The Influence of Location and Multinational Network Effects on Firm Value:

Evidence From US Manufacturing Firms, 1981-2000

by

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WP 2002-07

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September, 2002

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Abstract

In this study, I analyze how a firm's FDI location choice and its multinational network of operations interact to affect a firm's market valuation using a sample of 191 US manufacturing firms and their foreign investments over a twenty-year period (1981-2000). Results from fixed-effects panel data regression models reveal differences in shareholder valuation of advanced versus developing country foreign direct investment for US manufacturing firms in knowledge intensive industries – differences that are moderated by a firm's level of multinational network. For firms with lower levels of multinational networks, advanced country investment is rewarded by shareholders. For firms with higher levels of multinational networks, further expansion into advanced countries is not rewarded by shareholders, but expansion into developing countries is rewarded by shareholders. Taken together, these findings suggest that US manufacturing firms in knowledge intensive industries need a more extensive network of operations before they can effectively manage the higher risk associated with developing country locations. Further, while advanced country location investments may be rewarded for firms initially investing abroad and establishing their multinational networks, these firms need to find a balance between advanced and developing country location investments as they continue to expand abroad to gain competitive advantages from their network and to create value from their multinational operations.

Introduction:

There have been numerous attempts to determine when a firm's multinational operations will be value creating for firms. While some argue that firms have opportunities to gain greater returns from their intangible assets and market power, from spreading risk, from subsidizing poorly performing operations and from seeking less expensive inputs abroad (Doukas and Travlos (1988), Ramaswamy, (1992), Sullivan (1994), Morck and Yeung (1991) Bodnar, Tang and Weintrop (1999) and Berry, 2001), others argue that increased coordination and management costs, increased cultural and institutional diversity, and the increased complexity that results from differing government regulations and currency fluctuations create substantial barriers for firms that attempt to benefit from international operations (Sundaram and Black (1992), Geringer et al., 1989, Hitt et al (1997)). Many empirical analyses have been conducted on this issue (see, for example, Errunza and Senbet (1981 and 1984), Brewer (1981), Kumar (1984), Doukas and Travlos (1988), Geringer et al. (1989), Haar (1989), Morck and Yeung (1991) Christophe (1997) Bodnar, Tang and Weintrop (1999), Click and Harrison (1999), Dennis, Dennis and Yost (2000) and Berry (2001)), though no consensus has emerged regarding the question of when a firm's multinational operations will create value for firms.

Though numerous, existing studies on this issue have not yet considered how a firm's location choice and its multinational network of operations may interact to influence a firm's market valuation. This is an important omission given that there are significant differences across advanced and developing country locations in terms of institutional, financial, political, economic and social issues that may influence shareholder valuation of such investments. Further, there are important firm differences associated with different levels of multinational operations that may provide firms with various options and abilities to invest in these locations. In this paper, I focus on the higher level of risk associated with developing country locations and the capabilities of firms to manage this

risk to examine when these two locations choices are value creating for firms. I extend existing research on this issue by considering when shareholders will value different investment location choices, given different levels of multinational networks of operations.

I analyze these issues using a sample of 191 US manufacturing firms and their foreign investments over a twenty-year period (1981-2000). Based on the results from fixed-effects panel data regression models, I conclude that there are differences in shareholder valuation of advanced versus developing country foreign direct investment, and that these differences are moderated by a firm's level of multinational network. For firms with low levels of multinational networks, advanced country investment is rewarded by shareholders. For firms with higher levels of multinational networks, further expansion into advanced countries is not rewarded by shareholders, but expansion into developing countries is rewarded by shareholders. These findings suggest that US manufacturing firms need a more extensive network of operations before they can effectively manage the higher risk associated with developing country locations. Further, while advanced country location investments may be rewarded by shareholders initially investing abroad and establishing their multinational networks, firms need to find a balance between advanced and developing country location investments as they continue to expand to gain competitive advantages from their multinational network and to create value from their multinational operations.

Theory and Hypotheses:

The study of strategic management is concerned with the choices and actions of managers. The various decisions managers make regarding which products to produce and sell, what capabilities and resources to develop, when and where to invest (among many other issues), all impact the performance of firms. Not all firms will benefit from similar expansion strategies – rather, different expansion strategies will be more or less beneficial

3

given different firm capabilities and resources. In essence, heterogeneous firms will benefit from different

expansion strategies.

In this paper, I focus on the expansion strategies that are available to firms investing in foreign markets

through foreign direct investment (FDI). Following other studies (Morck and Yeung (1991), Sullivan (1994),

Christophe (1997), Berry (2001) Pantzalis, (2001)),[1] this foreign direct investment is referred to as a firm's

multinationality.[2] To further our understanding of when a firm's multinationality will be value-creating for firms. I

focus on the strategic choices managers make regarding location and the capabilities that are developed through

the multinational network of the firm. Below, I offer a set of hypotheses regarding how these choices may

interact to influence firm performance.

Following other studies (see Morck and Yeung (1991), Christophe (1997), Berry and Sakakibara (1999),

Doukas et al. (1999), Berry (2001), and Pantzalis (2001) for example), I will use the internalization theory as my

theoretical point of departure. This theory is primarily concerned with identifying situations in which the markets for

intermediate products are likely to be internalized, and in which firms will own and control value-adding activities

outside their national boundaries. The presence of strong intangible assets and a firm's desire to keep these

assets proprietary render alternatives to foreign direct investment (such as licensing or franchising) too expensive

because of the costs of monitoring the contracts (and the potential of giving other firms the ability to appropriate

returns from this firm specific know-how). Because of market imperfections associated with the international

transaction of firm-specific intangible assets (especially knowledge-based assets), it is a firm's possession of

intangible assets that is considered to be the central determinant of foreign direct investment in the internalization

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[1] In fact, Caves (1996) defines a multinational as a firm that has established two or more country business enterprises in which it exercises some minimum level of control.

