ABSTRACT

TU, JIAO. Essays on Inbound Foreign Direct Investment in the U.S. Real Estate Sector. (Under the direction of Dr. Ivan Kandilov).

This dissertation examines inbound foreign direct investment (FDI) in the U.S. real estate sector using a unique dataset from the International Trade Administration. In the first chapter, I review the theoretical background of FDI and MNEs, discuss recent patterns of FDI, and common issues related to the FDI data.

In the second chapter, I study the effects of interstate banking and intrastate branching deregulation on inbound FDI in the U.S. real estate sector. Using a difference-in-differences method that compares changes in the international flow of capital before and after the regulatory reform in the banking industry, the key findings of this analysis are: First, along the extensive margin, lifting the intrastate branching restriction significantly boosted the number of transactions in a deregulated state. Second, along the intensive margin, the intrastate branching deregulation had a positive effect on the average transaction value. Furthermore, foreign investors preferred to invest in real estate projects in more populous states that had a higher demand for residential and commercial real estate properties. The average transaction value was larger in states with a bigger economy. Finally, evidence from the quantile regressions indicates that the impact of the intrastate branching deregulation was most pronounced for small-sized deals as they have benefited the most from easier access to local credit following the repeal of the regulatory restriction.

The third chapter investigates the relationship between exchange rate, source country financial development and inward FDI in the U.S. for its top 7 source countries. The panel datasets consist of the annual total number of foreign acquisitions of U.S. real estate from a foreign country, as well as the total transaction value spanning the period from 1977 through

1994. In addition to using the level of exchange rate, I also consider two measures of exchange rate volatility, one constructed using the standard deviation and the other the GARCH method. My evidence reveals that an increase in the nominal exchange rate (dollar appreciation) significantly reduces the number of investments and the total volume of inbound FDIRE from a foreign source country. On the contrary, there is no robust evidence that suggests exchange rate volatility is detrimental to FDI. I also found that the size of source country financial markets measured by the stock market capitalization to GDP ratio has a strong positive effect with MNEs investing abroad, consistent with the cheap capital theory.

Essays on Inbound Foreign Direct Investment in the U.S. Real Estate Sector

by
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DEDICATION

This dissertation is dedicated to my grandmother, my parents, and my husband who encouraged me to pursue my dreams.

BIOGRAPHY

Born and raised in Shanghai, China, Jiao has dedicated the best years of her life to studying Economics. She obtained her bachelor's degree from the Shanghai University of Finance and Economics. During her college years, she has also studied at the Bordeaux Écoles de Management (Now Kedge Business School) as an exchange student. In 2010, she came to the U.S. to pursue a master's degree at the University of Delaware. The long and rewarding journey of her doctoral study began in 2013. She will graduate with her doctoral degree in December 2018.

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CHAPTER 1

INTRODUCTION

Multinational enterprises (MNEs) and foreign direct investment (FDI) are some of the most prominent features of international economic integration in the past several decades. Defined as at least 10% ownership of a business by a foreign investor in the host economy, FDI is known for its role in stimulating global integration and international trade. It encourages the transfer of technology and know-how between economies and allows the host economy to supply its products more widely in international markets.

Compared to a closely related form of international investment, the foreign portfolio investment (FPI), which entails ownership of less than 10% of stock, bonds, and other financial assets, FDI made by a resident of one economy (source country) with the objective of establishing a lasting interest in a company located in another economy (host country) is typically managed more efficiently. FDI is also less likely to cause large disturbances to the economy due to entry and exit of capital. As it is usually associated with establishing a stable and long-term relationship, the second moments of foreign equity flows are lower for FDI than they are for FPI. This generates another advantage of direct investment relative to portfolio investments – FDI avoids a situation where hot money quickly flees the host country, which is usually detrimental for the local economy, especially when there is a negative shock. Hence, not surprisingly, FDI is more favored by host countries.

FDI mainly falls into two categories, one is called brownfield investment, which involves cross-border mergers and acquisitions of existing local enterprises; the other is known as greenfield investment, which entails the establishment of new production facilities, such as buildings, offices, plants, or to expand an existing foreign-owned U.S. business, as well as the

movement of intangible capital. According to a BEA report, greenfield expenditures in 2016 were largest in real estate as well as in rental and leasing, and their combined value of $1.6 billion represents 20.7% of total greenfield expenditures across industries. Most of the greenfield expenditures were in California ($1.3 billion) and New York ($1.2 billion) while more than two-thirds of the expenditures were associated with investors from Europe, Asia, and Pacific countries (Thomas Anderson (2017)[1]).

In recent years, FDI experienced tremendous growth. Jansen and Stokman (2004) document that FDI has grown at rates that far outpaced those of international trade or output since the late 1980s. According to a report by the United Nations Conference for Trade and Development (UNCTAD), global FDI flows soared to $1.76 trillion dollars in 2015, a 38% jump from the previous year. The strong recovery of FDI flows was fueled by the surge in cross-border M&A, rising from $432 billion in 2014 to $721 billion. Outstanding global stock of FDI jumped from 8.3% of world GDP in 1990 to 34% in 2015. In terms of the main recipient of global FDI, the share of developing countries has been consistently higher than that of developed countries in the five years prior to 2015, but that trend has been reversed in 2015 as inward FDI flowing to developed economies leaped to 55%. The U.S. has been one of the largest recipients of global FDI for many years. In 2016, it had the largest net FDI inflows with a total of 479.4 billion dollars, followed by the U.K. and China.

1.1 Theoretical background of FDI

It is well known that multinational activities involve large entry costs and many other obstacles in doing business in an overseas environment. FDI investors who take both ownership

[1] https://apps.bea.gov/scb/pdf/2017/08-August/0817-new-foreign-direct-investment-in-the-united-states.pdf

and active control of projects in the foreign economy must learn to deal with local regulations and rules, different legal infrastructure, accounting standards, and overcome cultural and language differences. In most cases, fluctuations in the exchange rate could affect the relative prices and the rate of return to the investment thus MNEs must choose between bearing or hedging the risk. The surge of cross-border direct investment activities in both developed and developing countries in recent decades has inspired extensive research that tried to explain the observed patterns and the underlying mechanisms through which various trade and non-trade factors may influence FDI. I next sample some of the important literature that model multinational firms and their global operations within the general-equilibrium framework.

Traditional theories of trade are country-based and focus on comparative advantage and differences in factor endowments and productivity as the main drivers of trade. The Ricardian model of trade and the Heckscher-Ohlin (HO) model attribute production and trade between countries to differences in productivity and factor endowments which determine each country's comparative advantage. Because these models ignore differences in market size, they only apply to inter-industry trade and are thus not helpful in explaining intra-industry trade between countries that have similar endowments. These models are built upon the assumptions that countries adopt identical production technology, with capital and labor perfectly mobile within a country and immobile between countries. The key to generating a comparative advantage lies in the assumption of factor immobility because otherwise capital or labor will be able to move freely anywhere across economies, equating relative abundances.

In traditional trade models, there is no role for multinational firms. These models regard multinational firms as mere arbitrageurs that move the capital to where returns are higher. A key limitation in fitting these types of theory to recent foreign investment activities, as Markusen

(2002) points out, is that "the old view of direct investment as not fundamentally different from the theory of portfolio capital movements is completely wrong." In other words, they fail to rationalize why seeking higher return could result in capital flows into different ownership structures as in FDI and FPI. In fact, there is little empirical evidence that suggests FDI is positively related to differences in capital endowments across countries, or to differences in the general return to capital. The traditional trade theory is thus incapable of addressing some important aspects of FDI activities.

New theories improve upon traditional trade theories by integrating multinational firms into the model and adding a richer set of elements such as allowing increasing returns to scale and imperfect competition to endogenize direct investment decisions. Helpman and Krugman (1985) develop a model that features a constant marginal cost in terms of a linearly homogeneous function of capital and labor and production of differentiated goods that involves a fixed cost. In their model, transportation costs are of the iceberg type such that a faction of a good is being received by the importer, the rest is melted away during transportation. The key difference that sets the Krugman model apart from the Ricardian and HO models of trade lies in the fact that a welfare gain arises from the diversity of products available to consumers from trade, in addition to efficiency gains.

The modern theories of trade also began to take the perspectives of a firm and focus on questions of why some firms engage in multinational activities, what determines their location selections and why don't they contract with local producers or distributors. Answers to these questions are best explained by the Dunning's (1977, 1981) OLI framework which stands for ownership, location, and internationalization. The ownership advantage arises from the possession of firm-specific assets developed in the home country which allows MNEs to

compete in an overseas environment. This could be related to a proprietary technology or intangible assets that gives the firm the market power or cost advantage over domestic producers in the host country such that the benefit outweighs the cost of conducting business abroad. The firm-specific capabilities are the core driving force behind a firm's decision to enter a foreign market by setting up a foreign affiliate.

Acquiring tangible or intangible assets that could be used in different locations in a nonrival manner within the corporation gives the MNEs a location advantage. It allows them to expand their business across different hosting countries and benefit from the economies of scale. Location advantage could also stem from the cost-savings in segmenting the production process into locations where it is most cost-effective to be made. In addition, access to customers is a strong motivation to become MNEs especially for those firms in the service industries such as hotel and lodging where the core business must be provided on-site. In places where trade frictions such as transportation costs, tariffs, and non-tariff barriers inhibit import and export activities, location advantage could be a key consideration for a company to establish facilities in an overseas market.

The internationalization advantage asserts that considering the cost and barriers, firms must find it profitable or advantageous to set up production facilities overseas than licensing to a foreign firm. It is similar to location advantage but also encompasses the benefits of within-firm exploitation of firm-assets across countries relative to at arm's length. These benefits could come from improved risk sharing and easier access to capital through affiliates.

Factors that motivate firms to become MNEs can be further grouped into internal and external. Internal factors include firm-specific assets such as technology, managerial expertise, etc. which exist in the form of intangible assets and are considered as public goods within the

firm. MNEs may also choose to invest in real properties in a foreign country for corporate purposes, such as a growing need for business expansion that entails purchasing office buildings or establishing a new plant in a foreign country. External factors that could affect the location and size of FDI comprise the state economy, tax policies, exchange rates, trade protection, and trade flows, etc. (Blonigen 2005)[2]. For example, one explanation for the drastic increase in foreign holdings of U.S. real property is the depreciation of the U.S. dollar that makes assets in the U.S. market relatively cheaper and more attractive.

Helpman (1984), Helpman and Krugman (1985), and Grossman et al. (2006) study vertical direct investments which involve locating different stages of production based on the location's different factor abundances, such as locating skilled-labor-intensive production activities in skilled-labor-abundant countries. In contrast, Markusen (1984), Markusen and Venables (2000) feature horizontal models of FDI that replicate similar production activities across many countries. Efforts to combine horizontal and vertical direct investments have given rise to a hybrid model called the "knowledge-capital model". Carr et al. (2001) took the knowledge-capital approach to connect theories of MNE with empirics. They found that country characteristics such as size, size differences between economies, relative endowment differences, and trade and investment costs are closely tied to direct investment activities between two countries. Other important predictions of their model that match well with the empirical evidence include a substitution of inward affiliate production for trade activity as host-country trade costs go up. As the economy size between two countries converges, the affiliate sales between them will increase for both directions.

[2] Huizinga et al. (2008) argue that "multinational firms, face the more complicated choice of determining their overall indebtedness and the allocation of their debts to the parent firm and the subsidiaries across all countries in which the multinational operates. Consequently, the financial structure of a multinational firm is expected to reflect the tax systems of all the countries where it operates."

Melitz (2003) is one of the representatives of the "New New Trade Theory". He developed a model of intra-industry trade with monopolistic competition and firm-level heterogeneity. Helpman et al. (2004) built on the previous work to study firm's decision of export versus horizontal FDI emphasizing heterogeneous firms facing a proximity-concentration trade-off. Key implications of their model highlight the role of within-sector differences in firm productivity in determining the structure of international trade and direct investment.

Recent patterns of international expansion have gone beyond what the traditional and new theories of trade were able to explain. Researchers now tend to realize financial factors constitute an essential element in international trade and foreign direct investment due to the potential effects on a firm's access to external finance as well as on aggregate demand. More specifically, as multinational firms tend to be large and highly diversified organizations that can have access to credit market in multiple jurisdictions, changes in the local and source country financial development and credit market conditions may influence multinationals' decisions regarding production locations, integration, and corporate governance.

Antràs, Desai, and Foley (2009) develop a framework that builds on Holmstrom and Tirole (1997) to study MNEs and the monitoring role of banks in an open-economy model. They focus on investor protection and capital market development in host countries. Due to the existence of the agency problem and the possibility that entrepreneurs might misbehave to exploit private benefit, external investors require the parent company to hold an ownership claim in the foreign project and play a role in monitoring local entrepreneurs. This endogenously determines that a firm in possession of a proprietary technology uses direct investment rather than arm's length transfer when seeking to horizontally expand operations overseas. The model predicts that in host economies where investor protections are stronger, it is more common to

transfer technology using arm's length, the share of funds from the parent is smaller, and the ownership shares by the parent is lower. The model also ties the scale of multinational activity to the quality of the institutional environment by pointing out that areas characterized by better investor protections reduce the need for monitoring and thus allow the project to be larger.

Financial development is known to improve risk sharing by allowing investors to ensure against country-specific shocks in the global markets. It also promotes the efficient allocation of investment and consumption in moving funds to higher profitability uses. Combined with capital account liberalization that allows capital to flow freely in and out of countries, financial development and capital mobility are believed to have stimulated speedier investment and economic growth worldwide. The flip side is, they open up a potential channel through which financial shocks could be propagated more widely through a variety of channels which includes the financial accelerator effect, contagion, and spillover effects making the economy more susceptible to crisis.

Kroszner et al. (2007) investigate the credit channel through which the banking crisis affected sectoral growth with different levels of industry reliance on external finance. Using the ratio of private credit to GDP as a proxy for the depth of the financial system, they found that in normal times, sectors that are more dependent on external finance benefit more from the development of deeper financial systems. This asymmetry also applies to the crisis period: sectors that are more dependent on external finance tend to experience greater contraction in deeper financial systems. In the modern world, development of a stronger and more efficient financial system could be considered as a comparative advantage of a country when it comes to international trade.

In a study that focuses on the major decline of international trade during the global financial crisis, Chor and Manova (2012) show that credit market conditions played a predominant role. On the country level, the cost of external capital is found to be directly linked to the amount of exports of a country to the US. On the industry level, three industry characteristics including asset tangibility, reliability on external finance, and access to trade credit are shown to be significant factors in determining trade patterns.

Campello et al. (2010) conduct an extensive survey of 1,050 CFOs in the U.S., Europe, and Asia about how the credit constraints had impacted real firm behavior during the 2008 crisis. They found strong evidence that suggests tighter credit conditions affected the financially constrained firms more by forcing them to forgo valuable investment opportunities, cut budget on investment, R&D and dividend distributions. Constrained firms also accelerated the withdrawal of funds in fear of future decreases in their lines of credit and sold off more assets to generate funds compared to unconstrained firms. Their findings provide insights into how corporate policies and real firm activities have to readjust in response to changing conditions in the credit market.

Bilir, Chor and Manova (2017) point out in a study of MNEs' activities, "among affiliates of U.S.-based multinationals, nearly two-thirds of affiliate debt is raised in the host country, while U.S. headquarters hold only one-sixth of affiliate debt". Based on this empirical observation that multinational operations use a significant amount of debt raised from local sources, they construct a three-country model of international trade and multinational activity emphasizing imperfect capital markets in the FDI host economy faced by heterogeneous firms. Two mechanisms are proposed to explain the entry and sales decisions of MNEs in the presence of capital market imperfections which they call the competition effect and the financing effect.

The competition effect stems from increased entry by domestic firms which reduces individual affiliates' revenues in the local market. In contrast, the financing effect provides improved access to external financing for MNE affiliates and thus attracts more entry and boosts their aggregate activity. The model delivers predictions that match well with the empirical regularities observed in the data.

1.2 FDI Data and related issues

Before I present the stylized facts about the patterns of multinational's global operations, it is worth discussing the sources of FDI data and the related shortcomings. There are three classes of data for multinational activities: balance-of-payments data, government collected operations data, and customs data on intra-firm trade (Yeaple (2013)). FDI data produced by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce are the most comprehensive statistics of their kind and are obtained from mandatory surveys across industries and countries. They categorize the balance of payments and FDI into three financing modes: equity capital, debt instruments, and reinvested earnings. Other international organizations such as the United Nations Center for Trade and Development (UNCTAD), the International Monetary Fund (IMF), and the Organization for Economic Cooperation and Development (OECD) have also reported their own measurements of FDI. Some industry-level information of multinational activities can be obtained from customs data. For example, U.S. customs records each transaction and differentiates it into transactions between related parties and unrelated parties and provides the industry-level data online.

Measurements on inward and outward FDI stock are a fairly new invention, and due to empirical difficulty, the data have only existed for a relatively short time span. According to Linsi (2017), the FDI as a specific phenomenon that started being measured and given serious

consideration dates back only to the aftermath of World War II. Despite the simple theoretical definition of holdings of at least 10% of a company's voting stock, the empirical measurement of FDI is subject to several limitations due to statistical and estimation difficulty. It is important to recognize that the available data on FDI are constructed numbers rather than direct measurements.

Moreover, existing data are unable to make clear distinctions between the types of capital flows such as M&A versus greenfield investment. The entry mode of investment is also not documented even though investing in a hosting economy under alternative modes makes a difference in its subsequent influence on the local economy and its effects on a number of economic factors important to policy issues, such as job creation. Another drawback is, it is impossible to differentiate funds from abroad versus. capital raised locally in the hosting country. The concept of FDI implies that it adds to a nation's stock of physical capital by bringing capital from abroad to carry out an investment project. However, in reality, a substantial amount of capital used to fund the project is raised in local capital markets, or through reinvested earnings coming from profits generated by affiliates operating in the host economy. Strictly speaking, the origin of capital makes an important distinction in understanding the international flow of capital, but FDI as a statistical unit is silent in this regard.

As pointed out in Beugelsdijk et al. (2010), all else equal, the size and competitiveness of local financial markets are inversely related to the cost of obtaining local funds from external sources. It is then expected that MNE affiliates will have more incentives to finance their investment activities with locally raised capital, thus inward FDI tends to underestimate actual MNE affiliate activity in countries that have more developed financial markets. In host countries that are considered tax havens, inward FDI stocks are more likely to overestimate actual MNE

affiliate activity while in other cases such as countries with volatile exchange rates, FDI tend to underestimate actual MNE activity as they have more incentives to use a higher fraction of locally raised funds to finance the value-adding activities of their local affiliates.

Another flaw with the existing FDI measure as noted in Blanchard and Acalin (2016) is there is a high correlation between the observed quarterly FDI inflows and outflows while the expected correlation is zero or negative. The puzzle lies with why domestic investors would invest more abroad when foreign inflows are rising due to some reasons that make the domestic economy appealing. The measured FDI flows resemble portfolio debt flows, responding to short-run movements in monetary policy rather than to medium-run fundamentals in the economy. As the common perception is that FDI inflows are conducive while other forms of capital such as portfolio investment are more ambiguous, the measurement error in accounting for foreign portfolio investment as a direct investment may lead to erroneous policy recommendations and capital controls.

1.3 Stylized facts

This section analyzes the global operations of MNEs and provides some stylized facts about FDI. Figure 1.1 shows the stock and flow of inbound FDI in the U.S. from the rest of the world. Data come from FRED and are adjusted for inflation using the CPI to reflect real dollar values in 1983. From 1970 to 2017, the stock of FDI has been steadily increasing from 32,664 million to 1.86 trillion dollars, a more than 56-fold increase. The flow of FDI has also been trending up but appears to be more volatile as it reflects changes in the overall economic environment, policy changes, and also political uncertainty.

Following the Plaza Accord in 1985, inbound FDI abruptly accelerated in response to a joint effort of the U.S. government and governments of Japan, France, West Germany to

depreciate the value of the dollar by more than 40% between 1985-87. The fastest increase in inward FDI was recorded for 1993 and 2000 which corresponds to an extended period of economic prosperity. It ended with the bursting of the dot-com bubble in 2000. Rising FDI happened again during the run-up to the 2008 financial crisis. In 2015, FDI surged to 801.20 billion dollars reaching the highest level over the entire sample. Behind the FDI recovery was a surge in cross-border M&A activities due to large corporate reconfigurations by MNEs.

Using data from the IMF, Figure 1.2 shows another aspect of the rising importance of FDI based on its net inflow as a share of GDP. In 1970, net FDI inflow as a percentage of GDP was only 0.12% while in 2016 the ratio was 2.57%. At its peak, FDI represented more than 3.4% of GDP, with the fastest growth rate happening between 1977 and 2000. After the bursting of the dot-com bubble, inward FDI as a ratio of GDP fell from its all-time peak of 3.4% to less than 1 % in less than two years. Between 2005 and 2007, the ratio more than doubled but fell by a considerable margin due to the financial crisis of 2008. Relative to the overall size of the economy, FDI experienced rapid growth and appeared to be strongly cyclical.

