Diversification, Cost Structure, and the Risk Premium of Multinational Corporations*

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Abstract

We investigate theoretically and empirically the relationship between the geographic structure of a multinational corporation and its risk premium. Our structural model suggests two channels. On the one hand, multinational activity offers diversification benefits: risk premia should be higher for firms operating in countries where shocks covary more with the domestic ones. Second, hysteresis and potential losses induced by fixed and sunk costs of production imply that risk premia should be higher for firms operating in countries where it is costlier to enter. Our empirical analysis confirms these predictions and delivers a decomposition of firm-level risk premia into individual countries' contributions.

Keywords: Multinational firms, diversification, risk premium, stock returns.
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1 Introduction

Do firms' activities in foreign countries reduce the risk that investors bear? To address this question, we analyze how the geographic structure of a multinational corporation (henceforth, MNC) impacts its risk premium in the stock market.[1] The answer is "not necessarily", as foreign activities are also a source of risk to the investors.

Theoretically, a firm's decisions about which countries to enter affects the risk premium via two channels: operating an affiliate in a foreign country induces diversification and reduces risk exposure, but fixed operating costs and sunk entry costs generate operating leverage that increases risk exposure. Under the assumptions that agents are rational and markets are efficient, in equilibrium, risk averse agents require a risk premium that is higher the higher the risk exposure of the firms they invest into. Stock returns and risk premia are driven by the comovement between firm's cash flows and the marginal utility of the agent. We explore this comovement throughout our empirical analysis.

We focus on differences in risk premia across firms that differ in the set of countries in which they operate. To do so, we exploit a rich firm-level dataset on MNCs with detailed information about firms' foreign operations by country, accounting, and financial markets data. We find that firms operating in countries with GDP shocks that co-move more with those of the U.S. and in countries with higher fixed and sunk entry costs exhibit systematically higher risk premia.

The theoretical underpinning of our analysis is a streamlined, multi-country version of the model developed by Fillat and Garetto (2012), which links firms' international activities with their stock market returns.[2] In the model, multinational activity offers diversification potential: if the business cycles of two countries are not perfectly correlated, multinational sales diversify away the risk arising from country-specific fluctuations and reduce firms' returns in equilibrium. This mechanism, referred to as the "diversification channel", implies that, in equilibrium, MNCs should exhibit lower expected returns than non-multinational firms – all else

[1] Returns in excess of the risk-free rate define the risk premium of an asset. Here we refer to the risk premium associated to a firm's equity traded in the stock market.

[2] Our model builds on the literature on investment under uncertainty, particularly on the real option value framework developed by Dixit (1989) and Dixit and Pindyck (1994) as applied to the heterogeneous firms framework by Fillat and Garetto (2012).

equal. Within multinationals, returns should be higher for those firms operating in countries whose business cycles covary more with the one of the US. Moreover, the model introduces another channel of risk, arising from hysteresis due to sunk entry costs and potential losses induced by fixed operating costs, which make firms leveraged. Firms open affiliates abroad when prospects of growth make foreign operations profitable, but they must bear sunk entry costs to open an affiliate, and fixed costs of production. If the host country is hit by a negative shock, the affiliate may incur losses. The parent may find optimal not to exit the foreign market and bear those losses for a while, in order not to forego the sunk cost it paid to enter. The higher the fixed and sunk costs of production, the higher the potential losses and the longer the time for which a firm is willing to bear them. These potential losses are perceived as a cash flow risk by the investors. This second mechanism, that we refer to as the "fixed and sunk cost channel", implies that MNCs with affiliates in countries where entry is more costly and fixed operating costs are higher should exhibit higher stock returns than MNCs with affiliates located in countries that are more easily and cheaply accessible.

It is worth highlighting that we investigate stock returns because we are interested in the effects of multinational activities on the risk that the investors bear, not on the volatility of sales or profits of the firm. In our analysis, the investor is the representative agent and he cares about how profits and sales comove with his marginal utility, not about their volatility alone.

Our empirical analysis exploits a novel dataset obtained by merging accounting and financial data from Compustat/CRSP with the US Bureau of Economic Analysis (BEA) data on the operations of multinational corporations. The data display a large amount of variation across MNCs in terms of number, characteristics, and location of foreign affiliates, allowing us to study the cross-section of returns of MNCs and to relate it to firm- and country-level characteristics.

We start with a reduced form specification whose goal is to explore the statistical relationship between measures of diversification, entry costs, and returns. The results of our regression analysis are consistent with the predictions of the model: GDP growth covariances and entry costs in the countries in which firms have affiliates are positively correlated with the returns that firms offer in the stock market. These results are robust to controlling for the impact that potential activities in countries other than the ones currently served have on the returns of the firm (the option value).

The model at the heart of our analysis delivers a structural equation linking expected returns to firm- and country-level characteristics. By estimating this equation we are able to quantify the effect of the geographic choices of a MNC on its risk premium. This specification allows us to decompose firm-level risk premia along two dimensions. First, we compute the contribution of each host country to the firms' risk premium. Second, we separate the contribution of option value versus assets in place in explaining stock returns.

By aggregating our estimates, we show that the aggregate risk premium from multinational sales is large: a firm with affiliates in every country in our sample has, on average, expected annual returns that are 3.6 percent higher than those of a purely domestic firm. The countries that are associated with the highest risk premia are Greece, Malaysia, India, Singapore and China, while most European countries and Canada are associated with relatively low risk premia. The aggregate risk premium coming from the option value of foreign sales is smaller but also significant, at 0.5 percent, indicating that the mere possibility of entering foreign markets is a source of risk to the firm.

The question of understanding why and how average stock returns vary across firms based on certain characteristics is central to the asset pricing literature.[3] Nonetheless, very little empirical work has been done on the returns of multinational corporations. Early research examined the returns of MNCs to assess whether firms' foreign activities provide diversification benefits to their stockholders. Support for this "diversification hypothesis" is scarce: Jacquillat and Solnik (1978) regressed the returns of multinationals from nine countries on a set of market indices and found that multinational returns tended to covary most with the firm's home market, hence not providing any evidence in support of diversification. Senchack and Beedles (1980) compared the risk, returns and betas of portfolios of multinationals with portfolios of domestic and international equities and found that multinationals did not deliver diversification benefits. Using a different methodology based on mean-variance spanning tests, Rowland and Tesar (2004) also found limited evidence of

[3] An extensive literature in finance has been investigating cross-sectional differences in stock returns across firms, assets, or portfolios, identifying several variables driving returns differentials. Fama and French (1996) provide comprehensive evidence about returns differentials across portfolios formed according to particular characteristics like size and book-to-market.

diversification benefits for MNCs. More recently, using a sample of manufacturing firms from Compustat, Fillat and Garetto (2012) have shown that the stock market returns of multinational corporations are systematically higher than the stock market returns of non-multinational firms, also against what would be predicted by the diversification hypothesis. The structural model in Fillat and Garetto (2012) sheds light on this "puzzle" by introducing another channel, the fixed and sunk cost channel, that increases the risk to which MNCs are exposed compared to non-multinational firms and can potentially explain MNCs' higher returns and the lack of evidence of diversification.

Our analysis is also related to an extensive literature on foreign direct investment, which has documented important differences across firms in their choice of geographic locations,[4] and to empirical research using the BEA data on the operations of multinational corporations, starting with Kravis and Lipsey (1982) and Brainard (1997), and more recently Yeaple (2003), Helpman, Melitz, and Yeaple (2004), and Yeaple (2009). To our knowledge, this is the first paper to link the geographic information contained in the BEA data to stock market data from CRSP.[5]

Our work is also related to a strand of literature in corporate finance that studies the linkages between international activity and stock market variables.[6] Our analysis departs from these contributions by taking into account the full geographic structure of the firm as a determinant of stock returns, and by starting from the predictions of a structural model to identify the economic forces that link MNCs' structure and stock returns in the data.

The rest of the paper is organized as follows. Section 2 lays out the theoretical model at the basis of our empirical specification. Section 3 describes the financial data and the data on the operations of multinational corporations. Section 4 presents our baseline empirical specifications and results, and Section 5 concludes. The derivation of the model and several robustness exercises are relegated to the Appendix.

[4]See Helpman, Melitz, and Yeaple (2004), and more recently Yeaple (2009), Chen and Moore (2010), or Alfaro and Chen (2013).

[5]Branstetter, Fisman, and Foley (2006) merge the BEA data on the operations of U.S. multinationals with accounting data from Compustat to examine the effect of IPR reforms on technology transfer within multinational corporations.

[6]See Denis, Denis, and Yost (2002) and Baker, Foley, and Wurgler (2009).

2 The Returns of Multinational Corporations

The model we develop in this section is designed to illustrate how the stock returns of multinational corporations depend on a set of variables related to their international activities across countries. At the aggregate level, the model is specified as an endowment economy, consistently with consumption-based asset pricing models. We take aggregate consumption as given, and focus on modeling the production side of the economy, where firms' valuations are affected by firm-level and country-level characteristics. Firms' valuations and the covariance of their profits with the agents' stochastic discount factor drive the returns.[7]

The model is a multi-country extension of the framework developed in Fillat and Garetto (2012).[8] The economy is composed by $N+1$ countries: a Home country, that we denote by h, and N potentially asymmetric foreign countries, that we denote by $j = 1, ...N$. Time is continuous. Each country is hit by aggregate shocks to consumption growth (or aggregate demand). We proxy aggregate consumption growth with GDP growth due to data availability for all the countries that are present in our data set. Henceforth, we do not make any distinction between consumption and GDP growth. GDP growth rates are described by the following geometric Brownian motions:[9]

$$\frac{dY_i}{Y_i} = \mu_i dt + \sigma_i dz_i, \text{ for } i = h, j \text{ and } j = 1, ...N \quad (1)$$

where $\mu_i \geq 0$, $\sigma_i > 0$. Y_i denotes the GDP level in country i and dz_i is the increment of a standard Wiener process. GDP growth processes may be correlated across countries: let $\rho_j \in [-1, 1]$ denote the correlation between the GDP growth of

[7] Intertemporal marginal rate of substitution and stochastic discount factor are used interchangeably in the macro-finance literature and they refer to the same concept.

[8] While Fillat and Garetto (2012) distinguish entry in foreign markets according to whether it happens via export or FDI, due to data availability in this paper we disregard the decision to export and focus on the choice of becoming a multinational corporation.

[9] It is well accepted that equilibrium consumption growth follows a random walk since Hall (1978). The unit root process is necessary to generate an option value component in the value of the firm. We take standard deviations and correlations of consumption growth as exogenous parameters, and model firm's decisions depending on those parameters. In general equilibrium, firms' international activities could have an impact on host country-level variables, hence the consumption growth correlations ρ_j would be endogenous. In our data, total MNCs' sales to a host country are typically a very small fraction of the host country's GDP (3.3% on average), hence we argue that it is acceptable to take the consumption growth correlations as exogenous. For a different approach where country-specific volatility is endogenous and affected by international activity, see **?**).

the Home country and the one of country j.

International asset markets are incomplete, and there is no possibility of consumption smoothing over time. Asset prices, as opposed to goods quantities, reflect the willingness to transfer wealth from period to period. We assume complete home bias in the asset markets, in the sense that firms are owned by agents in country h, who discount cash flows with the following discount factor M_h:[10]

$$\frac{dM_h}{M_h} = -r_h dt - \gamma \sigma_h dz_h \tag{2}$$

where r_h denotes the risk-free rate in the Home country and γ denotes risk-aversion, and dz_h is the same aggregate shock as in (1) for the home country h.[11]

Aggregate output in each country Y_i is produced by domestic firms and by the affiliates of multinational firms located in country i. Each firm chooses its optimal production level in each country as a share of total output Y_i.

