Diversification, Cost Structure, and the Stock Returns of Multinational Corporations∗

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February 15, 2013

Very Preliminary
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Abstract

This paper investigates theoretically and empirically the relationship between the geographic structure of a multinational corporation and its stock market returns. We use a structural model to identify two main channels through which the fact of being a multinational firm affects returns. On the one hand, multinational activity offers diversification potential. On the other hand, there is cash flow risk arising from hysteresis and potential losses induced by sunk entry costs and fixed costs. To identify these channels empirically, we merge Compustat/CRSP data on stock returns with the Bureau of Economic Analysis data on the operations of multinational corporations. Preliminary empirical results confirm the predictions of the theory.

Keywords: Multinational firms, stock returns.
JEL Classification: F14, F23, G12.

∗The statistical analysis of firm-level data on U.S. multinational companies was conducted at the Bureau of Economic Analysis, U.S. Department of Commerce under arrangements that maintain legal confidentiality requirements. The views expressed are those of the authors and do not reflect official positions of the U.S. Department of Commerce. The authors would like to thank William Zeile and Raymond Mataloni for assistance with the BEA data.

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1 Introduction

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.\(^1\) However, existing explanations of the cross section of returns overlooked the role of the international status of the firm. About half of the manufacturing firms publicly listed in the U.S. are multinational corporations, with assets, operations, and sales in many countries. The objective of this paper is to investigate whether the geographic structure of a multinational corporation affects its stock market returns.

We present a streamlined, multi-country version of the model developed by Fillat and Garetto (2012) to identify two main channels via which the fact of being a multinational firm affects returns. On the one hand, 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 equilibrium returns. This mechanism, referred to as the “diversification channel”, implies that, in equilibrium, MNCs should exhibit lower returns than non-multinational firms—all else equal. Within multinationals, returns should be higher for those firms operating in countries whose business cycles are more correlated with each other. On the other hand, there is risk arising from hysteresis and potential losses induced by sunk entry costs and fixed costs: 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 payed 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, who must be rewarded by expected stock returns that are higher the higher the fixed and sunk costs of production. This second mechanism, that we refer to as the “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 country that are more easily and cheaply accessible.

The question of understanding why and how average stock returns vary across firms based on certain characteristics is central to the asset pricing literature. Nonetheless, existing empirical work on the returns of multinational corporations is scarce. Using a sample of manufacturing firms from

\(^1\)Fama and French (1996) provide comprehensive evidence about returns differentials across portfolios formed according to particular characteristics like size and book-to-market.
Compustat, Fillat and Garetto (2012) show that the stock market returns of multinational corporations (henceforth, MNCs) are systematically higher than the stock market returns of non-multinational firms. Lack of firm-level geographic information in the Compustat Segments database prevents their analysis from studying cross-sectional variation in returns within multinational corporations.

By merging Compustat/CRSP data on stock returns with the Bureau of Economic Analysis (BEA) data on the operations of multinational corporations, in this paper we are able to study the relationship between firms’ multinational organization and stock returns. The data display a large amount of variation across MNCs’ operations in foreign markets in terms of number and characteristics of countries entered, number of affiliates (total and per country), volumes of foreign sales and employment (total, per country, and at the affiliate level), and presence and extent of bridge multinational production (BMP). The preliminary results of our regression analysis are consistent with the predictions of the model in showing that GDP growth correlations and entry costs in the countries in which these firms have affiliates are correlated with the returns that these firms offer in the stock market.

Our work deepens our understanding of the operations of multinational corporations by examining the relationship between their geographical structure and their stock market returns. As such, our analysis is related to empirical research on the operations of multinational corporations, like Yeaple (2003) and Yeaple (2009). The theoretical framework at the basis of our empirical specifications 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).

Our work is also related to a small strand of literature in corporate finance that studies the linkages between international activity and stock market variables. Denis, Denis, and Yost (2002) find that multinational corporations trade at a discount, and Baker, Foley, and Wurgler (2009) link empirically market valuations, returns, and FDI activity. 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 specification and results. Section 5 outlines the next steps of the analysis, and Section 6 concludes.
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.