[2] It should be noted that exports are not considered part of this definition in this paper. While exporting is certainly one expansion strategy available to firms, the focus of this paper is on the effects from investment involving some level of control over operations in foreign countries.

theory. Empirically, Morck and Yeung (1991) Christophe (1997) (for part of his sample), Berry (2001) and Pantzalis (2001) have analyzed various time periods and found support for internalization theory arguments that investor will value a firms' multinationality only in the presence of strong firm intangible assets.

Location Choice:

Almost all studies examining the performance effects from a firm's multinationality use aggregate measures to examine a firm's multinationality – including measures such as foreign to total sales ratio, a firm's total number of foreign subsidiaries, or the total number of foreign nations in which firms have subsidiaries (Geringer et al., (1989), Morck and Yeung (1991), Sullivan (1994), Christophe (1997), Berry and Sakakibara (1999), Doukas et al. (1999), and Berry (2001)). In general, these aggregate measures have been regressed against a measure of firm performance to make conclusions about the overall effects from a firm's multinationality. The problem with these aggregate measures, however, is that there is no ability to distinguish between the characteristics of locations – especially how different firms may be affected by the costs and benefits of different locations, given different firm characteristics. Only one study (Pantzalis, 2001) has used a more disaggregated measure to consider whether there may be differences in how shareholders value a firm's investments in advanced versus developing country locations. Given that the differences between these two types of investment locations involve more than just different levels of economic development – with important differences in the types of institutions, levels of political risk, intellectual property protection, judicial remedies in place and other political, social, financial and institutional factors – the location choice of a firm's foreign direct investment may play an important role in determining how shareholders value such an investment.

In studies that have considered location issues (see the recent studies by Belderbos and Sleuwaegen 1996, Dunning, 1998, and Pantzalis, 2001 for example), the location choices that are available to firms have been

5

differentiated by an advanced and developing country category. The advanced country location classification generally includes the US, Canada, Western Europe, Japan, Australia and New Zealand, and the developing country location classification generally includes all other countries in the world (Eastern European countries, Central and South American countries, African countries, Asian countries (besides Japan) and Mexico). While the distinction between these groupings can be based simply on levels of economic development, there are other important differences between these locational groupings.

Extant literature in economics, finance and strategy suggest various well-known reasons for firms to invest in each location – on a fairly general level, advanced country locations are argued to provide firms with access to consumers with higher incomes and higher education levels, to locations with less risk, to locations where knowledge can be acquired or learned, and to more institutional protections for investments. Developing countries, on the other hand are argued to provide firms with higher returns (and higher levels of risk), lower costs and more abundant sources for inputs (including land, labor and capital), and in the specific cases of developing countries like China and India, access to areas of the world with the largest (and fastest growing) populations.

Using internalization theory reasoning and these locational groupings, Pantzalis (2001) has argued that because market failure is more likely in developing country locations, arm's-length transaction costs for proprietary know-how will be higher in developing countries than in advanced countries. An important implication for firms is that higher market valuation will result from investments in developing country locations than from investments in advanced country locations. Empirically, Pantzalis finds that the positive impact of a firm's intangible assets on its market value is enhanced by investments in developing country locations only (advanced country investments are negatively, though not significantly valued in Pantzalis' cross-sectional sample of US MNCs in 1990).

Pantzalis' study provides an important starting point to consider the issue of FDI location choice and performance effects from a firm's multinational operations. However, his results seem surprising for a couple of

6

reasons. First, while it seems fair to suggest that arms-length transactions may have higher transaction costs in developing countries, in both types of locations, firms need to be concerned with the cost of disseminating monopoly-yielding proprietary information. Further, though other studies have not broken down the multinationality variable into advanced and developing country components, Pantzalis' result would suggest that previous positive valuation findings are driven by developing country investment. This is hard to imagine, given that the vast majority of MNC investment occurs in advanced country locations. (According to the United Nations Commission on Trade and Development (UNCTAD) World Investment Reports, nearly seventy-five percent of all foreign direct investment occurs in advanced country locations.) Finally, if it is only developing country location investment that is valued by investors, it seems that US firms in particular would change their strategy and try to increase their market value by investing much more than they currently do in developing country locations.

In addition to the focus on transaction costs being higher in developing countries, an important difference between these investment location choices for shareholders may be the overall levels of uncertainty and risk involved with the investment. High transaction costs are generally argued to cause a firm to enter markets with more control (wholly owned subsidiaries versus licensing, for example). However, an addition issue for how shareholders will value a firm's investment is the levels of uncertainty and risk once a firm has entered the market – even if this entry is via greenfield wholly-owned investment. As noted above, there tend to be higher levels of political and financial risk, lower levels of intellectual property protection, fewer judicial remedies in place, more financial restrictions, less commitment to open markets and potentially large differences in the way business is conducted in developing countries. All of these differences are likely to impact how successful the firm is in this business environment. Thus, in addition to affecting how a firm will enter a foreign market to maintain control over its proprietary know-how, developing country environments also influence how successful a firm will be when it operates in these foreign markets.

7

Empirically, Bekaert et al (1998) have shown that investments in emerging markets offer higher expected returns, but also higher risks than investments in advanced markets. Further, Adler and Dumas (1983) and Fatemi (1984) argue that market values for firms investing in developing countries should be higher because multinational corporations (MNCs) provide a safer vehicle for investors wishing to invest in emerging markets than they can achieve on their own. In addition, Doukas and Travlos (1988) found that foreign acquisitions are value enhancing for US MNCs if the target firm is located in a country in which the acquiring firm did not operate before, and if the target firm is located in a developing country. Brewer (1981), however, found no differences between MNCs and purely domestic firms while Michel and Shaked (1986) found that domestic firms have better risk-adjusted performance than MNCs.

Though portfolio investment diversification reasons have fallen out of fashion for explaining advanced country investment (Calvet, 1981) (due to the fact that investors can diversify their portfolio of investments on their own), they do provide a reason for shareholders to value a firm's developing country investment. As finance studies have shown, MNCs are better able to hedge the increased risk from their developing country operations across many geographic areas and to reduce foreign exchange exposure (Agmon and Lessard (1977) Adler and Dumas (1983), Fatemi (1984) Doukas and Travlos (1988). Further, MNCs learn to deal with political risk, regulatory changes, financial crises and other issues that affect the value of operations in developing foreign countries more so than in advanced countries. Though the empirical evidence on whether developing country location investment will provide MNCs with higher market values is inconclusive, these studies suggest that shareholders may value developing country investment by MNCs that have gained experience through their previous international investments and that have the capabilities to manage the higher level of risk associated with developing country locations. This suggests that it may be important to consider an additional firm characteristic that may moderate

when a firm will be able to take advantage of opportunities in developing countries – the extent of a firm's multinational network of operations.