Let $\mathcal{V}$ denote the value of a firm. $\mathcal{V}$ depends on firm-specific characteristics, like productivity, size, employment, etc., and on country-specific characteristics, like the GDP growth processes of the countries where it operates, entry costs, and other operating costs. For this reason, we write $\mathcal{V} = \mathcal{V}(a, \bar{Y}, \bar{X})$, where a denotes firm-specific characteristics, $\bar{Y} = (Y_h, Y_1, ...Y_N)$ denotes a vector whose entries are the realizations of GDP described by (1), and $\bar{X} = (X_h, X_1, ...X_N)$ denotes a vector whose entries are other country-specific characteristics affecting firm value. Consistently with the literature on selection into export and multinational activity and with the empirical evidence on firms' international dynamics, fixed operating costs of production and sunk costs of entry into a market are particularly relevant among the variables entering the vector $\bar{X}$.[12] Depending on its characteristics a, each firm

[10]The model does not allow for any possibility of international portfolio diversification, but features perfect home bias in equity portfolios. This assumption is not at odds with the data: Tesar and Werner (1998) provide evidence of an extreme home bias in equity portfolios: about 90% of U.S. equity was invested in the U.S. stock market in the mid-1990s. Atkeson and Bayoumi (1993), Sorensen and Yosha (1998), and Crucini (1999) present evidence supporting the assumption of international market incompleteness.

[11]The process for the stochastic discount factor M_h is an equilibrium object that is be derived in this particular case from agents maximizing CRRA utility over aggregate consumption. Equation (2) represents the dynamics of the representative agent's marginal utility.

[12]Helpman, Melitz, and Yeaple (2004) model selection into multinational activity as motivated by the interaction of high productivity and fixed costs. The importance of fixed costs for multinational production is documented in the empirical work of Brainard (1997). Roberts and Tybout (1997) and Das, Roberts, and Tybout (2007) show the empirical relevance of sunk costs for entry in

self-selects into the set of countries where its operations are profitable. Given demand for each firm's product in each country, a drives both the intensive margin of production in each country and the extensive margin of entry in different countries.

We assume that firms' activities are independent across countries, *i.e.* each firm makes entry and production decisions country-by-country.[13] Since the decision of setting up a foreign affiliate is endogenous and affected by uncertainty through the country-specific GDP growth shocks, we must consider the fact that a firm's valuation is affected both by its assets currently in place in various countries, and by the possibility of entering new countries (its option value).[14] For these reasons we write the value of the firm as:

$$\mathcal{V}(a, \bar{Y}, \bar{X}) = V_h(a, Y_h, X_h) + \sum_{j \in \mathcal{A}} V_j(a, Y_j, X_j) + \sum_{j \notin \mathcal{A}} V_j^o(a, Y_j, X_j) \tag{3}$$

where $V_h(a, Y_h, X_h)$ denotes the firm's value of domestic sales, $V_j(a, Y_j, X_j)$ denotes the value of the firm's affiliate sales in country j if the firm has an affiliate there, and $V_j^o(a, Y_j, X_j)$ denotes the option value of the firm's affiliate sales in country j if the firm does not have an affiliate there. $\mathcal{A}$ denotes the set of countries where the firm has affiliates ($\mathcal{A} \subseteq \{1, 2, ...N\}$).

Given that we do not observe exit in our sample, we assume that all firms sell in the Home country. Conversely, firms' entry and exit into foreign markets are endogenous and observable. For these reasons, over a generic time interval Δt we

foreign markets.

[13]The model does not accommodate the possibility of bridge multinational production, whereby foreign affiliates of a multinational corporation export to third countries. As a result, a multinational firm is essentially a "portfolio" of assets in different countries, linked only by the fact that each segment of the firm operates with the same firm-level characteristics a.

[14]To understand why the option value enters the value of a firm, it is useful to recall that the value function of a firm is the present discounted value of its profits over an infinite time horizon. The possibility that a firm not selling in a market today maybe will do so in the future has a value and hence must be reflected in the value function. Dixit (1989) provides a seminal treatment of the option value of entry in a model of investment under uncertainty and sunk costs.

can express the components of a firm's value function as:

$$
\begin{aligned}
V_h(a,Y_h,X_h) &= \pi_h(a,Y_h,X_h)M\Delta t + E[M\Delta t \cdot V_h(a,Y_h',X_h|Y_h)] && (4)\\
V_j(a,Y_j,X_j) &= \max\left\{\pi_j(a,Y_j,X_j)M\Delta t + E[M\Delta t \cdot V_j(a,Y_j',X_j|Y_j)]\ ;...\right.\\
&\quad \left. ...\ V_j^o(a,Y_j,X_j)\right\} && (5)\\
V_j^o(a,Y_j,X_j) &= \max\left\{E[M\Delta t \cdot V_j^o(a,Y_j',X_j|Y_j)]\ ;\ V_j(a,Y_j,X_j) - F_j\right\} && (6)
\end{aligned}
$$

where $\pi_i(a,Y_i,X_i)$ denotes the flow profits of the firm in country i (for $i = h, j$ and $j = 1, ...N$), F_j denotes the sunk entry cost that a firm has to cover to open an affiliate in country j, and the terms in expectations indicate the firm's continuation value in the event in which its status in a country does not change (*i.e.* it does not enter or exit the country).

We show in the Appendix that, in the continuation regions, the three value functions above satisfy the following no-arbitrage conditions:

$$
\begin{aligned}
\pi_h - r_h V_h + (\mu_h - \gamma\sigma_h^2)Y_h V_{hY}' dt + \frac{1}{2}\sigma_h^2 Y_h^2 V_{hY}'' &= 0 && (7)\\
\pi_j - r_h V_j + (\mu_j - \gamma\rho_j\sigma_h\sigma_j)Y_j V_{jY}' dt + \frac{1}{2}\sigma_j^2 Y_j^2 V_{jY}'' &= 0 && (8)\\
-r_h V_j^o + (\mu_j - \gamma\rho_j\sigma_h\sigma_j)Y_j V_{j\ Y}^{o\prime} dt + \frac{1}{2}\sigma_j^2 Y_j^2 V_{j\ Y}^{o\prime\prime} &= 0 && (9)
\end{aligned}
$$

where the dependence of profits and values on $(a, \bar{Y}, \bar{X})$ has been suppressed to ease the notation.[15]

By combining equations (7)-(9) one can obtain the following expression for a multinational's expected returns:[16]

$$
\begin{aligned}
E(ret) \equiv \frac{\pi_h + \sum_{j\in\mathcal{A}} \pi_j + E(d\mathcal{V})}{\mathcal{V}} &= r_h + \gamma\left(\frac{\sigma_h^2 Y_h V_{hY}'}{\mathcal{V}} + \sum_{j\in\mathcal{A}} \sigma_h\sigma_j\rho_j \frac{Y_j V_{jY}'}{\mathcal{V}} + ...\right.\\
&\quad \left. ... \sum_{j\notin\mathcal{A}} \sigma_h\sigma_j\rho_j \frac{Y_j V_{j\ Y}^{o\prime}}{\mathcal{V}}\right). && (10)
\end{aligned}
$$

[15]Given functional forms for each firm's demand in each market, one could solve explicitly for the value functions using a system of value-matching and smooth-pasting conditions. The explicit solution of this problem is beside the scope of this paper. See Fillat and Garetto (2012) for details.

[16]Details of the calculations are relegated to the Appendix.

Equation (10) summarizes the implications of the model for the dependence of firm level returns (and hence of the risk premium $E(ret) - r_h$) on country-specific variables, and is the theoretical foundation of our empirical specifications. The risk aversion, γ, captures the price of risk for the representative agent, or how much does she need to be rewarded for additional exposure to risk incurred by the firms. The terms in the parenthesis capture the three sources of risk that a firm is exposed to: domestic risk, risk from the countries where the firm has an affiliate, and risk from the countries where the firm has the option of opening an affiliate, respectively. The first term of the expression describes the contribution of domestic activities to the returns, and is common to all firms in our sample. The last term captures the option value of entry in new countries, which we will approximate in our empirical analysis. We now focus on the second term, which we refer to as "assets in place". This term captures the exposure of multinational firms to the risk that arises from having affiliates in foreign countries, and generates two testable implications.

First, equation (10) indicates that expected returns should be higher the higher the covariances $\sigma_h \sigma_j \rho_j$ between the Home country's GDP growth rate and the GDP growth rates of the host countries. This prediction summarizes the effect of diversification on returns in the model: the more the GDP growth rates of two countries covary, the smaller the amount of diversification that foreign activities provide. As a result, MNCs with affiliates in countries whose GDP growth rates comove more with the U.S. GDP growth rate are less diversified (and more risky) than MNCs with affiliates in countries whose GDP growth rates comove less with that of the U.S.. Riskier firms command higher expected returns in equilibrium.

Second, the fact that a firm has activities in a foreign country indicates that the firm paid an entry cost to establish an affiliate there and is bearing fixed operating costs.[17] These costs, which are independent of firm size, affect a firm's value but not its derivative V'. In other words, the elasticity of the value function in host country j (the term $Y_j V'_{jY}/\mathcal{V}$) is increasing in the fixed and sunk costs of production, and equation (10) indicates that expected returns should be higher the higher the fixed and sunk costs of production in the host countries where the firm operates. The

[17]Due to data availability, we consider a firm to be operating in country j only if it has an affiliate there. If a firm only exports to a country, we have no information about its activities there, hence we cannot include the country in the set $\mathcal{A}$. This leads us to underestimate the contribution of assets in place to the risk premium of the firm, and to interpret our results as a lower bound of the amount of riskiness that operating in foreign markets generates.

economic intuition behind this prediction is the following: due to sunk entry costs and fixed costs of production, if a host country is hit by a negative shock, the foreign affiliate of a multinational firm may incur losses. The parent may find optimal not to exit the foreign market and bear those losses for a while, in order not to forego the sunk cost it paid to enter. The extent and duration of these losses are positively correlated with the size of fixed and sunk costs. Investors perceive as a risk the possibility of losses, and this cash flow risk must be rewarded by higher expected returns in equilibrium.

The analysis in Section 4 tests the empirical validity of these predictions.[18] Our empirical analysis is designed to test the importance of the channels that the model proposes for the cross-section of mean returns of MNCs. A large literature in finance has studied the risk-return trade-off by locating assets on a mean-variance frontier, whereby assets displaying higher mean returns should also display more volatile returns. However, the mean-variance relationship does not necessarily hold when multiple risk factors are considered, as it is the case in our model. In fact, in our sample, the mean and the volatility of returns have only a weak, albeit positive, correlation (0.38).

It is important to notice that, even if equation (10) is derived from a simple CCAPM framework, the qualitative predictions of the model are robust to alternative, more sophisticated specifications, namely the inclusion of permanent shocks to GDP growth rates ("long-run risk"), disaster risk, recursive preferences, and the addition of firm-specific productivity shocks. These alternative specifications affect the solution of the value functions, but not the general dependence of returns on covariances and fixed and sunk costs.