There are at least two sets of reasons why researchers, economists, and policymakers should care about how the banking sector affects FDI. First, the regulatory rules governing the banking sector may affect the competitive structure of the banking systems, having a direct influence on the price and quality of banking services provided to domestic and overseas investors in the host country. The 2008 financial crisis was a wake-up call and stark evidence which shows people financial shocks could be transmitted quickly and broadly in a growingly integrated global financial system. This could cause runs and panics, and the resulting credit crunch will lead to devastating impact to the real economy that takes a long time to recover. Even exogenous shocks outside of the financial system could be transmitted to other countries

through interdependences in financial assets and the resulting effects on investment due to the balance sheet channel and the stock market channel (Tobin's q).

A re-examination of banking deregulation may provide useful insights on policy designs toward building a safer and more stable financial system. As will be discussed in greater detail in the next chapter, banking deregulation fostered unprecedented consolidation through M&A and allowed banks to expand across the state-lines and grow bigger. While there are considerable benefits from economies of scale in making banks bigger, the rising power of these big banks and their aggressive risk-taking behavior could sew the seed for dire problems in the long run. Some researchers have pointed out that banking deregulation played a part in the savings and loan crisis of the 1980s and the financial crisis in 2008. The growing power of big banks and financial innovations in an environment with weak regulation and high moral hazards from the implicit government guarantee poses a threat to the stability of the system and the health of the economy. There are rising voices urging regulators to impose stricter rules and regulations to ensure safety and soundness in the way that banks do their businesses, making them more resilient to adverse economic scenarios.

It has been documented that the surge in FDI activities in the 1980s was largely spurred by the financial development in global markets that allowed firms to take advantage of investment opportunities both at home and abroad. As MNEs can potentially use funds from the parent source country or money raised through local channels in the host country, I examine separately the roles of host and source country financial developments on FDI. In the second chapter, I focus on the impact of U.S. banking deregulation on inbound FDI in the form of foreign acquisitions of U.S. real estate properties. The third chapter explores the influence of source country financial depth and exchange rate risk on foreign investors' decisions based on

cross-country data. Despite the voluminous literature on the effects of the exchange rate and its volatility on trade and FDI, the empirical results are mixed at best. This could be due to aggregation problems, as the actual impact and the underlying mechanism varies across sectors and could be influenced by a variety of factors including the industry characteristics, the level of competition, the nature of contracting, the availability of hedging instruments, and so on.

I separately examine three main issues in subsequent chapters— effects of local financial development in the host economy, source country financial development, and fluctuations in the exchange rate on FDI. The goal is to disentangle how inbound FDI responds to changing financial environment in the source and host countries, as well as uncertainty in the exchange rate. Having both generated abundant empirical research, the results were by no means conclusive. Finding out how the FDI channel operates and the interplay with financial markets, therefore, constitutes an interesting research agenda.

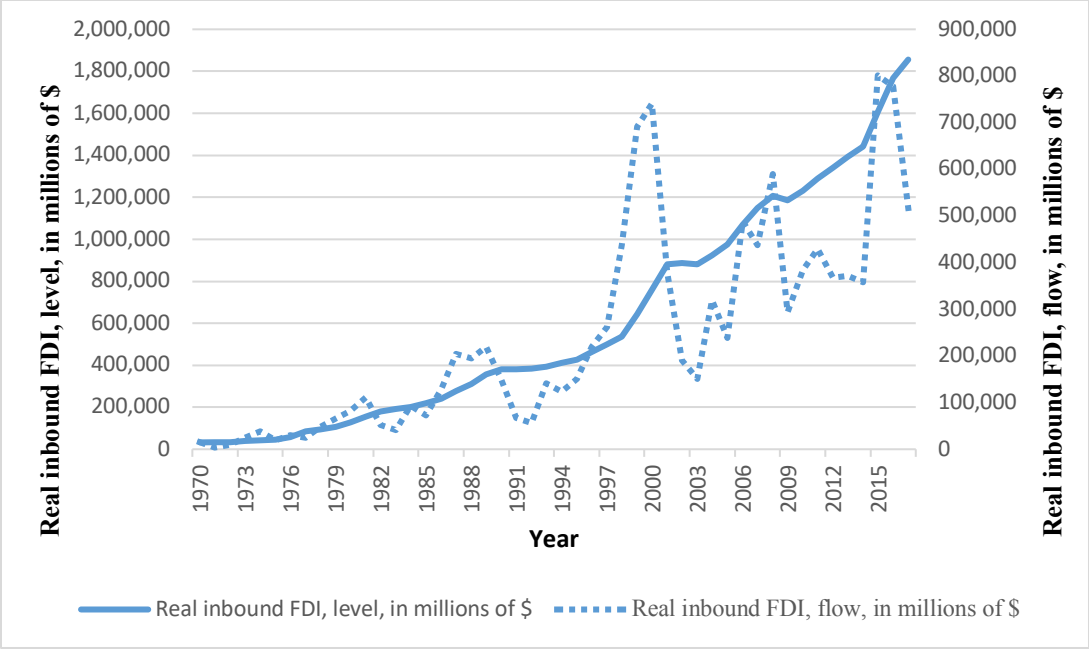

Figure 1.1 Real inbound FDI in the U.S. flow and stock ($ million), 1970-2017. (Source: FRED)

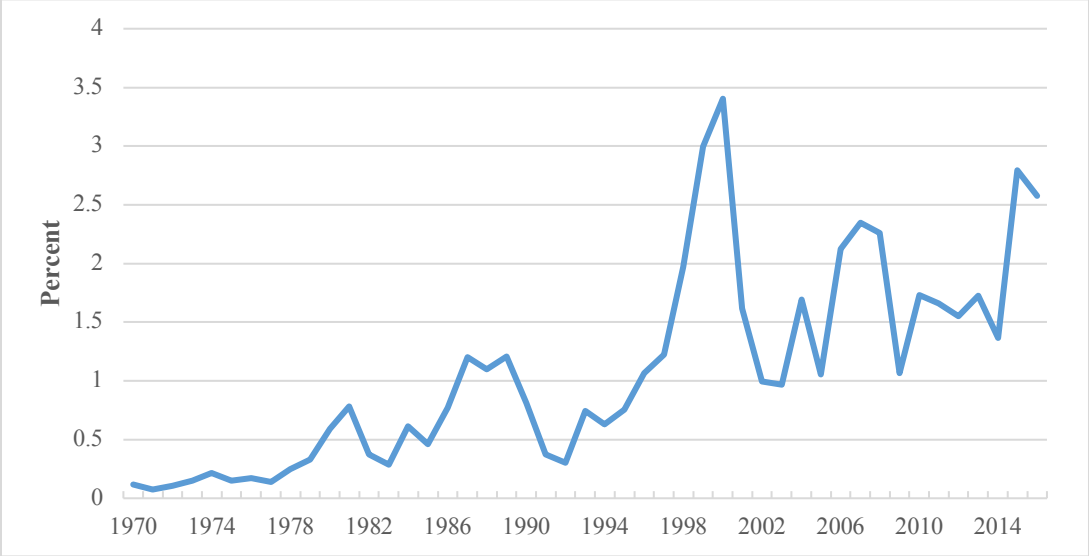

Figure 1.2 Net inflows of FDI relative to GDP, 1970-2016. (Source: World Bank)

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CHAPTER 2

Banking Deregulation and Inbound FDI in the U.S. Real Estate Sector

2.1 Introduction

Foreign Direct Investment and Multinational enterprises (MNEs) are integral components of the international economic system and major catalysts to global development. Because FDI activities usually incur a fixed cost of market entry as well as a variable cost for ongoing operations, to obtain funding for investment opportunities and to cover their working capital needs, MNEs employ a combination of equity and internally generated funds through retained earnings, as well as external funds through debt financing. The cost and availability of debt finance largely depend on the supply side of credit from banks. Yet, for a long period of time in U.S. history, the banking sector was largely segmented with services impeded by federal and state laws that restricted interstate banking and intrastate bank branching. Not only did many states prohibit or restrict intrastate branching, none of the states permitted banks headquartered in other states to set up branches or to acquire their banks. Starting in the 1970s, different states gradually lifted these restrictions allowing banks to operate across the state lines through mergers and acquisitions and later, de novo branching.

The banking reform brought about substantial changes to the system and inspired abundant research that studies the subsequent effects on economic growth and FDI. Previous research has mainly focused on the manufacturing (Friedman et al. (1992), Woodward (1992)) and financial sectors (Harris and Ravenscraft (1991)). Even though similar trends are replicated in the foreign holdings of U.S. real properties, a limited amount of work is done for that sector thus little is known about how financial imperfections affect foreign direct investment in real

estate (FDIRE). This paper intends to fill the gaps and expand our knowledge about the underlying mechanism through which the deregulation affects FDIRE activities. It also aims to quantify the size of impact by using the evolution of state-level removal of banking and branching constraints as a unique natural experiment.

The 1980s saw a significant increase in inbound FDIRE[3]. According to the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce, commercial property assets of U.S. non-bank affiliates of foreign-owned firms increased more than four-fold from 1980 to 1988 (Gerlowski et al. (1994)). The same period also witnessed drastic changes in the banking structure in removing some of the geographic restrictions imposed on bank branching that has kept it segmented for decades. Improved financial market characteristics in the host country as a result of banking deregulation allowed MNEs to borrow more easily at better terms from local banks in the hosting economy through their affiliates. This, as the previous example has identified, could lead to more entrant of foreign firms with increased usage of financing through local debt and driving up the inflow of FDI.

When a foreign firm engages in real estate acquisition, it can borrow U.S. dollars from a U.S. financial institution using the underlying property as collateral. Doing so allows it to hedge against potential currency movements by limiting its exposure to the down payment and initial transaction costs. Compared to banks in the source country, local banks in the host economy usually have an advantage in assessing the project's profitability, monitoring, and in case of default, in seizing firm assets in a liquidation. Due to financial frictions, all else equal, improvement in the host country financial markets and credit supply would ease up the financing

[3] Foreign direct investment in real estate (FDIRE thereafter) is defined as direct partial or complete ownership of real property for the foreign investors' own usage, leased space to renters, or a mixture of both.

constraint faced by multinational investors.

From a traditional corporate finance perspective, the tax deductibility of interest expense from corporate income implies that the tax bills of MNEs are inversely related to the amount of external debt finance. This in part explains why taking on some leveraging is desirable for business firms including the MNEs. As they are usually faced with greater challenges and risks than firms that operate domestically, financing decisions made by MNEs may reflect other strategic considerations. For example, Desai et al. (2004) document that multinational firms carefully choose their capital structure to limit parent company capital exposure (value at risk). Their evidence suggests when investing in settings characterized by higher political uncertainty, foreign firms employ greater financing of local lenders and shareholders to share the risk. Even though external finance is usually more expensive than internally generated funds, as Lehmann et al. (2004) point out, the desire of the foreign investor to utilize (albeit more expensive) local finance to hedge currency exchange exposure usually outweigh the benefit of cheaper finance using sources from the parent company.

Based on these reasons, it is logical to hypothesize that banking deregulation, by reducing the magnitude of financial frictions and lowering the cost of borrowing locally, may have given rise to more prosperous FDIRE activities within the deregulated states. However, as the interstate banking and intrastate branching are two distinct types of reform that carry different effects on the structure of the banking sector, the channel through which deregulation affects FDI crucially depends on the nature of deregulation. An immediate impact of branching deregulation was to lower entry barriers by allowing banks to enter a new market either by buying branches or by opening new branches. Increased competition means banks had less freedom to raise prices above costs. Removing the interstate banking restriction, however, as Black and Strahan (2002)

remarked can be thought of as "a positive innovation in the openness of the corporate takeover market" as it only dictates who can own bank assets. Given these differences, an interesting empirical question is whether allowing banks to operate more freely within a state or permitting cross-state expansions had a bigger role in affecting the incidence and intensity of foreign acquisitions of U.S. real estate assets.

This paper contributes to the growing body of work that combines financial frictions with international trade to cast light on the effects of capital market imperfections on foreign capital inflows. Traditional economic models tend to exclude the role of financial markets. Beginning in the late 1980s, the seminal work of Williamson (1987) and Bernanke, Gertler, and Gilchrist (1999) started to incorporate a financial sector into a general equilibrium framework and used incomplete financial markets to study the monetary transmission mechanism. These theoretical frameworks inform us that the financial sector could play a nontrivial role in the real economy, i.e. through its influence on firms' balance sheets. Since then, a growing amount of theoretical and empirical work has expanded our understanding of how the banking sector interacts with economic growth, international trade, and FDI activities.

The current investigation is directly related to the empirical literature on the impact of banking regulation which includes Jayaratne and Strahan (1996), Strahan (2003), and Kandilov et al. (2016). It is novel in using the historical event of banking deregulation as a natural experiment to quantify its impact on FDI activities in a rarely studied area, the real estate sector, using detailed annual transaction-level data. Due to the staggered timing in relaxing interstate banking and intrastate branching restrictions, I adopt a difference-in-differences empirical approach. This method provides a useful way to identify the effects of deregulation using variation within a state-year while being able to control for omitted variables using the fixed-

effect model. Specifically, I compare changes in the inbound FDI into the U.S. real estate sector before and after the regulatory reform along two dimensions: the average number of deals (extensive margin) and the average size of the investment project (intensive margin). The extensive margin explores a count-data model in evaluating the effects of banking deregulation on the total number of FDIRE investments in a state and year, while the intensive margin investigates the scale of the foreign acquisition based on reported transaction values.

My first contribution comes through establishing an empirical relationship between the intrastate branching deregulation and rising incidences of foreign holdings of U.S. real estate assets. Assuming that the intrastate branching deregulation improved efficiency, promoted greater competition, and facilitated easier access to credit, it boosted the number of real estate projects being pursued by foreign investors who tried to take advantage of the host country's financial development. In addition, I use the aggregate state-level data to explore some of the key economic factors to disentangle the mechanisms through which they tend to affect the observed variations in foreign holdings of U.S. real estate properties. I also seek to uncover what characteristics in a state are most attractive to foreign investors in their real estate investment decisions. Since investment in foreign real estate market involves large upfront costs, especially for MNEs that are first-time acquirers, my final contribution is to distinguish the effects of first time versus repeat investors to illuminate how their investment decisions differ. My empirical evidence leads to the conclusion that policies that aim at promoting financial markets can potentially increase FDI activities.

The remainder of the paper is organized into six sections. Section II briefly reviews the history of U.S. banking reform, followed by a discussion of the related literature in section III. Section IV presents the data and discusses the observed patterns of FDIRE to motivate key

research questions. Section V describes the empirical methodology. Section VI presents key findings based on the empirical analysis. Section VII comprises robustness checks. The last section summarizes the main findings in this paper.

2.2 Regulation in the Banking Industry

The U.S. banking structure is characterized by dual-chartering, depending on the type of charter a banking organization has, a commercial bank may subject to many regulations at the state and federal level. The charter type dictates the laws under which the bank would be regulated, while national banks are regulated under a system of federal laws, state-chartered bank operations are governed under state laws[4]. The Comptroller of the Currency (OCC), the Federal Deposit Insurance Corporation (FDIC), the Federal Reserve System (FRS), National Credit Union Administration (NCUA) and state-level agencies are common regulators, each has a specific range of regulatory responsibilities for the various types of financial institutions. These government agencies regulate and protect the banking system with a variety of rules and regulations ranging from restrictions on entry and bank activities to capital adequacy, deposit insurance, and so on. One set of rules targets on the geographic region that the activities were allowed to take place. Due to the existence of these laws and regulations, the U.S. banking system was largely segmented and inefficient prior to 1980s. Multistate, multibank bank holdings companies that operate bank subsidiaries in more than one state barely existed.

An important legislation that has regulated bank branching in the U.S. for about 70 years

[4] Neely (1994) documents that "Since the late 1920s, state legislatures have held most of the cards, in effect determining whether a bank could establish subsidiaries and branches, even if it had a national charter. That's because current federal laws governing expansion powers for state and national banks have a "states' rights" bent to them, generally allowing states to preempt federal laws by passing more or less restrictive legislation."

was the McFadden Act of 1927 (amended 1933). It prohibited bank holding companies headquartered in one state from acquiring a bank in another state unless the home state of the acquired bank has a statute authorizing such a deal, i.e. interstate banking. The Bank Holding Act of 1956 specified that approval of the Federal Reserve Board is mandatory to establish a bank holding company[5]. In addition to that, most states also had laws restricting within-state branching, i.e. intrastate branching. The key idea behind these geographic restrictions on interstate banking and intrastate branching was to protect local banks from competition and to prevent economic power being overly concentrated. On the other hand, these burdensome regulations kept the banking businesses from achieving a higher level of efficiency and economies of scale. Because banks were only allowed to play the classic role of financial intermediation in deposit-taking and lending, welfare gains from allocating capital to the highest value uses and benefits from risk sharing were also foregone.

In 1978, Maine became the first state to pass the interstate banking deregulation, allowing entry by out-of-state bank holding companies on a reciprocal condition. However, no other states responded until four years later, when Alaska and New York passed similar laws. This set off a competitive wave of banking deregulation as many other states gradually followed suit. The periods between 1970s and the 1990s witnessed a significant liberalization in the ability of banks to expand their business through setting up new branches (de novo branching) and through mergers and acquisitions. By the 1992, all states but Hawaii had passed laws that repealed restrictions on interstate banking. It should be noted that entering into an interstate banking agreement only allowed the outside banks to acquire a state's banks, unrestricted interstate

[5] FDIC, important banking laws. "Bank holding company" means but is not limited to any company which directly or indirectly owns, controls, or holds with power to vote, 25 percent or more of the voting shares of a bank.

branching was still not permitted.

In 1994, passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act (IBBEA) which aimed at amending the Bank Holding Company Act of 1956 and the Federal Deposit Insurance Act, further eliminated any remaining restrictions that limit interstate banking and merger transactions. This important piece of federal legislation amended the laws governing banks chartered at the federal level to restore their competitiveness in response to loosening regulations governing state-chartered counterparts. It acted to unify interstate acquisition and branching guidelines across the country, allowing bank holding companies to expand across state lines and profoundly changed the landscape of the banking industry.

When studying the impact of banking deregulation, it is important to address the potential endogeneity issue which arises when a state deregulates in response to factors that may also affect trade or FDI. To understand if endogeneity might be a problem, it is worth exploring the key determinants prompting a state to deregulate geographic rules imposed on banks. One of the main forces that contributed to the widespread deregulation across all states between 1970s and early 1990s was advancements in technologies in both deposit taking and lending which raised the awareness of expansion mindset among banks. For example, telecommunications technologies allowed information to be processed more efficiently. Rapid transfer of information and funds largely reduced the cost of providing banking services. While the technological progress in banking services affects all financial services firms across states, as Kroszner and Strahan (1999) and Strahan (2003) point out, the exact timing of a state's deregulation was largely influenced by the relative strengths of local interest groups and constituencies. Rajan and Ramcharan (2011) discuss in detail why landed elites may have played a successful role in preventing bank competition through their ability to pressure politicians to vote against the

McFadden Act in order to protect landowners, but in turn caused credit to be more expensive and harder to obtain in counties where the elites had large land holdings. As a result, the local political constituencies, through their influence on laws and the overall regulatory structure, more or less shaped the financial system.

Other evidence that could rule out the endogeneity concern includes Jayaratne and Strahan (1996) who provide evidence that suggests states did not deregulate their banks in response to future growth prospects. Kerr and Nanda (2009) argue that a state's decision to reform banking regulations is, "mostly exogenous to product markets, driven in part by federal actions and state-level structures of the banking industry."

2.3 Literature Review

One strand of research has attempted to establish the linkage between a country's financial development and economic growth. Deep roots of the growth effects can be traced back to works such as Schumpeter (1912) who stresses the importance of a country's financial sector in promoting the growth rate of its per capita income such that economies with more efficient financial systems tend to grow faster. Levine and Zervos (1998) argue that banking development and stock market liquidity are both related to economic growth, capital accumulation, productivity improvements, and savings rates[6]. In a seminal work, Rajan and Zingales (1998) exploit empirical evidence from within-country and cross-industry data to establish causality. They lend support to the view that financial development, by reducing the external costs to firms, promotes faster growth in industries that have greater financial dependence.

[6] They measure stock market liquidity using both the value of stock trading relative to the size of the market and by the value of trading relative to the size of the economy, and the level of banking development by bank loans to private enterprise divided by GDP.

A large body of literature has documented the effects of banking deregulation in promoting competition, reducing the degree of local monopoly power of financial intermediaries, lowering the cost of borrowing, and improving access to credit in the banking sector. For example, Jayaratne and Strahan (1996) argue that allowing banks to expand within a state through branching boosted the quality of bank intermediation skills. As a result, efficiency gains significantly lowered wages and other non-interest costs; in the meantime, advancements in loan monitoring and screening technology also helped to bring down loan losses thus reducing the overall cost of credit for business firms.

According to Kerr and Nanda (2009), between 1977 and 1994, the total number of banking organizations fell to 8,547 from 12,810, and the total number of banking branches jumped from 38,231 to 65,155. This suggests that banking deregulation results in an expansion of large bank holding company and a drop in small local banks. Meanwhile the number of branches mushroomed. They also investigate the impact of financial constraints on entrepreneurship emphasizing the important role played by external access to capital. In a world where credit market frictions preclude high-quality entrepreneurs from pursuing profitable investment projects, promoting financial market development through enhancing the depth of the local capital markets can lower the hurdle and ease financing constraints. The increase in credit supply lowers the price of loans, making external funds less costly to firms, stimulating entrepreneurship and creative destruction in product markets.