Network Effects:

Kogut (1983) and Kogut and Kulatilaka (1994) have suggested that MNCs have certain advantages over domestic firms that result from their network of operations. These advantages occur because of the increased opportunities available to MNCs from operating flexibility. Kogut (1983) argues that with more extensive operations, MNCs have more flexibility to transfer resources across borders through a globally maximizing network. He suggests that valuation effects from a firm's multinationality stem from the following options available to firms with extensive networks: the ability to arbitrage institutional restrictions; the informational externalities captured by the firm in the conduct of international business (learning cost externalities); and the cost savings gained by joint production in marketing and manufacturing.

As noted above, higher risks from developing countries result from a number of differences from advanced and developing countries (including different institutional settings that may not provide adequate legal protection (especially for property rights), higher levels of exchange rate risk, different types of government regulations, different levels of political risk and financial risk). A firm's multinational network of operations may provide a firm with a number of options and benefits that can be used to offset some of this risk – for example, a firm with a more extensive network may be able to leverage its size and influence in a region to bargain with developing country governments to reduce political risk, it may be able to hedge risk from one market with investments in other less risky markets to hedge financial risk, it may have learned from experiences with similar issues or problems in other countries, it may change production amounts depending on local situations (in a number of different markets) or it

9

may subsidize operations with profits from more profitable operations until a foreign subsidiary is able to operate on its own financially.

Because direct investment in developing countries is riskier than in advanced countries, it is suggested here that shareholders may not positively value a firm's investment in developing countries until that firm has a certain level of multinational network in place that allows it to effectively manage and hedge the higher risk (including financial, operational and political risk) and to apply learning from investments in other international markets. While clearly building on finance arguments that developing country investments are more risky, this is not meant to suggest that finance reasons provide the only rationale for firms to invest in developing countries, or the only reason for shareholders to value developing country investment. Rather, the fact that higher risk exists in one type of location may mean that economic and international strategic management reasons for the investment may be more effectively realized after a firm has learned from its previous network expansions and can better manage the increased risk found in developing country markets.

Building on this reasoning, firms can be categorized as having different degrees of multinational networks – based on how extensive their operations are in foreign countries.   One way to approach this issue is to categorize firms as having low, medium or high levels of multinational networks. Low multinational network levels include firms with few foreign subsidiaries (less ability to manage or hedge risk and fewer learning experiences from previous foreign investments) while high multinational network levels include firms that have much more extensive operations abroad (and thus much greater ability to manage and hedge risk and apply learning from other foreign investments). Firms with medium levels of multinational networks lie somewhere in between in terms of their abilities to manage risk and apply learning from other markets. In terms of these multinational network levels, it should be firms with medium or high levels of multinational networks that have the information externalities

and hedging opportunities that Kogut refers to when he writes about multinationality providing valuable options to firms.

While shareholders may want firms to have a network of multinational operations in place before valuing investments in developing countries, this may not be the case for advanced country investment. Advanced country investments provide firms with more protections in the form of institutions, judicial systems and intellectual property enforcement – basically, less risk to manage than developing country investment. Further, advanced country investments offer advanced country firms more similar market conditions (similar GDP, levels of education, population characteristics) than developing country locations. This type of environment provides a relatively safer market for firm investment – especially for firms that have not previously ventured abroad and do not have the capabilities to manage higher levels of risk.

Finally, there is some question as to whether all levels of a firm's multinational network will provide firms with benefits because of the complex organizational structure that can result from an extensive network of operations. To successfully manage a large number of business units across different countries requires immense coordination efforts and effective decision-making processes regarding resource allocation (Hitt et al., 1997). In addition, with a more extensive network of operations in many different foreign countries, various government regulations, trade laws, and currency fluctuations will add significant complexity to firms (Sundaram and Black, 1992). Empirically, Geringer et al. (1989) found that the relationship between multinationality and firm performance is positive for low and mid-levels of international involvement, but negative for firms with foreign sales representing more than 80% of total sales. Because this threshold seems quite high (and also because I do not have foreign sales data for the US firms in my sample), I do not include this reasoning in the hypotheses offered above. Rather, I note that these arguments question whether shareholders will value investments in both advanced and developing country locations for firms with very high levels of multinational networks

11

The preceding discussion about internalization theory, location differences and multinational network effects leads to the following hypotheses:.

H1: A firm's foreign direct investment (FDI) is only valued by shareholders in the presence of intangible assets.

H2; Shareholders value FDI in advanced countries for firms with low, medium and high levels of multinational networks.

H3: Shareholders value FDI in developing countries for firms with medium and high levels of multinational networks.

Description of the Data:

All publicly traded manufacturing firms that are listed in the Compustat Database from 1977-2000 and provide information on their R&D expenditures are included in the sample (this results in a sample size of 191 firms).[3] This sample is an unbalanced panel data set because some firms in the sample were acquired in the second half of the 1990s. All financial figures are real annual figures deflated to the base year 1977 using US Department of Commerce, Bureau of Economic Analysis GDP deflators.

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. Tobin's q is widely used as an indicator of intangible value in economics research and in the international strategic management literature (Dowell et al, 2000). The attractiveness of q is that, first, it provides an estimate of

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[3] 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.

the firm's intangible assets and second, no risk adjustment or normalization is required to compare q across firms (Lang and Stulz, 1994). Chung and Pruitt's (1994) approximation for q is used in this analysis for the US firms.[4]

<u>Intangible Assets)</u>:

Following other studies, a firm's R&D expenditures are used as a proxy for technical know-how. Because the effect of R&D expenditures can persist over time, an R&D stock measure (which includes both accumulated and current period expenditures) is used to proxy for a firm's technical know-how. Following Grilliches and Mairesse (1984), a depreciation rate of 15% is applied to the previous year's expenditures going back four years. I tested both a current year and one-year lag for the RDStock variable in the analysis below (as investment decisions occur prior to the actual investment). The results are the same whether I use the current or lagged R&D stock variable. Because of this, I report the current year RDStock results below to avoid losing one year of data.

