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UNIVERSITY OF CALIFORNIA

Los Angeles

The Exploitation and Development of Intangible Assets by Multinational

Enterprises (MNEs): An Empirical Analysis of the Foreign Direct

Investment of US and Japanese MNEs, 1974-1997

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Management

by

Heather Berry

2001

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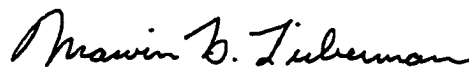Berry, Heather

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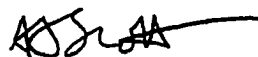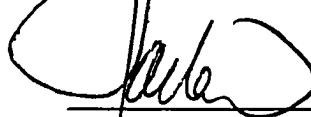The dissertation of Heather Berry is approved.

Marvin Lieberman

Richard Rumelt

Allen Scott

Mariko Sakakibara, Committee Co-Chair

José de la Torre, Committee Co-Chair

University of California, Los Angeles

2001

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To my most cherished supporter, Wayne, whose love and encouragement made this

dissertation possible.

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VITA

June 12, 1967   Born, Milwaukee, Wisconsin

1989   B.A., Political Science
McGill University
Montreal, Canada

1988-1989   Research Assistant,
Political Science Department
McGill University
Montreal, Canada

1989-1990   Analyst, Office of Policy and Legislative Analysis
U.S. Department of Labor
Washington, D.C.

1991   M.Sc., International and European Politics
Edinburgh University
Edinburgh, Scotland

1992-1994   Policy Analyst
U.S. House of Representatives, U.S. Congress
Washington, D.C.

1994-1995   Ways and Means Committee Associate,
U.S. House of Representative, U.S. Congress.
Washington, D.C.

1995-99   Research and Teaching Assistant
Management Department
University of California, Los Angeles

2000-01   Lecturer
Management Department, The Wharton School
University of Pennsylvania, Philadelphia, PA

PUBLICATIONS AND PRESENTATIONS

Berry, H., (2000) Product Diversification Activities in Foreign Markets by Japanese
MNCs, 1974-1997, Paper presented at the meeting of the Academy of
Management, Toronto, Canada.

viii

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____, (1999). Foreign Direct Investment by Japanese Multinationals: An Empirical Analysis of the Internalization Theory. Paper presented at the meeting of the Academy of Management, Chicago, Illinois.

____, (1999). Internalization Theory, the Value of Multinationality and Japanese Foreign Direct Investment. Paper presented at the UCLA Innovation Workshop.

____, and Sakakibara, M., (1999) Resource Accumulation and Overseas Expansion by Japanese Multinationals: An Empirical Analysis of the Internalization Theory. Strategy and Organization Working Paper No. 99-26, The Anderson School, UCLA.

____, (1998) "Internalization Theory, the Value of Multinationality and Japanese Foreign Direct Investment," CIBER Working Paper No. 98-12, The Anderson School, UCLA.

Hanson, H., (maiden name), (1995) "US Strategic Interest in NATO," *Strategic Review*, pp 76-80.

ABSTRACT OF THE DISSERTATION

The Exploitation and Development of Intangible Assets by

Multinational Enterprises (MNEs): An Empirical Analysis of the Foreign

Direct Investment of US and Japanese MNEs, 1974-1997

by

Heather Berry

Doctor of Philosophy in Management

University of California, Los Angeles, 2001

Professor José de la Torre, Co-Chair

Professor Mariko Sakakibara, Co-Chair

How do firms use home and foreign markets to exploit and develop their intangible assets? In contrast to the transaction-level analysis more commonly featured in extant international management literature, I focus on a firm's capabilities and idiosyncratic resources and analyze how firms exploit and develop their competitive advantages using intangible assets in both their home and foreign markets. I test several hypotheses while analyzing newly created panel datasets containing information on 191 US and 141 Japanese firms' investments in intangible assets and foreign direct

investment (FDI) over a twenty-four year period (1974-1997). Unlike previous research, I use lagged values to disentangle the causal relationship between a firm's intangible assets and its FDI to specifically test the internalization theory prediction that a firm's intangible assets created in its home market are exploited abroad. Based on Granger's test of causality, I find robust support for the internalization theory for both Japanese and US MNEs. I also analyze whether MNEs may be more than just exploiters of home country knowledge or advantages and test for feedback. In my results, I fail to find support from either sample. This suggests that more empirical analysis is needed to confirm under what conditions MNEs acquire and use competencies developed throughout their global network. I examine the factors that lead firms to tap into foreign knowledge to augment their technological capabilities through foreign R&D. Based on random effects probit models, I find that non-dominant firm arguments provide a strategic rationale for the small percent of R&D that is undertaken outside a firm's home market. Finally, I use firms' Tobin's q ratios to examine the performance effects from a firm's foreign investments. Based on panel data regression models, I conclude that there are large differences between US and Japanese firms. For US firms, multinationality is consistently negatively valued by shareholders, while for Japanese firms, multinationality is positively valued by shareholders, but only after a firm has experience with subsidiaries in foreign countries. Overall, the findings in this dissertation reveal similar motives for foreign investment by US and Japanese firms (asset-exploitation) but quite different performance effects from these investments.

INTRODUCTION

The resource based view is concerned with a firm's ability to obtain rents and sustain its competitive advantage (Barney, 1986 and 1991, Conner, 1991, Peteraf, 1990, Rumelt, 1987 and Wernerfelt, 1984). This view focuses on the rents accruing to the owners of scarce firm-specific resources. These rents are Ricardian due to the unique inputs rather than market power of the firm. The basic assumption in this view is that the firm has unique assets and that these assets provide the firm with unique opportunities. Itami (1987) has argued that it is a firm's intangible factors that are strategic in nature and likely to afford a firm these unique opportunities. He states that "intangible assets, such as a particular technology, accumulated consumer information, brand name, reputation and corporate culture, are invaluable to the firm's competitive power."

In the international management literature, the internalization theory (which according to Buckley (1990) is the "established theory of the multinational enterprise"[1]) emphasizes the existence of intangible assets and the competitive advantages of investing firms from their home market which more than offset the disadvantages of operating in a foreign country. The internalization theory (as developed by Buckley and Casson, 1976, Caves, 1971, Dunning, 1980, Hennart, 1982, Rugman, 1981 and others) uses transaction cost economics and is primarily concerned with identifying situations in which the markets for intermediate products are likely to be internalized and in which firms own

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[1] A multinational enterprise is defined here as a firm that controls and manages production establishment located in at least two countries – it is simply one subspecies of a multiplant firm (Caves, 1996)

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and control value-adding activities outside their national boundaries. According to the

internalization theory, a firm which invests in wholly-owned subsidiaries abroad must

possess some kind of strategic advantage that more than offsets the costs of operating in

countries alien to the firm and from a distance. Such assets tend to be intangible assets,

particularly various kinds of knowledge and know-how for new products and production

processes, for developing and carrying out marketing programs and for managing these

economic activities.[2]

In this dissertation, I draw from and contribute to both the resource-based view

and the international management literature. Common to both is a recognition of how

important a firm's intangible assets are. It is the same type of firm-specific assets that are

the focus of the resource based view which are assumed to exist in the international

management literature to explain why firms undertake foreign direct investment.

However, the resource based view does not consider how resources are used and created

in foreign markets, while the international management literature has tended to focus on

transaction costs and alternate governance structures rather than on the firm-specific

assets that are transacted abroad. In fact, Madhok (1991) has criticized the internalization

theory for focusing solely on transaction costs and market failure. Madhok (1991),

Bartlett and Ghoshal (1988), Dunning (1993), Dunning and Nurula (1995) and Zander

(1995) have all recognized that MNEs may be more than just exploiters of home country

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[2] By using the transaction cost approach, many studies have also investigated alternative modes firms can
enter foreign markets (including, for example, through joint ventures, alliances and licensing agreements).
Because I am more interested in the intangible assets of the investing firms than their entry mode choice, I
focus on all types of subsidiaries in this dissertation – though it should be noted that the vast majority of the

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knowledge or advantages and that foreign markets may allow firms to acquire competencies throughout their network. In this dissertation, I move beyond the transaction cost approach of the internalization theory and draw from the resource based view to analyze both the exploitation and development of a firm's intangible assets to more fully examine how firms build and sustain competitive advantage over time in both home and foreign markets.

I investigate how firms exploit and develop their intangible assets in four related essays, which appear as Chapters Two, Three, Four and Five. In these chapters, I apply more appropriate empirical tests than have previously been used to investigate the internalization theory's exploitation arguments, analyze how a firm's intangible assets and its foreign direct investment interact over time to enhance its Tobin's q ratios, and apply and develop the insights from non-dominant firm models of behavior to analyze firm decisions to conduct overseas R&D and develop capabilities abroad.

I address several research questions while I am analyzing these issues, including: Do the internalization theory predictions concerning a firm's exploitation of its intangible assets hold in a dynamic empirical setting? Are firm-specific advantages created in a firm's home market exploited abroad by MNEs at all levels of foreign investment? Does shareholder valuation of a firm's FDI change given different levels of international activity? How does the domestic competitive position of a firm affect its decision to undertake foreign R&D? And, are there differences between US and Japanese MNEs in

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worldwide foreign direct investment for Japanese firms and a significant portion of the worldwide foreign direct investment for US firms occurs through wholly-owned subsidiaries.

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terms of their exploitation and development of intangible assets in home and foreign

markets?

Why are these questions important? First, although there is a large body of

empirical work that claims to provide support for the internalization theory predictions,

the cross-sectional, static nature of previous studies does not consider the causal

implications of the internalization theory predictions regarding the exploitation of firm

specific advantages. In this dissertation, I argue that the exploitation argument can only

be tested using models that consider lagged variables to investigate the issue of

precedence that is suggested in the theory. In addition, although there is theoretical work

suggesting that firms acquire knowledge and competencies abroad, the empirical basis for

these ideas is somewhat limited. Further, given some of the recent theoretical arguments

which suggest that firms operating in many markets have access to foreign knowledge

that could enhance their competitive position (Bartlett and Ghoshal, 1990, Pearce and

Singh, 1992, Dunning, 1993, Kogut and Zander, 1993), it is contrary to expectations that

less than 10% of firms' total R&D expenditures are undertaken abroad. I investigate

whether there are similarities between the types of firms that pursue a strategy of trying to

tap into foreign knowledge and argue that non-dominant firm arguments may provide

some insight to help resolve this puzzle. In terms of performance implications, a number

of studies in both strategy and finance have analyzed whether a firm's multinational

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operations are value-creating or value-destroying.[3] In both of these fields, however, no

consensus has emerged about whether a firm's multinational operations enhance or

destroy value. An additional problem with prior studies is that they have tended to be

cross-sectional in nature. This type of analysis does not allow one to consider how

relationships may change over time as a firm's level of foreign investment increases or

decreases. Because I use panel data over the 1974-1997 time period, I am able to

examine the performance implications of different patterns of foreign direct investment

and different levels of foreign experience. Finally, most empirical studies of MNEs tend

to focus quite narrowly on MNEs from one nation or investment into one country. In

general, these studies focus on either US investment abroad or investment into the US.

Other populations need to be analyzed to determine whether similar findings result. By

analyzing the world wide investments of US and Japanese firms, I am able to examine

how similar foreign investment motives are between US and Japanese firms, and how

firms from different nations use home and foreign markets to sustain their competitive

advantage.

In the next chapter, I review the resource based view and internalization theory

arguments that form the theoretical basis for the four related empirical essays that make

up this dissertation. Chapters Two, Three, Four and Five develop the issues discussed

above. In Chapter Two, I investigate the resource accumulation and overseas expansion

of Japanese MNEs, both by testing the internalization theory and by evaluating the

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[3] See for example, Errunza and Senbet (1981 and 1984), Brewer (1981), Buhner (1987) Doukas and
Travlos (1988), Geringer et al. (1989), Kim et al. (1989) Morck and Yeung (1991), Christophe (1997),

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performance effects of Japanese firms' foreign investment. In Chapter Three, I compare the performance effects of US and Japanese firms' multinationality – providing the first comparison between the two panel data sets. In Chapter Four, I extend this comparison by analyzing how applicable the internalization theory is for US and Japanese firms' foreign direct investment. In Chapter Five, I examine how applicable non-dominant firm arguments are to explaining the small percent of firm investment in foreign R&D. Finally, I conclude with a review of the findings of this dissertation, a discussion of their implications and contributions, and a review of future research related to this dissertation that I am interested in pursuing.

Berry and Sakakibara (1999), Click and Harrison (1999) and Geringer et al. (2000)

CHAPTER ONE: LITERATURE REVIEW

The issues that are addressed in this dissertation are drawn from and contribute to both the resource-based view and the international management literatures. As noted in the introduction, both literatures recognize the importance of a firm's intangible assets, particularly various kinds of knowledge and know-how for new products and production processes, for developing and carrying out marketing programs and for managing these economic activities. However, the resource based view does not typically consider how resources are used and created in foreign markets, while the international management literature has tended to focus on transaction costs and alternate governance structures rather than on the management and development of the firm-specific assets that are transacted abroad. In this dissertation, I move beyond the transaction cost approach of the internalization theory and draw from the resource based view to focus on the exploitation and development of a firm's intangible assets to more fully examine how firms build and sustain competitive advantage over time in both home and foreign markets. Below I review the portions of the resource based view and the internalization theory which are most relevant to the topics analyzed in this dissertation.

I.   Resource Based View:

The resource based view is concerned with the firm's ability to obtain rents and sustain competitive advantage (Barney, 1986, 1991 and Conner, 1991). The basic assumption of the resource based view is that the firm has unique assets and that these

assets allow the firm unique opportunities. Rumelt (1984) states that "a firm's competitive position is defined by a bundle of unique resources and relationships and the task of general management is to adjust and renew these resources and relationships as time, competition and change erode their value." A firm is viewed as a pool of resources, and asymmetric resource bundles create the real phenomena of intrafirm profitability asymmetry. This view focuses on the rents accruing to the owners of scarce firm-specific resources. These rents are Ricardian due to the unique inputs rather than market power.

Wernerfelt (1984) has noted that the underlying theoretical approach in the resource based view is to see the firm not through its activities in product markets, but as a unique bundle of tangible and intangible resources. In contrast to the economic perspective (which views resources as immediately accessible on fungible factor markets), this view stresses the inherent immobility or stickiness of valuable factors of production and the time and cost required to accumulate these resources (Peteraf, 1990).

At the core of this view is the logic that the more unobservable and inimitable a firm's resources are, the higher the barriers to imitation and the more sustained the competitive advantage based on that resource is (Godfrey and Hill, 1995). The firm specific capabilities that qualify firm uniqueness and thus its market differential act as the main isolating mechanisms (Rumelt, 1987). They are at the basis of the value-creation process because the results of their use is appropriable exclusively by the specific firm.

Profits result from combinations of strategy and structure, which efficiently exploit firms-specific advantages. Profits are protected from erosion by firm-specific

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isolating mechanisms which make imitative strategies uncertain of success, rather than by collectively supported entry barriers (Rumelt, 1984).

In the resource based view, the deployment of resources and capabilities to establish competitive advantage is a primary goal for strategy formulation. The firm's resources and capabilities are the basis upon which a firm's competitive advantage is built. As Grant (1995) notes, structural sources of market power are based upon a firm's resources. Further, monopolistic price-setting power depends upon market share that is a consequence of cost efficiency, financial strength or some other resource (Grant, 1995).

The view of a firm as a collection of resources is not very helpful by itself. However, what is useful is the distinction between strategic and nonstrategic assets. Arrow (1964) approached this issue long before the resource based view became fashionable and attempted to separate strategic factors from other ones by reasoning that a factor traded on a perfect market could not be strategic because a firm could buy it, derive its marginal product for an arbitrarily short time span and then resell it. For Arrow, factors that can be traded on perfect markets cannot plausibly be described as strategic because choices concerning them may just as well be made myopically. More recently, Itami (1987) has argued that intangible factors are particularly apt to be strategic. He states that "intangible assets, such as a particular technology, accumulated consumer information, brand name, reputation and corporate culture, are invaluable to the firm's competitive power."

These firm-specific assets which are strategic in nature and which are the focus of the resource based view are the same assets which are assumed to exist in the

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international management (IM) literature to explain why firms undertake foreign direct investment. In the IM literature, however, much of the focus has been on transactions rather than on the firm-specific assets that are transacted. Therefore, the resource based view provides much more detail about the nature of these strategic assets than is provided in the IM literature.

For this dissertation, what the IM literature adds to the resource based view literature is the idea that multinational expansion is one way a firm can build and exploit its firm specific assets. As continuous investment in resources and capabilities is the key to competitive advantage over the long haul, it is important to consider how MNEs can use foreign markets to enhance their capabilities. The parts of the IM literature that are relevant to this issue are reviewed below.

II. International Management Literature:

A. Internalization Theory (IT):

Foreign direct investment (FDI) is, in essence, the creation or expansion of firms that operate across national boundaries. Traditional arguments in the IM literature about the motivation for FDI by multinational enterprises emphasize the possession and exploitation of firm-specific advantages. Borrowing from Coase, Hymer (1960) explained how the logic of multinational organization is governed by the internalization of international markets. Drawing on Bain (1956) and Dunning (1958), he explained how the profitability and growth of MNEs reflect their possession of monopolistic competitive

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advantages such as proprietary technology, brand names and other firm specific assets. As Dunning (1993) notes, Hymer's identification of the international firm as a firm that 'internalizes or supersedes the market' provided a useful prologue to the theory of internalization as a means for transferring knowledge, business techniques, and skilled personnel. It should be noted, however, that it was left to others to explore how these components related to institutional economics rather than to Marxist theory.

Over the past three decades, the idea that foreign direct investment is an economic solution to market imperfections has been extended by many others (Buckley and Casson (1976), Caves (1971) Dunning (1980), Hennart (1982) and Rugman (1981)) into what is generally referred to as the internalization theory (IT). This theory is primarily concerned with identifying the situations in which the markets for intermediate products are likely to be internalized, and in which firms own and control value-adding activities outside their natural boundaries. Like earlier attempts to explain the growth of domestic firms, it seeks to explain the international integration of value-added activities in terms of the relative costs and benefits of this form of organization relative to market transactions.

Thus, transaction cost reasoning forms the basis of the internalization theory. Market imperfections are argued to determine the choice between a wholly-owned subsidiary (WOS) and arms-length transacting. Absent transaction costs, MNCs would favor licensing because licensing avoids the costs associated with opening up a foreign market. However, licensing may not protect firm specific advantages in know-how from exploitation by opportunistic licensees.

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According to IT, a firm which invests in wholly-owned subsidiaries abroad must possess some kind of strategic advantage that more than offsets the cost of operating in countries alien to the firm and from a distance. As noted in the resource based view section above, such assets tend to be intangible assets, particularly various kinds of knowledge and know-how for new products and production processes, for developing and carrying out marketing programs and for managing these economic activities. These strategic advantages are based on a special class of assets held by the firm, with some unique characteristics. First, the firm must be able to transfer these assets from the home country location to foreign locations at a low incremental cost, without reducing their revenue-generating productivity at the original location. Second, the sale or lease of these assets to an independent party must involve substantial transaction costs, so that the firm decides that it may be able to appropriate the stream of rent arising from these assets more completely by internalizing them than by selling or leasing them.

These strategic assets are not likely to be distributed uniformly across firms within an industry. Firms acquire and accumulate strategic assets over time and the configuration of asset bundles may differ considerably across firms within an industry, depending on their initial and subsequent strategic choices. Firms with strong strategic advantages may undertake FDI whereas those firms lacking the advantages may remain home-bound or service foreign market in other modes.

Most of the arguments in IT involving firm-specific assets tend to be more relevant to horizontal investments. In fact, most empirical studies which claim to provide support for IT arguments have considered a firm's horizontal international investments in

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production and distribution. These studies tend to analyze the intangible assets of technological know-how and marketing ability and use annual R&D and advertising expenditures as proxies for these variables. In Table 1-1 (which appears at the end of this chapter), I review nineteen of the more cited empirical studies of IT. As noted in the table, seven of these studies have used industry level data. This is an inappropriate level to test empirically the IT view, as the arguments contained in this view are about firms expanding abroad. All but two of the studies listed in the table use static, cross-sectional data. The one study that uses pooled data (Kimura, 1989), studies only nine firms in the semiconductor industry over the period 1978-82. Importantly, this study does not include lagged variables in its analysis. While each study (except Lall and Siddharthan, 1982) claims to provide support for IT arguments, in reality, these studies are reporting statistically significant regression results between intangible assets and multinationality variables that are considered at the same point in time. The one study that uses event history analysis, Morck and Yeung (1992) is also limited because they only include foreign acquisitions in their analysis. It is difficult to conclude whether their findings apply beyond this type of entry mode. As I will argue below, the issue of precedence that is suggested in IT has not been adequately considered in any of these studies.[1]

Another limitation of the internalization theory that has been recognized by proponents of the theory (Buckley, 1988, for example,) also relates to the static nature of

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[1] Finally, it should also be noted that there is one study that is not included in the table, by Mitchell et al (1998) for which I have never seen a citation and which was brought to my attention after a draft of Chapter 2 had already been written. It employs a similar methodology to the one proposed in Chapter 2 of this dissertation and will be discussed (and critiqued) in both Chapters 2 and 4.

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the theory itself. The assumption that a firm is exploiting its firm specific advantages abroad does not provide any consideration for firms which have been present in foreign markets for some time. After firms overcome the initial disadvantage of being foreign, there are many potential advantages the firm can gain from operating in foreign markets. For example, firms can accumulate a broader knowledge base or different management skills or advertising know-how from their operations in different markets. Finally, the idea of developing advantages in foreign locations is not considered in the internalization theory.

B. Capabilities Development (CD) view:

Madhok (1997) notes that recently, there has been increasing attention in the strategy literature to the notion of firms competing primarily on the basis of capabilities (Prahalad and Hamel, 1990; Cantwell, 1991; Tallman, 1991; and Collis, 1991). He notes that this line of research is rooted in both behavioral theory and the evolutionary theory of the firm. In this perspective (termed the organizational capability perspective in Madhok's paper and the resource-based strategic management model in Tallman's paper), the focus is much broader than the IT view and incorporates the managing of value – both its erosion and enhancement – inherent in a firm's knowledge base. Madhok notes that while the internalization perspective focuses solely on the transaction cost involved and market failure, what he calls the organizational capability perspective focuses on a firm's capabilities and how they can be developed throughout the MNE's network. While the internalization perspective focuses solely on cost minimization, this view attempts to look

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at the benefits of investing abroad. What Madhok argues is that the transaction cost and operational capability perspectives operate at different levels of analysis – the transaction and the firm, respectively. Madhok states that there is a need for greater attention to a firm's capabilities in order to attain a more complete perspective on firms that are pursuing international expansion through foreign direct investment.

In Madhok's organizational capability view, the firm is essentially a bundle of relatively static and transferable resources which are transformed into capabilities through dynamic and interactive firm specific processes where individual skills, organization and technology are inextricably woven together (Nelson and Winter, 1982). Capability accumulation is critical and involves the firm's ability to acquire, assimilate, diffuse, deploy and exploit knowledge. The process and routines by which a firm's knowledge base is developed and integrated into functioning of the organization is enhanced through new combinations.

Bartlett and Ghoshal (1988) have also asserted that MNEs operating in a variety of environments are exposed to multiple stimuli that enable them to develop competencies and learning opportunities not available to firms which are domestic only. In this view, one of the key advantages of an MNE is its greater capacity to generate innovations. Solvell and Zander (1995) note that in recent international management research, there has been an attempt to move the analysis beyond the traditional view and bring together different research disciplines to further understand how the MNE builds and sustains competitive advantage over the long term. Further, Dunning, (1993) Dunning and Nurula (1995) and Zander (1995) note that the ability of MNCs to develop

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integrated technological networks and to coordinate geographically diversified activities, has become an important area of research in international management.

These ideas form the basis of what can be called a capabilities development (CD) view. This view moves beyond IT by recognizing that MNEs may not just be exploiters of home country knowledge or advantages, but as Barlett and Ghoshal (1989) state, "networks with access to technology from various locations shared throughout the organization." In this view, competencies can be acquired throughout the system, rather than simply emanating from the center of the system.

The literature reviewed above provides the theoretical underpinnings for the entire dissertation. The four chapters that follow offer empirical analyses of hypotheses based on these theories. For these chapters, I have created two panel data sets of the foreign direct investment activities of MNEs – the first consists of 141 Japanese MNEs and the second consists of 191 US MNEs.

In the next chapter, I argue that Granger's concept of causality offers a better test of the internalization theory and also provides a test for feedback from foreign subsidiaries to the parent firm. I test my hypotheses on the Japanese data set. In this chapter, I also examine the performance implications of a Japanese firm's multinationality. In Chapter Three, I provide the first comparison between Japanese and US firms in this dissertation by analyzing whether there are differences in how shareholders value the multinationality of US and Japanese firms. In Chapter Four, I return to Granger's concept of causality and provide the second comparison between

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Japanese and US firms by examining the results of this test on each of my two data sets. And finally, in Chapter Five, I specifically focus on the development of capabilities by analyzing which firms are investing in foreign R&D labs. I have supplemented my Japanese panel data set for this chapter and I analyze the foreign R&D decisions of 405 Japanese firms.

Table 1-1: Summary of the Most-Cited Empirical Studies of the Internalization Theory:

Author (Year)	Type of Data:	Level of Analysis:	Finding:
Horst (1972) Lall (1980) Pugel (1978; 1981) Wolf (1977)	Cross Section	Industry	All five industry level studies show that technology intensity is positively and significantly related to US FDI abroad.
Caves (1974)	Cross Section	Industry	Positive relation between the share of the Canadian industry accounted for by foreign owned affiliates and the R&D intensity of that industry.
Buckley and Casson (1976)	Cross Section	Industry (R&D data)	Positive relation between the value of sales attributable to production abroad and the industry R&D intensity.
Buckley and Dunning (1977)	Cross Section	Industry	UK R&D intensity is significantly related to US FDI in the UK
Swedenborg (1979)	Cross Section	Firm	R&D intensity of Swedish firms is significantly and positively related to overseas production.