3 Data

To test the predictions of the model outlined in Section 2, we need information on multinational companies' operations across countries and on their stock returns. We

[18]Our empirical analysis focuses on the relationship between the extensive margin of entry by country and the returns. If one had to parameterize the model using CES demand functions and linear cost functions (like in most of the new trade literature), the model would also imply that – keeping the extensive margin of countries constant – returns should be increasing in the unit cost of the firm. For the purpose of this paper we don't test this prediction but we limit our analysis to test the extensive margin predictions of the model.

also need country-level data on the covariance of GDP growth rates and on fixed and sunk costs of production.

The Bureau of Economic Analysis collects firm-level data on U.S. multinational companies' operations in its annual surveys of U.S. direct investment abroad. All U.S. headquartered firms that have at least one foreign affiliate and meet a minimum size threshold are required by law to respond to these surveys. The data include detailed information on the firms' operations both in the U.S. and at their foreign affiliates. Our empirical analysis uses information from the BEA data on the countries in which each firm has operations. We also use data on the sales by each foreign affiliate, as well as total global sales by the MNCs to control for the scale of operations in each location and by each firm. The BEA surveys cover both manufacturing and service industries, classified according to BEA versions of 3-digit SIC codes. We include firms in all industries and use data from 1987 through 2009.

Stock market returns data are obtained from the Center for Research in Security Prices (CRSP), which includes information on all firms that are publicly traded in the U.S. stock market.[19] We match the firm level stock return data from CRSP with the firm level data on multinational operations from the BEA to obtain a set of publicly traded US-headquartered multinational firms. To ensure that outlier firms are not biasing our results, we drop observations that fall into the highest or lowest 5 percent in terms of their annual stock market returns. The result is a sample of more than 3200 multinational firms operating in 118 countries and 148 industries over the 23 year period.

The model emphasizes two channels that link firms' foreign activities with their stock market returns. To measure the diversification channel, we construct a firm-level measure, Cov_{ft}, of the extent to which GDP growth in each host country of firm f co-varies with GDP growth in the home country (the U.S.). We begin with data on real GDP growth rates by country from the IMF. We assume that expected GDP growth is constant. We then compute the covariance between annual U.S. GDP growth and annual GDP growth in each country over our sample period (1987-2009), resulting in a time-invariant GDP growth covariance measure for each country, Cov_j. We use these covariances together with information on firm f's

[19]The CRSP population includes NYSE, AMEX, and NASDAQ. We identify firm-level returns with the returns of the firm's common equity. Stock market expected returns in excess of the risk free rate are the empirical counterpart of the risk premium.

affiliate sales to construct our firm-level measure as a weighted average of the GDP growth covariances for the countries in which the firm has foreign affiliates, where the share of sales by the affiliates in each country are used as weights:

$$Cov_{ft} = \sum_{j \in \mathcal{A}_f} s_{fjt} Cov_j \tag{11}$$

where Cov_j is the country-level GDP growth covariance and s_{fjt} is the share of sales by foreign affiliates of firm f that were produced in country j in year t.[20]

To measure the fixed and sunk cost channel, we use country level data on the cost of starting a business from the World Bank's Doing Business database. Doing Business records the costs and procedures officially required, or commonly done in practice, for an entrepreneur to start up and formally operate an industrial or commercial business. The information used to construct these data comes from official laws, regulations and publicly available information on business entry, and the data are verified in consultation with local incorporation lawyers, notaries and government officials. The database includes information on various aspects of the cost of starting a business, including initial capital requirements, license and registration fees, number of start up procedures that must be undertaken, and the amount of time these procedures usually require. Our primary specification uses the paid in minimum capital requirement. Doing Business defines this as "the amount that the entrepreneur needs to deposit in a bank or with a notary before registration and up to 3 months following incorporation, recorded as a percentage of the economy's income per capita". We convert this measure to a US dollar value by multiplying by income per capita. For robustness checks we also use the number of procedures required to start a business, and the number of days these procedures take to complete.[21] We use these variables to construct a firm-level measure of sunk costs. As with the GDP growth covariances, the firm-level sunk cost variable is a weighted average of the doing business measures for the countries in which the firm has foreign affiliates, where the share of sales by the affiliates in each country are used as

[20]Weighting the covariances by sales shares is the simplest way to obtain firm-level measures of covariances with host countries. In equation (10) the covariances enter in a different way, where the "weights" that the model generates are the country-specific elasticities of the value function. The model-based estimation we perform in Section 4.3 mimics more closely the structure of equation (10). Appendix B reports robustness test using GDP growth correlations rather than covariances.

[21]Results of these robustness checks are reported in Appendix B.

weights:

$$F_{ft} = \sum_{j \in \mathcal{A}_f} s_{fjt} F_j \tag{12}$$

where F_j is a measure of cost to start a business in country j.

Table 1: Summary Statistics.

	N. Obs	Mean	Std. Dev.	Min	Max
ALL FIRMS					
Tot. firm sales ($b)	21809	4.952	18.3	(confidential)	
Tot. affiliate sales by firm ($b)	21809	1.82	10.3	(confidential)	
N. of affiliates	21809	19.385	52.661	(confidential)	
N. of host countries	21809	9.428	12.437	(confidential)	
Annual Returns (%)	21809	11.296	42.015	-98.986	1315.79
Covariance (Cov_{ft})	21809	2.718	1.099	-6.585	8.096
Min. paid in capital (F_{ft}, $)	21809	4007.04	5247.67	0	75531.34
HORIZONTAL FIRMS					
Tot. firm sales ($b)	5688	2.656	9.125	(confidential)	
Tot. affiliate sales by firm ($b))	5688	0.408	1.67	(confidential)	
N. of affiliates	5688	11.656	55.406	(confidential)	
N. of host countries	5688	4.12	6.025	(confidential)	
Annual Returns (%)	5688	11.771	49.69	-96.073	1315.79
Covariance (Cov_{ft})	5688	2.725	1.205	-2.105	8.096
Min. paid in capital (F_{ft}, $)	5688	2559.17	5139.04	0	60266.7

Table 1 provides summary statistics for the firms in our dataset. We use data on the entire sample of firms, as well as data on only the subset of firms that can be classified as purely horizontal multinationals. In our model FDI sales are only of the horizontal type, so by restricting our sample to purely horizontal firms we prevent the possibility that our results are biased by different motives for FDI, which could have different implications for risk. We define purely horizontal firms as those firms for which at least 99 percent of sales by foreign affiliates are to the local market in which the affiliate resides. Using this definition, about 26 percent of the firms in our sample can be classified as purely horizontal MNCs. Most MNCs exhibit some combination of horizontal, vertical, and export platform FDI. In our dataset, about 94 percent of the firms have at least some horizontal sales, 66 percent have some sales back to the U.S., and 65 percent have some sales to third countries. In terms of total volumes of sales, about 64 percent of all sales by foreign affiliates are horizontal, about 10 percent are vertical, and about 26 percent are export platform.

We report summary statistics for this subset of horizontal firms as well as for the full sample of firms in Table 1. The average firm in our sample has about 19 foreign affiliates located in 9 different countries with total global sales of 5 billion and an 11.3 percent annual stock market return. The average covariance between the GDP growth in the U.S. and in the host countries is about 2.7. The purely horizontal firms have an average of 12 affiliates in 4 countries with global sales of about 2.7 billion and an 11.7 percent annual stock market return. Purely horizontal firms are on average smaller than firms in the full sample, but the summary statistics on returns are comparable. The average GDP growth covariances are similar for both sets of firms, while sunk costs are lower for the purely horizontal firms.[22] This is consistent with a proximity-concentration model of FDI, in which high entry costs are a deterrent to horizontal FDI.

4 The Role of Diversification and Cost Structure: Empirical Results

4.1 Reduced-Form Estimates

We test here the predictions of the model described in Section 2. The goal of the reduced form specification is to establish a statistical relationship between firm-level stock returns and the relevant explanatory variables that are suggested by the model: GDP growth covariances across countries and fixed and sunk costs of production. Our baseline specification is given by:

$$ret_{ft} = \alpha + \beta_1 Cov_{ft} + \beta_2 F_{ft} + \beta_3 X_{ft} + \delta_k + \delta_t + \varepsilon_{ft} \tag{13}$$

[22]It has to be noted that our measures of sunk costs are surprisingly small compared to the size of the firms in the sample. For this reason, we are not pushing the quantitative interpretation of the correlations between returns and sunk costs that are the results of our reduced form estimates. We argue that these sunk costs measures provide reasonable proxies for the cross-country variation of sunk costs, even if the actual level of sunk costs may be orders of magnitude higher.

where ret_{ft} is the annual stock return of firm f in year t, Cov_{ft} is the weighted covariance of GDP growth between the U.S. and the countries in which firm f has affiliates, and F_{ft} is the weighted cost of capital required to start a business in the countries in which firm f has affiliates. X_{ft} is a vector of firm level controls, including the total sales of the firm, the number of countries in which it has affiliates, the market *beta* of the individual firm to capture its exposure to systematic risk,[23] and gravity variables like GDP and distance from the host countries. Because the industry in which a firm operates is likely to impact returns, we also include fixed effects δ_k for each firm's primary industry.[24] We include year fixed effects δ_t to interpret our results as cross-sectional. ε_{ft} is an orthogonal error term.

In the model, GDP shocks in host countries impact U.S. MNCs through local demand, which should have a greater effect on firms that rely more heavily on sales to the local market, rather than sales back to the U.S. or to third countries (ours is primarily a model of horizontal, rather than vertical, FDI). For this reason, our reduced form estimates focus on firms that are purely horizontal in structure.

Table 2 shows the results. We begin by adding the two variables Cov_{ft} and F_{ft} separately. Column I shows the result of regressing returns on the covariance variable. As predicted, the coefficient on the variable measuring how much comovement there is between the U.S. and the countries in which a firm operates, Cov_{ft}, is positive and significant. This implies that stock returns are higher (lower) for MNCs with affiliates in countries where GDP growth co-varies more (less) with growth in the U.S.. Column II of Table 2 shows the results of regressing returns on our proxy for the entry costs. As predicted, the coefficient on the measure of sunk costs, F_{ft}, is positive and significant.[25]

Column III of Table 2 controls for both the covariance of GDP growth and

[23]The market *beta* of the individual firm is obtained by regressing firm-level returns on the aggregate return on the market portfolio. One time-series regression for each firm delivers each firm's equity *beta*.

[24]It is possible that the covariances of GDP growth shocks vary by industry, or that firms in certain industries are more likely to enter more or less risky countries. The industry fixed effects control for the time-invariant components of these industry differences. Addressing more complex components of industry level variation and decomposing risk by industry are topics that we plan to pursue in future work.

[25]Our measures of covariances and entry costs are composite variables which include both variation in the covariances and entry costs themselves as well as variation in the sales shares that we use as weights. Simply clustering the standard errors by country or firm would not address these multiple sources of variation. Instead, we report bootstrapped standard errors.

Table 2: The relationship between annual returns, GDP growth covariances, and entry costs.

