Working Papers

FEDERAL RESERVE BANK OF BOSTON™

No. 12-8

Core Competencies, Matching, and the Structure of Foreign Direct Investment: An Update

Federico J. Díez and Alan C. Spearot

Abstract:

We develop a matching model of foreign direct investment to study how multinational firms choose between greenfield investment, acquisitions, and joint ownership. Firms must invest in a continuum of tasks to bring a product to market. Each firm possesses a core competency in the task space, but the firms are otherwise identical. For acquisitions and joint ownership, a multinational enterprise (MNE) must match with a local partner that may provide complementary expertise within the task space. However, under joint ownership, investment in tasks is shared by multiple owners and hence is subject to a holdup problem that varies with contract intensity. In equilibrium, ex ante identical multinationals enter the local matching market, and ex post, three different types of heterogeneous firms arise. Specifically, the worst matches are forgone and the MNEs invest greenfield; the middle matches operate under joint ownership; and the best matches integrate via full acquisition. We link the firm-level model to cross-country and industry predictions related to distance between country pairs, development, and contract intensity. Specifically, smaller distances between host and source countries, a more developed target market, and greater industry contract intensity yield a higher share of full acquisitions. Using data on partial and full acquisitions across industries and countries, we find robust support for these predictions.

JEL Classifications: F12, F23

Keywords: foreign direct investment, multinational firms, joint venture, merger and acquisition, greenfield investment, incomplete contracts

---

Federico J. Díez is an economist in the research department at the Federal Reserve Bank of Boston. Alan C. Spearot is an assistant professor of economics at the University of California, Santa Cruz. Their e-mail addresses are federico.diez@bos.frb.org and acspearot@gmail.com, respectively.

The paper has benefited from presentations at the West Coast Search and Matching Workshop, the ASSA Annual Meetings (Chicago), the SCIEA meeting at the San Francisco Fed, and the North American Econometric Society Meetings (Evanston). The paper has also benefited from useful discussions with Pol Antràs. Kerem Cosar, Arnaud Costinot, Athanasios Geromichalos, Aspen Gorry, Beata Javorcik, Sylvan Leduc, and Robert Staiger. We also thank Nathan Nunn for sharing his data on industry-level contract intensity and Yifan Yu for excellent research assistance.

This paper, which may be revised, is available on the web site of the Federal Reserve Bank of Boston at http://www.bostonfed.org/economic/wp/index.htm.

This version: March 13, 2013

1 Introduction

As a result of the trade and financial liberalizations that have taken place over the last few decades, several new markets have been opened, providing new opportunities for large multinational enterprises (MNEs). Given the millions of potential new customers in these new markets, choosing the right mode of market entry is of paramount importance. Indeed, choosing the wrong entry mode can lead to poor outcomes, even for the "best" MNEs.[1]

What choices are available to an MNE preparing to enter a new market? At a general level, the MNE can work alone via greenfield investment, or it may instead choose to operate with a local partner. If it chooses the latter, the MNE has the option of working under a joint partnership with multiple stakeholders or purchasing the local partner outright. The costs and benefits of each option will likely vary with country and industry characteristics, complicating matters beyond the nontrivial number of entry choices. For example, consider a U.S. MNE entering a developing market. On one hand, there might be local partners, with poor outside options, that are relatively easy to purchase—thus, working with a local partner may be optimal. On the other hand, distance between the source and host of foreign direct investment (FDI) may complicate the integration of large affiliates in new markets. Further, industries in which contracts and bargaining are of high importance might require deeper relationships.

This paper addresses these issues, developing a model of FDI to study how multinationals enter a foreign market, and how industry and country characteristics affect this choice. In the model, MNEs choose whether to match with a local partner, and, if they do, whether to bring the match under full ownership. The key elements of the investment model are the following. First, we view production as a set of tasks that must be completed. Each firm, local and MNE, is relatively efficient at certain tasks and inefficient at certain other tasks. The task that can be performed most efficiently is the firm's core competency. Entering the market for corporate control is a way to increase efficiency by finding a local parter with complementary assets. However, as each task requires investment, an ownership structure involving multiple independent parties may be complicated by agency issues in the investment process. Hence, we allow the MNE to choose the contractual arrangement that governs the new foreign affiliate. Depending on the quality of the match with the local partner—the degree of complementarity—the MNE may be compelled to complete the match through a

[1] For example, Wal-Mart was not particularly successful when it entered Germany via full acquisition. Other famous examples include the brief experiences of Vodafone in Japan and of Home Depot in Chile.

full acquisition rather than to operate under joint ownership with multiple owners sharing revenues of a final product.

In equilibrium, all ex ante identical firms will enter the foreign matching market to find a local partner. The result is a group of ex post heterogeneous firms that have sorted into three forms of ownership. Specifically, we find that the least efficient of these matches are forgone, the mid-efficiency matches operate under joint ownership, and the most efficient matches involve full acquisition. The intuition for this sorting is straightforward. The least-efficient matches are forgone because the match does not offer joint profits sufficient to compensate the MNE and local firms for the opportunity cost of their outside option. For matches that reach a threshold level of efficiency gains, firms operate as a jointly owned firm, or if superior in efficiency, via full acquisition. Intuitively, the incomplete contracts associated with joint ownership cause a holdup problem in coordinating investments in the final product. When match potential is high, the loss of profits due to holdup is quite severe and the MNE instead chooses to buy out the local firm, pay a fixed integration cost, and bring all investment responsibilities under one owner.

The model yields a number of aggregate predictions regarding the industry-level contract intensity, the distance between the host and source country pair, and the relative development of the host-source countries that can be tested against the data. Specifically, we are able to derive predictions regarding the composition of acquisitions as a function of industry, country-pair, and host-country specific characteristics that somewhat resemble the gravity-like equation for FDI found in Head and Ries (2008).[2] In particular, industries with a greater contract intensity yield a larger share of transactions that are full acquisitions. Intuitively, for industries that need very specific inputs requiring hard-to-verify contracts, the potential for holdup problems is more pronounced, and MNEs are more likely to avoid these issues by purchasing firms in full. In terms of cross-country-pair predictions, a greater distance between the host and the source country decreases the share of acquisitions that are full acquisitions: the farther away the countries are, the costlier the fixed costs of establishing or integrating a wholly owned affiliate overseas. Additionally, in terms of cross-host-country predictions, a more developed host market increases the value of the outside option of the host-country firm, making both types of acquisition less profitable for the source-country firm. However, since joint ownership involves the least profitable matches, selection operates through this margin, and, therefore, a more developed host country yields a greater share of

[2]Head and Ries (2008) derive (and test) an equation for bilateral FDI that is similar to the gravity equation used for bilateral trade in goods.

full acquisitions. All of these predictions are supported, using a large database of acquisitions by host-source-industry groups. Indeed, using contract intensity data from Nunn (2007), we find that industries with a greater share of inputs requiring contracts involve a greater share of full acquisitions. Additionally, we find that a greater distance between the host and source country pair entails a lower share of full acquisitions. Finally, a more developed host in terms of GDP per capita also yields a higher share of full acquisitions.[3]

This paper merges multiple strands of literature on topics relating to firm heterogeneity and FDI, the property rights theory of the firm, and firm-to-firm matching. On a very basic level, our paper is similar to the canonical literature on firm heterogeneity in Melitz (2003) and Helpman et al. (2004), where firms select into different options by balancing fixed costs against heterogeneous operating profits. However, our paper differs in that heterogeneity in operating profits is endogenous and is a function of both the quality of a match with a local partner and the organizational form that governs the match.

In terms of modeling, we integrate a circle-type matching framework similar to those in Rauch and Trindade (2003) and Grossman and Helpman (2005) within an investment model in the mold of Antràs and Helpman (2008). Specifically, the investment framework in Antràs and Helpman (2008), in which firms invest in a continuum of tasks and earn revenues in the context of a constant elasticity of substitution (CES) type model, provides the foundation on which to define tasks around a circle and add a simple matching framework. Overall, the result is a hybrid model in which the closed-form solution for match efficiency is very simple and is likely applicable to any CES-type model that requires a matching component.

Our framework also provides other contributions to the literature on firm-to-firm matching. Relative to Rauch and Trindade (2003), which focuses on the role of information in the matching process, we allow for a varying degree of common ownership within the match. As discussed above, we are able to distinguish between joint ownership and full ownership as different forms of foreign investment and to use this distinction to motivate an empirical test of the model. Relative to Grossman and Helpman (2005), our contributions are complementary, in that we focus on the choice of foreign investment type rather than on the outsourcing vs. integration decision in developing a product. In contrast with both Rauch and Trindade (2003) and Grossman and Helpman (2005), we offer greenfield investment as an option when matches fail and we vary the degree of contracting intensity to better match

[3] This is consistent with empirical evidence in Desai et al. (2004) who find that almost 60 percent of U.S. affiliates in developing countries are partially owned, whereas this figure drops to 15.5 percent in the richest countries.

the empirical evidence.