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Table 1-1 (Con't): Summary of the Most-Cited Empirical Studies of the Internalization Theory:

Author (Year)	Type of Data:	Level of Analysis:	Finding:
Dunning (1980)	Cross Section	Industry	Skilled to unskilled employment ratio is Positively and significantly related to foreign production ratios for US MNEs in 5 advanced countries.
Lall and Siddharthan (1982)	Cross Section	Industry	R&D and Advertising intensity of US industries do not have a significant relation with foreign investment in the US in 1972 or 1977.
Grubaugh (1987)	Cross Section	Firm	The R&D intensity of 186 US firms is positively and significantly related to their decision to invest abroad.
Clegg (1987)	Cross Section	Firm	For the individual years 1965, 1970 and 1975, the R&D expenditure of US, Swedish and W. German MNEs is positively and significantly related to their FDI. (For Japanese firms, the relation is significant and negative and for UK firms, the relation is insignificant.)

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Table 1-1 (Con't): Summary of the Most-Cited Empirical Studies of the Internalization Theory:

Author (Year)	Type of Data:	Level of Analysis:	Finding:
Pearce (1989)	Cross Section	Firm	The R&D intensity of US firms is positively and significantly related to their foreign production ratio. For Continental European firms, research intensity is positively correlated with foreign production, but this relation does not hold for UK firms.
Kimura (1989)	Pooled Data (no lagged values)	Firm	For 9 Japanese firms in the Semiconductor Industry, the firm's technological innovation is significantly related to its FDI.
Kogut and Chang (1991)	Cross Section	Industry	Japanese investment in the US is significantly related to both the R&D intensity of the US industry and the R&D intensity of the Japanese industry
Morck and Yeung (1991)	Cross Section	Firm	Interaction between a firm's multinationality and its intangible assets causes superior firm performance

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Table 1-1 (Con't): Summary of the Most-Cited Empirical Studies of the Internalization Theory:

Author (Year)	Type of Data:	Level of Analysis:	Finding:
Morck and Yeung (1992)	Time Series Data	Firm	When US firms with intangible assets acquire firms abroad, their stock price increases
Hennart and Park (1994)	Cross Section	Product	R&D intensity of 680 Japanese firms is positively related to their decision to manufacture 1799 products in the US.

CHAPTER TWO: RESOURCE ACCUMULATION AND RESOURCE

ACCUMULATION BY JAPANESE MNES[1]

Abstract: This chapter explores two issues: first, the evolution of the value of multinationality to shareholders as a firm's level of international activity changes; and second whether the accumulation of a firm's intangible assets actually precedes its investment abroad, as implied by the internalization theory. These issues are analyzed in a dynamic context using a sample of 141 Japanese manufacturing firms over a twenty-four year period (1974–1997). The empirical results reveal that shareholder valuation of FDI changes as the level of a firm's international activity changes. Further, the result that intangible assets Granger cause FDI provides support for the internalization theory.

Introduction:

This chapter analyzes the process of resource accumulation and overseas

expansion by multinational enterprises (MNEs) in a dynamic context. According to the

internalization theory, an MNE's possession of intangible assets (such as technical know-

how, marketing abilities and managerial skill) is considered to be the central determinant

of foreign direct investment (FDI) because of market imperfections associated with the

international transaction of firm-specific intangible assets. We contribute to this line of

research by exploring two issues: first, the evolution of the value of multinationality to

shareholders as a firm's level of international activity changes; and second whether the

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[1] This chapter is a version of the working paper under the same name by myself and Mariko Sakakibara.

accumulation of a firm's intangible assets actually precedes its investment abroad, as implied by the internalization theory.

We explore the evolution of the value of multinationality to shareholders as reflected in a firm's Tobin's Q ratio as a firm expands its overseas activities and accumulates resources. Morck and Yeung (1991) analyzed the linkage between a firm's market value and its marketing ability, technological know-how, and multinationality. Their approach allows for the consideration of whether a firm's FDI is valued by shareholders simply because it enhances a firm's intangible assets or whether FDI is valued by itself. Building upon their work, we analyze firm-level panel data to consider how a firm's multinationality and intangible assets interact over time to enhance a firm's Tobin's Q ratio. Unlike many previous studies which have focused only on FDI as a measure of a firm's multinationality (including Morck and Yeung, 1991), we include two dimensions of a firm's multinationality: exports and FDI.

We then test the internalization theory's prediction that the accumulation of a firm's intangible assets should precede its investment abroad. While previous empirical studies have reported a significant relationship between intangible assets and foreign investment, the majority of studies have been limited in their analysis to cross-sectional data.[2] The problem with a static approach is that the internalization theory is not really tested. The theory does not simply predict an association between a firm's intangible

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[2] Two other empirical investigations (Morck and Yeung, 1992 and Mitchell et al., 1998) have investigated the issue of causality using a more appropriate type of analysis. However, Morck and Yeung's event study is limited because they only include foreign acquisitions in their sample, while Mitchell et al. only analyze foreign direct investment data from 1980s for the US firms in their sample and ultimately fail to find support for the internalization theory. Each of these studies will be discussed in more detail below.

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assets and foreign direct investment — rather, it predicts a very clear direction for this association: the existence of firm specific intangible assets should *precede* a firm's international investment abroad. By looking at only one year in time, previous studies have been unable to conclude whether a firm's accumulation of intangible assets actually precedes its international expansion. In this paper, we apply Granger causality tests to panel data that span over two decades to examine the dynamic relationship between intangible assets and international expansion. Our analysis is at the firm level, the appropriate level to test the prediction of the internalization theory.

Our sample includes 141 Japanese manufacturing firms over a twenty-four year period (1974–1997). This time span includes the period during which Japanese firms actively expanded their overseas activities, allowing us to conduct direct tests of the internalization theory. Based on panel data regression models, we find that FDI is positively valued by shareholders during a firm's more advanced level of investment abroad, though a firm's initial FDI is not significantly valued by shareholders. Our results also provide support for the internalization theory's prediction that the accumulation of a firm's intangible assets precedes its investment abroad. Using bivariate vector autoregressive analysis, we find that the accumulation of intangible assets Granger causes FDI. Finally, our results hold after taking into account firms in export-oriented industries that were affected by trade disputes in Japan.

The chapter is organized as follows. The next section reviews the internalization theory and develops four hypotheses: the first two focus on shareholder valuation of a firm's multinationality; the third and fourth hypotheses focus on the relationship between

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a firm's intangible asset accumulation and its foreign direct investment. A description of the data, variables and methodology are provided in the third and fourth sections, while the empirical results and their implications are discussed in the last two sections.

Theory:

Firm-based arguments of the theory of the MNE date back to the early 1960s, when Hymer argued that MNE's exploit their firm-specific advantages to offset the potential cost and market power advantages of the home-country producers in foreign markets (Hymer, 1960). Buckley and Casson (1976), Dunning (1980) and Rugman (1981) extended Hymer's ideas and adopted the transaction cost approach of Coase and Williamson to explain why the firm, by internalizing economic activities to minimize transaction costs, may provide more efficient outcomes than markets when investing abroad.

According to the internalization theory, FDI occurs when firms can increase their value by internalizing markets for their intangible assets. There is an opportunity to earn rents on assets that are already in the firm's possession and have been accrued through the firm's activities in its home-base market (Caves, 1993). These assets include superior marketing abilities, managerial skills or technical know-how; there are strong incentives for an MNE to exploit its intangible assets itself (through internalization and FDI) because these assets are difficult to capitalize in arm's length transactions. Firms can enhance their value by expanding abroad (direct investment), provided the gains from

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applying the intangible assets in a foreign market are sufficient to compensate for the inherent disadvantages of operating abroad in an unfamiliar environment.

A firm can pursue many different types of activities through its foreign direct investment (including, for example, production, distribution, sales, or any combination). Because of this, there are many potential reasons for FDI to be valued by shareholders. For example, access to low-cost labor or profitable markets could be valued (perhaps even more valued during economic downturns in the home market); or access to new types of technological know-how or marketing knowledge in foreign markets which can be transferred elsewhere could be valued by shareholders. Further, FDI may be valued by shareholders because is allows firms to serve export markets at lower costs or defend foreign market positions against host country protectionism. The first issue that is explored in this paper focuses on shareholder valuation of multinationality and how this valuation changes over time.

Building on other studies of market valuation,[3] Morck and Yeung (1991) investigate the relationship between a firm's market valuation and its multinationality. Morck and Yeung argue that if the internalization theory holds, then multinationality (which they define as the number of foreign subsidiaries) by itself should not have a significant impact on a firm's market value. Rather, international expansion simply enhances the scope for using a firm's intangible assets. In their analysis, Morck and Yeung include interaction terms between intangible assets and multinationality and find that the positive impact of both research and development and advertising spending on a

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firm's value is enhanced by multinationality, but that multinationality itself does not have a significant impact on a firm's value.

An issue that is not pursued by Morck and Yeung in their cross-sectional study is whether shareholder valuation of multinationality changes as a firm's level of multinationality changes over time. The internalization theory predicts that firms will use their technical or marketing capabilities to penetrate a foreign market. Thus, in an early stage of foreign expansion, Morck and Yeung's argument may be right; a firm's FDI may be valued because it enhances the firm's intangible assets of marketing ability and technical know-how. Morck and Yeung's argument may not apply after a firm has achieved a more advanced level of internationalization, however. As firms gain higher levels of activity abroad and after a firm's subsidiaries are more established in foreign markets, a firm's FDI may be valued by investors beyond simply enhancing the parent firm's intangible assets.

It is predicted in this chapter that shareholder valuation of multinationality changes over time. In an initial period of a firm's international expansion, FDI will be valued by shareholders because it enhances a firm's intangible assets of marketing ability and technical know-how, but not by itself. During a firm's initial investment in FDI, its subsidiaries are new and subsequently not yet in a position to be contributing much in terms of benefits from low-cost labor or new technical knowledge back to the parent firm. Further, in an early expansion period, a firm does not have experience with subsidiaries in foreign markets. Shareholders may discount a firm's early FDI because of this lack of

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[3] Including Tobin and Brainard (1977), Errunza and Senbet (1981, 1984), and Kim and Lyn (1986).

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experience abroad. Following Morck and Yeung, we argue here that in a firm's initial expansion abroad, it may be the strength of the parent firm's intangible assets that gives FDI value to shareholders. After a firm has established subsidiaries abroad and has invested in more advanced levels of international expansion, however, we predict that FDI will be valued by shareholders beyond simply enhancing the parent firm's intangible assets. Firms with more advanced levels of investment abroad have subsidiaries which have been around long enough to be established in foreign markets; the benefits from low-cost manufacturing, access to local knowledge and/or increased profits from foreign markets have more potential to be contributing to the parent firm's value.[4]

> *Hypothesis 1: During an early period of a firm's international expansion, FDI will not be valued directly by shareholders. A firm's FDI will only be valued to the extent that it enhances a firm's intangible assets of marketing ability and technological know-how.*

> *Hypothesis 2: During a more advanced stage of international expansion, a firm's FDI will be valued directly by investors.*

In addition to FDI, it is important to consider a firm's exports. Trade models have shown that exports and FDI can have either a substitution or complementary relationship (or both), depending on whether a firm is exporting intermediate or final goods (Brainard, 1977; Bloomstrom et al., 1988; Head and Ries, 1997; Lipsey and Weiss, 1981; Markusen,

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[4] We note that the distinction between a firm's initial expansion and its more advanced levels of expansion

1995; and Swedenborg, 1979). In addition, from a more practical point of view, Japanese

manufacturing firms had very high levels of exporting prior to the mid-1980s.[5] With the

appreciation of the yen and a series of trade disputes, there was a decline in Japanese

export growth and an increase in Japanese foreign direct investment starting in the late

1980s. Therefore, to more fully analyze shareholder valuation of a firm's

multinationality, we include exports in our model. However, because of data limitations

(we do not have intrafirm trade information for our firms), we do not pursue specific

hypotheses on shareholder valuation of a firm's exports.[6]

Our basic model focuses on shareholder valuation of a firm's multinationality,

including both the firm's FDI and exports. In firm-level analyses of the type we are

considering, it is common to include some measure of the firm's historical performance

to capture the growth prospects of the firm. As a control, we include the growth rate of

the firm's labor force to address this issue. In addition, we also include a control for real

exchange rate effects. There have been mixed theoretical arguments and empirical results

on the question of whether there is a link between exchange rate movements and FDI.[7]

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is an empirical question, which we will discuss later.

[5] In the late 1980s, the appreciation of the yen and a series of trade disputes brought a decline in Japanese export growth and an increase in Japanese foreign direct investment.

[6] We do note, however, that if FDI and exports are complements, when FDI is valued by shareholders, it is likely that exports will be valued by shareholders as well. If, on the other hand, FDI and exports are substitutes, when FDI is valued by investors, exports may or may not be valued by investors.

[7] On the one side is the view that when a domestic currency appreciates, domestic firms are able to purchase foreign assets more "cheaply." On the other side is the argument that the price of foreign assets should not matter, rather, it is only the rate of return that is important. McCulloch (1989) notes that as currencies depreciate relative to one another, not only prices, but nominal returns from the assets once they are converted back to the home currency also go down. Empirically, Froot and Stein (1991), Caves (1989) and Swenson (1994) have found correlations between dollar depreciations and FDI in the US. Ray (1989), Stevens (1992) and Healy and Palepu (1993), however, have found little support for a relationship between exchange rate movements and FDI.

Though there are mixed empirical results, to ensure that we are not simply capturing exchange rate effects, we also include a control for real exchange rate fluctuations in our model.

The second issue that is explored in this paper is whether the accumulation of a firm's intangible assets actually precedes its investment abroad. The internalization theory is focused on a firm's exploitation of its intangible assets abroad, and predicts that a firm's possession of intangible assets is the central determinant of foreign direct investment — as argued above, firms use their marketing or technical capabilities to penetrate foreign markets. Most empirical studies of the internalization theory have analyzed a cross-section of MNE data during a single period in time (Vernon, 1971; Caves, 1974; Buckley and Casson, 1976; Dunning, 1980; Morck and Yeung, 1991; Kogut and Chang, 1991; Pugel et al., 1996). While these studies report statistically significant regression results, they do not consider the issue of causality which is implied by the internalization theory.

Two prior empirical studies have investigated the issue of causality using panel or time series data. Morck and Yeung (1992) employ an event history analysis to investigate how acquiring firms' stock prices react to news of foreign acquisitions, given different levels of intangible asset investment. While they find that when firms with intangible assets expand abroad their stock prices rise, their sample includes only foreign acquisitions by US firms between 1978 and 1988. Given that they have limited their analysis to foreign acquisitions, one cannot conclude whether their findings apply beyond this type of entry mode. Because arguments in the internalization theory focus on firms

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minimizing their transaction costs and exploiting their intangible assets, it is important to test this theory with a sample that includes more than just foreign acquisitions. Further, we wonder how Morck and Yeung's results may be affected by firms attempting to acquire foreign know-how, rather than exploit intangible assets created in their home market.

More similar to our approach, Mitchell et al. (1998) use Granger causality to investigate the temporal causal relationship between an expansion of a firm's multinational structure as measured by three discrete states (including increase, does not change and decrease), and its growth in spending on intangibles. In their study, they analyze US firms' foreign operations during the 1980s (1982-1990). During this time period, the majority of the firms in their sample experienced no change (no increase or decrease) in their international subsidiary activity (they report that 1365 observations out of a total of 1787, or 76% of their observations, experience no change). Though they do not discuss this, their sample appears to be dominated by more established firms, which have already invested in foreign markets and are not actively increasing their foreign presence. Given that the internalization theory is concerned with how firms use their intangible assets to initiate or expand their foreign presence, Mitchell et al.'s sample may not provide enough foreign activity to test the internalization theory. At the very least, these sample issues have an influence on their results — which do not confirm that an increase in intangible assets precedes foreign expansion by US firms.

In the present analysis, the relationship between a firm's lagged intangible assets and its foreign investment is explored to test the internalization theory predictions

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regarding the exploitation abroad of intangible assets created in a firm's home market. Unlike Mitchell et al. (1998), our sample includes a time period during which Japanese firms actively expanded abroad. Granger's concept of causality (Granger, 1969) is used to investigate the issue of precedence between a firm's intangible asset accumulation and its investment abroad. If the internalization theory holds, a firm's intangible assets should Granger cause its investment abroad.

Hypothesis 3: The accumulation of intangible assets precedes a firm's foreign direct investment.

Kuemmerle (1996) and Wesson (1993) have argued that feedback may exist from a firm's subsidiaries to its technical activities in its home market. Foreign subsidiaries may gain access to local technological knowledge or may create knowledge themselves that can be transferred back to the parent company (Kogut and Chang, 1991). Further, rents may be earned abroad which contribute to funding technological endeavors of the parent firm. In fact, Mitchell et al (1998) found evidence that the US firms in their study increased their R&D expenditures after expanding abroad. Both directions between FDI and intangible assets are explored in tests of Granger causality. If there is feedback, then the results should reveal that a firm's FDI Granger causes its intangible assets.

Hypothesis 4: Feedback will exist from a firm's foreign subsidiaries to it's intangible assets.

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Hypotheses 3 and 4 complement Hypotheses 1 and 2 above. In Hypothesis 2, we noted that there may be many reasons for shareholders to value FDI beyond the rationale predicted in the internalization theory. We test whether FDI (at both initial and advanced foreign investment levels) creates excess value because firms are exploiting their intangible assets and/or because of these other reasons. In Hypothesis 3 and 4, we focus on the causal relationship between the accumulation of intangible assets and FDI to directly test the predictions of the internalization theory. In addition, we examine whether Japanese FDI has been asset-exploiting (hypothesis 3), asset-seeking (hypothesis 4), or both. Through these four hypotheses, we test the relevance of the internalization theory of FDI as a source of value.

Finally, the bivariate relationships between exports and FDI, and exports and intangible assets are also analyzed using Granger's concept of causality to provide a more complete analysis of the data. As argued above, given our data limitations on exports, we do not predict a specific causal relationship between FDI and exports. We employ Granger causality tests between these variables only to identify their empirical relationship. In addition, we do not predict a specific causal relationship between intangible assets and exports because exports could occur either because a firm (or country) has a comparative advantage in cheap inputs or because a firm possesses superior technological or marketing capabilities.

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Description of the Data:

All publicly traded manufacturing firms that are listed in the Japanese

Development Bank (JDB) Database from 1974-1997 and which provide information on

their advertising and R&D expenditures are included in the sample used in this study.

This results in a sample size of 141 firms.[8] All firm-level financial information is based

on data reported in either the JDB Database or the Japan Company Handbook.

Comparisons between our sample and the population reveal that it is representative of the

population.[9] All financial figures are real annual figures deflated to the base year 1970

using Japanese GDP deflators published in the Bank of Japan's *Economic Statistics*

Annual. Table 2-1 (all tables can be found at the end of this chapter) gives summary

statistics of the main variables. Table 2-2 describes the operationalization of each of the

variables (including the control variables to test for the robustness of the results), while

the main variables of Tobin's Q, marketing ability, technical know-how, exports and FDI

are discussed in more detail below.

Tobin's Q

Tobin's Q is defined as the ratio of the market value of the firm to the replacement

cost of its tangible assets. In this paper, JDB financial data have been used to create these

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[8] Somewhat surprisingly, in their analysis of US multinationals, Morck and Yeung assumed that if a firm did not report its advertising or R&D expenditures then it did not engage in these activities (this allowed them to maintain a sample size of 1600 firms). This seems problematic as many firms do not report these expenditures because they do not want their competitors to know the amount that is spent on these activities. Therefore, in the present study no assumptions of zero values are used.
[9] Comparisons between our sample and the population of firms which report R&D and Advertising in 1985 reveal no statistically significant differences between the mean R&D/Sales and Advertising/Sales of our sample and the population (comparing both by industry and overall). In addition, we compared the average number of subsidiaries for our sample to the average number of subsidiaries for all 997 manufacturing firms

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Tobin's Q values. Hoshi and Kashyap's (1990) methodology for calculating Tobin's Q values was followed.[10] In their methodology, a number of corrections have been made to the data that is reported by Japanese firms to correct for the fact that Japanese firms' book values tend to be much lower than replacement values — with land values being the most prominent problem. (For an in-depth review of this methodology, see the Appendix.) Chart 1 shows the average Tobin's Q values for the firms in the sample over the twenty-four year period.

Marketing Ability (ADStock):

Annual expenditures on advertising have been used as a proxy for marketing ability in many studies (Morck and Yeung, 1991; Morck and Yeung, 1992; Pugel et al., 1996; Kogut and Chang, 1991; Belderbos and Sleuwaegen, 1996; Kim and Lyn, 1987). However, a better proxy for marketing ability should capture a firm's accumulation of "marketing capital."[11] Accordingly, an advertising stock measure (which includes both accumulated and current period expenditures) is used to proxy for a firm's marketing ability. While there is no consensus on the rate of depreciation of advertising expenditures, following Hirschey and Weygandt (1985), a depreciation rate of 50% is used for previous years' expenditures going back two years.

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listed in JDB in 1985 and again, found no statistically significant difference between the mean from our sample and the mean from the population.

[10] The Tobin's Qs without tax adjustment were calculated due to data constraints and the relative computational simplicity.

[11] The effects of advertising can last beyond a single period, and accordingly, the stock of advertising will generate returns in subsequent periods. Studies on advertising expenditures have found a long-term effect on sales which carries over multiple years (Peles, 1971; Hirshey and Weygandt, 1985; Broadbent, 1993).

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<u>Technical-Know How (R&DStock)</u>:

Following other studies, a firm's R&D expenditures are used as a proxy for technical know-how. Similar to the arguments for the long-term effects of advertising expenditures, it is argued here that R&D expenditures' systematic influences on the market values of firms can persist over time. Thus, an R&D stock measure (which includes both accumulated and current period expenditures) is used to proxy for a firm's technical know-how. In this study, Grilliches and Mairesse (1984) are followed, and a depreciation rate of 15% is applied to the previous year's expenditures going back four years.

<u>Exports</u>:

The share of exports in total sales was determined for each firm for each year from the Japan Company Handbook. This share was multiplied by the total sales of the firm to obtain a yen value amount for total exports from the parent firm. There are 15 firms which never report any values for exports throughout the twenty-four year period.

<u>FDI Variables:</u>

The measure for FDI used in this study is a count for each firm of the number of subsidiaries; the higher the number, the higher the degree of FDI for that firm. For each of the 141 firms in the sample, a native Japanese speaker determined the number of subsidiaries for each year from the Japanese language directory of firms with foreign subsidiaries, the *Toyo Keizai Shinposha* Directory. As the directory for each year was examined, our data reflect entry and exit, and the global reconfiguration of activities by

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the 141 firms in our sample. The number of different types of subsidiaries, including manufacturing versus distribution, and developed versus developing countries are also used to test if certain types of subsidiaries have differential effects. Domestic firms which are not multinationals and thus have no subsidiaries abroad are included in the sample; a portion of these firms became multinational during the twenty-four year time period of this study.

IntangibleAssets:

The stock of R&D and the stock of advertising (as described above) were added together to create the total intangible assets for each firm.

Control Variables

Debt is described in Table 2-2. Debt is included to proxy for any variation in firm values because of differences in capital structure. The Yen real exchange rate is used to control for exchange rate effects.[12] Real exchange rate interaction terms with FDI and exports are used to capture firm-level effects of exchange rate movements. Growth of the firm is captured by the change in the number of employees over the previous three years.[13] Finally, Table 2-2 provides information on industry and *keiretsu* membership variables, which were included to test for the robustness of the results.

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[12] With the IMF data, an increase in the yen real exchange rate reflects an appreciation.

Specifications:

The methodology for testing hypotheses one and two builds on the approach from earlier studies of market valuation. The financial market-based approach has strong theoretical and empirical foundations in the efficient-markets literature (Ross, 1983; Fama, 1970). In a well-functioning capital market, the financial market value of a firm provides the best available unbiased estimate of the value of a company's assets (including both tangible and intangible assets). A basic assumption in this paper is that there is financial market efficiency and that the market value of a firm (V) is the sum of the value of its net tangible assets (T) and its net intangible assets (I). Thus,

$$V = T + I \qquad (1)$$

For publicly traded firms, V is defined as the market value of its outstanding common shares plus estimates of the market value of its debt. The tangible assets variable is an estimate of the replacement value of the firm's tangible assets. The intangible assets that are included in this model are technical know-how, marketing ability, exports and FDI. As indicated above, a leverage variable (debt) is also included to proxy for any variation in firm values owing to differences in capital structure. To control for firm size, all variables are scaled by the replacement cost of tangible assets[14].

$$\frac{V}{T} = \frac{T}{T} + \frac{I}{T} \qquad (2)$$

This causes the left hand side of the equation to become Tobin's Q.

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[13] We also tested growth of the firm by using the sales of each firm, but as the results are similar, we only report the results using change in number of employees below.

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To test whether the valuation of a firm's multinationality by shareholders changes over time, two equations are needed. First, an equation which includes only the main effects of the variables is tested:

$$Q_{it} = \alpha_i + \beta_1 \frac{R\&DStock_{it}}{Assets_{it}} + \beta_2 \frac{ADStock_{it}}{Assets_{it}} + \beta_3 \frac{Debt_{it}}{Assets_{it}} + \beta_4 \frac{Exports_{it}}{Assets_{it}} + \beta_5 \frac{FDI_{it}}{Assets_{it}} + \varepsilon_{it} \quad (3)$$

where Q is a firm's Tobin's Q ratio; $R\&DStock_{it}$ is a firm's stock of technical know-how; $ADStock_{it}$ is a firm's stock of marketing ability; $Debt_{it}$ is a firm's debt; $Exports_{it}$ is a firm's exports; FDI_{it} is the number of a firm's foreign subsidiaries; and $Assets_{it}$ is a firm's total tangible assets. α_i represents intangibles related to other factors, in Japanese firms, this term could represent such intangible assets as efficient use of human resources, management style or expertise, just-in-time delivery of components, or strict quality control. Finally, ε_{it} is an error term. Equation (3) indicates that the change in a firm's value to shareholders as measured by its Tobin's Q is a function of its technical know-how, marketing ability, leverage (debt), exports and FDI. We also test this same equation including the controls for exchange rate and firm growth discussed above.

Interaction terms between the FDI variables and both of the intangible assets are then added to test the interaction effects of Hypothesis 1 in the following equation:

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[14] Hoshi and Kashyap's methods for measuring the replacement cost of a firm's tangible assets was used. See Appendix for a discussion of this calculation.