	I	II	III
covariances (Cov_{ft})	1.465**		1.700**
	(0.661)		(0.693)
entry costs (F_{ft})		0.0004**	0.0005**
		(0.0002)	(0.0002)
industry and year FE	YES	YES	YES
N	5658	5658	5658
R-sq	0.0731	0.0737	0.0750

Notes: *,** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Additional controls (non reported) include: firm total sales, number of host countries, firm market *beta*, host countries' GDP, distance from the host countries, industry and year fixed effects. Bootstrapped standard errors are in parentheses.

our proxy for sunk costs. The results for these measures still hold when both are included. All the specifications shown control for the total global sales of the firm and for standard "gravity" variables like GDP and distance from host countries. Total sales capture the scale of firm activity, and have also been shown to be highly correlated with other factors, such as productivity, that may affect returns. Gravity variables don't have significant effects on returns.[26]

Our results confirm the importance of cross-country GDP growth covariances and entry costs into the host countries for the stock returns of U.S. multinationals. These results provide a "first pass" of a theory built on those fundamentals, but disregard the fact that – according to equation (10) – GDP growth correlations and entry costs in the countries in which the firm does not have affiliates also matter, through the option value term. The two-step model that we present in the next section controls for the components of the option value term by building proxies based on the estimated probabilities that firms open affiliates in given countries.

[26]The full table of results with all the coefficients reported is shown in Appendix B, together with the results with a battery of additional controls.

4.2 Two-Step Estimates

In this section we augment our reduced form specification to include proxies for the option value component of returns. Equation (10) shows that GDP growth covariances and entry costs matter not only for the value of assets in place, in the countries in which firms have affiliates, but also for the option value of entering new countries.

The difficulty in measuring the contribution of these variables to the returns through the option value is that we cannot construct firm-level measures like (11) and (12) since firms do not have sales in these countries. In order to proxy for the contribution of correlations and entry costs to the option value of the firm, we use a two-step approach. In the first step, using a separate sample of affiliate-level data, we estimate the probability that each firm will have an affiliate in each country using standard predictors of FDI activity. In the second step, we estimate the impact of the characteristics of countries in which the firm does have affiliates on annual returns, controlling for characteristics of the countries where the firm does not have any affiliates. We use the predicted probabilities of entering each country from the first step as weights in constructing these characteristics.

The first step estimation draws from the literature on the determinants of FDI. According to the knowledge capital model developed by Carr, Markusen, and Maskus (2001) and Markusen and Maskus (2002), the volume of FDI activity between two countries depends on the sum of the GDPs of the countries, the squared difference in their GDPs, the difference in skilled labor endowments, and trade costs. The proximity-concentration model developed by Brainard (1997) and Helpman, Melitz, and Yeaple (2004) suggests that a firm's decision to engage in FDI is a function of proximity, which we proxy with distance, and market size, measured by the sum of U.S. GDP and the GDP of the host country. Data on these variables are compiled from several sources. Information regarding real GDP and trade barriers come from the Penn World Tables. Trade costs are measured using standard definitions of openness: 100 minus the trade share of total GDP. Skill differences are measured using estimates of average educational attainment by Barro and Lee (2010).

When considering the likelihood of entering a new country, it is important to also consider where the firm already has foreign affiliates. Work by Ekholm, Forslid, and Markusen (2007) and Mrazova and Neary (2011) has demonstrated the importance of export platform FDI, that is, firms choosing to use one foreign affiliate to serve multiple countries rather than locating an affiliate in each country. This would suggest that, under certain conditions, already having an affiliate in the same region may reduce a firm's incentives to enter a neighboring country. On the other hand, Chen (2011) emphasizes the interdependence of location choices across affiliates of the same MNC. She finds that the impact of already having a nearby affiliate can be negative (in the case of export platform FDI) or positive, as is the case when firms ship components between affiliates and thus benefit from proximity.

Even if our structural model does not allow for export platforms or intrafirm trade in inputs, controlling for the presence of other affiliates in the region is important empirically. In our first step probit regression we include a dummy variable that equals one if the firm had an affiliate in the region in year $t-1$. To avoid placing strong restrictions on what constitutes a region, we define regions broadly as either Europe, Asia, NAFTA, Central and South America, Africa, and the Middle East. The estimating equation is:

$$A_{fjt} = \alpha + \beta_1 W_{jt} + \beta_2 Region_{fj,t-1} + \delta_t + \varepsilon_{fjt} \tag{14}$$

where A_{fjt} is a dummy variable that equals 1 if firm f has an affiliate in country j in time t. W_{jt} is a vector of the knowledge capital and proximity-concentration variables described above, including $ln(dist)_j$, $ln(sumgdp)_{jt}$, $ln(gdpdif^2)_{jt}$, $ln(skilldif)_{jt}$, and $ln(tradecost)_{jt}$. $Region_{fj,t-1}$ is a dummy variable that equals one if firm f had an affiliate in the region in which country j is located at time $t-1$. We estimate equation (14) using both the full sample and the sample of purely horizontal firms.

Table 3 shows the results of this probit regression. When considering the possible countries in which a firm may operate, we limited the sample to the top 50 destination countries, which account for 96 percent of all foreign activity by U.S. firms. Consistent with the knowledge capital and proximity-concentration models, these explanatory variables are significant predictors of whether or not a given firm will have an affiliate in a given country.

For each firm, we use these first step results to compute the predicted probability of entering each country in which the firm does not currently have an affiliate. We then construct a weighted average of the GDP growth covariances between the U.S. and the countries in which the firm does not have affiliates, using the predicted

Table 3: First step estimation: selection into FDI.

	ALL FIRMS	HORIZONTAL FIRMS
$ln(distance)$	-0.133**	-0.174**
	(0.068)	(0.071)
$ln(sumgdp)$	8.634***	9.14***
	(2.159)	(2.610)
$ln(gdpdif^2)$	1.991***	2.117***
	(0.633)	(0.767)
$ln(skilldif)$	-0.039	-0.057
	(0.041)	(0.051)
$ln(tradecost)$	-0.027**	-0.027**
	(0.012)	(0.014)
$Region^f_{t-1}$	0.391***	0.293***
	(0.033)	(0.038)
Year FE	YES	YES
N	2843508	1391552
Pseudo R-sq	0.1017	0.1085

Notes: ** and *** indicate significance at the 5 and 1 percent levels, respectively. Standard errors clustered by country are in parentheses.

probabilities as weights.

Using the results of the probit to proxy for the option value is consistent with the model we developed in Section 2. According to the theory, the option value of a firm in a foreign country is higher the likelier a firm is to enter a given country. In the language of the model, a firm enters a country when its expected profits in that country are above some threshold (that one can derive explicitly given functional forms for preferences and technologies). The estimated probability of entering a country that results from the probit can then be interpreted as a measure of how close a firm is to the entry threshold and hence of how important the option value of entering that country is.

The weighted covariance of GDP growth between the U.S. and countries in which the firm does not currently have affiliates is calculated as:

$$\rho^o_{ft} = \frac{\sum_{j \notin \mathcal{A}} prob^f_{jt} Cov_j}{\sum_{j \notin \mathcal{A}} prob^f_{jt}} \tag{15}$$

where $prob^f_{jt}$ is the predicted probability that firm f has an affiliate in country j in time t from the first step estimation and Cov_j is the covariance of GDP growth between the U.S. and country j. We construct a similar measure for the cost of capital required to start a business in the countries in which the firm does not currently have affiliates.

Table 4: Summary statistics by affiliate presence.

	Covariance	Entry cost ($)
ALL FIRMS		
Countries with affiliates	2.718	4007.04
Countries without affiliates	2.359	6645.29
HORIZONTAL FIRMS		
Countries with affiliates	2.725	2559.17
Countries without affiliates	2.322	6605.01

Table 4 shows the weighted average GDP growth covariances and cost of capital required to start a business for the countries in which a firm does and does not have affiliates. For the average horizontal firm in our sample, the GDP growth covariance for countries in which the firm has affiliates is 2.735. The weighted covariance of shocks for countries in which they do not have affiliates is 2.322. These numbers suggest that U.S. MNCs don't choose their affiliates' host countries to diversify away risk. If this were the case, we would observe them self-selecting into countries whose GDP growth covaries less with the U.S. GDP growth. The weighted cost of capital required to start a business in the countries where the firms have affiliates is $2,559. For countries in which they do not have affiliates, that cost is $6,605. These numbers indicate that U.S. MNCs privilege locations with lower entry costs. The same patterns hold for the full sample of firms.

Table 5: Second step estimation: the relationship between annual returns, GDP growth covariances, and sunk costs, controlling for the option value of entering new countries.

	I	II	II
covariances (Cov_{ft})	1.48**		1.801**
	(0.673)		(0.724)
entry costs (F_{ft})		0.0004*	0.0004*
		(0.0002)	(0.0002)
covar. non-aff. (Cov^o_{ft})	-0.183		1.926
	(1.567)		(14.651)
entry costs non-aff. (F^o_{ft})		-0.0008*	-0.001**
		(0.0005)	(0.0005)
industry and year FE	YES	YES	YES
N	5486	5486	5486
R-Sq	0.0748	0.0763	0.0794

Notes: *,** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Additional controls (non reported) include: firm total sales, number of host countries, firm market *beta*, host countries' GDP, distance from the host countries, industry and year fixed effects. Bootstrapped standard errors are in parentheses.

Table 5 shows the reduced form results controlling for characteristics of the countries in which each firm does not have affiliates.[27] The effects of GDP growth covariances and of the sunk cost measures are qualitatively and quantitatively similar to the results from Table 2. The effect of the GDP growth covariances and entry costs on the returns via the option value component should have the same sign as the effect of these forces through the component measuring assets in place. This is true for the covariances Cov^o_{ft}, which exhibit a positive, albeit non significant coefficient in the most inclusive specification, but not for the sunk costs, F^o_{ft}, whose coefficient is negative and significant.

[27]The use of the predicted probabilities to construct the variables Cov^o_{ft}, F^o_{ft} implies a generated regressor problem. As illustrated by Inoue and Solon (2010), there are two ways to correct the standard errors for the presence of generated regressors: consistently estimating the correct theoretical covariance matrix, or bootstrapping. We report bootstrapped standard errors together with our estimates.

4.3 Model-Based Estimates

The reduced form regressions we presented above confirm the presence of a statistical relationship between GDP growth covariances, sunk and fixed costs of production and the stock returns of multinational corporations. We now move to a more structural approach, which is derived closely from the theoretical relationship that the model delivers, equation (10). The model-based analysis presented here allows us to accomplish two tasks. First, we are able to decompose the risk premium into the separate contributions of individual host countries. Second, we are able to quantify the contribution of assets in place versus option value to the risk premium. Asset prices are driven by the comovement of changes in the firm's value due to demand shocks at the destination country with the marginal utility of the agent in the home country. Our results allow us to decompose the risk premium by country of destination but not to formally test this asset pricing model.[28]

We can re-write equation (10) as:

$$E(ret^f) - r_h = \gamma \left[\sigma_h^2 \varepsilon_h^f + \sum_{j \in \mathcal{A}} \sigma_h \sigma_j \rho_j \varepsilon_j^f + \sum_{j \notin \mathcal{A}} \sigma_h \sigma_j \rho_j \varepsilon_j^{of} \right] \qquad (16)$$

where $\varepsilon_h^f \equiv Y_h V'_{hY}/\mathcal{V}$ is the elasticity of the firm's value with respect to GDP in the home country, $\varepsilon_j^f \equiv Y_j V'_{jY}/\mathcal{V}$ is the elasticity of the firm's value with respect to GDP in host country $j \in \mathcal{A}$, and $\varepsilon_j^{of} \equiv Y_j V^{o\prime}_{j\,Y}/\mathcal{V}$ is the elasticity of the firm's option value with respect to GDP in a potential host country $j \notin \mathcal{A}$. The term $\sigma_h^2 \varepsilon_h^f$ captures firm f's domestic risk exposure. The term $\sum_{j \in \mathcal{A}} \sigma_h \sigma_j \rho_j \varepsilon_j^f$ captures the risk exposure arising from the foreign countries where firm f has affiliates. The term $\sum_{j \notin \mathcal{A}} \sigma_h \sigma_j \rho_j \varepsilon_j^{of}$ captures the risk exposure arising from the countries where firm f does not currently operates (the option value).