The results are also related to the literature that examines the optimal mode of foreign investment. As mentioned above, Head and Ries (2008) look at FDI as a manifestation of the market for corporate control, and derive a gravity-like equation to explain the observed FDI inflows/outflows between country pairs. In our work, we focus on the role of distance in affecting the *composition* of these transactions. Nocke and Yeaple (2007) examine the choice between greenfield FDI and mergers and acquisitions as a function of whether capabilities are transferrable across borders. Their work shows that the optimal sorting of firms is critically dependent on the degree to which capabilities are internationally mobile. Raff et al. (2009) examine the three-way decision between joint ventures, acquisitions, and greenfield investment in an oligopoly setting, and find that the profits from greenfield investment are a crucial factor in the choice between mergers and acquisitions and joint ventures. Finally, in recent work, Bircan (2011) examines the stability of partial ownership using a learning model of FDI and unique plant-level data from Turkey.[4] Our focus on contracts is similar to his, although our approach to evaluating cross-industry and cross-country patterns of investment is novel.

In terms of the empirical contributions, our paper is related to a burgeoning empirical literature that evaluates the incentives for acquisitions, and in some cases, the distinctions between different investment types—see, for example, Arnold and Javorcik (2005), Nocke and Yeaple (2008), Breinlich (2008), Spearot (2012), and Blonigen et al. (2012). Given data constraints where target and acquiring-firm observables are rarely jointly reported, we use our firm-level model to motivate a country pair-industry analysis of the composition of acquisition types as a function of the relative development of targets and of industry-specific contract intensity. In terms of broader policy questions, our model and aggregate empirical analysis may provide a framework to help guide future work that evaluates the efficacy of investment policies that are industry-specific and, in some cases, target the depth of foreign ownership.

The rest of the paper is organized as follows. Section 2 presents the basic setup of the model and describes the different organizational choices available to the MNE. Section 3 characterizes the equilibrium of the model and presents the comparative-static results and testable implications of the theory. Section 4 describes the dataset and presents the

[4]Other papers focusing on the stability of joint ownership include Killing (1982), Gomes-Casseres (1987), Hamel et al (1989), Kogut (1989), Inkpen and Beamish (1997), Miller et al. (1997), Sinha (2001), Inkpen and Ross (2001), and Roy Chowdhury and Roy Chowdhury (2001).

econometric results. Finally, Section 5 concludes.

2 Basic Setup

The primary focus of the model is an MNE that is deciding how to enter a foreign market and, where applicable, how to organize with a local partner. For simplicity, we assume that the MNE has three possible ways to enter the foreign market directly: greenfield investment, acquiring a local firm, and forming a joint venture with a local firm (operating under joint ownership).[5] The key to the model is how an MNE may divide the tasks required for production with the local firm and how the choice of organizational form incentivizes investment in each task. Shortly, we detail further particulars about each entry type, although the crucial distinction for the model will be that joint ownership projects operate under a less "complete" contract than the other forms of direct investment. While there may be fixed cost savings from not fully integrating the local partner, there may also be inefficiencies due to the standard holdup problem. Later, we introduce geographic frictions in terms of the investment and integration costs associated with whole ownership. To begin with, however, we focus on a foreign multinational firm matching with a local partner in an arbitrary market, and the subsequent decision over organizational choice.

2.1 Production and Operating Profits

Production in the model is defined over a continuum of tasks in which firms must invest to execute production of a final product, similar to the approach taken by Antràs and Helpman (2008). Specifically, we assume that all firms producing for market j do so subject to the following CES-type revenue function:

$$R_j = A_j Y_{i,j}^{\beta}, \qquad \beta \in (0,1). \tag{1}$$

In equation (1), A_j is a measure of market size in j, β is a revenue elasticity parameter that we assume is common across all j, and $Y_{i,j}$ is output by entity i to serve market j. While at this point we do not make a distinction about different markets that are served, we later add in geographic components between markets that yield different investment composition due

[5] A model with exports gives similar predictions to the current model of direct access in terms of the composition of corporate reallocations—full vs. partial acquisitions.

to distance and relative development. Hence, for the remainder of this section we suppress i's and j's for brevity.

As mentioned above, Y is a function of how the firm invests in a continuum of tasks. Specifically, we assume that Y is characterized by the following constant returns function over a continuum of tasks, T:

$$Y = \exp\left(\int_{t \in T} \log(y_t) dt \right), \tag{2}$$

where, y_t is investment in task t. We assume that tasks are uniformly distributed around a unit circle, where every firm, whether local or multinational, has a unique position around the circle. This is the location of a firm's *core competency*, and tasks farther away from this location around the circle are more costly for the firm. A standalone firm cannot change its position around the circle to improve the efficiency of production. However, a firm may match with a partner in order to divide tasks in a way that minimizes costs, and, if it chooses to do so, may operate the combined firm under joint or full ownership.

Figure 1 provides a graphical representation of the division of tasks around the circle. The MNE is positioned at point x, making x its core competency. Ideally, the MNE would like to form a match with a partner located exactly halfway around the circle, at point $x + \frac{1}{2}$. Generally, since we assume that firms are randomly distributed around the circle, the partner will be located at a distance $d \in [0, \frac{1}{2}]$ from x. As we explain below, when the local firm is identical in terms of efficiency in executing tasks around the circle, the MNE will take care of the tasks closest to x, and the partner will undertake those closest to $x + d$.[6]

We now consider production under all three cases of entry into the host country.

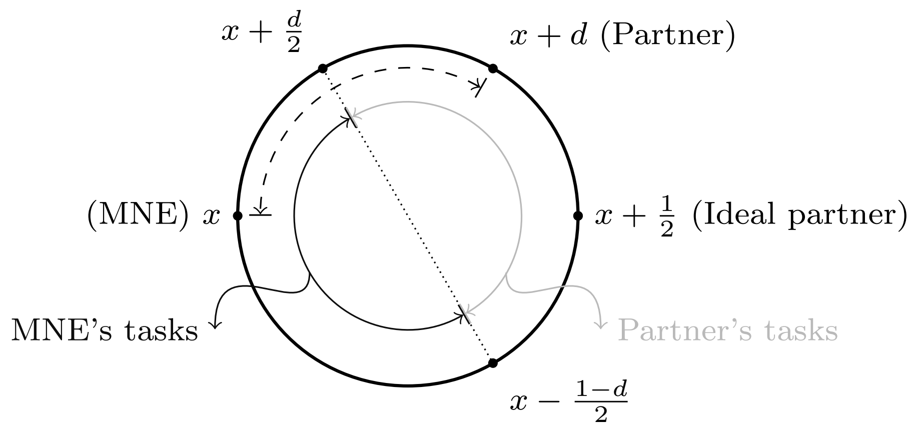
Standalone Firms

In the model, there are two types of standalone firms: MNEs that invest greenfield and local firms that operate independently. As their operating profits will be identical, we begin by deriving these standalone profits. Later, we distinguish one kind of firm from another in terms of fixed costs.

Denote the cost of investing in each task t as c_t. The optimization problem of a standalone

[6] An interesting venue for future research would be to have repeated or directed search instead of random matching.

Figure 1: Allocation of Tasks Around the Circle



firm is the following:

$$\pi_S = \max_{y_t \forall t \in T} \left\{ A \left(\exp \left(\int_{t \in T} \log(y_t) dt \right) \right)^{\beta} - \int_{t \in T} c_t y_t dt \right\}. \tag{3}$$

Differentiating with respect to investment y_t yields the following for all t:

$$y_t = \frac{\beta A Y^{\beta}}{c_t}. \tag{4}$$

Naturally, higher-cost tasks receive less investment. Since tasks are defined around a unit circle, it makes sense to normalize their distance relative to a given firm's core competency. Specifically, we assume that task t, which is at a point s_t (around the circumference of the circle in the closest direction) from the firm's core competency x, costs $c_t = e^{|s_t - x|}$ per unit to complete. Hence, a unit of investment in the task precisely at x requires one unit of labor to complete, and the unit labor requirement rises with distance around the circle from the firm's core competency. With this parameterization, optimal investment in task t is written as:

$$y_t = \frac{\beta A Y^{\beta}}{e^{|s_t - x|}}. \tag{5}$$

Taking into account the uniform location of tasks around the unit circle, the equation for Y

can be written as

$$Y = \exp\left(\int_{x}^{x+1/2} \log\left(\frac{\beta A Y^{\beta}}{e^{s-x}}\right) ds + \int_{x-1/2}^{x} \log\left(\frac{\beta A Y^{\beta}}{e^{x-s}}\right) ds\right), \tag{6}$$

which is simplified as:

$$Y = \beta^{\frac{1}{1-\beta}} A^{\frac{1}{1-\beta}} \exp\left(-\frac{1}{1-\beta}\left(\frac{1}{4}\right)\right). \tag{7}$$

Finally, using equation (2), we can rewrite operating profits in the following way:

$$\begin{aligned} \pi_S &= (1-\beta)\beta^{\frac{\beta}{1-\beta}} A^{\frac{1}{1-\beta}} \exp\left(-\frac{\beta}{4(1-\beta)}\right) \\ &\equiv \pi_0. \end{aligned} \tag{8}$$

The operating profits of the standalone firms are labeled π_0. The operating profits of all other options will be derived relative to π_0.