In studies examining the intangible assets of firms, it is also common to include the marketing ability of firms (Morck and Yeung, 1991; Morck and Yeung, 1992; Pugel et al., 1996; Kogut and Chang, 1991; Belderbos and Sleuwaegen, 1996). However, because of the problem of a severely reduced sample size if I limit my sample to only those US firms reporting their advertising expenditures,[5] I do not use a marketing ability variable in the

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[4] NBER q ratios (which were calculated following the more complex and involved Lindenberg and Ross (1981) approximation) are readily available through NBER for US firms up to 1991. I compared firm Tobin's q values using Chung and Pruitt's method to the NBER qs using Lindenberg and Ross' method for the US firms in the sample for the years 1981-1991 and found a .95 correlation between the two variables.

[5] 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 47 firms. I am unable to examine the network effects (because of a lack of firms in some of my categories) if I limit my sample to these firms.

analysis reported below. It should be noted, however, that I also ran the analyses using an IntanAssetStock variable, which combined the stock of R&D and the stock of advertising together and the results were the same.

Multinationality Variable (AdvancedcountryFDI and DevelopingcountryFDI):

Finding an adequate measure for a firm's multinationality, especially a measure that is consistently available for twenty years is challenging. Different measures have been used in previous empirical studies, including foreign to total sales ratio, number of foreign subsidiaries, and the number of foreign nations. The problem with the variable that has been used most often in empirical studies (foreign sales to total sales) is that a firm's foreign sales include both export and foreign operation sales, making it difficult to make conclusions about a firm's multinational operations. Information regarding foreign operations that is fairly consistently reported over time can be found in directories that list a firm's foreign subsidiaries and the location of these subsidiaries. Unfortunately, however, the data is very inconsistent in the reporting of performance or financial information (like value of assets or sales, or number of employees) that might provide more insight into this issue. In this study, a firm's multinationality is defined as a firm's number of advanced country foreign subsidiaries (advancedcountryFDI) and a firm's number of developing country foreign subsidiaries (developingcountryFDI) for each year from 1981-2000; the higher the number, the higher the degree of advancedcountryFDI or developingcountryFDI for that firm for that year.

I consulted the Directory of Corporate Affiliates to determine the number of foreign subsidiaries for each of the 191 firms in the sample for each year, I started with 1981 because the data is more consistent starting in this year (due to the publication of a separate directory that focuses specifically on the foreign affiliates of US MNCs). I coded each of the foreign subsidiaries of each of the firms in each year as coming from advanced or developing countries. Following other studies, advanced countries included the US, Canada, Western European countries, Japan, Australia, and New Zealand. All other countries are classified as developing countries (including Mexico,

14

most Asian countries (not Japan), Central and South American countries, Eastern European countries, ex-Soviet bloc countries, Russia and African countries).   As the directories for each year were examined, the data reflect entry and exit, and the global reconfiguration of activities by the US 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 multinationals during the twenty year time period of this study.

Control Variables

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; real exchange rate interaction terms with FDI are used to capture firm-level effects of exchange rate movements.[6] Growth of the firm is captured by the change in sales over the previous two years. Industry effects will be accounted for in the individual effect term for each firm (though more will be included about industry differences in the sensitivity analysis reported below). Table 1 provides summary statistics of the main variables. Table 2 provides the product moment correlations between the main variables. And finally, Table 3 describes each of the variables and gives information on data sources.

Specifications:

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[6] The models that are reported below include annual exchange rate variables. I also ran the models using year dummy variables and the results are the same. I do not report these year dummy variable results below as I am unable to run the models with both the exchange rate and year dummy variables (these two variables are too highly correlated).

The model used in this paper builds on the approach used in other studies of market valuation.[7] 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,

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

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, while the intangible assets variable is an estimate of the replacement value of a firm's intangible assets. To control for firm size, all variables are scaled by the replacement cost of tangible assets.

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

This causes the left hand side of the equation to become Tobin's Q[8], 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 this model are technical know-how and a firm's FDI (including advancedcountryFDI and developingcountryFDI). Following internalization theory predictions and previous study findings that firms with strong intangible assets will have higher market valuations associated with their multinationality, the model also includes interaction terms for a firm's international involvement and its level of intangible assets. As indicated above, a leverage variable (debt) is included to proxy for any variation in firm values

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

[8] 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).

owing to differences in capital structure. Further, controls for exchange rate effects and firm growth are included in

the model. Including the main effects, the interaction effects and the controls, the model becomes the following:

$$Q_{it} = \boldsymbol{a}_i + \boldsymbol{b}_1 \frac{RDStock_{it}}{Assets_{it}} + \boldsymbol{b}_2 \frac{Debt_{it}}{Assets_{it}} + \boldsymbol{b}_3 \frac{AdvancedCountryFDI_{it}}{Assets_{it}} +$$

$$\boldsymbol{b}_{44} \left[\left(\frac{AdvancedCounryFDI_{it}}{Assets_{it}} * \frac{RDStock_{it}}{Assets_{it}} \right) \right] + \boldsymbol{b}_5 \frac{DevelopingCountryFDI_{it}}{Assets_{it}} +$$

$$\boldsymbol{b}_{64} \left[\left(\frac{DevelopingCounryFDI_{it}}{Assets_{it}} * \frac{RDStock_{it}}{Assets_{it}} \right) \right] + \boldsymbol{b}_7 RER +$$

$$\boldsymbol{b}8 \left[\left(\frac{AdvancedCountryFDI_{it}}{Assets_{it}} * RER \right) \right] + + \boldsymbol{b}9 \left[\left(\frac{DevelopingCountryFDI_{it}}{Assets_{it}} * RER \right) \right] + \qquad (3)$$

$$\boldsymbol{b}_{106} \frac{FirmGrowth_{it-it(-2)}}{Assets_{it}} + \boldsymbol{e}_{it}$$

where Q_{it} is a firm's Tobin's Q ratio; $RDStock_{it}$ is a firm's stock of technical know-how; $Debt_{it}$ is a firm's debt;

AdvancedCountryFDI$_{it}$ is the number of a firm's foreign subsidiaries in advanced countries; DevelopingCountryFDI$_{it}$

is the number of a firm's foreign subsidiaries in developing countries; RER is the real exchange rate for the Dollar;

FirmGrowth$_{it-(it-2)}$ is the two-year change in sales 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 expertise, and other firm-specific intangible assets not included in the model (like

marketing know-how). 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, with controls for leverage (debt),

exchange rate fluctuations and firm growth, as discussed above.

