic theory, developed by Dunning, is still the most popular and classic theory to explain motives of FDI. According to Dunning (1988), FDI will occur when these conditions are satisfied: there is an ownership advantage - the firms must own some unique competitive advantage that overcomes the disadvantages of competing with foreign firms on their home market. There is a location advantage: Undertaking the business activity in a foreign location must be more profitable than undertaking it in a domestic location which says that firms invest oversea is mainly for seeking for either market or resource or efficiency abroad. In other words, market or resource or efficiency in a foreign country is attractive to foreign firms and becomes the motives of foreign firms to invest there. There is also an internalization advantage: the firm must benefit more from controlling the foreign business activity than from hiring an independent local company to provide the service.

Dunning's eclectic theory is popularly adopted to explain determinants of FDI. These works include that by Brouthers (2002) who analyzed market potential, legal restrictions and investment risk of the host countries by using 178 foreign entries of EU firms in 1995. Anand and Delios (2002) used 2175 entries by British, German, and Japanese firms into the United States between 1974 and 1991 to test if the factors of technological intensity of home and host country, advertising intensity of host country and sales force intensity of host country would influence the decision of a FDI.

Both theories suggest that national cultural difference is a significant determinant of FDI (Hofstede, 1983; Dunning, 1993; Shenkar, 2001). Similar cultures increase the likelihood of observing investment flows due to more efficient communication and lower managerial cost between similar cultures (Davidson, 1980; Edwards, & Buckley, 1998).

1.3.2. An Overview of "Culture" and "Cultural Distance"

In international business and management studies, culture is one of the most discussed and acknowledged factors which influence the decisions on FDI location choice. However, culture has been notoriously difficult to conceptualize and scale (Boyacigiller et al., 1996). There are many different versions of definitions for it. For instance, Linton (1945:32) proposes that "a culture is a configuration of learned behaviors and results of behavior whose component elements

are shared and transmitted by the members of a particular society". Kroeber and Kluckhohn (1952:47) defines culture as follows: "culture consists of patterns, explicit and implicit, of and for behavior acquired and transmitted by symbols, constituting the distinctive achievements of human groups, including their embodiments in artifacts; the essential core of culture consists of traditional (i.e. historically derived and selected) ideas and especially their attached values; cultural systems may, on the one hand, be considered as products of action, and on the other as conditioning elements of further action." Hofstede (1984:51) defines that "culture is the collective programming of the mind which distinguishes the members of one category of people from another". Lederach (1995:9) posits that "culture is the shared knowledge and schemes created by a set of people for perceiving, interpreting, expressing, and responding to the social realities around them".

Defining culture is difficult, establishing measures gauging culture and the "difference" between cultures has understandably presented an even greater challenge (Shenkar 2001). Most of the studies on the cultural issue adopt the definition and measurement of Hofstede. Hofstede (1980) uses four dimensions to define culture in each nation. They are PDI: Power Distance, IDV: Individualism, MAS: Masculinity, UAI: Uncertainty Avoidance. Power distance Index refers to how the people expect and accept power relations. This represents inequality. It suggests that a society's level of inequality is endorsed by the followers as much as by the leaders. Individualism is contrasted with collectivism, and refers to the extent to which people are expected to stand up for themselves and to choose their own affiliations, or alternatively to act predominantly as a member of a life-long group or organization. Masculinity refers to the value placed on traditionally male or female values. Uncertainty Avoidance reflects the extent to which members of a society attempt to cope with anxiety by minimizing uncertainty.

Some researchers have proposed a "cultural distance" or "cultural difference" concept, which is defined as a gap between the culture of two different groups (Kogut, & Singh, 1988) such as that between the cultures of rural societies and that of cities. The most popular index to measure "cultural distance" is Kogut and Singh's index. Kogut and Sigh formed a composite index based on the deviation along each of the Hofstede's four cultural dimensions (Kogut, & Sigh, 1988). Notable works using this index include the studies of Benito and Gripsrud (1992) and Edwards and Buckley (1998). The cultural distance calculated according to Kogut and Singh

is symmetric for each pair of countries and does not change over time either since Hofstede's cultural dimensions are constant data. The index describes an absolute and permanent cultural difference between two countries.

Despite its popular citation by the literature, Kogut and Sigh's index was criticized by some researchers. For instance, Shenkar (2001) argued that Kogut and Sigh's index has shortcomings from both a conceptual and a methodological point of view. In particular, it imposes on the cultural relationship an illusion of "symmetry" and "stability". Tversky (2004:8), in his book "Preference, belief, and similarity: selected writings" pointed out that "similarity judgments can be regarded as extensions of similarity statements, that is, statements of the form a is like b. Such a statement is directional". Bandelj (2002:422) argued that "we should understand culture not as a coherent national value but as a historically institutionalized cultural repertoire" and he proposed when one culture has much knowledge on another distant culture, it compensates the gap between the two cultures. DiMaggio (1993) suggested big cultural distance might not be an issue for business as long as investors and hosts having enough knowledge of each other allow "cultural matching" between them.

Based on these arguments, I think cultural distance which actually is cultural difference in most of the literature, describes only one important aspect of cultural relationship between two cultures. Ghemawat (2001) indicated that the "lack of connective ethnic or social networks" matters in international market extension. Therefore, I propose a factor to complement describing a bilateral cultural relationship, which is cultural connection. Cultural connection is defined as how much knowledge a group has of another one. The cultural connection from nation A to nation B at a certain time point is not necessarily as same as from nation B to nation A. It can be seen as a social linkage between two ethnical groups as well.

The development of "cultural connection" brings an asymmetric and dynamic concept into cultural relationship. Therefore, in this thesis, a cultural relationship between countries is measured by two dimensions: cultural difference, which describes how different the two cultures are and cultural connection, which describes how much knowledge one culture has of another one.

With the establishment of the concept of "cultural connection", I aim to understand the impact of FDI location choice and put the focus on the impact of the national cultural connection on the formation of FDI linkages.

1.3.3. An Overview of the Impact of "Relationship" and "Connectivity" on FDI

Even though the eclectic theory and TCE provide the most popular and dominant explanations for FDI, researchers have noticed that some FDI phenomena are hardly explained by the two theories. For instance, some studies find that trades between investor and host countries have a positive effect on FDI (Barry, & Bradley, 1997; Helpman, 2004). Chen and Chen (1998) argue that where FDI goes is decided by the social network resources which target firms have and can be used by investor firms. Literature has addressed the impact of cultural compatibility (DiMaggio, 1993) or "cultural tie" (Bandelj, 2002) on FDI location choice. Some literature has argued that the extent of FDI is related to the form of the mutual interdependence among the players (Knickerbocker, 1973), the rush amongst rivals to enter emerging markets often triggers the bandwagon effect (Knickerbocker, 1973; Sethi et al., 2003) and rival countries compete for FDI (Bjorvatn, & Eckel, 2006). Hopkins (2008) found that "they (cross-border M&A transactions) are done for strategic reasons including growing market share or quickly occupying new markets. In a number of other cases, the deal fever catches on. Some CEOs may do deals because they want to be bigger than their competitors. FDI thus is realized by researchers being a complex and multi-dimensional phenomenon (Sethi et al., 2003), and FDI theory also gradually moved from economics towards the new interdisciplinary field of international business, which are more concerned with firm strategy (Hosseini, 2008).

Because of the constraints of transaction cost economics and eclectic theory on explaining FDI location choice, some researchers have proposed different perspectives such as "relational approach" and "embeddedness view".

In "relational approach", FDI of firms are seen as linkages built up between the investment home and host countries. The formation of these strategic linkages is influenced by various social relationships between investors and their hosts (Bandelj, 2002). Uzzi (1996) proposed the "embeddedness" view, stating that the type of network in which an organization is

embedded defines the opportunities potentially available; its position in that structure and the type of interfirm ties that it maintains, define its access to those opportunities. According to Uzzi, a decision of an oversea M&A may be influenced by the firm's partner or competitor's investment relationships. These two frameworks provide the possibility to explain the phenomenon in FDI, which could not be explained before by the classic FDI theories.

1.4. Method

1.4.1. Data

Cross-border M&A transaction data are chosen as the data sample to study FDI in this thesis. I choose the electricity industry as the studied industry mainly because of three reasons: Firstly, it is an industry of prime importance. The electricity industry supplies energy to almost all other industries and plays an important role in production. Secondly, there were few cross-border M&A transaction in the industry before the mid-1990s. As presented in the background section in the thesis, the electricity firms in most countries were owned by State before the 1990s. A deregulation wave in the electricity industry in the world started in the1990s. Following that, M&A boomed in the industry after the mid-1990s and reached the first peak in the early 2000s. All analyses in this thesis are based on the cross-border M&A data after the year of 1997 in order to capture the characteristics of cross-border M&A in a complete wave in the industry. Thirdly, the electric industry represents some other industries such as telephone, telecommunications, and internet services. For example, they face comparable issues of peak-load pricing and load-balancing (Granovetter, 1998).

From the background introduction, it has been known that cross-border M&A is the major form of FDI, which on average takes account of nearly 70% of FDI during the past two decades. The trend of cross-border M&A in the electricity industry is similar to the ones of the global FDI and cross-border M&A during the period. All of these show that cross-border M&A in the electricity industry somehow represent the global FDI. It should be a representative data sample for my study goal to study FDI location choice issue.

Cross-border M&A Data in the Electricity Industry

From the industry background, it is known that the first cross-border M&A wave in the global electricity industry started from the middle of 1990s and reached a peak in 2000. In this thesis, I chose the time period from 1997 to 2001 as the study period since it is the cross-border M&A booming period in the first wave process.

The cross-border M&A transaction data of the electricity industry used in this thesis are obtained from the M&A section of the business database - SDC Platinum Database. All M&A transactions either from or to the electricity industry in the world that took place between 1997 and 2001 were collected. This provides a total of 2,087 transaction records, amongst which, 652 transactions are cross-border M&A deals. The information on the data contains 1) the effective date of the transaction, 2) the transaction value, 3) the names of the firms involved in the M&As, 4) the country where both acquirers and target firms are from 5) the status of the transactions, 6) the name of the industry sector for both acquirers and targets.

The cross-border M&A data records involve 92 countries and regions in the world, however, in most of these countries and regions, firms are not active in the cross-border M&A market. I found that more than 75% of cross-border M&A transactions were conducted among only one third of these countries. Therefore I selected only 38 countries from these 92 countries to avoid a sparse network. The criterion to choose these 38 countries is the frequency of cross-border M&A related to the country and the geographic balance as well. Table 1.4 shows the names of these 38 countries.

Table 1.4. The list of the selected 38 countries

	Country		Country		Country		Country
1	Argentina	11	Czech	21	Ireland	31	Russia
2	Australia	12	Denmark	22	Italy	32	Spain
3	Austria	13	Ecuador	23	Japan	33	Sweden

4	Belgium	14	Estonia	24	Mexico	34	Switzerland
5	Brazil	15	Finland	25	Netherlands	35	Thailand
6	Bulgaria	16	France	26	New Zealand	36	Turkey
7	Canada	17	Germany	27	Norway	37	U.K.
8	Chile	18	Greece	28	Peru	38	United States
9	China	19	Hungary	29	Poland		
10	Colombia	20	India	30	Portugal		

Two steps have been made to filter the data. Only the data that met the following criteria are selected in the sample:

1) The status of the transactions must be "completed".

2) Acquirer and target firms are from the selected 38 countries.

Given these criteria, only 495 transaction records are kept in the sample. Table 1.5 provides a descriptive statistic report for the data sample.

Table 1.5. A descriptive statistic report of the cross-border M&A transactions in the electricity industry

Effective year	Total transaction value ($mil)	Average transaction value ($mil)	Biggest transaction value in the year ($mil)	Transaction times (value > 100 $mil)	(transaction value > 100 million) / total transaction value (%)
1997	87993.1	462	3772.8	29	25.1
1998	82066.6	626.3	11049.6	35	45.3
1999	108145.1	361.7	12599.6	40	32.9
2000	138084.9	330.3	5425.9	40	23.1
2001	103156.8	217	2480.4	37	15.5

Culture

The data of the national cultures are obtained from the website of Geert Hofstede. Hofstede (1980)'s four cultural dimensions contain a series of integer numbers from 0 to 120, which indicate the level of PDI, IDV, MAS and UAI. If I take Germany as an example, its four cultural dimension scores are as follows: Germany has a 35 on the Hofestede cultural scale of PDI compared to Arab countries where the PDI is very high (80) and Austria where it is very low (11), Germany is somewhat in the middle. On the IDV score, Germany can be considered as individualistic with a high score (89) on the scale of Hofstede compared to a country like Guatemala where they have strong collectivism (6 on the scale). Germany has a masculine culture with a 66 on the MAS scale of Hofstede (Netherlands 14). The United States scored 62 on Hofstede's scale. So these two cultures share similar values, in terms of masculinity. In Germany, there is reasonably high uncertainty avoidance (65) (UAI) compared to countries such as Singapore (8) and the neighboring country Denmark (23). German society relies on rules, laws and regulations. Germany wants to reduce its risks to the minimum and proceed with changes step by step.

The average values of the four dimensions among all countries which have Hofstede scores are 59 on PDI, 44 on IDV, 51 on MAS and 66 on UAI respectively and the median values are 66, 39, 50 and 69 respectively.

Figure 1.2 shows the distribution of the four cultural dimensions scores in the world (http://www.clearlycultural.com).
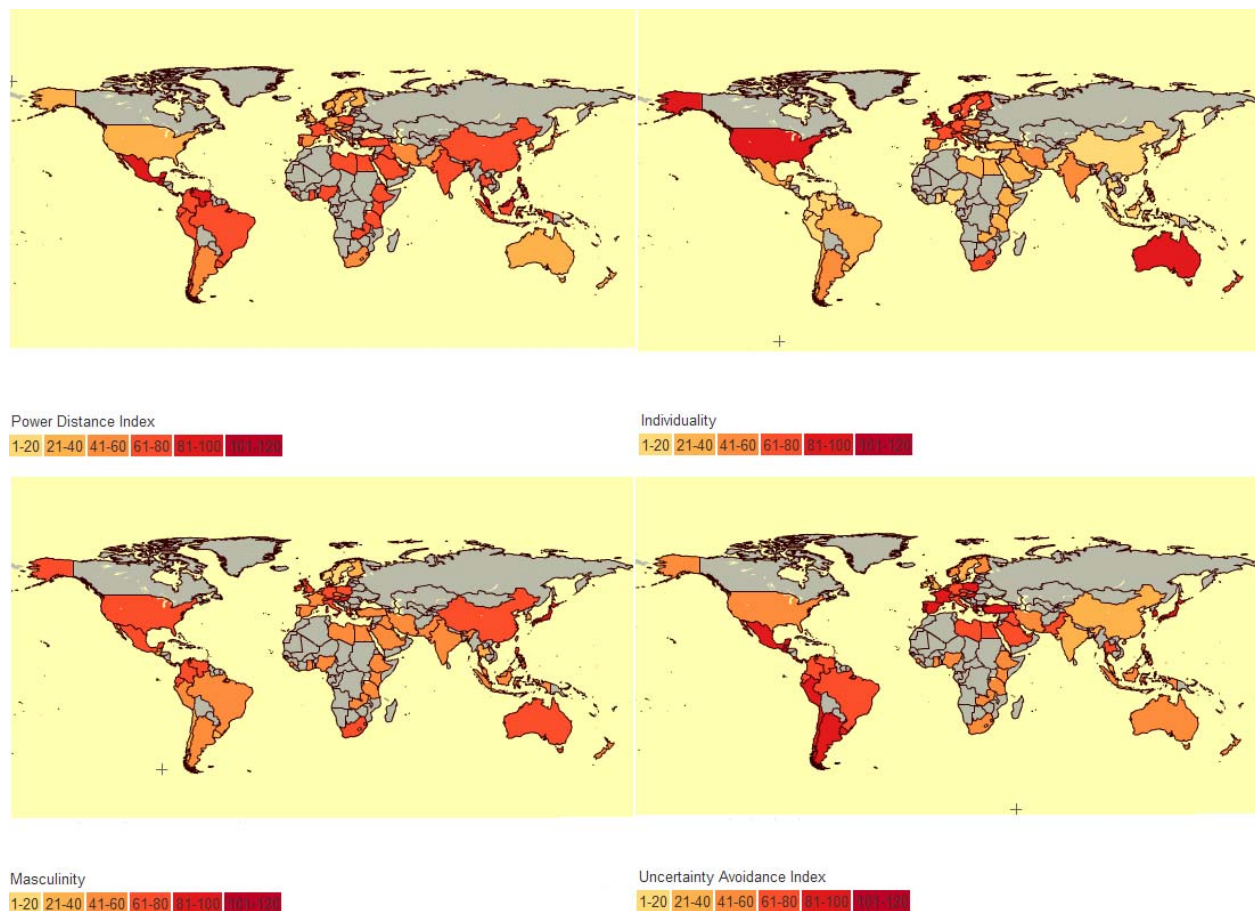
Figure 1.2. The distribution of the four cultural dimension scores in the world

Cultural Difference

Kogut and Singh (1988) formed a composite index based on the deviation along each of the Hofstede's four cultural dimensions to measure cultural difference. The formula is broadly used by the literature as the method to calculate cultural difference (Morosini et al., 1998; Yu et al., 2009).