The model is a multi-country extension of the framework developed in Fillat and Garetto (2012). 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 \( j = 1, \ldots, N \). Time is continuous. Each country is hit by aggregate shocks to its GDP growth rate, which are described by the following geometric Brownian motions:

\[
\frac{dY_i}{Y_i} = \mu_i dt + \sigma_i dz_i, \text{ for } i = h, j \text{ and } j = 1, \ldots, N
\]  

(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 the Home country and the one of country \( j \).

International markets are incomplete: aggregate consumption in each country is equal to the GDP level \( Y_i \), and there is no possibility of consumption smoothing over time. 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 \( M_h \):

\[
\frac{dM_h}{M_h} = -r_h dt - \gamma \sigma_h dz_h
\]  

(2)

where \( r_h \) denotes the risk-free rate in the Home country and \( \gamma \) denotes risk-aversion.

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2 While the framework in Fillat and Garetto (2012) distinguishes entry in foreign markets according to whether it happens via export or FDI, in this paper we disregard the decision to export and focus on the choice of becoming a multinational corporation.

3 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 Yoshia (1998), and Crucini (1999) present evidence supporting the assumption of international market incompleteness.

4 The process for the stochastic discount factor \( M_h \) can be derived from agents having CRRA preferences over aggregate consumption \( Y_i \).
Let \( \mathcal{V} \) denote the value of a multinational firm. The value of a firm depends on both 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 the GDP growth shocks 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, of particular importance among the variables entering the vector \( \bar{X} \) are fixed operating costs of production and sunk costs of entry into a market.\(^5\)

We assume that firms’ activities are independent across countries, \( i.e. \) each firm makes entry and production decisions country-by-country.\(^6\) Since the decision of setting up a foreign affiliate is endogenous and affected by uncertainty through the country-specific GDP 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).\(^7\) For these reasons we write the value of the firm as:

\[
\mathcal{V}(a, \bar{Y}, \bar{X}) = \mathcal{V}_h(a, Y_h, X_h) + \sum_{j \in \mathcal{A}} \mathcal{V}_j(a, Y_j, X_j) + \sum_{j \notin \mathcal{A}} \mathcal{V}_o(a, Y_j, X_j) \tag{3}
\]

where \( \mathcal{V}_h(a, Y_h, X_h) \) denotes the firm’s value of domestic sales, \( \mathcal{V}_j(a, Y_j, X_j) \) denotes the value of the firm’s affiliate sales in country \( j \) if the firm has an affiliate there, and \( \mathcal{V}_o(a, Y_j, X_j) \) 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 \( \Delta t \) we can express the components of a firm’s value function

\(^5\)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 foreign markets.

\(^6\)The model does not accommodate the possibility of bridge multinational production, whereby foreign affiliates of a multinational corporation export to third countries.

\(^7\)Dixit (1989) provides a seminal treatment of the option value of entry in a model of investment under uncertainty and sunk costs.
as:

\[ \begin{align*}
V_h(a, Y_h, X_h) &= \pi_h(a, Y_h, X_h)M\Delta t + E[M\Delta t \cdot V_h(a, Y'_h, X_h|Y_h)] \\
V_j(a, Y_j, X_j) &= \max \left\{ \pi_j(a, Y_j, X_j)M\Delta t + E[M\Delta t \cdot V_j(a, Y'_j, X_j|Y_j)] : V_j^o(a, Y_j, X_j) \right\} \\
V_j^o(a, Y_j, X_j) &= \max \left\{ E[M\Delta t \cdot V_j^o(a, Y'_j, X_j|Y_j)] : V_j(a, Y_j, X_j) - F_j \right\}
\end{align*} \] (4)

where \( \pi_i(a, Y_i, X_i) \) denotes the flow profits of the firm in country \( i \) (for \( i = h, j \) and \( j = 1, \ldots, N \)), \( F_j \) 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:

\[ \begin{align*}
\pi_h - r_h V_h + (\mu_h - \gamma \sigma_h^2)Y_h V_h'Y_h dt + \frac{1}{2} \sigma_h^2 Y_h^2 V_h''Y_h &= 0 \\
\pi_j - r_h V_j + (\mu_j - \gamma \rho_j \sigma_h \sigma_j)Y_j V_j'Y_j dt + \frac{1}{2} \sigma_j^2 Y_j^2 V_j''Y_j &= 0 \\
-r_h V_j^o + (\mu_j - \gamma \rho_j \sigma_h \sigma_j)Y_j V_j^o'Y_j dt + \frac{1}{2} \sigma_j^2 Y_j^2 V_j^{o^2}Y_j &= 0.
\end{align*} \] (7)-(9)