Amore et al. (2013) employ firm level data on patents and tie banking development to corporate innovation through increased credit supply and more willingness to take risks among deregulated banks by allowing them to better diversify risk geographically following interstate banking deregulation. The banking deregulation allows the formation of large national banks that

can adopt better screening and monitoring technologies thus fostered more aggressive corporate innovation and drives technological progress even though the benefits are highly heterogeneous across firms with varying degrees of reliance on external capital. Other studies have found that integration of banking across localities also reduces the degree of local monopoly power of financial intermediaries as noted in Morgan et al. (2004) and Cacciatore et al. (2015). The subsequent effects on the real economy may include faster growth in the state economy, increased entrepreneurial activity and lower state-level business cycle volatility (see Strahan (2003)).

Kandilov et al. (2016) examine the structural change in the banking system induced by the banking deregulation. While both forms of deregulation had significant effects in promoting greater competition within the banking industry, only the interstate banking deregulation is significantly associated with a lower average loan yield. Enhanced banking competition made local finance not only cheaper but also more accessible to firms. Lifting the regulatory rules on the intrastate branching and interstate banking has also boosted consolidation among banks by transferring a bigger share of assets to large banks[7]. Their evidence suggests as a result of the interstate banking deregulation bringing down the overall cost of credit on overseas participants entering the U.S. market, new entrants of inward FDI in the U.S. manufacturing sector surged. Allowing banks to conduct business across states also appeared to be negatively related to the average value of inward FDI transactions. This is rationalized by the fact that as the cost of external finance declined, smaller projects became more profitable and were pursued by an increasing number of investors from overseas.

[7] Berger et al. (1995) pointed out that "over one-third of all independent banking organizations (top-tier bank holding companies and unaffiliated ban) disappeared over the period 1979-94, even while the assets of the industry were growing"

I next discuss the key driving forces behind firms' decisions to engage in cross-border investments in U.S. real estate properties. While various causes underlie the fact that foreign investors diversify their target portfolios toward the U.S. real estate markets in particular cities within the U.S., it all boils down to seeking returns and risk diversification. The flourishing economy in the U.S. and the public's expectation that it will continue trending up going into the future continuously draw international investors from across the globe. Combined with a stable social and political environment, investments opportunities in the U.S. market are appealing in the global asset market among foreign investors. This is especially so if the returns to investments in the U.S. market exhibit little correlation with the returns in their domestic asset market.

Institutional investors such as insurance companies, banks, corporations and pension funds are the primary players in the property market. For example, pension funds of the Netherlands have long established large percentage holdings of overseas property investment. Investors often anticipate capital appreciations from the real properties they select and in the case of commercial or industrial property, net cash flows in the form of rental income after paying for property operating and other financial expenses. It is estimated that returns in U.S. real estate assets range between 6.5% and 10%.

Markowitz (1959) proposed the portfolio theory and argued that diversification would be more likely to produce benefits in markets that were not highly correlated, thus low correlations of risk between domestic assets and foreign real properties may offer some diversification gains to the enterprise. Proponents of the diversification theory of real estate believe, based on substantial empirical evidence, that adding international real estate assets to a portfolio of pure financial assets improves mean-variance efficiency for foreign institutional and individual

investors (Acharya et al. (2011)). Other studies argue that adding U.S. real estate assets to a mixed-asset portfolio (including both financial and real estate assets) does not improve its performance, since the potential diversification gains are often offset by volatile changes in the exchange rate (Ziobrowski and Curcio (1991)).

Froot and Stein (1991) find that capital market imperfections open up a potential channel through which exchange rate movements may affect FDI. Through its effects on investor's net worth, a weak currency in the host country may give an edge to foreign firms in their ability to obtain low-cost funds relative to domestic counterparts in the host country, leading to increased FDI inflows. They also propose that tax code changes can explain shifts in the relative amounts of domestic versus foreign investment. The most common types of taxation imposed on real estate are income, capital gains, property, value-added, and transfer taxes, there are also landholding, wealth, assets, estate, and withholding taxes. Host country's local state taxation treatments are a key element that must be factored into cross-border investment decisions.

Among studies that examine the locational preferences for foreign acquisition of U.S. real properties, Gerlowski et al. (1994) study location choice of individual and institutional investors from Canada, Japan, and the United Kingdom using a random effects model. Their evidence based on state-level U.S. real property investments data reveals that foreigners preferred states with large and developed economies. The observed patterns of locational characteristics also highlight the traditional "Port of entry" concept. When choosing where to invest, foreign investors tend to start from areas where their nationals most commonly enter the host country. Access to better information about the local economy and investment opportunities may make FDI in that location more likely. For example, Los Angeles and Honolulu have been the top locations for Japanese investors. This "port of entry" theory only tells part of the story, as foreign

investors run out of opportunities in the markets where they first began, and as they gain more experience and become more familiar with U.S. markets they will move to other major markets such as Atlanta, Boston and Seattle and eventually expand the locus of their acquisitions to smaller cities.

A relatively small literature also explored the interplay between FDI and property prices. For example, He, Wang and Cheng (2009) demonstrate that property price appreciation in a host country attracts foreign investors to seek investment opportunities in the real estate sector. Other research supports the reverse causality and holds the view that FDI can result in real estate appreciation due to a higher demand for assets. In contrast, Gholipour et al. (2014) demonstrate that FDI in real estate is neither responsible for causing property price increases nor contributing to economic growth among OECD countries. Based on these mixed findings, the coefficient for land prices on FDI could be positive, negative or zero.

2.4 Data and Stylized Facts

This section sets the scene for the empirical analysis that follows by presenting some stylized facts about FDIRE. Data on FDI in the United States mainly come from two sources. The Bureau of Economic Analysis (BEA) reports state-level aggregates of the stock of foreign investment. Because these data do not distinguish between capital inflow and outflow, we can only track the net increase of FDI from year to year. An alternative source on FDI is compiled by the International Trade Administration (ITA) of the U.S. Department of Commerce. The ITA data are based upon publicly available information and they record transaction-level details that contain the year, location, and value for each transaction as well as the nationality of the foreign

investor and mode of entry of the deal (e.g. New Plant vs. Merger & Acquisition)[8].

The FDI measures based on the balance-of-payment concept have been pointed out to suffer from many defects such that the actual activity may not be in the same industry as the stock, or not in the same host country, or has not originated from the same source country. Studies based on actual transactions or activities tend to suffer less of such biases (Lipsey (2004)). Moreover, for the purpose of this study, the ITA data can offer more dimensions to analyze and illuminate the potential channels through which the banking deregulation may affect FDIRE.

The data are manually collected from all annual print publications by the ITA that cover the period from 1977 through 1994. It marks the beginning and completion of a large wave of banking deregulation across states (See Section 2 on the history of U.S. banking regulation). Following the convention in this line of research, I exclude the states of Delaware and South Dakota because both states were subject to some special tax codes in the legal treatment of credit card banks. I use three conditions to sort out real estate related transactions: standard industrial classification (SIC) codes that are equal to 65 ("real estate") and 7011 ("hotels and motels"), and transactions specifically recorded as "Real Estate" by the ITA. A total number of 3,211 transactions are identified, among which 1,989 transactions have reported values. As there is no discernible pattern for investments missing transaction values, these are treated as missing at random[9].

I consider a rich set of factors that are commonly used as determinants of FDI in previous

[8] ITA classifies transactions into merger and acquisition, new plant, plant expansion, equity increase, joint venture, real property, and "other" category.
[9] Kandilov et al. (2016) points out that there is no systematic reason for data missing reported value, and there is little difference in the distribution of other transaction characteristics such as location, year of completion, source country, and mode of entry among groups with and without documented value.

research. These control variables include: the gross state product which measures the size of the state economy; the state's market potential in year *t* is calculated as the sum of the ratio of gross state product of other states *n* to the centroid distance from state *s* (i.e. $MarketPotential_{st} = \sum_{n \neq s} \frac{GSPnt}{Distance_{ns}}$). Demographic factors are also known to influence the demand for real estate demand. I include a population density variable calculated as the ratio of state population to total land area. To reflect the health of the local state economy, I use the state unemployment rate. Moreover, states sometimes offer business incentives in order to attract foreign investors. One of the trade promoting policies is to create foreign trade zones that are similar to free trade zones known in other countries. The number of foreign trade zones in a state may influence the attractiveness of FDIRE. Lastly, the decision to acquire real estate properties is affected by real estate prices as well as the cost of doing business which warrants adding real property prices and the state average wage rate to the list of covariates. (Sources for the data are provided in the appendix).

In analyzing the impact of local finance on foreign investment in the U.S. real estate sector, I consider two outcomes – the average transaction value and the number of statewide investments in a given year. The transaction value data set is used to analyze the intensity of FDIRE and contains information on each individual transaction that has a reported value. I exclude investments that do not have reported values. The number of FDI investments is a state-year balanced panel dataset. It is constructed by counting the incidence of foreign acquisitions of U.S. real estate projects in a given state that occurred in a given year. The latter preserves transactions without reported values because that information is not relevant for the count data set.

Panel A. of Table 2.1 provides summary statistics for all the variables used in the

regression analysis. The average transaction value for FDIRE investments is about $34.44 million in 1983 dollars. The large standard deviation suggests transaction size varies widely across deals. While the median transactions value is $8.77 million, some states completed megadeals worth up to $1.7 billion. On average, a state is involved in 3.55 new FDIRE projects annually. The zero minimum and median values along with the low mean value compared to a maximum of 235 deals implies that inbound FDI are highly concentrated in a few states. While a small number of states has accounted for most of the FDIRE transactions in a given year, most states were not engaged in any transactions over the sample period. Panel B shows the distribution of mode of entry for the entire sample. More than 80% of the transactions in the sample belong to the real estate type of investment while M&A takes the second largest share, the rest of the real estate related transactions are distributed among joint venture, equity increase, new plant, plant expansion and the other mode.

Even though foreign investments in the U.S. real estate market can come from virtually anywhere in the world, investors from only a small number of origins have seen persistent participation throughout the sample period. As shown in Panel C of Table 2.1, Canada and Japan are the top two players in the list with more than 40% of foreign transactions in U.S. real estate coming from institutional or individual investors that reside in these two countries. Three European source countries were also among the top 5 – the Netherlands Antilles, United Kingdom, and the Netherlands, all other countries in the world combined had a share of about 30%. Since the 1980s, foreign holdings of U.S. real estate more than doubled as investments from Japan and Europe increased rapidly.

Japan has been a primary source of FDIRE for decades. In some years, Japanese investors even outpaced British investors in the U.S. FDIRE market. However, starting from the early

1990s Japanese property investors began withdrawing from the U.S. market. Not only many existing holdings were sold, but also a limited amount of new money was brought to the U.S. real estate market. The timing of this decline, as many researchers have tried to understand, corresponds with the collapse of the Japanese banking system. Another hypothesis argues that as Asian economies recovered from the financial crisis of the mid-1990s, new opportunities sprouted in those nations and diverted the attention of Japanese investors.

Table 2.2 reveals the locational preferences among foreign investors in U.S. real estate between 1977 and 1994. Of the five census regions in the U.S., the most favorable destination for FDIRE is the South region which consists of South Atlantic, East South Central, and West South Central. Within these geographic zones, Florida, Georgia and Texas hosted the highest numbers of FDIRE. Besides the South region, foreign investors also preferred to invest in properties located in the West, especially in states such as California and Hawaii.

To further investigate the location preferences of foreign investors in U.S. real estate, Figure 2.1 lists the top five hosting states of FDIRE investments over the entire sample period. Florida hosted the highest number of foreign acquisitions of real estate deals, followed by California, Texas, New York, and Hawaii. A closer look at Figure 2.1 reveals that Canadian investors' favorite destinations are Florida and California. Japanese investors, on the other hand targeted most of their real estate investments in California, Hawaii, and New York. It should be noted that, a majority of acquisitions of real estate properties in Hawaii are associated with Japanese investors. Figure 2.2 shows the distribution of the total value of real estate investments of top foreign investors across top five hosting states over the entire sample. Not surprisingly, the largest inbound FDI in the U.S. came from Canadian investors into California, Texas, and Florida. However, though Canadian investors acquired more real estate properties in Florida, the

aggregate value of deals are more sizable in California than in Florida. Similarly, the aggregate FDI inflow into California by Japanese investors are significantly higher than Hawaii and New York. Due to differences in the land price and the available investment opportunities, average size of deals differs for the same foreign investor across various states.

To preview the data, I use the ITA firm-level data to create two aggregated data sets – one for the total inflows of foreign capital into the U.S. real estate sector constructed by summing up the transaction values for each state/year, and the other for the total annual number of transactions in a given state. Figure 2.3 plots these two series for the entire U.S. from 1977 through 1994. Prior to 1983, the close co-movement between the total volume and total number of FDIRE transactions is visually apparent. From 1977 to 1981, the total inflow of FDIRE increased from a total of 1,389.14 million dollars to its peak in 1981 of 8,398.5 million dollars, a more than five-fold increase. A downturn happened in 1982 with a sharp decline in both the incidence and the total volume. In the second half of the sample, the number of inbound FDIRE stayed relatively stable, while the total volume surged again from 1985 to 1989. This is also the period with the most active banking deregulation activity; according to Table 2.3, 25 states completed interstate banking deregulation and 14 states repealed intrastate branching restrictions. The onset of the 1991 recession witnessed drastic declines in both the total number of FDIRE transactions and the total FDIRE volume.

Based on these empirical facts, I hypothesize that interstate banking is unlikely to be the main cause for the observed increase in the number of FDIRE transactions in the early 1980s since for many states it did not happen until after 1985. The documented patterns are more likely to be explained by the incidence of intrastate branching deregulation, with more than half of all states adopting this deregulation prior to 1984. Despite the high volume of FDIRE from 1984

through 1990, a period that corresponds to the most active interstate and intrastate branching, there exists a large discrepancy between the total incidence and total volume, leading me to hypothesize that the average deal value must have increased by a large magnitude.

2.5 Model

Using detailed transaction level data allows me to explore the effects of banking deregulation within a given state. To this end, I use a fixed-effect difference-in-differences empirical approach to establish the causal link. The advantage of the fixed-effect method over the traditional cross-sectional analysis is that many unobservable common characteristics such as nationwide macroeconomic policy shocks, federal legislation, or other common trends and non-economic variables that are difficult to include in the model but might confound the results if left unaddressed can be fully controlled for by the inclusion of fixed effects.

2.5.1 Count Data Model for the Number of FDIRE Transactions

The first specification is a state-year panel estimation of a count data model. It uses the number of new inbound FDIRE transactions N_{st} in state s and year t as the response variable. The model takes the following form:

$$E(N_{st}|deregulation) = \exp(\beta_1 InterBankig_{st} + \beta_2 IntraBranching_{st} + \gamma_1 lnGSP_{st} + \gamma_2 GSPGrowth_{st} + \gamma_3 Unemployment_{st} + \gamma_4 lnWage_{st} + \gamma_5 Tax_{st} + \gamma_6 ForeignTradeZone_{st} + \gamma_7 lnMarketPotential_{st} + \gamma_8 lnPopDensity_{st} + \gamma_9 lnLandPrice_{st} + \omega_s + \tau_t + \omega_s * Trend_t + \mu_{st}) \quad (1)$$

The conditional mean of the number of FDIRE transactions $E(N_{st}|\ deregulation)$ is a function of the covariates where the subscript s indexes states and the subscript t indexes years.

The treatment variable $InterBanking_{st}$ is an indicator equal to one beginning in the year that a state allows interstate banking. Similarly, $IntraBranching_{st}$ is an indicator that is set to one if a state permits branching. Both bank deregulation indicators equal zero prior to deregulation and equal one beginning in the year when the deregulation occurred. In addition to these two indicators, the right-hand-side variables also include a set of time-varying covariates that are commonly known to influence FDI. The covariates consist of the natural logarithm of the gross state product in a given state *s* and year *t* represented by $ln(GSP_{st})$, growth rate of the gross state product $GSPGrowth_{st}$, state unemployment rate $Unemployment_{st}$, logarithm of the state average wage $ln(Wage_{st})$, state corporate tax rate Tax_{st}, number of foreign trade zone $ForeignTradeZone_{st}$, logarithm of population density $ln(PopDensity_{st})$, and the logarithm of real land price $ln(LandPrice_{st})$.

To control for the time-invariant unobservable characteristics in a given state, I include ω_s for state fixed effects. The sample period encompasses two large scale banking failures, known as the saving and loan crisis of the 1980s and 1990s. These unobservable effects in a given year are accounted for by adding a year fixed effect variable τ_t. Since it is also possible for each state to experience a distinct trend in FDIRE inflows and ignoring this will likely result in overestimation of the underlying effects of banking deregulation, it is important to include a cross-interaction term $\omega_s * Trend_t$ term capturing the state-specific time trends. In a more compact form, when combining all the covariates into a vector X_{st}, the model to be estimated is reduced to:

$$E(N_{st}|deregulation) = e^{\beta_1 Interbanking_{st} + \beta_2 Intrabranching_{st} + X_{st}\gamma + \omega_s + \tau_t + \omega_s * Trend_t + \mu_{st}} \quad (2)$$

The typical approach to estimate a count data model when the response variable takes on values of non-negative integers is to use either a Poisson or a Negative Binomial regression

(Wooldridge 2001). The probability mass function for the Poisson distribution takes the form of:

$$\Pr(N_{st} = n_{st}|deregulation) = \frac{e^{-\lambda}\lambda^{n}}{n!}, \mathrm{n_{st}} = 0, 1, 2, 3 \ldots \quad (3)$$

where the mean and variance of the distribution are denoted by λ. The Poisson distribution relies on the assumption that the mean and variance are equal, a strong assumption that is often violated in applications. Due to the fact that many states do not have any reported FDIRE investment in a given year, the dependent variable comprises an excessive number of zeroes making it unreasonable to assume that the mean variance equality would hold with such over-dispersed data. To circumvent the restrictive assumption of mean variance equality, I fit a Negative Binomial model in addition to the Poisson estimation. The probability mass function of the negative binomial distribution is:

$$\Pr(N_{st} = n_{st}|deregulation) = \frac{\Gamma(n_{st} + v)}{n_{st}!\,\Gamma(v)}\left(1 + \frac{\lambda}{v}\right)^{-v}\left(1 + \frac{\lambda}{v}\right)_{t}^{-n_{st}},$$

$$n_{st} = 0, 1, 2, 3 \ldots \quad (4)$$

where the parameter λ represents the mean of the negative binomial distribution $E(N_{st}|$ *deregulation)* $= \lambda$, and v is the over-dispersion parameter also known as the shape parameter. The variance of the negative binomial distribution is given by $Var(N_{st}|$ *deregulation)* $= \lambda + \lambda^2/v$. The negative binomial distribution is a mixture of the Poisson distribution and the Gamma distribution, and as the shape parameter approaches infinity, the negative binomial distribution approaches the Poisson distribution.

2.5.2 Econometric Model for FDIRE Transaction Values

Turning to the intensive margin of the effects of banking deregulation on FDIRE, I estimate the following econometric specification with the logarithm of real transaction values

(expressed in 1983 U.S. dollars) in state *s* and year *t* as the dependent variable $ln(V_{isct})$:

$$lnV_{isct} = \beta_1 InterBanking_{st} + \beta_2 IntraBranching_{st} + X_{st}\gamma + Z_i\alpha + \omega_s + \tau_t + \omega_s * Trend_t + \eta_t + \epsilon_{icst} \qquad (5)$$

X_{st} contains the same covariates in state s and in year t as in the previous count data model. Because some foreign investors are associated with multiple FDIRE deals across different states and years, of the 1,718 FDIRE deals completed in the sample period10, about 23% (391 projects) are conducted by foreign investors that have invested more than once in the U.S. (see Table 2.4). To exploit the effects of investor-specific characteristics on the transaction values of FDIRE, equation (5) includes a list of investor-level covariates Z_i which contains an indicator variable that notes whether the foreign investor is involved with one or multiple transactions, the total number of real estate transactions of that foreign investor in previous years, as well as a dummy variable that equals one if the investor completed a deal in the preceding year. To capture source country fixed effects such as geographic distance to the destination states, culture and language differences between the source and host countries without sacrificing many degrees of freedom, I group the source countries based on their geographic continent and include a continent fixed effect variable η_t. Table 2.5 shows the distribution of source countries by their continents. Most of the FDIRE in U.S. come from investors in Europe, Asia, and North America.

2.6 Results

In this section, I first discuss the estimated effects of banking deregulation on the number

[10] These exclude the FDIRE transactions if missing investor name and recorded transaction value.

of FDIRE transactions using the balanced state-year panel data set[11]. Every specification in Table 2.6 includes year fixed-effects and state fixed-effects. Results in Column (1) are obtained by regressing the number of FDIRE transactions in a given state/year on the two banking deregulation indicators using a negative binomial model. The coefficients suggest that relaxing branching regulation raised the incidence of inbound real estate FDI deals by 50.9%, an effect that is significant at the 5% confidence level. This corresponds to a 66% [12] increase in the number of FDIRE projects, or equivalently 2.33 more deals in a given state in a year on average. In contrast, lifting the interstate banking restrictions is an insignificant factor for the average number of FDIRE deals. It suggests that host country financing plays an important role for foreign investment, and the response was mainly due to allowing banks to freely set up branches within states. The second specification estimated in column (2) includes additional covariates but no state-specific time trends ($\omega_s * Timetrend$). The resulting coefficients on the two banking deregulation indicator variables are insignificant even though the intrastate branching coefficient preserves the positive sign as in the first specification.