The cultural difference calculated from the formula of Kogut and Singh is symmetric for any two countries and constant as well. The biggest value of cultural difference among all countries is between Slovakia and Denmark. The cultural difference between these two countries is on a score of 132.3. The smallest value of cultural difference is between Peru and South Korea.

The cultural difference between these two countries scored only 5.7. The average cultural difference between countries in the world is of 58 and the median value is 58.

Cultural Connection

Cultural connection is defined as knowledge that one ethnic group has of another one. It is measured by migration population from one country to another country in this thesis according to the suggestion of Bandelj (2002). Bandelj put forward a concept of "cultural tie" which is similar to "cultural connection". It is defined as how much knowledge one culture has of another. Cultural tie is proposed to be measured by "the presence of a nonimmigrant minority with host-country national origin in the investor country" (Bandelj, 2002). However, the disadvantage of using nonimmigrant minority population is to make cultural ties highly correlated to national geographic adjacency.

Therefore, when it comes to measuring cultural connection on a worldwide scale, I propose to adopt migration population living in the investor country with host-country national origin. I collected these data from United Nation Migration Database (http://esa.un.org/unmigration/). The United Nations Population Division of the Department of Economic and Social Affairs (DESA) has developed the United Nations Global Migration Database (UNGMD), a comprehensive collection of empirical data on the number of international migrants by country of birth and citizenship, sex and age as enumerated by censuses, population registers, nationally representative surveys and other official statistical sources from more than 200 countries and territories in the world. The data contained in the database were derived from numerous sources, including the Demographic Yearbook, produced by United Nations Statistics Division, tabulations collected by the Population Division as well as official publications available from resource centers, libraries and the Internet.

1.4.2. Models

In the main body of the thesis, SNA methods are employed to conduct the analysis. In the SNA method, each FDI that firm from country i performed in country j is seen as a linkage built up

from country *i* to country *j*. in figure 1.3, the nodes represent countries and the arrow represents the FDI linkage.
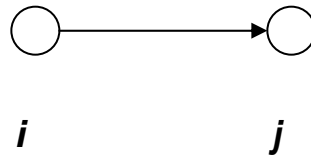
Figure 1.3. FDI linkage from country *i* to country *j*

FDI linkage between countries has two characteristics. One is that FDI linkages are ones of direction. The investment flows from country *i* to country *j*. Another characteristic is that FDI linkage changes over time. All of these directed FDI linkages together at different time periods form FDI networks over time. The figure 1.4 shows the FDI networks in 1997 and 1998.

1997   1998
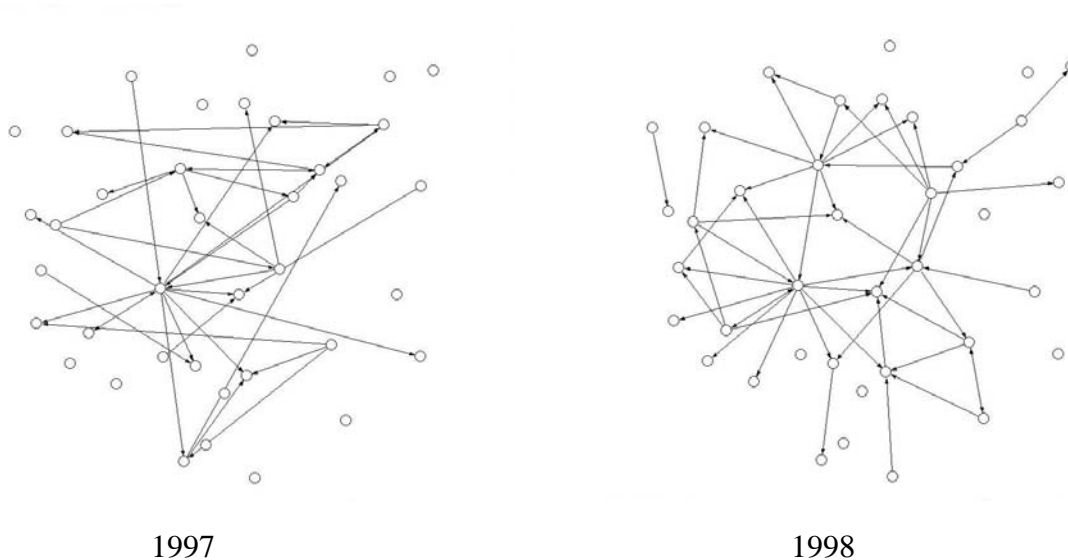
Figure 1.4. FDI networks in 1997 and 1998

Three SNA methods are used in the following three chapters. Each chapter will answer one specific research question related to the main research question with one specific SNA analysis model. The logic of the research design in the thesis is to go from preliminary and qualitative analysis to more rigorous and quantitative ones in order to answer the major research question step by step.

A network clustering analysis is applied in the first study – in chapter 2. Network clustering can be seen as a special case of clustering. Unlike conventional clustering analysis which clusters the actors based on similarity in their attributes, network clustering analysis clusters the actors into groups based on similarity in their positions in a network. Afterwards, some common attributes of the groups will be identified and the relationships among these groups will also be a result of this analysis. The goal of network clustering is to reduce a large, potentially incoherent network to a smaller, comprehensible structure that can be interpreted more readily (Doreian, 2005). Network clustering analysis has been widely adopted in very broad studies to obtain empirically meaningful patterns of relationships that varied from international trade flows to corporation directorship (Brieger 1976; Snyder, & Kick 1979; Gerlach, 1992; Lomi, 1997; Chi-nien, 1997). A hierarchical clustering algorithm called CONCOR is chosen as the analysis tool to cluster the FDI network. This technique was developed by Breiger, Boorman, and Arabie (1975) and has already had broad applications (Walter, & Barney, 1990; Nohria & Garcia-Pont, 1991; Gerlach, 1992). The details about the CONCOR algorithm will be explained in the methodology section in the first study. The results of CONCOR analysis in the first study will help to draw a preliminary and qualitative conclusion.

A network regression analysis is done in chapter 3 in this thesis to examine how cultural relationship influences FDI linkage formation by controlling other economic and social factors. As in all common regression analysis, regression analysis between networks is to seek for how much the independent variables can explain the dependent variable. The coefficients are estimated for the parameters including control variables as well. The goal of this study is to get more quantitative and rigorous results for the research question. The multiple regression quadratic assignment procedure (MRQAP), this regression analysis technique is specifically designed for the analysis of relational data (in sociomatrices) and able to deal with autocorrelation in dyadic data (Krackhardt, 1988). It is a static model and cannot deal with the time series network data. The results of such analysis can be interpreted in a way similar to the results of ordinary multiple regression. The technique has had wide applications. A few recent ones include the papers of Tsai and Ghoshal (1998), Tsai (2002) and Chen and his colleagues (2007). The model will be elaborated in the methodology section of the chapter 3.

After examining how the cultural relationship impacts on the formation of FDI linkages, I want to study if FDI network connectivity influences FDI linkages. Chapter 4 in this thesis, is an application of a dynamic network regression model, which allows analyzing FDI networks over time. An actor-oriented model called SIENA is used to estimate the parameters in this study. This model was introduced and developed by Tom Snijders (1996). It is described as a longitudinal strategy for examining the evolution of networks. The model provides advantages over conventional approaches due to their ability to account for inherent dependencies between actors embedded in a network and model interdependencies between network and behavioural dynamics (Snijders et al., 2007). These models have had many applications in social network studies in recent years (Van de Bunt, Van Duijn, & Snijders, 1999; Van de Bunt, Wittek, & De Klepper, 2005; Checkley, & Steglich, 2007). Again, the technique details will be elaborated in its application study.

1.4.3. Main Variables and Measures

Dependent Variable

FDI linkage between countries is the dependent variable in all studies in this thesis. Since the analysis level in all these studies is based on the country level, I aggregate investment linkages from firm level up to country level by counting cross-border M&A transactions frequency. I use M&A transaction frequency instead of M&A value as the data for the dependent variable because entry frequency reflects better investors' decisions on preference to some factors than transaction value.

Independent Variables

There are two main types of independent variables in this study, which are *cultural relationship* and *network connectivity*. Cultural relationship is measured at two dimensions – cultural difference and cultural connection in this thesis. Cultural difference is measured by Kogut and Sigh index in this study. Kogut and Sigh's index is the most popular measurement on cultural difference and has been applied to a multitude of culture related research questions (Shenkar, 2001). Therefore, I adopt the index as the measurement of cultural difference in my studies as

well. Cultural difference is a time-invariant variable. "Cultural connection" depends on knowledge that one national culture has of the other, which is difficult to quantify. The concept includes differences in local language, business language, and business cooperation experience between two countries, and so on. In this study, in order to simplify it, I use migration population data from one country to another country as the measure for cultural connection that another country has of this country. So if a large fraction of the migrant population from country A lived in country B in the previous period, it may suggest that the people in country B have substantial knowledge of the culture of country A.

Network connectivity includes a series of network "endogenous" variables: *Reciprocity* represents the tendency of ties to be mutual. *Transitivity* effect is the classical representation of network closure. In FDI network, *transitivity* represents that firms in country *i* invest in country *j*, and firms in country *j* invest in country *z*, then firms in country *i* will invest in country *z*. *Balance* represents the tendency that the nodes that receive the ties from the same node will form ties between them. In this study, it is expected to be negative, which indicates that the countries which received investment from the same country (investment competitors) are not tending to invest into each other. *Popularity* signifies that popular nodes which receive a large number of ties become more and more popular and attractive. In my analysis, *popularity* indicates that countries that attract FDI from many countries will attract more. *Three-cycles* effect denotes the tendency for a relationship to be cyclical. In a FDI network, *three-cycle* represents that firms in country *i* invest in country *j*, and firms in country *j* invest in country *z*, then firms in country *z* will invest in country *i*.

The independent variables will be elaborated on the following chapters.

1.5. Main Contributions

The thesis makes three main contributions to literature. Firstly, it contributes to the theory of FDI. The thesis extends FDI from an attribute concept into a relational one and studied it by performing SNA methods. The findings from the three papers in the thesis support that *cultural relationship* and FDI *connectivity* influence FDI linkage formation, and provide proof that the two views complement the classic FDI theory on the determinants of FDI. Secondly, it

contributes to cultural studies. The conventional "cultural distance" concept was criticized by researchers because of its static and symmetric characteristics. This work developed "cultural distance" into a dynamic and asymmetric concept - "cultural relationship" - and proposed a measurement to measure it. It broadens the opportunities for the application of the cultural study. Thirdly, it contributes to the literature of the SNA application study by employing three social network models to study the FDI issue. SNA methods have been adopted broadly in business and management domains to study firm alliances, collaboration and resource sharing. To my knowledge, investment has never been seen as a relational tie established between firms and been studied with SNA methods so far. Therefore, the thesis leads the SNA application into a new domain. These will be elaborated on as follows:

1.5.1. Contributions to FDI Theory

The thesis introduced a social network perspective into FDI study. The theoretical argument is that the cultural relationship and FDI network connectivity impact on the formation of FDI linkages. Empirical analysis provides supportive evidence for this argument: the cultural difference in the cultural relationship has a negative and the cultural connection in the cultural relationship has a positive impact on FDI linkage formation. "Transitivity" in the FDI network connectivity has a positive impact and "balance" and "three-cycle" has a negative impact on FDI linkage formation. It is the first study to provide evidence of extra-dyadic dependence in FDI.

1.5.2. Contributions to Cultural Studies

The thesis developed the concept of "cultural relationship". I argue that "cultural relationship" between two countries is described along two dimensions: cultural difference and cultural connection. The concept of "cultural connection" brings asymmetry and dynamics into cultural relationship. Empirical analysis provides supportive evidence for this argument as well: "cultural connection" is highly significant in explaining the formation of FDI linkages and even stronger than cultural difference.

1.5.3. Contribution to Social Network Study

FDI activities between countries have been viewed as building up investment linkages between countries. The thesis provides three social network application studies for FDI linkages with the adoption of three social network analysis methods: network clustering analysis model – CONCOR; network regression analysis model – MRQAP; and network longitudinal statistic analysis model – SIENA. These analysis tools vary from qualitative to quantitative and from static to dynamic analysis. The results of these analysis methods are consistent by adopting the same data sample, which shows that the conclusions are robust.

Summary of the Terms

M&A: Acquisition tends to be used when a firm, normally a larger one, absorbs another firm, normally smaller than the acquiring firm, and merger tends to be used when the combination is portrayed to be between equals.

Cross-border M&A: When the acquiring firm and the target firm are located in different countries, the M&A between them is called cross-border M&A.

FDI linkage: Under the globalization of industries, firms view their overseas investment as not only providing access to a certain market or resource, but also strategic linkages with their investment hosts.

FDI network: All FDI linkages between countries defined in a certain boundary form an FDI network.

Culture: Culture is the collective programming of the mind which distinguishes the members of one category of people from another (Hofested, 1984).

Hofstede Cultural Dimensions: Hofstede uses four cultural dimensions to describe culture in each nation. The four dimensions are PDI: Power Distance, IDV: Individualism, MAS: Masculinity, UAI: Uncertainty Avoidance.

Power Distance (PDI): Refers to how the people expect and accept power relations. It is one of Hofstede's four cultural dimensions.

Individualism (IDV): Refers to the extent to which people are expected to stand up for themselves and to choose their own affiliations, or alternatively act predominantly as a member of a life-long group or organization. It is one of Hofstede's four cultural dimensions.

Masculinity (MAS): Refers to the value placed on traditionally male or female values. It is one of Hofstede's four cultural dimensions.

Uncertainty Avoidance (UAI): Reflects the extent to which members of a society attempt to cope with anxiety by minimizing uncertainty. It is one of Hofstede's four cultural dimensions.

Cultural Relationship: is measured in this thesis in two dimensions: cultural difference and cultural connection.

Cultural Difference: A gap between the cultures of two different groups (Kogut and Singh, 1988). It is named "cultural distance" as well in many studies and often measured by Kogut and Singh's index (Kogut and Singh, 1988).

Cultural Similarity: Opposite concept of cultural difference which describes closeness between the cultures of two different ethnical groups.

Cultural Connection: Cultural connection describes how much knowledge one culture has of another one.

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Chapter 2

FDI Linkages and Network Structure

Abstract

FDI is a linkage that multinational enterprises built with their partners. In this chapter, the objective of the study is to gain a deeper knowledge regarding the structure of these linkages, as well as the factors that determine the formation of these linkages. I adopted a social network clustering algorithm – CONCOR – to analyze the structure of the FDI network. By employing pooled cross-border M&A data among 38 countries in the electricity industry during the period of 1997 to 2001, I found that blocks of FDI in the industry have some overlaps with either cultural difference lower or cultural connection higher blocks. However, exceptions were also found, for example, a higher cultural difference and lower cultural connection block also formed FDI block.

Keywords: *Cultural difference, Cultural connection, Cross-border M&A, Strategic groups, Strategic blocks.*

2.1. Introduction

FDI grew dramatically in the past 15 years (UNCTAD, 2008). The significant growth in FDI accelerated globalization of industries and placed firms in unprecedented global collaboration and connection. "Globalization mandates alliances, makes them absolutely essential to strategy" (Ohmae, 1989). Today's challenges urge firms to view their cross-border investment behavior not only as access to enter a certain market or resource, but also as linkages to build up with the hosts of their investment.

In many industries, these linkages are so dense that some structure in these industries is observed and described as "networks". Despite of the popular arguments of "networks" "no attempts have been made to understand or explain how these networks are structured and what implications that has for firm conduction and performance" (Nohria, & Garcia-Pont, 1992).

Nohria and Garcia-Pont's paper "Global strategic linkages and industry structure" (1992) is one of the few studies which have tried to answer the question of how the structure is formed in an industry. The authors chose 35 firms from the global automobile industry as their sample and the analysis mainly focuses on the firms-level variables, however, they pointed out as well that "firms may often be endowed with different capabilities based on the country in which they are located". A wealth of literature found investment strategy of firms is based on the characteristics of country-level. For example, Sethi, and his colleagues (2003) showed that multinational enterprises often invest in a particular country or region, although individual investment decisions might vary.