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

\[ E(ret) \equiv \frac{\pi_h + \sum_{j \in A} \pi_j + E(dV)}{V} = r_h + \frac{\gamma \sigma_h \left( \sigma_h Y_h V_h'Y_h + \sum_{j \in A} \rho_j \sigma_j Y_j V_j'Y_j + \sum_{j \notin A} \rho_j \sigma_j Y_j V_j^{o^2}Y_j \right)}{V}. \] (10)

Equation (10) summarizes the implications of the model for the dependence of returns on country-specific variables, and is the theoretical foundation of our empirical specifications. First, equation (10) indicates that expected returns should be higher the higher the correlations \( \rho_j \) between the Home country’s GDP growth rate and the GDP growth rates of the host countries (Prediction 1). This prediction summarizes the effect of diversification on returns in the model: when the GDP growth rates of two countries are highly correlated, foreign activities provide a relatively small amount of diversification. As a result, MNCs with affiliates in countries whose GDP growth rates are highly

\[ \text{Details of the calculations are relegated to the Appendix.} \]
correlated with the U.S.’ one are less diversified (and more risky) than MNCs with affiliates in countries whose GDP growth rates are not strongly correlated with the U.S.’ one. Riskier firms command higher returns in equilibrium.

Second, the fact that a firm has activities in a foreign country indicates that the firm payed an entry cost to establish an affiliate there and is bearing fixed operating costs. These costs, which are independent on firm size, affect a firm’s value but not its derivative $V'$. In other words, the elasticity of the value function 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 it operates (Prediction 2). The 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 payed 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 a higher stock return in equilibrium.

Third, the extensive margin of the number of countries in which a firm operates (the cardinality of $A$) also matters for the returns. The effect of the number of countries on the returns is ambiguous: on the one hand, operating in more markets may induce more diversification, and then command lower returns in equilibrium. On the other hand, operating in more markets entails paying more fixed and sunk costs, and then a higher risk induced by potential losses. It is a quantitative question to determine which effect is stronger empirically. However, once one controls for country-characteristics (like the GDP growth correlations and the fixed and sunk costs mentioned above), the number of countries served should act as a pure extensive margin and increase the firm’s riskiness and hence its returns (Prediction 3).

The analysis in Section 4 tests the empirical validity of these predictions.

3 Data

To test the predictions of the model outlined in Section 2, we need information on multinational companies’ operations across countries and their stock returns. We also need country-level data on GDP growth correlations and on fixed and sunk costs of production.
The Bureau of Economic Analysis collects firm-level data on U.S. multinational company operations in its annual surveys of U.S. direct investment abroad. All US 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 US and at their foreign affiliates. To test the predictions of our model, we use 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 US stock market. 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.

To capture risk exposure, we created a measure of the extent to which GDP shocks in each country are correlated with GDP shocks in the US. We begin with data on real GDP growth rates by country from the IMF. We assume that expected GDP growth is constant. We then take the correlation between annual US GDP growth and annual GDP growth in each country over our sample period (1987-2009), resulting in a time-invariant GDP shock correlation measure for each country. We use these correlations to construct a firm-level measure of risk exposure for each firm \( f \) with affiliates in countries \( i \) in each year \( t \). This measure is:

\[
\text{corr}_{ft} = \sum_i s_{fti} \text{corr}_i
\]  

where \( \text{corr}_i \) is the country-level GDP shock correlation and \( s_{fti} \) is the share of sales by foreign affiliates of firm \( f \) that were produced in country \( i \) in year \( t \). In other words, the firm-level variable is a weighted average of the GDP shock correlation 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 weights.