The third specification in Column (3) considers the full set of covariates, state and year fixed effects as well as state trends. It is the most preferred specification as it additionally controls for existing differences in state-specific time trends in the foreign acquisitions of U.S. real estate assets. The result indicates that removing intrastate branching restrictions leads to an average of 59.2% increase in the number of deals in a given year, which translates into 2.1 additional projects being completed after a state deregulates intrastate branching, an effect that is significant at the 5% confidence level. Compared to the first specification that only uses the two

[11] Since what matters is the actual number of FDIRE projects, I include transactions without reported value in the data set.
[12] $(e^{0.509}- 1)*100=66\%$

banking deregulation indicators as control variables, the estimated coefficients are smaller in magnitude but still suggests that allowing branching within states significantly attracted more real estate projects being acquired by overseas investors. The empirical evidence supports the literature that attributed changes in banking efficiency to intrastate branching deregulation. The insignificant coefficient on the interstate banking deregulation variable is consistent with Jayaratne and Strahan (1996) who document that the gradual removal of interstate banking restrictions had little impact on the costs of intermediation.

Other coefficients that are statistically significant show that foreign investors completed fewer deals in states where the state economy is larger. This could be due to higher competition with domestic investors among states that have stronger economies. Moreover, overseas investors prefer to invest in states where land prices are relatively lower but are more populous. The former reflects the cost of investment while the latter is directly linked to the demand for residential and commercial real estate properties, the estimated signs are broadly as expected. The state unemployment rate, which also captures the economic health of the states, exhibit a weak negative impact on foreign investors acquisition decisions. It is worth noting that, a comparison between results in Column (2) and (3) highlights the importance of controlling for state-trends in isolating the effects of the structural change in the banking system on the incidence of FDIRE deals.

Columns (4) - (6) in Table 2.6 report results obtained from the Poisson regressions which show that the estimated coefficients preserve the sign and significance as before. The estimated effects are somewhat larger in all specifications compared to results obtained using the negative binomial model. For example, the model that only uses the banking deregulation indicators as the control variables in column (4) suggest that intrastate branching attracts on average of 3.18 more

FDIRE projects in a given state annually as opposed to the 2.1 increase predicted by the Negative binomial estimation. Column (6) augments the model in column (4) with a full list of covariates and predicts an average increase in the number of FDIRE deals by 97.6%[13].

Table 2.7 presents results from estimating specification (2) which quantifies the impact of banking deregulation on (the natural logarithm of) the average transaction value. When using only the banking deregulation indicators as the control variables, neither coefficient on the interstate banking and intrastate branching deregulation in column (1) is statistically significant even though they both have negative signs. Adding the state-specific time trend term to the model in Column (2) changes the coefficient of the intrastate branching indicator to positive, however, it is still not statistically significant. Allowing for additional covariates in the model leads to a statistically significant, positive coefficient on the intrastate branching indicator of 0.45 as reported in Column (3). The implication is that following intrastate bank branching deregulation, the average transaction value of inbound real estate FDI transactions increased by 57%, which is equivalent to 20.2 million dollars. As real estate investment is heavily leveraged, the predicted effect is consistent with the hypothesis that easier access to credit following the deregulation could lead to more expensive projects being pursued by foreign investors. The positive coefficient on (the logarithm of) the gross state product variable suggests that the average size of real estate deals being completed by foreign investors is significantly higher in states where the economy is larger. Meanwhile, states with a faster GSP growth rate experience lower transaction values. The results further suggest that higher population density is associated with smaller average deal size, while land prices and transaction values are positively related.

Column (4) through (6) further include the source country fixed-effects by allowing

[13] $(e^{.681}-1)*100=97.6\%$.

additional dummy variables that indicate the continent where the source country is located. Using the banking deregulation indicators as the only predictor variables while controlling for state-specific time trends and source country fixed-effects yields a positive coefficient on the intrastate branching deregulation variable as shown in Column (4). The coefficient on the intrastate branching indicator becomes statistically significant with the inclusion of covariates. According to Column (5), after a state has adopted intrastate branching deregulation, the average transaction size of FDI real estate deals increases significantly by 63%.

Table 2.8 shows the regression results when adding three investor specific covariates to the previous model. While whether or not the foreign investor has invested before does not exhibit any statistically significant influence over the average transaction size, the evidence does reveal that multiple transaction investors invested significantly more compared to their single transaction counterparts. On average, repeat investors invest 0.58% or 0.27 million dollars more relative to one-time investors. The last column in Table 2.8 is a full-blown model that includes the state-specific time trends, the source-country-specific effects, and the foreign investor specific effects. The estimated coefficients for the gross state product, its growth rate, population density, and the real land price variables are similar to the results in Table 2.8.

2.7 Robustness

The findings so far inform us that allowing banks to set up new branches through intrastate branching deregulation significantly boosted the incidence and intensity of FDI inflow into the real estate sector. To examine whether deregulations had a different impact for projects of varying sizes, I further divide the data into two sub-groups using either the mean or median transaction value as cutoffs. As is shown in Table 2.9, subsequent to the intrastate branching deregulation, the real value of FDIRE deals rose by 43% for transactions that are smaller than the

median value. Table 2.9 also reveals that the coefficient on interstate banking deregulation indicator is weakly significant at the 10% confidence level, confirming the hypothesis that changes in the interstate banking regulations causes a reduction in the size of FDIRE projects. This empirical evidence is consistent with previous research highlighting the significance of removing interstate banking on FDI. Moreover, FDI projects that are smaller than the mean value are also more responsive to changes in the banking structure via intrastate branching and the positive effect is strongly significant at the 1% significance level. A potential explanation for this is that small-sized deals tend to be completed by small and medium-sized foreign investors who are more likely to be affected by financial constraints than large enterprises who have ample cash flow on their balance sheets or could raise funds through equity or bond markets. The former are thus more sensitive to changes in the financing environment due to their high dependence on bank loans, and as the credit market condition improves will choose to participate in an increasing number of small-sized projects.

To further investigate whether smaller or larger deals are more likely to be affected by banking deregulations, I present results from quantile regressions. Quantile regression has gained increasing popularity in cross-sectional econometrics; it estimates the impact of covariates on the quantile of the dependent variable. Conditional on the size of the transaction value, I group FDIRE transactions into four size categories and rerun the preferred specification which includes the whole list of covariates and state trends. The results are provided in Table 2.10 and they indicate that intrastate bank branching led to an increase in the FDIRE transaction value for every percentile group, but the effect is most pronounced and statistically significant for the 25% percentile subgroup. This further supports the hypothesis that small to median sized deals benefited the most from the adoption of the intrastate bank branching deregulation.

2.8 Concluding Remarks

Using transaction-level data from the ITA over the period of 1977 to 1994, this paper has presented evidence which shows that banking deregulations matter for inward US FDI in the real estate sector. The main contribution of this analysis is to argue that intrastate branching deregulation significantly boosted the incidence of FDI transactions while in the meantime, increased the average transaction value in a given state and year. Unlike related works in this line of research that attributed the causal link on the inward FDI in manufacturing sector to interstate banking deregulation, FDI flowing into the U.S. real estate sector were mostly driven by the intrastate branching deregulation. In terms of the timing, most states removed intrastate branching restrictions before they opened up for interstate banking. The latter does not exhibit a significant impact on FDI in U.S. real estate along the extensive nor the intensive margin.

The key channel through which this occurs is because intrastate branching deregulation effectively increased competition within deregulated states leading to greater efficiency. As the regulatory rules on branching were lifted, assets moved more efficiently toward better-run banks. This reduced the overall cost of capital, allowed credit to be more easily accessible to borrowers and as a result, caused more overseas investors to acquire U.S. real estate assets taking advantage of the funds they were able to raise locally.

The empirical evidence also reveals that foreign investors had a locational preference for states with high population density and low land prices and invested more projects in states that fit these profiles. This is broadly consistent with the view that demand for residential and commercial real estate properties are higher in more populated areas. On the other hand, the average size of FDI in the real estate sector is larger in states that had bigger economies but were growing at a slower rate. The average transaction value is also bigger in states that were less

populated and in states where the land prices were relatively higher. Finally, evidence from fixed-effect quantile regressions reveals that the impacts of the intrastate branching deregulation are most pronounced for small-sized deals.

Since FDI activities are not only affected by the host country credit conditions but are also likely to be influenced by source country banking health and financial depth, future effort can be focused on adding variables that capture the source country's financial development. For example, Kandilov et al. (2016) find that the financial depth in a source country significantly boosts the number of cross-border M&A transactions. They also point out that interstate banking deregulation in the host state provided easier access to credit and more permissive liquidity conditions, which could substitute source country credit market development. The interplay between two alternative sources of funds from the source and local economy have strong implications for MNEs.

Another direction to further extend this analysis is to consider an important FDI determinant which is the exchange rate. It is an essential component of the massive flows of international investment as it can affect relative prices, balance sheets and hence the functioning of financial markets. MNEs must factor in the potential risk associated with currency uncertainty in making cross-border investment decisions and take necessary measures to protect themselves against unfavorable fluctuations. How exactly does the exchange rate affect firm decisions in the context of foreign direct investment is yet to be understood and provide plentiful ground for future research.

Table 2.1 Descriptive statistics. Panel A. summarizes main characteristics of the variables used in the regression analysis. Panel B. reports the distribution of modes of entry for the inbound FDI in real estate related transactions. Panel C. records the distribution of the number of inbound FDIRE transactions from the top five source countries.

Panel A. Main Characteristics

Variable	Mean	Std.Dev	Min	Median	Max
Transaction value (in 1983 $, millions)	35.44	84.3	0	8.77	1791.19
Number of transactions (in state and year)	3.55	12.65	0	0	235
Interstate banking	0.47	0.5	0	0	1
Intrastate branching	0.63	0.48	0	1	1
Gross State Product (in 1983 $, millions)	79591.07	92345.27	5501.01	50740.96	589415.6
Population Density (persons/ sq mi)	161.65	231.83	0.7	79.05	1080.86
Unemployment Rate (%)	6.64	2.08	2.28	6.38	17.45
Real Wage (weekly, in 1983 $)	398.57	454.34	6.63	246.04	2890.49
Corporate Tax (%)	6.49	2.81	0	6.65	12.25
Number of foreign trade zone	2.27	2.94	0	2	27
Market potential (in 1983 $, millions)	5427.38	2230.36	749.09	5242.99	12924.23

Panel B. Mode of Entry (Excluding missing value)

Investment Type	Freq.	% of All Transactions
Real estate	1,578	83.18
Merges and acquisitions	263	13.86
Joint venture	21	1.11
Other	21	1.11
Equity increate	10	0.53
New plant	3	0.16
Plant expansion	1	0.05

Panel C. Top nationality	Freq.	% of All Transactions
Canada	394	20.97
Japan	383	20.38
Netherlands Antilles	255	13.57
United Kingdom	168	8.94
Netherlands	125	6.65

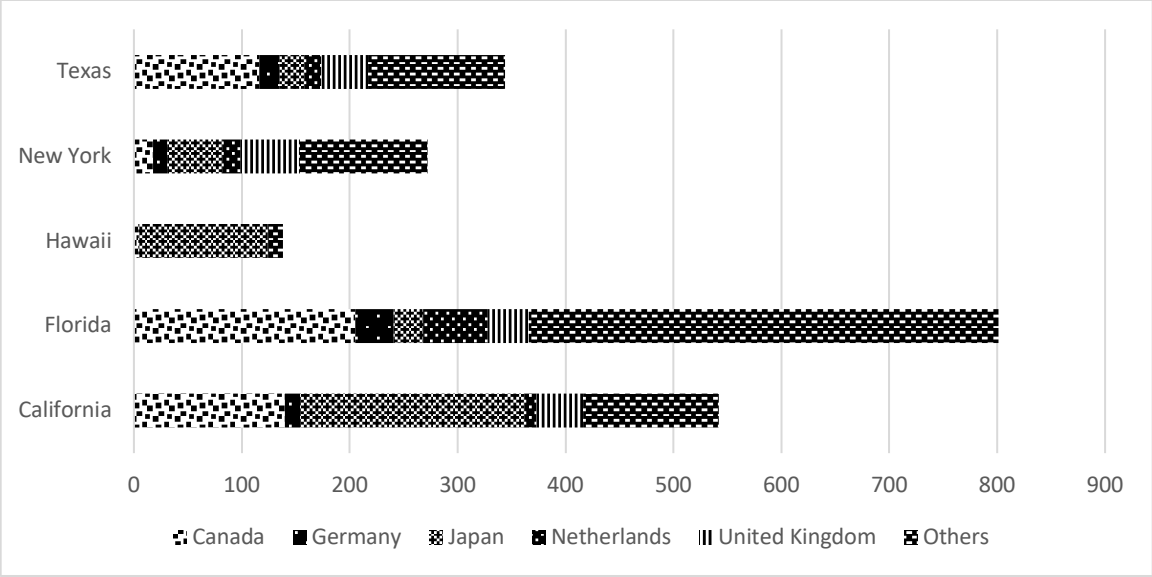

Figure 2.1 Distribution of foreign investors among the top 5 hosting states (Florida, California, Texas, New York, and Hawaii) for the number of inbound FDIRE transactions (the extensive margin), 1977-1994.

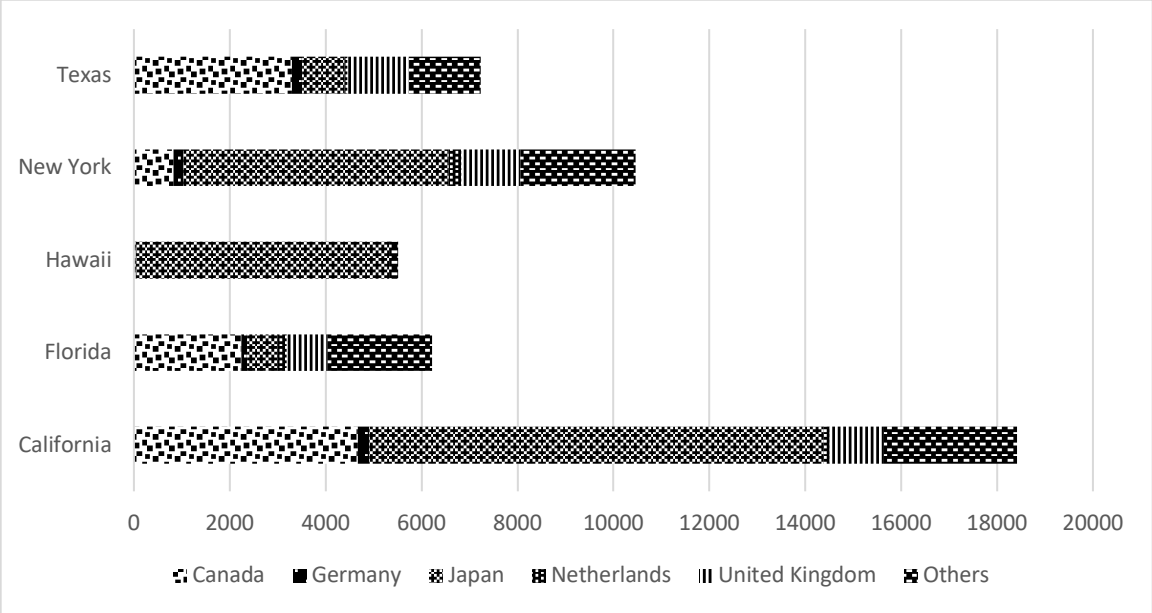

Figure 2.2 Distribution of foreign investors among the top 5 hosting state (Florida, California, Texas, New York, and Hawaii) for the average transaction value of inbound FDIRE (the intensive margin), 1977-1994.

Table 2.2 Detailed percentage distribution of FDIRE by region, division and state, 1977-1994 (extensive margin).

Region I: Northeast	**% of U.S.**	**12.38**
CT	0.63	Division 1
MA	1.42	New England
ME	0.05	
NH	0.05	
RI	0.11	
VT	0.05	
NJ	0.79	Division 2
NY	8.22	Mid Atlantic
PA	1.05	

Region II: Midwest	**% of U.S.**	**4.69**
IL	2.27	Division 3
IN	0.32	East North Central
MI	0.42	
OH	0.42	
WI	0.16	
IA	0.21	Division 4
MN	0.63	Wes North Central
MO	0.21	
ND	0.05	

Region III: South	**% of U.S.**	**51.32**
FL	29.19	Division 5
GA	5.22	South Atlantic
MD	1.42	
NC	0.79	
SC	0.32	
VA	2.32	
WV	0.11	
AL	0.11	Division 6
KY	0.37	East South Central
TN	1.05	
AR	0.05	Division 7
LA	0.42	West South Central
OK	0.37	
TX	9.59	

Region IV: West	**% of U.S.**	**31.61**
AZ	2.05	Division 8
CO	3.27	Mountain
ID	0.05	
MT	0.05	
NV	0.58	
UT	0.16	
AK	0.21	Division 9
CA	17.39	Pacific
HI	5.27	
OR	1.26	
WA	1.32	

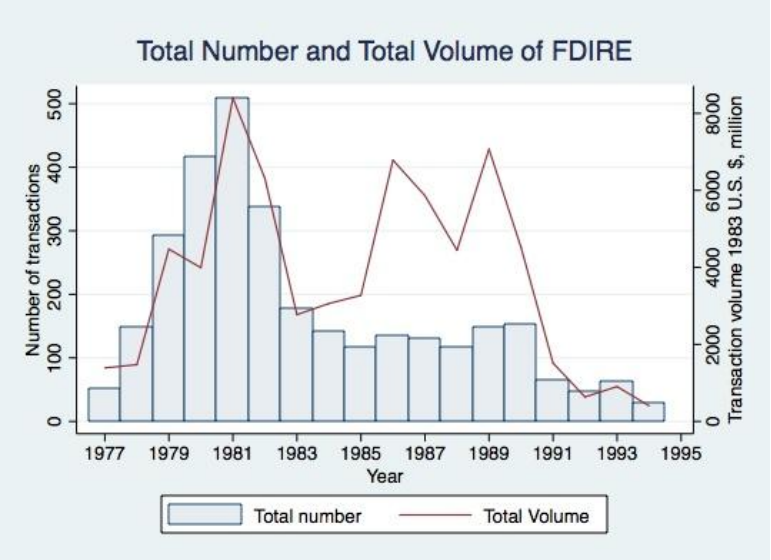

Figure 2.3 Total number (left axis) and total volume (right axis) of FDIRE in U.S., 1977-1994.

Table 2.3 List of the number of deregulated states by year.

Year	Interstate banking	Intrastate branching
1977	0	14
1978	1	15
1979	1	16
1980	1	17
1981	1	19
1982	3	20
1983	5	21
1984	8	22
1985	17	26
1986	27	28
1987	36	33
1988	40	39
1989	42	40
1990	43	44
1991	45	46
1992	46	46
1993	47	47
1994	47	48

Table 2.4 Tabulation of repeated investor, excluding FDIRE transactions with unidentified investor. This reduces the sample to 1718 observations. I further group the foreign firm based on whether they are associated with multiple transactions during the sample period.

Repeated investor	Freq.	Percent
0	1391	77.24
1	391	22.76
Total	**1,718**	**100**

Table 2.5 Distribution of FDIRE transactions by source country continent.