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$$Q_{it} = \alpha_i + \beta_1 \frac{R\&DStock_{it}}{Assets_{it}} + \beta_2 \frac{ADStock_{it}}{Assets_{it}} + \beta_3 \frac{Debt_{it}}{Assets_{it}} + \beta_4 \frac{Exports_{it}}{Assets_{it}} + \beta_5 \frac{FDI_{it}}{Assets_{it}}$$

$$+ \beta_6 \left(\frac{FDI_{it}}{Assets_{it}} * \frac{R\&DStock_{it}}{Assets_{it}} \right) + \beta_7 \left(\frac{FDI_{it}}{Assets_{it}} * \frac{ADStock_{it}}{Assets_{it}} \right) + \varepsilon_{it} \qquad (4)$$

Equation (4) allows for consideration of whether FDI enhances firm specific assets, given

different levels of a firm's investment abroad. Both equation (3) and (4) allow for

consideration of differences between shareholder valuation between FDI and exports.[15]

We also test this equation including the controls discussed above.[16]

A pooled time series methodology is used to analyze the data. Hsiao (1986) and

Baltagi (1995) have noted that pooling data across time can result in serially correlated

error terms. In fact, the combination of time series and cross section variables adds a

dimension of difficulty to the problem of model specification because the error term may

be correlated over time and over cross-sectional units. This serial correlation problem

can introduce substantial bias into the efficiency of the estimators. To control for serial

correlation problems, we use the first differences of all variables and include a first-order

autoregressive term.[17] By using first differences, we are also capturing new investment

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[15] All the scaled variables have been transformed by adding a constant to all observations and taking the natural log of this sum. Using the log transformation does not change the statistical significance of any of the variables of interest, it does results in a better fit of the model, as reflected in higher r-squares and F statistics, however.

[16] One might argue that there is a simultaneity bias in this equation because Tobin's Q may influence FDI. We performed a Granger causality test between Q and FDI and found that Q does not Granger cause FDI, suggesting the validity of our specifications in equations (3) and (4). We thank Takeo Hoshi for bringing this issue to our attention.

[17] An AR(1) model is employed because the result of the Durbin-Watson test suggests that there is autocorrelation of the disturbances.

by a firm for each of our variables in our models.[18] We use generalized least squares

(GLS) to test Hypotheses 1 and 2.

To test for differences between a firm's initial and advanced levels of

international investment, the sample was divided into two unbalanced panel data sets.

The data set of initial international investment includes observations before and during a

firm's first three years of international expansion abroad while the set of advanced

international investment includes observations of subsequent investments after the firm's

first three years of investing abroad. Wald tests are used to test whether there are

statistically significant differences between the parameter coefficients of interest in the

two periods.

There are differences between industries in terms of their accumulation of

intangible assets, level of exports and FDI. Thus, one potential problems with our

specifications is that they may inappropriately aggregate firms in industries with different

export and intangible asset accumulation experiences. As a test for the robustness of the

results, we performed two additional tests. First, we eliminated the observations in the

three industries (electric equipment, machinery and transportation) that were affected by

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[18] Because we use first differences, equation (4) needs to be revised to more accurately reflect the change of
the interaction terms, which is analogous to taking the first derivative. While the main effects terms only
change to the extent that first differences are used instead of levels, both of the interaction terms (between
FDI and ADStock and between FDI and R&DStock) change because (ignoring all other non-interaction
terms) if
$$Q = FDI * R\&DStock,$$
taking the first derivative with respect to time results in the following interaction term:
$$\Delta Q = (FDI * \Delta R\&DStock) + (\Delta FDI * R\&DStock).$$
So, in equation (4), the FDI and R&DStock interaction term becomes the following:
$$+ \beta_6 \left[\left(\Delta \frac{FDI_{it}}{Assets_{it}} * \frac{R\&DStock_{it}}{Assets_{it}} \right) + \left(\frac{FDI_{it}}{Assets_{it}} * \Delta \frac{R\&DStock_{it}}{Assets_{it}} \right) \right]$$

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VERs and antidumping measures in the late 1980s.[19] Second, we ran equations (3) and

(4) with industry dummy variables (for all industries). Another potential problem

involves the *keiretsu* structure of the Japanese system, which may provide some firms

with an important source of competitive advantage (Gerlach, 1992). Horizontal *keiretsu*

membership affords some Japanese firms with access to financial capital and foreign

market information. To ensure that our results are not influenced by keiretsu

membership, we also ran all variations of equations (3) and (4) with *keiretsu* membership

dummies.

Finally, as noted above, there are 15 firms that do not report export data. To

ensure that these missing data points which were assumed to be zero are not driving the

results, we also ran equations (3) and (4) with a reduced sample of 126 firms. As the

results are not affected by these firms, we report the results for Hypotheses 1 and 2 using

the full 141 firm sample.

To test hypotheses 3 and 4, we perform a Granger causality test on the pooled

time series and cross-section data. Because we are interested in the intangible assets of a

firm, we used the IntangibleAsset variable (in which we combined the scaled R&D stock

and scaled advertising stock data). A bi-variate vector autoregressive (VAR) technique is

used to test the nature of the causality linkage between FDI and the accumulation of

intangible assets using the first difference of each variable. The two equations are

estimated by:

The ADStock interaction term with FDI changes in the same way. We thank Bernie Yeung for suggesting this specification.

$$\Delta FDI_{it} = \sum_{j=1}^{n} \alpha_j \Delta FDI_{i(t-j)} + \sum_{k=1}^{n} \beta_k \Delta IntangibleAssets_{i(t-k)} + \varepsilon_{it} \qquad (5)$$

$$\Delta IntangibleAssets_{it} = \sum_{j=1}^{n} \lambda_j \Delta FDI_{i(t-j)} + \sum_{k=1}^{n} \delta_k \Delta IntangibleAssets_{i(t-k)} + \varepsilon_{it} \qquad (6)$$

where variables are for firm i in year t, and n is the lag period. Granger causality tests are performed by joint F-tests of the hypothesis that the collective coefficients of the lagged causal variables in the model are significantly different from zero. With several lags of the same variable, each estimated coefficient may not be statistically significant, possibly due to multicollinearity. Therefore, we report the sum of the coefficients in Tables 5 and 6. Because the results of the Granger causality test can be sensitive to the specification of the lag structure, we ran our tests separately using 3, 4, 5 and 6 lags in our equations.

We also test other pairs of variables to consider the issue of precedence between FDI and exports, and exports and intangible assets.[20] As noted above, we have 15 firms which did not report any values for export data. Because of this, we ran the Granger test on both the full sample of 141 firms (assuming the export levels were zero for 15 firms) and on a sample without the 15 problem firms (for a total of 126 firms). With bivariate tests, these missing values could play a more prominent role in the results. To ensure that our three variable pairs are comparable between the variables, we report the sample of 126 firms in our results in Table 4. However, we note that the results do not change whether we use the full sample or the restricted 126 firms.

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[19] This also provides a test for the robustness of the results because by dropping the firms in those industries affected by trade disputes, we are also dropping those firms which have the highest number of subsidiaries.
[20] For the other pairs of variables, we use similar models to those described in equations (5) and (6).

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Similar to equations (3) and (4), one potential problem with our specification in equations (5) and (6) is that it may inappropriately aggregate firms in industries with different export and intangible asset accumulation experiences. Further, our results in this section could also be affected by the voluntary export restraints that were imposed on the electric equipment, machinery and transportation industries in Japan. To test the robustness of the results, we eliminated firms in these three industries from our sample and re-ran the Granger causality tests. Finally, we also ran the Granger causality tests using R&DStock and ADStock individually (instead of the combined IntangibleAsset variable).

Results:

<u>Shareholder Valuation of Multinationality</u>:

Overall, the empirical results provide mixed support for the predictions about when shareholders will value multinationality. The empirical results from equations (3) and (4) are reported in Tables 2-3 and 2-4. Table 2-3 reports the results for a firm's early level of international investment while Table 2-4 reports the results for a firm's more advanced level of international investment. These tables contain the parameter estimates of the main effects and interaction effects models (with t-statistics in parentheses). In both Tables 2-3 and 2-4, Model 1 includes the main effects, Model 2 includes the main effects and the (real exchange rate and firm growth) control variables, Model 3 includes the interaction effects and Model 4 includes the interaction and (real exchange rate and firm growth) control variables.

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Hypothesis 1 predicts that during a firm's initial period of international expansion, FDI will not be valued directly by shareholders, but only to the extent that it enhances a firm's intangible assets of marketing ability and technological know-how. The results provide mixed support for this hypothesis. Table 2-3 reveals that in all models (with or without the control variables), a firm's initial FDI is not valued directly by shareholders. Contrary to expectations, however, no interaction terms between the FDI variables and a firm's intangible assets (R&DStock and AdStock) are significant and positively valued in any of the models. Also unexpectedly, the interaction term between a firm's FDI and its marketing ability is significant and negative in both Models 3 and 4 in the initial investment period and in Model 3 in the more advanced investment period.

Hypothesis 2 predicts that in a more advanced stage of a firm's international investment (and after a firm's foreign subsidiaries have been established in foreign markets), FDI will be valued directly by investors. As expected, and as revealed in Table 4, a firm's FDI is valued directly by shareholders (with or without the control variables). Wald tests on the coefficients reveal that there are statistically significant differences between the FDI coefficients in Models 1 and 2 between the two levels of investment, though not in Models 3 and 4 (which include the interaction terms).

Tables 2-3 and 2-4 further reveal that the change in a firm's intangible assets of R&DStock and ADStock is significantly and positively valued during the models which test a firm's more advanced level of international investment by shareholders. In addition, exports are significantly valued by shareholders in models using both initial and

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advanced levels of investment.[21] Regarding the control variables, the yen real exchange rate interaction terms is not significant in any of the models. Firm growth is significant in both Models 2 and 4 during a firm's more advanced level of international expansion, and in Model 4 during a firm's initial period of expansion. Though not reported in the table, the statistical significance of any parameter does not change with the inclusion of either industry dummies or *keiretsu* membership. While some industry dummies are significant, the keiretsu variable is not significant in any model. Further, the results do not change when the 15 problem export firms are dropped from the sample. Finally, while the inclusion of industry dummies did not affect the results, there are some differences that appear when we dropped firms from the three industries (transportation, electric equipment and machinery) that were affected by trade disputes in Japan. Though not reported in the tables, when we dropped firms from the three industries, the change in ADStock was not significantly valued by shareholders in the models that include a firm's advanced level of international investment. None of the other variables changed in significance or sign with the deletion of the export-oriented industries.

We also attempted to break down the FDI variables by different types of subsidiary (manufacturing versus distribution and developing versus developed country). The results are less clear than the case using the aggregated FDI variables. We interpret this to mean that the different classifications of subsidiaries we used are highly correlated,

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[21] We also tested our models excluding the years 1986-1990 to ensure that our results are not affected by what has been called the "bubble economy" in Japan. (During this period the value of Q might have been inflated.) As the statistical significance of the variables of interest do not change when these years are excluded, we do not report those results here.

making it difficult to identify independent effects. In this paper, therefore, we report the results from the aggregated FDI variables only.[22]

Asset Accumulation and Investment Abroad:

The predicted relationship from the internalization theory between a firm's intangible assets and its investment abroad is supported. Table 2-5 reports the Granger causality results for firms in all manufacturing industries. The table provides the F-statistic for Granger causality, the number of observations, the sum of the lagged explanatory coefficients and the adjusted R-squared statistic for the three pairs of bivariate relations.

In Hypothesis 3, it was predicted that the accumulation of a Japanese firm's intangible assets would precede its direct investment abroad. Table 2-5 reveals that intangible assets Granger cause FDI ($F=12.15$, $p<.01$). Interestingly, Table 2-5 also reveals that exports Granger cause FDI ($F=5.45$, $p<.01$). The same results occur whether three, four, five or six lags are used. In addition, while only the results for IntangibleAssets are presented in the table, the results hold when R&Dstock or ADStock are considered separately. (Both of these variables individually Granger cause FDI when all industries are included.)[23]

Table 2-6 reports the Granger causality results excluding firms in the electric equipment, machinery and transportation industries. With the reduced sample, the only statistically significant relationship is that intangible assets Granger cause FDI ($F=11.78$,

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[22] We also tested the same models using an initial period of international investment which included a firm's first five years of international expansion. The results did not change.

p<.01). Again, though only the results using four lags are reported, the same results occur whether three, four, five or six lags are used. While only the results for IntangibleAssets are presented, the results also hold for the R&DStock variable (R&DStock Granger causes FDI). However, the ADStock variable does not Granger cause FDI in the reduced sample. Therefore, the results in Table 6 that IntangibleAssets Granger cause FDI are driven by the R&DStock variable when firms in the electric equipment, machinery and transportation industries are excluded.

Our results do not support Hypothesis 4, that there is feedback from FDI to intangible assets. We were unable to find feedback from FDI to the parent firm's intangible assets even when we limited our FDI variable to include those observations of a firm's advanced level of FDI, or when we distinguished between industrialized country and less developed country (LDC) investments. Also, no other pair of variables reveal any causal linkages in either Tables 2-5 or 2-6.

Discussion and Implications:

In this chapter, we have considered two issues. First, we explored the evolution of the value of multinationality to shareholders as a firm's level of international activity changes. Second, we analyzed whether the accumulation of a firm's intangible assets precedes its investment abroad, as implied by the internalization theory. Our analysis of

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[23] We also performed the Granger causality tests using the level of each variable; this yielded qualitatively similar results.

the determinants of firms' q ratios reveals that shareholder valuation of FDI changes as the level of a firm's international activity changes over time. Our analysis of Granger causality reveals that Japanese FDI has been asset-exploiting (intangible assets Granger cause FDI) and provides support for the internalization theory's prediction that the accumulation of a firm's intangible assets precedes its investment abroad. Overall, our results suggest that while it is necessary for Japanese firms to accumulate intangible assets to invest in foreign markets, it takes time before a return on this investment will be realized.

The results provide mixed support for our hypotheses regarding shareholder valuation of a firm's multinationality. As predicted, a firm's initial investment in FDI is not valued directly by shareholders. Further, a firm's more advanced level of international investment in FDI is valued positively and significantly by shareholders. These results suggest that FDI is an independent and additive source of value when the market registers that a firm has been confirmed a "winner" by the profitability of its initial FDI. Apart from exploiting intangible assets, the results suggest that FDI creates value for firms for other reasons. Factor price differentials, especially access to lower labor costs or inputs, access to more profitable markets, servicing export markets at lower costs or defending market positions from host country protectionism are all potential reasons shareholders may value a firm's FDI. Consistent with our findings, Sakakibara and Yamawaki (2000) find that in Europe, the local experience by Japanese subsidiaries accompanied with the establishment of their local supplier network contributes to their profitability. This suggests that at least in this market, it takes time for a Japanese

subsidiary to effectively deal with local suppliers and local labor relationships to realize profits.

Contrary to predictions, however, the interaction terms between FDI and a firm's intangible assets are not positively and significantly valued by shareholders in any of the models. Unlike Morck and Yeung's (1991) cross sectional findings for US firms, we do not find that the positive impact of a firm's intangible assets on its value is enhanced by its FDI for our Japanese sample. In fact, for our sample, we find the interaction term between ADStock and FDI to be negative and significant. We believe this suggests that given the cultural and linguistic differences between Japan and other nations (as well as differences between distribution systems), shareholders do not view a home-firm advantage in marketing capabilities as translating into a firm-specific advantage abroad for Japanese multinationals.[24] The non-significant R&DStock interaction term with FDI is more difficult to explain, however. Japanese firms have certainly used their firm-specific advantages in technological know-how to expand into foreign markets. Regardless, in our initial international investment period, none of the foreign direct investment variables is positively and significantly valued by shareholders (only a firm's exports are positively and significantly valued by shareholders). These findings, together with Morck and Yeung's (1991) findings for their US sample, suggest that there may be differences between how shareholders value Japanese and US firms' foreign direct investment. As firms from Japan started investing abroad much later than firms from

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[24] For example, Porter, Takeuchi and Sakakibara (2000) illustrate how the Japanese idiosyncratic demand conditions and archaic distribution system became obstacles for firms in advertising-intensive consumer

most other industrialized countries, a Japanese firm's entry into foreign markets and its initial multinational status may not confer the same advantages it does in other countries. Further, given the high levels of exporting by Japanese firms, a firm's prior exporting experience may be more valued by shareholders than the firm's investment in intangible assets. More study of these issues is needed, however, before specific conclusions about why there are differences between our Japanese sample and Morck and Yeung's US sample can be offered.

We included many controls in our models, and overall, we find our results to be robust. We considered exports in our analysis of a firm's multinationality to account for the potential relationship between exports and FDI. The positive and significant coefficients for this variable (especially for advanced international investment) suggest that exports and FDI may be complementary. We also included a control for a firm's debt in our models. In the majority of our models, the coefficient of debt is not significant. This suggests that for Japanese firms, financial constraints due to high leverage do not affect a firm's market valuation. Finally, we controlled for exchange rate changes, growth prospects of the firm, and industry and *keiretsu* membership. As noted above, the *keiretsu* variable was not significant in our models. We suspect that this may be due to competing effects of horizontal *keiretsu* membership. *Keiretsu* firms are less liquidity constrained (Hoshi, Kashyap and Scharfstein, 1991), and have better information through networks for foreign entry decisions (Tan and Vertinsky, 1996). However, *keiretsu* firms also tend to over-invest and over-produce relative to independent firms (Weinstein and

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packaged goods industries to gain international competitiveness.

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Yafeh, 1995).

This chapter also makes some important contributions to testing the internalization theory. Though many other studies have reported a significant relationship between intangible assets and foreign investment, this is the first paper to test the applicability of the internalization theory over a twenty-four year period of foreign expansion. We go beyond the two previous studies which have analyzed the issue of causality by including a time period during which our firms actively expanded abroad and by considering all foreign direct investment by the firms in our sample (not just foreign acquisitions).

The results of this chapter provide very robust empirical support for the internalization theory. The results suggest that the internalization theory predictions hold both for firms in export intensive industries that increase FDI as a result of trade friction, and for firms in industries that are not affected by government regulations restricting exports. It should be noted, however, that there are differences regarding which intangible assets are driving foreign expansion when changes to the industry composition are analyzed.

When firms in all manufacturing industries are considered, both R&DStock and ADStock individually Granger cause FDI. When excluding firms in the three industries affected by trade disputes in Japan, only R&DStock Granger causes FDI. This finding suggests that for firms in all Japanese manufacturing industries, foreign expansion has tended to rely on the parent firm's technological capabilities, while only firms in the transportation, electric equipment and machinery industries has the parent firm's

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marketing capability led to foreign expansion. Interestingly, our results also show that shareholders value those intangible assets that Granger cause FDI. For all industries, shareholders value both ADStock and R&DStock, while when the three industries are excluded, only R&DStock is valued by shareholders. Taken together, this suggests that while the accumulation of ADStock for firms in the three export-intensive industries in our sample contributed to foreign expansion and increased valuation by shareholders, it is only R&Dstock that is consistent with the internalization theory in this Japanese sample.

While our results reveal that exports Granger cause FDI, this relationship is dependent on firms in the three export-oriented industries (electric equipment, machinery and transportation). This finding suggests that the early increase of exports of firms in these industries led to the trade disputes that forced these firms to invest in foreign markets to further participate in them.

Because our results do not support the existence of feedback from FDI to intangible assets, it may be the case that Japanese shareholders value FDI only as a revenue generator for Japanese firms in the later period. It might take years for FDI to work as a vehicle to transfer overseas knowledge back to parent companies; even in this twenty-four year study, however, this relationship was not captured. Interestingly, Mitchell et al. found support for feedback from FDI to intangible assets with their US sample. As mentioned above, there are differences between US and Japanese samples regarding when firms from each country began expanding abroad. US firms may have

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already reached the point where a firm's FDI can serve as a vehicle to transfer knowledge

back to the parent company.[25]

The issues that are explored in this chapter are important to managers because

given resource constraints, evidence of the time sequence of investment in firm-specific

intangible assets and foreign expansion can help guide decisions about resource

allocation. Our results reveal that for all manufacturing industries, firms need to invest

first in intangible assets and then in foreign expansion. This finding holds even after

export-oriented industries are taken into account. Also of interest to managers, our

results reveal that FDI itself is valued by shareholders only after it establishes a certain

presence in foreign markets, giving a guidance of the timeframe managers should expect

from FDI.

There are limitations to this study. The first is that only Japanese firms are

included. Similar analyses need to be performed on other samples to ensure that these

results are not unique to Japanese MNEs. Another limitation of this study is that the

degree of multinationality variable is measured simply as a count of the number of

foreign subsidiaries. A better measure would take into consideration additional issues,

such as the size of the subsidiaries, the number of employees, or the market value of the

subsidiaries. In our analysis, we attempted to include data on the type and location of

each firm's subsidiaries. However, we determined that when these variables were

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[25] Alternatively, there may be differences between how US and Japanese firms establish and use their FDI which is causing the different results. For example, Japanese firms consistently had lower return on assets than U.S. counterparts during the period of this analysis and, ironically, US subsidiaries in Japan are more profitable than Japanese firms (Porter et al., 2000), suggesting the possibility that Japanese FDI decisions tend to be made for reasons beyond short-term profit maximization.

considered together, the correlated nature of the variables affected the reliability of the results. Finally, to more appropriately analyze whether FDI and exports are substitutes or complements and how that relationship affects shareholder valuation of these multinationality variables, much more disaggregated export figures are needed.

Future research on the topics addressed in this paper should continue to consider the changing nature of a firm's investment activities abroad over time. More studies are soundly warranted and encouraged to investigate further the effect of the accumulation of different classes of intangible assets on multinationality. Finally, analysis of more detailed data is needed to better understand when a firm's exports and FDI will be substitutes or complements.

Chart 1: Average Tobin's Q (1974-1997)
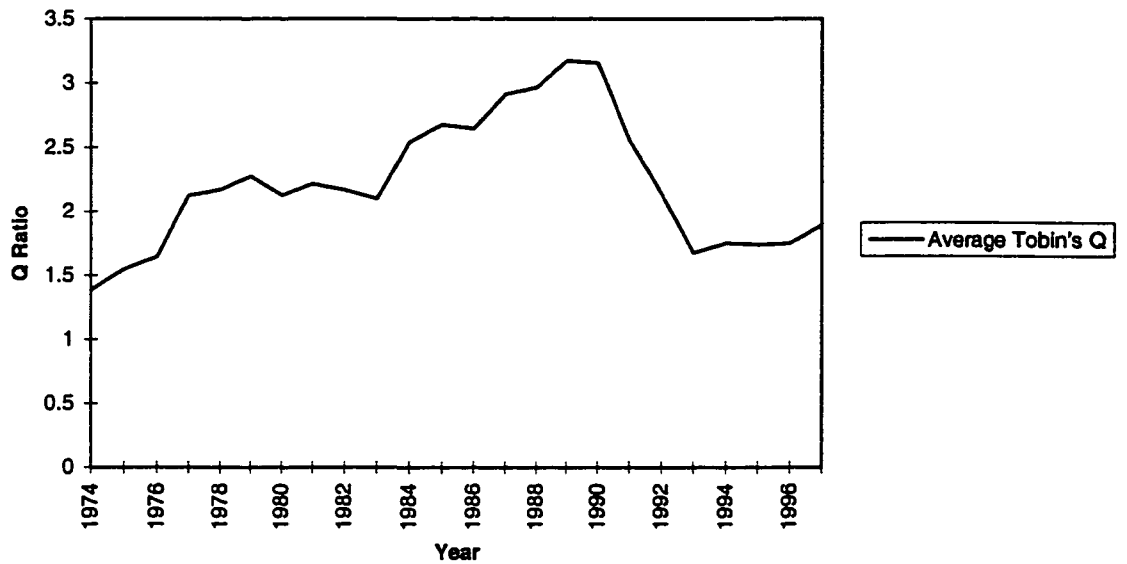
Table 2-1: Summary Statistics

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Q	3384	2.21	1.36	0.24	13.06
ADStock (mil Yen)	3384	3848	7517	1.36	65840
R&DStock (mil Yen)	3384	15560	53984	1.19	6914557
Debt (mil Yen)	3384	120109	271335	1720	3431605
Exports (mil Yen)	3384	27728	83658	0	1256143
FDI	3384	7.5	13.2	0	89

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Table 2-2: Operationalization of Variable:

Q	A firm's Tobin's Q is the ratio of its market value to the replacement cost of its tangible assets, following Hoshi and Kashyap's (1990) method for Japanese firms. All variables are inflation adjusted using Bank of Japan GDP deflators.
ADStock**	The stock of a firm's advertising expenditures is its marketing ability. ADStock is the total value of 100% of a firm's current year expenditures on advertising, plus spending from the previous two years depreciated at a 50% rate. Yearly firm level financial data come from JDB and are inflation adjusted. (mil of yen)
R&DStock**	The stock of a firm's R&D is its technical know-how. R&DStock is the total value of 100% of a firm's current year expenditures on R&D, plus R&D spending from the four previous years depreciated at a 15% rate. Yearly firm level financial data come from the Japanese Development Bank Database (JDB) and are inflation adjusted. (mil of yen)
Debt**	The market value of a firm's short and long term debt, as described in the Appendix. All values are inflation adjusted using GDP deflators. (mil of yen)
Exports**	A firm's inflation adjusted level of exports. (mil of yen)
FDI**	A firm's number of subsidiaries according to the Toyo Keizai Shinposha Directory.
IntangibleAssets	The total for each firm of RDStock+ADStock.
Yen	Yen real exchange rate as published by the IMF. Interaction terms (Yen*FDI, Yen*FDI and Yen*Exports) are used to capture the firm-level effects.
FirmGrowth**	The three-year change in the number of employees for each firm.
Keiretsu	Dummy variable horizontal Keiretsu membership which equals one if the firm is affiliated with one of the six main banks in Japan, including Mitsui, Mitsubishi, Sumitomo, DKB, Fuyo and Sanwa.[1]

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[1] A firm is classified as group affiliated with one of the six groups if at least one of the following holds: 1.) a group's main bank is the firm's biggest lender for three consecutive years, and total shareholding by members exceeds 20%; 2.) main bank loans account for at least 40% of the firm's loans for at least three years; and 3.) the firm is historically affiliated with a group.

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This affiliation comes from Weinstein and Yafeh's (1995) publication and is made as of 1988.

Industry   Industry dummies are coded at the 2 digit SIC level using the JDB industry codes. We include all manufacturing industries: (with number of firms in parentheses) foods (10); textiles (8); chemicals (38); machinery (22); electrical equipment (24); transportation (6); precision instruments (5); plastics (7); and a miscellaneous category for firms which mostly use raw materials (for a total of 21 firms – these industries each have 4 or fewer firms: paper and pulp (1); rubber products (4); stone, clay and glass (2); iron and steel (2); fabricated metal products (4); nonferrous metals (4) and misc. (4).