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

17

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.[9] To ensure that my results are not influenced multicollinearity between the main and interaction terms, I

centered the variables involved with the interaction terms (Aiken and West, 1991).

To analyze differences across levels of a firm's multinational network of operations, the sample was

divided into subsamples based on quartile differences for the total number of nations in which a firm has

subsidiaries. I used the number of nations to construct this variable to capture the leverage and arbitrage

opportunities available to a firm across different countries.   I used a one-year lag in the information on the number

of nations to capture the network that was fully available to the firm. (A one-year lag is used because it may take

some time before foreign subsidiaries are integrated into a firm's multinational network.) By using the number of

nations in which a firm has subsidiaries, the network effects for a firm that has five subsidiaries in Canada will be

classified differently from a firm that has two subsidiaries in Canada, one subsidiary in Mexico and two subsidiaries

in the UK – though they both have five foreign subsidiaries in total. About 25% of the observations are for firms with

no foreign operations (domestic only firms). These firms are included in each of the other three subsamples to

provide a base case for analysis. A low level of multinational network is assigned to the second quartile

observations – firms with subsidiaries in two or fewer foreign countries.   A medium level of multinational network is

assigned to the third quartile observations – firms with subsidiaries in three to eight foreign countries. A high level

of multinational network is assigned to the fourth quartile observations – firms with subsidiaries in nine or more

foreign countries. Table 4 gives firm characterizes each for each of these subsamples. Not too surprising, firms

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[9] I also ran random effects models; Hausman tests results reject the null hypothesis that the random effects estimator is correct.

with higher levels of multinational networks have more investment in R&D, higher sales, and more foreign

subsidiaires.   Firms in each of the low, medium and high multinational network subsamples invest in both

advanced and developing countries.

Results:

Overall, the empirical results reveal support for the hypotheses and differences between shareholder

valuation of investment location choices. The empirical results from equation (3) for the entire sample and the 3

subsamples are reported in Table 5. Model 1reports the results for the full sample. Model 2 reports the results for

firms in the low level of multinational network group (firms with subsidiaries in one to two foreign countries). Model

3 reports the results for firms in the medium level of multinational network group (firms with subsidiaries in three to

eight foreign counties). And finally, Model 4 reports the results for firms in the high level of multinational network

group (firms with subsidiaries in nine or more foreign countries). In each model, the beta coefficients have been

standardized.

Hypothesis 1 follows internationalization theory arguments by predicting that a firm's foreign direct

investment will only be valued by shareholders in the presence of intangible assets. As revealed in Table 5, none

of the main effects for the multinationality variables is significant in any of the models. It is only the interaction

effects between a firm's RDStock and the two multinationality variables that provide statistically significant results in

terms of the multinationality variables. (The signs and significance of the variables in any of the models do not

change if the interaction terms are dropped.) These results provide support for the internalization theory and

compliment previous studies that have found that foreign direct investment will only add to a firm's market valuation

if a firm has strong intangible assets (including Morck and Yeung, 1991, Christophe, 1997, Berry, 2001, and

Pantzalis, 2001).

Hypothesis 2 predicts that shareholders will value firm investments in advanced countries at all levels of

firm multinational networks. Again, though the main effects are not significant, Models 2 and 3 in Table 5 reveal

that the interaction term between a US firm's AdvancedcountryFDI and its RDStock is positive and significant for

firms with low and medium levels of multinational networks. Model 4 in Table 5, however, reveals that for firms

with high levels of multinational networks, the interaction term between advancedcountryFDI and RDStock is

negative and significant. This result suggests that firms with intangible assets can enhance their market value by

expanding their international operations into advanced country locations when they have low and medium levels of

multinational networks, but that extending a multinational network too far with advanced country location

investment is not valued by shareholders.

Hypothesis 3 predicts that shareholder valuation of FDI in developing countries will increase with the

extensiveness of the firm's multinational network – that shareholders will value firm investment in developing

countries for firms with medium and higher levels of firm multinational networks. Model 4 in Table 5 reveals that

the interaction term between a US firm's DevelopingcountryFDI and its RDStock is positive and significant for high

levels of multinational networks. Model 3 in Table 5, however, reveals that the interaction term is not statistically

significant for firms with medium levels of multinational networks. This result suggests that firms with intangible

assets can enhance their market values by expanding their international operations into developing country

locations, but only after they have a higher level of multinational network in place.

The control variables are significant in each of the models. Firm growth is positively and significantly

valued by shareholders in every model. Debt is negative and highly significant in every model. The main

exchange rate effects are significant for firms with low and medium levels of multinational networks – suggesting

that shareholders may view exchange rate changes as having more influence on firms that lack an extensive network of multinational operations.

Regarding the economic significance of the variables included in the model, a firm's RDStock and its previous sales growth (FirmGrowth) are valued the highest by shareholders in each of the models. Debt is negatively valued at a similar level. As can be seen from each of the models, firm investment abroad contributes only about a third as much to firm performance as firm investment in R&D. This is not too surprising, given internalization theory arguments that a firm needs such investment to be able to compete in international markets. Finally, the models reveal that once a firm has a high level of multinational network in place, the significant developing country location variable is valued higher by shareholders than the advanced country location variables at any level of multinational network.