Continent	Freq.	Percent
Africa	31	1.66
Asia	527	28.26
Europe	801	42.95
North America	446	23.91
Oceania	32	1.72
South America	28	1.5
Total	**1865**	**100**

Table 2.6 The impact of interstate banking and branching deregulation on the total number of transactions in the U.S. real estate sector, 1977–1994. The dependent variable is the total number of FDIRE transactions in a given state and year. The two indicator variables Intrastate banking and Interstate branching equal to one starting in the year in which the state allowed statewide bank branching and interstate banking, respectively, and zero otherwise. All specifications include a full set of state and year fixed effects. Robust standard errors clustered at the state. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

	(1)	(2)	(3)	(4)	(5)	(6)
Interstate banking	0.21	-0.09	0.08	-0.05	-0.42	-0.14
	(0.25)	(0.34)	(0.28)	(0.22)	(0.32)	(0.21)
Intrastate branching	0.51**	0.22	0.47**	0.64**	0.22	0.68***
	(0.23)	(0.19)	(0.22)	(0.25)	(0.20)	(0.22)
Ln (Real GSP)		-0.24	-2.46**		-0.13	-2.06**
		(0.91)	(1.12)		(0.99)	(0.99)
GSP Growth Rate		0.00	0.01		0.03	0.03
		(0.02)	(0.03)		(0.02)	(0.02)
Unemployment		-0.10*	-0.08		-0.09*	-0.08
		(0.06)	(0.08)		(0.06)	(0.07)
Ln (Real Wages)		-0.91	-0.54		-1.08	-1.01
		(0.74)	(1.88)		(0.86)	(2.13)
Corp Tax Rate		-0.01	-0.04		-0.18	-0.15
		(0.12)	(0.12)		(0.18)	(0.19)
Foreign Trade Zone		0.01	0.04		-0.01	0.05
		(0.02)	(0.07)		(0.02)	(0.05)
Ln (MarketPotential)		13.91*	9.72		-2.43	1.26
		(8.30)	(9.59)		(10.82)	(9.05)
Population Density		0.01	0.06**		-0.00	0.10***
		(0.01)	(0.03)		(0.01)	(0.03)
Ln (Real Land Price)		-0.57	-1.41***		-0.41	-1.29***
		(0.41)	(0.51)		(0.45)	(0.48)
Observations	864	864	864	864	864	864
State trends	Yes	No	Yes	Yes	No	Yes
Model Specification	NB	NB	NB	Poisson	Poisson	Poisson

Robust standard errors in parentheses

Table 2.7 The impact of interstate banking and branching deregulation on average FDI transaction value in the U.S. real estate sector, 1977–1994. The dependent variable is the natural logarithm of the real value of transaction *i* in state *s* from source country *c* and in year *t*. The two indicator variables Intrastate banking and Interstate branching equal to one starting in the year in which the state allowed statewide bank branching and interstate banking, respectively, and zero otherwise. Robust standard errors clustered at the state level are reported in parentheses. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

	(1)	(2)	(3)	(4)	(5)	(6)
Interstate banking	-0.26	-0.30	-0.09	-0.34	-0.11	-0.01
	(0.21)	(0.24)	(0.24)	(0.25)	(0.24)	(0.24)
Intrastate branching	-0.01	0.40	0.45**	0.41	0.49**	0.40**
	(0.26)	(0.27)	(0.21)	(0.24)	(0.19)	(0.17)
Ln (Real GSP)			6.67***		6.64***	6.06***
			(1.71)		(1.78)	(2.24)
GSP Growth Rate			-0.09**		-0.09**	-0.09**
			(0.04)		(0.04)	(0.04)
Unemployment			-0.06		-0.06	-0.04
			(0.09)		(0.09)	(0.10)
Ln (Real Wages)			-0.39		-0.42	-0.43
			(1.64)		(1.69)	(2.04)
Corp Tax Rate			-0.42		-0.43	-0.46
			(0.33)		(0.30)	(0.34)
Foreign Trade Zone			-0.02		-0.03	-0.05
			(0.09)		(0.09)	(0.09)
Ln (Market Potential)			0.47		-1.45	2.95
			(10.97)		(11.04)	(9.89)
Population Density			-0.18***		-0.17***	-0.16**
			(0.05)		(0.05)	(0.06)
Ln (Real Land Price)			1.81***		1.72***	1.96***
			(0.52)		(0.56)	(0.58)
Observations	1,888	1,888	1,857	1,866	1,866	1,866
R-squared	0.23	0.27	0.29	0.29	0.31	0.35
State trends	No	Yes	Yes	Yes	Yes	Yes
Source country FE	No	No	No	Yes	Yes	Yes
Source country* year FE	No	No	No	No	No	Yes

Table 2.8 The impact of banking deregulation on the logarithm of transaction values with additional variables that capture investor specific characteristics, 1977–1994. I create three additional variables: multiple transaction investor, invested before, and the number of previous investments. Columns (1) and (2) present the results for a specification that uses only the banking deregulation indicators, the investor characteristic variables, state fixed-effects, and state trends. Column (2) augments the Column (1) specification with additional covariates. In columns (3) and (4), I gradually include source country fixed effects, and an interaction term for source country and year fixed effects. Robust standard errors clustered at the state level are reported in parentheses. For the sake of degrees of freedom, I group the source country based on the continent that it belongs to. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

	(1)	(2)	(3)	(4)
Interstate banking	-0.17	0.00	-0.02	0.03
	(0.26)	(0.27)	(0.28)	(0.24)
Intrastate branching	0.47*	0.58**	0.56**	0.46***
	(0.27)	(0.24)	(0.22)	(0.16)
Multiple Transaction Investor	0.58***	0.59***	0.56***	0.58***
	(0.10)	(0.10)	(0.10)	(0.11)
Invested Before	0.32	0.29	0.34	0.29
	(0.25)	(0.25)	(0.26)	(0.25)
No. Previous Investments	0.04***	0.04**	0.03*	0.03
	(0.02)	(0.02)	(0.02)	(0.02)
Ln (Real GSP)		6.83***	6.66***	5.74**
		(1.91)	(2.08)	(2.19)
GSP Growth Rate		-0.09**	-0.08**	-0.08**
		(0.04)	(0.04)	(0.04)
Unemployment		-0.03	-0.03	-0.01
		(0.10)	(0.11)	(0.11)
Ln (Real Wages)		-0.06	0.05	0.28
		(2.09)	(2.26)	(2.46)
Corp Tax Rate		-0.33	-0.36	-0.37
		(0.30)	(0.29)	(0.33)
Foreign Trade Zone		-0.02	-0.04	-0.04
		(0.08)	(0.08)	(0.09)
Ln (Market Potential)		-3.06	-3.56	1.36
		(11.37)	(11.76)	(10.32)
Population Density		-0.15***	-0.14**	-0.12*
		(0.05)	(0.06)	(0.06)
Ln (Real Land Price)		1.28***	1.13**	1.39**
		(0.47)	(0.46)	(0.54)
Observations	1,708	1,702	1,696	1,696
R-squared	0.34	0.3	0.37	0.41
State trends	Yes	Yes	Yes	Yes
Source country FE	No	No	Yes	Yes
Source country* year FE	No	No	No	Yes

Table 2.9 The impact of interstate banking and branching deregulation on the logarithm of transaction values using the median and mean transaction values as cutoffs, 1977–1994. Using the median and mean transaction value, I divide the individual transaction into four subsamples and run the specification of column (2) in table 2.8. The model contains the interstate banking and intrastate branching deregulation indicators, a full set of covariates, the state and year fixed-effects, and the state specific time trends.

	(1)	(2)	(3)	(4)
VARIABLES	<p50	>=p50	<=mean	>mean
Interstate banking	-0.40*	-0.06	-0.21	0.38
	(0.22)	(0.21)	(0.34)	(0.27)
Intrastate branching	0.43***	0.12	0.58***	0.60
	(0.15)	(0.15)	(0.19)	(0.53)
Observations	917	940	1,184	704
R-squared	0.16	0.19	0.17	0.15
Covariates	Yes	Yes	Yes	Yes
State trends	Yes	Yes	Yes	Yes

Table 2.10 Quantile regression for the impact of banking deregulation on the value of FDIRE, 1977-1994. Using the transaction value as the dependent variable, I run a quantile regression for with the interstate banking and intrastate branching deregulation indicators, a full set of covariates, the state and year fixed-effects, and the state specific time trends.

VARIABLES	.1	.25	.5	.75	.9
Interstate banking	-0.43	-0.04	-0.06	0.19	-0.16
	(0.32)	(0.29)	(0.29)	(0.28)	(0.40)
Intrastate branching	0.55	0.79**	0.49	0.17	0.20
	(0.36)	(0.32)	(0.32)	(0.31)	(0.45)
Observations	1,888	1,888	1,888	1,888	1,888
State trends	Yes	Yes	Yes	Yes	Yes
State fixed-effects	Yes	Yes	Yes	Yes	Yes
Year fixed-effects	Yes	Yes	Yes	Yes	Yes

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CHAPTER 3

The Impact of Exchange Rate Risk on Inbound FDI in the U.S. Real Estate Sector

3.1 Introduction

Since the dissolution of the Bretton Woods system in 1973 that allowed the exchange rate to float, risks associated with unexpected exchange rate movements has become a greater concern for MNEs. As an increase in risk will usually induce risk-averse agents to look for less risky alternatives, an increase (decrease) in exchange rate risk is considered detrimental (beneficial) to FDI. However, the reality is not as simple as the common notion and even economic theory fails to offer a clear-cut prediction as to how exchange rate risk should affect FDI. De Grauwe (1988) illustrate the ambiguity of the impact of exchange rate volatility on international trade using a simple theoretical model of production and export[14]. According to his model, although an increase in exchange rate risk may reduce welfare, it may also induce the producers to export more if they are sufficiently risk averse[15]. Thus, the conventional understanding of the negative effects of exchange rate variability on international trade lacks a solid theoretical basis.

While in the long run, exchange rate dynamics are closely related to macroeconomic fundamentals, fluctuations in the short-run are usually driven by forces such as bandwagon

[14] He also illustrates the "political economy effect of exchange rate variability" which might result in a negative impact on international trade.

[15] The degree of risk aversion determines whether the first order condition of the expected utility is convex or concave. If producers are risk averse, the coefficient of relative risk aversion is greater than 1. It follows that an increase in exchange rate risk raises the expected marginal utility of export revenue thus encourage firms to export more.

effects, overreaction to news, as well as excessive speculation and technical trading[16]. Thus, movements in exchange rates are largely unpredictable (Meese and Rogoff (1983)), making the impact of fluctuations in the exchange rate on FDI even harder to predict. Similar to the theoretical ambiguity, existing empirical analyses on the trade impact of the exchange rate have also been characterized by mixed findings. For example, Cushman (1988) documented a positive relationship between exchange rate risk and inward FDI into the US. Wei (1999) and Rose (2000) identified a significant negative relationship between these two. Tenreyro (2003) and Hondroyiannis et al. (2005) in contrast, found no significant evidence of such a negative impact of exchange rate risk on trade.

The ambiguity is due in part to the development of the financial system in the past two decades which has been offering a growing variety of financial instruments for hedging currency movements. In economies where the financial market is able to provide a rich set of hedging instruments, future movements in exchange rates can be mitigated or hedged away through the use of financial derivatives such as forward contracts. This is especially so in developed countries where foreign exchange markets are typically more efficient and liquid than in developing economies. A majority of foreign investors in the U.S. real estate market are in fact overseas pension funds, insurance companies, sovereign governments, and multinational corporations who are skilled at managing market risk using available financial instruments. The availability of these tools allows multinational firms to hedge against exchange rate risk and market swings, leaving the exchange rate effect on FDI negligible.

The impact may have been further dampened with the integration of the global market. As MNEs are companies that are domiciled in one country but have operations in various

[16] Cheung and Chinn (2001) came to this conclusion by surveying a large number of interbank foreign exchange traders.

countries in the world, fluctuations of different exchange rates in their portfolio may have offsetting effects on their profitability. For longer-term investments, MNEs may also borrow in local currency to offset their commitments. For example, Graham and Harvey (2001) point out that foreign exchange risk is the most important nonmarket risk factor for large firms and hedging against currency fluctuations is the primary motivation for issuing debt in a foreign currency. Due to the usage of these hedging and offsetting strategies, the MNEs' net exposure to exchange rate risk is limited and the impact of fluctuations in the exchange rate risk is barely observable.

This paper intends to revisit this empirical issue and examine whether fluctuations in the exchange rate matter for FDI in the real estate sector. More specifically, we investigate whether a more volatile currency exchange rate is detrimental or conducive to foreign investment activities. Because exchange rate measures the relative price of a currency, this is a study of the real effect of a nominal variable. To our knowledge, this is the first study in this line of research that estimates the effects of exchange rate and exchange rate uncertainty on inbound FDI in the U.S. real estate sector.

Acquisition of U.S. real estate assets entitles the foreign acquirer to a claim to the future stream of dollar-denominated profits. The foreign exchange rate could be an important factor to FDI as it may influence the investment decisions such as the location and magnitude of FDI flows (Goldberg and Kolastad (1995)). The level of the currency exchange rate may affect the relative value and attractiveness of the project at the time the investment decision is being made (e.g. Froot and Stein (1991)). It may also affect the project's realized rate of return as foreign investors convert the profits back to their home currency. There is an abundant literature surrounding the relationship between exchange rates and FDI, however previous work has only

examined the issue for the total volume (the intensive margin), this paper is novel in analyzing the impact along both the extensive margin, the number of FDI projects, and the intensive margin, the total dollar volume.

The theoretical basis of this paper builds on the classic work of Froot and Stein (1991) and De Grauwe (1988). The former examines how FDI is affected by changes in the level of the exchange rates, while the latter ties the slowdown in the growth rate of international trade to the variability of exchange rates under a flexible exchange rate regime. These papers do not consider the role of the capital market and thus their analysis precludes the possibility that firms may use various financial instruments to mitigate exchange rate risk. My main contribution comes through expanding earlier research in a number of dimensions to provide some novel empirical evidence on the impact of the level and the volatility of the exchange rate on FDI inflows in the U.S. real estate sector. To this end, I reassess the relative wealth channel hypothesis proposed by Froot and Stein (1991) by examining how interactions of exchange rate fluctuations and capital market imperfections affect cross-border acquisitions of U.S. real assets.

Buying an office building, hotel, or a mixed-use development involves putting down money on immobile assets, the transaction can be time consuming and costly due to various fees, expenses, and taxes. As investment decisions are made well in advance of the realization of the exchange rate, it could be expensive to adjust the scale of the project in response to shifts in the projects' profitability due to fluctuations in the exchange rate. To quantify the impact of exchange rate uncertainty on FDI, I seek to evaluate two competing views surrounding the relationship between the two. The first hypothesis is related to Abel (1983) who developed a model to study investment decisions of risk-neutral competitive firms facing convex costs of adjustment. He argues that higher output price uncertainty leads to an increase in the optimal rate

of investment. Extending his framework to the open economy implies that macroeconomic uncertainty such as exchange rate volatility should boost FDI activities.

Dixit and Pindyck (1994) offer a different view. Although unpredictable fluctuations in a macroeconomic variable may increase the expected value of future payoffs from an investment project, it may also lead to postponement of investment by giving the investor an option to take action until the uncertainty is resolved. Moreover, movement in the exchange rate can be a double-edged sword to FDI. While a stable currency exchange rate reduces the uncertainty in the future income stream and profit, it also rules out the potential opportunity to profit from large swings in the currency that work in the investors' favor.

In some situations, a volatile exchange rate might present an attractive opportunity to score a higher return on the investments than when the exchange rate is relatively stable. In a seminal finance literature about real options originally proposed by Myers (1977), an option exists when a company has the right, but not the obligation, to perform a deal on real assets. FDI fits this definition and could be considered as a real option which allows the firm to postpone an investment decision until additional information is received or when uncertainty is resolved. Like any option, the value of a real option is enhanced by volatility in the underlying relationship. If the option value of waiting outweighs the potential profit from higher uncertainty, a negative relationship is expected between macroeconomic uncertainty and FDI.

An important FDI related theory that I also seek to evaluate is the cheap financial capital hypothesis proposed by Baker et al. (2004). They found that MNEs tend to take advantage of the temporary overvaluation in the domestic stock market which decreases their cost of financial capital. The lower cost of financial capital could be a result of the issuance of new equity or a lower cost of debt due to higher valuation in the value of the collateral. Because the common

credit scoring models often use share price as a key input to evaluate credit risk, overpriced shares can inflate the perceived collateral values which in turn help to bring down the cost of debt for those firms. In either case, FDI may reflect an arbitrage incentive by multinationals driven by temporary mispricing in the source country capital market. Specifically, their theory hypothesizes that FDI is higher when financial capital in the source country is cheap, which can be captured by the country-level stock-market-capitalization-to-GDP ratio.

Methods for measuring exchange rate volatility have evolved over time thanks to advances in econometric techniques, but the simple and reliable measure of standard deviation remains the most commonly used. Because the empirical regularities of exchange rates are characterized by serial dependence and volatility clustering, Bollerslev (1986) extended the ARCH model in Engle (1982) to the GARCH model which estimates the conditional variance of the error term as an autoregressive-moving average (ARMA) process. The GARCH method has gained increasing popularity in academia and industry in modeling risk and developed into a number of variants, such as the GARCH-M estimator with corrections for leptokurtic errors, exponential GARCH (EGARCH) model, etc. to capture the asymmetry in volatility clustering and the leverage effect in the exchange rate.

Using the standard deviation of the exchange rate and volatilities estimated based on the GARCH method which accounts for the conditional time-varying nature of exchange rate risk, the main findings of this paper may be summarized as follows. Results from the panel data fixed effect OLS estimation suggest that an increase in the nominal exchange rate (dollar appreciation) significantly reduces the total number and the average volume of inbound FDIRE from a foreign source country. A higher realized exchange rate volatility does not seem to have a statistically significant impact in most cases. Evidence based on the GARCH volatility does seem to suggest

that a higher realized exchange rate volatility may be viewed as a favorable opportunity thus attracting a larger inflow of foreign capital into the U.S. My findings also indicate the existence of a cheap capital channel, through which source country financial development may influence FDI, as MNEs seize the opportunity to utilize a cheaper cost of funding due to temporary stock market mispricing.

The remainder of this chapter proceeds as follows: Section 3.2 reviews the related literature. Section 3.3 presents the data to motive key research questions, Section 3.4 shows how the exchange rate volatilities are measured. Section 3.5 discusses the empirical method taken and the model to be estimated. Section 3.6 presents the main empirical findings. Section 3.7 concludes.

3.2 Literature Review

A commonly held view on the FDI effects of exchange rates is that a weak currency exchange rate in the host country increases while a strong currency deters foreign inflows of capital[17]. A variety of theories have been developed to understand the underlying mechanism behind the negative relationship between the two. For example, Froot and Stein (1991) document a strong correlation between the detrended FDI inflow and the real dollar exchange rate. In trying to understand the surge in FDI into the U.S. during an episode of weak dollar valuation in the late 1980s[18], they propose investors' net worth is an important channel through which exchange rates may affect the demand for direct investment and influence foreign capital flows. They coined the term "the relative wealth channel". In the spirit of Townsend's costly state

[17] Cushman (1985), Froot and Stein (1991), Klein and Rosengren (1994), and Blonigen (1997).
[18] It should be noted that the costly state verification theory applies to small privately-owned companies since larger firms can often resort to equity finance.

verification (1979), the information asymmetry related to an asset's payoff prevents the lender from knowing the profit of the project without paying a monitoring cost. Due to these imperfections, external finance is usually more expensive than internal finance, creating a wedge between the two. As entrepreneurs must finance a fraction of the deal using internally generated funds through accumulated net worth, the existence of capital market imperfections allows movements in the currency exchange to affect the relative wealth of firms across countries. Changes in relative wealth thus play a role in the outcome of the deal by influencing the agent's demand for host country assets and the bidding values they put forward.

While the "relative wealth channel" emphasizes the role of the exchange rate in determining the bid amounts made by offshore investors and thus the successful buyer of the acquisition, a comparable theory proposed by Blonigen (1997) highlights the exchange rate adjusted return to the foreign firms using the firm-specific assets[19] purchased from the host country. He points out that the observed drastic short-run swings in the U.S. inward acquisition FDI during the 1980s and 1990s are too large to be solely accounted for by the comparative costs or transaction cost theory between the U.S. and the source countries alone. Using Japanese acquisitions in the U.S., he presents empirical evidence that suggests FDI decisions are influenced by exchange rate movements. The effect is especially pronounced when the underlying assets being acquired can be used to generate returns in currencies other than the currency of the host country.

To evaluate which theory is more in line with empirical evidence, Klein and Rosengren (1994) conduct a "horse race" between the relative wealth and the relative wage theories by constructing four different measures of inward FDI from seven industrial countries. They favor

[19] such as technology-related high research and development manufacturing industries.

using the relative wealth channel to explain the observed negative co-movements between the FDI inflow and the value of the dollar. In a series of related work, Peek and Rosengren (1997, 2002, 2005) document the difficulty with Japanese banks due to the collapse of the Japanese real estate market and tie it to the inbound FDI into the U.S. by Japanese investors. They propose using the relative access to credit (RAC) hypothesis as a way to understand the puzzling pattern of continued decline in the U.S. inbound FDI from Japanese firms during periods of dollar depreciation since late 1985. As the availability of external finance differs across firms and across time, their analysis highlights that the credit channel affects a firm's FDI decisions in meaningful ways. Following the deterioration of bank credit due to troubles in the Japanese real estate market, states that were heavily dependent on the source of finance from Japanese banks showed lower construction activity in the U.S.

While various theories have been developed seeking to establish a causal link between the rise and fall of FDI and exchange rates, the channels through which exchange rate volatility can potentially affect FDI have also inspired abundant research. According to Abel (1983), a higher price uncertainty is associated with higher investment regardless of the shape of the marginal adjustment cost function. Cushman (1988) suggests higher price uncertainty can raise the expected profitability of a project leading to a higher level of investment if the investors are risk neutral. Sung and Lapan (2000) show that exchange rate uncertainty raises FDI by a risk-neutral MNE. On the other hand, due to the irreversibility of FDI and the large such cost, MNEs tend to delay investment decisions facing large uncertainty to avoid making any costly mistakes, such as in Dixit and Pindyck (1994). Goldberg and Kolstad (1995) established a positive relationship between exchange rate volatility and the share of FDI in total investment, using quarterly U.S. bilateral FDI flows to four developed countries.