In this chapter, I focus on the country-level characteristics and aim at understanding if FDI linkages in the global electricity industry are structured through cultural blocks and what strategies can be suggested for firms when they build up their FDI linkages abroad in the near future. The FDI linkage in this application refers to cross-border M&A investment in the international electricity industry.

This chapter is organized as follows: The second section provides a theoretical framework. The method will be elaborated in the third section. The fourth section contains empirical analyses. Conclusions and discussions are provided in the last section.

2.2. Theory

2.2.1. Strategic Groups and National Culture

Countries are often segmented into different conceptive groups based on similarities in their economic conditions, geographic location, and/or politic regime. The measurement of a country's economic conditions includes the Gross Domestic Production (GDP), GDP per capita, Purchasing Power Parity (PPP) and/or average income in a society. Most familiarly, groups that are divided according to economic conditions are the developed and developing countries. The conceptive groups based on the geographic locations are many. They can be relatively small regions such as the Nordic countries, or bigger regions such as the Asian and Pacific region or Latin America. The division of groups can also be based on the political regime. For example, countries are categorized as communist countries and capitalist countries. The nations are categorized according to many different concepts, because it can be seen that the nations in a certain conceptive group often have similar behavior patterns, perform similar strategy, and have more strategic connections inside groups. The significance of the analysis on country groups is argued by Ronen and Shenkar (1985:435)

> "By defining the country as the unit of analysis, the clustering of these countries has important implications for managers and academicians. Managers in multinational corporations can better understand the basis for similarities and differences between countries. With this knowledge, they can more effectively place international assignees, establish compatible regional units, and predict the results of policies and practices across national boundaries (Ronen, & Kraut, 1977). Clusters also can help academicians by defining the extent to which results should be generalized to other countries. Properly employed results from one country can be generalized to the entire group of countries sharing a particular variable within the same cluster. Clusters also aid the researcher in identifying variables that explain the variance in work goals and managerial attitudes variables such as language, religion, or level of industrialization."

These comments can be interpreted as follows: Firstly, the members in the same strategic group tend to behave similarly and perform similar strategies. Secondly, the strategy taken by firms in one strategic group might not be borrowed by other groups or could not be simply copied by other groups because of characteristics of groups. Thirdly, common characteristics of the group decide what strategies firms in the group will take when they make decisions.

Therefore, these conceptive groups can also be referred to as "strategic groups". Normally, these groups have no strict and permanent boundary and they are intangible as well. But for the firms in certain countries, in order to make the proper strategy in the future, it is crucial to understand which group they belong to.

Plenty of research has been done on clustering countries into strategic groups according to attributes of countries. Ronen and Schenkar (1985) gave a review on the 8 cluster studies emerged from the literature research. These studies include Haire, Ghiselli, and Porter (1966); Sirota and Greenwood (1971); Ronen and Kraut (1977); Hofstede (1976); Griffeth, Hom, Denisi, and Kirchner (1980); Hofstede (1980); Redding (1976); and Badawy (1979). In these studies, the authors cluster countries with different variables. These variables can be grouped into four categories: work goal importance; need deficiency, fulfillment, and job satisfaction; managerial and organizational variables; and work role and interpersonal orientation. All of these studies found that countries are clustered into culturally similar groups. These groups are summarized in a figure in Ronen and Schenkar (1985)'s paper which is shown below.
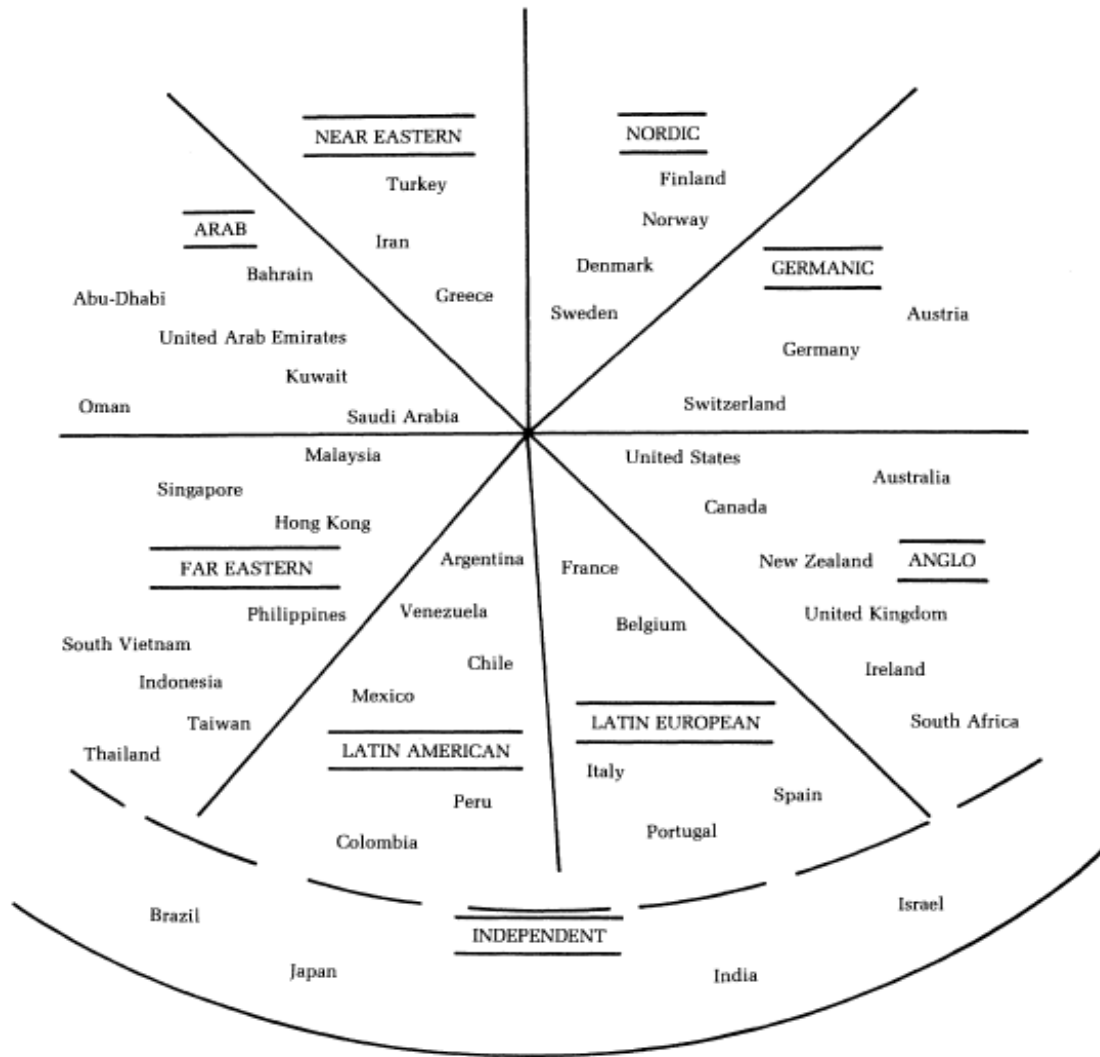
Figure 2.1. A synthesis of country clusters according to Ronen and Schenkar (1985)

Therefore, I assume that clusters obtained from the FDI network clustering have certain cultural characteristics because national culture decides the business environment and routines of firms which become then the resource of firms (Morosini et al., 1998). These resources will finally decide the success of business. Thus, Hypothesis 1 is built up as follows,

Hypothesis1: FDI groups are formed by firms in culturally similar countries.

According to Bandelj (2002) and DiMaggio (1993), not only cultural similarity but also cultural connection will help FDI formation. H2 is set up as,

Hypothesis2: FDI groups are formed by firms in culturally connected countries.

2.2.2. FDI Linkage, Network and Blocks

According to Nohria and Garcia-Pont (1992), the network of linkages in an industry is not randomly patterned but is structured as blocks of different types. They view a block as "a set of firms that are connected more densely to each other than to other firms in the industry". Two types of blocks are defined according to Nohria and Garcia-Pont, one type is pooling blocks which are formed by firms within same group. Another type is complementary blocks which are formed by firms from different groups. This is shown in figure 2.2 and figure 2.3.

Figure 2.2. Pooling blocks
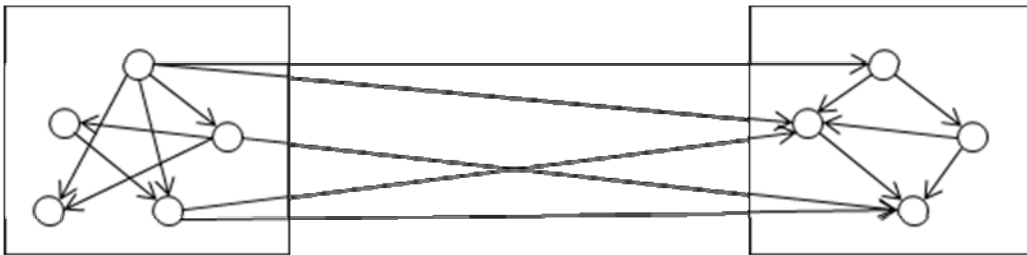
Figure 2.3. Complementary Blocks

Firms in the same group have similar strategies to build their strategic blocks**.** This is supported by Caves and Porter (1977:250-251): "Because of their structural similarity, group members are likely to respond in the same way to disturbances from inside or outside the group, recognizing their interdependence closely and anticipating their reactions to one another's moves quite accurately." Then, another issue appears in nature: what are the strategies that strategic groups employ and what attributes of groups can explain the variance of these strategies?

The theory of familiarity argues that firms are more likely to invest in culturally similar markets (Shenkar, 2001). The widely accepted explanation is that communication and information transfers would be more efficient and effective in a more similar cultural environment. This would make the investor firms' managerial uncertainty low and permit them to operate with less risk in their investment behavior. It gives implications that firms in the nations who have similar culture would prefer to build linkage between them. Therefore, the third hypothesis is built up as,

> *Hypothesis3: FDI blocks are formed by pooling blocks and complementary blocks between culturally similar strategic groups.*

In fact, in the practical operation, FDI has often happened between two culturally different countries. DiMaggio (1993) suggested cultural investors and hosts having enough knowledge of each other to allow "cultural matching" between them, which then becomes the base of a successful transaction. Bandelj (2002) suggested that hosts who share cultural ties with potential investors attract more FDI than those who do not and he found empirical supportive evidence for it as well. The explanation can be that more cultural connection helps understanding and respecting another culture even though the recognition and communication between them is slow. At least, cultural conflict and clash can be effectively reduced in the process of the business. Therefore, the fourth hypothesis is built up as follows,

> *Hypothesis4: FDI blocks are formed by pooling blocks and complementary blocks between culturally connected strategic groups.*

2.3. Method

2.3.1. Research Design

The research method is designed to test the hypotheses set up above in this study through the following steps:

1. A network clustering analysis will be performed for the FDI network in order to find out the strategic groups and blocks.

2. Then exam if firms in the same groups are from culturally more similar and/or connected countries.

3. To look if FDI blocks are formed within the same FDI groups and between different culturally similar groups

4. The FDI groups will be analyzed.

2.3.2. Data and Sample

The Sample of Cross-border M&A

The selection of the data sample has been elaborated in the general introduction section of the thesis. Table 2.1 lists the names of the selected countries and the continents that they belong to.

Table 2.1. Name list of the selected countries

Asia:

China, India, Japan, Thailand, Turkey

Europe:

Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, Switzerland, United Kingdom

North and Middle America:

Canada, Mexico, United States

Oceania:

Australia, New Zealand

South America:

Argentina, Brazil, Chile, Colombia, Ecuador, Peru

An Integrated FDI Network

In this study, I aggregate cross-border M&A transactions from firms-level up to country-level and see these transactions as building up FDI linkages between the two involved countries. To avoid sparse networks, I integrate all FDI linkages in these 5 years into one FDI network.

The network is represented by a binary matrix because this study focuses on the FDI network structure rather than the value or frequency of FDI. The 38 countries which were selected are the actors in the network. Thus, a 38 by 38 adjacency matrix is formed in which each cell contains "0" or "1", and "1" represents that firms in the country in the column side of the matrix had FDI in the country in the row side, otherwise "0" is coded. The matrices of the FDI network in this study are asymmetric, which means that they are directed networks.

The Figure 2.4 shows the picture of the FDI network in the period from 1997 to 2001. In the network, the nodes are marked with names of countries and represent firms in these countries and the ties between nodes represent firms' collective FDI behaviors between countries. The density of this FDI network is 0.114. As seen in figure 2.5, countries such as Germany, Sweden, United Kingdom, and United States, are located in more central positions in the network and have more out- and in- FDI linkages.
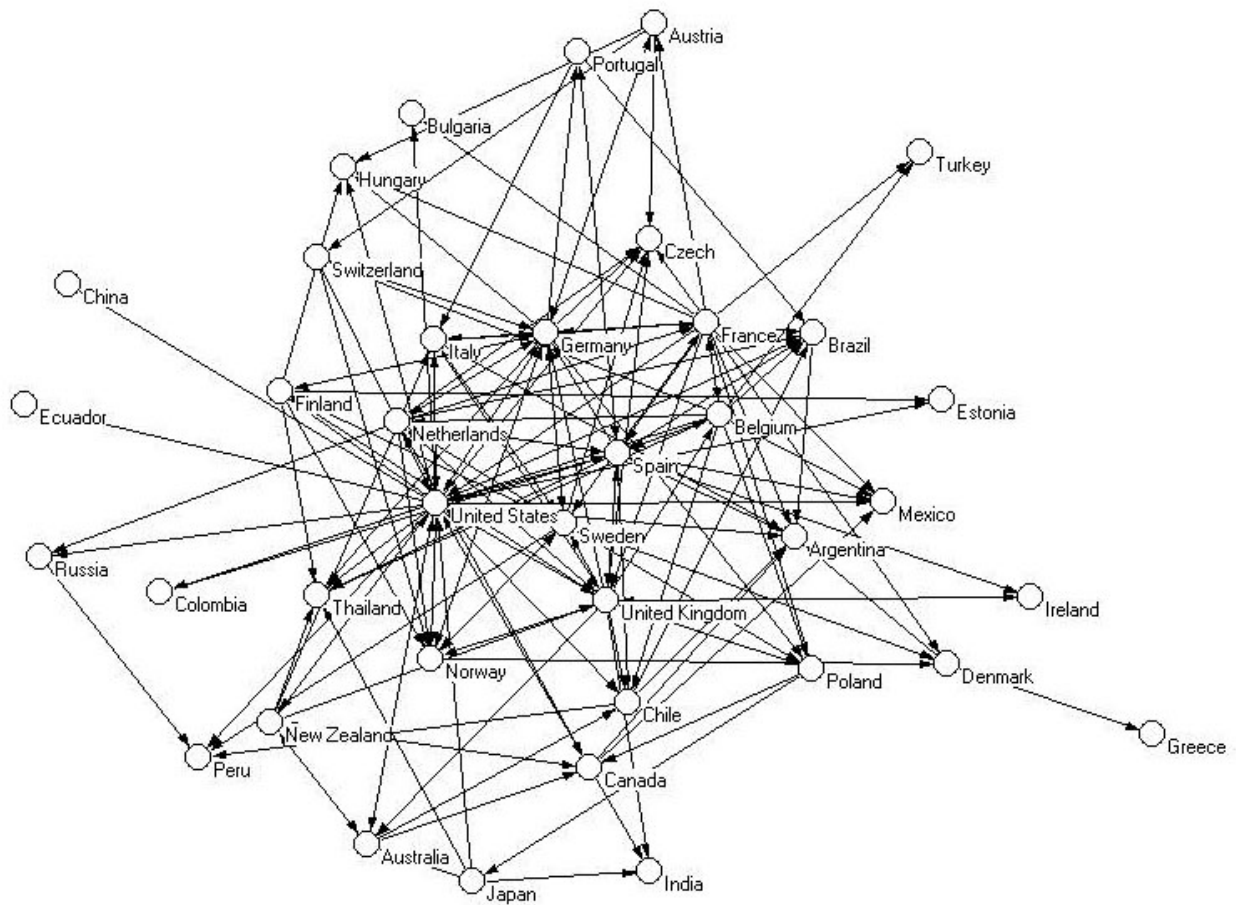
Figure 2.4. The FDI network in the year of 1997 to 2001

Culture

Cultural difference. The data of the national cultures for these 38 countries are selected from the Hofstede cultural dimensions. Cultural difference is calculated according to Kogut and Singh (1988) index. The formula is shown as follows.

$$CD_{ck} = \sqrt{\sum_{i=1}^{4}(I_{ic} - I_{ik})^2}$$

Where:

CD_{ck}: Cultural difference for the cth country to the kth country.

I_{ik}: Hofstede's score: ith cultural dimension and kth country.