Acquisition

The main difference between a greenfield investment and an acquisition is that in the latter case the MNE is matched with a local partner and purchases the capabilities of the local partner. Hence, the MNE decides which capabilities, MNE or local, are best suited to invest in each of the tasks required for production. The MNE then chooses the investment level in each task, using whichever capabilities are closest in the task space (the MNE's or the acquired firm's).

Since only one firm controls the investment levels in tasks, the optimal investment in task t as a function of c_t is the same as for the standalone firm. However, the marginal costs may differ because some of the tasks are being performed by capabilities acquired from the local partner. Within the circle context discussed above, the core competency of the matched local firm is at a distance $d \leq \frac{1}{2}$ away from the MNE. Hence, via cost minimization, the MNE, which is located at x, performs tasks between $\left(x - \frac{1-d}{2}\right)$ and $\left(x + \frac{d}{2}\right)$. The assets acquired from the local partner perform all other tasks. This is also depicted in Figure 1. With this parameterization, the equation for Y can be written as:

$$Y = \exp\left(2\int_{x}^{x+d/2} \log\left(\frac{\beta A Y^{\beta}}{e^{s-x}}\right) ds + 2\int_{x-\frac{1-d}{2}}^{x} \log\left(\frac{\beta A Y^{\beta}}{e^{x-s}}\right) ds\right). \tag{9}$$

Simplifying yields the optimal level of production for the merged firm, Y:

$$Y = \beta^{\frac{1}{1-\beta}} A^{\frac{1}{1-\beta}} \exp\left(-\frac{1}{1-\beta}\left(\frac{d^2 - d + 1/2}{2}\right)\right). \tag{10}$$

Using the equation for Y and simplifying yields the following equation for operational profits of the merged firm:

$$\begin{aligned} \pi_A(d) &= (1-\beta)\beta^{\frac{\beta}{1-\beta}} A^{\frac{1}{1-\beta}} \exp\left(-\frac{\beta}{1-\beta}\left(\frac{d^2 - d + 1/2}{2}\right)\right) \\ &= \phi\left(d\right)\pi_0, \end{aligned} \tag{11}$$

where $\phi(d) \equiv \exp\left(\frac{\beta}{1-\beta}\frac{d(1-d)}{2}\right) \geq 1$, $\forall d \in \left[0, \frac{1}{2}\right]$.

We think of $\phi\left(d\right)$ as a measure of the quality of the match between the MNE and the domestic firm: $\phi\left(d\right)$ measures the improvement from splitting tasks with a partner (as opposed of being in charge of all tasks). Since $\phi\left(d\right) \geq 1$, an acquisition (weakly) increases the efficiency of production relative to a standalone firm. Additionally, since ϕ is increasing in d for $d \in [0, \frac{1}{2})$, this implies that better matches (that is, matches where the partners are farther away and are better complements) enjoy higher profits.

Joint Ownership

Having detailed the (polar) options of establishing a wholly owned subsidiary in the local market via greenfield investment and via acquisitions, we now turn to the option of joint ownership. Under this mode of FDI, the MNE forms a match with a local partner, but without buying out the local firm's capabilities. This option may provide advantages in terms of the costs of market entry—no new facilities are built, and there is no cost of buying out the local firm. However, because there are two owners jointly investing in the combined product, agency issues may arise when contracts are incomplete. Indeed, we adopt the assumption that contracts are at least partially incomplete under joint ownership and focus on these issues next.

We assume a flexible framework of partial contractibility, where we allow the degree of contractual incompleteness to vary across industries. Indeed, the severity of contractual issues for industries that must deal with highly sophisticated, customized tasks (hard to verify for a third party) is different than for industries contracting over something homogeneous (like how much light-sweet crude to buy). Thus, having a varying degree of contractual intensity will be helpful for guiding the empirical work.

To add in contractual incompleteness, suppose that task y_t is made of a contractible component and a component subject to incomplete contracts. Specifically, assume that the composite task is split into the two types of tasks as follows:

$$y_t = \left(\frac{y_t^I}{\gamma}\right)^{\gamma}\left(\frac{y_t^c}{1-\gamma}\right)^{1-\gamma}. \tag{12}$$

In equation (12), y_t^I represents investment in tasks subject to incomplete contracts, and y_t^c is investment in tasks subject to complete contracts. The term $\gamma \in (0,1)$ represents the relative weight on tasks subject to incomplete contracts.

Substituting (12) into the expression for Y, we have the following:

$$\begin{aligned} Y &= \exp\left(\int_{t\in T}\log(y_t)dt\right) \\ &= \exp\left(\gamma\int_{t\in T}\log\left(\frac{y_t^I}{\gamma}\right)dt\right)\exp\left((1-\gamma)\int_{t\in T}\log\left(\frac{y_t^c}{1-\gamma}\right)dt\right). \end{aligned} \tag{13}$$

Next, we need to specify how the investment levels for contractible and noncontractible tasks are determined. For tasks subject to complete contracts, we assume that the investment levels will be as if both parties agreed to maximize the joint production of the relationship. That is, each party is contractually obligated to invest such that the joint product is maximized, where these investments are verifiable to an outside party. In this case, the maximization problem and the resulting investment level for either party are given by:

$$\max_{y_t^c \forall t\in T}\left\{A\left(\exp\left(\int_{t\in T}\log\left[\left(\frac{y_t^I}{\gamma}\right)^{\gamma}\left(\frac{y_t^c}{1-\gamma}\right)^{1-\gamma}\right]dt\right)\right)^{\beta} - \int_{t\in T}c_t\left(y_t^I + y_t^c\right)dt\right\}$$

$$y_t^c = \frac{(1-\gamma)\,\beta A Y^{\beta}}{c_t}. \tag{14}$$

For tasks subject to incomplete contracts, each party is contractually obligated to invest such that joint product is maximized, but these investments are not verifiable to a third party. Hence, we assume parties invest to maximize their own share of profits, which we assume to be one half of the total revenue earned from the joint investment.[7] Under this assumption, investments in noncontractible tasks (y_t^I) by the MNE are defined by the following

[7] The model can be easily extended to shares not equal to 1/2

maximization problem:

$$\max_{y_t^I \forall t \in T_{MNE}} \left\{ \frac{A}{2} \left(\exp \left(\int_{t \in T_{MNE}} \log \left[\left(\frac{y_t^I}{\gamma} \right)^{\gamma} \left(\frac{y_t^c}{1-\gamma} \right)^{1-\gamma} \right] dt + \int_{t \in T_P} \log(y_t) dt \right) \right)^{\beta} - \int_{t \in T_{MNE}} c_t \left(y_t^I + y_t^c \right) dt \right\},$$

where T_{MNE} is the set of (composite) tasks that are performed by the MNE within the total set of tasks T. The maximization problem of the local partner is identical to that of the MNE, shown above, with the exception that T_P, the set of tasks undertaken by the local firm, and T_{MNE} are switched. Note that while the parties agree to share the revenue generated by the joint venture, the revenue itself depends on the investments undertaken by both parties. Given the incomplete contract environment, the parties cannot commit to an investment level (the maximization takes the contractible tasks y_t^c and the other party's tasks as given) despite the fact that each party must incur the full costs of the tasks for which it has responsibility.

Differentiating with respect to y_t^I yields the following for all t:

$$y_t^I = \frac{\gamma \beta \frac{A}{2} Y^{\beta}}{c_t}. \tag{15}$$

Hence, conditional on Y (which will be endogenous) investment levels in each noncontractible task are exactly one half of what they would be under complete contracts. Plugging the investment levels, contractible and noncontractible, into the equation for Y, we get:

$$Y = \left(\frac{1}{2} \right)^{\frac{\gamma}{1-\beta}} \beta^{\frac{1}{1-\beta}} A^{\frac{1}{1-\beta}} \exp \left(-\frac{1}{1-\beta} \frac{d^2 - d + 1/2}{2} \right). \tag{16}$$

Using the equation for Y and simplifying yields the following equation for the MNE's profits under joint ownership:

$$\widetilde{\pi}_J(d) = \left[1 - \beta \left(1 - \gamma + \frac{\gamma}{2} \right) \right] \left(\frac{1}{2} \right)^{\frac{1-\beta+\beta\gamma}{1-\beta}} \beta^{\frac{\beta}{1-\beta}} A^{\frac{1}{1-\beta}} \exp \left(-\frac{\beta}{1-\beta} \frac{d^2 - d + 1/2}{2} \right). \tag{17}$$

We assume that the MNE and the local firm, if they choose joint ownership, can engage in side payments, so the primary measure relevant for organizational choice is the operating profits earned under the venture. These operating profits under joint ownership can be written as follows:

$$\pi_J(\gamma, d) = \lambda(\gamma)\phi(d)\pi_0, \tag{18}$$

where $\lambda(\gamma) \equiv \frac{1-\beta\left(\frac{2-\gamma}{2}\right)}{1-\beta}\left(\frac{1}{2}\right)^{\frac{\beta}{1-\beta}\gamma} \in [0, 1]$. As with acquisitions, the MNE benefits from matching with a partner that is more efficient at some tasks—there is an efficiency gain through $\phi(d)$. However, there is also a potential efficiency loss due to a loose contractual relationship, which is measured by the term $\lambda(\gamma)$. Lemma 1 details precisely the properties of λ, and in particular, how λ changes with γ.