** These variables are scaled by the replacement cost of tangible assets to control for firm size. The tangible assets of each firm are calculated according to Hoshi and Kashyap (1990). Inflation adjusted values are used.

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Table 2-3: Shareholder Valuation of Intangible Assets (including FDI and Exports): for Initial International Investment

GLS Estimation in first differences with first-order autoregressive term
Dependent Variable: ΔQ

Variables:	Model 1 Main Effects	Model 2[1] Main Effects with Controls	Model 3 Interaction Effects	Model 4[1] Interaction with Controls
ΔADStock Assets	.14 (1.38)	.07 (.65)	.02 (.16)	.06 (.50)
ΔR&Dstock Assets	.05** (1.96)	.05* (1.87)	.15 (1.23)	.04 (.64)
ΔDebt Assets	.19* (1.73)	.18 (1.14)	.05* (1.66)	.06 (.45)
ΔExports Assets	.09*** (2.41)	.04 (.88)	.12*** (2.75)	.03 (.41)
ΔFDI Assets	-12.70 (-.32)	-7.17 (-1.45)	9.13 (1.51)	10.67 (1.48)
$\frac{\Delta FDI * ADStock}{Assets \ \ Assets} + \frac{FDI * \Delta ADStock}{Assets \ \ Assets}$ [2]			-53.85*** (-3.24)	-65.6*** (-3.35)
$\frac{\Delta FDI * R\&DStock}{Assets \ \ Assets} + \frac{FDI * \Delta R\&DStock}{Assets \ \ Assets}$ [2]			-14.8 (-.96)	-5.04 (-.19)
ΔYen*ΔFDI Assets		1.91 (.61)		1.41 (.44)
ΔYen*ΔExports Assets		.01 (.97)		.001 (.178)
ΔFirmGrowth Assets		.10 (1.50)		.11* (1.85)
AR(1)	.06*** (2.53)	.05*** (2.40)	.03*** (2.51)	.04*** (2.46)
Adj R^2	.039	.021	.023	.02
n=	1124	908	1124	1012

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Notes to Table 2-3:

T statistics are in parentheses. Variables are explained in text.

Using a two-tailed t-test: * Significant at .10 level ** Significant at .05 level ***
Significant at .01 level

(1) Control Models 2 and 4 were also run with Keiretsu and Industry Dummies. Though
some industry dummies were significant, these dummy variables are not reported
here because their inclusion did not affect the significance of the other variables in
either model.

(2) See footnote 17 for a discussion of the econometric specification for these interaction
terms

Table 2-4: Shareholder Valuation of Intangible Assets (including FDI and Exports): for Advanced Levels of International Investment

GLS Estimation in first differences with first-order autoregressive term
Dependent Variable: ΔQ

Variables:	Model 1 Main Effects	Model 2[1] Main Effects with Controls	Model 3 Interaction Effects	Model 4[1] Interaction with Controls
ΔADStock Assets	.53*** (3.84)	.61*** (3.27)	.72*** (4.28)	.77*** (4.31)
ΔR&Dstock Assets	.38*** (3.84)	.33*** (3.20)	.44*** (3.78)	.40*** (3.09)
ΔDebt Assets	.01 (.21)	.01 (.3)	.01 (.01)	.02 (.11)
ΔExports Assets	.11*** (4.66)	.10*** (4.19)	.11*** (4.72)	.10*** (4.28)
ΔFDI Assets	5.71** (1.97)	7.37** (2.33)	11.02*** (2.92)	12.48*** (3.03)
ΔFDI * ADStock + FDI* ΔADStock[2] Assets Assets Assets Assets			-29.03* (-1.66)	-24.60 (-1.37)
ΔFDI * R&DStock + FDI* ΔR&DStock[2] Assets Assets Assets Assets			-6.73 (-.58)	-8.20 (-.68)
ΔYen*ΔFDI Assets		.39 (1.48)		.58 (.26)
ΔYen*ΔExports Assets		.01 (.17)		.01 (1.58)
ΔFirmGrowth Assets		.25** (2.16)		.26** (2.10)
AR(1)	.04* (1.94)	.02 (.92)	.02* (1.98)	.02 (.56)
Adj R^2	.057	.044	.05	.055
n=	1833	1689	1833	1689

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Notes to Table 2-4:

T statistics are in parentheses. Variables are explained in text.

Using a two-tailed t-test: * Significant at .10 level ** Significant at .05 level *** Significant at .01 level

(1) Control Models 2 and 4 were also run with Keiretsu and Industry Dummies. Though some industry dummies were significant, these dummy variables are not reported here because their inclusion did not affect the significance of the other variables in either model.

(2) See footnote 17 for a discussion of the econometric specification for these interaction terms

Table 2-5: Granger Causality Test Results
for Firms in all Manufacturing Industries

OLS Estimation in first differences (with four lags) 126 Firms		F	N	Σ (Coeff.)	Adj R²
I Bivariate Relationship between Intangibles and FDI:					
ΔIntangibleAssets	⇒ ΔFDI	12.15***	2394	.042	.15
ΔFDI	⇒ ΔIntangibleAssets	1.25	2394	.02	.054
II. Bivariate Relationship Between Exports and FDI:					
ΔExports	⇒ ΔFDI	5.45***	2394	.029	.13
ΔFDI	⇒ ΔExports	1.15	2394	.024	.04
III. Bivariate Relationship between Intangibles and Exports:					
ΔIntangibleAssets	⇒ ΔExports	.16	2394	-.004	.04
ΔExports	⇒ ΔIntangibleAssets	.31	2394	-.004	.05

Variables are explained in text. * Significant at .10 level ** Significant at .05 level *** Significant at .01 level

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Table 2-6: Granger Causality Test Results Excluding Firms in Transportation, Machinery, and Electric Equipment Industries

OLS Estimation in first differences (with four lags)

70 Firms		F	N	Σ (Coeff.)	Adj R^2
I **Bivariate Relationship between Intangibles and FDI:**					
ΔIntangibleAssets	⇒ ΔFDI	11.78***	1558	.062	.12
ΔFDI	⇒ ΔIntangibleAssets	1.07	1558	.024	.09
II. Bivariate Relationship Between Exports and FDI:					
ΔExports	⇒ ΔFDI	1.10	1558	.005	.09
ΔFDI	⇒ ΔExports	1.04	1558	-.021	.05
III. Bivariate Relationship between Intangibles and Exports:					
ΔIntangibleAssets	⇒ ΔExports	.27	1558	-.003	.04
ΔExports	⇒ ΔIntangibleAssets	.04	1558	.002	.08

Variables are explained in text. * Significant at .10 level ** Significant at .05 level *** Significant at .01 level

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CHAPTER THEE: DO FOREIGN ASSETS HARM STOCK PRICES? A COMPARISON OF THE EFFECTS OF MULTINATIONALITY ON US AND JAPANESE FIRM VALUES

Abstract: This chapter explores the effects of multinationality on firm values for US and Japanese firms. I analyze the influence of firm level characteristics (including a firm's level of intangible assets and previous experience with foreign subsidiaries) and time period characteristics (exchange rate fluctuations) on shareholder valuation of a firm's multinationality using two panel data sets of 191 US and 141 Japanese firms, each covering the same time period (1974-1997). Based on the results from panel data regression models, I conclude that there are large differences between US and Japanese firms. For US firms, multinationality is consistently negatively valued by shareholders over the entire time period, whether a US firm has experience with foreign subsidiaries or not and regardless of its level of intangible assets. Further, this relationship holds whether there are exchange rate fluctuations or not. For Japanese firms, multinationality creates value, but only after a firm has experience with subsidiaries in foreign countries. Similar to US firms, the level of intangible assets of a Japanese firm does not influence this relationship and the results hold whether there are exchange rate fluctuations or not.

Introduction:

A number of studies in both strategy and finance have analyzed whether a firm's multinational operations are value-creating or value-destroying.[1] In both of these fields, however, no consensus has emerged about whether a firm's multinational operations enhance or destroy value. While it seems logical that higher levels of international

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[1] See for example, Errunza and Senbet (1981 and 1984), Brewer (1981), Buhner (1987) Doukas and Travlos (1988), Geringer et al. (1989), Kim et al. (1989) Morck and Yeung (1991), Christophe (1997), Berry and Sakakibara (1999), Click and Harrison (1999) and Geringer et al. (2000)

involvement could lead to better performance, such a relationship has not been established with consistently. While Errunza and Senbet (1981 and 1984), Doukas and Travlos (1988), Geringer, Beamish and daCosta (1989), Morck and Yeung (1991) and Berry and Sakakibara (1999) find that a firm's multinationality creates value, Christophe (1997), Brewer (1981), and Click and Harrison (1999) find that a firm's multinationality either has no effect or destroys value.

The issue of whether a firm's multinational operations are value-creating or value-destroying is particularly relevant to managers in firms which are either considering expanding abroad or furthering the scope and scale of their existing international activities – a group which has been fast growing in the last decade as evidenced by the fact that worldwide levels of foreign direct investment (FDI) doubled between 1990 and 1997 (UNCTAD). With existing empirical research, however, it is difficult to determine whether there are firm and time period characteristics that may influence when a firm's multinationality will create value for firms. Part of the problem lies in the fact that prior research has focused on a limited set of firm and time period characteristics – with different sets of characteristics considered in different analyses. In addition, it is difficult to compare results from prior research because fairly different time periods have been analyzed in these studies.[2] And finally, the vast majority of studies on this issue have analyzed only how shareholders value US firms' operations abroad, with little

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[2] For example, Morck and Yeung (1991) analyzed cross-sectional data for US MNEs in the 1970s; Christophe (1997) analyzed cross sectional data for US MNEs for the late 1970s and early 1980s; Click and Harrison (1999) analyzed a panel dataset of US MNEs from 1984-1997. While Berry and Sakakibara (1999) analyzed a panel dataset of MNEs from 1974-1997, they focused solely on Japanese MNEs.

consideration for whether there may be differences between firms originating from different cultures and governing systems. Differences in firm characteristics, time period characteristics, and in the nationality of the firms studied may influence when a firm's multinationality will create or destroy value. To better determine how firm, time period and national differences influence when a firm's multinationality may create value for firms, a more thorough analysis of all of these factors is needed.

The present study contributes to this debate in two ways. First, I identify firm-level and time period characteristics that may influence whether a firm's multinationality is value-creating or value-destroying. Firm-level characteristics include the influence of a firm's level of intangible assets and the influence of a firm's previous experience with foreign subsidiaries; time period characteristics include the influence of exchange rate fluctuations. Next I analyze these characteristics using two panel datasets of MNEs (one containing information on 191 US MNEs and the other containing information on 141 Japanese MNEs), each covering the same time period, 1974-1997. I include each of the characteristics identified above to analyze whether different sets of firm and time period characteristics influence when a firm's multinationality will create or destroy value.

Based on the results from panel data regression models, I conclude that there are large differences between US and Japanese firms. For US firms, multinationalty is consistently negatively valued by shareholders, over the entire period 1974-1997, whether a US firm has foreign experience or not, and regardless of its level of intangible assets. This relationship holds whether there are exchange rate fluctuations or not. For Japanese firms, multinationality creates value, but only after a firm has some experience with

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subsidiaries in foreign countries. Once a Japanese firm has this experience, its multinationality is positively valued by shareholders. Similar to US firms, the level of intangible assets of a Japanese firm does not influence this relationships and the results hold whether there are exchange rate fluctuations or not.

The paper is organized as follows. The next section reviews the literature on the effect of multinationality on firm value and develops three hypotheses. This is followed by a discussion of why there may be potential differences between US and Japanese firms. A description of the data, variables and methodology are provided in the third and fourth sections, while the empirical results and their implications are discussed in the last two sections.

Theory:

In his review of the literature on the relationship between performance and multinationality, Ramaswamy (1992) identified the main potential benefits to MNEs from their wide geographic spread or scope of operations. According to this literature review, the first benefit a multinational firm has comes from its ability to exploit interrelationships between the various markets in which it operates. For example, firms can benefit from factor price differentials (i.e. access to lower labor costs or cheaper inputs) or they can cross-subsidize particular markets in order to build global market share. With a larger scale and scope of operations (and from increased production experience), firms may also be able to realize cost efficiencies. Second, there are benefits to spreading investments across several geographic regions – each with a unique pattern

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of risk-return relationship. Multinational firms can benefit from exploiting idiosyncratic inter-market variation (i.e., exchange rate variation, differentials in corporate income, tax rates, and consumer tastes). And third, it is often the case that firms with overseas activities have higher R&D and advertising intensity. While he does not argue for a causal effect (because these assets could be the result and not the cause), Ramaswamy notes that in general, these intangible assets positively influence the performance of firms. Overall, Ramaswamy (1992) concludes that it is commonly argued that multinationality positively impacts organizational performance. Firms that operate abroad have opportunities to gain greater returns to their intangible resources, to use market power, to spread their market risks, to seek less expensive inputs and less price-sensitive markets and to cross subsidize poorly performing operations.

What is not reviewed by Ramaswamy in as much detail are the potential costs, or negative consequences, associated with increased foreign activities. For example, geographic dispersion can increase coordination, distribution and management costs. Differing government regulations, trade laws, and currency fluctuations add significant complexity as firms increase their international presence (Sundaram and Black, 1992). Cultural diversity and country differences also require considerable coordination before any advantages from differences in factor price differentials can be realized. Institutional and cultural factors may also create substantial barriers to the transfer of competitive advantages across borders (Kogut, 1985). To successfully manage a large number of business units across different countries requires immense coordination efforts and effective decision-making processes regarding resource allocation. As Hitt et al. (1997)

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note, the managerial information-processing demands are similar to those Chandler

identified in his classic work on product diversification – however, they are even more

challenging when different country markets are added to the equation.

Empirical research has revealed both value-creating and value-destroying effects

from multinationality. After reviewing nineteen studies published between 1971 and

1989, Ramaswamy concludes that "empirical research has provided no conclusive

evidence of the ability of foreign direct investment to generate superior corporate

performance." These nineteen studies included various measures of performance (mostly

return on assets and return on sales), just one measure of multinationality (foreign sales)

and various methodological specifications (including both firm-level and industry-level

data).[3]

Interestingly, while empirical research (after Ramaswamy's article) in the 1990s

has converged on a fairly similar methodology from which to examine the impact of a

firm's multinationality, the results remain equivocal. The methodology employed by

Morck and Yeung (1991), Christophe (1997), Berry and Sakakibara (1999) and Click and

Harrison (1999) uses firms' Tobin's q ratios to examine how shareholders value a firm's

intangible assets (and includes a firm's multinationality as one of these assets).[4] Though

the method is similar, Morck and Yeung (1991) and Berry and Sakakibara (1999) find

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[3] Also, as evidenced by all of these studies, one challenge with this type of research comes from the difficulty of obtaining adequate operationalization of the variables under consideration. For many years, foreign sales to total sales was the only measure of a firm's multinationality. One problem with this variable, however, is that foreign sales may include sales from both exports and foreign operations.
[4] By focusing on a firm's Tobin's q ratio rather than on its stock return or on an accounting measure of performance, no risk adjustment or normalization is required to make comparisons across firms (Lang and Stulz, 1995).

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that a firm's multinationality creates value for firms while Christophe (1997) and Click and Harrison (1999) find that a firm's multinationality destroys value for firms.

For each of the two studies that find positive effects from a firm's multinationality, the result is dependent upon a firm having or achieving a specific characteristic. For Morck and Yeung (1991), this firm characteristic is strong intangible assets, while for Berry and Sakakibara (1999), it is experience with foreign subsidiaries. In the two studies that find negative effects from a firm's multinationality, both discuss the importance of exchange rates, with Click and Harrison (1999) documenting that dollar depreciation reduces the value of MNCs. Though Click and Harrison include a firm's intangible assets (but do not obtain the same positive results Morck and Yeung do), they do not include a firm's previous foreign experience. Further, differences in the results from these studies may also be due to the fact that Morck and Yeung (1991) use cross sectional data from 1978 for US firms, while Christophe (1997) uses cross sectional data from the period 1978-1985 for US firms, Click and Harrison (1999) use cross sectional data from the period 1984-1997 for US firms, and Berry and Sakakibara (1999) use panel data covering the period 1974-1997 for Japanese firms. In terms of the time periods, both of the studies which have used more recent data on US firms (Christophe (1997) and Click and Harrison (1999)) have found that multinationality consistently destroys value for US firms.

Below, I build on these prior studies by considering the influence of each of these firm and time period characteristics. I develop three hypotheses that focus on the types of

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firm and time period characteristics that may be needed for a firm's multinationality to create value. Each of the characteristics is discussed in turn.

Intangible Assets:

According to the internalization theory, an MNE's possession of intangible assets (such as technical know-how, marketing abilities and managerial skill) is considered to be the central determinant of foreign direct investment (FDI). Because of this, Morck and Yeung (1991) suggest that multinationality by itself should not have a significant impact on a firm's market value. Rather, international expansion simply enhances the scope for using a firm's intangible assets. In their analysis, Morck and Yeung include interaction terms between intangible assets and multinationality and find that the positive impact of a firm's intangible assets on a firm's value is enhanced by multinationality, but that multinationality itself does not have a significant impact on a firm's value. Morck and Yeung use 1978 data for US firms, but confirm that their finding applies to the cross sectional years 1976, 1977, 1978, 1979 and 1980.

Christophe (1997) and Click and Harrison (1997) also include interaction effects in their analysis of US firms, but fail to find this positive effect. In addition, Berry and Sakakibara (1999) include interaction effects in their analysis of Japanese MNEs, and also fail to find positive interaction effects.

Though empirical research that has analyzed both US and Japanese firms has not consistently found support for this, the internalization theory which Morck and Yeung (1991) highlight suggests that there should be a positive interaction effect, and that

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multinationality should create value for firms which are using their intangible assets abroad. This reasoning leads to the first hypothesis:

H1: Multinationality will create value for firms with strong intangible assets.

<u>Foreign Experience:</u>

Berry and Sakakibara (1999) argue that there will be differences between how shareholders value a firm's initial and advanced levels of international investment. They argue that shareholders may discount a firm's early FDI because the firm lacks experience in operating and managing subsidiaries abroad. As firms gain more experience abroad, they will accumulate knowledge about different country-markets and develop capabilities that will help them to succeed in these markets. As Barkema, Bell and Pennings (1996) note, firms that are active in many different countries have learned to adapt to different market situations. Berry and Sakakibara (1999) argue that once a firm has experience with foreign subsidiaries, shareholders will value a firm's multinational operations precisely because of the many potential benefits that are outlined above (for example, access to low-cost labor or profitable markets, or access to new types of technological know-how could be valued by shareholders).

Berry and Sakakibara analyze the foreign direct investment of Japanese MNEs over the 1974-1997 time period and find that while a firm's initial investment in foreign subsidiaries abroad is not valued by shareholders, a firm's advanced level of international investment in foreign subsidiaries is valued by shareholders. They define advanced level of investment to include all foreign direct investment after a firm's initial three years of

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investing abroad. (They also test five years, and get the same results.) This suggests an additional firm characteristic that may influence when a firm's multinationality may be value-creating:

H2: Multinationality will create value for firms that have experience with foreign subsidiaries.

Exchange Rates

Christophe (1997) notes that Morck and Yeung (1991) analyzed their valuation relationship for US firms during the 1970s. He summarizes this decade as a period of fixed, and then moderately variable, floating exchange rates and suggests that exchange rate stability may be driving the positive association between firm value and international operations during the 1970s. Christophe applies Morck and Yeung's model to data on US firms in the late 1970s and early 1980s. He confirms Morck and Yeung's findings for the year 1978. When applying the model to the 1980s, however, he finds that the relationship between international operations and firm value changes from positive to negative (as the dollar increased in value relative to foreign currencies). Multinationality (which he defines as foreign sales percentage) is negatively correlated with Tobin's q in each year 1980-1985, and significantly negatively during 1981, 1982 and 1983.

While he never actually controls for exchange rates, Christophe hypothesizes that adverse shifts in currency exchange rates can lead to rational hysteresis in product pricing

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in foreign markets – and that this is what decreases firm value.[5] These arguments suggest

that there may be differences between the 1970s, and the 1980s and 1990s. During the

1970s, a period of fixed and then moderately variable floating exchange rates for both US

and Japanese firms, these arguments suggest that the international operations of firms will

create value. However, during the 1980s, which was a fairly turbulent time period for

both the dollar and the Yen and during the 1990s, which continued to be fairly turbulent

for the Yen, exchange rate volatility may reduce the value of a firm's international

operations. If correct, this reasoning could help to explain why Morck and Yeung (1991)

found positive effects for US firms' multinationality in 1978 while Christophe (1997) and

Click and Harrison (1999) found negative effects for US firms in the 1980s and 1990s.

The third hypothesis will specifically test for this possibility by analyzing whether there

are structural changes between the 1970s and the later decades.

> *H3: The stable currency system of the 1970s positively affected shareholder
> valuation of a firm's multinationality.*

Other theoretical arguments regarding a link between exchange rates and FDI

focus on the potential effects of strong versus weak home and host currencies on foreign

direct investment. The conventional view is that when a host currency is weak (and a

home currency is strong), firms will be able to purchase assets abroad more "cheaply."

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[5] Christophe's arguments focus on a stable versus volatile exchange rate regime. The 1980s were
a particularly turbulent decade, (because of the extreme volatility of the dollar/yen exchange rate). With
exchange rate uncertainty, a firm may price products it sells in foreign countries below the long-run average
variable cost for certain periods of time (Dixit, 1989), because such firms are reluctant to quit a foreign
market during an adverse shift in exchange rates because of sunk cost investments (Baldwin, 1986).
Though this behavior may be an optimal response to exchange rate uncertainty, it may lead to reduced
foreign operating profits (at least in the short run) and may reduce the value of a firm's international
operations.

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Empirical findings suggest a correlation between dollar depreciations and increased levels of FDI in the US (see Caves (1989), Froot and Stein, (1991) and Swenson (1994) Yamawaki (1991) and Kogut and Chang (1996)).[6] Other arguments, however, reject any link between exchange rate effects on FDI because the price of foreign assets should not matter, rather it is the rate of return that is important. When a currency depreciates relative to another country's currency, not only the price, but the nominal return of the assets in a foreign currency will also go down.

Click and Harrison (1999) include a control for exchange rate effects in their analysis of US MNEs, covering the time period 1984-1997. In annual regressions for the years 1985-1997, they find that multinationality always significantly reduces Tobin's q – this suggests that a multinational discount is present throughout the period (regardless of the level of the exchange rate). Further, companies that expanded the foreign share of their output over time fared progressively worse in the market, while those cutting back such operations did better. They also document that the high value of the dollar destroys market value for multinational firms.[7]

A strong home currency existed for US firm in the early 80s, and for Japanese firms in the late 1980s and 1990s. In addition to testing for structural differences between the 1970s, and the 1980s and 1990s, I will also include a control for exchange rates during each of these periods to examine the direction of any potential influence.

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[6] Following an appreciation of an exporting firm's home currency, exports become more expensive abroad and firms may establish manufacturing sites in foreign countries to serve those markets

Comparing US and Japanese Firms:

There are differences between the US and Japan which need to be kept in mind

when comparing US and Japanese firms and shareholder valuation of such firms. Below

I review some of the main differences that are relevant to this study.

Firm Governance and Industrial Organization:

There is a common perception about differences in management styles between

the two countries. According to Fukao (1995), Japanese governance has traditionally

placed more emphasis on goals than on profits and the maximization of shareholder

value. Firms in the US, on the other hand, are often characterized as being disciplined by

capital markets. Kaplan (1997) characterizes the US governance system as market-based

(with focus on more short-term goals, especially high stock prices and profitability) and

the Japanese system as relationship oriented (and more long-term goal oriented). The US

system has also been described primarily as stock-holder oriented, while the Japanese

system has been characterized as stake-holder oriented.

As is also commonly described, the environment in which a Japanese firm

operates is also very different from that of a US firm. Japanese firms typically operate in

corporate groups, or *keiretsus*. Each group is centered around a bank, with many

between-firm ties, such as mutual stockholding, mutual directors, and selling products

through the same trading company. Interfirm business within the group is given high

priority. The *keiretsu* structure of the Japanese system has been identified as an important

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[7] Berry and Sakakibara (1999) control for exchange rate fluctuations in their analysis, and they also find

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source of competitive advantage for Japanese firms (Gerlach, 1992). *Keiretsu*

membership provides firms with access to financial capital and foreign market

information. Hoshi et al (1991) found that *keiretsu* affiliated firms are less liquidity

constrained than other firms in investment decision (and thus, *keiretsu*-member firms may

have higher debt ratios). Further, Tan and Vertinsky (1994) have suggested that *keiretsu*

firms have reduced uncertainties in foreign operations because of their access to foreign

market information and experience through *keiretsu* linkages.

Who are the Shareholders?

According to Gerlach (1992), 70 to 75% of shareholders in Japan are the so-called

"stable investors," which are often companies (including banks) affiliated with each

other. These stable investors have their shares held reciprocally and in complex networks

of company groups. This practice of mutual share holding started in the 1950s and

accelerated during the 1970s. By 1990, holdings of Japanese stocks by individual

investors declined to 23% (from 61% in 1950). Foreign share holding of Japanese stocks

has grown to 9.4% in 1995 from 3.9% in 1987 (Buhner et al., 1998).

In contrast, in the United States, the prevailing pattern for major firms is that

stockholdings are widely dispersed among a large number of stockholders, though there is

considerable institutional investment (mostly through large pension funds). Fukao (1995)

has estimated institutional investment as 55-60% in the US. In addition, the public

equity markets serve as the major sources of capital.

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significant currency effects, further suggesting the importance of including for exchange rate effects.

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<u>Foreign Direct Investment:</u>

Japanese firms are late-comers to international expansion. The majority of Japanese firms started investing in foreign subsidiaries in the 1970s. This is in contrast to many US firms, for whom foreign direct investment and expansion has been going on for well over a century.

It wasn't until the 1970s that Japanese firms began investing in manufacturing sectors of industrialized countries, especially the United States. This investment followed the depreciation of the US dollar (after the collapse of the Bretton Woods system) and the rise of political pressure to protect US industries from Japanese exports. Prior to that, Japanese firms invested abroad for natural resource extraction and processing in developing countries. Additionally, Japanese firms invested in simple manufacturing activities in near-by Asian countries.