Sensitivity Analysis:

The above analysis was run on firms in all manufacturing industries. To determine whether these results apply across all manufacturing industries, the sample was divided in a number of different ways. First, the larger and more internationally integrated industries (and those subsamples that could be run separately) were run separately (including chemicals, electric equipment, industrial machinery, and precision instruments). Though varying in statistical significance, the results hold for each of these 2-digit SIC code industries. As these firms tend to be the more knowledge-intensive ones, I grouped them together in what I call a high R&D intensive industry grouping (including firms in the transportation equipment industry) and report the results in Table 7. (Table 6 shows descriptive statistics of this subsample.) Tough not reported in this table, these results also hold when the 1980s and 1990s are run separately, and when year dummies are included (instead of the RER term).

I grouped the low R&D intensive firms in a separate analysis. Low R&D intensive firms include the textiles, food, paper and paper products, rubber products and fabricated metals industries. Because these firms have much lower degrees of multinationality, I have recalculated the quartile differences to examine the influence of network effects. As can be seen in Table 8, there are large differences in the results for the low R&D-intensive industries. The main effects are significant (not the interaction effects) and shareholders value investment in both advanced and developing country locations for firms with low and medium levels of multinational networks. At a high level of multinational network (which for these firms is investment in 6 or more countries), Table 8 reveals that shareholders do not value investment in either location.

Discussion and Implications:

In this study, I have analyzed how a firm's FDI location choice and its multinational network of operations interact to affect a firm's market valuation. By examining FDI location choice, I have focused on whether shareholder valuation of multinational operations is the same for investments in advanced and developing country locations. By examining how a firm's multinational network of operations may influence this relationship, I have focused on the benefits a firm can derive from maintaining more extensive international operations. I have argued that because direct investment in developing countries is riskier than in advanced countries, shareholders may not value a firm's investment in developing countries until that firm has a certain level of multinational network in place that allows the firm to manage the higher risk and to apply learning from previous investments in foreign locations. The empirical results provide support for these arguments for firms in technology intensive industries (chemicals, electric equipment, industrial machinery, transportation and precision instruments). These industries include the firms that are doing the majority of foreign direct investment.

For firms in these industries, I conclude that there are differences in shareholder valuation of advanced versus developing country foreign direct investment, and that these differences are moderated by a firm's level of multinational network. For firms with low levels of multinational networks, advanced country investment is rewarded by shareholders. For firms with higher levels of multinational networks, further expansion into advanced countries is NOT rewarded by shareholders, though expansion into developing countries IS rewarded by shareholders. As noted in the results section, these findings apply to firms with strong intangible assets only. None of the main effects for the multinationality variables is significant – it is only through the interaction term with a firm's R&D stock that the multinationality variables are significantly valued by shareholders. Though not intended to simply be a test of the internalization theory, this study supports internalization theory arguments for firms in high R&D intensive industries.

The results reveal that both location and a firm's multinational network are important factors when considering whether a firm's multinationality will create value for technology intensive firms. The results for advanced country location investment show that shareholders reward advanced country location investment by US manufacturing firms with low and medium levels of multinational networks. Because these markets are more similar to the US market in terms of GDP, education levels, types of governmental systems, and institutional protections, expansion into advanced countries provides a relatively safe way for firms to venture into the international marketplace and to create a multinational network. The results also suggest, however, that there are limits to the benefits of advanced country investments. Perhaps, as prior studies have suggested, the higher organizational costs and increased difficulties of managing a more extensive network of operations may outweigh the benefits from additional international investments in advanced country locations. However, unlike prior studies, this study shows that even at these same higher levels of multinational networks, additional investments in developing countries can provide a firm with increased market valuation. This implies that the difficulties of

managing a more extensive network of operations may not be driving the advanced country location results.

Rather, as technology intensive manufacturing firms continue to develop their multinational network, they may

need developing country investment to access cheaper inputs, or larger populations to increase demand for their

products. While advanced country investment may provide a relatively safe setting in which to create a network of

operations abroad, to fully develop a multinational network of operations (and to fully benefit from the international

environment) requires investment in developing country locations. Taken together, the results suggest that while

advanced country location investments may be rewarded for firms with low and medium levels of multinational

networks, technology intensive firms need to find a balance between advanced and developing country location

investments as they continue to expand to gain competitive advantages from their network and to create value for

their firm from their multinational operations.

For managers of international expansion, the results reveal that shareholders value a large network when

technology intensive firms are expanding into developing country locations – where risk management is essential

for success. US manufacturing firms need to gain managerial capabilities and to establish a network of operations

before shareholders will value their developing country location investments. While there may be economic and

strategic reasons for firms to invest in developing country locations (to access cheaper inputs or rapidly growing

populations, for example), shareholders need to see that firms have the necessary capabilities and experiences to

successfully manage these operations.

Sensitivity tests reveal that these results do not apply to firms in low R&D-intensive industries. Because

firms in these industries (textiles, paper and paper product, fabricated metal) are often involved in foreign

investment to access raw materials or cheaper inputs (especially labor costs), it would appear that shareholders

value investment in developing countries before firms have acquired capabilities in foreign markets to manage the

higher risks in these locations. This suggests that the findings for R&D intensive industries may be driven by the

24

importance of the proprietary knowledge of those firms. Given higher levels of overall risk in developing countries, shareholder may be concerned about whether firms will be able to adequately protect these assets. At the very least, these results suggest that the two groupings of firms should be considered separately in future analyses. Future research may benefit from distinguishing among different reasons for foreign investment. The results in the present analysis may apply more to horizontal than vertical foreign direct investment. Without additional data on the purpose of the investment, however, it is difficult to adequately address this issue in the current paper.

Because of data availability, one limitation of this study is the use of a count variable for the multinationality variables. A better approach would include additional information about the specific activities of the foreign investment (including information about the size of the investment or the profitability of the investment) to more thoroughly examine this issue. Additional data on the business line and purpose of the investment would also increase our understanding of differences across high and low R&D-intensive industries. Further, these findings are based on a US sample of manufacturing firms. Additional study of other national firms and other industries are needed to examine how generalizeable the results are. Also, by grouping countries into advanced or developing country locations, this study reveals some interesting differences between these categories – however, more refined categories of location choices (including regional groupings or groupings by institutional characteristics) might reveal other issues of interest to academics and managers alike. Finally, additional analysis of firms with the highest levels of multinational networks is needed to better understand whether or when firms may no longer benefit from increased international operations in either location.