The cultural difference calculated from the Hofstede cultural dimensions for the 38 countries is a 38 by 38 valued matrix, in which, the biggest score of cultural difference is of 115 which is between Japan and Sweden. The smallest score of cultural difference 6.6 is between United States and Australia. The average cultural difference between countries in the sample is 56 and the median value is 56. If I calculate the sum of cultural difference for each country, Denmark is the country which has the biggest cultural difference with others and Czech is the country which has the smallest cultural difference with others.

Cultural connection. Since the FDI network was aggregated to one static network in this chapter, cultural connection is therefore treated as a static network as well. It is measured by 5 years average migration population during the period of 1997 to 2001. The data is obtained from the United Nation Global Migration Database (UNGMD). I chose the cut off line as 1000 people, which means that when country A has an average migration population of more than 1000 people from country B in the 5 years, it is seen as country A having a cultural connection with country B. The cultural connection network is a 38 by 38 valued matrix as well.

Figure 2.5 shows all of these cultural connections in the study period. Among the countries in the sample, the United States is the country which has the most connections – It has the most cultural knowledge about other countries. From the figure, it can be seen that countries such as Denmark, Greece, the Netherlands, Sweden, France, Australia, are located in a more central position in the cultural network, which means that they have more cultural connections with other countries.
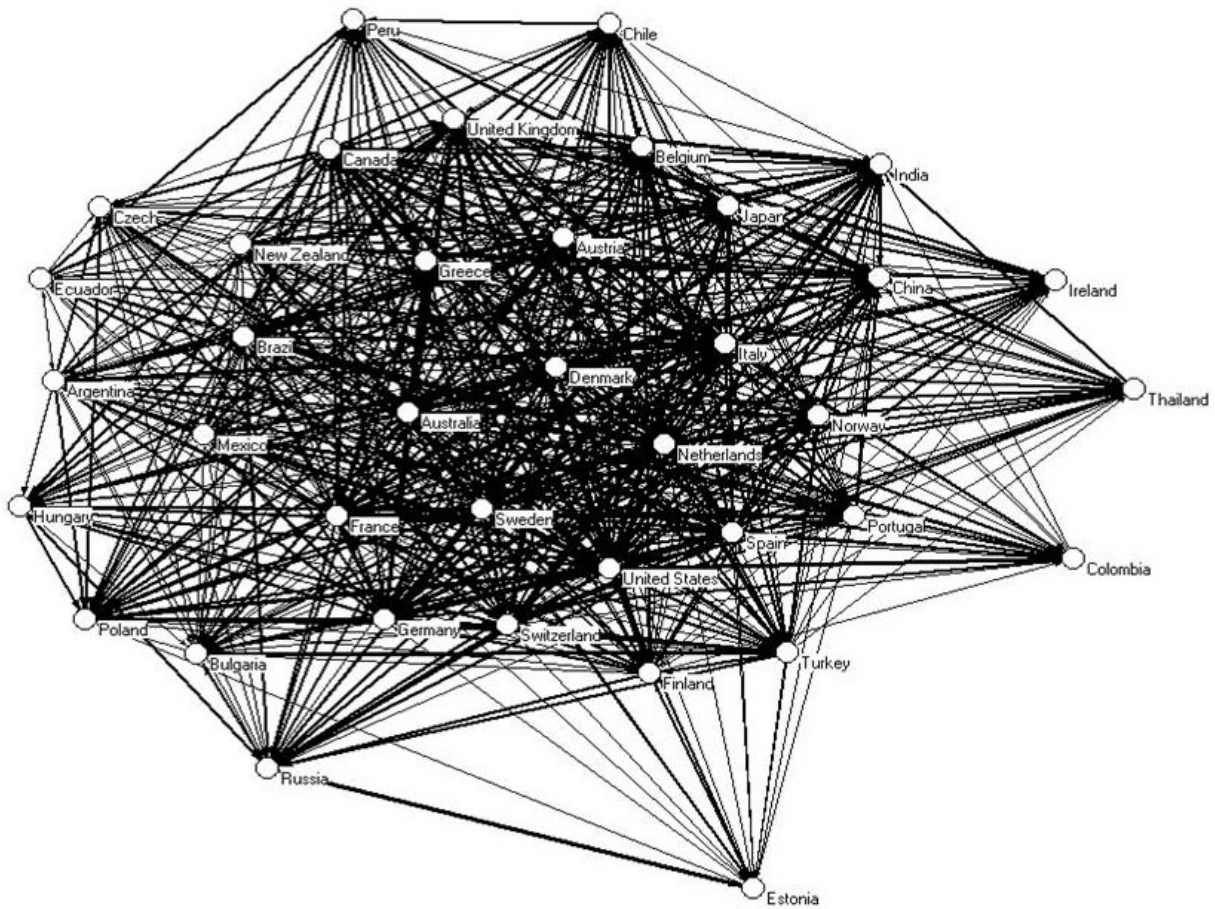
Figure 2.5. Cultural connections within the 38 countries in the year of 1997 to 2001

2.3.3. Model Specification

A clustering analysis is to cluster the actors based on similarity in their attributes. Unlike the conventional clustering analysis, network clustering analysis is to cluster the actors based on similarity in their positions in a network. A network clustering algorithm called CONCOR, which was developed by Breiger, Borman, and Arabie (1975), is used to analyze the structure of FDI network in this study. CONCOR is a hierarchical clustering algorithm that successively splits the actors in the network into a larger number of blocks of actors with a similar pattern of relationships until a specified number of blocks have been formed. CONCOR operates on the basis of convergent correlations. The idea underlying the blocks in the CONCOR algorithm is

that the linkages of the actors of the same block are more highly correlated than those outside the block. As with all cluster analyses, there is no rule that determines how many blocks should be reported in a network. The analytical judgment of the researcher must be brought to make this decision.

2.4. Empirical analyses

As with all clustering analyses, there is no rule that determines how many groups or blocks should be reported in the result. The analytical judgment of the researcher must be brought to make this decision. Since I have only 38 countries in the sample, to avoid too small groups, and consider the interpretability of the cluster solution as well, I propose 4 groups in the result.

I split the network twice so that four groups are formed in the network. The clustering result is shown in Figure 2.6
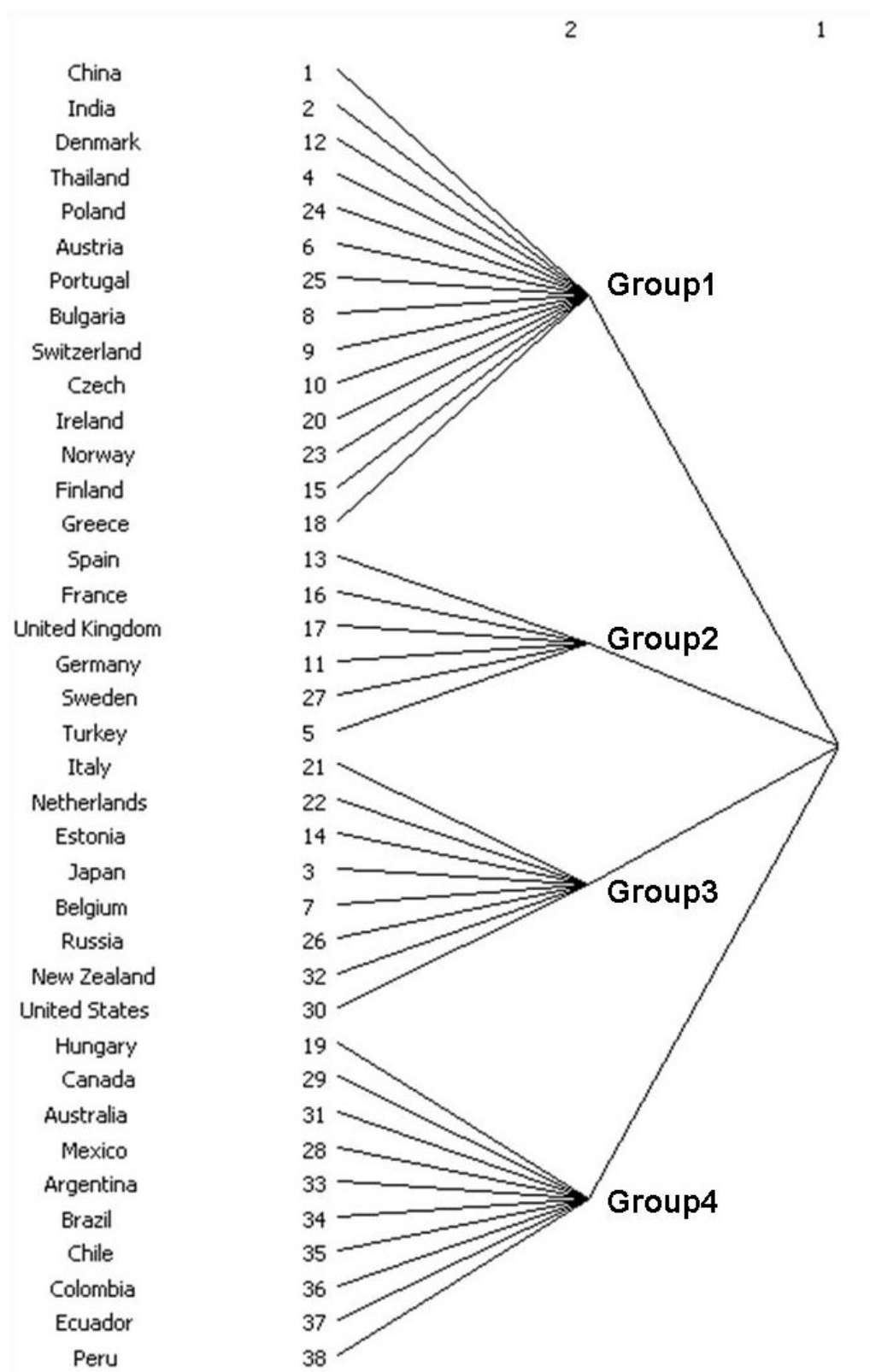
Figure 2.6. CONCOR clustering results

2.4.1. FDI groups

The first group was composed of major Asian countries: China, India and Thailand, and some European countries. They include almost all major transition and developing economies in the world. Therefore, it can be referred to as transition and developing economy group. This group has some overlap with the combination of the three groups: Far eastern group, Germanic and Nordic group in the summarized country groups from the 8 studies (Ronen, & Schenkar, 1985). The second group was dominated by developed European countries. It is formed by Spain, France, United Kingdom, Germany, Sweden, and Turkey. One prominent characteristic of this group is that the countries host large migration populations. This group has some overlap with the Latin European group in the study of Ronen and Schenkar. Thus, I define the second group as European-migration group. The third group was made up of the main industrial countries in the world. This group contains some members in the Latin European group and some in the Anglo group. I call this group as industrial-countries group. The fourth group was consisted of Central and South American countries. They are geographically close to each other. It is similar to the Latin American group in Ronen and Schenkar's study. This group is defined as the Latin-American group.

By a rough observation, it seems that the countries in same groups have some characteristics in common and they are either culturally close or connected. To provide more evidence, I calculated the average cultural difference and cultural connection for every two groups. These results are shown in table 2.2 and 2.3.

Table 2.2 shows that the average cultural difference inside groups are generally lower than the overall average cultural difference in the sample and also generally lower than the ones between different groups. Only within Group 1, the cultural difference inside is a bit higher than the overall average cultural difference 55.342. The results provide certain supportive evidence for hypothesis 1 that these strategic groups are culturally similarly clustered.

Table 2.2. Average cultural difference in blocks

Cultural Difference: Average: 55.342				
Group	1	2	3	4
1	57.694	56.353	59.668	57.603
2	56.353	46.858	52.644	56.461
3	59.668	52.644	50.642	58.867
4	57.603	56.461	58.867	47.083

The ln values of the average cultural connection in blocks are shown in table 2.3. From the table, it can be seen that Group 4 does not have high cultural connection within the group even though the average cultural difference in this group is lowest among groups. However, cultural connections within Groups 2, and 3 are relatively higher. Therefore, half of the groups are formed by countries which have more cultural connections. This result gives support somehow to hypothesis 2 that strategic groups in FDI are formed by the firms in the culturally connected countries.

Table 2.3. Average cultural connection in blocks (ln value)

Cultural connection Average: 10.414				
Group	1	2	3	4
1	7.872	9.440	8.495	6.513
2	10.753	11.562	10.525	9.449
3	10.301	10.923	10.469	11.606
4	9.477	10.426	10.203	8.807

2.4.2. FDI Blocks

When the countries in the sample are split into 4 groups, the FDI linkages in the network thus are segmented into 16 blocks. The density of each block is calculated and shown in table 2.4.

Table 2.4. Density and image matrix of the CONCOR algorithm

Strategic groups

1	China, India, Denmark, Thailand, Poland, Austria, Portugal, Bulgaria, Switzerland, Czech, Ireland, Norway, Finland, Greece
2	Spain, France, United Kingdom, Germany, Sweden, Turkey
3	Italy, Netherlands, Estonia, Japan, Belgium, Russia, New Zealand, United States
4	Hungary, Canada, Australia, Mexico, Argentina, Brazil, Chile, Colombia, Ecuador, Peru

Density matrix of blocks (density =0.150)

	1	2	3	4
1	0.036	0.095	0.036	0.036
2	0.321	0.389	0.250	0.217
3	0.134	0.292	0.203	0.238
4	0.000	0.017	0.063	0.080

Image matrix (Cut off value=0.150)

FDI blocks

	1	2	3	4
1	0	0	0	0
2	1	1	1	1
3	0	1	1	1
4	0	0	0	0

Since the density of the entire network is 0.150, I chose it as the cut off value to dichotomize the density matrix. Then I got a binary matrix of the blocks which represents a reduced version for the FDI network, where 1 represents that the two corresponding strategic groups formed the strategic block. 0 represents that they did not. This is also shown in table 2.4. The structure of the FDI blocks is drawn in Figure 2.7.
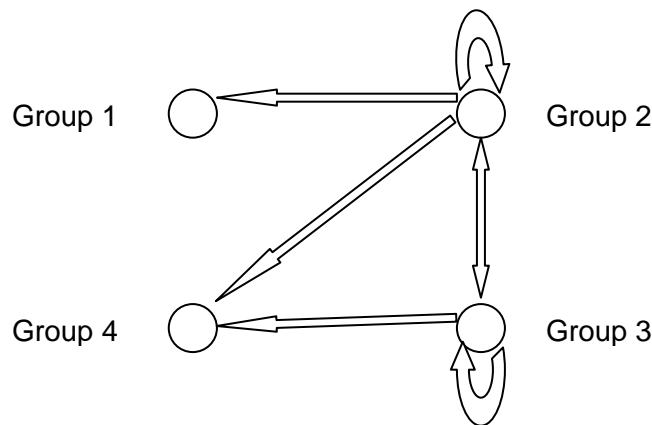
Figure 2.7. FDI blocks

Obviously, the structure of image matrix depends strongly on the choice of the cut off value of the density matrix. The idea of clustering analysis in the network study is to find those blocks where the linkages of the actors are denser than those outside the blocks. The cut off value should be chosen to make the matrix emerge in a clear, rational and interpretable structure.

Table 2.5 lists the cultural difference matrix, cultural connection matrices and FDI blocks matrix together. By comparing the cultural difference table and strategic blocks table, I noticed that two groups – group 2 and 3, which have low cultural difference within the groups, formed the pooling blocks. The cultural difference between group 2 and 3 is relatively low as well, and the two groups formed complementary blocks between each other. It is notable that group 2 and 3 have reciprocal linkages. Reciprocal investments built the international operation on the base of the mutual relationships and it can significantly reduce the risk in the process of operation. These results provide certain supportive evidence for hypothesis 3 that the strategic blocks in FDI network are formed by pooling blocks and complementary blocks between culturally similar groups.

Table 2.5. Matrices of cultural difference, cultural connection and strategic blocks

Cultural Difference	1	2	3	4
1	57.694	56.353	59.668	57.603
2	56.353	46.858	52.644	56.461
3	59.668	52.644	50.642	58.867
4	57.603	56.461	58.867	47.083
Cultural Connection				
1	7.872	9.44	8.495	6.513
2	10.753	11.562	10.525	9.449
3	10.301	10.923	10.469	11.606
4	9.477	10.426	10.203	8.807
FDI Blocks				
1	0	0	0	0
2	1	1	1	1
3	0	1	1	1
4	0	0	0	0

There are a few exceptions when cultural difference is used to explain the motives of FDI. Firms in group 3 and 4 have large cultural difference, but firms from group 3 invested in the group 4. So do group 2 and group 1. In order to understand why firms would invest in cultural different locations, cultural connection matrix might help. In cultural connection matrix, groups 2 and 3 have relatively high cultural connection with all other groups except that group 2 has low cultural connection with group 4. By comparing with the FDI blocks, I found that most of the FDI blocks are formed within culturally connected blocks. Group 3 invested in group 4 and group 2 invested in group 1, which can't be explained by cultural difference, but can be explained by cultural connection. These results provide certain supportive evidence for hypothesis 4 that the strategic blocks in FDI network are formed by pooling blocks and complementary blocks between culturally connected strategic groups.