By the mid-1980s, the patterns of foreign direct investment by Japanese firms were converging toward the norms recorded by their US and European rivals (Encarnation, 1992). For both US and Japanese firms, a heavy concentration of investment occurs in developed or high-income countries. And for both US and Japanese firms, interest in developing countries outside of Latin America and East Asia is fairly limited. However, differences include the fact that US investments tend to be concentrated in the major European countries and Canada, while the United States is a very popular location choice for Japanese investment (as well as other European countries and Canada). Japanese firms continue to have strong interests in investing in East Asia. In addition, Japanese direct investment abroad primarily take the form of wholly-owned

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subsidiaries, with a very small percent of investment occurring through the acquisition or joint venture entry mode. Firms from other nations invest abroad through all types, with European firms giving a heavier preference to alliances than US firms (Vernon, 1992)

There are also differences between the size and natural resource availability of the two countries. Unlike the US, Japan is a small country that is lacking in indigenous raw materials. Japanese firms may be attracted to sectors in other countries that enjoy access to raw materials (for example, in the US or Canada, Japanese firms may be attracted to forestry or agriculture). On the other hand, the lack of resources in Japan also implies that Japan is a poor site for the types of activities that require such inputs. This suggests that these sectors may not flourish in Japan and that there will be fewer potential Japanese investors that could enter foreign countries as foreign investors in these sectors.

Finally, it should be noted that there was a surge in FDI worldwide after 1985. United Nations Center on Transnational Corporations (UNCTC) data show that the G5 nations (France, West Germany, the United Kingdom, Japan and the United States) were the source nations of almost 70 percent of FDI flows in the late 1980s and early 1990s, while these nations were also recipient nations for close to 60 percent of these flows. During the 1980s, the United States surpassed the United Kingdom as the largest destination for worldwide direct investment, while Japan remains a relatively small host nation of inward direct investment (in the 1980s, the Japanese economy was the recipient of less inward investment than Greece).

Given these differences in terms of firm governance and industrial organization, shareholders, and foreign investment patterns and histories between US and Japanese

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firms, I expect that there will be some differences between how shareholders value a US and Japanese firms' multinationality. However, I also expect that the hypotheses developed above should apply to firms regardless of their nationality. Internalization theory arguments are not nation-specific, and neither are arguments regarding exchange rate effects. In addition, by testing for differences between initial and more advanced levels of multinationality, I will be comparing firms at a similar stage in the internationalization process in both the US and Japan. Therefore, I do not posit specific hypotheses regarding differences between the samples. Rather, below, I test for the possibility that there will be differences by running the analyses separately for the two national samples.

Description of the Data:

There are two samples that are analyzed in this paper. In the Japanese sample, all publicly traded manufacturing firms that are listed in the Japanese Development Bank (JDB) Database from 1974-1997 and which provide information on their advertising and R&D expenditures are included in the sample (results in a sample size of 141 firms). Financial information on the Japanese firm comes from either the Japanese Development Bank (JDB) Database or the Japan Company Handbook. All financial variables are deflated to the base year 1970 using Bank of Japan GDP deflators.[8]

The second panel dataset is comprised of 191 US firms. All publicly traded manufacturing firms that are listed in the Compustat Database from 1974-1997 and which

provide information on their R&D expenditures are included in the sample.[9] Similar to

the Japanese sample, all financial figures are real annual figures deflated to the base year

1970 using US Department of Commerce, Bureau of Economic Analysis GDP deflators.

Table 3-1 gives summary statistics of the main variables.

Tobin's q:

Tobin's q is defined as the ratio of the market value of the firm to the replacement

cost of its tangible assets. The attractiveness of q is that it provides an estimate of the

firm's intangible assets. In addition, no risk adjustment or normalization is required to

compare q across firms (Lang and Stulz, 1994). See Appendix Two for a discussion of

the Chung and Pruitt (1994) approximation for q that has been used in this analysis for

the US firms.[10] For Japanese firms, Hoshi and Kashyap's methodology has been used to

create q values. See Appendix One for an in-depth discussion of how this ratio was

calculated.

Chart 3-1 (all tables are reported at the end of this chapter) shows the average

Tobin's Q values for the US firms in the sample over the twenty-four year period. While

the Tobin's q values for US firms tends to hover around one, the average Tobin's q value

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[8] See Berry and Sakakibara (1999) for a much more detailed description of the Japanese data.

[9] US firms were included in the sample as long as they reported data in at least three-quarters of the years, or at least 18 of the 24 years in this study. If a US firm did not report R&D data during four consecutive years (where I would be unable to create a stock variable), I did not include it in the sample. This yielded a sample size of 191 firms.

[10] NBER q ratios (which were calculated following the more complex and involved Lindenberg and Ross (1981) approximation) are available for US firms up to 1991. Though not reported in this paper, I also ran my analyses using the NBER q ratios from 1974-1991. As I mention in the Appendix, the Chung and Pruitt (1994) approximation has a very correlation with the NBER q ratios. Therefore, not too surprisingly, my results were the same.

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for Japanese firms is considerably higher. This is true not only during the so-called bubble economy period (the late 1980s) but in every year of the sample.

Marketing Ability (ADStock):

Annual expenditures on advertising have been used as a proxy for marketing ability in many studies (Morck and Yeung, 1991; Morck and Yeung, 1992; Pugel et al., 1996; Kogut and Chang, 1991; Belderbos and Sleuwaegen, 1996; Kim and Lyn, 1987). However, a better proxy for marketing ability should capture a firm's accumulation of "marketing capital."[11] Accordingly, an advertising stock measure (which includes both accumulated and current period expenditures) is used to proxy for a firm's marketing ability. While there is no consensus on the rate of depreciation of advertising expenditures, following Hirschey and Weygandt (1985), a depreciation rate of 50% is used for previous years' expenditures going back two years.

Technical-Know How (R&DStock):

Following other studies, a firm's R&D expenditures are used as a proxy for technical know-how. It is argued here that R&D expenditures' systematic influences on the market values of firms can persist over time. Thus, an R&D stock measure (which includes both accumulated and current period expenditures) is used to proxy for a firm's technical know-how. In this study, Grilliches and Mairesse (1984) are followed, and a depreciation rate of 15% is applied to the previous year's expenditures going back four years.

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<u>Intangible Assets (IntanAssStock)</u>:

One important difference between the US and Japanese samples concerns the intangible assets variables. Japanese firms are much more consistent in reporting their advertising expenditures than US firms.[12] Because of the potential problem of a severely reduced sample size if I used only those US firms reporting their advertising expenditures (and the inability to run the analysis on some of the different time periods of interest), I use an Intangible Assets variable that combines both the technical know how and marketing ability of a firm. I combine the stock of R&D and the stock of advertising to create the IntanAssStock variable.

<u>FDI Variables</u>:

The measure for FDI used in this study is a count for each firm of the number of subsidiaries it has in each year; the higher the number, the higher the degree of FDI for that firm. For the Japanese firms, I worked with a native Japanese speaker to determine the number of subsidiaries for each year for each firm from the *Toyo Keizai Shinposha* Directory (the Japanese-language directory of firms with foreign subsidiaries). For the US sample, for each of the 191 firms in the sample for each year, I consulted the Directory of Corporate Affiliates to determine the number of foreign subsidiaries.[13]

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[11] The effects of advertising can last beyond a single period, and accordingly, the stock of advertising will generate returns in subsequent periods. Studies on advertising expenditures have found a long-term effect on sales which carries over multiple years (Peles, 1971; Hirshey and Weygandt, 1985; Broadbent, 1993).

[12] If I limit my US sample to include those firms that report their advertising expenditures for at least half of the time period under consideration, my sample is cut down to 58 firms.

[13] For the years 1981-1990 a separate volume (in the Directory of Corporate Affiliates series) exists which documents foreign subsidiaries of US publicly traded companies. Prior to 1981, foreign subsidiaries are contained within the volume that list all of the subisdiaries (US and foreign subsidiaries are mixed). There are some problems with the US data – especially prior to 1981. For 31 of the US firms, the Directory of

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As the directory for each year was examined, the data reflect entry and exit, and the global reconfiguration of activities by the US and Japanese firms in the sample. Domestic firms that are not multinationals and thus have no subsidiaries abroad are included in the sample; a portion of these firms became multinational during the twenty-four year time period of this study

Control Variables

Debt is described in Table 3-2. Debt is included to proxy for any variation in firm values because of differences in capital structure. The Dollar real exchange rate is used to control for exchange rate effects for US firms and the Yen real exchange rate is used for Japanese firms. Real exchange rate interaction terms with FDI (and exports for Japanese firms) are used to capture firm-level effects of exchange rate movements. Growth of the firm is captured by the change in employees over the previous two years. Finally, I include exports for Japanese firms because the data is readily available and the results do not change without it. (If I could get the data for US firms back to the 1970s, I would include it as well.) It should be noted that *keiretsu* effects for Japanese firms and industry effects for both Japanese and US firms will be accounted for in the individual effect term for each firm.

Corporate Affiliates will suddenly report a firm as having a large number of foreign subsidiaries (when none existed according to Directories from prior years). This is probably due to the fact that they started reporting in this year, as opposed to suddenly investing in 48 subsidiaries. The problem is most noticable right after the 1974-1981 time period) For these 31 firms, I first consulted company 10K reports to ensure that they did not acquire a foreign firm (that may have had a large number of subsidiaries). Provided there was no evidence that an acquisition had occurred, I deleted the years prior to the high reporting year. (Thus,

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Specifications:

The model used in this paper builds on the approach used in other studies of market valuation.[14] A basic assumption is that there is financial market efficiency and that the market value of a firm (V) is the sum of the value of its net tangible assets (T) and its net intangible assets (I). Thus,

$$V = T + I \qquad (1)$$

For publicly traded firms, V is defined as the market value of its outstanding common shares plus estimates of the market value of its debt. The tangible assets variable is an estimate of the replacement value of the firm's tangible assets. The intangible assets that are included in this model are technical know-how, marketing ability, and a firm's multinationality

As indicated above, a leverage variable (debt) is also included to proxy for any variation in firm values owing to differences in capital structure. To control for firm size, all variables are scaled by the replacement cost of tangible assets.

$$\frac{V}{T} = \frac{T}{T} + \frac{I}{T} \qquad (2)$$

This causes the left hand side of the equation to become Tobin's q[15], and the right hand side to be function of a firm's intangible assets (with each intangible asset divided by the replacement cost of the firm's tangible assets). The intangible assets that are included in

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some firms in the US sample will only appear in the unbalanced panel dataset that includes advanced levels of foreign direct investment.)

[14] Going back to Ross, 1983; and Fama, 1970. See Morck and Yeung (1991) or Berry and Sakakibara (1999) for more discussion of this methodology.

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this model are technical know-how, marketing ability and FDI. As indicated above, a leverage variable (debt) is also included to proxy for any variation in firm values owing to differences in capital structure. The model becomes the following:

$$Q_{it} = \alpha_i + \beta_1 \frac{In\tan AssStock_{it}}{Assets_{it}} + \beta_2 \frac{Debt_{it}}{Assets_{it}} + \beta_3 \frac{FDI_{it}}{Assets_{it}} + \beta_4 \left[\left(\frac{FDI_{it}}{Assets_{it}} * \frac{In\tan AssStock_{it}}{Assets_{it}} \right) \right]$$
$$+ \beta_5 \left[\left(\frac{FDI_{it}}{Assets_{it}} * RER \right) \right] + \beta_6 \frac{FirmGrowth_{it-it(-2)}}{Assets_{it}} + \varepsilon_{it} \qquad (3)$$

where Q is a firm's Tobin's Q ratio; IntanAssStock$_{it}$ is a firm's stock of technical know-how and marketing ability; Debt$_{it}$ is a firm's debt; FDI$_{it}$ is the number of a firm's foreign subsidiaries; RER is the real exchange rate (for either the US or Japan, depending on which sample is being used); FirmGrowth is the three year change in the number of employees for each firm; and Assets$_{it}$ is a firm's total tangible assets. α_i represents intangibles related to other factors, this could represent such intangible assets as efficient use of human resources, management style or expertise, and other firm-specific intangible assets not included in the model. Finally, ε_{it} is an error term. Equation (3) indicates that the change in a firm's value to shareholders as measured by its Tobin's Q is a function of its intangible assets (including FDI), with controls for leverage (debt), exchange rate fluctuations and firm growth, as discussed above. In addition, through the interaction term, I can consider whether FDI enhances firm specific assets.

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[15] By focusing on a firm's Tobin's q ratio rather than on its stock return or on an accounting measure of performance, no risk adjustment or normalization is required to make comparisons across firms (Lang and Stulz, 1995).

The first part of the analysis involves testing equation (3) using the full sample to obtain parameter estimates for a firm's FDI over the entire time period, 1974-1997. The next part of the analysis divides the sample into different time periods and then different levels of FDI (an initial versus more advanced level). Standard Chow tests are applied to test the equivalence of the regression estimates between the subsamples.

A pooled time series methodology is used to analyze the data. I considered both the fixed effect and random effects models. The relevant distinction between these models involves the assumption about the individual effect (α_i). In the random effects model, the individual effect is assumed to be uncorrelated with the explanatory variables while in the fixed effect model, the individual effect is assumed to be correlated with the explanatory variables. In the present analysis, the individual effect is assumed to pick up a firm's intangible assets for which I am unable to get measures. As these unmeasured firm individual effects are likely to be correlated with the intangible assets included in the model, I use the fixed effect model for the regressions that are reported below.[16]

To test for differences between a firm's initial and advanced levels of international investment, the sample was divided into two unbalanced panel data sets. The data set of initial international investment includes observations before and during a firm's first three years of international expansion abroad while the set of advanced international investment includes observations of subsequent investments after the firm's

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[16] I also ran random effects models in each of the analyses and used Hausman tests to determine whether the random effects estimators were correct. The results of the Hausman tests reject the null hypothesis that the random effects estimator is correct. Because of the difficulty of succinctly presenting the additional random

first three years of investing abroad.[17] In addition to the Chow test discussed above,

Wald tests are used to test whether there are statistically significant differences between

the parameter coefficients of interest in the two periods.[18]

Results:

Overall, the empirical results reveal mixed support for the hypotheses, and large

differences between the US and Japanese samples. The empirical results from equation

(3) for both the US and the Japanese samples are reported in Table 3-3. This tables

reports the fixed effect results for both the entire time period (1974-1997) and for the

different sub-time periods under consideration.

For each of the samples, I first ran the model using the entire period. I then broke

up each of the samples into the three decades to test for structural differences between the

decades. For the US firms, Chow tests reveal that I cannot reject the hypotheses that all

the coefficients are the same in the different time periods. For the Japanese firms, Chow

tests also revealed that I could not reject the null that all coefficients were the same

between the 1970s and 1980s, and between the 1980s and 1990s. However, there were

significant differences between the 1970s and 1990s. Considering the Japanese data, a

more natural break point for this sample is the mid 1980s. And in fact, a Chow test

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effects models and χ^2 test statistics (and given that the random effects estimator is inconsistent), I have not reported the random effects estimators or Hausman test χ^2 statistics in the tables below.

[17] A cut-off point of five years was also tested. As the results are the same, only the three year cut-off is reported below.

[18] To ensure the results are not affected by what has been called the "bubble economy" in Japan, I also ran the model on the Japanese sample dropping the years 1986-1990. These results are not reported below as the statistical significance of the variables of interest did not change.

supports the separation of the Japanese sample into the two periods: 1974-1984 and 1985-1997. Therefore, for the Japanese sample, I have reported only the results for these two periods, which are significantly structurally different.[19] These results did not change when excluding the bubble period years in Japan (1986-1990).

Hypothesis 1 predicts that multinationality will create value for firms with strong intangible assets. The coefficients from the interaction between a firm's FDI and its intangible assets in Table 3-3 reveals that this hypothesis is not supported in any of the results for either Japanese or US firms. Trying to find support for this hypotheses, I also ran the interaction term for just the R&DStock variable and further, tried both a lagged R&Dstock and IntanAssets variable. As the results from all of these analyses are the same, I have not reported them in the table.[20]

Hypothesis 2 predicts that multinationality will create value for firms that have experience with foreign subsidiaries. Table 3-4 reports the coefficients for initial and advanced levels of foreign investment. For ease of presentation and interpretation, I only report the coefficients from the multinationality variable, though it should be noted that the full model was run. As revealed in Table 3-4, both the initial and advanced levels of a firm's multinationality for US firms are valued the same – negatively. A Wald test reveals that there is no significant difference between the initial and advanced variables for US firms. For Japanese firms, however, there are differences between initial and

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[19] For comparison purposes, I also ran the US model with a 1985 breakpoint, but Chow tests reveal no structural change between these periods either.
[20] It should also be noted that the signs and statistical significance of the variables in any of the model do not change if the interaction terms are dropped.

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advanced levels of FID. A Japanese firm's initial FDI is negatively valued by shareholders, while its advanced FDI is positively (and significantly) valued during each of the time periods under consideration. Further, Wald tests confirm that there are statistically significant differences between the coefficients for initial and advanced FDI for Japanese firms in each of the periods and over the entire period.

Hypothesis 3 predicts that shareholders will value a firm's multinationality during the stable currency system of the 1970s. As noted above, Chow tests reveal no structural differences between the decades for the US firms. Also as noted above, there were no structural differences between the 1970s and 1980s for Japanese firms. Rather the mid 1980s provides a significant structural change for Japan. As this does not correspond with the arguments made in Hypothesis 3, neither the US nor the Japanese sample provides support for this hypothesis.

Controls for exchange rate effects were included in each of the models. These coefficients are significant (at the .10 level) and positive in some of the US models and significant and negative in some of the Japanese models.

Discussion and Implications:

Given the large increases in worldwide levels of foreign direct investment over the last decade, it is hard to reconcile findings of consistently negative valuations of a firm's multinationality. However, this is exactly what the data reveal for the US firms in this and previous studies. The Japanese firm results, which reveal that certain firm

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characteristics are needed before a firm's multinationality is valued by shareholders, are far easier to embrace.

In this study, I examined whether a firm's multinationality creates or destroys value in a number of different ways. I examined the influence of a firm's intangible assets; whether there are differences between levels of foreign experience; whether there are differences between time periods; and how exchange rates fluctuations may influence this relationship. And finally, I analyzed whether there are differences between US and Japanese firms.

From the results of this analysis, I conclude that there are large differences between US and Japanese firms. For US firms, multinationality is consistently negatively valued by shareholders over the entire period 1974-1997, whether a US firm has experience with foreign subsidiaries or not and regardless of its level of intangible assets. This relationship holds whether there are exchange rate fluctuations or not. For Japanese firms, multinationality creates value, but only after a firm has experience with subsidiaries in foreign countries. Similar to US firms, the level of intangible assets of a Japanese firm does not influence this relationship and the results hold whether there are exchange rate fluctuations or not.

These results reveal that assumptions about similarities across nations and about the general applicability of theories across these same nations need to be examined more carefully. In the present analysis, I did not posit specific hypotheses about differences between the two samples, rather, I allowed for the possibility by testing the two samples separately. Future work I intend to pursue will examine this issue further to investigate

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the potential causes for the very different performance effects from multinationality across US and Japanese firms.

The differences between US and Japanese firms that were highlighted in this chapter focused on different industrial organization structures, different types of shareholders and different foreign investment patterns and histories. These issues suggest a couple of places to start further investigations. For example, is FDI viewed differently in Japan because that nation is relatively resource-scarce? And does the fact that 70-75% of Japanese company shareholders tend to be affiliated companies mean that these shareholders make a more realistic valuation of the potential benefits of FDI than do US shareholders (the majority of which are individuals)? Because it takes time before any profits will be realized from foreign operations, a longer-term orientation by shareholders may be necessary for multinationality to create value for firms. And how does the fact that a high percent of Japanese FDI is in the US market affect these results? Historically, the US has been a very attractive market in which to invest, with average rates of return being higher than in the European and Japanese markets during the 1974-1997 time period. Do shareholders place more value on investment in some markets versus others? Also, are there performance differences between the subsidiaries of US and Japanese firms? Further, could there simply be a cultural bias in the US against investment in foreign locations? Finally, Click and Harrison (1999) offered an explanation for their negative findings for shareholder valuation of multinationality for the US firms in their sample. They concluded that empire building motives may be the cause for much of the foreign expansion of US firms, and further that management may be reluctant to sell

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underperforming assets because they value firm size. Additional study of this rationale, with specific application to Japanese firms, my provide another avenue for future research.

Chart 3-1:

Comparison of US and Japanese Firms' Tobin's q Ratios, 1974-1997
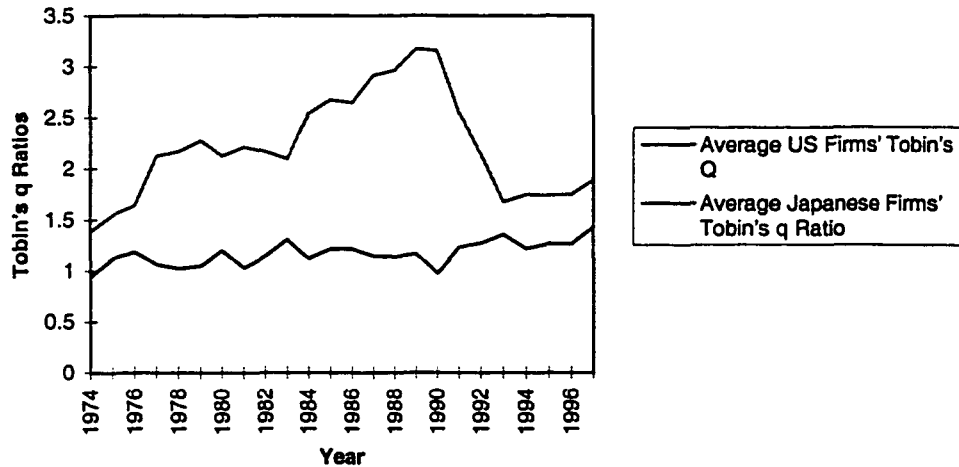
Table 3-1: Summary Statistics

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
US Firms:					
Q	4486	1.18	.84	-.21	9.46
IntanAssetStock (M$)	4486	45	114.2	.0157	1,217
Debt (M$)	4486	178	473	0	6,863
FDI	4198	12.95	24.1	0	203
Japanese Firms:					
Q	3384	2.21	1.36	0.24	13.06
ADStock (MYen)	3384	3,848	7,517	1.36	65,840
R&DStock (MYen)	3384	15,560	53,984	1.19	6,914,557
Debt (MYen)	3384	120,109	271,335	1,720	3,431,605
FDI	3384	7.5	13.2	0	89

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Table 3-2: Operationalization of the Variables:

For All Firms (US and Japanese):

Q	A firm's Tobin's Q is the ratio of its market value to the replacement cost of its tangible assets. All variables are inflation adjusted using GDP deflators.
R&DStock**	The stock of a firm's R&D is its technical know-how. R&DStock is the total value of 100% of a firm's current year expenditures on R&D, plus R&D spending from the four previous years depreciated at a 15% rate. Yearly firm level financial data are inflation adjusted using GDP deflators.
ADStock**	The stock of a firm's advertising expenditures is its marketing ability. ADStock is the total value of 100% of a firm's current year expenditures on advertising, plus spending from the previous two years depreciated at a 50% rate. Yearly firm level financial data are inflation adjusted using GDP deflators.
IntanAssStock**	The total for each firm of RDStock+ADStock.
FDI**	A firm's number of subsidiaries.
Debt**	The market value of a firm's short and long term debt. All values are inflation adjusted using GDP deflators.
RER	Real exchange rate as published by the IMF. (The Dollar Real Exchange Rate is used for US firms and the Yen Real Exchange Rate is used for Japanese firms.)
FirmGrowth**	The three-year change in the number of employees for each firm.

** These variables are scaled by the replacement cost of tangible assets to control for firm size. Inflation adjusted values are used.

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Table 3-3: Shareholder Valuation of Multinationality for Japanese and US MNEs

Dependent Variable Q	JAPANESE FIRMS			US FIRMS			
	I 1974-1997	II[1] 1974-1984	III[1] 1985-1997	IV 1974-1997	V 1974-1979	VI 1980-1989	VII 1990-1997
IntanAssStock Assets	.20** (2.25)	.37*** (2.63)	.31* (1.65)	.45*** (2.20)			
Debt Assets	-.01 (-.43)	-.04 (-1.06)	-.01 (-.40)	-.75*** (-7.3)	Chow tests reveal no structural change between time periods		
FDI Assets	3.3*** (4.08)	-2.9 (1.45)	2.5*** (3.87)	-4.29 (2.07)			
Exports Assets	.12*** (4.17)	.20*** (2.07)	.46*** (3.77)	N/A			
FDI * IntanAssStock Assets Assets	-1.2 (-1.11)	-1.46 (-.63)	-2.6 (-.89)	-.14 (-1.3)			
FDI * RER Assets	-.021*** (3.73)	.062 (.72)	-.033*** (3.76)	.004 (1.53)			
FirmGrowth Assets	.38** (1.80)	.39** (2.31)	.42** (1.88)	.35*** (5.44)			
AR(1)	.72*** (3.7)	.63*** (2.8)	.73*** (3.6)	.74*** (6.36)			
Adj. R^2	.82	.88	.83	.84			
n=	2958	1269	1551	3816			

(T statistics) Using a two-tailed t-test:* Significant at .10 level ** at .05 level *** at .01 level
[1] Chow tests reveal structural change between the 1974-1984 and 1985-1997 periods

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Table 3-4: Shareholder Valuation of Initial and Advanced Levels of Multinationality for US and Japanese Firms

	Time Period	LEVEL OF FDI Initial includes first three years of investing abroad Advanced is all subsequent investment abroad			
		Initial FDI	# OBS	Advanced FDI	# OBS
US FIRMS:	1974-1997*	-1.34*[1] (-1.71)	1511	-3.34***[1] (-3.35)	2473
JAPANESE FIRMS:	1974-1997	-1.2*[2] (-1.69)	822	6.4**[2] (2.02)	536
	1974-1984	-.63[2] (-1.50)	490	2.53**[2] (2.28)	580
	1985-1997	-.019[2] (-.18)	297	5.34***[2] (2.99)	890

(T-statistics)

*Chow tests reveal that there are no differences between the model for the 1970s, 1980s and 1990s for the US sample, therefore, the coefficients for multinationality for these periods are not reported here.

(1) Wald test reveals no significant differences between these coefficients (2) Wald tests reveal significant differences between these coefficients.

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CHAPTER FOUR: A COMPARATIVE TEST OF THE INTERNALIZATION THEORY

Introduction:

As discussed in Chapter One, according to the internalization theory, foreign direct investment (FDI) occurs when firms can increase their value by internalizing markets for their intangible assets. There is an opportunity to earn rents on assets that are already in the firm's possession and have been accrued through the firm's activities in its home-base. Previous empirical studies that claim to provide support for the internalization theory[1] have reported a significant relationship between intangible assets and foreign investment. The problem, however, is that the majority of these studies have used cross sectional data and are actually reporting statistically significant correlations between a firm's (or industry's) intangible assets and its international investments which are considered at the same point in time.