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9We identify firm-level returns with the returns of the firms common equity.
To capture the sunk cost of opening a foreign affiliate, we use country level data on the cost of starting a business from the World Bank’s Doing Business database. Doing Business records all procedures officially required, or commonly done in practice, for an entrepreneur to start up and formally operate an industrial or commercial business. These procedures include obtaining all necessary licenses and permits and completing any required notifications, verifications or inscriptions for the company and employees with relevant authorities. 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. Our primary specification uses the number of required procedures, however for robustness checks we also use the required number of days and cost to complete these procedures and the paid-in minimum capital requirement. We use these variables to construct a firm-level measure of sunk costs. As with the GDP growth correlations, 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 weights:

$$procedures_{ft} = \sum_{i} s_{fit} procedures_{i}$$

where $procedures_{i}$ is the number of required procedures to start a business in country $i$.

### 4 The Role of Diversification and Cost Structure: Empirical Results

#### 4.1 Reduced-Form Analysis

We begin by testing the predictions described in Section 2. Our baseline specification is given by:

$$Ret_{ft} = \alpha + \beta_1 corr_{ft} + \beta_2 procedures_{ft} + \beta_3 X_{ft} + \delta_k + \varepsilon_{ft}$$

where $Ret_{ft}$ is the annual stock return of firm $f$ in year $t$, $corr_{ft}$ is the weighted correlation of GDP shocks between the U.S. and the countries in which firm $f$ has affiliates, and $procedures_{ft}$ is the weighted average number of procedures 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 and the number of countries in which it has affiliates. Because the industry in which a firm operates is likely to impact returns by affecting risk and other factors, we also include fixed effects, $\delta_k$, for each firm’s primary industry. $\varepsilon_{ft}$ is an orthogonal error term.
Table 1: The relationship between annual returns, GDP growth correlations, and sunk costs.

<table>
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<th>II</th>
<th>III</th>
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<td></td>
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<tr>
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<tr>
<td>procedures</td>
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<td>0.002**</td>
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<tr>
<td></td>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
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<tr>
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</tr>
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</table>

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

Table 1 shows the results. We begin by adding the two variables $corr_{ft}$ and $procedures_{ft}$ separately. Column I shows the result of regressing returns on the correlations variable. As predicted, the coefficient on the variable measuring how correlated shocks are between the US and the countries in which a firm operates, $corr_{ft}$, is positive and significant. This implies that stock returns are higher (lower) for MNCs with affiliates in countries where GDP shocks are more (less) positively correlated with shocks in the U.S.. Quantitatively, the interpretation is as follows: ceteris paribus, a firm that engages in FDI in a destination country whose GDP is uncorrelated with the domestic GDP would reduce its risk premium by 2.7% with respect to a firm engaging in FDI in a country with perfectly correlated GDP. This result supports the model in which more highly correlated shocks imply greater risk, and thus higher returns are necessary to compensate for this risk. Column II shows the results controlling for the total global sales of the firm. 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. The impacts of the correlation of GDP shocks and sunk costs on stock returns still hold even when controlling for total firm sales.

Columns III and IV of Table 1 show the results of regressing returns on our proxy for the entry costs. As predicted, the coefficient on the measure of sunk costs, $procedures_{ft}$, is positive and significant. As the model predicts, higher sunk costs increase the likelihood that a firm will be willing to bear temporary losses when hit with a negative shock. In particular, returns increase by 0.2% for each
additional procedure required in a particular country of destination. This additional procedure, which proxies sunk and fix operating costs, increases the risk of experiencing negative cash-flows, and higher returns are necessary to compensate for this risk. The result holds also when controlling for the total sales of the firm (see Column IV).