There is still one exception in FDI blocks when both cultural difference and cultural connection are used to explain motives of FDI. Group 2 has above average cultural difference and no strong cultural connection with group 4, but group 2 formed FDI block with group 4. It

shows that the formation of FDI linkages might be impacted by other factors as well even though most of the FDI blocks are overlapped with low cultural difference or high cultural connection blocks.

2.4.3. FDI Strategy besides Culture

By preliminarily observing the image of the FDI blocks, two types of structures in the FDI network are found. The first type is the reciprocal structure which group 2 and 3 had. Reciprocal strategy is based on trust and mutual understanding and reciprocal linkages are easy to master, maintain and develop for firms. The second type is the triangle structure which group 2, 3 and 4 had. Triangle structure forms a closed investment relationship within three groups and is supposed to reduce the risk on international investment operation.

Are the cultural difference and cultural connection the impacts of FDI linkages formation from more rigorous analysis? Do the FDI network structures play a significant role on the FDI linkage formation as well? The following chapters will study the issue further.

2.5. Conclusions and Discussions

This paper adopts a network hierarchical clustering analysis tool – CONCOR to analyze the structure of the FDI network. By adopting cross-border M&A data from the 38 most investing-active countries in the global electricity industry in the world, the empirical results show certain support for my theoretical arguments: Firstly, firms in culturally similar or connected countries form intangible strategic groups; Secondly, the blocks in the FDI network are formed by pooling blocks and complementary blocks between culturally similar or connected groups. However, the exception is also found that high cultural difference and low cultural connection groups formed the FDI linkage.

Two types of structure are found in the FDI network: Reciprocal structure suggests that firms build up investment linkages with the firms in the group which has investment linkages

with their own group already. Triangle structure suggests that firms invest in a closed triangle to reduce the international operation risk.

This study has a number of limitations. These limitations will be further studied in the following chapters in this thesis. Firstly, the conclusions that I have drawn in the study in this chapter are based on a network clustering analysis. They are very qualitative and preliminary. It will be very interesting to analyse FDI networks with more rigorous models. In the next chapter, quantitative analyses will be conducted for FDI networks in the two periods in order to have more strict examination on the conclusions. Secondly, FDI network evolution over time should be analysed in order to understand the investment choice more precisely. A longitudinal network analysis model will be adopted to analyze the FDI networks overtime in the chapter 5.

2.6. Summary

A qualitative analysis method - network clustering analysis - is adopted in chapter 2 to examine the strategies and motives of FDI in global electricity industry. The empirical results from CONCOR algorithm have shown the certain supportive evidence for the three hypotheses out of the four which were built up in this chapter. According to the analysis results, I preliminarily believe that national cultural difference and cultural connection motives FDI formation and the FDI network structures might explain the formation of FDI linkages as well.

These results also provide the study guide for the next chapter. In chapter 3, a quantitative SNA regression model will be applied to continue the study on how cultural difference and cultural connection influence the formation of FDI linkages.

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Chapter 3

the Effects of Cultural Relationship on FDI Location Choice

Abstract

This study examines the impact of national cultural relationship (cultural difference and cultural connection) on location choice of FDI. By using aggregated cross-border M&A transaction data in the periods of 1997-1999 and 2000-2001 respectively, the objective of the study is to understand how cultural relationship influences FDI linkage formation and how such influence changes over the two periods under continuing industry globalization. A multiple regression quadratic assignment procedure (MRQAP) is used to perform the estimation. As predicted, I find negative relationships between FDI and cultural difference and positive relationships between FDI and cultural connection in both periods after controlling trade, economic and geographic borders. The estimation results also indicate a decreasing trend of the influence of both cultural dimensions on investment flow.

Keywords: *Cross-border M&A, Cultural Network, MRQAPModel*

3.1. Introduction

In 2000, the global FDI raised 30 percent as compared to 1999 and reached to 1.4 billion US dollars. The value is nearly 8 times that of 176 million US dollars in 1992. Continued consolidation through cross-border M&A contributed substantially to the global surge in FDI (UNCTAD, 2001). With the significant growth in FDI, firms faced difficulty in choosing target firms and were willing to understand determinants of international investment. FDI is a capital flow from an origin (home) to a destination (host), thus the causes of FDI must likewise be traced to the relations between the involved transactors, rather than only to the attributes of each individual. Researchers have examined the relations between investors and hosts in broad domains such as economics, finance, politics, institution and culture to identify the effects on FDI (Bandelj, 2002; Anand, & Delios, 2002; Worthington, 2004). Amongst the relationships, cultural difference between investors and hosts is one of the most discussed and acknowledged factors which influence the formation of international investment (Shenkar, 2001). As explained in chapter 1, cultural relationship has been expanded in this thesis in two dimensions: cultural difference and cultural connection. Based on the cultural relationship defined on the two dimensions, I address the issue in this chapter: Does cultural relationship impact the location choice of FDI in the international market?

I found that so far, almost all of the empirical research on the determinants of international investment has a narrow focus because they studied the issue by taking the specific investor country or host country (Benito, & Gripsrud, 1992; Sathe, 2006; Wang, & Schaan, 2008) and comparing "one to many" national cultures. For example, Wang and Schaan (2008) take a sample of Japanese FDI in 53 countries and regions over 30 years. Zhang Kevin Honglin (2001) takes a sample of China's inward FDI during the period 1987-1998. Yet, the influence of cultural relationship between the home and host country on international investment has seldom been tested in a large sample of nations. Obviously, the research would be more appropriate when looking at "many to many" which means different investment in different countries (Hoetzel, 2005).

In this study, I address this issue by using cross-border M&A transactions data among 38 countries in the international electricity industry in the period of 1997 to 2001. Cross-border

M&A transaction value went up from 1997 to 1999 and reached to the peak in 2000. The period is split into two parts in this study, from 1997 to 1999 and from 2000 to 2001 in order to compare the changes on the impacts of FDI and to reveal the FDI trends. I chose to split from 1999 because the impacts of FDI in the going-up and going-down periods might be different.

This chapter is organized as follows. The second section provides a literature review and hypotheses. The methods are elaborated in the third section. The fourth section contains the analysis results. Conclusions and discussions are provided in the last section.

3.2. Literature Review and Hypotheses

3.2.1 The Impact of Cultural Difference on FDI

The theory of cultural familiarity argues that firms are more likely to invest in culturally similar markets (Shenkar, 2001). The widely accepted explanation is that communication and information transfers would be more efficient and effective in a more similar cultural environment. This would make the investor firm's managerial uncertainty low and permit them to operate with less risk in their investment behavior. Hence, it is argued that cultural difference discourages FDI. Much of the extant empirical studies have found supportive evidence to this theory. Kogut and Singh (1988) studied cultural distance and uncertainty avoidance factors for foreign investment in U.S. in 1981-1985. They concluded that higher cultural distance reduced the likelihood of acquisitions. Brouthers and Brouthers (2000) examined the factors at firm-level and country-level by using 136 Japanese entries to Western Europe after 1980; they concluded that cultural difference is negatively related to entry by acquisition. Yoshino (1976) and Ozawa (1979) viewed Japan's cultural distance from Western nations as a constraint on Japanese FDI in the West. Davidson (1980) attributed the large US investment in Canada and the UK well beyond what their market size, growth, tariffs and proximity would have predicted to cultural similarity. Edwards and Buckley (1998) examined investments from Australia to Britain, and found the common language and familiar history and culture were important in explaining the location choice. Zhang (2001) found cultural proximity between FDI homes and hosts would encourage

FDI flows into China after regressing FDI flows to China during the period 1987-1998. In summary, I have the following hypothesis:

> **Hypothesis 1:** *As the cultural difference between countries A and B increases, firms in country A will be less likely to invest in country.*

3.2.2 The Impact of Cultural Connection on FDI

DiMaggio (1993) and Bandelj (2002) proposed "cultural matching" and "cultural tie" concepts, which are both based on the knowledge that one culture has of the other. In this study, I adopt this concept to complement measuring cultural relationship and define it as "cultural connection". "Cultural connection" describes how much one culture is connected to another, in other words, how much knowledge one has of another. I think cultural difference and cultural connection describe two different important aspects of cultural relationship between two countries. The cultural difference described by Kogut and Sigh (1988) derives from the concept of "culture" in a nation, which is based on a series of national characteristics. Therefore, the difference from country A to country B must be as same as from country B to country A. Conversely, the connection of a culture to another culture expresses the collective knowledge of the people in one nation about the people in another nation. Cultural connection is an asymmetric concept, which means that if one country has a certain cultural connection to another country, this does not necessarily imply that there is same level of connection in the reciprocated direction.

Higher cultural connection helps better investment happening. Individuals and corporations in a culture with more knowledge of one another are able to better understand and respect another culture even though the recognition and communication between them are slow and costly. At least, cultural conflict and clash can be effectively reduced in the process of the business, DiMaggio (1993) concluded that investors' and hosts' cultures need not be similar for a successful transaction to occur as long as each party has knowledge of the other, and allows for "cultural matching". Bandelj (2002) found empirical evidence as well that hosts who share cultural ties with potential investors attract more FDI than those who do not.

The above context is summarized in the following hypothesis:

Hypothesis 2: As the cultural connection between counties A and B increase, firms in country A will be more likely to invest in country B.

Cultural difference and cultural connection are not necessarily correlated. Firstly, big cultural difference does not mean that the two cultures have little knowledge of each other. Some cultures are generally more open than others and they have more knowledge about others than others have of them. Some cultures are more attractive or in a core position because of some aspect in the world compared with others. Others are willing to have more knowledge about them. In fact, sometimes one culture is attractive to others because it is very different. These factors are noted by Shenkar (2001) in his review of CD. Secondly, small cultural difference does not imply the two countries have rich knowledge of each other. Examples for these observations can be found in many studies: O'Grady and Lane (1996)'s research concerned Canadian executives' perceptions of cultural similarity between Canada and the United States and their subsequent difficulties due to unanticipated lack of cultural knowledge. Sappinen (1992) studied the case of Finns moving into Estonia and the reunification of West and East Germany, which also reflected similar difficulties because of lack of knowledge on each other.

3.3. Methods

3.3.1. Data

In this study, the period of 1997 to 2001 was split into two time periods. The first period includes all data records from 1997 to 1999, and the second period includes data records from 2000 to 2001. The FDI data took the yearly average cross-border M&A frequency during the corresponding time period. Therefore, in this study, FDI network is valued network. The other data took the corresponding average yearly value as well. The results from valued FDI network can be compared to the results in the first chapter to see if it is consistent.

Figure3.1 shows the average valued FDI network in the 38 countries during the period of 1997 to 1999.
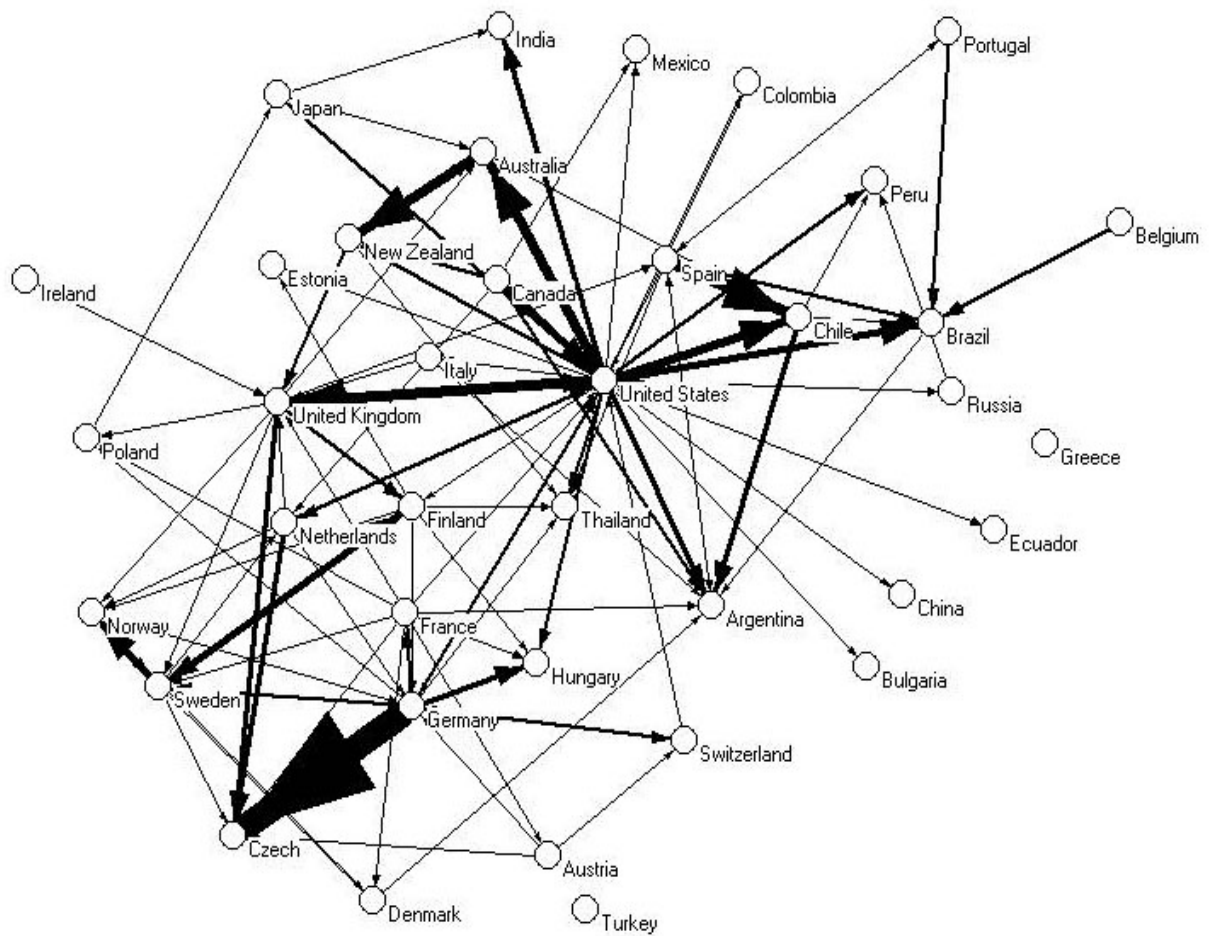
Figure 3.1. The average valued FDI network in the 38 countries in 1997 - 1999

Figure3.2 shows the valued FDI network in the 38 countries during the period of 2000 and
2001.
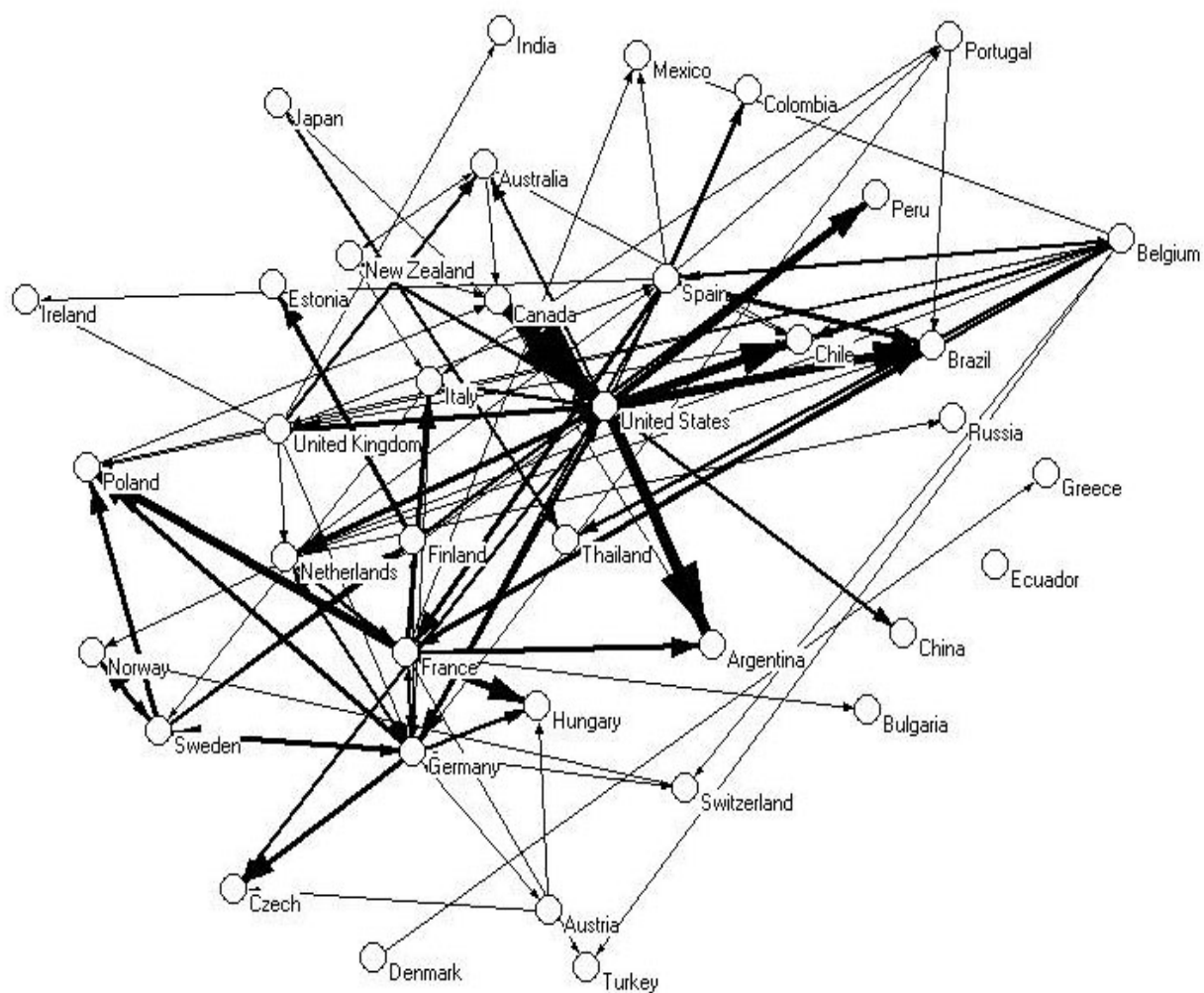
Figure 3.2. The average valued FDI network in the 38 countries in 2000 – 2001