I have argued in Chapters One and Two of this dissertation that because the vast majority of previous studies on this issue have only used a static approach without considering lagged variables, the internalization theory has not really been tested. The theory does not simply predict an association between a firm's intangible assets and

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[1] Hosrt (1972), Lall (1980), Pugel (1978), Wolf (1977), Caves (1974), Buckley and Casson (1976), Buckley and Dunning (1977), Dunning (1980) Lall and Siddharthan (1982) and Kogut and Chang (1991) all use cross sectional tests with industry level data on intangible assets. Swedenborg (1979), Pearce (1989), Morck and Yeung (1991) and Hennart and Park (1994) use cross sectional firm or product level data. Kimura (1989) uses pooled firm level data, however he does not use lagged values.

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foreign direct investment, rather, it predicts a very clear direction for this association: the

existence of firm specific intangible assets should *precede* a firm's international

investment abroad. By looking at only one year in time, previous studies have been

unable to conclude whether a firm's accumulation of intangible assets actually precedes

its foreign expansion. As I will expand on below, even those few studies (two in addition

to Chapter Two of this dissertation) that have considered time series or panel data have

limitations which need to be addressed.

Previous Research:

Because I reviewed eighteen of the previous studies that focus on cross-sectional

data tests of the internalization theory in Chapter One, I do not repeat this information

here. In stead, I focus on the three prior empirical studies that have investigated the issue

of causality using panel or time series data.[2] The first study which has analyzed this issue

using time series data, is Morck and Yeung's (1992) event history analysis of how

acquiring firms' stock prices react to news of foreign acquisitions, given different levels

of intangible asset investment. They find that when firms with intangible assets expand

abroad their stock prices rise. However, their sample includes only foreign acquisitions

by US firms between 1978 and 1988. Given that they limited their analysis to foreign

acquisitions, it is difficult to conclude whether their findings apply beyond this type of

entry mode. Because arguments in the internalization theory focus on firms minimizing

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[2] Included among these three is the working paper version of Chapter Two, cited as Berry and Sakakibara, 1999.

their transaction costs and exploiting their intangible assets, it is important to test this theory with a sample that includes more than just foreign acquisitions. Further, it is unclear how Morck and Yeung's results may be affected by firms attempting to acquire foreign know-how, rather than exploit intangible assets created in their home market.

Two other empirical studies that have analyzed this issue both used Granger causality to investigate the temporal causal relationship between a firm's FDI and its intangible assets. Mitchell et al. (1998) used Granger causality to investigate the temporal causal relationship between an expansion of a firm's multinational structure as measured by three discrete states (including increase, does not change and decrease), and its growth in spending on intangibles. In their study, they analyze US firms' foreign operations during the 1980s (1982-1990). During this time period, the majority of the firms in their sample experienced no change (no increase or decrease) in their international subsidiary activity (they report that 1365 observations out of a total of 1787 (76% of their observations experience no change). Though they do not discuss this, their sample appears to be dominated by more established firms, which have already invested in foreign markets and are not actively increasing their foreign presence. Given that the internalization theory is concerned with how firms use their intangible assets to initiate or expand their foreign presence, Mitchell et al.'s sample may not provide enough foreign activity to test the internalization theory. At the very least, these sample issues have an influence on their results – which do not confirm that an increase in intangible assets precedes foreign expansion by US firms.

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Berry and Sakakibara (1999) also used Granger's concept of causality to analyze

the relationship between a firm's intangible assets and its foreign investment using a

sample of Japanese MNEs over a twenty-four year period (1974-1997). Their sample

includes a time period during which Japanese MNEs were more active in expanding

abroad – providing a better test of the internalization theory than Mitchell et al. Berry

and Sakakibara find very robust support for the internalization theory.

Given the previous research in this area, there is still an open question as to how

well the internalization theory may explain the foreign direct investment decisions for US

firms during a time in which many of these firms are not actively increasing their foreign

investments in subsidiaries. Though there are no arguments in the internalization theory

that suggest that it may apply better or worse to different stages of the internationalization

process, the empirical results from prior research suggest that firms which are more

mature in their international expansion activities (and not as active in increasing their

foreign presence) may not be expanding abroad for purely exploitative reasons. As I will

discuss more in Chapter Five, many theorists in international management are focusing

on asset-seeking reasons for foreign direct investment. Mitchell et al.'s findings could be

interpreted as providing evidence that the internalization theory does not apply to the

internationalization stage where firms are no longer actively expanding abroad. Rather,

Mitchell et al.'s finding of feedback from foreign subsidiaries suggests that the asset-

seeking motivation may be more relevant for explaining the expansion abroad by US

firms in the 1980s. Based on Mitchell et al.'s finding, it could be the case that the

internalization theory is more applicable to firms that are in a relatively early stage of internationalization (as Japanese firms are during the 1970s and 1980s).

However, the difference between the results could also be a function of the different time periods that were studied. Mitchell et al.'s sample is limited to the 1980s, while Berry and Sakakibara's sample covers a much longer time period (1974-1997).

As the internalization theory does not offer any suggestions in terms of the limitations of its applicability (in terms of the types of firms, the stage of the internationalization process, or the time period under consideration), I do not offer any specific hypotheses on these issues in this chapter. Rather, I apply Granger's test of causality to both of my panel data sets on US and Japanese firms to test a longer time period for the US firms, and to consider firms from two different nations, at different stages of the internationalization process.

Hypotheses:

I test the same hypotheses that were tested in Chapter 2, but apply them to both of my panel data sets (to both US and Japanese firms). The first hypothesis argues that if the internalization theory holds, a firm's intangible assets should Granger cause its investment abroad.

> *Hypothesis 1: The accumulation of intangible assets in a firm's home market precedes its foreign direct investment.*

In addition, I test for feedback to determine whether foreign subsidiaries contribute to the research capabilities of the parent firm. In Chapter Two, I reviewed

Kuemmerle's (1996) and Wesson's (1993) argument that feedback may exist from a firm's subsidiaries to its technical activities in its home market. Foreign subsidiaries may gain access to local technological knowledge or may create knowledge themselves which can be transferred back to the parent company. Further, rents may be earned abroad which contribute to funding technological endeavors of the parent firm.

> *Hypothesis 2: A firm's foreign subsidiaries, and their access to local knowledge or profits, contribute to the accumulation of the parent firm's intangible assets.*

I test both of these hypotheses using initial and advanced levels of a firm's international activity to more fully analyze how firms use home and foreign market to exploit and develop their intangible assets. By analyzing different levels of international activity, I will investigate whether firm specific advantages created in the home market are exploited abroad throughout a firm's international expansion, or whether this view is more applicable during a firm's initial foreign expansion. Further, I want to test whether feedback may exist only after a firm has obtained a more advanced level of international activity. Finally, by testing for differences between initial and advanced levels of investment, I will be able to compare US and Japanese firms at similar stages of the internationalization process.

Data:

All publicly traded manufacturing firms which are listed in either the Japanese Development Bank (JDB) Database or Compustat from 1974-1997 and which provide information on their advertising and R&D expenditures are included in the sample used

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in this study. This results in a sample size of 141 Japanese firms and 191 US firms. All financial data come from either the Japanese Development Bank Database or Compustat, and are inflation adjusted to the base year 1970. Unlike previous studies which use annual expenditures to proxy for intangible assets, I use stock measures (which include both depreciated past years and current year expenditures to capture a firm's accumulation of marketing or technical capital). For each firm, the number and main functions of subsidiaries is determined from either the Toyo Keizai Shinposha Directory[3] (for Japanese firms) or the Directory of Corporate Affiliations (for US firms) for each year from 1974-1997. The variables to be used in Hypotheses 1 and 2 are described in detail in previous chapters (for the Japanese data, see chapter 2 and for the US firms, see chapter 3). I noted above that Mitchell et al.'s sample was dominated by firms that experience no change during their sample time period (76% of their observations). For my US sample, I also have this characteristic. 2882 out of 4008 observations in my sample of US firms (or 72%) experience no change in foreign subsidiaries for my US sample. This compares to 1865 out of 3243 observations (or 57%) in my Japanese sample.

To test for differences between a firm's initial and advanced levels of international investment, the each of the samples was divided into two unbalanced panel data sets. The data set of initial international investment includes observations before and during a firm's first three years of international expansion abroad while the set of

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[3] A native Japanese speaker translated the Japanese data as the Japanese source is in Japanese.

advanced international investment includes observations of subsequent investments after the firm's first three years of investing abroad.

Specification:

To test hypotheses 1 and 2, Granger causality tests will be used on pooled time series and cross-section data. An IntangibleAsset variable (which is the combined scaled R&D stock and scaled advertising stock data) will be used to proxy for a firm's intangible assets. A bi-variate vector autoregressive (VAR) technique is used to test the nature of the causality linkage between FDI and the accumulation of intangible assets using the first difference of each variable. The two equations are estimated by:

$$\Delta FDI_{it} = \sum_{j=1}^{n} \alpha_j \Delta FDI_{i(t-j)} + \sum_{k=1}^{n} \beta_k \Delta IntangibleAssets_{i(t-k)} + \varepsilon_{it} \qquad (1)$$

$$\Delta IntangibleAssets_{it} = \sum_{j=1}^{n} \lambda_j \Delta FDI_{i(t-j)} + \sum_{k=1}^{n} \delta_k \Delta IntangibleAssets_{i(t-k)} + \varepsilon_{it} \qquad (2)$$

where variables are for firm i in year t, and n is the lag period. Granger causality tests are performed by joint F-tests of the hypothesis that the collective coefficients of the lagged causal variables are significantly different from zero.[4] I will test these equations using both initial and advanced levels of international investment.

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[4] Because the results of the Granger causality test can be sensitive to the specification of the lag structure,

Results:

The predicted relationship from the internalization theory between a firm's intangible assets and its investment abroad is supported. Table 4-1 (which can be found at the end of this chapter) reports the Granger causality results for firms in all manufacturing industries for both the US and Japanese samples. The table provides the F-statistic for Granger causality, the number of observations, the sum of the lagged explanatory coefficients and the adjusted R-squared statistic for the three pairs of bivariate relations.

In Hypothesis 1, it was predicted that the accumulation of a firm's intangible assets would precede its direct investment abroad. Table 4-1 reveals that intangible assets Granger cause FDI for both Japanese firms ($F=12.15$, $p<.01$) and for US firms ($F=12.11$, $p<.01$). The same results occur whether three, four, five or six lags are used. In addition, while only the results for IntangibleAssets are presented in the table, the results hold when R&Dstock is considered separately for each of the samples (R&DStock individually Granger cause FDI).

The results in Table 4-1 include the FDI variable that is a count for all of a firm's foreign subsidiaries. I also ran the test on the unbalanced panel data sets that separate a firm's initial international investment from its advanced international investment. I was unable to get significant results for either the US or Japanese firms using the initial investment abroad variable. While I did get significant results for the advanced FDI

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lags of 3, 4, 5 and 6 years were tested.

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variable, the results are stronger when the total FDI variable is used. Therefore, I have only reported the total FDI variable in the table.

The results do not support Hypothesis 2, that there is feedback from FDI to intangible assets for either US or Japanese firms. I am unable to find feedback from FDI to the parent firm's intangible assets even when I limited the FDI variable to include those observations of a firm's advanced level of FDI (for both the Japanese and US samples), or when I distinguished between industrialized country and less developed country (LDC) investments (for Japanese firms).

Discussion:

The results from this analysis suggest that the internalization theory is applicable to firms from different nations, with different investment histories, and at different stages of the internationalization process. All of the differences between the two samples that were discussed in Chapter Three do not seem to influence the applicability of the basic argument of the internalization theory.

The results from the analysis suggest that both US and Japanese FDI has been asset-exploiting (intangible assets Granger cause FDI). The internalization theory's prediction that the accumulation of a firm's intangible assets precedes its investment abroad is supported by the results from each of the panel data sets.

These analysis in this chapter goes beyond the previous studies that have analyzed US firms (including Morck and Yeung, 1992, and Mitchel et al, 1998) because, first, I consider all foreign direct investment by the firms in the sample (not just foreign

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acquisitions). In addition, I have an extended time period for the US firms in the sample – even though for these US firms, the level of change in foreign investments is comparable to Mitchell et al.'s study. This analysis adds to the third paper that has considered this issue (Berry and Sakakibara, 1999) by specifically examining firms from two different nations.

Because my sample of US firms is similar to Mitchell et al's in terms of the change in foreign activity by these firms, the difference between my results and Mitchell et al's may be due to methodological issues. Granger's test of causality can be quite sensitive to the number of lags included in the model. The results here suggest that it may be sensitive to the number of years included in an analysis as well. To test for this, I performed a Granger causality test on the data for the 1980s for the US firms in my sample. Similar to Mitchell et al., I failed to find support for the internalization theory with this limited sample.

Though Mitchell et al. found support for feedback from FDI to intangible assets with their US sample, I failed to replicate this finding with my sample. I performed a Granger causality test for the 1980s data for both the US and Japanese firms, but failed to find support for any feedback.

As I will discuss more in the last chapter of this dissertation, I would like to try alternate tests for the feedback hypothesis in future research. Given the results in this chapter, Granger causality is quite sensitive to the number of years included in the study. This suggests that additional statistical tests should be performed to corroborate the findings of in this chapter. As I will propose in the last chapter of this dissertation, what I

believe to be a better way to test the feedback idea involves obtaining much more detailed data on what firms are doing in all of their worldwide subsidiaries. Briefly, I would like to get information of the types of products a firm makes and sells in various worldwide markets. I would need panel data covering at least 10 years if possible. I would like to analyze where products are first developed, manufactured and sold. If there is feedback, than products from a firm's foreign subsidiaries should permeate through its worldwide system. If there is no feedback, than product life cycle arguments may be more relevant. Ideally, more than one industry should be tested – though industries should either be tested separately or with industry controls. I will return to this issue in Chapter 6.

Table 4-1: Granger Causality Test Results for US and Japanese Firms

OLS Estimation in first differences (with four lags)*

	F	N	Σ (Coeff.)	Adj R^2

Bivariate Relationship between Intangibles and FDI:

I. Japanese Sample: 141 firms:

	F	N	Σ (Coeff.)	Adj R^2
ΔIntangibleAssets ⇒ ΔFDI	12.15***	2394	.042	.15
ΔFDI ⇒ ΔIntangibleAssets	1.25	2394	.02	.054

II. US Sample: 191 firms

	F	N	Σ (Coeff.)	Adj R^2
ΔIntangibleAssets ⇒ ΔFDI	12.11***	3251	.07	.04
ΔFDI ⇒ ΔIntangibleAssets	.14	3247	.05	.02

3, 4, 5, and 6 lags were all tested, with similar results from each.
Variables are explained in text. * Significant at .10 level ** Significant at .05 level *** Significant at .01 level

CHAPTER FIVE: NON-DOMINANT FIRMS AND THE DEVELOPMENT OF TECHNOLOGICAL CAPABILITIES IN FOREIGN MARKETS

Abstract: In this chapter, I examine the home market competitive environment of firms to determine whether non-dominant firm arguments may provide a strategic rationale for the small group of firms that invest in foreign R&D. I analyze a panel data set of 405 Japanese manufacturing firms in five industries over the period 1975-1994. Based on random effects probit models, I conclude that non-dominant firms are more likely to undertake foreign R&D, but that this finding is dependent on the industry under study. Non-dominant firms are significantly more likely to develop capabilities abroad through foreign R&D in the chemical, electric equipment and machinery industries. However, this is not the case in the transportation and precision instrument industries. I also describe the foreign R&D patterns in each of the five industries, with specific examples from the pharmaceutical and computer and electronic equipment industries.

Introduction:

Bartlett and Ghoshal (1990) and Pearce and Singh (1992) argue that firms

competing in global industries need to adopt a global approach to innovation. They have

suggested that the intensity of competition between firms requires an integrated strategy

for global innovation and stress that basic and/or applied research needs to be carried out

throughout an MNE's network in order to formulate new product concepts that are

responsive to the demand characteristics of the major markets. Viewing the firm as a

learning organization, R&D provides a process through which MNEs can increase their

stock of knowledge and capabilities from foreign markets. Through internal R&D,

innovative corporations generate a stream of proprietary advantages that lead to rapid

growth in international markets with R&D learned (or acquired) in one market spread throughout other markets (Kogut and Zander, 1993; Zander, 1994).

A contrary view has been offered by Porter (1990; 1991; 1993), who argues that the true origin of competitive advantage may be found in the firm's home environment. Porter maintains that local rivals pursue different strategies and push each other to innovate and improve much more rapidly than foreign rivals, and that this allows firms to penetrate and prosper in foreign markets. The home environment is important in providing the initial insight that underpins competitive advantage, the inputs needed to act on it, the ability to accumulate knowledge and skills over time, and the forces needed to keep progressing. Porter (1993) notes that despite the acknowledged trend toward greater globalization, a full 90% of corporate R&D spending by US MNCs takes place in the United States. In Porter's view, it is the home base of an MNE that is crucial to the competitive and innovative success of firms.

While the statistics on corporate R&D cited above[1] demonstrate that for the majority of firms, technological development takes place in the home market, these statistics also reveal that a small percent of firms are pursuing and developing capabilities in foreign markets. Though Porter does not focus on this, his home country rivalry may explain not only the high percent of corporate R&D performed in home markets, but it also may help to explain the small percent of firms that pursue capabilities abroad. This is because the home country rivalry that Porter writes about may cause firms not only to

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[1] And not just for US firms – according to the 1992-93 MITI Benchmark Survey, only 4% of Japanese corporate R&D took place abroad.

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push each other to innovate in their own home market, but also may cause non-dominant firms in their home market to seek capabilities and new technologies abroad to better compete with the dominant firms from their home market.

In this paper, I suggest that the home market competitive environment of firms may provide a strategic rationale for the small group of firms investing in foreign R&D. I examine how the domestic competitive environment of a firm affects its decision to tap into foreign knowledge and develop capabilities abroad by testing whether non-dominant firm arguments apply to firm decisions to conduct overseas R&D. I apply non-dominant firm arguments to answer such questions as: Do firms with different home market positions pursue different global strategies to develop new technological capabilities? And do non-dominant firms in an industry put more emphasis on developing capabilities abroad to compete with the dominant firms in their industry?

Based on random effects probit models, I conclude that non-dominant firms are more likely to undertake foreign R&D, but that this finding is dependent on the industry under study. Non-dominant firms are statistically and significantly more likely to develop capabilities abroad through foreign R&D in the chemical, electric equipment and machinery industries. However, this is not the case in the transportation industry, and the model is not significant for the precision instrument industries. Through a more descriptive analysis of the foreign R&D lab activities of publicly traded Japanese manufacturing firms, I show that even within the chemical, electric equipment and machinery industries, both leader and non-dominant firms in industry sub-groupings have initiated the pursuit of technological development in foreign countries in their industries.

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This suggests that while non-dominant firm arguments help to explain the types of firms that tend to pursue foreign R&D activities, other unobserved firm and industry characteristics may influence when non-dominant firms will initiate this competitive strategy in an industry.

The paper is organized as follows. The next section reviews the literature on non-dominant firms and relates these arguments to firms that tap into foreign know-how. A description of the data, variables and methodology are provided in the third and fourth sections. Next, I discuss the statistical analysis and empirical results from the random effects probit model. I then describe the foreign R&D patterns of firms in each of the five industries, with specific examples from the pharmaceutical and computer and electronic equipment industries. I conclude with a discussion of the implications in the last section.

Theory:

Up to the 1970s, Vernon's product life cycle model provided a general explanation for foreign R&D: technology was produced and developed at home by multinational corporations and transferred within the MNC to its subsidiaries where it needed some adaptation to local markets. After establishing a new product or production process in the home market, firms would subsequently export and/or locate production facilities in foreign locations. This process would inevitably involve some foreign R&D to adapt the products to account for differences in consumer tastes and the processes to suit local market conditions. In this view, the main purpose of foreign technological activities is to support foreign production and to service the foreign market.

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This traditional explanation, based on technology transfer to foreign subsidiaries from parent companies locating their innovatory activities at home, was unable to account for all of the missions of expatriate R&D, however (Niosi, 1999). In the late 1980s, additional reasons for foreign R&D have been proposed both theoretically and empirically. Viewing the firm as a learning organization, R&D is seen to provide a process through which MNCs can increase their stock of knowledge in foreign markets. Through internal R&D, innovative corporations generate a stream of proprietary advantages that lead to rapid growth in international markets with R&D learned (acquired) in one market spread throughout other markets (Kogut and Zander, 1993; Zander, 1994). In addition, MNCs need to monitor new technological developments from their global competitors (Cantwell, 1992, Pearce and Singh, 1992; and Dunning and Narula, 1995).

Previous case studies and empirical work (Serapio (1995) Florida and Kenney, 1994, Florida, (1997) Patel and Vega, (1999)) have confirmed that more than just local adaptation of products is being conducted by overseas R&D laboratories and revealed three main reasons for foreign R&D: 1.) adapting products, processes and materials to suit foreign markets and providing technical support to off-shore manufacturing plants; 2.) monitoring scientific and technological developments in foreign countries; and 3.) generating entirely new products and core technologies outside the home countries. Along similar lines, Kuemmerle (1997 and 1999) has made the distinction between knowledge exploitation and knowledge creation as the main missions of foreign laboratories, while Dunning (1995) has called attempts to acquire new technologies

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strategic "asset seeking FDI." Thus, while product life cycle reasoning is still relevant, additional reasons which consider the development of new technological capabilities by firms through foreign R&D have been given much more prominence in more recent analytic and empirical work.

Among these three reasons cited above for firms to undertake foreign R&D, I am interested in analyzing those firms that pursue foreign R&D to generate entirely new products and core technologies outside of their home country. Because of this, I limit my analysis to those firms that invest in or acquire R&D labs abroad. It is in these types of subsidiaries where firms are more likely to generate new core technologies in foreign countries. (I will discuss my sample in more detail in the section that describes the data.)

Non-Dominant Firms:

My main interest in this paper is to analyze whether non-dominant firms are more likely to undertake foreign R&D. I examine whether it is the non-dominant firms in an industry that are attempting to tap into foreign knowledge to gain competitive advantages.

Non-dominant firms have been studied in the IO literature which analyzes strategic actions and reactions by rivals in an industry. Timely strategic actions and reactions are critical for a firm's commercial success. When one firm invest in a new product (or country) market, the competitive advances made by the firm often come at the expense of other firms. Therefore, the study of the competitive interactions among firms provides important insights into both firm behavior and performance.

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Non-dominant firms are those firms which are smaller than the largest firms in their industry and which do not have the same advantages or the resources for retaliating and damaging challengers. The domestic competitive advantage of leaders may come from a variety of sources, such as lower cost, better products and services, faster innovation, strong distribution channels or financial strength (Ito and Pucik, 1993). The followers lack some of the advantages of the domestic leaders.

Porter (1985) hypothesized that successful strategies of follower firms seek to nullify the competitive advantages of a dominant firm, while avoiding the full-scale retaliation. Mascarenhas (1986) applied this to international strategy and argued that non-dominant firms may venture abroad to avoid the retaliation from dominant firms in their home markets and because they enjoy a relative competitive advantage over local host-country market firms. He has shown that in some industries, the dominant firm (in terms of market share) has remained domestic while a non-dominant firm has invested abroad to avoid competitive pressures in the home market. Abbeglen and Stalk (1985) have documented some Japanese cases where a non-dominant firm entered foreign markets before a dominant firm. For example, Sony entered the US before Matsushita, Honda entered before Toyota and Epson entered before NEC. This suggests that non-dominant firms may be attempting to compete with dominant firms by venturing abroad first. Hennart and Park (1994) note, however, that smaller firms may not have enough financial and managerial resources to invest abroad, however, and therefore, the expectation is that firms with medium market shares have a greater tendency to manufacture abroad than dominant firms or non-dominate firms with smaller market share.

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Firm performance can be measured by relative industry market share (Clark, 1979 and Patrick and Rosovsky 1976). For Japanese firms in particular, as Borrus and Zysman (1986) note, there is often a scramble for market share rather than short-term profits. An important challenge for follower firms is to develop responses to a leader firm in the industry which takes away the leader's advantage without engaging in head-on collision (Ito, 1997). Optimal responses include those that lead to higher levels of performance rather than the more common imitative responses in the highly competitive Japanese domestic market. One option that follower firms have to sustain their growth is to find different geographic markets. Going abroad ahead of the dominant firm may enable the non-dominant firm to gain a head start over its rivals (Ito, 1997). Mascarenhas (1986) and Hennart and Part (1994) have documented that this reasoning applies to the international expansion of Japanese firms and Ito and Pucik (1993) and Ito (1997) have shown that it also applies to exporting by Japanese firms. What has not yet been studied is whether this reasoning may apply to firms that undertake foreign R&D.

Empirical research has documented that firms expand abroad for more than just asset exploiting reasons. Establishing and acquiring foreign R&D labs is one way firms can create knowledge and technological innovation which can help to give it a competitive edge over its rivals. This leads to the main hypothesis in the paper, which tests the idea that non-dominant firms may be the ones who are investing in overseas R&D to avoid competing directly with a dominant firm in the home market and to accumulate technological advantages and gain access to new types of knowledge overseas.

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Hypothesis 1: Non-dominant firms in their home market are more likely to conduct overseas R&D

Previous studies of the determinants of foreign R&D have found both firm-level and location-level factors to be significant determinants of overseas R&D. I include the following firm variables, which have been identified in previous research on the firm-level determinants of foreign R&D.

Exports: Hirshey and Caves (1981) found overseas R&D to have a negative relationship with exports from the parent firm. This has been interpreted as indicating that serving overseas markets through export from the home country makes it more advantageous for the firms to concentrate their R&D in the home country.

Foreign Experience: Several authors (Hewitt, 1980, Zejan, 1990,) have suggested that firms or industries that started their overseas activities earlier are more likely to undertake R&D abroad because they have accumulated more experience in overseas operations. In addition, these firms may have felt more of a need for local R&D over the course of their foreign activities.

Foreign Manufacturing Activities: The internationalization of production has been found to be robust a factor which explains the internationalization of R&D across industries. Pearce and Singh (1990) found the proportion of overseas production to be positively associated with the propensity of the firm to undertake R&D abroad.