Building on the theory developed by Dixit (1989), Campa (1993) addresses the effects of real exchange rate volatilities on FDI in the U.S. among wholesale industries by foreign manufacturing firms. His evidence supports the view that a more volatile exchange rate is associated with a lower number of foreign investments. However, as many studies have pointed out, the estimated impacts across industries are not homogeneous. Among industries that require more sunk costs in physical and intangible assets, the responses to exchange rate fluctuations are more pronounced than others. Furthermore, responses to real exchange rate uncertainty across countries are not uniform. While the coefficients on exchange rate volatility, sunk costs and the forward-looking expectations of the exchange rate trend variables are significant for Japanese investors, the same Tobit estimation for England and Germany are not.

Existing empirical work on the determinants of FDI has featured a number of macroeconomic factors. For example, Ray (1988) identifies the relative growth in GNP across countries and changes in currency exchange rates as the key drivers for FDI into the U.S. during the period of 1979 to 1985. Devereux and Lane (2002) model bilateral exchange rate variability across countries and argue that large stocks of unhedged external debt have important implications on the financial sector and corporate balance sheets. Their evidence indicates the negative relationship predicted by economic theory between a country's financial linkage with its creditor country and the level of bilateral exchange rate only applies to developing countries. For industrial nations, the Optimal Currency Area (OCA) factors[20] have much bigger roles in explaining exchange rate volatility than the stock of external debt.

Given that previous research usually employs a quite varied list of variables in explaining the observed fluctuations of FDI, Blonigen and Piger (2014) provide a systematic investigation

[20] The OCA hypothesis by Mundell (1961) which identified factors such as trade interdependence and the degree of commonality in economic shocks.

using the Bayesian method. They survey a comprehensive list of 56 variables as potential covariates. Their results suggest using the gravity variables, cultural distance factors, parent-country per capita GDP, relative labor endowments, and regional trade agreements for modeling FDI in a parsimonious form are most desirable.

In addition to the traditional trade and macroeconomic variables being used to explain the inflows of foreign capital, recent literature tends to put more emphasis on the role of the capital market. To understand how stock market mispricing could affect inflows and outflows of FDI, Baker et al. (2009) highlight the importance of the cheap capital theory[21]. They find that firms tend to take advantage of the temporary overvaluation in the stock market due to a domestic bubble. If a firm knows its stock price is overvalued, it can benefit from using either the newly raised capital or from the lower cost of debt as overvaluation raises the perceived collateral value. Contrary to the cheap capital channel, the cheap asset channel is a distinct theory which posits higher FDI inflow is a response by the foreign investor to undervalued assets being bought from the host country (See for example, Shleifer and Vishny (1992), Krugman (1998) and Aguiar and Gopinath (2005)). Under this rationale, undervaluation can be triggered by fire-sales of financially distressed firms in cases of a liquidity crisis or a stock market crash. The empirical findings by Baker et al. (2009) underscore that the cheap capital theory is more relevant in explaining the increase in FDI than the cheap asset channel since it is easier for the firm to know the mis-valuation of their own value than to identify temporary mis-valuation of target asset in a foreign host country.

Many previous researches have pointed out that FDI studies need to employ disaggregated analyses using industry and country level data (see for example McKenzie (1999),

[21] The term "mispricing" refers to deviations from a theoretical, integrated and efficient world capital market benchmark price.

Blonigen (1997), Cho et al. (2002), Kandilov (2008)). The analysis of country-level aggregated data may result in ambiguous findings as responses to changes in the exchange rate across industries may offset each other. It is also worth noting that, the empirical effects differ largely depending on whether the country is developed or developing. Sauer and Bohara (2001) constructed three measures of real effective exchange rate (REER) volatility, using an ARCH model, an AR(1) model, and a moving standard deviation method. Based on a sample of 91 countries over 1966-1993, they find that REER volatility has a negative effect on real exports for the entire sample. Using the developed and Asia countries reveals no effect, and the subsample of Latin America and Africa economies implies a negative relationship.

3.3 Data

To investigate how the currency exchange rate affects foreign acquisitions, I focus on the largest trading partners to the U.S. because only a small number of countries have invested actively in the U.S. real estate projects throughout the entire sample period. The list of countries in the sample includes Canada, France, Japan, Germany, the Netherlands, Switzerland, and the United Kingdom[22], all of which are members of the OECD. Using data compiled by the International Trade Administration (ITA) of the U.S. Department of Commerce on FDI transactions, a total number of 3,215 events of real estate related deals are identified for the top 7 source countries. FDIRE investments in the U.S. originated from these countries combined represent 70.18% of the total worldwide over the sample period from 1977 to 1994. Distribution of the number of FDI investments by source countries in Figure 3.1 shows 36% of the FDI projects in the U.S. real estate sector is associated with foreign investors from Canada, followed

[22] These seven countries are among the G12 of industrial nations. Klein and Rosengren (1993) and Froot and Stein (1994) used the same list of largest source countries in their work.

by investors that reside in Japan and the United Kingdom.

I use the nominal exchange rate for the analysis because previous studies have demonstrated that nominal and real exchange rate series produce nearly identical empirical results (McKenzie 1999). Since countries in the sample are all developed nations and the inflation rate over the sample period stayed relative stable, using nominal exchange rates should make little difference in practice. The monthly exchange rates data come from the FRED and are denominated in terms of foreign currency per dollar. An increase in the exchange rate thus corresponds to dollar appreciation. Data for real GDP and real GDP per capita come from the *Penn World Table* 9.0[23].

A growing body of research has found that financial deepening, measured either by the size or the amount of liquidity provided by the financial market is closely linked to foreign investment activities as it is easier for firms to undertake an investment project under a financially deep market[24]. To examine how financial deepening within a country can aid its firms in investing abroad, I follow convention in the finance and growth literature and use private credit as a share of GDP as a measure of financial development in the source country (Kandilov (2017)). Private credit is the value of credit extended to the private sector by banks and other financial intermediaries. It isolates credit to the private sector and identifies the contribution of financial institutions in financing private sector investments. I also use the stock-market-capitalization-to-GDP ratio obtained from the FRED as an alternative measure for a country's

[23] The Penn World Table is a set of national account data that reports real GDP across countries from 1950-2014. The real GDP data are PPP adjusted, as opposed to the traditional practice of comparing GDPs across countries using exchange rates. Using market exchange rate instead of PPPs to convert GDPs across countries are subject to the Penn effect, and tend to understate the real GDP.

[24] It should be noted that financial deepening within a country can aid domestic firms in investing abroad, while in the meantime, a deeper financial market in the host country may also attract foreign investors as they usually employ some amount of local capital see Kandilov et al. (2017).

financial development. Even though improvements in both proxies are indications of better conditions in the source country's financial market they each work through distinctive channels. The private credit to GDP reflects the availability of financial resources to the private sector in a country from financial institutions such as banks and nonbank corporations. In contrast, the stock-market-capitalization-to-GDP mainly captures the total value of all publicly traded stocks relative to the aggregate value of the economy and is a gauge of relative valuation of the overall market.

To shed light on how bilateral exchange rates and source country's financial development affect foreign capital flowing into the U.S. real estate sector, I construct two country-level balanced panel data sets using the transaction level data obtained from ITA[25]. One dataset counts the annual number of FDIRE projects (the extensive margin), the other adds up the real dollar value of FDIRE deals from a foreign source country in a given year (the intensive margin). Figure 3.2 plots these two series for each of the top source countries over the sample period. While the co-movement of these two series are widely different across different countries, the total size of FDI inflow from a foreign source country tends to be negatively correlated with the bilateral exchange rate.

Take Japan and the Netherlands for example. The aggregate value of foreign acquisitions of U.S. real estate assets is higher when the dollar depreciates or equivalently when the exchange rate is relatively low[26]. It should be noted that the Japanese acquisition of U.S. real estate assets

[25] A few transactions in the sample do not have recorded values, which will be dropped out in the regression analysis for the intensive margin. As there is no evidence that shows the data are not missing at random, I interpolate the missing value using the average size of FDIRE value from a given country. This correction technique relies on the assumption that foreign firms entering a U.S. market will have to establish an investment close to the scale of the average deals made by that country.

[26] In 1985, the U.S. government signed into the Plaza Accord with governments of France, West Germany, Japan, and the United Kingdom to depreciate the U.S. dollar in relation to the yen and Mark by

continued to decline despite the strengthening of the Japanese yen against the U.S. dollar since 1990. This phenomenon is associated with the period of economic recession followed by the collapse of the Japanese asset price bubble, also known as the "Lost Decade". The subsequent impact largely dampened and dominated the exchange rate effects, suppressing the FDIRE activities made by Japanese investors under a weak dollar.

Table 3.1 provides summary statistics for the country-level data based on the annual total number and the total dollar value of FDI inflows into the U.S. real estate sector. It is evident from the table that Canada, Japan, and the United Kingdom are the top three countries in terms of the average annual acquisition of U.S. real estate properties. Each invested an average of 44.28, 32.5 and 17.89 projects respectively. Moreover, the average investment sizes by Japanese, Canadian, and the British investors are much larger than the rest of the major source countries, indicating preferences for large deals over medium and small size deals among investors in these countries.

Table 3.2 presents a cross-country correlation matrix of the annual dollar inflow of real estate investment. The series are more highly correlated among European countries themselves than between a European country and Japan. For example, FDIRE from Switzerland and Germany had a correlation of 89% while the correlation between these two countries with Japan is 48% and 53%, respectively. Moreover, annual FDIRE coming from Canada also exhibits a strong correlation with capital inflows from Germany, Switzerland, and U.K. It is evident that the Netherlands is a special case as it is the only country where the number of FDIRE projects is negatively correlated with the rest of the countries. The absence of a clear and consistent pattern in the cross-country correlations highlights the need for adding the country dummy variable to

intervening in the currency markets in an effort to reduce the large U.S. trade deficit. The exchange rate value of the dollar vs. the yen declined by 51% from 1985 to 1987.

account for country fixed effects. Table 3.3 reports the statistical summarization for all other variables used in the empirical analysis.

3.4 Measuring Exchange Rate Volatility

This section discusses how exchange rate variability is measured. The first and most common approach is to measure a realized ex-post exchange rate variability based on past values of the exchange rate over the short run. This is a simple measure that relies on the assumption that economic agents use only past exchange rate to predict future exchange rate distributions. It is constructed as the standard deviation of the first-differenced series of the natural logarithm of bilateral exchange rates using monthly data from 1977.1 to 1994.12. Exchange rate volatility between country *i* and the U.S. in year *t* is denoted by vol_{ti}, where the monthly exchange rate between country *i* and the U.S. in year *t* is represented by $EX_{it,m}$.

$$Volti = Std.dev.[\ln(EXit,m) - \ln(EXit,m-1)], \text{ where m} = 1,2,3 \dots 12 \qquad (1)$$

Despite its simplicity, the standard deviation method has been the most popular measure of risk. However, there are several empirical regularities in the exchange rate series that call for more sophisticated methods to capture agents' expectations about exchange rate risk. For example, the exchange rate series are known to be subject to volatility clustering, meaning that the variance appears to be high during some periods and low in other periods. Furthermore, current volatility can affect the next period's volatility, which implies the presence of an ARMA process. Depending on the realized volatility in the previous period, it is likely to continue in the present and the near future periods. There is also evidence that exchange rate volatility is subject to asymmetry, for example currency depreciation is more likely to be followed by higher

volatility than currency appreciation of the same magnitude due to leverage effects. For these reasons, I introduce a second exchange rate volatility measure which is widely used in modeling return and exchange rate volatility created using the time series equations based on the ARCH-GARCH approach.

The GARCH method is a convenient reduced form method to capture the rational expectations process and it belongs to the family of time-varying volatility models. It is based on the assumption that the variance of a stochastic process is itself randomly distributed and the underlying concept that economic agents form rational forecasts about the future exchange rate volatility based on past values of the exchange rate. The model to be estimated is:

$$100 * \left(lnEX_{it,m} - lnEX_{it,m-1}\right) = \Psi_0 + \epsilon_{it,m} \qquad (2)$$

$$\epsilon_{\mathrm{it,m}} | I_{t,m-1} \sim N(0, \sigma^2_{t,m}) \qquad (3)$$

$$\sigma^2_{\mathrm{t,m}} = \delta_0 + \delta_1 \epsilon^2_{it,m-1} + \delta_2 \sigma^2_{t,m-1}, \mathrm{t} = 1977,1978 \ldots 1994 \text{ and } \mathrm{m} = 1,2,3 \ldots 12. \qquad (4)$$

I use $EX_{it,m}$ and $EX_{it,m-1}$ to denote the exchange rate in month m and $m-1$, of country i and the U.S. in year t, respectively. The log difference of the monthly exchange rate can be decomposed as a constant term Ψ_0 plus a time-varying residual term $\epsilon_{it,m}$, which indicates the time series is expected to vary randomly about its mean Ψ_0. The variance equation (4) indicates that next period's variance is a blend of last period's forecast and last period's squared return. The GARCH (1,1) model is thus an ARMA (1,1) model on squared residuals. It assumes that an agent predicts this period's variance by forming a weighted average of a long-term average (the constant term), the observed volatility in the previous period (the ARCH term), and the forecast variance from last period (the GARCH term).

Before applying the GARCH method, it is necessary to check the residuals of the series

for heteroscedasticity using the Lagrange Multiplier (LM) test proposed by Engle (1982). The LM test examines the existence of ARCH in the selected model, against the null of no ARCH. After fitting an autoregressive model with GARCH (1,1) errors to the growth rates of exchange rate series, a Wald test is performed on the null hypothesis that the ARCH and GARCH coefficients are jointly zero. The test confirms the existence of the GARCH effect in the exchange rate variable as the null hypothesis of no GARCH is rejected at the 5% level or better.

The volatility measures constructed using the standard deviation and the GARCH methods have a correlation of 0.49. Table 3.4 shows the sample average of exchange rate volatility for the seven source countries based on the two exchange rate measures discussed above. Over the entire sample period, the Swiss franc was the most volatile currency against the dollar, while the Canadian dollar was the most stable. This is true for both the realized exchange rate volatility as well as the expected volatility estimated using the GARCH method. The expected exchange rate volatility also appeared to be higher than the realized volatility for the same period.

In September 1985, the US signed an agreement with the government of France, West Germany, Japan, and the United Kingdom to deliberately depreciate the dollar by intervening the currency market. This constitutes a structural break in the time series which may have caused nontrivial changes in the responses of FDI activities. To quantify the impact, I further use 1984 as a cutoff period to divide the data into two subsamples. The subsample of 1977 to 1984 covers the period before the Plaza Accord, while the subsample 1985 to 1994 covers the period after the agreement took effect. A comparison between these two subsamples shows that besides the Canadian dollar all other currencies showed larger fluctuations against the dollar in the second subsample displaying an impact of the Plaza Accord. Since Canada is the only country that did

not participate in the Plaza Accord, the currency exchange rate between Canada and the U.S. was less volatile during the second half of the sample for both measures of exchange rate risk.

Figure 3.3 plots the time series of the exchange rate volatility based on the two methods previously discussed for each source country over the entire period. The GARCH conditional volatility is less variable than the realized exchange rate volatility calculated using the standard deviation of the exchange rate.

3.5 Empirical Methodology

The empirical analysis is divided into three parts. In the first section, I evaluate the effects of exchange rate, exchange rate volatility, and source country financial development on the extensive margin of FDI activity, using the number of projects made by a foreign source country in a given year as the dependent variable. Next, I consider the intensive margin and focus on the impact of exchange rate and source country financial depth on the total value of real estate investment. Finally, given the time it takes to make adjustments to a changing economic environment, models that incorporate the lagged values of exchange rate and exchange rate volatility are presented.

3.5.1 The Extensive Margin

I start by quantifying the impact of exchange rate fluctuations on the aggregate number of real estate acquisitions, which is the extensive margin. The following econometric equation is specified for the aggregate number of real estate acquisitions:

$$N_{it} = \alpha_1 \ln(EX_{it}) + \alpha_2 Vol_{it} + \beta_1 \ln(\mathrm{GDP_{it}}) + \beta_2 \ln(GDP\_per\_Capita_{it}) + \beta_3 GDP\_Grwoth\_Rate_{it} + \beta_4 Credit\_to\_GDP_{it} + \beta_5 Market\_Cap\_to\_GDP_{it} + \tau_t + \mu_i + \varepsilon_{it} \quad (5)$$

The extensive margin specification uses the total number of annual FDIRE projects from source country *i* in year *t* (where t=1977-1994) as the dependent variable where N_{it} can take on values of non-negative integer. Given the count data nature, it is best estimated with a Poisson regression using the Maximum likelihood method. The right-hand side variable in equation (5) Vol_{it}, represents one of the annual exchange rate volatility measures described in the previous section for source country *i* against the dollar in year *t*. EX_{it} denotes the level of the exchange rate of a dollar relative to the foreign currency thus an increase in the exchange rate variable corresponds to a dollar appreciation and is expected to be negatively correlated with the inflow of FDIRE. It is important to take the natural logarithm of the level of the exchange rate to make the percentage change across countries comparable. As discussed in the previous section, the signs for the exchange rate variable is expected to be negative while the coefficient for the exchange rate volatility variable could be either positive or negative.

To capture the macroeconomic business cycle in each source country, I use the natural logarithm of GDP and GDP per capita (in PPP units) of foreign country *i* in year *t*. Two proxies for source country financial development are the Private-Credit-to-GDP and Market-Cap-to-GDP ratios in country *i* in year *t*. Equation (5) also includes τ_t to capture the unobserved time-specific effect in the aggregate economy and uses the source country dummy variables μ_i to absorb country-specific effects. Since the data have a relatively short time string, the variation is driven mostly by the cross-section.

3.5.2 The Intensive Margin

Following the standard practice of gravity models, the baseline model along the intensive margin uses the natural logarithm of the total value of FDIRE (in constant 1983 dollar) in country *i* and year *t* as the dependent variable. It is denoted by $ln(V_{it})$ and the estimated coefficients can be interpreted as elasticities. The model is specified as follows and estimated using panel fixed effects OLS:

$$\ln(V_{it}) = \alpha_1 \ln(EX_{it}) + \alpha_2 Vol_{it} + \beta_1 \ln(GDP_{it}) + \beta_2 \ln(GDP\_per\_Capita_{it}) + \beta_3 GDP\_Grwoth\_Rate_{it} + \beta_4 Credit\_to\_GDP_{it} + \beta_5 Market\_Cap\_to\_GDP_{it} + \tau_t + \mu_i + \varepsilon_{it} \qquad (6)$$

The simple methodology using the pooled OLS estimation has several drawbacks. First, it fails to account for the unobserved country-specific effects, causing omitted variable bias which is picked up in the residual term. Second, there are factors other than the exchange rate that may affect FDI and it is important to account for them in a way that is consistent with economic theory, but the potential correlation between some of the covariates and country-specific effects may lead to endogeneity problems. To address these issues, the fixed effects method is employed to control for the unobserved country-specific time-invariant effects in the data. It accounts for the possible correlation between these effects by taking deviations from time-averaged sample means, the so-called "within-transformation".

I check the robustness of the empirical findings using the Poisson pseudo-maximum likelihood (PPML) method first introduced by Gourieroux et al. (1984). Santos Silva and Tenreyro (2006) propose using this method as a simple way to deal with the presence of heteroscedasticity under the assumption of a multiplicative error term in the nonlinear gravity model specification as in Anderson and van Wincoop (2003). Estimating the log-linearized

gravity model using OLS may subject to bias as the error term is often heteroscedastic with cross-sectional data. The Poisson method has become the workhorse gravity model estimator in recent years due to its desirable features. As long as the gravity model contains the correct set of covariates, the Poisson pseudo-maximum likelihood estimator will produce estimates that are consistent. The PPML estimator identifies the coefficients using the same first-order conditions that are used by the maximum-likelihood estimator derived from the Poisson distribution, however, it does not require the underlying distribution of the data to be Poisson. Moreover, since the natural logarithm of zero is undefined and dropping it may lead to sample selection bias under OLS, the ability of Poisson to preserve the observations with zero values is a desirable feature in empirical practice.

3.5.3 The Dynamic Adjustment

As it takes time and proper preparation to carry out a foreign investment project, the response to a changing exchange rate is not likely to be instantaneous. Moreover, because FDI involves large "sunk costs", research has found that when exchange rate fluctuates widely MNEs will tend to adopt a "wait and see" approach and will wait to invest in the host country until they see a clearer picture. This strategy also applies to a foreign investor that already has holdings of host country assets. As the exchange rate becomes more volatile, investors may delay their decision to further invest or to exit the market and wait for the situation to get better. A more volatile exchange rate is thus expected to increase the inertia in entry and exit decisions. Table 3.5 reports the correlation matrix for the current and lagged values of the exchange rate and the standard deviation measure of exchange rate volatility. While the levels of the exchange rate are almost perfectly correlated with its lagged values, the realized unconditional exchange rate volatility is only moderately correlated with its one period and two period lagged values.