Lemma 1 *For* $\beta \in (0, 1)$, $\lim_{\gamma \to 0} \lambda(\gamma) = 1$, *and* $\frac{\partial \lambda}{\partial \gamma} < 0$.

Proof. See Appendix ■

In Lemma 1, the inefficiency related to holdup is nil when there are no tasks subject to incomplete contracts ($\gamma \to 0$), and more pronounced with higher γ ($\frac{\partial \lambda}{\partial \gamma} < 0$). Intuitively, the greater the share of each task that involves unverifiable contracts, the larger is the degree to which holdup reduces profits under joint ownership.

Crucially, as detailed in equation (18), the degree to which inefficiency related to holdup reduces profits is, in absolute terms, a function of the quality of the match, $\phi(d)$. Specifically, the profit loss from holdup $(1 - \lambda(\gamma))$ is larger in absolute terms when the match quality $\phi(d)$ is higher. Lemma 2 provides two useful benchmarks:

Lemma 2 *For* $d \in [0, 1/2]$ *and* $\beta \in (0, 1)$*:*

1. $\lim_{\gamma \to 1} \lambda(\gamma)\phi(d) < 1$,
2. $\lim_{\gamma \to 0} \lambda(\gamma)\phi(d) = \phi(d)$.

Proof. See Appendix ■

Via Lemma 2, whenever $\gamma \to 1$, it is always the case that $\lambda\phi(d) < 1$, which implies that the inefficiency associated with holdup *always* degrades the match to the point of being less profitable (on an operational basis) than a standalone firm. In contrast, whenever $\gamma \to 0$ and all tasks are contractible, there is no efficiency loss due to holdup, and hence, operational profits under joint ownership are identical to operational profits of acquisitions.

2.2 Total Profits and Organizational Choice

The previous section characterized the operational profits for each organizational form as a function of match quality. In this section, we characterize the optimal organizational choice as a function of the quality of the matches that occur and prove that there exists a parameter space such that all three types of FDI occur after ex ante identical firms enter the matching market for corporate control.[8] To begin, we introduce the fixed costs that must be paid to complete each type of investment.

Recall that in terms of operating profits, standalone firms earn π_0. If this standalone firm is a foreign multinational that invested greenfield, it must pay a fixed setup cost equal to F_G. Hence, total profits under greenfield investment are written as:

$$\Pi_G = \pi_0 - F_G. \tag{19}$$

In the equilibrium that follows, we view Π_G as the outside option of the MNE. Given that Π_G is a function of exogenous parameters, unrelated to contracts and matching, we assume that $\Pi_G > 0$, thus guaranteeing entry of the MNE into the new market. However, we will allow for F_G to vary with distance, where more distant markets incur larger setup cost.

Moving on to the local firms in the host country, we assume that the local firm differs from the MNE in that, as an established firm in the local market, it incurs no fixed costs. Hence, total profits of the local firm are written as:

$$\Pi_L = \pi_0. \tag{20}$$

Moving to acquisitions, the MNE must pay an integration cost associated with an acquisition, which is defined as F_A. Hence, total profits of the acquisition are written as:

$$\Pi_A(d) = \phi(d)\pi_0 - F_A \tag{21}$$

Finally, we assume that a joint venture, as a loose organizational form, incurs no integration

[8] Alternatively, one could think of the MNE as first making the organizational choice based on the expected match quality, and adjusting after the actual match is observed. In an extension to the present model (available upon request), we find that this alternative generates three possible equilibria. First, if the expected match quality is sufficiently low, only greenfield investment occurs. Second, only acquisitions occur if the expected match quality is sufficiently high. Moreover, given that fixed costs of integration are sunk, acquisitions are never dissolved. Finally, only joint ventures occur if the expected quality is intermediate. But once the uncertainty is revealed, matches are dissolved/deepened just as outlined in this section. However, in our data we find that it is extremely rare to have acquisitions that are deepened from partial to full over long periods of time. This finding, in turn, may be indicating that firms do have information about (some) observables when matches are presented to them—so their decisions are not taken (only) on expected match quality.

or setup costs. Hence:

$$\Pi_J(d) = \phi(d)\lambda(\gamma)\pi_0. \tag{22}$$

To build intuition regarding the equilibrium of the model as it relates to match quality, it is straightforward to show that:

$$\begin{aligned}\frac{\partial \Pi_G}{\partial \phi(d)} &= 0 \\ \frac{\partial \Pi_J}{\partial \phi(d)} &= \lambda(\gamma)\pi_0 \\ \frac{\partial \Pi_A}{\partial \phi(d)} &= \pi_0.\end{aligned}$$

Obviously, greenfield investment is not affected by the quality of a match, simply because no match has occurred. However, for joint ventures and acquisitions, the effect of match quality is an increasing and monotonic function of $\phi(d)$, where via Lemma 2, we have shown that $\frac{\partial \Pi_J}{\partial \phi(d)} < \frac{\partial \Pi_A}{\partial \phi(d)}$ whenever $\gamma > 0$, which we assume for the remainder of the paper. It is then clear that the critical issue in pinning down the sorting of entry choices as a function of match quality is the relative ranking of fixed costs. We now turn to address precisely this issue.

2.3 Equilibrium

First, consider the choice between joint ownership and declining the match. The MNE can compensate the local firm for its outside option (standalone operation) and also make additional profit for itself, if the following holds:

$$\begin{aligned}\Pi_J(d) &\geq \Pi_G + \Pi_L \\ \lambda\phi(d)\pi_0 &\geq \pi_0 - F_G + \pi_0.\end{aligned} \tag{23}$$

Simplifying, this condition can be written as:

$$\phi(d) \geq \frac{2\pi_0 - F_G}{\lambda\pi_0} \equiv \phi_J. \tag{24}$$

In equation (24), only matches of relatively high quality operate under joint ownership rather than outcomes in which the match is declined and the parties operate as standalone entities. Note that a higher π_0 increases the value of the cutoff ϕ_J: a higher outside option for the domestic firm makes joint ownership less desirable for the MNE vis à vis greenfield investment. In contrast, a higher value of λ decreases the cutoff ϕ_J: more complete contract environments increase the relative profitability of joint ventures.

Consider next the choice between the MNE acquiring a local firm and forming a joint venture. An acquisition is preferred if the profits earned under acquisition are larger than the combined profits of the MNE and the local firm under joint ownership. This is characterized by the following condition:

$$\begin{aligned} \Pi_A(d) &\geq \Pi_J(d) \\ \phi(d)\pi_0 - F_A &\geq \lambda\phi(d)\pi_0. \end{aligned}$$

Simplifying, this condition is written as:

$$\phi(d) \geq \frac{F_A}{(1-\lambda)\,\pi_0} \equiv \phi_A. \tag{25}$$

In equation (25), a matched party prefers an acquisition to a joint venture when the match is of relatively high quality. In this case, the additional rents earned from the match are sufficient to overcome the fixed costs of integrating the local firm into the MNE. Note that the cutoff ϕ_A increases with λ, as better contracting settings increase the range of match quality for which operating under joint ownership is preferred to a full acquisition. In contrast, ϕ_A decreases with π_0, since a reduction in profits due to the holdup problem is more pronounced when market potential is higher. Consider also the polar case in which the fixed costs of integration are equal to zero. In this case, all matches that provide a nonzero benefit of specialization take the form of acquisitions, since there are no additional fixed costs, and an acquisition provides the benefits of a match without the agency issues of two parties splitting revenues but making independent investments.

Finally, consider the choice between acquisition and greenfield investment. The former organizational form will be preferred over the latter if and only if:

$$\begin{aligned} \Pi_A(d) &\geq \Pi_G + \Pi_L \\ \phi\pi_0 - F_A &> 2\pi_0 - F_G \\ \phi &> \frac{2\pi_0 - F_G + F_A}{\pi_0} \equiv \phi'_A. \end{aligned} \tag{26}$$

Note that a high π_0, low F_G, or high F_A requires a better match to make acquisition preferred over greenfield investment. However, as we show below, this choice is inframarginal in our baseline equilibrium.