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Firm size has also been identified as an important firm factor. Mansfield, Teece and Romeo (1974) found the proportion of overseas R&D to be positively related to firm size. Odagiri and Yasuda (1996) also found firm size to be a significant determinant of overseas R&D and note that a large firm is likely to have richer managerial resources, which could make global R&D activity easier and more attractive.

R&D: Several studies indicate that higher parent firm intensity in R&D (in the home market) will lead to higher overseas R&D. Hewitt (1980) and Miller (1994) make arguments for high-tech industries while Odagiri and Yasuda (1996) argue and find that that this applies to all manufacturing industries in their sample. They suggest that R&D abroad and R&D at home are complementary rather than substituting.

In addition, the age of the Japanese firm is included to control for differences between more mature firms and relatively newer firms. Finally, the keiretsu structure of the Japanese system has been identified as providing firms with an important source of competitive advantage (Gerlach, 1992). Horizontal keiretsu membership affords some Japanese firms with access to financial capital and foreign market information. To determine how the results may be affected by this potential source of information about foreign markets, I include keiretsu membership dummies for each of the firms.

Because I perform a firm-level analysis[2] that includes all of the worldwide foreign R&D labs of these firms (my dependent variable takes a value of one if the *firm* has foreign R&D subsidiaries, not if the foreign subsidiary is an R&D lab), I do not include

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[2] I have performed a firm-level analysis because of the data hurdles involved with collecting information on all worldwide foreign subsidiaries for all Japanese manufacturing firms over the 1975-1994 time period. I

the location attracting variables that have been identified in previous studies. These location-specific variables tend to focus on the technological capabilities and size of the country. For the foreign subsidiaries in this sample, there is not too much location variation among the sites chosen by Japanese firms. The majority (nearly 85%) of the foreign R&D labs of Japanese firms are in the US, the United Kingdom or Germany.

The focus of the analysis is about whether non-dominant firms are more likely to invest in foreign R&D. To more fully analyze this issue, it is also necessary to consider who is following whom in terms of foreign R&D investment and whether it is a dominant or non-dominant firm that is investing first in foreign R&D.

It has often been pointed out that there is more behavioral similarity among rivals in Japan than the US. Abbeglen and Stalk (1985) have noted how Japanese firms respond very quickly and rarely miss the opportunity to respond to an initiative by a competitor.

In the present analysis, if a dominant firm invests in foreign R&D first, and is then followed by a non-dominant firm, non-dominant firms may be simply following dominant firms and/or responding to a belief that dominant firms have rich information sets. In other words, investment by a dominant firm may be triggering non-dominant firms to invest. If, on the other hand, it is non-dominant firms that are investing first in foreign R&D, the strategic rationale for foreign R&D I put forth above and which I am trying to test in this essay is more meaningful. Therefore, I will examine each industry in more detail to see if it is the industry leader that is investing in foreign R&D first. As part

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plan to undertake future analysis on some of these issues where I focus on one industry in more depth at the foreign subsidiary level.

of this analysis, I will describe the foreign R&D investment patterns of firms in each of the industries I am analyzing. But first, I will describe the data and econometric model.

Data and Variables:

Given my interest in foreign R&D labs that are tapping into local host-country knowledge, I limit the types of labs I analyze to include only those subsidiaries whose main purpose is "research and development." I do not include R&D labs that have been listed as a secondary purpose (this tends to be the case for labs which are connected to manufacturing facilities to adapt technologies developed in the home market for the host market). Further, I do not include subsidiaries with the main purpose of information gathering or support. My data source for the function of the subsidiary is the Toyo Kaizai publication. With this more limited R&D focus, at the end of 1994, out of all of the publicly traded manufacturing firms in Japan, 76 firms had 161 foreign subsidiaries with the main purpose of "research and development." (This breaks down to 21 firms (with 48 foreign R&D subsidiaries) in the chemical industry; 10 firms (with 14 foreign R&D subsidiaries) in machinery; 24 firms (with 65 foreign R&D subsidiaries) in the electric equipment; 12 firms (with 20 foreign R&D subsidiaries) in transport and 9 firms (with 14 foreign R&D subsidiaries) in precision instruments.) The majority of the subsidiaries are in the United States, the United Kingdom or Germany. Of these foreign subsidiaries, 22 were acquired. A native Japanese speaker also consulted the *Toyo Keizai Shinposha* Directory for the years 1989 and 1984 to ensure that there were no additional foreign R&D subsidiaries that may have been sold or closed (none were found).

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As can be seen from the breakdown of the industries that have foreign R&D labs, wide industry differences appear in the levels of internationalization of R&D. Pharmaceuticals drugs and medicines are at the forefront of the globalization of R&D, followed by machinery, electric equipment and transportation equipment. My sample includes five industries: chemical (including pharmaceutical) machinery, electric equipment, transportation, and precision instruments. With this sample, I include all of the manufacturing industries in which Japanese firms have foreign "research and development" subsidiaries (as defined above).

To determine the sample, I started with all firms in my five industries of interest that are listed in the JDB in 1994. No firm invests in a foreign R&D lab without having prior subsidiary experience in foreign markets. Therefore I further limited the analysis to include only those firms with at least one foreign subsidiary at some time prior to 1994. This results in a sample size of 405 firms (76 of which have a separate foreign R&D lab in a foreign country). All financial data come from either the JDB database or the Japan Company Handbook, and is deflated to the base year 1975.

I created a panel data set that covers the years 1975-1994. With these years, I have included the initial investment in foreign R&D in each of the industries I am analyzing.

Variables:

The dependent variable is a 0/1 variable that takes a value of zero if firm i has no foreign R&D labs at time t and one if firm i has foreign R&D labs at time t. I include all of the firm characteristics identified from prior research to influence the decision by firms

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to conduct overseas R&D. I also include a relative market share (RelMarketSh) variable to test my non-dominant firm hypothesis. Table 5-1 lists all of the variables and their expected signs, while Table 5-2 gives descriptive statistics for each of the variables. (All tables and figures appear at the end of this chapter.) Below, I discuss the RelMarketSh variable in more detail.

I use a relative market share variable to determine the position of a firm in its industry. This variable is measured by the total sales of a firm divided by the leader firm's total sales in the industry. The leading firm in an industry will have a value of 1 and other firms will have a value of more than 0 but less than 1. The industry classification is based on classifications by MITI,[3] and roughly corresponds to 3-digit SIC code classifications.[4] I considered all publicly traded manufacturing firms (all firms which are included in the JDB database) in the five industries included in the sample to determine a firm's relative position in their industry.

Econometric Specifications:

I modeled the decision to do foreign R&D using the following limited dependent variable model using panel data:

$$P_{it}(t) = \Phi(\alpha_i + \beta X_{it} + \varepsilon_{it}) \qquad (1)$$

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[3] MITI has adopted the Standard Industry Classification for Japan (JSIC), which is based on the United Nations' International Standard Classification with some adjustments. Professor Hideki Yamawaki was very helpful in provided me with the MITI codes and in going over the JDB industry codes to match them up with the MITI codes.

[4] Because I include only those firms which have foreign subsidiaries, I do not include in my sample the firms that tend to have much smaller domestic market share. While Hennart and Park (1994) and Ito have

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where P_{it} is the probability at time t of a firm establishing a foreign R&D lab; X_{it} is a time varying vector of covariates or explanatory variables characterizing firm i, ε_{it} is the unobserved time-constant effects no captured by the independent variables, and Φ is the normal cumulative distribution function. The model accounts for unobserved heterogeneity using a random effects approach. I ran the model on each of the industries separately.

I chose the random effect probit model because I will be estimating the effects for the industry groupings separately. With the smaller sample size in each of the industries, the random effects model offers potential improvements in statistical precision because of the reduced number of parameters to be estimated (in comparison to the fixed effects model). Further, the random effects approach allows me to identify the coefficient for the time-invariant *keiretsu* dummy variable. In a fixed effect model, this coefficient would be confounded with the individual-specific effects (Maddala, 1983)

Results from Econometric Specification:.

Table 5-3 reports the results from the random effects probit model for each of the five industries separately. Each of the independent variables identified above is included in the model. In addition, Sigma_u is the firm-specific variance component and Rho (which is a number between 0 and 1) is an indicator for whether a pooled estimator would be different from the panel data (random effects) estimator. The estimated log-likelihood,

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suggested an inverted U relationship, I do not consider this because my sample consists of the high and

the number of observations and the overall model test statistic (which is a Wald Chi-Square test) are included in the table. A positive (negative) sign on an explanatory variable's coefficient indicates that higher values of the variable increase (decrease) the likelihood that a firm has a foreign R&D lab.

From prior research, the expected signs for parent R&D, the number of foreign manufacturing subsidiaries (#ForManSubs), Size, Foreign Experience (ForExp), and *keiretsu* dummy variables are positive. The exports variable is expected to be negative and age is a control variable.

As was noted above, a high value for the variable that represents relative market share (RelMarketSh) means that the firm is the industry leader. A lower value means that it is a non-dominant firm.[5] The expected sign for this variable (if non-dominant firm arguments hold) is negative.

Table 5-3 reveals that the model is significant for four out of the five industries. The model is not significant in the precision instruments industry. Below, I review the results for each of the industries, pointing out the deviations from expectations.

In the chemicals industry (which includes pharmaceuticals), contrary to expectations, the *keiretsu* dummy is negative and significant. As predicted, the RelMarketSh is negative and highly significant.

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medium market share firms.
[5] As noted above, because I only include firms with some type of foreign subsidiary in the sample, the lowest values for this variable represent the medium market share firms (as those firms with the smallest market share are unlikely to have foreign subsidiaries.

In the machinery industry, contrary to expectations, parent R&D is not significant and neither is the *keiretsu* variable (though both have the expected signs). As predicted, the RelMarketSh variable is negative and highly significant.

In the electric equipment industry, contrary to expectations, parent R&D is not significant. In addition, the number of foreign manufacturing subsidiaries (#ForManSubs) is negative (though not significant) and age is negative and significant. Also contrary to expectation, exports are positive and significant. As predicted, the RelMarketSh variable is negative and highly significant.

Finally, in the transportation industry, parent R&D is not significant. Also contrary to expectations, the number of foreign manufacturing subsidiaries (#ForManSubs) and Size are significant and negative. Foreign experience (ForExp) is negative (though not significant) and the *keiretsu* dummy is not significant. In addition, the exports variable is positive and signficant. Finally, contrary to expectations, the RelMarketSh is positive and significant at the .10 level.

Because of the insignificant R&D results for three of the industries, I also ran the model with a lagged R&D variable. These results are not reported in the tables because the lagged R&D model produced the same results.

In each of the industry models, Rho is highly significant and the Sigma_u coefficients are significant in three of the four industries. This implies that unobserved characteristics of firms are important explanations of the variance in foreign R&D decisions.

Finally, to try to address the issue of which firm is initiating foreign R&D activity in an industry, I created a market share leader variable, which took a value of one if the firm was among the firms with the top market share in the industry (defined in a number of ways, including top five firms, top 10 firms, firms with at least 80% of the top firms market share, etc.). Every variation I tried with this variable was highly correlated with the RelMarketSh variable. Because of multicollinearity problems, these variables do not perform well when analyzed together. When run separately, they produce the same results, leading one to question which is the best variable. I decided to keep the model intact for the statistical analysis and address the potential issue of imitative strategies through a more descriptive analysis of the data.

Descriptive Analysis of the Data:

Table 5-4 and Figures 5-1 and 5-2 present the results from the descriptive analysis. In Table 5-4, I have listed each of the 3-digit industries that are included in the sample and indicated whether the first firm to undertake foreign R&D was a leader firm or a non-dominant firm. For the purposes of the table, a leader firm is defined as either the firm with the highest market share or a firm with at least 80% of the market share of the top firm in the industry. A non-dominant firm is all other firms. While it is difficult to determine precisely what a leader firm is, the results in this table are unaffected by variations in the definition of a leader firm.

As is revealed by Table 5-4, on a strictly numerical basis, the majority of foreign R&D initiating firms were non-dominant firms (in 12 out of 19 industries). However, as

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is revealed in this table, even in those industries where the non-dominant firm rationale was supported in the econometric analysis, leader firms occasionally initiated foreign R&D activities.

In Figures 5-1 and 5-2, I have plotted the investment time-line of firms that have established foreign R&D labs in two (3-digit SIC equivalent) industries. The pharmaceutical industry (Figure 5-1) provides an example of an industry in which non-dominant firms invested in foreign R&D labs in the US – Shinogi was the first to invest in an R&D lab in the US in 1982. Takeda Chemical, the market share leader ultimately invested in an R&D lab in Germany in 1992, after nine other non-dominant firms had already invested in foreign R&D labs. The computer and electronic equipment industry (Figure 5-2) provides an example of market leaders investing in foreign R&D first. NEC, Hitachi and Toshiba all have high market shares in Japan in this industry. The figure shows that NEC and Hitachi were the first two firms to invest in foreign R&D in the 1970s in this industry.

Discussion and Implications:

Home country rivalry may encourage the type of competitive interaction Porter describes, where the firm's home environment provides the necessary conditions to foster innovative activity for the majority of the domestic firms. However, this analysis reveals that home country rivalry may also encourage a smaller number of firms to innovate in foreign countries to compete with their industry rivals – and more specifically, to compete with the leader firms in an industry.

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Based on random effects probit models, I conclude that non-dominant firms in Japan are more likely to undertake foreign R&D, but that this finding is dependent on the industry under study. Non-dominant firms are statistically and significantly more likely to develop capabilities abroad through foreign R&D in the chemical, electric equipment and machinery industries. This is not the case in the transportation and precision instrument industries. The econometric results suggest that in the chemical, electric equipment and machinery industries, the less your relative market share in your home market, the more likely you are to pursue foreign technology. In the transportation industry, the statistical results reveal that the higher your relative market share in your home market, the more likely you are to pursue foreign technology.

The results in this analysis suggest that the horizontal group affiliation in Japan does not always have a significant positive effect. Though many studies have suggested that *kieretsu* membership affords firms better information and financing, this influence does not appear to affect all firms the same in this study. The results reveal that *kieretsu* membership is highly significant and negative in the chemicals industry, and positive and significant in the electric equipment industry. In the other two industries, it is not significant. Further, though most previous studies have suggested a positive influence from parent firm R&D, in general, I did not find this effect in this sample (except in the chemical industry where R&D was positive and significant at the .10 level). Most prior research on the determinants of foreign R&D have not broken down their sample into industries. As a robustness check, I ran the results on the entire sample. While my

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variable of interest in this study, RelMarketSh, is significant and negative for the entire

sample, the parent R&D variable remains positive, but insignificant for the entire sample.

The positive but insignificant R&D finding could be influenced by the fact that the

majority of the firms investing in foreign R&D are the non-dominant firms in an industry.

However, though not controlled for, this would also be true in previous studies.

The statistical analysis reveals that the variables under consideration affect firms

differently across the industries. The model is not significant for the precision

instruments industry, and firms in the Japanese transportation industry do not behave in a

similar manner to firms in the other industries. Firms that undertake foreign R&D in this

industry tend to be smaller, and they do not have as much foreign experience or

manufacturing subsidiaries abroad. The finding in this industry is probably driven by the

car parts sub-industry grouping in the sample. Car parts firms tend to be smaller and are

likely to be following the Japanese car manufacturer they supply into foreign markets.

More study of this particular industry is needed – in particular the ties with car

manufacturers needs to be included and controlled for in future analyses of rivalry for this

industry.

In addition, while the firms in the pharmaceutical industry behave as predicted,

there may be additional influences on this industry that could also be effecting the results.

For example, most of the foreign R&D subsidiaries are located in the United States.

Because of this, additional analysis of the potential influence of FDI regulations needs to

be considered in future research.

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Finally, by analyzing each industry in a more descriptive way, I reveal that even within these statistically significant industries, both leader and non-dominant firms initiate competitive strategies of pursuing technological development in foreign countries. This suggests that while non-dominant firm arguments help to explain the types of firms that tend to pursue foreign R&D activities, other unobserved firm and industry characteristics may influence when non-dominant firms will initiate this competitive strategy in an industry.

One limitation of this study is that it may only apply to Japanese firms. Other studies of firms from different nations are needed to determine how broadly the results apply. The analysis is also limited because private firms that are not included in the JDB database are not considered in the analysis. This could have an effect if private firms were in fact the market share leaders in an industry in which they are not included. If this were the case, non-dominant firms may be more likely to initiate foreign R&D in the industries I characterized as being leader-led. The ultimate effect on the results could be an increase in the applicability of the non-dominant firm arguments presented in this analysis.

Finally, this analysis provides an examination of the types of firms that pursue foreign R&D, in terms of the home competitive market. It does not address whether this strategy actually benefits the firm in any way. An additional issue for future research is determining whether these foreign labs have any beneficial effects on the non-dominant firms that invest in them in terms of competing with the leader firms in their industries.

Table 5-1: List of Variables and Expected Signs for Random Effects Probit Model

I. <u>Firm Factors</u>:

R&D/Sales:	(+)	R&D/Sales
#ForManSubs:	(+)	Total number of manufacturing subsidiaries abroad
SIZE(assets):	(+)	Total assets of the firm
Age	(+)/(-)	Years since establishment of firm in Japan
ForeignExp.:	(+)	Years since first subsidiary abroad
Exports/Sales:	(-)	Export/Sales ratio
KeiretsuDummy	(+)	Keiretsu member dummy

II. <u>Strategic Factor</u>:

RelMarketSh	(-)	Market share relative to largest firm in MITI classified 3-digit SIC code industry (with 1.0 being the market leader)

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Table 5-2: Descriptive Statistics

	Chemicals		Machinery		Electric		Transport		Prec.Inst.	
	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
RelMarketSh	.247	.2593	.169	.2408	.198	.2581	.226	.2464	.264	.2788
R&D	5395.67	8388.46	1514.29	5587.85	8583.56	36974.33	5806.618	33808.06	3578.953	14355.79
#ForManSubs	2.29	3.897	2.03	2.549	4.929	7.256	4.011	6.082	3.614	5.151
Assets	12828.93	15426.57	7115.74	11510.05	33991.48	63192.39	38909.13	97729.46	9555.406	14332.03
Age	50.63	14.628	45.977	13.936	43.818	15.93	45.45	14.11	42.82	15.03
ForExp	10.37	9.312	10.034	8.778	11.972	8.829	10.76	8.334	9.518	8.116
Exports	.1114	.1523	.1768	.1416	.2486	.1997	.2019	.1741	.187	.2071

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Table 5-3: Random Effects Probit Model Results

	Chemicals	Machinery	Electric	Transport	Prec. Inst.
Home Industry Position:					
RelMarketSh	-13.222***	-94.027***	-4.810***	2.157*	
	(2.373)	(33.951)	(1.093)	(1.253)	
Firm Characteristics					
R&D/Sales	6.248*	79.819	9.135	12.762	
	(3.405)	(92.012)	(5.927)	(37.190)	
#ForManSubs	276.7384**	169.819**	-34.856	-174.085***	
	(119.2043)	(71.527)	(31.971)	(43.036)	
Size(Assets)	.0000208***	.0001414***	8.24e-07**	-4.62e-06**	
	(3.65e-06)	(.0000514)	(3.62e-07)	(2.00e-06)	
Age	.1235***	.3468**	-.0908***	.0481***	
	(.0196)	(.1532)	(.0131)	(.0170)	
ForeignExp	.3101***	.2254*	.1769***	-.0287	
	(.0418)	(.1355)	(.0274)	(.0391)	
Exports/Sales	-12.449***	-6.941***	2.107**	2.374*	
	(1.681)	(7.777)	(.9653)	(1.410)	
KeiretsuDummy	-5.580***	2.018	2.198***	.818	
	(.7109)	(.766)	(.3752)	(.748)	
Constant	-13.19***	-38.746***	-2.019***	-4.052***	
	(1.67)	(14.217)	(.4306)	(.8671)	
Sigma_u	5.87	20.36***	4.462***	4.369***	
	(.687)	(7.186)	(.494)	(.781)	
Rho	.9717***	.9975***	.9521***	.9502***	
	(.0064)	(.0016)	(.0109)	(.0169)	
Chi2 Model	71.15***	13.92**	67.14***	28.22***	Model Not Significant
Log likelihood	-143.087	-39.414	-159.08	-85.401	
Observations	1289	1054	1717	972	587

* Significant at .10 level   ** at .05 level   *** Sig. at .01 level

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Table 5-4: List of Industries and Types of Firms that were First to do Foreign R&D in those Industries

Industry:*	Type of Firm that Established/Acquired first Foreign R&D lab in the Industry: (Non-Dominant or Leader)
Chemical Industry:	
Inorganic Chemical and Chemical Fertilizer	Non-Dominant Firm First
Manmade Fiber and Organic Chemical	Leader First
Soap, Detergents, Paint and Inks	Leader First
Pharmaceuticals	Non-Dominant Firm First
Misc.	Non-Dominant Firm First
Machinery Industry:	
Industrial Machinery:	Non-Dominant Firm First
Office and Service Machines	Non-Dominant Firm First
Misc. Machinery	Leader First
Electric Equipment Industry:	
Industrial Electric Machinery Equipment:	Non-Dominant Firm First
Household Appliances	Non-Dominant Firm First
Computer and Electronic Equipment	Leader First
Electronic and Telecom Part and Equipment	Non-Dominant Firm First
Misc Electric Equipment	Non-Dominant Firm First
Transportation	
Car Industry	Leader First
Parts	Non-Dominant Firm First
Misc Transport	Non-Dominant Firm First
Precision Instruments:	
Optical Equipment	Non-Dominant Firm First
Medical Equipment	Leader First
Watches and Clocks	Leader First (and only)

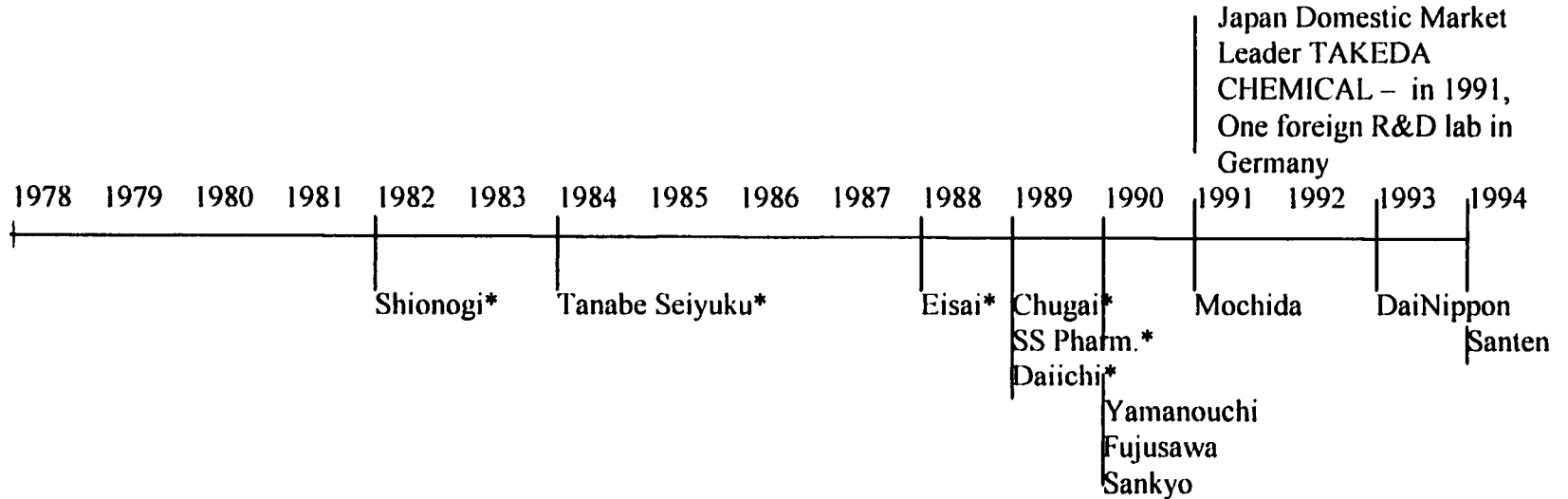*based on MITI classifications of industries (similar to 3-digit SIC codes)

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Figure 5-1: Timeline of the First Year in which Japanese Firms Established Foreign R&D Labs (Pharmaceutical Industry – Non-Dominant Firm-Led Industy)

I. Example of an Industry in which a **Non-Dominant Firm** was the first to do foreign R&D:

Pharmaceuticals Industry: (MITI Code 204)
By 1994, 13 Japanese firm had 27 foreign "R&D labs" (with the majority in the US, Germany and the UK):

Japan Domestic Market
Leader TAKEDA
CHEMICAL – in 1991,
One foreign R&D lab in
Germany

1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994

Shionogi*   Tanabe Seiyuku*   Eisai* Chugai*   Mochida   DaiNippon
SS Pharm.*   Santen
Daiichi*
Yamanouchi
Fujusawa
Sankyo

*These early entrants each have one-third or less of
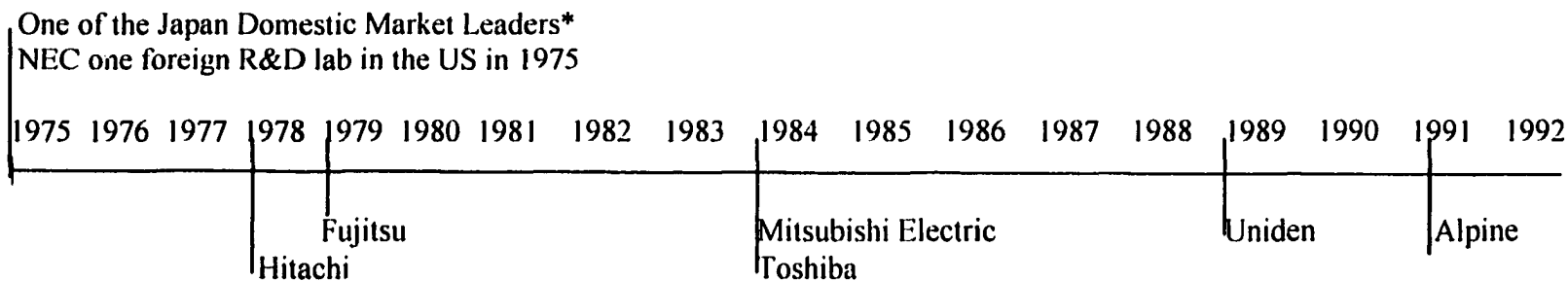the market share of Takeda Chemical in the early to mid 1980s

Figure 5-2: Timeline of the First Year in which Japanese Firms Established Foreign R&D Labs (Computer and Electronic Equipment – Leader Firm-Led Industry)

II.   Example of an industry in which one of a group of **Leader Firms** was the first to do foreign R&D:

Computer and Electronic Equipment (MITI Code 304):
By 1994, 7 Japanese firms had 33 foreign "R&D labs" (majority in the US)

One of the Japan Domestic Market Leaders*
NEC one foreign R&D lab in the US in 1975

1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992

Fujitsu
Hitachi

Mitsubishi Electric
Toshiba

Uniden

Alpine

*NEC, Hitachi and Toshiba all have high market shares in this industry. Hitachi had the highest market share in the years when foreign R&D activities were undertaken in the 1970s, but Toshiba and NEC weren't too far behind.