The national cultural data which are used to gain cultural difference are obtained from the website of Geert Hofstede (Hofstede). Migration data which are used to measure cultural connection are from United Nation Global Migration Database (United Nations). Domestic M&A data are from SDC database. The other data used in the analysis for control variables are obtained from a few online national databases and matched to the investment data. The population and electricity capacity data are from the website of Energy Information Administration (EIA). Electricity trade data are obtained from United Nation Comtrade database. GDP per capita data

are obtained from World Economic Outlook (WEO). Geographic data are from the CEPII distance data on the website of CEPII (CEPII).

3.3.2. Model

Since I take the investment data among a group of countries as the sample, there exists correlation on FDI between the dyadic countries because the FDI between the dyadic countries both are impacted by the bilateral policies and agreements. Therefore, I introduce the QAP model, which stands for quadratic assignment procedure, into this study. This regression analysis technique is specifically designed for the analysis of relational data (in sociomatrices) and it is able to deal with autocorrelation in dyadic data (Krackhardt, 1988).

The model framework can be described as the following formula:

$$Y = a\,X1 + b\,X2 + c\,X3 + d\,X4 + \ldots\ldots$$

Where,

Y: dependent variable, coded in adjacency matrix

a, b, c,… : the coefficients for the explanatory variables

X1, X2, X3… : explanatory variables, coded in adjacency matrices

This algorithm first performs a standard multiple regression across corresponding cells of the dependent and independent matrices. Then it randomly permutes rows and columns of the dependent matrix and re-computes the regression. This permutation regression process is repeated a high number of times (in this case, 2,000 times) to estimate the standard error for the statistics of interests. So, the results of such analysis can be interpreted in a way similar to the results of ordinary multiple regression, but with corrected standard errors. A detailed explanation of this technique can be found in Krackhardt (1988)'s paper. The technique has had wide applications. A few recent applications include the papers of Tsai and Ghoshal (1998), Tsai (2002) and Chen et al. (2007).

3.3.3. Variables and Measures

Dependent variable

FDI linkage between firms in different countries is the dependent variable in this study. I aggregate cross-border M&A data from firm level to country level by checking how many times cross-border M&A transactions have ever taken place between the two countries. So transaction frequency is used instead of transaction value as the data for dependent variable because transaction frequency reflects better investors' preference on locations than transaction value. Thus, the FDI networks among the selected 38 countries are of two 38 by 38 adjacency matrices for the years of 1997-1999 and 2000-2001 respectively. The dependent variable matrices will eventually contain "0" and integer numbers. Amongst these numbers, "0" indicates that firms from the dyadic countries did not have any FDI activities and the integer numbers indicate the yearly average frequency of FDI transactions that firms in countries on the column-side performed in countries on the row-side of the matrices.

Independent variables

There are two independent variables in this study, which are cultural difference and cultural connection. Cultural difference is measured by Kogut and Sigh (1988) index in this study. The formula is shown as follows.

$$CD_{ck} = \sqrt{\sum_{i=1}^{4} (I_{ic} - I_{ik})^2}$$

Where:

CD_{ck}: Cultural difference for the cth country to the kth country.

I_{ik}: Hofstede's score: ith cultural dimension and kth country.

Cultural difference is a time-invariant variable. Therefore, the cultural difference matrices for 1997-1999 and for 2000-2001 are exactly same. The data are organized in a 38 by 38 adjacent

72

matrix. The biggest value of cultural difference is between Sweden and Japan, which has a score of 115. The smallest value of cultural difference is between Australia and the United States. The cultural difference between these two countries scored only 6.6. The average cultural difference between countries in the world is 56 and the median value is 56 as well. The country in the sample which is most distant to all other ones is Denmark and the country which is most similar to all others is the Czech Republic.

As "cultural connection" depends on knowledge that one national culture has of the other, it is difficult to quantify. Ideally, the concept should include historical relations, differences in local language and "business language", business cooperation experience between two nations, and so on. In this study, I adopt migration population in one nation from the specific nation to measure the cultural connection that this nation has of the specific one. When the migration population is more than 1000 people, I think that means that there exists a cultural connection between the two countries. So if country A hosts a certain population of migration from country B in the previous period, I think it means that individuals and firms in country A have knowledge of country B, which means as well that individuals and firms in country A have cultural connection with individuals and firms in country B. Thus, average yearly migration population between each pair of dyadic countries in the corresponding periods is used as data for the cultural connection variable. Two 38 by 38 dyadic matrices of in the years of 1997-1999 and 2000-2001 are coded respectively.

Control Variables

While my focus is on the effect of cultural relationship on FDI, I also control for a list of other factors that have been found important in the literature. FDI is conventionally thought to have three main justifications (Dunning, 1993; 2000). First, market-seeking occurs when firms set up production facilities abroad in order to serve local and regional markets. Second, resource-seeking FDI occurs when firms invest oversea to acquire resources that are rare or not available in the home country, such as natural resources and raw materials. Third, efficiency-seeking aims at searching for production abroad at low-cost. I therefore include market difference, resource difference, and efficiency difference between acquirer's and target's countries as control

73

variables in the models. They are measured by population difference, electricity capacity difference and domestic M&A difference between countries.

As Grant (1987:82) noted, "The closer the international operations are, the easier it is to internationally integrate operations." Short geographic distance allows managers to travel to the locations of target firms more quickly, frequently, and less expensively, making it easier for acquirer firms to manage their foreign subsidiaries (Gomez-Mejia, 1984). Thus, I assume that shorter geographic distance should help FDI taking place. Geographic distance is measured by asking if home and host countries have a common border. It is a constant and binary variable.

Trade relationship is another popular factor which was used to explain FDI in many studies. (Barry, & Bradley, 1997; Helpman, 2004). Most of the studies found that trades between investor and host countries have a positive effect on FDI. In my models, I also include trade relationship between countries as one control variable. Trade relationship is measured by electrical energy trade. It is coded as a 38 by 38 binary matrix.

Economic differences between investment home and host countries are considered by some researchers as an important factor which influences the success of FDI. Chakrabarti and his colleagues (2009) state that economic difference between the two countries might be expected to have a considerable effect on FDI. Therefore, I include economic difference as control variable in my models. It is measured by GDP per capita difference between investment home and host countries.

3.4. Analysis

3.4.1. Correlations of Variables

The correlations for the independent variables and the dependent variable for 1997-1999 and 2000-2001 are presented in table 3.1 and table 3.2 respectively. As shown in both tables, "cultural difference" is significantly and negatively correlated with FDI, and cultural connection

is significantly and positively correlated with FDI, providing initial supportive evidence for the hypotheses 1 and 2. I have seen that cultural difference and cultural connection are not correlated in the two tables. Therefore, it is reasonable to treat them as two variables in the models. They represent two dimensions of cultural relationship in my study. The tables show as well that efficiency difference and resource difference, trade relationship and country border are significantly correlated. Since the correlation ratios are not extremely high, I keep all of these factors as control variables in the models.

Table 3.1. Correlations of variable in the model of 1997-1999

	Variables	1	2	3	4	5	6	7	8
1	market difference								
2	resource difference	0.427							
3	efficiency difference	0.142	0.838**						
4	border	0.000	0.000	0.000					
5	trade relationship	0.006	-0.010	-0.018	0.541***				
6	economy difference	-0.267*	0.215	0.335*	0.000	-0.004			
7	cultural difference	0.000	0.000	0.000	-0.223***	-0.175***	0.000		
8	cultural connection	-0.002	0.201*	0.232**	0.075*	0.073	0.108**	-0.051	
9	FDI	0.009	0.165**	0.180***	0.125**	0.183***	0.113**	-0.142***	0.130*

* $p < 5\%$; ** $p < 1\%$; ***$p < 0.1\%$

Table 3.2. Correlations of variable in the model of 2000-2001

	Variables	1	2	3	4	5	6	7	8
1	market difference								
2	resource difference	0.457							
3	efficiency difference	0.096	0.834**						
4	border	0.000	0.000	0.000					
5	trade relationship	0.001	-0.027	-0.033	0.497***				
6	economy difference	-0.252	0.252	0.426**	0.000	-0.018			
7	cultural difference	0.000	0.000	0.000	-0.223***	-0.166**	0.000		
8	cultural connection	-0.004	0.168*	0.197***	0.038	0.040	0.097**	-0.010	
9	FDI	0.003	0.096**	0.110**	0.168***	0.224***	0.108**	-0.130**	0.077*

* $p < 5\%$; ** $p < 1\%$; ***$p < 0.1$

3.4.2. Estimation Results

Table 3.3 and 3.4 show the estimation results of QAP multiple regression analyses for the variables in the models of 1997-1999 and 2000-2001 respectively. Three models are listed out in each table. A stepwise strategy is conducted. Model 1 in table 3.3 and 3.4 include control variables only. The model 2 reports the effect of cultural difference on FDI. Model 3 also adds in a cultural connection variable and tests the effects of cultural connection and cultural difference on FDI simultaneously.

Table 3.3. Results of regression analysis in the models of 1997-1999

	Variables	Model 1	Model 2	Model 3
1	market difference	-0.027	-0.027	-0.023
2	resource difference	0.084	0.085	0.079
3	efficiency difference	0.098*	0.097*	0.086
4	border	0.034	0.013	0.011
5	trade relationship	0.168**	0.159**	0.155***
6	economy difference	0.056*	0.056*	0.055*
7	cultural difference		-0.111**	-0.109***
8	cultural connection			0.070*
	adjusted R-sqr	0.069	0.080	0.084

Number of permutations performed: 2000; * $p < 5\%$; ** $p < 1\%$; ***$p < 0.1\%$

Table 3.4. Results of regression analysis in the models of 2000-2001

	Variables	Model 1	Model 2	Model 3
1	market difference	0.002	0.002	0.005
2	resource difference	0.035	0.035	0.031

3	efficiency difference	0.053	0.053	0.047
4	border	0.072*	0.056	0.055
5	trade relationship	0.192***	0.185**	0.184**
6	economy difference	0.080**	0.081**	0.080**
7	cultural difference		-0.087**	-0.087**
8	cultural connection			0.044*
	adjusted R-sqr	0.070	0.076	0.077

Number of permutations performed: 2000; * p < 5%; ** p< 1%; ***p<0.1%

In both table 3.3 and 3.4, model 1, which contains only the control variables, has the lowest adjusted R squares – 0.069 and 0.070. With cultural difference and cultural connection variables being added, the adjusted R squares are firstly improved to 0.08 in the 1997-1999 table and 0.076 in 2000-2001 table, and then to 0.084 and 0.077 in the two tables respectively. The coefficients of the variables in all models remain stable in the models 1 to 3. I therefore believe that the last models in both tables explain their dependent variables best.

In the model 3 in tables 3.3 and 3.4, the estimates for the variable cultural difference both are negative and significant at the 0.1 percent and 1 percent significant level respectively, which supports hypothesis 1 that as the cultural difference between countries A and B increases, firms in country A will be less likely to invest in country B. The estimates of the cultural connection variables are both positive and significant at the 5 percent significant level in the two tables. Hypothesis 2, then, was clearly supported as well: as the cultural connection between counties A and B increase, firms in country A will be more likely to invest in country B.

In addition to the cultural difference and connection variables, I found trade relationship exerts a positive and significant effect on the formation of FDI linkages, which indicates that firms are more likely to invest in firms in the country which they have electrical trade with. The economy difference variable is positive and significant in both study periods, which suggests that firms in countries where the economy is higher are more likely to invest in firms in countries where the economy is lower.

3.4.3. Analysis and Implication on FDI Trend

In the two result tables, both independent variables cultural difference and cultural connection are significant. It shows that firms are not afraid of cultural difference in FDI as long as they have cultural connection with the country where the target firm is located.

By comparing the two final models for the two study periods, I found that the absolute values of the coefficients for both cultural relationship dimensions – cultural difference and cultural connection in table 3.4 are bigger than the ones in table 3.5. And the variables of trade relationship and economy difference become stronger. These changes suggest that during the two periods, firms consider economic and trade factors more and cultural factors less when they make the decisions on FDI location. I interpret the results as an implication of industry globalization and cultural convergence. As introduced before, most of the countries in the world, which have deregulated their domestic electricity industry, did it in the mid 1990's. Following this, a FDI wave in the industry started at the middle period of the 1990's and reached the peak in the early 2000's. At the beginning of the 2000's, the industry was still in the first stage of foreign market exploitation. Because of this, firms tried to seek for safer locations – more culturally similar and connected locations in order to reduce the risk that they might undertake in their overseas investment activities. With accumulating more experience in overseas markets and promotion of global investment environment as well, firms are able to choose their investment partner from a more economic point of view. Since electricity capacity rich countries normally produce abundant and cheap power, they have the internalized advantage to enter into a foreign market where there is a lack of this advantage. Especially with the power transmission technique advancing, it is possible to transmit electricity to a much farther destination today than before. So the changes of the coefficients of the variables imply actually that FDI in the electricity industry is becoming more market-oriented. I predict that the trend will continue in the near future. Cultural factors would play less and less of a role and economic factors would impact more on FDI location choices although the influence of cultural relationship will still be there for a long period.

3.5. Conclusions and Discussions

This study has two important contributions to FDI research. Firstly, I defined cultural relationship on two dimensions: cultural difference and cultural connection. Secondly, I examined the relation between two dimensions of cultural relationship and FDI linkages in a large sample of countries. The models were estimated for the period of 1997-1999 and 2000-2001 by adopting a MRQAP technique and the results support hypothesis 1 and 2, and rejected hypothesis 1 alt.

This study has several findings.

First, firms prefer cross-border investment in countries where the national culture is similar to that of their own country. Second, firms prefer cross-border invest in countries which they have more cultural connection with. Third, the influence of cultural difference and cultural connection on FDI became weaker from the period of 1997-1999 to 2000-2001. The national macro-economic influence such as resource, trade and economy became stronger.

The results indicate that even though firms consider cultural factors when they choose their investment targets, they take into account more economic factors. It implies that investors have gained more confidence in investing in market overseas. It implies also an industry globalization trend and the improvement of global investment environment in the electricity industry.

This study has a number of limitations. The QAP model is a static model. The effect change of cultural relationship on cross-border M&A in this chapter can only be studied through comparing two models. More rigorous dynamic model is required to further study the relation between cultural relationship and FDI location choice. In the next chapter, I will apply a social network longitudinal model – SIENA to study this issue. More various variables which might influence the taking place of cross-border M&A will be taken into account as well.

3.6. Summary

A relational data regression analysis model – QAP model, is adopted in chapter 3 to examine the determinants and motives of FDI in the international electricity industry. The estimation results from the models show the supportive evidence to the hypothesis 1 and 2, and rejected hypothesis

1 alt. The results further strengthen my theoretical arguments on the effect of cultural relationship on FDI: National cultural difference and cultural connection can explain formation of FDI linkages. Firms are less likely to invest in firms in countries where the culture is more distant to their own country. Firms are more likely to invest in firms in countries with which their own country has more cultural connections.