Column V of Table 1 controls for both the correlation of GDP shocks and sunk costs. The results for these measures still hold when both are included. The specification in Column V also includes the number of countries in which a firm operates as a control. As illustrated in Section 2, the sign of the relationship between the number of countries in which a firm operates and its stock returns is ambiguous. The number of countries in which a firm has affiliates can impact returns through two opposing channels. The risk diversification channel suggests that operating in a larger number of countries will spread risk and thus lead to lower returns. However, the sunk cost channel moves in the opposite direction. Each affiliate that the firm opens in a new country requires additional sunk costs, and these sunk costs make the firm more likely to tolerate temporary losses, increasing risk and raising the returns required to compensate for this risk. Once one controls for the relevant country-level characteristics (like the GDP growth correlations and the fixed and sunk costs mentioned above), the number of countries served should act as a pure extensive margin and increase the firm’s riskiness and hence its returns. The positive coefficient on the number of countries confirms the validity of this prediction.

4.2 Structural Analysis

The regressions we presented above confirm the validity of the predictions of the model regarding the impact of GDP growth correlations and of sunk and fixed costs on the returns. We now move to a more structural approach, which is derived closely from the theoretical relationship that the model delivers (equation (10)).

We can re-write equation (10) as:

$$E(ret^f) = \alpha + \sum_{j=1}^{N} \psi_j \sigma_j \rho_j \varepsilon_j^f + \eta^f$$

(14)

where $E(ret^f)$ denotes the expected returns of firm $f$, $\sigma_j$ is the standard deviation of GDP growth in country $j$, $\rho_j$ is the correlation of GDP growth between the U.S. and country $j$, and $\varepsilon_j^f$ is the elasticity of the firm’s value with respect to GDP in country $j$. $\eta^f$ is an error term composed by the elasticity.
of the option value of the firm in the countries in which it does not own an affiliate and by an error
term $\nu^f$:

$$\eta^f = \sum_{j=1}^{N} \zeta^f_i + \nu^f \quad (15)$$

where:

$$\zeta^f_i = \begin{cases} 
0 & \text{if } \varepsilon^f_j \neq 0, \\
\frac{V^j_0 Y_j}{V^j_0'} & \text{if } \varepsilon^f_j = 0.
\end{cases} \quad (16)$$

The error term $\zeta^f_i$ depends on the elasticity of the value of the firm with respect to demand fluctuations in countries where the firm does not have an affiliate. This elasticity is ultimately a function of the firm’s productivity. Therefore, we need to account for the fact that the error term in equation (14) may be correlated with $\varepsilon^f_j$, the elasticity of the firm’s value with respect to GDP in those countries where there exists an affiliate.

In order to run a regression based on (15), we need to compute the elasticities $\varepsilon^f_j$. In our baseline specification, we proxy firm value with flow profits:\(^{10}\)

$$\varepsilon^f_j \approx \frac{1}{T} \sum_{t=0}^{T} \left( \frac{\pi^f_{jt+1} - \pi^f_{jt}}{Y^j_{jt+1} - Y^j_{jt}} \right) \cdot \left( \frac{Y^j_{jt}}{\pi^f_{jt}} \right) \quad (17)$$

The estimated values of $\alpha$ and $\psi_j$, for $j = 1, \ldots, N$, will allow us to compute the predicted returns from the model and to compare the returns of firms with different elasticities and correlation structures.

In particular, the structural approach allows us to do some counterfactual analysis. We explore the cross section of predicted returns for a given set of firms with affiliates in the same set of countries. By doing that, we are holding the diversification channel fixed and exploiting the heterogeneity in the elasticity, which is a function of the firms’ productivity and fixed operating costs. The objective of the counterfactual exercise is to quantify the risk premium that results from differences in elasticity of value to GDP shocks. Therefore, we can test more accurately the prediction of the model that indicates that expected returns should be higher the higher the fixed and sunk costs of production. A

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\(^{10}\)Proxying firm value with flow profits is inaccurate because it disregards the option value of assets in place. For robustness, we construct $\varepsilon^f_j$ also using market capitalization as a measure of firm value. This alternative is also problematic as we only have information on the firm total market capitalization, not by individual affiliate or country of operation, and the variation of $\varepsilon^f_j$ across countries only comes from variation in $Y^j_{jt}$. To construct $\varepsilon^f_j$, 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, if firm $f$ does not sell in country $k$ for one period or more, we set $\varepsilon^f_j = 0$. In other words, we only consider the effect on the returns of those assets that are in place for the entire sample period. In the Appendix we report results on the robustness of this assumption.
positive estimated value for $\psi_j$ for those firms with affiliates in the same set of countries with similar productivity measures indicate that there exists a positive relationship between returns and elasticity, which in turn is increasing in sunk and fixed costs.