2.4 Equilibrium Sorting of Matches

In this subsection, we prove that there exists a range of exogenous parameters such that the least efficient matches are declined, mid-efficiency matches become joint ventures, and the most efficient matches result in acquisitions. Given the preference conditions above, this outcome occurs if the following condition holds:

$$1 < \phi_J < \phi_A < \widehat{\phi}, \tag{27}$$

where $\widehat{\phi} \equiv \phi|_{d=1/2}$ is the maximum possible benefit from a match.

To begin with, consider the condition $1 < \phi_J < \widehat{\phi}$. As a function of the model's parameters, this condition can be simplified as:

$$\begin{aligned} \lambda\pi_0 &< 2\pi_0 - F_G < \lambda\pi_0\widehat{\phi} & (28)\\ &\Leftrightarrow \\ \left(2 - \lambda\widehat{\phi}\right)\pi_0 &< F_G < (2-\lambda)\,\pi_0. & (29) \end{aligned}$$

Next, consider $\phi_J < \phi_A < \widehat{\phi}$, which implies the following condition:

$$\frac{1-\lambda}{\lambda}\left(2\pi_0 - F_G\right) < F_A < \frac{1-\lambda}{\lambda}\lambda\widehat{\phi}\pi_0. \tag{30}$$

Note that $2\pi_0 - F_G < \lambda\widehat{\phi}\pi_0$ is equivalent to the right-hand side of (28) being satisfied. Hence, if joint ventures are chosen at all over greenfield investment, then there exists a range of F_A such that acquisitions also occur, but only for matches of the highest quality. This is intuitive, as F_A simply shifts Π_A up and down, while the slope of Π_A is fixed, given match quality, and is steeper than Π_{JV}. Hence, there exists a value of F_A such that $\phi_J < \phi_A < \widehat{\phi}$.

Finally, the above expressions imply that $\phi_J < \phi'_A$ and that $\phi'_A < \phi_A$. Indeed, substituting in the expressions for the cutoffs, we find that

$$\frac{1-\lambda}{\lambda}\left[2\pi_0 - F_G\right] < F_A, \tag{31}$$

which is precisely the left-hand side of expression (30).

Overall, we have the following proposition:

Proposition 1 *Suppose that F_G and F_A satisfy (29) and (30). Then, for $\phi \in (1, \phi_J)$, matches are immediately declined (and firms operate independently); for $\phi \in (\phi_J, \phi_A)$, matches form joint ventures; and for $\phi \in (\phi_A, \widehat{\phi})$, matches form acquisitions.*

Figure 2 provides a graphical representation of the equilibrium, and the shaded area in Figure 3 represents all the possible combinations of fixed costs F_G and F_A such that the equilibrium is the one described in Figure 2. We see that the marginal value of a high-quality match is higher for acquisitions than for joint ventures. This is due to the holdup problem that is present under joint ownership, and is key to understanding the equilibrium sorting of matches into entry modes. Specifically, the forgone profits due to the holdup problem are largest when the potential profits of the match are large. Hence, the MNE is willing to pay a fixed cost to solve the holdup problem and integrate the local firm into one entity that controls investment in all tasks.

Figure 2: Profits as a Function of Match Quality, ϕ

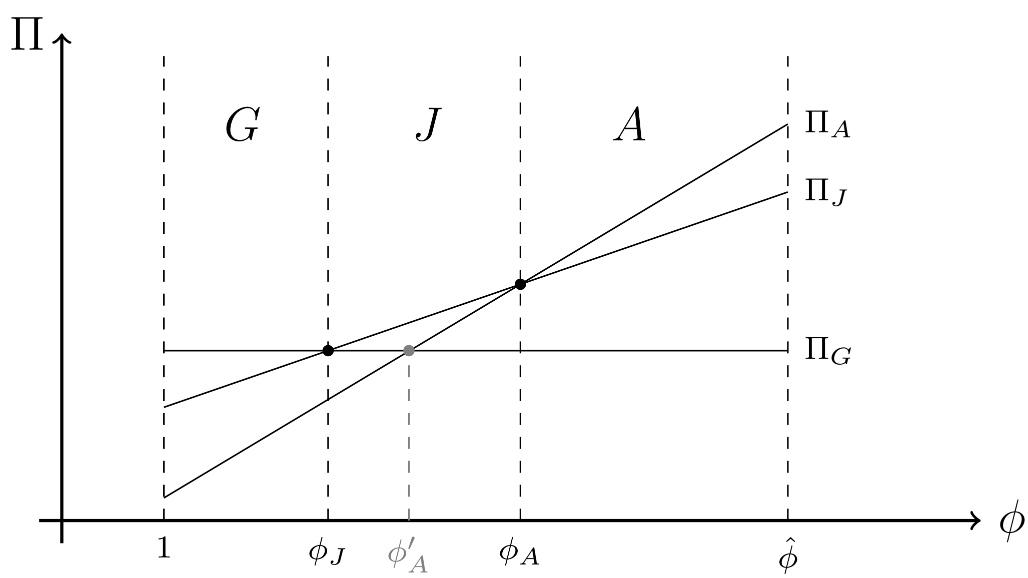
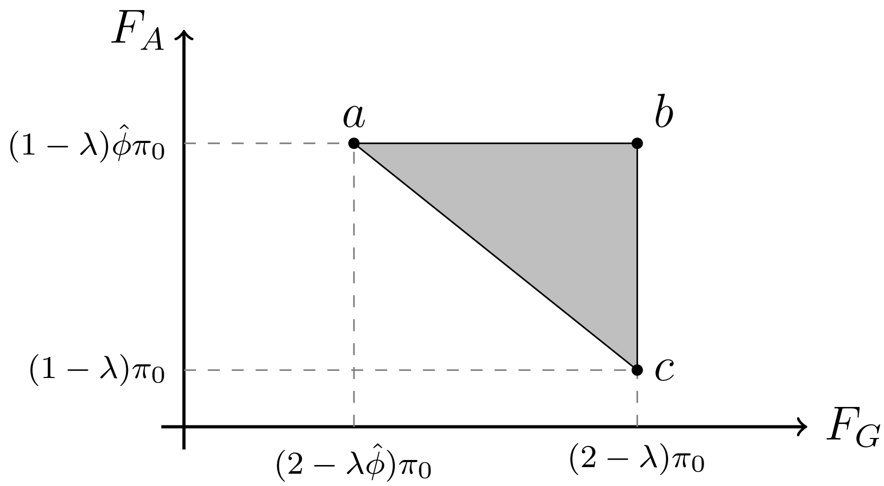


Figure 3: Conditions for F_G and F_A



3 Distance, Development, and the Composition of Investment

The equilibrium above details the average investment behavior of a given group of multinationals entering an arbitrary foreign market deciding whether to proceed with a match and, if so, whether that match is loose or deep. However, the relative attractiveness of each option may change with the contracting environment within an industry, with host-country specific differences related to market size, and/or with source-host country-pair differences, such as geographical proximity. In this section, we spell out precisely these issues by adding industry and country-specific components into the model.

To put more structure on the geographic and country-specific dimensions, suppose that a firm from country k randomly matches with a firm in country j for purpose of serving country j. Note that j might equal k, in which case the merger or joint venture is purely domestic. We model the distinction between the source-of-investment nation and the target nation in terms of the fixed costs of standalone operation (F_G) and integration (F_A). Specifically, similar to Head and Ries (2008), we assume that both fixed costs are positively related to the geographic distance between the source and target nations. This is meant to reflect the increased organizational and monitoring costs associated with operating a wholly owned affiliate in a distant location. Specifically, we adopt the following functional form for the fixed costs:

$$F_G^{k,j} = \psi_G \cdot d_{k,j}, \tag{32}$$
$$F_A^{k,j} = \tilde{F}_A + \psi_A \cdot d_{k,j}. \tag{33}$$

First, consider the fixed costs of standalone operation, $F_G^{k,j}$, where $d_{k,j}$ is the geographic distance between the source k and the host j, and ψ_G is the marginal effect of distance on fixed costs. Note that when distance is zero, there is no additional fixed cost since they are already an operable firm in that location. However, as distance increases, the fixed costs of standalone operation increase, which represents logistical or monitoring costs, distribution investment, or investments in new facilities. Next, consider the cost of integrating a local firm in market j by a firm from market k, $F_A^{k,j}$. Here, the fixed costs have similar properties in that bilateral geographic distance increases these costs, which represent increased monitoring expenditures or other costs associated with integration of a distant affiliate. The marginal effect of distance is modeled by the parameter ψ_A. However, when distance is zero, fixed costs are nonzero, representing the fact that an integration of any firm, domestic or foreign, will incur additional fixed costs above and beyond those of loose contracts and joint ownership (à la Williamson, 1973).

With this setup, we can re-write the equilibrium cutoffs as follows:

$$\phi_J^{k,j} = \frac{2\pi_0^j - \psi_G \cdot d_{k,j}}{\lambda \pi_0^j}, \tag{34}$$
$$\phi_A^{k,j} = \frac{\tilde{F}_A + \psi_A d_{k,j}}{(1-\lambda)\,\pi_0^j}, \tag{35}$$

where π_0^j, equation (8) evaluated at A_j, is a measure of the target nation's market size/potential.