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Chapter 4

FDI Location

Choice through the Lens of Connectivity

Abstract

In this paper, I study determinants of FDI by taking into account the fact that FDI location decisions are affected by their partners', competitors' and/or even other players' choices of investment location. These are called "*connectivity*" impacts of the FDI network. A number of hypotheses concerning these effects are set up and tested by employing 5 years of consecutive data during the period 1997-2001. I estimate the parameters using an actor-oriented social network model developed by Snijders. The results indicate that firms do not a form mutual investment relation (*reciprocity*) and there is no evidence of "hot" FDI inflow markets in the electricity industry (*popularity*). The results also show that firms are more likely to invest in their FDI partner's partner (*transitivity*), less likely to invest in their investor's investor (*cyclic*) and their competitor (*betweenness*) after controlling a few attribute and relational variables including cultural relationship.

Keywords: *FDI, Cross-border M&A, Cultural Difference, Cultural Connection, Reciprocity.*

4.1. Introduction

With globalization and increased economic integration, international competition for investment among countries is becoming more intense than ever before. Therefore, fully understanding the influence of investment competitors and collaborators in international investment decision can help making a good FDI location decision and a successful international operation.

So far, almost all of the related literature addresses the issue from the viewpoint of individual transaction. Few researchers have paid attention to the interdependence effects on the formation of investment linkages. Some researchers proposed the concepts of "embeddedness" in the study of investment choice. However, they did not really take the dependence of investment relations into account. [1] Quantitative studies are even fewer mainly due to instruments and data restrictions (Desai et al., 2005; Stevens, & Lipsey, 1992). In this study, I adopt a "longitudinal social network" approach to study this issue in order to more deeply investigate the determinants of FDI.

I address this issue by using cross-border M&A transaction data in the international electricity industry during the period of 1997-2001. The model adopted in this study will treat each year as study time unit and examine the determinants of FDI linkages dynamically.

This chapter is organized as follows: The second section provides a literature review and hypotheses. The research design is elaborated in the third section. The fourth section contains estimation results from the analysis. Conclusions and discussions are provided in the last section.

4.2. Literature Review and Hypotheses

According to Noria and Garcia-Pont (1991), mergers and acquisitions are first relations that they include as the linkages between firms in their study. As previous research has pointed out, the linkages between firms in many industries have become so dense that some observers have been

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[1] For example, Bandelj (2002) adopted an OLS model to study the FDI choice issue in his paper "Embedded economies: social relations as determinants of foreign direct investment in central and eastern Europe".

prompted to describe the structure of these industries as "networks" (Thorelli, 1986; Jarillo, 1988; Powell, 1990). I can therefore consider the FDI linkages as FDI network.

These FDI linkages in the network are not independent, but dependent. According to Stevens and Lipsey (1992), investment in a given location will be affected by variables specific to the others. These investment relations might therefore all be connected and dependent on each other in the entire system. I am going to elaborate on this as follows:

First, FDIs are affected by other social linkages. This was addressed by Chen and Chen (1998). Their article concludes that business alliance linkages motivate FDI, while personal linkages facilitate FDI. Obviously, these business alliances and personal linkages are not independent since firms or persons get involved in different alliances with other firms or relations with other people. Second, an economic entity should be able to learn from its own and others' experience. This process is referred to as a learning process. Many previous studies on foreign investment have found that organizations learn from their own, their partners' and even their competitors' previous investment experience. In other words, the previous investment experience influence the formation of future investment linkages (Haleblian, & Finkelstein, 1999; Vermeulen, & Barkema, 2001; Hayward, 2002).

According to the analysis above, I believe that the FDI linkages are dependently connected to each other and the formation of a new FDI linkage very much depends on the structure of the existed FDI linkages in the network. Then another issue appears in nature: What kind of connectivity would influence the formation of FDI linkages?

Flowers (1976) noted a tendency for entry concentration to rise with seller concentration in the home country. Knickerbocker (1973) finds that the extent of foreign investment is related to the form of the mutual interdependence among the players. It can be understood as once a FDI is conducted between two economic entities, trust and understanding relations are established between them as well. When foreign capital is invested the next time by either of the two entities, the investor prefers to choose that entity which it trusts or understands as its investment target. We assume that this kind of trust and understanding can be transferred down one step. It means that an investor would trust or understand its partner's partner and then prefer to invest in its

partner's partner. These are summarized in the following hypotheses (reciprocity and transitivity hypotheses).

> **Hypothesis 1.** *firms prefer to form a reciprocal investment relationship between countries.*
>
> **Hypothesis 2.** *firms prefer to form a transitive investment relationship among countries.*
>
> H3 (three-cycles hypothesis) can be derived from hypothesis 1 and hypothesis 2.
>
> **Hypothesis 3:** *firms prefer to form a three-cycles investment relationship between countries.*

Foreign investment considered rivalry and competition to be important drivers of a firm's foreign investment decisions (Flowers, 1976; Knickerbocker, 1973). When the firms from different countries invest in the same location, they are rivals in their investment host region or they have competition on the local market. Therefore, I assume that they would not like to invest each other. Therefore, the hypothesis 4 is described as follows (oppose-balance hypothesis):

> **Hypothesis 4** *firms do not prefer to form an investment relationship between countries which invested in the same location abroad.*

Popular FDI destinations can be seen as a result of organizations learning. An investor would imitate the investment behavior of others and prefer to invest in the same location where others invested. Knickerbocker (1973) states that the rush amongst rivals to enter emerging markets often triggers the bandwagon effect. Sethi and his colleagues (2003) mention that these surveys and publications often reveal a significant increase of FDI into a particular region, with a concurrent deceleration of investments into others. Hence I have the following hypothesis (popularity hypothesis):
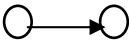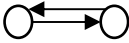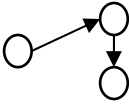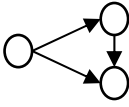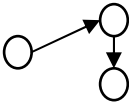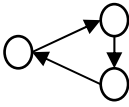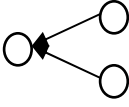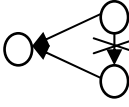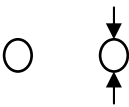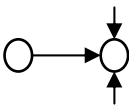
> **Hypothesis 5:** *firms prefer to form an investment relationship with a country that attracted more FDI.*

The previous discussion on FDI shows that FDI location choices can be influenced not only by the usual determinants such as macro-level relations between investment home and host countries, which have been broadly tested in empirical studies, but also by endogenous connectivity effects from the FDI linkages. Surprisingly, although the literature has discovered some interdependent characteristics in international investment networks, few studies formally

take these dependences as variables which influence FDI linkage formation, especially in quantitative studies.

Table 4.1 summarizes all hypotheses that I set up in this chapter and the iconography for them.

Table 4.1. Hypotheses summary

Code	Hypothesis	Claim	Expected Qualitative	
			t1	**t2**
		Connectivity effects		
H1	Reciprocity hypothesis	Firms prefer to form a reciprocal investment relationship between countries.		
H2	Transitivity hypothesis	Firms prefer to form a transitive investment relationship among countries.		
H3	3-cycle hypothesis	Firms prefer to form a three-cycles investment relationship between countries.		
H4	Oppose-balance hypothesis	Firms do not prefer to form a balance investment relationship between countries.		
H5	Popularity hypothesis	FDI linkage is more likely to form an investment relation with a country which attracted more FDI.		

○ =arbitrary score

4.3. Research Design and Models

4.3.1. Data

Cross-border M&A Data Sample

As in the previous chapters, cross-border M&A transaction data in the 38 countries in the electricity industry from 1997 to 2001 were adopted as the data sample in the current study. Table 4.2 contains a basic descriptive statistic report for the data sample used in this study on a yearly base.

Table 4.2. Data sample description

Year	Network density	Number of countries involved in receiving	Number of countries involved in investing
1997	0.026	26	31
1998	0.037	29	33
1999	0.045	31	35
2000	0.052	35	37
2001	0.046	32	36

FDI Network

In this study, I aggregate cross-border M&A transaction data from the firm level to the country level on a yearly base between 1997 and 2001 by checking whether cross-border M&As have ever taken place between two countries in the corresponding year. If cross-border M&A transactions were shown up, it was seen that there was investment linkage between the two countries, whereas there was no investment linkage. Therefore, in this study, FDI networks are represented by the 5 binary networks instead of valued networks because I want to focus on the structure, not the value, in this study. Due to the requirement of the SNA software adopted in this study, the FDI networks were coded as 5 same size 38 by 38 adjacency matrices. The 38

countries selected are the actors (players) in the networks. The matrices contain "0" or "1" in each cell between each pair of countries, where "1" represents a FDI linkage from the country in the matrix column to the one in the matrix row in the year and "0" is coded for the absence of FDI linkage in the year.

Figure 4.1 shows the picture of the FDI network in the year of 2001.
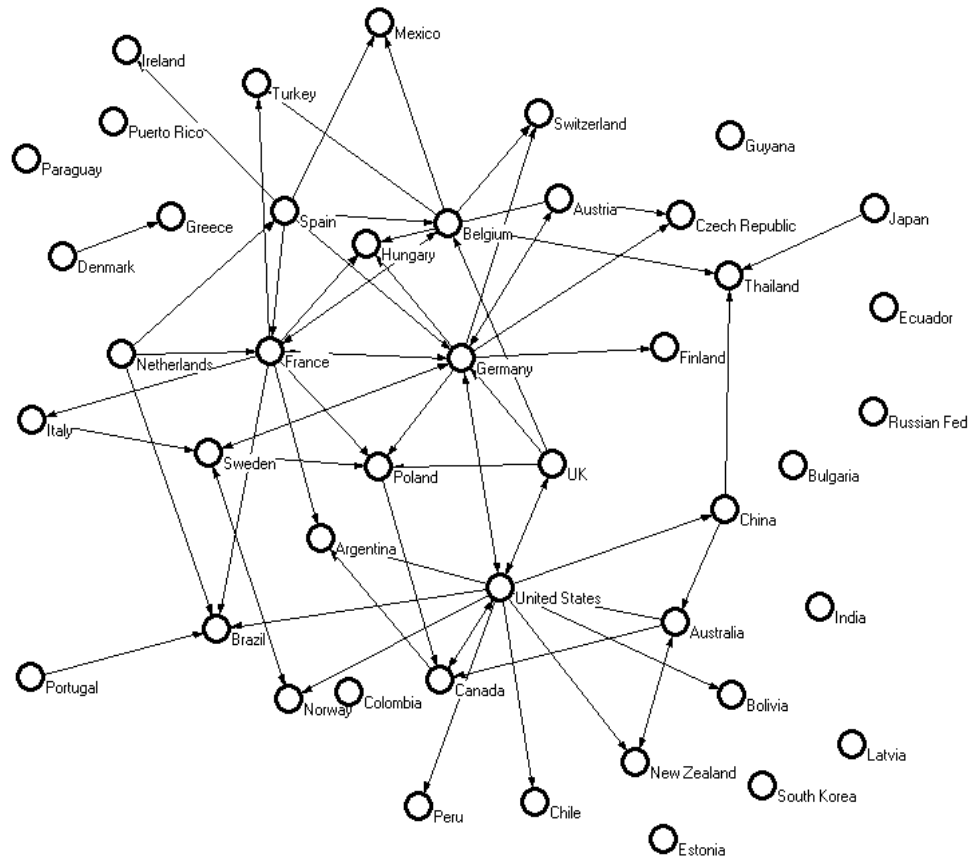
FIGURE 4.1. The FDI network in the year of 2001

Table 4.3 gives a descriptive report of the five FDI networks and the change of the FDI networks over years in this chapter.

Table 4.3. A descriptive report of the networks

Observation time	1	=>	2	=>	3	=>	4	=>	5
Density	0.03		0.04		0.05		0.05		0.05

Average degree	1.00		1.41		1.70		1.97		1.73
Number of ties	37		52		63		73		64
Jaccard index		0.16		0.21		0.21		0.27	

Jaccard index is an index to express quantitatively whether the data collections are not too far apart (Batagelj, & Bren, 1995). The equation is as follows:

$$\frac{N_{11}}{N_{11} + N_{01} + N_{10}}$$

Where,

N_{11} is the number of ties present at both observation times, N_{01} is the number of ties newly created, and N_{10} is the number of ties terminated. Experience has shown that Jaccard values between consecutive observation times should be between 0.2 and 0.6, in order to ensure that the networks change is gradual over time. The index values in this case are all above 0.2, except that the value in the first observation period is a bit lower. It shows that the FDI networks in the study changed gradually and this fits the statistical assumption.

Other Data for Control Variables

The national cultural data, which are used to calculate cultural difference, are obtained from the website of Geert Hofstede. Migration data, which are used to measure cultural connection, are from United Nation Global Migration Database (United Nations). The other data used in the analysis for control variables are obtained from online national databases and matched to the FDI data. The domestic M&A transactions data are from the same source (Security Database Company platinum Database) as cross-border M&A data. The electricity capacity and population data are from the website of Energy Information Administration (EIA). Geographic distance data are from the CEPII data on the website of CEPII (CEPII). GDP per capita data are obtained from World Economic Outlook (WEO).

4.3.2. Empirical Model Specifications

I adopted actor-oriented models to estimate the parameters in this study. These models are introduced by Snijders (1996) and implemented in the System Integration Estimation of Network Analysis (SIENA) programme of the STOCNET package. They are described as a longitudinal strategy for examining the change of networks over time. They provide advantages over conventional approaches due to their ability to account for inherent dependencies between actors embedded in a network (Snijders et al., 2007).

SIENA can estimate the models based on a method of moment, (implemented as a continuous-time Markov chain Monte Carlo simulation (MCMC). A three-phase stochastic approximation algorithm is used to approximate the solution of the moment equation. The first phase calculates a covariance matrix for the estimation algorithm. Phase two simulates the choice process based on the starting values, compares the resultant simulated network with the observed second period network, and adjusts values to reduce differences between the observed and the simulated data. The third phase uses simulations to determine the frequency distribution of errors in prediction, which then are used to calculate the standard errors for the final parameter values. In this case, the program simulates the process 5,000 times.

These models have had wide applications in many social network studies in recent years (Van de Bunt et al., 1999; Van de Bunt et al., 2005; Checkley, & Steglich, 2007). More details about the model can be found in the appendix attached in this chapter. The software STOCNET and its Manual can be downloaded freely at the website (http://stat.gamma.rug.nl/stocnet/).

4.3.3. Variables and Measures

Dependent Variables

The change of FDI linkages between countries over time is the dependent variable in this study. Thus, the input data for the dependent variable are of five 38 by 38 adjacency matrices, which represent FDI linkages among the selected 38 countries in the 5 years between 1997 and 2001.

Independent Variables

Independent variables in this study include several parameters representing network connectivity effects. They are reciprocity, transitivity, three-cycles, balance and popularity. For the hypothesis 4, in order to calculate easily, the variable is set up as balance. If the estimation result is negative and significant, it supports the original hypothesis. The data for these connectivity variables are generated from the network according to the equation in table 4.4.

Control Variables

While my focus in this study is on the interaction between network connectivity variables and FDI linkage, I also control a few other factors that have been found to be important in the literature. They are elaborated as follows:

The first control variable is network density, which is required in all models in SIENA. Network density is to test an overall tendency for firms to form investment linkage abroad.

According to the conventional FDI theory, the FDI location choice issue is conventionally thought to have 3 justifications. First, market-seeking occurs when firms set up production facilities abroad in order to serve local and regional markets. Second, efficiency-seeking aims at searching for production abroad at low-cost. Third, resource-seeking FDI occurs when firms invest overseas to acquire rare or not available resource in the home country, such as natural resources and raw materials (Dunning, 1993; 2000). Economy level in host country (Gomez-Mejia, 1984) and geography (Chakrabarti et al., 2009) between two countries are often found significant for FDI linkage formation as well. Cultural difference and connection are found significant for FDI linkage formation in the previous chapters. Therefore, I include resource, efficiency, market, economy in host country and geography as control variables in the models.

The explanations of all the variables are given in table 4.4.