RESULTS TBA

5 The Choice of Opening an Affiliate Abroad: Time-Series Analysis

We plan to exploit the time-series dimension of the data to explore the effect of extensive margin decisions on the returns. First, we compare the stock returns of two groups of domestic firms: firms that stay domestic throughout the sample period, and firms that open affiliates later in the sample period. This will help to address the issue of whether multinational activity drives higher returns, or whether firms that give higher returns self-select into multinational activity. Preliminary results suggest that is multinational activity that drives higher returns.

At a more detailed level, we study the returns' dynamics before and after a firm decides to open an affiliate, and the impact of different location choices for the returns.

RESULTS TBA

6 Conclusions

In this paper we study theoretically and empirically the cross-section of returns of multinational corporations. Stock returns are impacted by firms’ diversification of country-level risk, which makes firms safer and decreases returns, and by the sunk costs associated with investing abroad, which make firms more subject to losses, hence riskier, and increases 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 are more highly correlated with U.S. shocks are riskier, and thus require greater equilibrium stock returns. Firms operating in countries where the sunk costs of investing are higher are more likely to bear temporary losses when hit with a negative shock, increasing their risk and implying greater equilibrium stock returns.
References


Tesar, Linda L., and Ingrid Werner. 1998. “The internationalization of securities markets since the


**Appendix**

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 $V^o_j$) satisfies:

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

For $\Delta t \to 0$:

$$\pi(a,Y,X)Mdt + E[d(M \cdot V(a,Y,X))] = 0. \quad (A.2)$$

The term in the expectation can be written as:

$$E[d(M \cdot V)] = E[dM \cdot V + M \cdot dV + dM \cdot dV]$$

$$= M \cdot V \cdot E \left[ \frac{dM}{M} + \frac{dV}{V} + \frac{dM}{M} \cdot \frac{dV}{V} \right]$$

$$= M \cdot V \left[ -r dt + E \left( \frac{dV}{dt} \right) + E \left( \frac{dM}{M} \cdot \frac{dV}{V} \right) \right]$$

$$= Mdt \left[ -rV + E \left( \frac{dV}{dt} \right) + E \left( \frac{dM}{M} \cdot \frac{dV}{dt} \right) \right] \quad (A.3)$$

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

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

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 (A.4):

\[
\begin{align*}
dV & = V'_Y dY + \frac{1}{2} \sigma^2 Y^2 V''_Y dt = V'_Y [\mu Y dt + \sigma Y dz] + \frac{1}{2} \sigma^2 Y^2 V''_Y dt \\
E[dV] & = \mu Y V'_Y dt + \frac{1}{2} \sigma^2 Y^2 V''_Y dt.
\end{align*}
\]

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

\[
\begin{align*}
\pi_h dt - r_h V_h dt + \mu_h Y_h V'_Y dt & + \frac{1}{2} \sigma^2_h Y^2 V''_Y dt + E \left[ (-r_h dt - \gamma \sigma_h dz_h) \cdot \left( \mu_h Y_h V'_Y dt + \sigma_h Y_h V'_Y dz_h + \frac{1}{2} \sigma^2_h Y^2 V''_Y dt \right) \right] = \pi_h dt - r_h V_h dt + \mu_h Y_h V'_Y dt + \frac{1}{2} \sigma^2_h Y^2 V''_Y dt + E \left[ (-r_h dt - \gamma \sigma_h dz_h) \cdot \left( \mu_h Y_h V'_Y dt + \sigma_h Y_h V'_Y dz_h + \frac{1}{2} \sigma^2_h Y^2 V''_Y dt \right) \right] = 0.
\end{align*}
\]