In order to run a regression based on (16), we need to compute the elasticities ε_h^f, ε_j^f for $j \in \mathcal{A}$, and ε_j^{of} for $j \notin \mathcal{A}$. Since the value of the firm in the countries where it has affiliates is not observable, we proxy it with the firm's net income in country j, I_{jt}^f.[29] Since income is an imperfect measure of the value of the firm, we

[28] Fillat and Garetto (2012) explore different asset pricing models and find that most of the MNC premium is captured by operating leverage coupled with disaster risk.

[29] Net income is given by the firm's income from sales and investment minus total costs and expenses, so it is a measure of the firm's affiliate profits in country j. Net income exhibits a

assume that the true elasticity ε_j^f is given by the approximated elasticity $\tilde{\varepsilon}_j^f$ times a country-specific unobserved component ζ_j:

$$\varepsilon_j^f \equiv \zeta_j \tilde{\varepsilon}_j^f. \tag{17}$$

The approximated elasticity $\tilde{\varepsilon}_j^f$ is estimated by running one time series regression of log-income on log-GDP for each firm f and host country j. We estimate $\tilde{\varepsilon}_h^f$ in the same way, regressing the log of each firm's domestic net income on the log of U.S. GDP. The terms ζ_j account for other country-specific factors that impact the value of firms in each country and are not captured by net income. Income changes are primarily driven by shocks to local demand, however value has much broader determinants, including the expectation about future cash-flows. For example, shocks to expectations about institutional quality, rule of law, taxes, or political factors may impact the valuation of firms in a country without necessarily being reflected in their income.

Estimating the elasticity $\tilde{\varepsilon}_j^f$ using actual data on the responsiveness of each firm's income to local GDP shocks also helps us avoid potential complications resulting from differences between horizontal, vertical, and export platform FDI. GDP growth shocks in host countries impact U.S. MNCs through local demand, which should have a greater effect on firms that rely more heavily on sales to the local market. For our reduced form approach, we addressed the distinction between horizontal versus vertical sales by only including purely horizontal firms in our analysis. However, this distinction is not an issue in our model-based estimation. Here we are able to directly identify the responsiveness of the net income of each firm to fluctuations in the local market using the estimates of $\tilde{\varepsilon}_j^f$. By estimating this elasticity directly

substantial amount of variation across countries and firms. Over our sample period, about 28% of affiliate-year observations report negative net income. This observation is consistent with our model's sunk and fixed cost channel, which operates through the possibility of large cash flows fluctuations and possibly negative profits in firms' foreign locations. Net income, like flow profits at the affiliate level (which are not available from the BEA data), is not a perfect measure of the value of the firm because it disregards the option value of assets in place. Alternatively, CRSP contains data on profits and market capitalization at the firm level. This measure is also problematic as we only have information on the firm total market capitalization and total profits, not by individual affiliate or country of operation, hence the variation of ε_j^f across countries only comes from variation in Y_{jt}. To construct ε_j^f, we also need to take a stand on the status of MNCs that enter or exit countries during the sample period. In our baseline specification, we consider the effect on the returns of those assets that are in place for at least two years of sample period.

at the firm level, we pick up any differences in responsiveness to local GDP across firms that may result from being primarily horizontal or vertical in structure.

We also prefer to avoid making a strong distinction between horizontal versus vertical FDI in these estimates because most firms do not fall cleanly into one of those two categories. The majority of U.S. MNCs engage in some combination of both horizontal and vertical FDI, but most of the sales by U.S. MNCs are horizontal. For example, in our sample, 64 percent of sales by foreign affiliates of US firms are to the market in which the affiliate is located and 94 percent of the firms have at least some sales to the local markets in which their affiliates are located. Thus for our full sample of firms, almost all of them have at least some sales to the local market, and for most affiliates these local sales make up the majority of their total sales. The structural estimates that follow make use of the full sample of firms, rather than focusing on firms that only have horizontal sales.

Next, in order to estimate the full equation (16), we need to construct a proxy for the elasticity of the option value of the firm $\varepsilon_j^{of} \equiv \frac{Y_j V_{j\ Y}^{o\prime}}{\mathcal{V}}$. We cannot proxy this elasticity using foreign income measures since firms don't have income in the countries where they don't have affiliates. We proxy it instead as $\varepsilon_j^{of} \approx \zeta_j^o prob_j^f \tilde{\varepsilon}_h^f$, where $\tilde{\varepsilon}_h^f$ is the firm's elasticity of domestic net income with respect to GDP fluctuations in the U.S.. This measure captures the firm-specific component of elasticity, but does not suffer from bias due to selection into affiliate countries, as it is a purely domestic measure. $prob_j^f$ is the predicted probability that firm f will enter country j, as estimated in Section 4.2. By multiplying the domestic elasticity by the estimated probability, we assign higher responsiveness to shocks to those firms that are more likely to enter a foreign market, and for which the model predicts the option value to be more important. The term ζ_j^o accounts for other country-specific factors that may impact the value of firms in potential host country j.

This leads to the following estimation equation:

$$E(ret^f) - r_h = \psi_h \sigma_h^2 \tilde{\varepsilon}_h^f + \sum_{j \in \mathcal{A}} \psi_j \sigma_h \sigma_j \rho_j \tilde{\varepsilon}_j^f + \sum_{j \notin \mathcal{A}} \psi_j^o \sigma_h \sigma_j \rho_j prob_j^f \tilde{\varepsilon}_h^f + \nu^f \qquad (18)$$

where $\psi_h \equiv \gamma\zeta_h$, $\psi_j \equiv \gamma\zeta_j$, $\psi_j^o \equiv \gamma\zeta_j^o$.

We present the results in two parts. First, we decompose the risk premium of the firm into the contributions of each individual host country. Next, we aggregate the risk premium across countries to give an estimate of total MNCs' risk. Each of these sets of results is further decomposed into the contributions of assets in place and option value.

4.3.1 Decomposition of Risk Premium by Country

In this section we use the entire sample of firms having affiliates in the top 50 countries to estimate equation (18). We begin by estimating (18) without controlling for the option value. We do this by introducing a separate variable for each host country j which takes value $\sigma_h \sigma_j \rho_j \tilde{\varepsilon}_j^f$ if firm f has an affiliate in country j and equals zero if firm f does not have an affiliate in country j. It is worth noting that we do not identify the estimated coefficient ψ_j as the risk price (or risk aversion) because it also contains the country specific non-observed component of the firms' elasticity of value with respect to GDP. The results of this specification, which we refer to as specification I, are reported in Table 6.[30] In the left panel we report the estimated coefficients ψ_j, while in the right panel we report the corresponding risk premia $\psi_j \sigma_h \sigma_j \rho_j \tilde{\varepsilon}_j^f$. For clarity of exposition, Table 6 only reports the risk premia for ψ_j coefficients that are either statistically significant or that correspond to a country that is an especially important FDI destination for U.S. firms, such as the U.K., Mexico, and China. We report the full set of results for all countries in Appendix C.

As Table 6 shows, 11 of the ψ_j coefficients are statistically significant at least at the ten percent level. Of these 11 significant coefficients, 9 are positive and associated with a positive risk premium ($\psi_j \sigma_h \sigma_j \rho_j \tilde{\varepsilon}_j^f > 0$), indicating that the corresponding host countries are a source of risk to MNCs with affiliates there. The countries with the highest risk premia in Table 6 are Greece, Malaysia, India, Singapore, and China. Most European countries and Canada have relatively low risk premia, indicating that the effect of low sunk costs outweighs the one of high co-movement with the U.S..

Each country-specific risk premium can be interpreted as the additional annual return required to induce investors to hold shares of firms with affiliates in that country. For example, firms with affiliates in Greece have annual returns that are,

[30]Since the firm-level elasticities $\tilde{\varepsilon}_j^f$ are generated regressors, we report bootstrapped standard errors.

Table 6: Country-specific estimates of risk premia, observations at the firm-year level.

	coefficients			risk premia		
	I	II		I	II	
	ψ_j	ψ_j	ψ_j^o	$\psi_j \sigma_h \sigma_j \rho_j \tilde{\varepsilon_j}^f$	$\psi_j \sigma_h \sigma_j \rho_j \tilde{\varepsilon_j}^f$	$\psi_j^o \sigma_h \sigma_j \rho_j Z_j^f$
US Domestic	0.036***	0.058***		**0.23**	**0.371**	
	(0.010)	(0.019)				
United Kingdom	0.011	0.010	1.242**	0.060	0.055	**0.496**
	(0.010)	(0.010)	(0.611)			
Canada	0.034***	0.033***	0.622	**0.137**	**0.133**	0.136
	(0.012)	(0.012)	(0.813)			
Germany	-0.008	-0.007	1.338	-0.014	-0.012	0.292
	(0.006)	(0.007)	(1.023)			
Singapore	0.075***	0.064***	-3.223	**0.491**	**0.419**	-0.206
	(0.021)	(0.022)	(2.983)			
Ireland	0.001	0.005	-1.273	0.014	0.069	-0.396
	(0.002)	(0.004)	(0.921)			
Japan	0.011	0.011	-0.270	0.011	0.011	-0.042
	(0.009)	(0.011)	(0.926)			
Mexico	0.037	0.040	1.718	0.131	0.142	0.223
	(0.036)	(0.037)	(1.363)			
China	0.951	0.818	-5.105	0.409	0.351	-0.066
	(0.599)	(0.623)	(8.955)			
Australia	0.125**	0.109**	-0.033	**0.202**	**0.176**	-0.001
	(0.052)	(0.052)	(4.906)			
Hong Kong	0.026**	0.021	-4.075	**0.170**	0.137	-0.192
	(0.013)	(0.013)	(4.020)			
South Korea	0.148*	0.115	9.746	**0.249**	0.194	0.374
	(0.082)	(0.085)	(6.019)			
Malaysia	0.243**	0.222**	-0.685	**0.576**	**0.526**	-0.027
	(0.105)	(0.105)	(5.490)			
India	0.324*	0.259	10.480	**0.535**	0.428	0.127
	(0.189)	(0.186)	(12.477)			
Poland	-0.066*	-0.061*	11.643***	**-0.358**	**-0.331**	**0.685**
	(0.038)	(0.037)	(3.182)			
Denmark	0.158***	0.15***	2.223	**0.388**	**0.368**	0.217
	(0.046)	(0.047)	(3.624)			
Israel	-0.73***	-0.662***	-42.397***	**-0.882**	**-0.800**	**-0.540**
	(0.228)	(0.227)	(15.916)			
Greece	0.379***	0.344**	0.599	**0.674**	**0.612**	0.030
	(0.138)	(0.136)	(12.326)			
R-Sq	0.177	0.182				

Notes: *,** and *** indicate significance at the 10, 5 and 1 percent levels. Both specifications include year fixed effects and have N=25569. Bootstrapped standard errors are in parentheses.

on average, 0.67 percentage points higher than those of firms that do not have affiliates in Greece. For firms that have affiliates in the U.K., the additional annual return is only 0.06 percentage points.