Table 1: Descriptive Statistics (full sample)

Variable	Mean	Standard Deviation	Minimum	Maximum
Q	1.15	.86	-.14	5.85
RDStock (M$)	51.31	138.6	.0015	1892.94
Debt (M$)	194.81	497.41	0	6863.49
AdvancedFDI	8.6	16.6	0	206
DevelopingFDI	6.34	14.01	0	202
Sales (M$)	1302.3	3053.5	1.07	41326.4

Table 2: Product Moment Correlations (Full Sample)

	1.	2.	3.	4.	5.	6.
1. RDStock/Assets	1					
2. Debt/Assets	-.183	1				
3. AdvancedCountryFDI/Assets	.056	- .133	1			
4. DevelopingCountryFDI/Assets	.036	. -.095	.47	1		
5. RER	-.016	-.038	.019	.04	1	
6. FirmGrowth/Assets	.133	-.084	059	.029	.048	1

Table 3: Operationalization and Sources of Variables:

Variable:	Operationalization:	Source:
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.	Compustat
RDStock*	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.	Compustat
Debt*	The market value of a firm's short and long term debt. All values are inflation adjusted using GDP deflators.	Compustat
AdvancedCountryFDI*	A firm's number of foreign subsidiaries in Industrialized countries	Directory of Corporate Affiliates
DevelopingCountryFDI*	A firm's number of foreign subsidiaries in Developing countries	Directory of Corporate Affiliates
RER	Dollar Real Exchange Rate	International Financial Statistics, International Monetary Fund
FirmGrowth*	The two-year change in sales for each firm.	Compustat
Multinational Network Levels	Low level is defined as a firm with subsidiaries in one to two foreign countries. Medium level is defined as a firm with subsidiaries in three to eight foreign countries. High level is defined as a firm subsidiaries in nine or more foreign countries. (These cut-offs correspond to the quartile levels in in the sample. See the description of the data in the text for more discussion)	Directory of Corporate Affiliates

* These variables are scaled by the replacement cost of tangible assets (from Compustat data) to control for firm size. (Inflation adjusted values of this variable are used.)

	Full Sample (Including Domestic)	Low Level of Multinational Network ^	Medium Level of Multinational Network^	High Level of Multinational Network^
Mean Q (St.Dev.)	1.15 (.86)	1.12 (.90)	1.18 (.88)	1.20 (.82)
Mean RD (St.Dev.)	51.31 (138.6)	5.75 (18.6)	18.12 (56.42)	142.23 (221.18)
Mean Debt (St.Dev.)	194.8 (497.4)	68.79 (305.86)	109.4 (384.3)	431.5 (657.6)
Mean Sales (St.Dev)	1302 (3053)	354.4 (1181.44)	748.3 (2171.3)	3041.1 (4434.1)
Mean #Advanced Subsidiaries	8.6 (16.6)	1.11 (1.6)	4 (4.9)	24.5 (25.1)
Mean #Developing Subsidiaries	6.3 (14)	.5 (.89)	2.5 (2.91)	20 (20.3)

*Firms can and do change categories over the 20 year time period of this study. Therefore, it is difficult to classify the number of firms in each of the categories. What can be classified is the number of observations. For this information, please see Table 5 below.

^ A low multinational network level is defined as firms with subsidiaries in 1 to 2 foreign countries, a medium level is defined firms with subsidiaries in 3-8 foreign countries, a high level is defined as firms with subsidiaries in 9 or more foreign countries. See text for more discussion.

TABLE 5: Shareholder Valuation of Advanced and Developing Country Foreign Direct Investment:

Dependent Variable: Q	Model 1	Model 2	Model 3	Model 4
Multinational Network Level:	All Firms	Low Level^	Medium Level^	High Level^
RDstock	.09**	.08*	.07*	.09*
Assets	(2.18)	(1.88)	(1.79)	(1.88)
Debt	-.10***	-.09***	-.10***	-.10***
Assets	(3.95)	(4.12)	(3.44)	(3.28)
AdvancedCountryFDI	-.01	-.02	.01	.02
Assets	(-.12)	(-1.34)	(.39)	(.68)
Advanced CountryFDI*RDStock	-.02*	.03**	.03*	-.04**
Assets Assets	(-1.88)	(2.18)	(1.88)	(-2.34)
DevelopingCountryFDI	.02	.02	.01	.01
Assets	(1.07)	(1.26)	(.59)	(.63)
DevelopingCountryFDI *RDStock	.02	.01	.01	.05***
Assets Assets	(.47)	(.41)	(.51)	(2.73)
RER	.02	.02**	.02*	.01
	(1.21)	(2.45)	(1.69)	(.54)
RER* AdvancedCountryFDI	.01	02	.01	.01
Assets	(.04)	(.94)	(.18)	(.63)
RER*DevelopingCountryFDI	-.01	-.01	-.01	-.01
Assets	(-.86)	(-1.25)	(-.52)	(-1.32)
FirmGrowth	.08***	.08***	.08***	.09***
Assets	(4.39)	(4.32)	(4.34)	(4.31)
AR(1)	.06***	.06***	.07***	.05***
	(3.63)	(3.51)	(3.53)	(3.69)
Firm Fixed Effects	Yes	Yes	Yes	Yes
F	7.09***	6.33***	6.78***	6.81***
Adj R^2	.87	.82	.85	.86
n=	3214	1387	1398	1282

(T statistics) Heteroscedasticity-consistent standard errors used. Variables explained in Table 3 above.
(Beta coefficients have been standardized)   * Significant at .10 level, ** at .05 level, *** at .01 level.
^ A low multinational network level is defined as a firm with subsidiaries in 1 to 2 foreign countries, a medium level is 3-8 foreign countries, a high level is 9 or more foreign countries. See text for more discussion.