To account for the dynamics of adjustment, I estimate another set of models for the two FDI outcomes on the lagged values of the exchange rate and its volatility using up to two lags.

$$\mathrm{FDI_{it}} = \alpha_1 \ln(EX_{it-l}) + \alpha_2 Vol_{it-l} + \beta_1 \ln(\mathrm{GDP_{it}}) + \beta_2 \ln\left(GDP_{Per_{Capita_{it}}}\right) + \beta_3 GDP\_Grwoth\_Rate_{it} + \beta_4 Credit\_to\_GDP_{it} + \beta_5 Market\_Cap\_to\_GDP_{it} + \tau_t + \mu_i + \varepsilon_{it}, \quad \text{where } l = 1,2 \quad (7)$$

3.5.4 FDI Transaction Values

Finally, to fully explore the exchange rate effect on FDI from different dimensions, I take advantage of the transaction level data and specify the following econometric specification for each individual transaction:

$$\ln(V_{ijt}) = \alpha_1 \ln\left(EX_{jt}\right) + \alpha_2 Vol_{jt} + + \beta_1 Repeat_{ijt} + X_{jt}\gamma + \tau_t + \mu_i + \varepsilon_{ijt} \quad (8)$$

where $ln(V_{ijt})$ is the natural logarithm of the real value (expressed in 1983 U.S. dollars) of individual investment *i* from source country *j* in year *t*. $Repeat_{ijt}$ is an indicator variable that equals one if the foreign investor of the deal is associated with multiple transactions and zero if it is a one-time investor. The vector X_{jt} contains the country-specific, time-varying control variables that include the natural logarithm of GDP_{jt}, natural logarithm of $GDP\text{-}per\text{-}capita_{jt}$ from source country *j* in year *t*, and the growth rate of GDP. In addition, I include two proxies for financial market depth in the source country namely, the market-cap-to-GDP and private-credit-to-GDP. Like before, the econometric model also features year fixed effects, τ_t, and country fixed effects, μ_t. Lastly, the ϵ_{ijt} denotes the individual transaction residual.

3.6 Empirical Results

Table 3.6 reports results from the Poisson estimation of equation (5), using the total

number of FDIRE transactions as the dependent variable. Each specification also includes a year and a country fixed effect, robust standard errors are clustered at the country level. According to the table, estimated coefficients on the natural logarithm of the exchange rate levels have negative signs in all specifications and are strongly significant, indicating that an increase in the exchange rate (dollar appreciation) is responsible for a lower average number of real estate projects from a foreign source country in a given year. Column (1) estimates the simplest specification using only the natural log of the exchange rate and the volatility as the explanatory variables. The estimated coefficients suggest a 1% increase in the exchange rate (dollar appreciation) reduces the average number of FDIRE transactions by 2.8%. Column (2)-(4) gradually include covariates that capture the source country's economic and financial characteristics. Each specification includes a full set of source country and year fixed-effects. With the inclusion of the additional explanatory variables, the estimated effects become smaller but remain to be negative and statistically significant. This finding is consistent with Froot and Stein (1991) who established a negative correlation between FDI and the value of the dollar.

The exchange rate volatility variable is positive in all specifications though lack of statistical significance. Furthermore, the growth rate of GDP in the source country significantly affects the incidence of U.S. investment in two specifications, suggesting that as the foreign source country experiences faster growth in the economy, its foreign investment also increases. It is estimated that holding everything else constant, the number of U.S. real estate projects invested goes up by 8% to 9%, or in terms of the number 1.4 to 1.6, in response to a 1% increase in the growth rate of GDP.

Of the two proxies for source country financial development, only the stock market capitalization as a percentage of GDP variable is statistically significant which suggests that

foreign investors may take advantage of the higher domestic stock market valuation and invest more aggressively and is consistent with the "cheap capital" theory in Baker et al. (2009). It is estimated that a 1% increase in the stock-market-capitalization-to-GDP ratio can increase the number of projects by 2%. Column (4) further includes the logarithm of GDP and logarithm of GDP per capita variables. The negative coefficient on the logarithm of GDP variable indicates that a 1% increase in the source country's economic size reduces its real estate projects invested in the U.S. by 3.85%. This could be due to more availability of domestic investment opportunities.

Table 3.7 re-estimates equation (6), replacing the realized exchange rate volatility with the estimated GARCH conditional volatility. Compared to the results in Table 3.6, the estimated coefficients for the natural logarithm of the exchange rate variable have the same significant sign and are similar in magnitude. Unlike the realized exchange rate volatility, the estimated coefficients for the GARCH volatility are significant in two of the four specifications with positive signs, suggesting that a higher exchange rate uncertainty is associated with a higher number of foreign investment in U.S. real estate assets. The evidence lends credence to the real options view of FDI. While an increase in the level of the currency exchange rate (dollar appreciation) discourages foreign investment activities, a more volatile exchange rate may be considered as a favorable opportunity thus stimulating a larger number of real estate deals made by international investors. Other coefficients that are statistically significant are the market-capitalization-to-GDP and the growth rate of GDP.

The evidence so far highlights the negative relationship between currency appreciation and the number of FDI in real estate projects. It also shows the importance of source country financing in the form of stock-market-capitalization-to-GDP ratio in determining the investment

decisions by foreign nationals. Turning to the real total value of real estate investment from a foreign source country and use that as the dependent variable, I estimate panel fixed effect OLS regressions and report the results in Table 3.8. The first four columns use the exchange rate volatility calculated using the standard deviation method while column (4)-(8) are based on the GARCH method.

Column (1) in Table 3.8 shows a one percent appreciation in the value of the dollar significantly reduces the average size of the annual inflow by 4.05% or 18.18 million dollars, equivalently. On the other hand, higher exchange rate volatility measured as the standard deviation of the exchange rate series does not affect the capital inflow in a statistically meaningful way. Column (2) and (3) gradually augment the model with additional covariates. The results are consistent with the baseline model even though the estimated reduction in the size of the projects in response to a stronger dollar tends to be smaller. Other variables that report positive and significant coefficient are the GDP growth rate and the market-capitalization-to-GDP ratio. It is found that as the growth rate of GDP increases by 1%, the total value of real estate investment coming from a source country in a given year rises by 23%. Similarly, a stock market boom is also responsible for the higher volume of real estate investment such that a 1% increase in stock market capitalization-to-GDP is associated with 4% higher total value coming from a source country.

Column (5)-(8) in Table 3.8 replace the standard deviation volatility with the GARCH volatility. Compared to the results in column (1)-(4), coefficients for the exchange rate level variable preserve the sign and significance. However, unlike the small negative coefficient on the standard deviation of the exchange rate variable, the GARCH volatility shows a bigger positive relation with the size of FDI inflow. This highlights the fact that economic agents' expectations

of a more volatile exchange rate may induce them to invest more heavily in the host country real estate projects.

To check the robustness, I also report coefficients estimated with the Poisson Pseudo Maximum Likelihood (PPML) method, using the real total value of FDIRE projects as the dependent variable. The findings reported in Table 3.9 are broadly consistent with the fixed effect OLS regressions. The coefficient in column (1) implies in response to a 1% increase in the value of the dollar, the total volume of FDI goes down by 4.36%. The realized exchange rate volatility affects the total volume positively with two of the estimated coefficients being weakly significant at 10% significance level. Moreover, according to the specification in column (2), a bigger market-capitalization-to-GDP ratio raises the average inflow by 3%, while an increase in GDP growth rate raises the aggregate volume by 16%.

To further assess how the GARCH conditional volatility may influence the total size of FDI inflows into the U.S. real estate sector, I run the previous model specifications substituting the standard deviation volatility with the GARCH volatility. This produces similar findings for the GDP growth rate and market-capitalization-to-GDP. However, with additional covariates, the natural logarithm of the exchange rate becomes insignificant with the predicted sign. The GARCH volatility variable is found to be weakly significant in only one of the specifications that use the level of the exchange rate and its volatility as the independent variables.

To account for the dynamics of adjustment, I estimate another set of models on the lagged values of the exchange rate and its volatility, up to two lags and report the results in Table 3.10. The extensive margin uses the total number of real estate transactions in a given year from a source country as the dependent variable, while the intensive margin uses the total volume as the dependent variable. Specifications in column (1), (3), (5), and (7) regress the outcome

variable on the exchange rate and exchange rate volatility variables only, while specifications in column (2), (4), (6), and (8) are based on models that are augmented with a full list of covariates. Because as Table 3.5 shows, the contemporaneous exchange rate is almost perfectly correlated with the one and two period lagged values, coefficients on the exchange rate variable using the lagged values are similar to my findings in the previous sections.

The two coefficients on the one-period lagged values of the natural logarithm of the exchange rate are similar to the previous findings along both the extensive margin and the intensive margin. However, using the lagged values produce a slightly bigger effect in absolute terms relative to using the current values of the exchange rate. Based on the coefficients in column (1)-(4), the exchange rate volatility one-period and two-period past do not affect the number of real estate investment from a foreign source country. On the contrary, unlike the previous insignificant effects found on the realized exchange rate volatility using its current value, the realized exchange rate volatility in the last period and two periods before are positively related to this period's total value of real estate investment in the U.S. This is an interesting finding as it implies that foreign investors who have observed volatile movement in the exchange rate in the past period may interpret it as an appealing time to invest in the U.S. real estate sector. Consistent with a time-to-build lag, the actual investment may happen one year or even two years after the initial shock.

Turing to the transaction level data, Table 3.11 reports results obtained from estimating equation (7) using the dollar value of the project from a source country in a given year as the dependent variable. The estimated coefficient in Column (1) suggests a one percent increase in the exchange rate corresponds to 2.08% decrease in the average transaction size. This is another evidence that suggests currency appreciation in the U.S. discourages the intensity of foreign

direct investment. Column (2) and (3) gradually include additional covariates that capture source country economic condition and an indicator variable which identifies whether the foreign investors has invested in the host country before. The coefficient on the exchange rate variable is still negative and significant. Furthermore, repeat investors tend to invest 1.1% more than single time investors. As multiple-transaction investors are usually larger multinationals that are more adept at running large-scale operations, it is not surprising that the empirical evidence reveals the average investment project is bigger for multiple-transaction investors.

It is interesting that on the individual transaction level, neither exchange rate volatility variable is statistically significant in any of the model specifications. This could be due to the usage of hedging instruments against volatile exchange rate fluctuations thus making them negligible. Other coefficients that are statistically significant are the natural logarithm of source country real GDP and the natural logarithm of GDP per capita as shown in column (3). A one percent increase in the source country GDP reduces the investment size by 6.37%. This could be due to more investment opportunities becoming available in the foreign country as the economy gets stronger, thus foreign investors substitute domestic investment for foreign acquisition.

On the other hand, a higher GDP per capita raises the individual transaction size of foreign investment by 8.58%. This suggests that as foreigners' per capita income rises their purchases of offshore assets also increase by a significant amount. Using the GARCH exchange rate volatility produce similar results, except that the coefficient on the natural logarithm of real GDP is no longer statistically significant. Results in this table highlight the importance of currency depreciation in driving the intensity of foreign acquisition of U.S. real estate assets. The evidence from our unique transaction level data also indicates that exchange rate risk does not matter much as foreign investors could use various hedging tools to protect themselves from this

type of risk.

3.7 Conclusion

This paper contributes to the FDI and exchange rate literature by quantifying the impact of exchange rate risk on inward U.S. FDI in the real estate sector from the top 7 source countries. I applied two different measures of exchange rate uncertainty. One is based on the realized unconditional volatility constructed as the standard deviation of the difference in the monthly exchange rate. The other is a conditional volatility estimated using the GARCH specification (Bollerslev 1986) which captures the ex-ante risk.

The study yielded three important insights: first, the evidence reveals that an increase in the nominal exchange rate (dollar appreciation) significantly reduces the incidence as well as the total volume of inbound FDIRE from a foreign source country. It implies that currency movement may affect FDI through the "relative wealth channel".

Second, there is some evidence which suggests a positive relationship between exchange rate volatility and FDIRE, as a statistically significant coefficient is found in some but not all of the specifications when the two measures of volatility are being used. This is not surprising, however, as previous literature has come to conclude that the empirical evidence of exchange rate variability on trade and FDI are quite mixed and are not robust to alternative ways of controlling for factors that could affect FDI. There is certainly no evidence that suggests exchange rate volatility hampers FDI for the real estate sector and no grounds to take measures to reduce exchange rate movements from the perspective of promoting FDI. Even though exchange rate volatility does not pose a major policy concern, the consistent negative relationship between the level of the exchange rate and FDIRE still make the case that currency depreciation is an appealing factor to attract foreign investors.

Finally, a strong and consistent positive relationship was established between the source country's financial development and the nation's acquisition of U.S. real estate assets. This finding emphasizes the importance of the cheap financial capital theory proposed in Baker et al. (2004) which indicates that foreign firms tend to take advantage of the cheap cost of capital given the temporary overvaluation in the domestic stock market. Efforts in this paper can be easily expanded into other in-depth studies of the impact of the exchange rate on FDI that include a richer sample of countries across a longer time span.

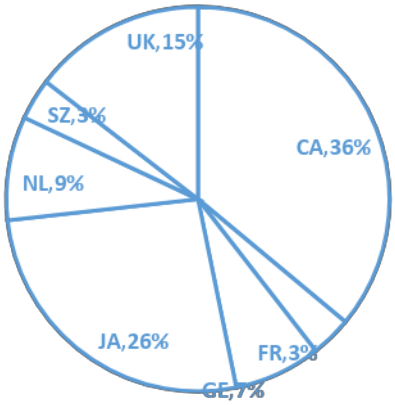

Figure 3.1 Distribution of the total 3215 number of FDIRE acquisitions among top source countries, 1977-1994.

Figure 3.2 Total value of acquisitions of U.S. real estate in millions of 1983 $ (left scale) and the foreign currency per dollar exchange rate (right scale), 1977-1994.

Chart A

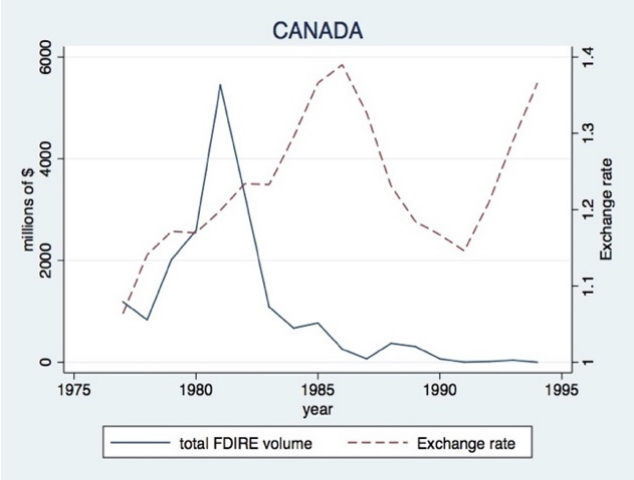

Chart B

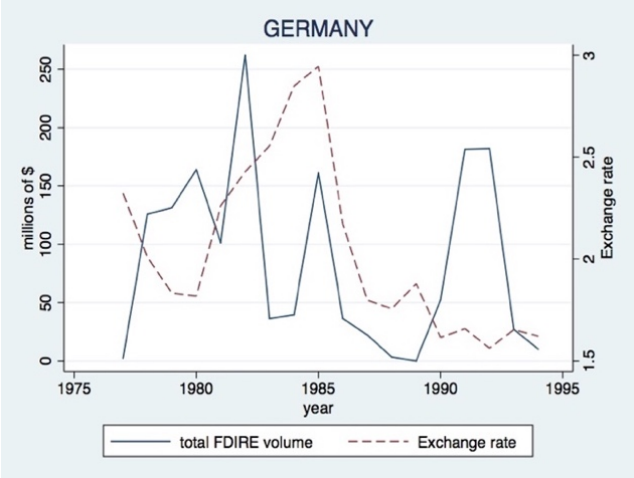

Chart C

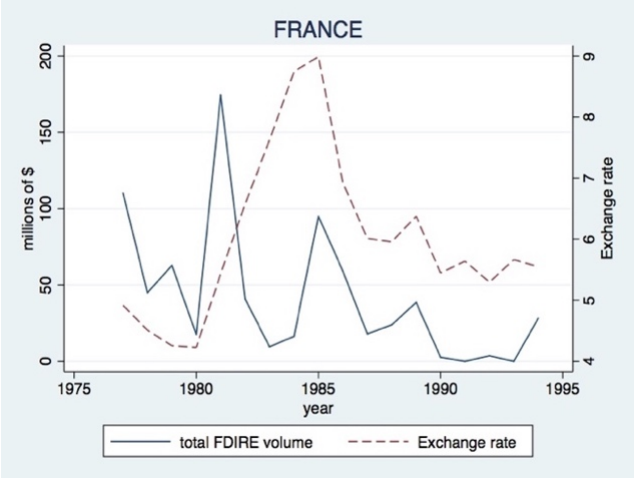

Chart D

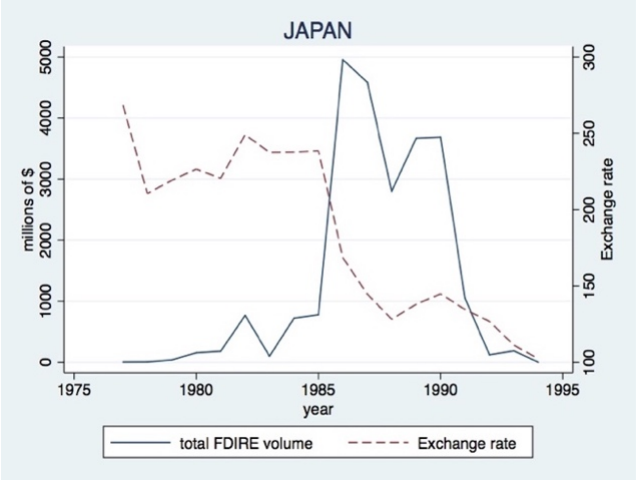

Chart E

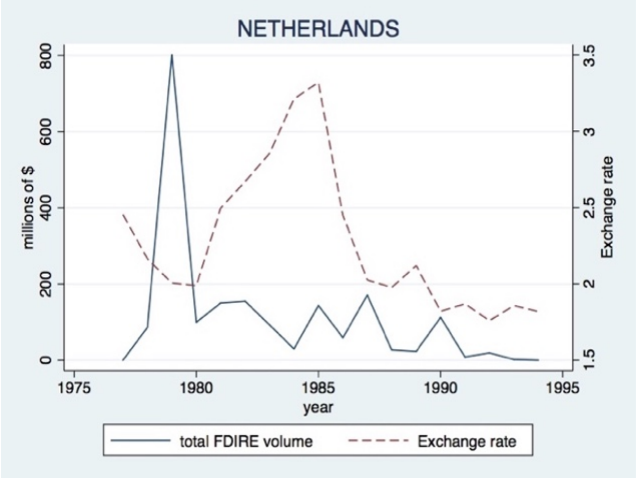

Chart F

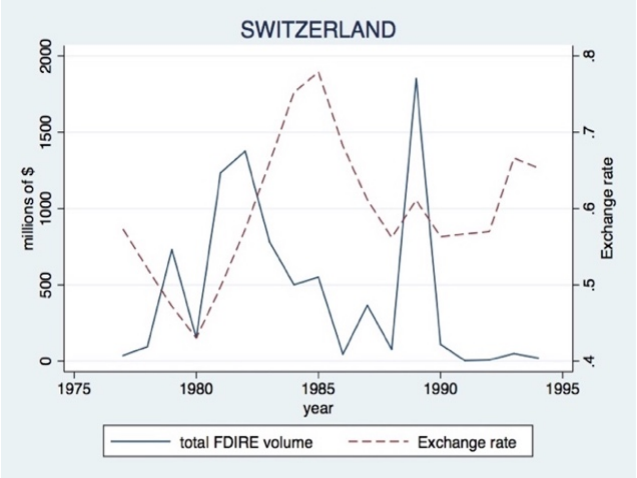

Chart G

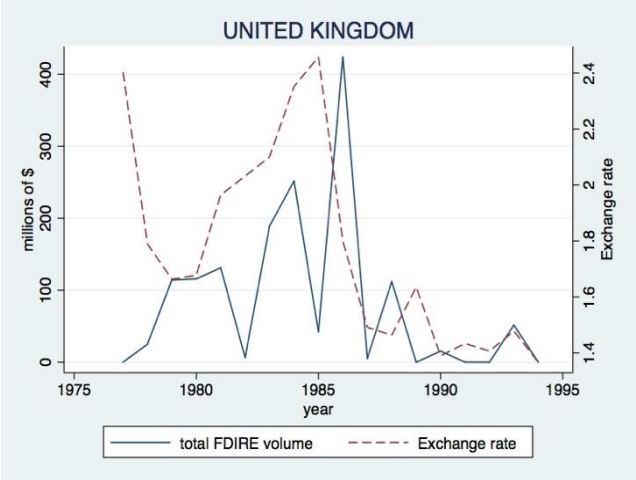
UNITED KINGDOM
millions of $
0
100
200
300
400
Exchange rate
1.4
1.6
1.8
2
2.2
2.4
1975
1980
1985
1990
1995
year
total FDIRE volume
Exchange rate

Table 3.1 Summary statistics of the annual number and total value of U.S. real estate investments by source country, 1977-1994 (values are in millions of 1983 $).

	Annual Count			Annual Total Value		
	mean	min	max	mean	min	max
Canada	44.28	1.00	201.00	1056.46	0.00	5451.05
France	4.22	1.00	13.00	41.39	0.00	174.44
Germany	9.00	0.00	26.00	85.48	0.00	262.16
Japan	32.50	1.00	83.00	1321.98	1.01	4954.19
Netherlands	10.72	0.00	82.00	110.03	0.00	801.46
Switzerland	4.28	0.00	14.00	82.45	0.00	424.03
United Kingdom	17.89	1.00	60.00	444.25	3.36	1851.03

Source: ITA, and author's computations.