The country-specific risk premia reported here are for the average firm in our sample. However, firms are very heterogeneous in terms of their responsiveness to shocks. This heterogeneity enters through ε_j^f, the elasticity of the firm's value with respect to changes in host country GDP. Thus the positive values for the contry-level risk premia indicate that firms whose values are more responsive to changes in destination countries' GDP tend to be riskier and to exhibit higher returns.

As mentioned above, the results of specification I do not take into account the contribution to the risk premium of potential host countries (the option value). This results in biased estimates of the risk premia. To address this concern, in specification II we report the results of regression (18) including the controls for the option value countries. As long as our proxy for the option value is a good one, controlling for the option value term corrects the omitted variable bias in the estimated coefficients on assets in place, ψ_j. Moreover, the difference between the R^2 in the two specifications quantifies how much more of the variance of the risk premium is explained by explicitly taking into account the option value of entering new countries using the approximation described above.

For 11 of the 14 countries that had a positive risk premium in specification I, adding the control for the option value decreases the estimated risk premium. This suggests that attempting to estimate the risk premium without controlling for the option value overestimates the risk premium. Figure 1 plots the estimated country-level contributions to the risk premium. To keep the graph legible, we've only labeled data points for the highest and lowest risk countries, as well as for the most important FDI destination countries.

In addition to their role in resolving the omitted variable bias, the option value terms are also informative themselves. In the entire sample of top 50 countries, there are 9 for which the ψ_j^o coefficient is significant; of those, 5 are associated with a positive risk premium, indicating that the mere possibility of entering those countries is a source of risk to the firm. The coefficients on the option value terms vary much more widely than the coefficients on the the assets in place. This is not surprising, as the approximated firm-level elasticities for the option value countries are not as good of an approximation of the true elasticity as in the case of assets

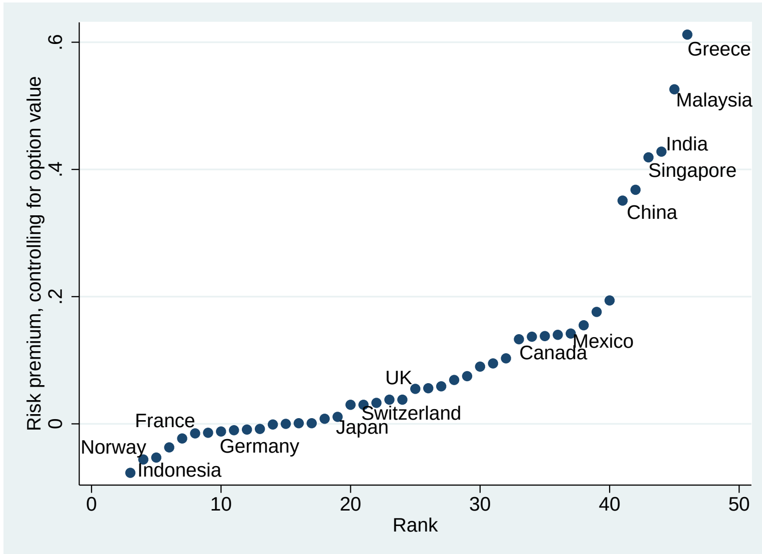

Figure 1: Estimated Country-Specific Risk Premia.

in place. The corresponding risk premia ($\psi_j^o \sigma_h \sigma_j \rho_j prob_j^f \tilde{\varepsilon}_h^f$) are still reasonable in magnitude, ranging from -0.540 to 0.685.

Finally, F-tests (not reported here) show that all the estimated parameters ψ_j and ψ_j^o are significantly different from each other. This result confirms the importance of across-country heterogeneity in the unobserved component of the elasticity of firms' value with respect to GDP.

4.3.2 Aggregate Risk Premium

The results presented in Table 6 shed light on the magnitude of country-level risk premia. However, we are also interested in their aggregation to the overall risk premia of multinational firms, most of which have affiliates in more than one country.

To estimate the aggregate risk premium we sum the country-specific risk premia reported in Table 6, which were estimated using equation (18). Table 7 shows the results. The aggregate risk premium from foreign assets in place is large, at 3.6 percentage points. By summing over the risk premia for all countries, we are constructing an estimate of what the risk premium would be for a firm that has affiliates in all of the top 50 FDI host countries. This implies that a firm with affiliates in every country in our sample would have, on average, expected annual

Table 7: Aggregate risk premia.

	I	II
Risk premium:		
- from domestic sales:	0.23	0.371
- from foreign sales:	3.647	3.265
- from option value:		0.488

returns that are 3.6 percent higher than those of a purely domestic firm.[31]

As was the case for most of the country-level risk premia, the aggregate risk premium from assets in place falls slightly when the option value term is included. The aggregate risk premium of the option value implies that if a firm did not have affiliates in any of the countries in our sample, the option to enter those countries in the future would increase expected returns by 0.488 percent for the average firm.

As mentioned above, the aggregate results give the risk premium for an average firm with affiliates in all of the countries in the sample. However, it is also possible to use the country-specific results from Table 6 to estimate the expected risk premium for a typical firm with any combination of foreign affiliates. For example, suppose that a firm only has affiliates in Canada, Singapore, and Ireland. The expected contribution of these assets in place to the firm's risk premium would be $0.133 + 0.419 + 0.069 = 0.621$. The contribution to the risk premium from the option value of entering countries in which the firm does not currently have affiliates would be the sum $\sum_{j \notin \mathcal{A}} \psi_j^o \sigma_h \sigma_j \rho_j prob_j^f \tilde{\varepsilon}_h^f$ where $j \notin \mathcal{A}$ includes all countries except for Canada, Singapore, and Ireland. This is a value of 0.954. Adding in the risk premium for domestic U.S. assets, the total risk premium for the average firm with affiliates in Canada, Singapore, and Ireland would be $0.371 + 0.621 + 0.954 = 1.946$, so the expected returns would be about 2 percentage points higher than the returns of a purely domestic firm.

[31] As mentioned above, these results hinge on the assumption that firms take the decision of entering a country independently of their presence in other countries.

4.3.3 Goodness of Fit

We conclude our empirical analysis with a graphical representation of the model fit with and without controlling for the option value of entering new countries.

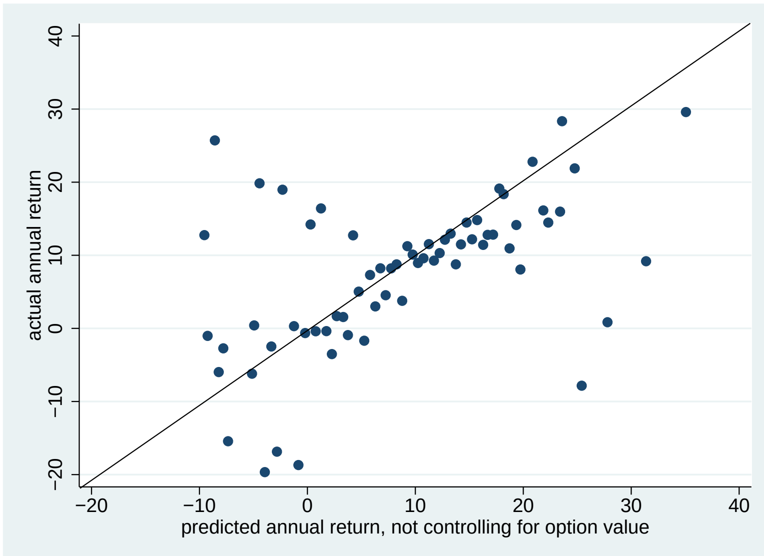

Figure 2: Predicted versus realized returns.

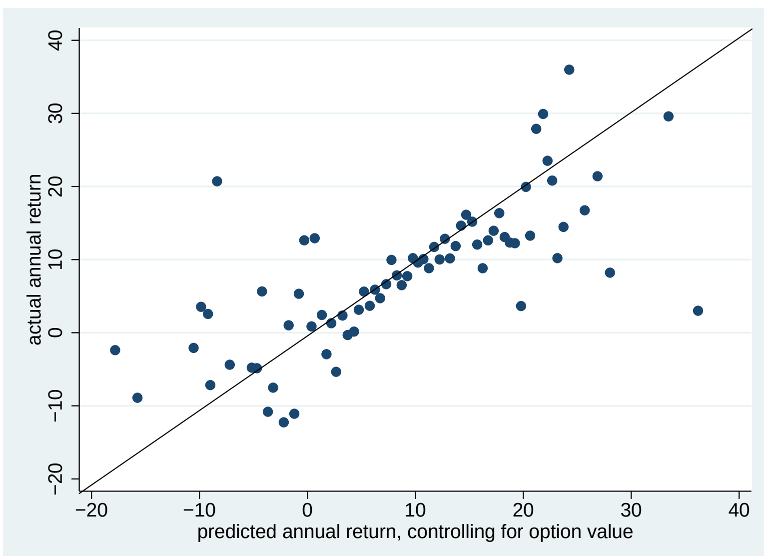

Figure 3: Predicted versus realized returns. Predicted returns include the option value of entering new countries.

Figures 2 and 3 plot realized returns against returns predicted by the model.[32] Figure 2 corresponds to specification I of Table 6, where the option value is not taken into account, while Figure 3 corresponds to the full specification II. The differences between the two plots give a graphical representation of the contribution of the option value to improve the fit of the model. It is clear from looking at the two graphs that controlling for the option value improves the risk premium estimates.

5 Conclusions

In this paper we study theoretically and empirically the cross-section of returns of multinational corporations, to establish a link between the geographic structure of a firm and its risk premium. Stock returns are impacted by firms' diversification of country-level risk, which makes firms safer and decreases returns, and by the fixed and sunk costs associated with investing abroad, which make firms more leveraged, hence riskier, and increase returns. We test the predictions of the model using firm level data on multinational corporations from the U.S. BEA merged with firm level stock return data from CRSP. The empirical results support the model's predictions. MNCs with affiliates in countries where shocks comove more with the home country and where entry costs are higher tend to have higher risk premia. Moreover, we use the structural model to decompose firm-level risk premia into individual host countries' contributions and to assess the relative importance of assets in place versus option value for the returns.

We see this paper as a first step to understand the complex interactions between MNCs and financial markets. There are a number of additional questions that this analysis leaves aside. Are there systematic patterns in the expansion strategies of MNCs across host countries over time? Are entry and exit episodes associated with sizable changes in the stock market valuation of firms? What is the relevant time horizon to study MNCs' expansion across countries and the corresponding stock market responses? These are interesting avenues that we plan to pursue in future work.

[32]To construct the plots, we divided the observations into bins based on their predicted annual returns from regression (18). Each bin is 0.5 units wide, resulting in about 65 bins. Then we averaged actual and predicted annual returns within these bins and graphed those averages.