The terms in expectations can be reduced to:

\[
\begin{align*}
E \left[ (-r_h dt - \gamma \sigma_h dz_h) \cdot \left( \mu_h Y_h V'_Y dt + \sigma_h Y_h V'_Y dz_h + \frac{1}{2} \sigma^2_h Y^2 V''_Y dt \right) \right] & = -\gamma \sigma^2_h Y V'_Y dt \\
E \left[ (-r_h dt - \gamma \sigma_h dz_h) \cdot \left( \mu_j Y_j V'_Y dt + \sigma_j Y_j V'_Y dz_j + \frac{1}{2} \sigma^2_j Y^2 V''_Y dt \right) \right] & = -\gamma \rho_j \sigma_h \sigma_j Y V'_Y dt \\
E \left[ (-r_h dt - \gamma \sigma_h dz_h) \cdot \left( \mu_j Y_j V'_Y dt + \sigma_j Y_j V'_Y dz_j + \frac{1}{2} \sigma^2_j Y^2 V''_Y dt \right) \right] & = -\gamma \rho_j \sigma_h \sigma_j Y V'_Y dt.
\end{align*}
\]

So we obtain:

\[
\begin{align*}
\pi_h - r_h V_h + (\mu_h - \gamma \sigma^2_h) Y_h V'_Y + \frac{1}{2} \sigma^2_h Y^2 V''_Y & = 0 \quad (A.5) \\
\pi_j - r_h V_j + (\mu_j - \gamma \rho_j \sigma_h \sigma_j) Y_j V'_Y + \frac{1}{2} \sigma^2_j Y^2 V''_Y & = 0 \quad (A.6) \\
-r_h V'_j + (\mu_j - \gamma \rho_j \sigma_h \sigma_j) Y_j V'_Y + \frac{1}{2} \sigma^2_j Y^2 V''_Y & = 0. \quad (A.7)
\end{align*}
\]

Combining the three equations and adding and subtracting the term \( \mu_h Y_h V'_Y + \sum_{j \in A} \mu_j Y_j V'_Y + \)
\[ \sum_{j \notin A} \mu_j Y_j V_{jY}^t : \]
\[
\pi_h - r_h V_h - \gamma \sigma^2_Y Y_h V_h V'_{hY} + \mu_h Y_h V_h V'_{hY} + \frac{1}{2} \sigma^2_Y Y_h^2 V_h V'_{hY} + \ldots
\]
\[
\sum_{j \in A} \pi_j - r_h V_j - \gamma \rho_j \sigma_h \sigma_j Y_j V_j V'_{jY} + \mu_j Y_j V_j V'_{jY} + \frac{1}{2} \sigma^2_Y Y_j^2 V_j V'_{jY} + \ldots
\]
\[
+ \sum_{j \notin A} \left[ -r_h V_{jY} - \gamma \rho_j \sigma_h \sigma_j Y_j V_{jY}^t + \mu_j Y_j V_{jY}^t + \frac{1}{2} \sigma^2_Y Y_j^2 V_{jY}^t \right] = 0. \quad (A.8)
\]

Since \( E(dV_h) + \sum_{j \in A} E(dV_j) + \sum_{j \notin A} E(dV_{jY}^o) = E(d\mathcal{Y}) \):
\[
\pi_h + \sum_{j \in A} \pi_j + E(d\mathcal{Y}) = r_h V_h + \gamma \sigma^2_Y Y_h V_h V'_{hY} + \sum_{j \in A} \left( r_h V_j + \gamma \rho_j \sigma_h \sigma_j Y_j V_j V'_{jY} \right) + \sum_{j \notin A} \left( r_h V_{jY} + \gamma \rho_j \sigma_h \sigma_j Y_j V_{jY}^t \right)
\]
\[
\pi_h + \sum_{j \in A} \pi_j + E(d\mathcal{Y}) = r_h \gamma \sigma_h \left( \sigma_h Y_h V_{hY} + \sum_{j \in A} \gamma \rho_j \sigma_j Y_j V_{jY} + \sum_{j \notin A} \gamma \rho_j \sigma_j Y_j V_{jY}^t \right) \quad (A.9)
\]