Using these refined cutoff definitions, we can now evaluate the effects of target nation characteristics, distance between host and source nations, and industry's contract completeness on each cutoff. Lemma 3 details these effects.

Lemma 3 *The effects of* π_0^j, $d_{k,j}$, *and* λ *on the cutoffs* $\phi_J^{k,j}$ *and* $\phi_A^{k,j}$ *are as follows:*

$$\textbf{i}. \quad \frac{\partial \phi_J^{k,j}}{\partial \pi_0^j} > 0, \qquad \frac{\partial \phi_A^{k,j}}{\partial \pi_0^j} < 0.$$

$$\textbf{ii}. \quad \frac{\partial \phi_J^{k,j}}{\partial \lambda} < 0, \qquad \frac{\partial \phi_A^{k,j}}{\partial \lambda} > 0.$$

$$\textbf{iii}. \quad \frac{\partial \phi_J^{k,j}}{\partial d_{k,j}} < 0, \qquad \frac{\partial \phi_A^{k,j}}{\partial d_{k,j}} > 0.$$

Proof. See Appendix. ■

The first set of results in Lemma 3 summarizes the effect of π_0^j, that is, the level of market potential in country j. We find that higher values of π_0^j reduce the cutoff $\phi_J^{k,j}$ and increase the cutoff $\phi_A^{k,j}$. The intuition for the former is that higher market potential in the target reduces the relative size of the fixed cost of greenfield investment and the outside option of the local firm to operate independently. Hence, greenfield investment is relatively more profitable. For the latter, as discussed earlier, holdup issues have a larger absolute effect when there is greater market potential. Hence, higher π_0^j yields a larger range of matches ϕ such that acquisitions are preferred over joint ownership.

The second set of results in Lemma 3 summarizes the effect of the level of contractual completeness, λ. Intuitively, higher λ increases the level of contractual completeness and decreases the loss in profits due to loose ownership, in this case through joint ownership. Hence, relative to both greenfield investment and acquisitions, the region of joint ownership expands with λ.

The final set of result refers to the effect of $d_{k,j}$, where distance makes whole ownership less profitable relative to joint ownership, whether it be greenfield or acquisitions. This results from the assumption that distance has an effect on the fixed costs of operating a wholly owned enterprise at a distance.

Finally, to motivate the forthcoming empirical exercise (in which we only have data on partial and full acquisitions), we use the results in Lemma 3 to evaluate the effects of π_0^j, λ, and $d_{k,j}$ on the *share* of corporate reallocation that is a full acquisition.[9] Specifically, we are

[9]Note that this is similar to Helpman et al. (2004), which, lacking domestic sales, evaluates the relative importance of exporting to FDI.

interested in the following measure of acquisition depth

$$S^{k,j} = \frac{1 - G(\phi_A^{k,j})}{1 - G(\phi_J^{k,j})},$$

where $G(\phi)$ is the cumulative distribution function (CDF) of match quality (with probability distribution function (pdf), $g(\phi)$). Note that we require no strong assumptions on the distribution of matches other than being differentiable and identical across markets, which is satisfied if matches are random and firms are uniformly distributed around the circle. Further, since we are not deriving a structural estimating equation, we do not assume a Gumbel distribution as in Head and Ries (2008), or a Pareto as in the other parts of the trade literature.[10] However, our distribution of random matches serves the same purpose as in Head and Ries (2008), to facilitate acquisition activity in shares that can be taken to the data. The following proposition summarizes the effects of π_0^j, λ, and $d_{k,j}$ on the share of full acquisitions.:

Proposition 2 *The effects of the target's size π_0^j, the industry's contract completeness λ, and the host-size distance $d_{k,j}$ on the share S of full acquisitions are as follows:*

i. $\frac{\partial S}{\partial \pi_0^j} > 0,$

ii. $\frac{\partial S}{\partial \lambda} < 0,$

iii. $\frac{\partial S}{\partial d_{k,j}} < 0.$

Proof. See Appendix. ■

The intuition in Proposition 2 is the same as the intuition for the cutoffs in Lemma 3, although its importance is worthy of a proposition on two levels. First, in the next section, we propose a measure of the share of acquisitions that are 100 percent, using a common merger database that can be linked back to measures of market potential, contractual completeness, and distance. Hence, Proposition 2 details the predictions that we test against the data. Specifically, we test whether (i) the market potential of the target economy has

[10] A Gumbel or Pareto distribution of match quality could represent unobserved matching technologies within our framework. However, again, the main testable implications of the model do not change by making stronger distributional assumptions.

a positive effect on the likelihood of a full acquisition within all firm-to-firm transactions, while (ii) increased contractual completeness or (iii) increased geographic distance reduces this likelihood.

Second, we present a corollary of Proposition 2 that summarizes the unconditional differences between foreign and domestic acquisitions *within a target market*.

Corollary 1 *Within target market j, domestic acquisitions are more likely to be full acquisitions.*

Proof. Straightforward application of the last item on Proposition 2. ■

Corollary 1 makes clear the role of fixed costs in the model. When an acquisition is domestic, the distance between the contracting parties is minimized, which makes standalone operations and acquisitions attractive relative to joint ownership. Since this is an unconditional pattern that we find in the data, we can evaluate the role of distance in explaining this pattern. We now turn to evaluating this and other patterns using a large database of partial and full acquisitions.

4 Empirical Analysis

The model presented in the previous sections delivers a rich set of predictions regarding acquisition depth across industries and countries. Specifically, in Proposition 2, we prove that a greater degree of contractual completeness reduces the share of 100 percent acquisitions within all corporate reallocation, that greater distance between the acquiring and target nations also reduces this share, and that a smaller, less-developed target market reduces this share as well.[11] We now utilize a large database of acquisitions to test these predictions.

4.1 Data Sources and Description

A main challenge we face in testing these predictions is how to classify joint ownership. On one hand, joint ownership may involve a loose agreement within which two parties work on a project without swapping ownership shares. On the other hand, joint ventures may involve

[11] When testing Proposition 2 against the data, one might be concerned that in the model firms have only one shot at matching, whereas in reality they may be matched repeatedly. While this is a valid concern, our data seem to indicate that this is not actually a pressing issue. Indeed, it is extremely rare to find a partial acquisition later deepened into a full acquisition. Specifically, of all the transactions that were full acquisitions five years after the initial transaction, over 99.7 percent were full acquisitions from the start.

a limited exchange of ownership shares. Given the difficulty in observing the former group of transactions, we focus our empirical attention on the latter group, classifying joint ownership as partial ownership, according to the percentage acquired in a transaction between two firms.

The sample of firm transactions is obtained from the *Thomson SDC Platinum* dataset, which uses regulatory filings and public records to build a large database of acquisition behavior across countries and industries.[12] The main sample of acquisitions is constructed by restricting transactions to those that start from 0 percent ownership. This removes gradual acquisitions from the dataset and focuses the analysis on initial purchases. Further, we restrict attention to transactions above a 10 percent purchase. As some countries (namely, the United States) require additional oversight/disclosure of foreign transactions above this level, this cutoff is applied to the entire sample for consistency (removing this cutoff adds roughly 10,000 transactions and has no effect on the results). The sample of transactions consists of 372,542 transactions over the period 1980–2006. We then collapse this dataset into a four-way sample of observations by (target) firm industry (SIC2)-Source country-Host country-year. Below, i is the industry SIC2, h is host (target) country, s is the source (acquiring) country, and t is the year.

We construct two measures of the share of full acquisitions S from the theory. The primary measure is the share of transactions within each observation that are 100 percent acquisitions, $Full_{i,h,s,t}$. The secondary measure is the average percentage of the target firm that is acquired within each observation, $PerAcq_{i,h,s,t}$.[13] We regress these measures of acquisition depth on three primary independent variables—the distance between the two markets, the size and/or development in the host market, and the degree of contractual completeness in the target industry. These variables are meant to measure $d_{k,j}$, π_j^0, and λ_j, respectively. We now discuss the construction of each measure.

In order to measure the distance between host and source countries we use the CEPII's distances measures, discussed in Mayer and Zignago (2011). These distances are the geodesic distances calculated using the great circle formula, based on the latitudes and longitudes of the most important cities. Additionally, this dataset provides "intra-national" distances, often used as an average distance between producers and consumers in a country. In our empirical work, $log(distance)_{h,s}$ is the log of the distance in kilometers between the host

[12] The *Thomson* dataset was initially used in the economics literature by Gugler et al. (2003), and notably, also was used in Breinlich (2008).