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Appendix

A Derivation of the Model

We present here the derivation of the results of Section 2. In the continuation region, each one of the three value functions of a firm (V_h, V_j, and V_j^o) satisfies:

$$\pi(a, Y, X)M\Delta t + E[M\Delta t \cdot V(a, Y', X|Y)] - V(a, Y, X) = 0. \tag{B.1}$$

For $\Delta t \to 0$:

$$\pi(a, Y, X)Mdt + E[d(M \cdot V(a, Y, X))] = 0. \tag{B.2}$$

The term in the expectation can be written as:

$$\begin{aligned} E[d(M \cdot V)] &= E[dM \cdot V + M \cdot dV + dM \cdot dV] \\ &= M \cdot V \cdot E\left[\frac{dM}{M} + \frac{dV}{V} + \frac{dM}{M} \cdot \frac{dV}{V}\right] \\ &= M \cdot V\left[-rdt + E\left(\frac{dV}{V}\right) + E\left(\frac{dM}{M} \cdot \frac{dV}{V}\right)\right] \\ &= Mdt\left[-rV + E\left(\frac{dV}{dt}\right) + E\left(\frac{dM}{M} \cdot \frac{dV}{dt}\right)\right] \end{aligned} \tag{B.3}$$

where the dependence of V on (a, Y, X) has been suppressed to ease the notation. Plugging (B.3) into (B.2):

$$\pi - rV + E\left(\frac{dV}{dt}\right) + E\left(\frac{dM}{M} \cdot \frac{dV}{dt}\right) = 0. \tag{B.4}$$

By applying Ito's Lemma and using the expressions for the Brownian motions ruling the evolution of Y, we can derive expressions for some of the terms in (B.4):

$$\begin{aligned} dV &= V_Y' dY + \frac{1}{2}\sigma^2 Y^2 V_Y'' dt = V_Y'[\mu Y dt + \sigma Y dz] + \frac{1}{2}\sigma^2 Y^2 V_Y'' dt \\ E[dV] &= \mu Y V_Y' dt + \frac{1}{2}\sigma^2 Y^2 V_Y'' dt\ . \end{aligned}$$

Using these results and the equation describing the evolution of M, we can rewrite (B.4) for the three value functions as:

$$\pi_h dt - r_h V_h dt + \mu_h Y_h V_{hY}' dt + \frac{1}{2}\sigma_h^2 Y_h^2 V_{hY}'' dt + ...$$
$$...E\left[(-r_h dt - \gamma\sigma_h dz_h)\cdot\left(\mu_h Y_h V_{hY}' dt + \sigma_h Y_h V_{hY}' dz_h + \frac{1}{2}\sigma_h^2 Y_h^2 V_{hY}'' dt\right)\right] = 0.$$
$$\pi_j dt - r_h V_j dt + \mu_j Y_j V_{jY}' dt + \frac{1}{2}\sigma_j^2 Y_j^2 V_{jY}'' dt + ...$$
$$...E\left[(-r_h dt - \gamma\sigma_h dz_h)\cdot\left(\mu_j Y_j V_{jY}' dt + \sigma_j Y_j V_{jY}' dz_j + \frac{1}{2}\sigma_j^2 Y_j^2 V_{jY}'' dt\right)\right] = 0.$$
$$-r_h V_j^o dt + \mu_j Y_j V_{j\ Y}^{o\prime} dt + \frac{1}{2}\sigma_j^2 Y_j^2 V_{j\ Y}^{o\prime\prime} dt + ...$$
$$...E\left[(-r_h dt - \gamma\sigma_h dz_h)\cdot\left(\mu_j Y_j V_{j\ Y}^{o\prime} dt + \sigma_j Y_j V_{j\ Y}^{o\prime} dz_j + \frac{1}{2}\sigma_j^2 Y_j^2 V_{j\ Y}^{o\prime\prime} dt\right)\right] = 0.$$

The terms in expectations can be reduced to:

$$E\left[(-r_h dt - \gamma\sigma_h dz_h)\cdot\left(\mu_h Y_h V_{hY}' dt + \sigma_h Y_h V_{hY}' dz_h + \frac{1}{2}\sigma_h^2 Y_h^2 V_{hY}'' dt\right)\right] = ...$$
$$... - \gamma\sigma_h^2 Y V_{hY}' dt$$
$$E\left[(-r_h dt - \gamma\sigma_h dz_h)\cdot\left(\mu_j Y_j V_{jY}' dt + \sigma_j Y_j V_{jY}' dz_j + \frac{1}{2}\sigma_j^2 Y_j^2 V_{jY}'' dt\right)\right] = ...$$
$$... - \gamma\rho_j\sigma_h\sigma_j Y V_{jY}' dt$$
$$E\left[(-r_h dt - \gamma\sigma_h dz_h)\cdot\left(\mu_j Y_j V_{j\ Y}^{o\prime} dt + \sigma_j Y_j V_{j\ Y}^{o\prime} dz_j + \frac{1}{2}\sigma_j^2 Y_j^2 V_{j\ Y}^{o\prime\prime} dt\right)\right] = ...$$
$$... - \gamma\rho_j\sigma_h\sigma_j Y V_{j\ Y}^{o\prime} dt.$$

So we obtain:

$$\begin{aligned}
\pi_h - r_h V_h + (\mu_h - \gamma\sigma_h^2) Y_h V_{hY}' + \frac{1}{2}\sigma_h^2 Y_h^2 V_{hY}'' &= 0 \\
\pi_j - r_h V_j + (\mu_j - \gamma\rho_j\sigma_h\sigma_j) Y_j V_{jY}' + \frac{1}{2}\sigma_j^2 Y_j^2 V_{jY}'' &= 0 \\
-r_h V_j^o + (\mu_j - \gamma\rho_j\sigma_h\sigma_j) Y_j V_{j\ Y}^{o\prime} + \frac{1}{2}\sigma_j^2 Y_j^2 V_{j\ Y}^{o\prime\prime} &= 0.
\end{aligned}$$

Combining the three equations above and adding and subtracting the term

$\mu_h Y_h V'_{hY} + \sum_{j \in \mathcal{A}} \mu_j Y_j V'_{jY} + \sum_{j \notin \mathcal{A}} \mu_j Y_j V^{o\prime}_{j\ Y}$:

$$\pi_h - r_h V_h - \gamma \sigma_h^2 Y_h V'_{hY} + \underbrace{\mu_h Y_h V'_{hY} + \frac{1}{2}\sigma_h^2 Y_h^2 V''_{hY}}_{E(dV_h)} + \ldots$$

$$\sum_{j \in \mathcal{A}} \pi_j - r_h V_j - \gamma \rho_j \sigma_h \sigma_j Y_j V'_{jY} + \underbrace{\mu_j Y_j V'_{jY} + \frac{1}{2}\sigma_j^2 Y_j^2 V''_{jY}}_{E(dV_j)} + \ldots$$

$$+ \sum_{j \notin \mathcal{A}} \left[-r_h V_j^o - \gamma \rho_j \sigma_h \sigma_j) Y_j V^{o\prime}_{j\ Y} + \underbrace{\mu_j Y_j V^{o\prime}_{j\ Y} + \frac{1}{2}\sigma_j^2 Y_j^2 V^{o\prime\prime}_{j\ Y}}_{E(dV_j^o)} \right] = 0.$$

Since $E(dV_h) + \sum_{j \in \mathcal{A}} E(dV_j) + \sum_{j \notin \mathcal{A}} E(dV_j^o) = E(d\mathcal{V})$:

$$\pi_h + \sum_{j \in \mathcal{A}} \pi_j + E(d\mathcal{V}) = r_h V_h + \gamma \sigma_h^2 Y_h V'_{hY} + \sum_{j \in \mathcal{A}} \left(r_h V_j + \gamma \rho_j \sigma_h \sigma_j Y_j V'_{jY} \right) + \ldots$$

$$\ldots \sum_{j \notin \mathcal{A}} \left(r_h V_j^o + \gamma \rho_j \sigma_h \sigma_j Y_j V^{o\prime}_{j\ Y} \right)$$

$$\frac{\pi_h + \sum_{j \in \mathcal{A}} \pi_j + E(d\mathcal{V})}{\mathcal{V}} = r_h + \frac{\gamma \sigma_h \left(\sigma_h Y_h V'_{hY} + \sum_{j \in \mathcal{A}} \gamma \rho_j \sigma_j Y_j V'_{jY} + \sum_{j \notin \mathcal{A}} \gamma \rho_j \sigma_j Y_j V^{o\prime}_{j\ Y} \right)}{\mathcal{V}}.$$

B Robustness: Reduced Form Estimates

In this section we include a number of robustness tests to ensure that our empirical results are not sensitive to changes in variable definitions or controls. We begin by controlling for a variety of factors that may impact stock returns including total firm sales, market capitalization, leverage, and the book-to-market ratio of the firm. We then replace our measure of country-specific entry costs with two alternative measures from the World Bank's Doing Business Database: the number of procedures required to start a business and the average number of days required to start a business. Finally, we measure the co-movement of GDP shocks in the US and the host country using the correlation, rather than the covariance, of these shocks.

Table B.1: Summary Statistics of Robustness Controls.

	N. Obs	Mean	Std. Dev.	Min	Max
ALL FIRMS					
Firm *beta*	21809	0.921	1.128	-12.487	23.552
Market cap. ($b)	21809	5.439	20.508	0.0006	511.887
Leverage	21809	0.047	1.701	-122.097	206.254
Book-to-market	21809	0.906	7.456	-906.639	66.022
Nr. of days	21809	15.181	12.235	0	195
Nr. of procedures	21809	5.319	2.578	0	17
Correlation (ρ_{ft})	21809	0.63	0.209	-0.355	0.918
HORIZONTAL FIRMS					
Firm *beta*	5688	0.928	1.256	-5.94	23.552
Market cap. ($b)	5688	2.754	10.486	0.001	267.336
Leverage	5688	0.074	2.743	-5.937	206.254
Book-to-market	5688	0.762	6.786	-479.385	30.3
Nr. of days	5688	12.054	12.257	0	149
Nr. of procedures	5688	4.314	3.073	0	17
Correlation (ρ_{ft})	5688	0.652	0.268	-0.22	0.918

We run all of these robustness tests for both the reduced form and the two-step regressions. Table B.1 provides summary statistics for the variables we use in the robustness checks.

Columns I-III of Table B.2 report the reduced form estimates inclusive of additional potential determinants of annual stock returns, like market capitalization, leverage, and book-to-market. Total firm sales and market capitalization are conceptually similar, as they each proxy for firm size, so we do not include both of these variables in the same specification. The same applies to leverage and book-to-market. Our results are robust to the inclusion of these measures. The coefficients on GDP growth covariances and entry costs are all positive and significant regardless of which combination of the firm-level controls are included.

Columns IV-VI of Table B.2 report the results using the correlation of GDP shocks in the US and the host country, rather than the covariance of these shocks.[1]

[1] Country-level correlations are aggregated into firm-level measures using the same methodology we used to aggregate covariances.

Table B.2: The relationship between annual returns, GDP growth covariances and correlations, and entry costs: robustness.

	I	II	III	IV	V	VI
covariances (Cov_{ft})	1.7**	1.705**	1.714**			
	(0.693)	(0.694)	(0.692)			
correlations (ρ_{ft})				6.115**	6.152**	6.124**
				(3.065)	(3.118)	(3.102)
entry costs (F_{ft})	0.0005**	0.0005**	0.0005**	0.0005**	0.0005**	0.0005**
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
nr. of countries	0.035	0.036	-0.032	0.032	0.034	-0.034
	(0.102)	(0.102)	(0.1)	(0.1)	(0.101)	(0.1)
beta	4.253**	4.242**	4.227**	4.288**	4.278**	4.263**
	(1.793)	(1.785)	(1.785)	(1.784)	(1.809)	(1.776)
GDP	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
distance	-0.00003	-0.00003	0.00001	-0.00001	-0.00002	0.00003
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
global sales	3.1e-08	3.07e-08		3.03e-08	2.99e-08	
	(6.53e-08)	(6.43e-08)		(6.49e-08)	(6.5e-08)	
market cap.			0.0002***			0.0002***
			(0.00009)			(0.00009)
leverage		-0.393			-0.393	
		(2.714)			(2.783)	
book-to-market			0.07			0.073
			(0.49)			(0.491)
industry and year FE	YES	YES	YES	YES	YES	YES
N	5658	5658	5658	5658	5658	5658
R-sq	0.075	0.0755	0.0772	0.0745	0.0749	0.0766

Notes: *,** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Bootstrapped standard errors are in parentheses.