Table 6: Subsample Descriptive Statistics

Firms in High R&D Intensive Industries (126 firms):
(Including chemical, electric equipment, industrial machinery, transportation, and precision instruments)

Variable	Mean	Standard Deviation	Minimum	Maximum
Q	1.30	.87	-.06	5.85
RDStock (M$)	80.94	188.7	.0015	1892.94
Debt (M$)	230.46	581.13	0	4376.2
AdvancedFDI	10.2	19.82	0	206
DevelopingFDI	7.3	16.38	0	202
Sales (M$)	1503.57	2881.5	2881	41326.4

Firms in Low R&D Intensive Industries (65 firms):
(Including textiles, food, paper and paper products, rubber products, fabricated metals, and misc.)

Variable	Mean	Standard Deviation	Minimum	Maximum
Q	1.07	.70	-.14	3.62
RDStock (M$)	23.41	64.3	.0033	501.23
Debt (M$)	190.23	496.32	0	6863.49
AdvancedFDI	5.4	8.3	0	56
DevelopingFDI	4.6	9.2	0	52
Sales (M$)	1228.4	3772.5	1.07	38558.2

TABLE 7: Shareholder Valuation of Advanced and Developing Country Foreign Direct Investment:
For Firms in High R&D Intensive Industries

Dependent Variable: Q	Model 1	Model 2	Model 3	Model 4
Multinational Network Level:	All Firms	Low Level^	Medium Level^	High Level^
RDstock Assets	.09** (2.21)	.09** (2.20)	.08* (1.85)	.09* (3.32)
Debt Assets	-.10*** (2.97)	-.09*** (3.01)	-.10*** (2.57)	-.10*** (3.12)
AdvancedCountryFDI Assets	-.02 (-1.42)	-.01 (-1.06)	.01 (.21)	.01 (.37)
Advanced CountryFDI*RDStock Assets Assets	-.02* (-1.76)	.04** (2.83)	.02* (1.77)	-.04** (-2.88)
DevelopingCountryFDI Assets	.02 (.87)	.02 (1.01)	.01 (.98)	.01 (.73)
DevelopingCountryFDI *RDStock Assets Assets	.02 (1.34)	.01 (1.05)	.02 (1.54)	.06*** (2.94)
RER	.02* (1.72)	.02** (1.98)	.02 (1.22)	.01 (.31)
RER* AdvancedCountryFDI Assets	.01 (.33)	02 (.77)	.01 (.21)	.01 (.45)
RER*DevelopingCountryFDI Assets	-.01 (-.75)	-.01 (-1.01)	-.01 (-.44)	-.01 (-.97)
FirmGrowth Assets	.09*** (6.34)	.09*** (5.50)	.09*** (5.84)	.10*** (6.21)
AR(1)	.07*** (3.43)	.06*** (3.24)	.07*** (3.27)	.07*** (3.47)
Firm Fixed Effects	Yes	Yes	Yes	Yes
F	28.71***	19.32***	22.78***	25.77***
Adj R^2	.88	.83	.84	.89
n=	2077	933	979	1168

(T statistics) Heteroscedasticity-consistent standard errors used. Beta coefficients have been standardized.

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

^ A low multinational network level for firms in high R&D intensive industries is defined as a firm with subsidiaries in 1 to 3 foreign countries, medium level is 4-15 foreign countries, high level is 16 or more foreign countries. See text for more discussion.

TABLE 8: Shareholder Valuation of Advanced and Developing Country Foreign Direct Investment:
For Firms in Low R&D Intensive Industries

Dependent Variable: Q	Model 1	Model 2	Model 3	Model 4
Multinational Network Level:	All Firms	Low Level^	Medium Level^	High Level^
$\frac{\text{RDstock}}{\text{Assets}}$	.03 (1.48)	.03 (1.21)	.03 (1.29)	.04 (1.54)
$\frac{\text{Debt}}{\text{Assets}}$	-.11*** (-4.54)	-.09*** (-4.12)	-.11*** (-4.93)	-.10*** (-4.67)
$\frac{\text{AdvancedCountryFDI}}{\text{Assets}}$	.02 (1.48)	.02* (1.71)	.02* (1.73)	.01 (.89)
$\frac{\text{Advanced CountryFDI}}{\text{Assets}}*\frac{\text{RDStock}}{\text{Assets}}$	.01 (.86)	.01 (.64)	.02 (.75)	.02 (.94)
$\frac{\text{DevelopingCountryFDI}}{\text{Assets}}$	.02* (1.69)	.03* (1.89)	.03* (1.75)	.01 (.93)
$\frac{\text{DevelopingCountryFDI}}{\text{Assets}}*\frac{\text{RDStock}}{\text{Assets}}$	.01 (.54)	.01 (.39)	.01 (.67)	.01 (.44)
RER	.02 (1.20)	.02* (1.73)	.01 (.96)	.02 (1.38)
$\text{RER}*\frac{\text{AdvancedCountryFDI}}{\text{Assets}}$	.01 (.04)	01 (.94)	.01 (.18)	.01 (.63)
$\text{RER}*\frac{\text{DevelopingCountryFDI}}{\text{Assets}}$	-.01 (-.77)	-.01 (-1.15)	-.01 (-.41)	-.01 (-1.21)
$\frac{\text{FirmGrowth}}{\text{Assets}}$	.10*** (4.88)	.08*** (4.10)	.10*** (4.89)	.09*** (4.41)
AR(1)	.06*** (3.32)	.06*** (3.11)	.07*** (3.43)	.05*** (3.56)
Firm Fixed Effects	Yes	Yes	Yes	Yes
F	6.88***	5.82***	6.55***	6.21***
Adj R^2	.83	.81	.85	.83
n=	1076	428	489	595

(T statistics) Heteroscedasticity-consistent standard errors used. Beta coefficients have been standardized. *
Significant at .10 level, ** at .05 level, *** at .01 level.

^ A low multinational network level for firms in low R&D intensive industries is defined as a firm with subsidiaries in 1 to 2 foreign countries, medium level is 3-5 foreign countries, high level is 6 or more foreign countries. See text for more discussion.

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