[13] These measures are not weighted by the value of the transaction, since values are not consistently reported in *Thomson*.

country h and the source country s.[14]

To examine development of the host market, we acquire GDP per capita data from the *Penn World Tables*. Recall from the theory section that $\pi_j^0(A_j)$ measures the local firm's outside option in terms of the operating profits that it can obtain if it operates as a standalone firm. Thus, to proxy for π_j^0, we use the log of the host nation's GDP per capita in year t, $log(GDPperCap)_{h,t}$.[15]

In terms of contract incompleteness, λ, we construct our measure using estimates of contract intensity from Nunn (2007). In Nunn (2007), an industry's contract intensity is measured by the share of inputs that are procured from differentiated industries. To construct our measure, for each target SIC2 industry, we first average contract intensity weighted by total value (from Nunn) at the SIC 4-digit level. Then we subtract this average from 1 to obtain our measure of contract completeness for target industry i, $Completeness_i$. This measure captures the idea that those industries that need a larger share of differentiated inputs (difficult to contract) are more prone to suffer from contractual problems. In contrast, those industries dealing with homogeneous, easy-to-contract inputs will generally enjoy a more complete contract environment.

Finally, to identify cross-border relationships, we define a dummy variable $Crossborder$ which is set equal to 1 when the host and source nations are different.

Summary statistics for all variables are presented in Table 1. Consistent with earlier studies of mergers, most of the mergers are 100 percent transactions, and many partial mergers involve a high share of ownership. Further, due to the aggregation we perform, a majority of the acquisitions in our final dataset are cross-border, although this is not the case at the transaction level.[16]

4.2 Distance, Relative Development and Acquisition Depth

We first focus the analysis on the country specific characteristics of the acquisitions in our sample. That is, we are interested in how do cross-border, distance, and GDP per capita affect the share of 100 percent acquisitions in the data. Precisely, we estimate the following

[14] In our results below, we use the mentioned internal distances, but setting these distances equal to zero leaves our results unchanged.

[15] As an alternative, we also tried using total GDP as a proxy for π_j^0. While conceptually we think that GDP per capita better captures the idea of how wealthy consumers are in the host country (and how costly it potentially is to buy out a local firm), total GDP could be a good measure in the case of firms producing goods on a massive scale and making profits from the volume of sales. The estimates when using total GDP are qualitatively identical to the ones presented in the paper.

[16] Across the transaction level data, over 60 percent of acquisitions are domestic.

Table 1: Descriptive Statistics

Variable	Mean	St. Dev.	Min	Max
$Full_{i,h,s,t}$	0.639	0.441	0	1
$PerAcq_{i,h,s,t}$	0.839	0.251	0.101	1
$CrossBorder$	0.666	0.472	0	1
$log(distance)_{h,s}$	6.944	1.655	0.632	9.883
$log(GDPperCap)_{h,t}$	9.699	0.813	4.881	11.378
$Completeness_i$	0.232	0.207	0.004	0.903

Notes: Descriptive statistics calculated by SIC2 industry i, source country s, host country h, and year t groups. See text for variable definitions.

specification,

$$\begin{aligned} FULL_{i,h,s,t} &= \alpha_1 \cdot Crossborder + \alpha_2 \cdot \log(GDPperCap)_{h,t} + \alpha_3 \log(distance)_{h,s} \\ &\quad + \alpha_h + \alpha_s + \alpha_{i,t} + \epsilon_{i,h,s,t}, \end{aligned} \tag{36}$$

where we use industry-year ($\alpha_{i,t}$), host country (α_h), and source country (α_s) fixed effects. Thus, we obtain identification by exploiting variation across country pairs and across countries over time within SIC2-year groups.

The baseline results are presented in Table 2. To begin, we find in column (1) that the *Crossborder* dummy is estimated to be negative and significant, implying that transactions that take place between firms from different countries are less likely to be 100 percent acquisitions—this finding is consistent with our theory, as Corollary 1 indicates that domestic acquisitions are more likely to be full acquisitions *when not controlling for distance*. When controlling for distance in column (3), note that this estimate is reduced by 50 percent, suggesting that distance is responsible in large part for the negative unconditional relationship between cross-border acquisitions and the share of acquisitions that are 100 percent. Though outside the scope of the model, the remaining relationship between cross-border acquisitions and full ownership may be due to risk aversion in cross-border investment (firms optimally start small in new markets).

Next, we also find that the coefficient of the GDP per capita of the host country is positive and significant. Once again, this is consistent with our theory, as we expect the share of 100 percent acquisitions to depend positively on π_j^0, which we proxy by GDP per capita. Intuitively, if the host country is relatively wealthy, joint ownership is discouraged in two ways: first, local firms have a higher outside option from which to bargain and, second, the potential profit losses due to holdup problems are more severe.

Finally, we also find that distance has a negative and significant effect on the share of 100 percent acquisitions. As our theory predicts, when the host country is farther away from the source country, it is more likely that the transactions will involve joint ownership. Note that these facts hold across all the different specifications presented in Table 2, even in column (6), where we keep only those cross-border transactions.

To test the robustness of our dependent variable, we run these same regressions using $PerAcq_{i,h,s,t}$ as the dependent variable. The results, which are presented in Table 3, are arguably as strong as our baseline results.

4.3 Contract Completeness and Acquisition Depth

The previous regressions focused on the variation in acquisition patterns across country pairs to identify the effects of distance and relative development on the type of corporate reallocation. In this section, we evaluate the depth of acquisitions as a function of industry differences in contract completeness. To do so, we estimate the following specification:

$$FULL_{i,r,h,s,t} = \alpha_1 \cdot Completeness_i + \alpha_{h,s,r,t} + \epsilon_{i,r,h,s,t}. \quad (37)$$

In (37), we examine the effects of $Completeness_i$, the degree of contract completeness in industry i, which was previously absorbed by the industry-year fixed effects. In adjusting our fixed effects, we now estimate the model within 1-digit SIC sector r, host h, source s, and year t groups. Using this approach allows us to absorb any bilateral factors that affect the composition of acquisition patterns, and control for sector-country-year policies or financial dependence that may vary over the sample period. The baseline results are presented in column 1 of Table 4. We observe that, as the model predicts, when target industries have more inputs that involve complete contracts, there is a lower share of 100 percent acquisitions.

In column 2 of Table 4, we add in as additional regressors the other three variables from our theory, distance, GDP per capita, and the cross-border dummy. In this case, we need to adjust the fixed effects that now are 1-digit sector, year, host country, and source country (separately). This case is particularly interesting because we are simultaneously considering all points of Proposition 2, and we find support in the data for all three points. In columns 3 and 4, we rerun these two specifications but restricting the sample to cross-border observations only. Once again, we find that the data support the theory's prediction with the restricted sample.

Finally, as a robustness check, in columns 5 through 8, we rerun all four regressions but replacing the dependent variable $Full$ with the continuous measure of acquisition activity, $PerAcq$. We find that the estimates with $PerAcq$ are essentially the same as in the previous case.

5 Conclusion

We have presented a model of foreign direct investment in which MNEs match with firms in a local market. When the MNEs match, they choose between incomplete contractual relationships with no fixed costs (joint ownership) and full ownership with integration costs (acquisitions). When they fail to find a sufficiently good match, they instead undertake greenfield investment. In equilibrium, ex ante identical multinationals enter the local matching market, and, ex post, three different types of ownership within a heterogeneous group of firms arise. In particular, the worst matches dissolve and the MNEs invest greenfield, the middle matches operate under joint ownership, and the best matches integrate via full acquisitions.

We have also shown that joint ownership is more common when the host country is relatively less developed and when it is farther away from the source country. Further, we have shown that joint ownership is more common when contract intensity is lower. We find robust empirical support for these predictions, using a large database of country and industry acquisitions patterns, where greater distance between host-source country pairs, less-developed host markets, and a less-intensive contract environment lead to more joint ownership.

In future work, we intend to focus on the endogenous choice of the type of products that a firm brings to a local market as a function of the investment mode. Indeed, since many policies restrict the types of foreign investments that are permissible, this focus may elucidate the ramifications of such policies when technology transfer depends on the type of products that a firm brings into a local market. Further, we plan to extend the model to a dynamic setting with repeated search to examine how firms optimally adjust or abandon matches in response to shocks.