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CHAPTER SIX: CONCLUSION

Most multinational enterprises (MNEs) can be readily identified as originating from a single country (Dunning, 1993) and having a national identity. For example, most people would identify Volvo to be a Swedish firm, Coca-Cola to be a US firm, Sony to be a Japanese firm, and Siemens to be a German firm. But in reality, each of these firms is listed on a number of stock exchanges in different countries throughout the world. In addition, more than half of each of these firms' sales is made outside their home country. In 1989, a full 80% of Volvo's sales were made outside Sweden; 54% of Coca-Cola's sales were made outside the US; 51% of Seimens' sales were made outside West Germany; and 66% of Sony's sales were made outside Japan. (Business Week, 1990).

Given these statistics, one could argue that the globalization of many enterprises should be reducing the significance of the home country nationality of multinational firms. With no one country dominating all sectors or holding a monopoly on innovations or new technologies, it seems logical that the national identity of a multinational firm might be reduced. In fact, Robert Reich (1990; 1991) argues that American multinational corporations are really global corporations with multinational identities which have located many activities that matter to the competitiveness of a country (such as technologically sophisticated manufacturing that provides good jobs and world class products that can be sold worldwide) outside the United States. At the same time, Reich points out that foreign-owned corporations have sited research intensive activities in the United States, leading him to question "Who is us?" and "Who is them?". From Reich's

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reasoning, one can question how important the home country of many of today's larger MNEs really is.

A contrary view has been expressed by Michael Porter (1990; 1991; 1993), who argues that the true origin of competitive advantage may be found in a firm's home environment. As reviewed in Chapter Five, Porter maintains that local rivals pursue different strategies and push each other to innovate and improve much more rapidly than foreign rivals, and that this allows firms to penetrate and prosper in foreign markets. The home environment is important in providing the initial insight that underpins competitive advantage, the inputs needed to act on it, the ability to accumulate knowledge and skills over time, and the forces needed to keep progressing. In Porter's view, the home base of an MNE is crucial to the competitive success of firms.

Parallel arguments to Porter's views about the importance of a firm's home country and from where an MNE's competitive advantage originates and is developed can be found in the internalization theory. This theory focuses on how MNEs exploit firm-specific advantages that have been created in their home market and emphasizes the competitive advantages firms have from their home market. Reich's view has similarities to more recent research in international management which views MNEs not just as exploiters of home country knowledge or advantages, but as networks with access to technology from various locations shared throughout the organization (Bartlett and Ghoshal, 1989). As Ghoshal (1987) points out, the internalization theory's focus on exploitation from the center of the system ignores the reverse flow of information into the firm, and further, detracts from the competencies acquired throughout the system.

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In this dissertation, I have drawn from each of these views (in addition to others summarized in Chapter One) to analyze both the exploitation of firm-specific advantages created in the home market and the development of capabilities and knowledge in foreign markets by multinational enterprises.

The issues and results from this dissertation can be grouped into three broad categories: asset exploitation, asset development and performance effects from multinationality. I will review my results on each of these issues in turn. In addition, I will discuss the implications of my results in each category. I conclude this dissertation with a discussion of the contributions and a brief discussion of future research I am interested in pursuing.

RESULTS AND IMPLICATIONS:

I.   Asset Exploitation:

As reviewed at great length in Chapter One, according to the internalization theory, the motivation for foreign direct investment comes from a firm's possession of strong intangible assets (that more than offset the disadvantages of operating in a foreign country). Unlike previous research, I use lagged values in this dissertation to specifically test the issue of precedence that is implied by this theory. I use lagged values of a firm's R&D and advertising expenditures to specifically test the internalization theory prediction that a firm's intangible assets created in its home market are exploited abroad.

The results in this dissertation suggest that the internalization theory is applicable to firms from different nations, with different investment histories, and at different stages

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of the internationalization process. All of the differences that are discussed in this dissertation between US and Japanese firms (including differences in firm governance and industrial organization, differences in investors, in size and natural resources available within the home country, and different foreign investment patterns and histories) do not appear to influence the applicability of the basic argument of the internalization theory. The results from this dissertation suggest that both US and Japanese FDI is motivated by asset-exploiting reasons (intangible assets Granger cause FDI). This finding supports Porter's arguments concerning the importance of a firm's home market for both US and Japanese firms.

This finding goes beyond the two existing studies that have analyzed the internalization theory using more than just cross-sectional data (Morck and Yeung, 1992, and Mitchel et al, 1998 (both of which consider only US firms)) because I consider all foreign direct investment by the firms in the sample (not just foreign acquisitions) and further, I include a much longer time period than has been previously studied. This analysis adds to the third paper that has considered this issue (Berry and Sakakibara, 1999 which considered only Japanese firms) by specifically applying the same methodology to two separate samples of firms.

Also using Granger's test of causality, I fail to find support for feedback from FDI to intangible assets with either sample. Even when I analyzed a subset of my data (using data only from the 1980s), included only advanced levels of FDI, or included only FDI in industrialized countries, I consistently fail to find any support for feedback. This finding (or lack of finding) is important because though there are many proponents of the idea

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that an MNE will use its global network to tap into foreign knowledge that can then be used throughout the firm's operations, the empirical support is rather limited (and tends to come from specific case examples). Though I am quite sympathetic to the theoretical idea, the findings in this dissertation do not confirm that feedback exits, despite my efforts to analyze the data in every possible way to find support. One limitation of the analysis for feedback used in this dissertation is that Granger's test of causality can be quite sensitive to the number of lags and years included in the model. Additional tests are clearly warranted on this issue – some of which I hope to perform in the future.

The overall results on this issue suggest that both US and Japanese FDI is motivated by asset exploiting reasons, as suggested by the internalization theory, and that more empirical analysis is needed to confirm under what conditions MNEs acquire and use competencies developed throughout their global network.

II. Asset Development:

To further study the issue of asset development, I examined the home competitive environment of firms to determine whether non-dominant firm arguments provide a strategic rationale for the small percent of R&D that is undertaken outside a firm's home market. As noted above, Porter (1990) has argued that home country rivalry encourages the type of competitive interaction that provides the necessary conditions to foster innovative activity for the majority of the domestic firms. In this dissertation, I conclude that Porter's home country industry rivalry also encourages some firms to innovate in foreign countries to compete with the dominant firms in their industry.

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I examine the home market competitive environment and specifically analyze whether it is the non-dominant firms in an industry that are attempting to tap into foreign knowledge to gain competitive advantage. Based on random effects probit models, I find that non-dominant firms in Japan are more likely to undertake foreign R&D, but that this finding is dependent on the industry under study. Non-dominant firms are statistically and significantly more likely to develop capabilities abroad through foreign R&D in the chemical, electric equipment and machinery industries. This is not the case in the transportation and precision instrument industries. The econometric results suggest that in the chemical, electric equipment and machinery industries, the less your relative market share in your home market, the more likely you are to pursue foreign technology. By analyzing each industry in a more descriptive way, I also reveal that even within these statistically significant industries, both leader and non-dominant firms initiate competitive strategies of pursuing technological development in foreign countries.

It is important to note that this analysis provides an examination of the types of firms that pursue foreign R&D, in terms of the home competitive market. It does not address whether this strategy actually benefits the firm in any way. An additional issue for future research will be to determine whether these foreign labs have any beneficial effects on the non-dominant firms that invest in them in terms of competing with the leader firms in their industry.

III. Performance Effects of Multinationality:

As I discussed in Chapter Three, a number of studies in both strategy and finance have analyzed whether a firm's multinational operations are value-creating or value-destroying. As I also noted, no consensus has emerged on this issue in either of these fields.

In this dissertation, I use firm's Tobin's q ratios to examine the performance effects of a firm's foreign expansion. I consider how shareholders value US and Japanese firms' foreign direct investment. Building on prior research, I examine this issue in a number of different ways. I examine the influence of a firm's intangible assets; whether there are differences between levels of foreign experience; whether there are differences between time periods; and how exchange rates fluctuations may influence this relationship. Improving on previous work, I specifically analyze whether there are differences between US and Japanese firms.

From my results, I find that there are large differences between US and Japanese firms. For US firms, multinationality is consistently negatively valued by shareholders over the entire period 1974-1997, whether a US firm has experience with foreign subsidiaries or not and regardless of its level of intangible assets. This relationship holds whether there are exchange rate fluctuations or not. For Japanese firms, multinationality creates value, but only after a firm has experience with subsidiaries in foreign countries. Similar to US firms, the level of intangible assets of a Japanese firm does not influence this relationship and the results hold whether there are exchange rate fluctuations or not.

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Overall, these results suggest that multinationality creates value for Japanese firms, but not for US firms. I offer a number of potential reasons for this difference. I suggest that because Japan is a relatively resource-scarce country, FDI may be viewed more positively by Japanese shareholder. I also suggest that the fact that 70-75% of the shareholders of Japanese companies tend to be affiliated companies may mean that these shareholders make a more realistic valuation of the potential benefits of FDI than do US shareholders (the majority of which are individuals). Further, I question whether there may be performance differences between the subsidiaries, or whether different rates of return across markets may influence the results. Historically, the US is a very attractive market in which to invest, with average rates of return being lower in the European and Japanese markets during the 1974-1997 time period. Finally, I question whether they may be cultural biases across nations that affect the results.

My results for the US firms contradict the findings of Morck and Yeung (1991). In that paper, shareholders positively valued a US firm's multinationality in the presence of strong intangible assets (their interaction term between FDI and intangible assets was positive and significant). And, in fact, Morck and Yeung's results are much more appealing than my findings given the results from Granger's test of causality. As argued above, a firm's intangible assets Granger cause its FDI for both US and Japanese firms. The support for the internalization theory arguments provide one reason for shareholders to value FDI for firm's with strong intangible assets – as Morck and Yeung argue and find in their 1991 article. My results in this dissertation do not conform quite as nicely.

Morck and Yeung's (1991) paper inspired much of my interest in this line of research and I intend to pursue this contradiction further. One specific issue I have with Morck and Yeung's paper is that they assume zeros values for US firms that do not report their R&D or advertising expenditures. This allowed them to maintain a sample size of 1600 firms. Having spent quite a bit of time with the Compustat data for this dissertation, I am aware that there are many firms that do not report their R&D expenditures, and even more that do not report their advertising expenditures. I am interested in pursuing how this assumption may be influencing Morck and Yeung's positive finding for US firms. Regardless of the effect of this assumption, however, the internalization theory does provide one specific reason for shareholders to value a firm's multinationality. I specifically tested for this by including an interaction term between a firm's intangible assets and its FDI for both the US and Japanese samples (which was not significant for either sample). Additional research is clearly needed to determine what may be overriding this potentially positive influence for US firms.

CONTRIBUTIONS:

By focusing on how firms use home and foreign markets to exploit and develop intangible assets, and ultimately sustain and build competitive advantage, the findings from this dissertation contribute to both the strategy and international management fields in several ways.

First, while an empirical study of the exploitation of intangible assets by MNEs is not new, an empirical study that provides robust support for the internalization theory

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predictions by 1.) analyzing the lagged accumulation of a firm's intangible assets and its foreign direct investment over a twenty-four year period, and 2.) considering firms from both the US and Japan, is new. Additional tests of causality are certainly warranted, but the approach used in this dissertation offers an improved methodological test of the internalization theory.

Second, analyzing where capabilities are created is important because while theoretical arguments suggest that MNEs may be networks with access to knowledge in many countries, the empirical base for these arguments is rather limited. My lack of results for feedback is as important as my results supporting the internalization theory. In some ways, I find this lack of result to be more interesting. I am quite sympathetic to the idea that MNEs are more than just exploiters of home country knowledge. I also believe that some firms are capable of acquiring and developing knowledge and competencies outside their home market that they will then use throughout their global network. One key issue, however, may be that only certain types of firms are able to exploit global opportunities in this way. This suggests that more analysis is needed to confirm what types of firms, and under what conditions firms are able to acquire and use competencies developed throughout their global network.

Further, given the extent of MNE investment in manufacturing and distribution in many countries, it is somewhat counter-intuitive to think that the R&D function of so many firms would be focused so narrowly in a firm's home country. It is important to look beyond case studies at larger samples of firms to determine how relevant the theory is. I characterize the types of firms that are doing capability development abroad and

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show that the domestic market conditions help to explain the types of firms that are investing in foreign R&D.

Third, I show that after a Japanese firm has achieved a more advanced level of international investment, its foreign activities are valued positively and significantly by shareholders. This result suggests that it is important to consider differences between various levels of foreign activity of firms. Most of the theoretical arguments in the international management literature do not consider how a firm's previous foreign experience and multinational network may influence its decisions or future investments abroad.[1] As Kogut (1998) notes, many of the theories of direct investment, seek "to explain it as if a firm were investing in a foreign country for the first time." The results in this dissertation show that a firm's foreign experience and multinational network can provide a firm with an additional resource – an additional intangible resource that needs to be included among the other resources firms have.

Further, my results show that shareholders value the multinationality of US and Japanese firms quite differently. This finding raises many more questions than it answers and provides a line of future research that I am interested in pursuing. I will discuss this in more detail at the end of this chapter.

Fourth, the results of this research may help managers make decisions about resource allocations within their firms. Given resource constraints, evidence of the time sequence of investment in firm-specific intangible assets and foreign expansion can guide

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decisions about resource allocation. In addition, the issue of whether a firm's

multinational operations are value-creating or value-destroying is particularly relevant to

managers in firms which are either considering expanding abroad or furthering the scope

and scale of their existing international activities – a group which has been fast growing

in the last decade as evidenced by the fact that worldwide levels of foreign direct

investment (FDI) doubled between 1990 and 1997.

Fifth, the home/foreign market distinction has relevance to policy issues. Among

US policy makers, there has long been concern about foreigners tapping into our

technological base, and whether the US is loosing its competitive edge. The results from

this dissertation suggest that assets created in a firm's home country are exploited in other

countries. The results further suggest that home country industry rivalry may encourage

some firms to invest in foreign R&D to better compete with their industry leader. Thus,

policymakers should be concerned about the competitive conditions in their home market,

and ensure that the regulations they enact encourage as competitive a market as possible.

And finally, an additional contribution of this dissertation comes from the fact that

I have empirically analyzed many of these issues on two different multinational firm

samples, one containing US firms and the other Japanese firms, over the time period

1974-1997. The comparison between U.S. and Japanese firms is important because most

empirical studies of MNEs tend to focus quite narrowly either on MNEs from one nation

or on investment into one country. In general, these studies have tended to focus on

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[1] This finding reinforces Kogut's writings about the sequential investment process of firms, which stresses the advantages MNEs can gain from their multinational network. Much of Kogut's work on this issue,

either U.S. investment abroad or investment into the U.S. There is a gap in the literature about whether results that hold for US firms also apply to non-US firms. By performing the same analysis (and methodology) on two samples, I have compared how firms from different nations use home and foreign markets to sustain their competitive advantage.

FUTURE RESEARCH:

Overall, the results in this dissertation suggest that there are similar motives for foreign investment for US and Japanese firms (asset exploitation) but quite different performance effects from this investment across the samples. My future research agenda involves further analyzing what may be causing the valuation differences between my US and Japanese samples. I intend to start this future research by analyzing the influence of differences across investment choices by US and Japanese firms. More specifically, I intend to focus initially on different rates of return across worldwide markets. If this influence explains much of the variation, and if it turns out that the US market is simply "the place to be," that would suggest that US firms would benefit more from domestic expansion than from foreign investment. If rates of return across different markets do influence shareholder valuation of a firm's multinationality, however, it also suggests that a firm may not be able to rely on its multinationality creating value over the long term. Along these same lines, I would like to test whether shareholders value domestic and foreign expansion differently.

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however, does not include any empirical investigation of these ideas.

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I also intend to consider the performance of foreign subsidiaries and examine whether there are differences between US and Japanese subsidiaries. In addition, I would like to test for differences between industrialized country and LDC investment choices – both in terms of asset-seeking and asset-exploiting arguments. As suggested in Chapter Three, I would like to test whether these reasons may also be driving the different valuation results. Further in the future, I am interested in analyzing firms that undertake product diversification in unrelated business fields in foreign markets. More specifically, given all the hurdles a firm faces when investing in foreign countries, I would like to determine what drives a firm to pursue unrelated investments in a foreign country.

Finally, I intend to try alternate tests to better determine under what conditions MNEs acquire and use competencies developed throughout their global network – alternate tests for my feedback hypothesis. Given the results in this dissertation, Granger causality is quite sensitive to the number of years included in the study. I believe a better way to test the feedback idea involves obtaining much more detailed data on what firms are doing in all of their worldwide subsidiaries. I would like to get information of the types of products a firm makes and sells in various worldwide markets. I would need panel data covering at least 10 years if possible. I would like to analyze where products are first developed, manufactured and sold. If there is feedback, than products from a firm's foreign subsidiaries should permeate through its worldwide system. If there is no feedback, than product life cycle arguments may be more relevant. Ideally, more than one industry should be tested – though industries should either be tested separately or with industry controls.

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APPENDIX ONE: Calculating Tobin's Q for Japanese Firms:

To calculate Q for Japanese firms, Hoshi and Kashyap's (1991) method was
followed. The financial data comes from the Japanese Development Bank (JDB)
database for publicly traded Japanese firms. Other sources are noted in the summary of
the calculations below. Q is defined as the ratio of the value of a collection of assets to
their replacement cost. Here, the following formula is used:

$$Q = P_{g,t}V_t / P_{k,t}XK_t$$

where $P_{g,t}V_t$ is the market value of the firm (and accounts for the value of debt), P_k is the
price of capital and XK_t is the market value of the firm's assets.

Equity is calculated as the number of shares outstanding (at the end of the accounting
period) times the price of a share. The price of a share is the average of the high and low
values during the accounting period. This value was used because the end of period share
price was only available for approximately 70% of the sample. Tobin's Q was calculated
for the firms for which the end of period share price was available for the years 1984,
1989 and 1994 and was found to result in Q's that had a .95 correlation with the Tobin's
Q values which were calculated with the average share price.

Debt: Short term and long term liabilities are arranged into two categories: interest-
bearing and non-interest-bearing liabilities. Liabilities (like loans, for example) require
interest payments and are grouped into the interest-bearing liability category. In this

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category, all distinctions between debt and borrowing are dropped. The remaining liabilities are categorized as non-interest-bearing liabilities (including things like accounts payable to affiliated companies and accrued expenses to affiliated companies). For these, the market value is assumed to be the book value.

The market value of interest-bearing liabilities is calculated by dividing the interest payment of a firm by a properly averaged interest rate. This rate is given in Hoshi and Kashyap as: $ra_t = (rs_t BS_t + rl_t BL_t) / (BS_t + BL_t)$, where rs_t and rl_t are the short-term and long-term interest rates and BS_t and BL_t are the short-term and long-term interest bearing liabilities in book values. Essentially, ra_t is a weighted average of short-term and long-term interest rates – determined by the proportions of long-term and short term interest-bearing liabilities of each firm. Prevailing interest rates were taken from the 1997 Economic Statistics Annual. The average rate for loans and discounts made by all types of bands was used for the short-term interest rate; the longest remaining life bonds for listed bonds was used for the long-term interest rate.

Inventories: Firms can value their inventory in several ways. In Japan, these methods include: first-in first-out (FIFO); last-in first-out (LIFO); average method; individual method; latest cost method; and sales price method. For firms which use a last-in first-out method of inventory valuation, the book value can be significantly different form the market value. Following Hoshi, we assume that for all method except LIFO, the book value should be close to the market value.

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The JDB database indicates the inventory valuation method for three categories of investment, including: a) inventories of finished goods; b) inventories of work in progress; and c) inventories of raw materials. In this sample, approximately 4% of the firms use the LIFO method. For these firms, we adjusted the book value in the following way. It is assumed that in 1970 (the first year for which the method of valuation is reported), the book and market values of inventories are equal. If a firm increases its inventories, any additions are assumed to be recorded on the books at the prevailing market value. The sum of the current year's additions and the inflation-adjusted market value of the inventories which were carried forward from the previous period give this period's market value for inventories. If a firm decreases its inventories, it is assumed that the cleared inventories are 1 year old and the appropriate correction for inflation is made. The following formulas were followed:

$$INV_t = INV_{t-1}*(PrINV_t/PrINV_{t-1}) + DELINV_t$$
$$\quad\quad if\ DELINV_t > 0\ or\ DELINV_t = 0$$
$$= INV_{t-1}*(PrINV_t/PrINV_{t-1}) + DELINV_t\ (PrINV_t/PrINV_{t-1})$$
$$\quad\quad if\ DELINV_t < 0$$

where $DELINV_t = INV_t - INV_{t-1}$. Wholesale price indices were used to adjust the market value of inventories which are carried forward.

Land: For most companies, the value of land is recorded using the price when it was purchased. To adjust these market values, a LIFO-type adjust is made. The first year for which land price valuation information is available is 1970. Thus, a base year of 1970 is used (where it is assumed that market value equals book value). To correctly adjust for

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inflation, the holding period for which land is sold is needed. Like Hoshi and Kashyap, it is assumed that land which is sold was bought at the most recent price the firm paid for any land acquisitions. The recursion for the market value of land after 1970 is given as:

If a firm acquires land in a period:

$MARVALLAND_t = MARVALLAND_{t-1}(Prland_t / Prland_{t-1}) + ACLandVal_t$

If a firm sells land in a period:

$MARVALLAND_t = MARVALLAND_{t-1}(Prland_t / Prland_{t-1}) + SoldLanVal_t (Prland_t / Prlandlastbought_{t-...})$

The land price index in the 1997 Economic Statistics Annual was used in the recursion. For firms that have their main offices in one of the six prefectures that have the six largest cities, the land price index for commercial areas in the six largest cities was used. The large city category includes the six largest cities in Japan: Tokyo, Yokohama, Osaka, Nagoya, Sapporo and Kyoto. The Japan Company Handbook was used to determine where the principal office of each firm was located. For all other firms, the urban land index was used.

Depreciable Assets: Since the capital stock is recorded using the purchase price, it is necessary to adjust the book value for depreciable assets as well. The reevaluation method is essentially a LIFO type recursion which is augmented to take depreciation into account.

It is assumed that the same proportion of the capital stock depreciates every year. To calculate this firm-specific rate, it is necessary to distinguish between firms which use

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exponential depreciation and those which use straight line depreciation. The JDB gives

the method of depreciation back to 1970, so this is the base year for each type of

depreciation. For firms which use exponential depreciation (85% of our sample), the

economic depreciation rate is given as:

$$\text{Decon} = (1/28)\sum_{t=70}^{97} (\text{Deprec}_t/K_t + \text{Intan}_t + \text{FinanInves}_t + \text{Dep}_t)$$

where the denominator is the stock of the depreciable assets, the intangible assets, the

financial investment and the depreciation. The depreciation which is reported by

Japanese firms includes each of these types of assets. For firms which use straight line

depreciation, it is first necessary to estimate the average life of capital:

$$L = (1/28)\sum_{t=70}^{97} (K_t + \text{Intan}_t + \text{FinanInves}_t + \text{Dep}_t/\text{Dep}_t)$$

Following Hoshi and Kashyap, if alpha is the ratio of the scrap value of the capital to its

initial value, then the economic depreciation is calculated as the value of the exponential

depreciation rate (Decon) that would leave exactly alpha of an investment after L years.

Decon is: $\text{Decon} = 1 - [\alpha]^{1/L}$

The ratio of scrap value to initial value for fixed tangible assets is mandated by Japanese

law to be .10, and this value is used here. Using these estimates for Decon, the market

value of depreciable assets XK_t can be calculated through the following recursion (where

it is assumed that depreciation occurs at the end of the period):

$$XK_t = [XK_{t-1}(P_{k,t}/P_{k,t-1}) + I_t]*(1-\text{Decon})$$

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where I_t is the investment in depreciable assets, and is imputed from changes in the book value of capital with a correction for depreciation.

$$I_t = K_t - K_{t-1} + yDep_t$$

where y is defined as the fraction of depreciation that occurs for depreciable assets – it can be estimated as:

$$y = (1/28) \sum_{t=70}^{97} (K_t / K_t + Intan_t + FinanInves_t)$$

As Hoshi and Kashyap note, this method imposes consistency between the capital and investment measures. The wholesale price index for investment goods is used for the price of new capital.

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APPENDIX TWO: Creating Tobin's Q for US Firms:

Lindenberg and Ross (1981) proposed an approximation for q which is quite

complex with respect to the debt and inflation adjustments. Chung and Pruitt (1994) offer

an approximation of Tobin's q which is based on basic financial information and

assumes that the replacement values of a firm's plant, equipment and inventories are

equal to their book values. Further, this method uses the book value of a firm's long-

term debt.

$$q = \frac{(MVE + PS + Debt)}{TA}$$

where MVE is the product of a firm's share price and the number of common

stock shares outstanding, PS is the liquidating value of the firm's short term-liabilities net

of its short-term assets, plus the book value of the firm's long-term debt, and TA is the

book value of the total assets of the firm.

Chung and Pruitt empirically tested their approximation against Tobin's q and

find a very high correlation between their q values and the more complicated Linderberg

and Ross calculations of Tobin's q. They find that at least 96.6% correlation between the

two variables. NBER has calculated Qs using Lindenberg and Ross' methodology for US

firms up to 1991. I compared Tobin's qs using Chung and Pruitt's method to the NBER

qs for the US firms in my sample for the years 1974-1991 and found a .942 correlation

between the two variables. I have used the approximate Tobin's q throughout the

analysis.

Chung and Pruitt's approximation of q's for US firm cannot be used for Japanese firms because Japanese firms' book values tend to be much lower than replacement values – with land values being the most prominent problem. Also for Japanese firms, there are no NBER q values which have been determined for any years. Therefore, as described in much more detail in Berry and Sakakibara (1999), Hoshi and Kashyap's methodology for creating Tobin's q values has been followed.

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