Table 4.4. The explanations of the all variables in the model

Variables	Definition	Description
Objective function		
Network connectivity variables		
Reciprocity	$s_1^{net}(x) = \sum_j x_{ij} x_{ji}$	having reciprocated ties
Transitivity	$s_2^{net}(x) = \sum_{j,h} x_{ij} x_{ih} x_{jh}$	having transitive ties
Three-cycles	$s_3^{net}(x) = \sum_{j,h} x_{ij} x_{jh} x_{hi}$	having ties to form a closed cycle
Balance	$s_4^{net}(x) = \sum_{j=1}^{n} x_{ij} \sum_{\substack{h=1 \\ h \neq i,j}}^{n} (b_0 - |x_{ih} - x_{jh}|)$	Having ties to form balance structure
Popularity	$s_5^{net}(x) = \frac{1}{n} \sum_j x_{ij} \sum_h x_{hj}$	having ties to more popular others
Control variables		
Outdegree (density)	$s_6^{net}(x) = \sum_j x_{ij}$	having ties to arbitrary others
Resource	$s_7^{net}(x) = \sum_j x_{ij} v_{ij}$	having ties to high value attribute others
Efficiency	$s_8^{net}(x) = \sum_j x_{ij} v_{ij}$	having ties to high value attribute others
Market	$s_9^{net}(x) = \sum_j x_{ij} v_{ij}$	having ties to high value attribute others
Economy	$s_{10}^{net}(x) = \sum_j x_{ij} v_{ij}$	having ties to high value attribute others
Geography	$s_{11}^{net}(x) = \sum_j x_{ij} (w_{ij} - \overline{w})$	having ties to dyadic high value attribute partners
Cultural difference	$s_{12}^{net}(x) = \sum_j x_{ij} (w_{ij} - \overline{w})$	having ties to dyadic high value attribute partners
Cultural connection	$s_{13}^{net}(x) = \sum_j x_{ij} (w_{ij} - \overline{w})$	having ties to dyadic high value attribute partners

Measures

Dependent variable - FDI is measured as the presence of cross-border M&A between two countries on a yearly base from 1997 to 2001. It is a changing dyadic binary variable.

Independent variables – FDI network connectivity is independent variable, which is measured by network reciprocity, transitivity, three-cycles, balance and popularity in this study. The calculations of these connectivity variables are shown in the table 4.4.

For the control variables, outdegree variable is measured by network density. Resource is measured by the electricity capacity within countries. Efficiency is measured by domestic M&A number within countries. Market is measured by electricity consumption within countries. Economy variable is measured by GDP per capita and geography between countries is measured by whether the two countries are contiguous. If they are contiguous, 1 is coded in the matrix. If they are not, 0 is coded. The logarithm value of the real data is adopted for the resource, market and economy variables. All of these control variables except geographic distance are changing vectors. Geographic distance variable in this study is a constant dyadic binary variable.

Cultural difference is measured by the Kogut and Singh index (1988) and it is a constant dyadic variable. Cultural connection is measured by the logarithm value of migration population, which are more than 1000 people in host country from original country. If migration population is fewer than 1000 people, it is seen as no connection. The variable is a changing dyadic variable.

4.4. Results and Analysis

The results from the SIENA estimation show that absolute values of all t-ratios for deviations are less than 0.01, which indicates that the convergence of the model is good. The estimated coefficients of the parameters are presented in table 4.5.

Table 4.5. SIENA estimation results (Method of Moment)

Variables		
Objective function	coefficient	s.e.
Network connectivity variables		
Reciprocity	0.371	0.216
Transitivity	0.326	0.068***
Three-cycles	-0.372	0.181*
Balance	-2.074	0.421***
Popularity	-2.856	2.113
Control variables		
Outdegree (density)	-2.829	0.203***
Resource	-0.067	0.314
Efficiency	0.006	0.005
Market	0.017	0.120
Economy	-0.039	0.206
Geography	0.394	0.181*
Cultural difference	-0.014	0.003***
Cultural connection	0.101	0.016***

Note. 1. Estimation method: Method of Moment. 2. *p<0.05; **p < 0.01; ***p < 0.001;

In the independent variables, the reciprocity is the tendency to reciprocate n investment relationship. The parameter is not significant in the model. Thus, there is no statistical evidence to support the reciprocity hypothesis. The transitivity is the tendency to have transitive triadic patterns of investment. The transitivity parameter is positive and significant at the 0.1 percent significant level in the model, which indicates in my case that FDI tends to form a transitive structure among countries. The transitivity hypothesis is supported. The three-cycles effect, which can be regarded as generalized reciprocity, is negative and significant at the 5 percent significant level in the model. It indicates that FDI is less likely to form a three-cycles strucuture among countries. The three-cycles hypothesis is rejected. A negative three-cycles effect, together

with a positive transitivity effect, may be interpreted as a tendency toward local hierarchy. The balance expresses a preference of actors to fight against ties to those other actors who have a similar set of outgoing ties as they themselves. The parameter is negative and significant at the 0.1 percent significant level in the model. The result indicates that FDI is less likely to form an investment relation between countries that invest in the same location. The oppose-balance hypothesis is supported. Popularity is the tendency to have outward FDI with countries that have more inward FDI. Popularity is not significant in the model. The popularity hypothesis is rejected. In the independent variables, I have got transitivity, three-cycles and balance, the three parameters significant.

In the control variables, the density parameter models the overall tendency of firms to form outward FDI linkages. It is expected to be negative and significant indicating in my case that the formation of FDI linkages is costly for acquirers from an economic point of view. Firms prefer to hold their capital and not invest abroad if they do not see any significant investment chances (other significant parameters in the models in my case). The resource, efficiency, market and economy parameters model the tendency of firms to have FDI linkages with regions which have much resource, high efficiency, great market and good economy respectively. The four parameters are not significant in the model, which shows that FDI has no tendency to choose resource, efficiency, market and economy higher location as investment host.

The geography parameter models the tendency of firms to form outward FDI linkages with dyadic high geographic value countries. It is a binary variable and measured by whether two countries are contiguous. The estimate for this parameter in the model is positive and significant at the 5 percent significant level, which indicates that countries are more likely to invest to countries with which they share border.

The cultural difference parameter indicates the tendency that firms having FDI linkages to culturally more different partners. The estimation results of the model show that the cultural difference parameter is negative and significant at the 0.1 percent significant level. The estimate shows, in my case, that higher cultural difference between two countries will cause lower probability for two countries forming FDI linkage between them.

The cultural connection parameter models the tendency of firms having FDI linkages to cultural connection high value partners. The estimate is positive and significant at the 0.1 percent significant level in the model. The estimate for the cultural connection parameter can be interpreted in my case as countries are more likely to invest to countries with which they have more cultural connection.

The model shows that the cultural difference is negative and significant and cultural connection is positive and significant. These results are consistent with the estimation results from the QAP model analysis in chapter 3. It provides evidence that the empirical results from dynamic analyses are robust compared with the ones from the static analysis.

In the model of this chapter, the cultural difference and connection parameters' signs remain same as in the model 3 of chapter 3. The economic parameters are all insignificant in the model. It shows that FDI network connectivity variables, cultural difference, and cultural connection are more important factors than economic parameters on influencing FDI linkage formation.

So far, transitivity and balance hypotheses are supported; reciprocity, three-cycles and popularity hypotheses are rejected. The reciprocity and three-cycles hypotheses are rejected, which indicates that there is no evidence to support that FDI in the international electricity industry has preference on mutual or generalized mutual relationships between countries. The rejection of FDI popularity could be explained by the characteristics of the electricity industry. Electricity enterprises in many countries are owned, or partially owned or controlled by national or local governments because of their high importance for the local social security and industrial production. Governments normally adopted very strict regulations and policies to identify the state of the foreign enterprises and restrict FDI in the domestic electricity industry, which makes the entry barrier very high in this industry. These characteristics decide that FDI into this industry in a country will not successively be followed by new investors. "Fashionable" is not an element to determine FDI in the electrical industry.

4.5. Conclusions

This study adopts a longitudinal SNA method to examine the dynamic relations between FDI connectivity effects and FDI linkage formation. Using a dataset of global cross-border M&A in the electricity industry in the period 1997-2001, I find supportive evidence for two of my hypotheses.

The main findings of this study are:

Firstly, transitivity plays a role on formation of FDI linkages, which implies that previous direct and indirect FDI experience does matter in FDI linkage formation. Because investors have understood and trusted their FDI target from their pervious FDI collaboration, when they plan to make new investment abroad, they prefer to choose firms in the locations that they understand and trust.

Secondly, balance plays a role that FDI linkages are against forming ties with locations that have similar investment linkages like them. If two firms from different countries invest abroad in same location, they are obviously competitors in local market. They would rarely invest in each other.

Thirdly, three-cycles plays a negative role on FDI linkages formation, which indicates that FDI linkages are less likely to form a generalized mutual FDI linkages. A negative three-cycles effect, together with a positive transitivity effect, may be interpreted as a tendency toward local hierarchy.

4.6. Summary

A social network longitudinal model is adopted in this chapter to dynamically examine the FDI connectivity determinants and motives of FDI in the global electricity industry. The estimation results from the model shows the supportive evidence for the transitivity and balance hypotheses. The results about the control variables of culture prove again my theoretical arguments on the effect of cultural difference and cultural connection on FDI linkage formation.

Appendix

The actor-oriented model provides parameter estimates based on actors' decisions regarding changes in network ties. The actors involved in the network change their outgoing ties as a consequence of myopic stochastic optimization of an objective function (Steglich et al., 2004). This framework offers the flexibility to represent a variety of network effects. In a way to model changes between discrete time points, network "micro-steps" are estimated using continuous-time Markov chains, which mean that the current state of the network determines the probabilities of changes in the network.

Analytically, in the static space, Pair $(x,b)(t)$ contains an adjacency matrix x at time point t. Moving to the stochastic process, the evolution is modelled by specifying transition probabilities between such states $(x,b)(t1)$ and $(x,b)(t2)$. The Continuous time model evolution can be modelled in smaller units in which observed changes are quite complex and they are interpreted as resulting from a sequence of so called "micro steps". Hence, micro steps that are modelled explicitly are: "network micro steps": in which pairs $(x,b)(t1)$ and $(x,b)(t2)$ differ only in one tie variable x_{ij}. As I mentioned previously, in the actor oriented model, "micro steps" are modelled as outcomes of an actor's decisions that are conditionally independent, given the current state of the process. The timing of decisions or transitions is assumed to be exponentially distributed (Markov process).

Therefore, my model is based on one objective function that is defined over ties. The objective function focused on the modelling of types of changes with network. The network micro steps (network decisions) by actor i consist first of all in choosing between whether or not changing the tie variable to one other actor j and then to maximize the network objective function given by the following equation:

$$f^{net}(X,b) = \sum_k \beta_k^{net} s_{ik}^{net}(X,b) + \varepsilon_i^{net} \qquad (1)$$

Where the *s*-terms stand for statistics that can depend on the network *x* in the neighbourhood of actor *i*, the distribution of behaviour *b* and other actor characteristics in this neighbourhood. The objective function *f* is linear combination of "effects", with parameters as effect weights. Each statistic, or effect, captures a specific dynamic mechanism which influences the evolution process. While the first part of the last formula is deterministic and depends on the network neighbourhood of actor *i*, the second part is random in which the errors are assumed to be independent and distributed according to a standard Gumbel distribution. The choice of the transition probabilities resulting from distribution of ε is of multinomial logit shape, so the probability that *i* chooses to change x_{ij} for any particular *j*, given that *i* makes some change, is given by:

$$\Pr(X(i \rightarrow j)/x,b) = \frac{\exp(\sum_k \beta_k^{net} s_{ik}^{net}(X(i \rightarrow j),b))}{\sum_{k \in \{1,\ldots,N\}} \exp(\sum_k \beta_k^{net} s_{ik}^{net}(X(i \rightarrow k),b)}} \qquad (2)$$

Where *k* denotes another actor different from *i* and *j*, $x(i \rightarrow j)$ is the network obtained from *x* by changing tie to actor *j* and $x(i \rightarrow j)$ formally stands for keeping the network as it is.

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Chapter 5

Conclusions

FDI location choice is long time a popular research question in FDI literature. Researchers studied this issue mainly from economic point of view and focused on the characteristics of investment host region. Even though the factors of social relationship and connectivity on determining FDI location were realized by some researchers and discussed in the literature, few studies provided properly quantitative analysis. In this thesis, I addressed the issue of how national cultural relationship and FDI connectivity impact on FDI location choice by viewing FDI as strategic linkages between countries. Three SNA methods from qualitative to quantitative and from static to dynamic are adopted in this thesis to examine the impacts of cultural difference, cultural connection, FDI reciprocity, transitivity, three-cycles, opposite-balance and popularity on formation of FDI linkages in the global electricity industry. The three applications have consistent empirical results on the factors.

5.1. Main Findings

The results of this study may be summarized as follows:

Firstly, this thesis studied how cultural relationship influences FDI linkage formation. The cultural relationship is measured in this thesis at two dimensions: cultural difference and cultural connection. I hypothesized that cultural difference hinders and cultural connection encourages FDI linkage formation. Based on the preliminary supportive results on chapter 2, chapter 3 empirically tested these two hypothesises. I found the supportive evidences in chapter 3 as well. In chapter 4, cultural difference and cultural connection were treated as control variables. The regression results regarding the two variables were consistent with the previous results in chapter 2 and 3. The strategic implication of these conclusions for firms on FDI decision is that firms can overcome large cultural difference shortage in the process of international investment operation by improving cultural connection with the investment host country.

The study in regard to cultural relationship in this thesis contributes to the research on FDI theory and cultural studies in the following ways. First, unlike the conventional FDI theory seeing FDI as an attribute value, the thesis interpreted FDI as a dyadic relationship between investment home and host and introduced SNA methods into FDI study. The empirical results

indicate the cultural relationship variables explain the dependent variable – FDI linkage better than most of the attribute variables. These results can be read as providing complementary theory to conventional FDI location choice theory. Second, the thesis comes up with the cultural relationship concept, which is measured by both cultural difference and cultural connection dimensions. In particular, I proposed migration population from country A to country B as the measurement for cultural connection that country B has with country A, which made the abstract cultural connection measurable. This work provided possibility in cultural studies to extend the static and symmetric cultural difference into a dynamic and asymmetric concept.

Secondly, this thesis studied how FDI connectivity influences FDI linkage formation. FDI connectivity indicates reciprocity, transitivity, three-cycles, balance and popularity variables. A network longitudinal model is adopted to test these hypotheses in chapter 4. The estimation results show that several FDI network connectivity variables play roles in the formation of FDI linkages: transitivity plays a positive role, on the other hand, balance and three-cycles play negative role on FDI linkage formation. The strategic implication from these results might be that trust and competition are both important factors in FDI location decisions. Firms should try to form transitivity structure, and avoid forming balance and three-cycles structures when they make investment choices in overseas markets.

The work regarding FDI connectivity in this thesis contributes to the research on FDI theory and SNA application studies as follows. First, to the best of my knowledge, the study in chapter 4 is the first empirical test of FDI connectivity parameters on FDI location choice and to provide evidence of extra-dyadic dependence in FDI. With help of SNA methods, hypotheses concerning rivalry, competition and collaboration relationship in FDI would impact on FDI location choice can be tested. The empirical results indicate considering rivalry and collaboration relationship in FDI decisions are more important than considering other economic attribute variables. These results can as well be read as providing complementary theory to conventional FDI location choice theory. Second, the main body of this thesis provided three SNA application studies. Before, even though FDI was recognized by researchers as relational phenomenon, few studies adopted SNA methods to study FDI. This thesis provided evidence that SNA is a powerful and efficient method to study FDI issues.

5.2. Limitation, Discussion and Future Work

This thesis is subject to a few limitations. Future work is therefore proposed according to the limitations of this thesis.

Firstly, the FDI networks in chapters 2 and 4 are dichotomized as binary ones. With binary networks, the network structure is seen more clearly. The technical constraint of the analysis tool – SIENA, which was adopted in the chapter 4, is also the reason that binary networks were adopted. I believe that the results from the analysis of binary FDI network will be hold with valued FDI network because the FDI network structure remains same. However, binary network lost value information of linkages. Strong ties and weak ties are treated equally. When the analysis technique is available for valued networks, it is significant to analyze the FDI valued networks in the future.

Secondly, in the study, the data sample that I adopted to test the hypotheses is from the electricity industry. The electricity industry has primary importance in production and it represents some other industries. The conclusions in this thesis are believed to be able to transfer to some similar industries such as telephone, telecommunication and internet services. These industries have high technique barriers and are certainly protected and controlled by their own states because of national security consideration. However, each industry has specific characteristics that are different from other industries. Whether or not the conclusions on the significant parameters that I drew in the thesis can be generalized to other industries needs to be further studied.

Thirdly, cross-border M&A data were used to study FDI location choice issue in this thesis because of the data constraint. Using cross-border M&A to represent FDI missed another FDI type: Greenfield. I believe that the conclusions from this thesis will be hold with complete FDI data since cross-border M&A is the dominant form of FDI. However, greenfield FDI has some different characteristics with cross-border M&As. In the future, it is necessary that these conclusions are tested with greenfield investment data as well.