Correlations are convenient measures to interpret the coefficients of our regressions. We can compare risk exposures in the extreme cases of perfect diversification ($\rho_{ft} = 0$) and no diversification (ρ_{ft}=1): ceteris paribus, a firm that has affiliates only in a host country whose GDP growth is perfectly correlated with the US has a risk premium about 6% higher than a firm with affiliates only in a host country whose GDP growth is uncorrelated with the US.

Table B.3 uses alternate measures of country-level entry costs from the World Bank's Doing Business Database. Columns I-III report the results using the number

Table B.3: The relationship between annual returns, GDP growth covariances, and entry costs: robustness. Entry costs measured as the number of days or the number of procedures necessary to start a business.

	I	II	III	IV	V	VI
covariances (Cov_{ft})	1.609**	1.613**	1.618**	1.565**	1.569**	1.579**
	(3.354)	(3.351)	(3.354)	(3.351)	(3.356)	(3.353)
entry costs (days)	0.125**	0.124*	0.116*			
	(0.063)	(0.064)	(0.063)			
entry costs (procedures)				0.84**	0.841**	0.803**
				(0.373)	(0.376)	(0.371)
nr. of countries	0.058	0.06	-0.004	0.048	0.05	-0.014
	(0.1)	(0.1)	(0.097)	(0.1)	(0.101)	(0.096)
beta	4.25**	4.24**	4.226**	4.242**	4.232**	4.217**
	(1.822)	(1.795)	(1.823)	(1.766)	(1.786)	(1.805)
GDP	-0.002	-0.002	-0.002	-0.002*	-0.002*	-0.003*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
distance	-4.15e-06	-5.65e-06	0.00004	-0.0002	-0.0002	-0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0003)
global sales	3.97e-08	3.94e-08		3.92e-08	3.89e-08	
	(6.61e-08)	(6.6e-08)		(6.63e-08)	(6.62e-08)	
market cap.			0.0002***			0.0002***
			(0.0001)			(0.0001)
leverage		-0.379			-0.381	
		(2.754)			(2.723)	
book-to-market			0.068			0.067
			(0.482)			(0.479)
industry and year FE	YES	YES	YES	YES	YES	YES
N	5658	5658	5658	5658	5658	5658
R-sq	0.0739	0.0743	0.076	0.0744	0.0749	0.0765

Notes: *,** and *** indicate significance at the 10, 5 and 1 percent levels, respectively. Bootstrapped standard errors are in parentheses.

of days necessary to start a business. Columns IV-VI report the results using the number of required procedures. Consistently with the predictions of the model, both of these measures are positively and significantly related to annual returns.

We run all the robustness test above also for the second step regressions of our two-step approach. We do not report here all the results, however the two-step results are also robust to the different definitions of entry costs, as well as to using

Table B.4: Summary statistics by affiliate presence: Robustness to different measures of entry costs.

	Entry cost (nr. of days)	Entry cost (nr. of procedures)
ALL FIRMS		
Countries with affiliates	15.181	5.319
Countries without affiliates	22.287	7.478
HORIZONTAL FIRMS		
Countries with affiliates	12.054	4.314
Countries without affiliates	21.567	7.318

the GDP growth correlations instead of the covariances.[2]

Regarding our alternative specifications of entry costs, Table B.4 shows the weighted average number of days and procedures necessary for starting a business in countries in which the firms do and do not have affiliates. As with the paid in capital requirement used in our primary specification, these summary statistics show that the firms in our sample are much more likely to open affiliates in countries with lower entry costs. Our two-stage results are robust to using both of these measures.

C Robustness: Model-Based Estimates

Table C.1 shows the full set of country-level results described in Section 4.3.1.

[2]The results are available upon request to the authors.

Table C.1: Country-specific estimates of risk premia, observations at the firm-year level.

	coefficients			risk premia		
	ψ_j	ψ_j	ψ_j^o	$\psi\sigma_h\sigma_j\rho_j\varepsilon_j^f$	$\psi\sigma_h\sigma_j\rho_j\varepsilon_j^f$	$\psi_j^o\sigma_h\sigma_j\rho_j Z_j^f$
Country	I	II		I	II	
US Domestic	0.036***	0.058***		0.23	0.371	
	(0.010)	(0.019)				
United Kingdom	0.011	0.010	1.242**	0.060	0.055	0.496
	(0.01)	(0.01)	(0.611)			
Canada	0.034***	0.033***	0.622	0.137	0.133	0.136
	(0.012)	(0.012)	(0.813)			
Germany	-0.008	-0.007	1.338	-0.014	-0.012	0.292
	(0.006)	(0.007)	(1.02)			
Singapore	0.075***	0.064***	-3.228	0.491	0.419	-0.206
	(0.021)	(0.022)	(2.983)			
Switzerland	0.031	0.021	-0.258	0.048	0.033	-0.014
	(0.028)	(0.028)	(3.863)			
Ireland	0.001	0.005	-1.273	0.014	0.069	-0.396
	(0.002)	(0.004)	(0.921)			
Japan	0.011	0.011	-0.270	0.011	0.011	-0.042
	(0.009)	(0.01)	(0.926)			
Netherlands	0.032	0.029	1.088	0.155	0.140	0.060
	(0.022)	(0.02)	(1.547)			
France	-0.01	-0.007	-1.366	-0.022	-0.015	-0.301
	(0.014)	(0.015)	(1.333)			
Mexico	0.037	0.040	1.718	0.131	0.142	0.223
	(0.036)	(0.037)	(1.363)			
China	0.951	0.818	-5.105	0.409	0.351	-0.066
	(0.599)	(0.622)	(8.955)			
Brazil	-0.018	-0.018	-8.398	-0.009	-0.009	-0.12
	(0.04)	(0.04)	(10.96)			
Australia	0.125**	0.109**	-0.033	0.202	0.176	-0.001
	(0.052)	(0.052)	(4.906)			
Belgium	0.017	0.016	4.449	0.030	0.030	0.461
	(0.033)	(0.034)	(3.064)			
Italy	0.032	0.033	-0.426	0.087	0.090	-0.079
	(0.025)	(0.026)	(1.445)			
Hong Kong	0.026**	0.021	-4.02	0.170	0.137	-0.192
	(0.013)	(0.013)	(3.164)			
Spain	-0.004	-0.006	-1.189	0.001	0.001	-0.151
	(0.01)	(0.01)	(2.35)			

	coefficients			risk premia		
	ψ_j	ψ_j	ψ_j^o	$\psi\sigma_h\sigma_j\rho_j\varepsilon_j^f$	$\psi\sigma_h\sigma_j\rho_j\varepsilon_j^f$	$\psi_j^o\sigma_h\sigma_j\rho_j Z_j^f$
Country	I	II		I	II	
South Korea	0.148*	0.115	9.746	0.249	0.194	0.374
	(0.082)	(0.085)	(6.018)			
Norway	-0.069	-0.037	-9.849	-0.105	-0.056	-0.610
	(0.131)	(0.13)	(7.01)			
Malaysia	0.243**	0.221**	-0.685	0.576	0.526	-0.027
	(0.105)	(0.105)	(5.49)			
India	0.324*	0.259	10.480	0.535	0.428	0.127
	(0.189)	(0.186)	(12.477)			
Sweden	0.015	0.008	0.889	0.071	0.038	
	(0.026)	(0.026)	(2.622)			
Thailand	0.032	-0.019	-18.164**	0.063	-0.037	-0.434
	(0.052)	(0.046)	(11.523)			
Argentina	0.02	0.021	96.846*	-0.014	-0.014	-0.445
	(0.046)	(0.045)	(50.321)			
Poland	-0.066*	-0.061	11.643***	-0.358	-0.331	0.685
	(0.038)	(0.038)	(3.182)			
Luxembourg	0.004	0.004		0.059	0.059	
	(0.006)	(0.007)				
Russia	-0.018	-0.020	-12.414*	0.030	0.030	-0.627
	(0.015)	(0.015)	(6.542)			
Chile	0.069	0.087	5.520	0.075	0.095	0.143
	(0.093)	(0.093)	(10.425)			
Indonesia	0.081	0.079	-6.277	-0.079	-0.077	0.136
	(0.053)	(0.053)	(13.312)			
Austria	0.004	0.006	-6.542	0.006	0.008	-0.433
	(0.024)	(0.024)	(6.547)			
Venezuela	-1.063	-1.146	10.765	0.128	0.138	-0.022
	(1.115)	(1.121)	(149.025)			
South Africa	-0.060	-0.045	18.842	-0.071	-0.053	0.284
	(0.084)	(0.083)	(15.046)			
Turkey	0.057	0.061	14.127**	0.052	0.056	1.100
	(0.082)	(0.081)	(7.214)			
Denmark	0.158***	0.15***	2.223	0.388	0.368	0.217
	(0.046)	(0.047)	(3.624)			
Hungary	0.022	0.018	-4.592**	0.189	0.155	-0.623
	(0.027)	(0.028)	(1.889)			
Colombia	-1.743	-1.756	4.533	-0.023	-0.023	-0.002
	(1.561)	(1.581)	(852.773)			
Czech Rep.	-0.021	-0.007	-2.240	-0.030	-0.010	-0.337
	(0.036)	(0.037)	(2.539)			

	coefficients			risk premia		
	ψ_j	ψ_j	ψ_j^o	$\psi\sigma_h\sigma_j\rho_j\varepsilon_j^f$	$\psi\sigma_h\sigma_j\rho_j\varepsilon_j^f$	$\psi_j^o\sigma_h\sigma_j\rho_j Z_j^f$
Country	I	II		I	II	
Philippines	-0.019	-0.012	37.058***	-0.013	-0.008	0.776
	(0.086)	(0.086)	(11.796)			
Israel	-0.73***	-0.662***	-42.397***	-0.882	-0.800	-0.540
	(0.228)	(0.227)	(15.916)			
Peru	0.0007	0.0003	-17.99	-0.001	-0.001	0.186
	(0.0014)	(0.014)	(37.649)			
Finland	0.013	0.018	1.119	0.028	0.038	0.154
	(0.018)	(0.019)	(4.008)			
Portugal	-0.005	-0.004	7.142	0.001	0.001	0.470
	(0.046)	(0.047)	(5.979)			
New Zealand	0.074	0.062	-15.592	0.123	0.103	-0.396
	(0.098)	(0.098)	(11.056)			
Greece	0.379***	0.344**	0.599	0.674	0.612	0.030
	(0.138)	(0.136)	(12.326)			
Panama	0.005	0.005	0.553	0.075	0.075	-0.028
	(0.006)	(0.006)	(5.781)			
Ecuador	0.00005	9.34e-06	-10.589	0.00005	9.34e-06	0.121
	(0.01)	(0.01)	(34.415)			
R-Sq	0.177	0.182				

Notes: Bootstrapped standard errors are in parentheses. *,** and *** indicate significance at the 10, 5 and 1 & levels. Both specifications include year fixed effects and have n=25569.