Table 3.2 Cross-country correlation table of the total volume of FDIRE from the top 7 source countries in 1977-1994.

	Canada	France	Germany	Japan	Netherlands	Switzerland	United Kingdom
Canada	1.00						
France	0.67	1.00					
Germany	0.84	0.57	1.00				
Japan	0.49	0.30	0.53	1.00			
Netherlands	-0.15	-0.20	-0.32	-0.24	1.00		
Switzerland	0.80	0.48	0.89	0.48	-0.07	1.00	
United Kingdom	0.82	0.80	0.70	0.27	-0.08	0.69	1.00

Table 3.3 Summary Statistics (full panel 1977-1994)

Variables	min	max	mean	median	SD	N
Number of deals	0.00	201.00	17.56	7.00	29.24	126
Real total value	0.00	5451.05	448.86	89.53	996.41	126
Real GDP	17070.09	3980359	1171914	1155107	859749	126
GDP growth rate	-2.84	9.75	2.75	3.05	2.72	126
GARCH volatility	0.91	4.36	2.67	2.90	0.77	126
Std. Dev. volatility	0.41	4.64	2.42	2.46	0.96	126
Private Credit to GDP	1	124	61.52	61.5	36.48	126
Market Cap to GDP	3.13	129.38	45.88	38.11	31.29	123
real GDP per capita	16140.57	35915.05	24348.66	23760.11	4643.17	126
GDP per capita growth rate	-3.92	9.41	2.22	2.32	2.72	126

Note: the stock-market-capitalization-to-GDP ratio for Switzerland is not available until 1980.

Table 3.4 Mean exchange rate volatility for the source countries using the standard deviation and the GARCH volatilities over three sample periods (in percentage terms). The first two columns cover the entire sample period of 1977-1994. Column (3) and (4) cover the period until before the Plaza Accord. Column (5) and (6) cover the period after the Plaza Accord took into effect.

	1977-1994		1977-1984		1985-1994	
Nationality	Std.dev	GARCH	Std.dev	GARCH	Std.dev	GARCH
Canada	0.97	1.26	1.00	1.46	0.94	1.10
France	2.50	2.67	2.33	2.28	2.65	2.98
Germany	2.62	2.82	2.49	2.49	2.72	3.08
Japan	2.67	2.95	2.68	2.90	2.67	2.98
Netherlands	2.58	2.87	2.40	2.62	2.73	3.07
Switzerland	3.05	3.24	3.01	3.09	3.08	3.37
United Kingdom	2.54	2.90	2.09	2.53	2.90	3.20

Figure 3.3 Exchange rate volatility using the standard deviation and the GARCH methods, 1977-1994. The blue line shows the realized unconditional exchange rate volatility calculated based on the standard deviation of the logarithm of differenced exchange rate series. The red line represents the conditional exchange rate volatility estimated using the GARCH method.

Chart A

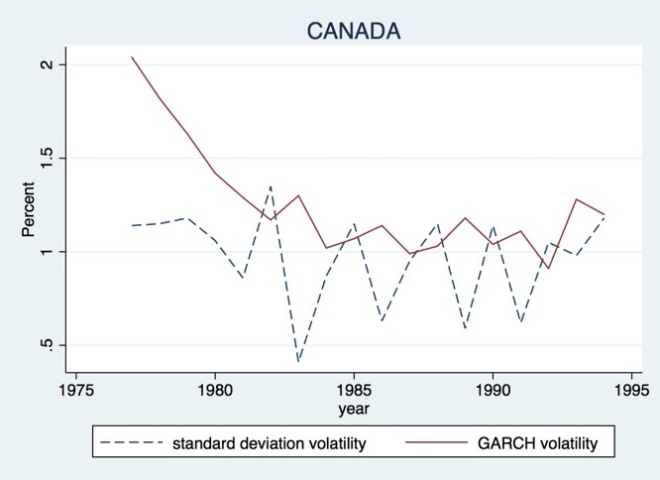

Chart B

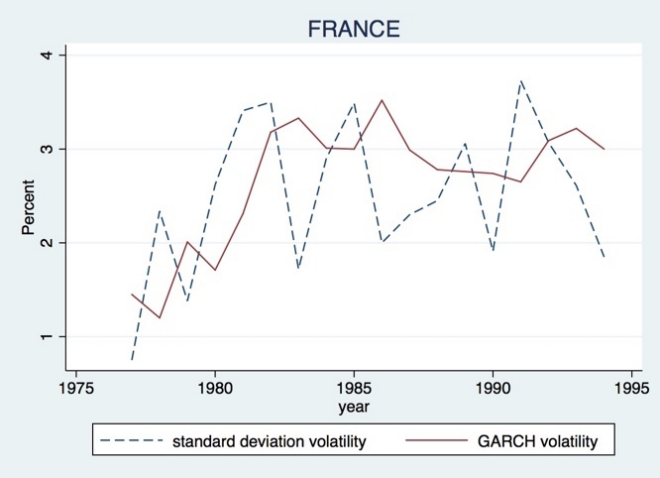

Chart C

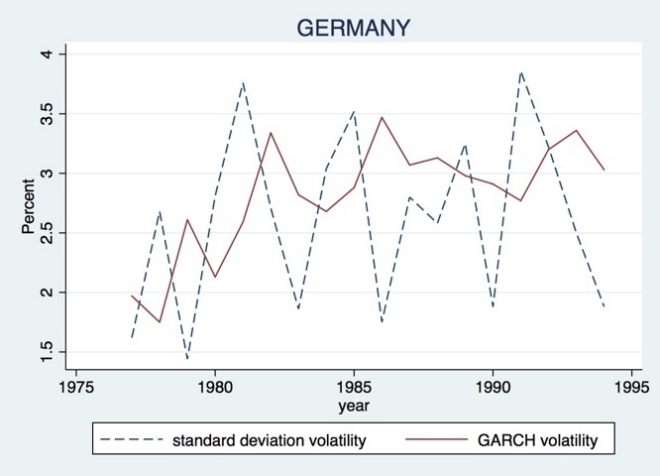

Chart D

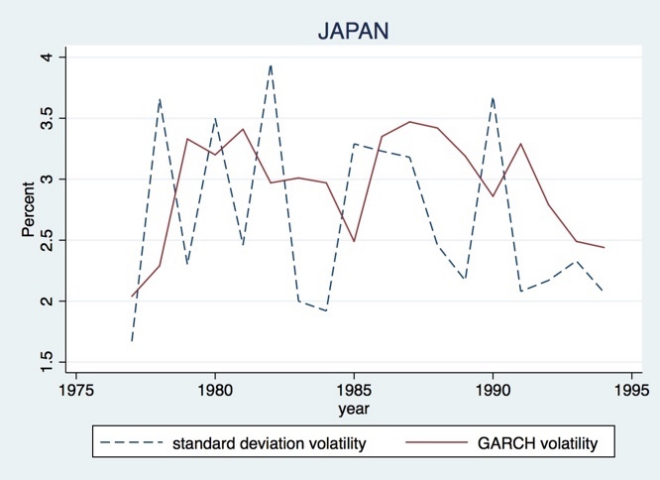

Chart E

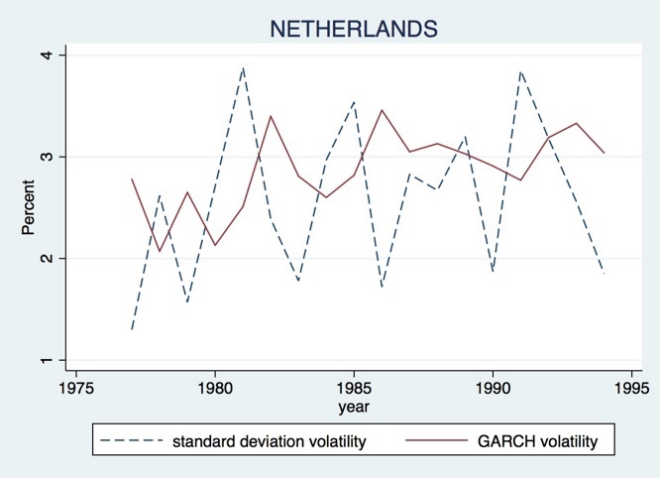

Chart F

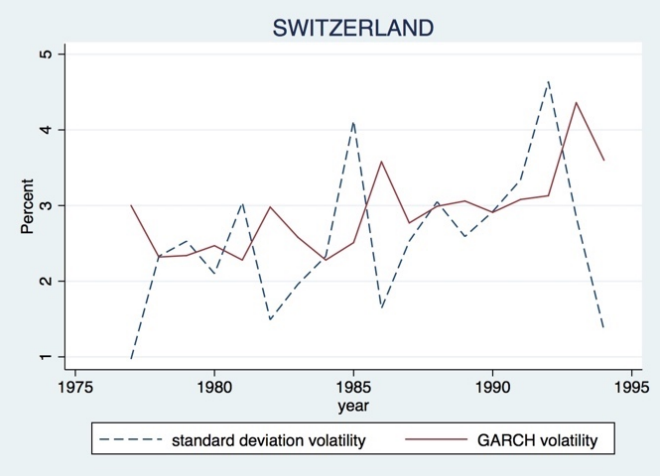

Chart G

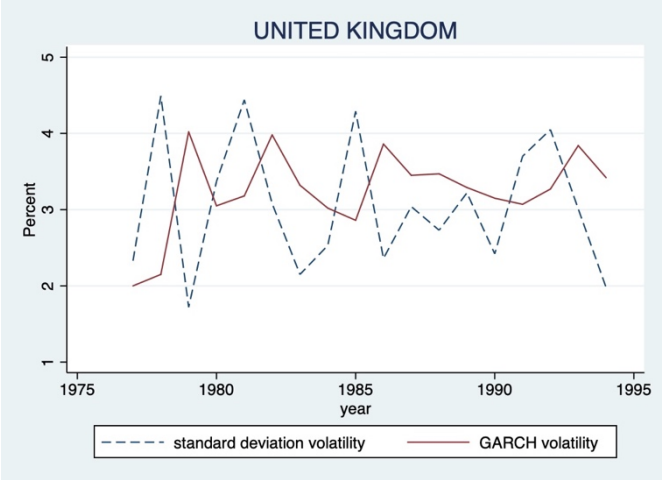
UNITED KINGDOM
Percent
1
2
3
4
5
1975
1980
1985
1990
1995
year
standard deviation volatility
GARCH volatility

Table 3.5 Correlation matrix of exchange rate and exchange rate volatility with their lagged values.

	Exchange rate	**Exchange rate$_{t-1}$**	**Exchange rate$_{t-2}$**	**Std. Dev.**	**Std. Dev.$_{t-1}$**	**Std. Dev.$_{t-2}$**
Exchange rate	1					
Exchange rate$_{t-1}$	0.99	1				
Exchange rate$_{t-2}$	0.98	0.99	1			
Std.Dev.	0.12	0.12	0.12	1		
Std. Dev.$_{t-1}$	0.07	0.07	0.07	0.38	1	
Std. Dev.$_{t-2}$	0.05	0.04	0.04	0.29	0.39	1

Table 3.6 Estimation of the number of FDIRE transactions into the U.S. (extensive margin), 1977-1994. The dependent variable is the natural logarithm of the total number of FDIRE project in year *t* from source country *i*. The first column estimates a Poisson model using only the log of exchange rate and the standard deviation of exchange rate volatility as the independent variables. Column (2)-(4) gradually include covariates that capture the source country's economic and financial characteristics. Each specification includes a full set of source country and year fixed-effects. Robust standard errors clustered at the country level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**
Ln(exchange rate)	-2.80***	-2.57***	-1.88***	-1.80**
	(1.06)	(0.88)	(0.48)	(0.48)
Std. Dev. Volatility	0.03	0.07	0.03	0.02
	(0.19)	(0.15)	(0.16)	(0.17)
Growth rate of GDP		0.09**	0.08*	0.07
		(0.04)	(0.04)	(0.05)
Credit-to-GDP			0.00	-0.00
			(0.01)	(0.00)
Market-Cap-to-GDP			0.02***	0.02***
			(0.000)	(0.005)
Ln(GDP)				-3.85**
				(3.07)
Ln(GDP per capita)				4.59
				(3.85)
Constant	3.37***	2.93***	1.53***	6.49
	(0.200)	(0.24)	(0.41)	(15.44)
Observations	126	126	123	123
Model specification	Poisson	Poisson	Poisson	Poisson

Table 3.7 Estimation of the number of FDIRE transactions into the U.S., GARCH volatility, 1977-1994. The dependent variable is the natural logarithm of the total number of FDIRE project in year *t* from source country *i*. The first column estimates a Poisson model using only the log of exchange rate and the GARCH volatility as the independent variables. Column (2)-(4) gradually include covariates that capture the source country's economic and financial characteristics. Each specification includes a full set of source country and year fixed-effects. Robust standard errors clustered at the country level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level**.**

VARIABLES	(1)	(2)	(3)	(4)
Ln(exchange rate)	-2.95***	-2.69**	-1.89**	-1.79**
	(0.92)	(0.76)	(0.37)	(0.46)
GARCH volatility	0.41**	0.38**	0.04	-0.04
	(0.19)	(0.18)	(0.16)	(0.21)
Growth rate of GDP		0.09**	0.08**	0.07*
		(0.04)	(0.04)	(0.04)
Credit-to-GDP			0.00	-0.001
			(0.01)	(0.01)
Market-Cap-to-GDP			0.02***	0.02***
			(0.00)	(0.01)
Ln(GDP)				-4.43
				(3.37)
Ln(GDP per capita)				5.06
				(3.70)
Constant	2.70***	2.37***	1.51***	9.53
	(0.30)	(0.32)	(0.46)	(19.87)
Observations	126	126	123	123
Model specification	Poisson	Poisson	Poisson	Poisson

Table 3.8 Estimation of the real total value from a source country into the U.S., 1977-1994. The dependent variable is the natural logarithm of the total volume of FDIRE in year *t* from source country *i*. The first column estimates a fixed-effect OLS regression using only the log of exchange rate and the standard deviation of exchange rate volatility as the independent variables. Column (2)-(4) gradually include covariates that capture the source country's economic and financial characteristics. Column (5)-(8) replace the standard deviation volatility with the GARCH estimated volatility. Each specification includes a full set of source country and year fixed-effects. Robust standard errors clustered at the country level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(exchange rate)	-4.05**	-3.52**	-3.17*	-2.76**	-4.47**	-3.93***	-3.56**	-2.93**
	(1.40)	(1.43)	(1.18)	(1.03)	(1.34)	(1.38)	(0.95)	(0.91)
Std. Dev.	-0.09	-0.09	-0.19	-0.26				
	(0.18)	(0.19)	(0.23)	(0.17)				
GARCH volatility					0.70*	0.63*	0.37	0.23
					(0.34)	(0.32)	(0.34)	(0.16)
Growth rate of GDP		0.23**	0.24**	0.23*		0.22***	0.24**	0.22**
		(0.09)	(0.09)	(0.09)		(0.08)	(0.09)	(0.09)
Credit-to-GDP			-0.01	-0.01			-0.01	-0.01
			(0.01)	(0.01)			(0.01)	(0.01)
Market-Cap-to-GDP			0.04**	0.04*			0.04**	0.04*
			(0.01)	(0.02)			(0.01)	(0.01)
Ln(GDP)				-11.55				-7.35
				(10.41)				(10.55)
Ln(GDP per capita)				12.53				9.29
				(10.08)				(10.00)
Constant	5.12***	4.06**	2.27	29.78	4.73***	3.75***	2.23**	6.50
	(0.77)	(0.92)	(1.00)	(42.94)	(0.67)	(0.60)	(0.80)	(46.42)
Observations	126	126	123	123	126	126	123	123
R-squared	0.60	0.62	0.68	0.69	0.61	0.63	0.68	0.68
Model specification	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS

Table 3.9 PPML estimation of the determinants of total volume of FDIRE 1977-1994. To check the robustness of the OLS regressions, I use the total volume of FDIRE in year *t* from source country *i* as the dependent variable. Column (1) and (2) estimate a PPML model using the natural logarithm of exchange rate and the standard deviation volatility, along with gradual inclusion of other country-level covariates. Column (3) and (4) estimate the same specifications replacing the standard deviation volatility with the GARCH volatility. Each specification includes a full set of source country and year fixed-effects. Robust standard errors clustered at the country level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

VARIABLES	(1)	(2)	(3)	(4)
Ln(exchange rate)	-4.36***	-2.88*	-4.51***	-2.82
	(1.59)	(.74)	(1.59)	(0.81)
Std. Dev.	0.29*	0.34*		
	(0.17)	(0.19)		
GARCH Volatility			0.77*	0.08
			(0.40)	(0.20)
Growth rate of GDP		0.16***		0.15***
		(0.03)		(0.03)
Credit-to-GDP		-0.01		-0.01
		(0.01)		(0.01)
Market-Cap-to-GDP		0.03***		0.03**
		(0.01)		(0.01)
Constant	6.78***	5.09***	5.58***	0.08
	(0.24)	(0.75)	(0.78)	(0.20)
Observations	126	123	126	123
Model specification	Poisson PML	Poisson PML	Poisson PML	Poisson PML

Table 3.10 Estimation of the total volume of FDIRE on the lagged values of exchange rate. To account for the dynamics of adjustment, I estimate another set of models on the lagged values of exchange rate and its volatility, up to two periods of lags. The extensive margin uses the total number of real estate transactions in a given year from a source country as the dependent variable, while the intensive margin uses the total volume as the dependent variable. Each specification includes a full set of source country and year fixed-effects. Robust standard errors clustered at the country level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

	Extensive Margin				Intensive Margin			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exchange rate_lag1	-3.12***	-1.57**			-4.51**	-3.05**		
	(1.00)	(0.77)			(1.36)	(0.86)		
Std.dev._lag1	0.06	-0.07			0.35*	0.09		
	(0.07)	(0.06)			(0.16)	(0.13)		
Exchange rate_lag2			-2.88***	-0.61			-4.22*	-2.20
			(1.05)	(1.23)			(1.74)	(1.40)
Std.dev._lag2			0.04	-0.06			0.36*	0.12
			(0.09)	(0.09)			(0.16)	(0.14)
Constant	3.28***	27.09	3.15***	16.77	5.20***	16.75	4.57***	4.06
	(0.16)	(29.65)	(0.30)	(34.00)	(0.62)	(49.43)	(0.57)	(44.53)
Observations	126	123	126	123	126	123	126	123
R-squared	NA	NA	NA	NA	0.61	0.69	0.61	0.68
Model specification	Poisson	Poisson	Poisson	Poisson	OLS	OLS	OLS	OLS

Table 3.11 Transaction level regression on the exchange rate and other covariates, 1977-1994. To fully explore the effects of exchange rate and source country financial development on FDI from different dimensions, I utilize the transaction level data and created an indicator variable $Repeat_{ijt}$ to identify if a foreign investor is associated with multiple FDIRE transactions during the sample period. I regress the logarithm of individual transaction value on the exchange rate, exchange rate volatility and other covariates. Each specification includes a full set of source country and year fixed-effects. Robust standard errors clustered at the country level. *** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Ln(exchange rate)	-2.08***	-1.89***	-1.38***	-2.06***	-1.87***	-1.35***
	(0.35)	(0.27)	(0.16)	(0.32)	(0.28)	(0.15)
Std.Dev. Vol.	0.07	0.13	0.07			
	(0.06)	(0.07)	(0.07)			
GARCH Vol.				0.15	0.16	-0.02
				(0.13)	(0.14)	(0.30)
Repeat		1.11***	1.12***		1.11***	1.12***
		(0.27)	(0.27)		(0.27)	(0.27)
Growth rate of GDP		0.08	0.06		0.07	0.06
		(0.05)	(0.05)		(0.04)	(0.05)
Credit-to-GDP			-0.004			-0.005
			(0.003)			(0.003)
Market-Cap-to-GDP			0.002			0.002
			(0.003)			(0.003)
Ln(GDP)			-6.37***			-7.13
			(1.27)			(4.68)
Ln(GDP per capita)			8.58***			9.23*
			(1.75)			(4.05)
Constant	3.03***	2.04**	0.34	2.81***	1.88**	4.00
	(0.18)	(0.27)	(4.23)	(0.35)	(0.26)	(23.55)
Observations	944	944	939	944	944	939
R-squared	0.18	0.27	0.27	0.18	0.27	0.27
Model specification	OLS	OLS	OLS	OLS	OLS	OLS

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APPENDIX

Data Sources

Foreign acquisitions of U.S. real estate, transaction level data – International Trade Administration, Department of Commerce

Gross state product— Bureau of Economic Analysis

State unemployment rate — Bureau of Labor Statistics

Average wage — the Current Population Survey, U.S. Census Bureau

Number of foreign trade zones – the U.S. Foreign-Trade Zones Board, International Trade Administration, Department of Commerce

State market potential – Kandilov et al. (2016)

State land area– U.S. Census Bureau

State population -- U.S. Census Bureau

State census regions and divisions -- U.S. Census Bureau

Consumer price index – Bureau of Labor Statistic