Table 2: Distance, Relative Development, and Full Acquisitions

Dependent variable: *Full*	(1)	(2)	(3)	(4)	(5)	(6)
Crossborder	-0.049***	-0.049***	-0.023***	-0.023***		
	(0.004)	(0.004)	(0.006)	(0.006)		
log(GDPperCap)		0.097***		0.092***	0.092***	0.166***
		(0.028)		(0.029)	(0.029)	(0.037)
log(distance)			-0.012***	-0.012***	-0.018***	-0.008***
			(0.002)	(0.002)	(0.002)	(0.003)
Observations	58,324	58,324	54,995	54,995	54,995	35,506
R^2	0.158	0.158	0.160	0.161	0.160	0.161
Cross-border Only?	No	No	No	No	No	Yes

Notes: Robust standard errors in parentheses. SIC2-year, host country, source country fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Distance, Relative Development, and Percent Acquisitions

Dependent Variable: *PerAcq*	(1)	(2)	(3)	(4)	(5)	(6)
Crossborder	-0.027***	-0.027***	-0.011***	-0.011***		
	(0.002)	(0.002)	(0.003)	(0.003)		
log(GDPperCap)		0.048***		0.047***	0.046***	0.085***
		(0.017)		(0.017)	(0.017)	(0.022)
log(distance)			-0.008***	-0.008***	-0.010***	-0.006***
			(0.001)	(0.001)	(0.001)	(0.002)
Observations	55,260	55,260	52,247	52,247	52,247	33,366
R^2	0.140	0.141	0.141	0.141	0.141	0.146
Cross-border Only?	No	No	No	No	No	Yes

Notes: Robust standard errors in parentheses. SIC2-year, host country, source country fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Contract Completeness and Acquisitions Depth

Dependent Variable:	(1) *Full*	(2) *Full*	(3) *Full*	(4) *Full*	(5) *PerAcq*	(6) *PerAcq*	(7) *PerAcq*	(8) *PerAcq*
Completeness	-0.043***	-0.048***	-0.044**	-0.050***	-0.021***	-0.027***	-0.026**	-0.031***
	(0.012)	(0.010)	(0.019)	(0.014)	(0.007)	(0.006)	(0.011)	(0.008)
$log(GDPperCap)$		0.102***		0.183***		0.053***		0.098***
		(0.026)		(0.033)		(0.016)		(0.021)
$log(distance)$		-0.012***		-0.007***		-0.008***		-0.006***
		(0.002)		(0.002)		(0.001)		(0.001)
Crossborder		-0.024***				-0.011***		
		(0.005)				(0.003)		
Observations	58,324	54,995	38,826	35,506	55,260	52,247	36,375	33,366
R^2	0.372	0.193	0.342	0.198	0.405	0.175	0.418	0.187
Cross-border Only?	No	No	Yes	Yes	No	No	Yes	Yes

Notes: Robust standard errors in parentheses. Odd-numbered columns have sector-year-acquiring nation-target nation fixed effects. Even-numbered columns have sector, year, acquiring nation, target nation fixed effects. *** p<0.01, ** p<0.05, * p<0.1

References

Antràs, Pol, and Elhanan Helpman. 2008. "Contractual Frictions and Global Sourcing." In *The Organization of Firms in a Global Economy*, eds. E. Helpman, D. Marin, and T. Verdier. Cambridge: Harvard University Press.

Arnold, J., and B. Javorcik. 2005. "Gifted Kids or Pushy Parents? Foreign Acquisitions and Plant Performance in Indonesia." World Bank Policy Research Working Paper No. 3597.

Bircan, Cagatay. 2011. "Optimal Degree of Foreign Ownership under Uncertainty." Working Paper, Research Seminar in International Economics, University of Michigan.

Blonigen, Bruce A., Lionel Fontagné, Nicholas Sly, and Farid Toubal. 2012. "Cherries for Sale: The Incidence of Cross-Border M&A." Working paper.

Breinlich, H. 2008. "Trade Liberalization and Industrial Restructuring through Mergers and Acquisitions." *Journal of International Economics* 76(2): 254–266.

Desai, Mihir A., C. Fritz Foley, and James R. Hines. 2004. "The Costs of Shared Ownership: Evidence from International Joint Ventures." *Journal of Financial Economics* 73(2): 323–374.

Gomes-Casseres, Benjamin. 1987. "Joint Venture Instability: Is It A Problem?" *Columbia Journal of World Business* 22(2): 97–102.

Grossman, Gene, and Elhanan Helpman. 2005. "Outsourcing in a Global Economy." *Review of Economic Studies* 72(1): 135–159.

Gugler, Klaus, Dennis C Mueller, B Burcin Yurtoglu, and Christine Zulehner. 2003. "The Effects of Mergers: an International Comparison." *International Journal of Industrial Organization* 21(5): 625–653.

Hamel, Gary, Yves L. Doz, and C. K. Prahalad. 1989. "Collaborate with Your Competitors—And Win." *Harvard Business Review* 67(1): 226–232.

Head, Keith, and John Ries. 2008. "FDI as an Outcome of the Market for Corporate Control: Theory and Evidence." *Journal of International Economics* 74(2): 2–20.

Helpman, Elhanan, Marc Melitz, and Stephen Yeaple. 2004. "Export versus FDI with Heterogenous Firms." *American Economic Review* 94(1): 300–316.

Inkpen, Andrew, and Paul W. Beamish. 1997. "Knowledge, Bargaining Power, and the Instability of International Joint Ventures." *Academy of Management Review* 22(1): 177–202.

Inkpen, Andrew, and J. Ross. 2001. "Why Do Some Strategic Alliances Persist Beyond Their Useful Life?" *California Management Review* 44(1): 132–148.

Killing, J.P. 1982. "How to Make a Global Joint Venture Work." *Harvard Business Review* 60(3): 120–127.

Kogut, Bruce. 1989. "The Stability of Joint Ventures: Reciprocity and Competitive Rivalry." *Journal of Industrial Economics* 38(2): 183–198.

Mayer, Thierry, and Soledad Zignago. 2011. "Notes on CEPIIs Distances Measures: The GeoDist Database." *CEPII Working Paper 2011-25*.

Melitz, Marc. 2003. "The Impact of Trade on Aggregate Industry Productivity and Intra-Industry Reallocations." *Econometrica* 71(6): 1695–1725.

Miller, Robert, Jack Glen, Fred Jaspersen, and Yannis Karmokolias. 1997. "International Joint Ventures in Developing Countries." *Finance and Development* 34(1): 26–29.

Nocke, Volker, and Stephen Yeaple. 2007. "Cross-Border Mergers and Acquisitions vs. Greenfield Foreign Direct Investment: The Role of Firm Heterogeneity." *Journal of International Economics* 72(2): 336–365.

Nocke, Volker, and Stephen Yeaple. 2008. "An Assignment Theory of Foreign Direct Investment." *Review of Economic Studies* 75(2): 529–557.

Nunn, Nathan. 2007. "Relationship-Specificity, Incomplete Contracts, and the Pattern of Trade." *The Quarterly Journal of Economics* 122(2): 569–600.

Raff, Horst, Michael Ryan, and Frank Stähler. 2009. "The Choice of Market Entry Mode: Greenfield Investment, M&A and Joint Venture." *International Review of Economics & Finance* 18(1): 3–10.

Rauch, James E., and Vitor Trindade. 2003. "Information, International Substitutability, and Globalization." *American Economic Review* 93(3): 775–791.

Roy Chowdhury, Indrani, and Prabal Roy Chowdhury. 2001. "A Theory of Joint Venture Life-Cycles." *International Journal of Industrial Organization* 19(3-4): 319–343.

Sinha, Uday Bhanu. 2001. "International Joint Venture, Licensing and Buy-Out under Asymmetric Information." *Journal of Development Economics* 66(1): 127–151.

Spearot, Alan C. 2012. "Firm Heterogeneity, New Investment and Acquisitions." *The Journal of Industrial Economics* 60(1): 1–45. ISSN 1467-6451.

Appendix

A Section 2

To save on notation within these derivations, we use $\lambda(0)$ and $\lambda(1)$ to represent $\lim_{\gamma\to 0}\lambda(\gamma)$ and $\lim_{\gamma\to 1}\lambda(\gamma)$, respectively.

A.1 Lemma 1

Recall from section 2 that

$$\lambda(\gamma) \equiv \frac{1-\beta\left(\frac{2-\gamma}{2}\right)}{1-\beta}\left(\frac{1}{2}\right)^{\frac{\beta}{1-\beta}\gamma}.$$

It is clear from above that $\lambda(0) = 1$. To sign the derivative with respect to γ, we first take natural logs (written log) to get:

$$\log(\lambda(\gamma)) = \log\left(1-\beta+\gamma\frac{\beta}{2}\right) - \log(1-\beta) + \frac{\beta}{1-\beta}\gamma\log(1/2).$$

Differentiating with respect to γ:

$$\frac{1}{\lambda}\frac{\partial\lambda}{\partial\gamma} = \frac{\beta/2}{1-\beta+\gamma\frac{\beta}{2}} + \frac{\beta}{1-\beta}\log(1/2).$$

Factoring out $\frac{\beta}{1-\beta}$, we get:

$$\frac{1}{\lambda}\frac{\partial\lambda}{\partial\gamma} = \frac{\beta}{1-\beta}\left(\frac{\frac{1-\beta}{2}}{1-\beta+\beta\gamma/2} + \log(1/2)\right).$$

Dividing the first fraction within the parenthesis by $\frac{1-\beta}{2}$, we have:

$$\frac{1}{\lambda}\frac{\partial\lambda}{\partial\gamma} = \frac{\beta}{1-\beta}\left(\frac{1}{2+\frac{\beta}{1-\beta}\gamma} + \log(1/2)\right).$$

Noting that $\log(1/2) < -\frac{1}{2}$, and that $\frac{1}{2+\frac{\beta}{1-\beta}\gamma}$ is bounded between zero and 1/2, it follows that $\frac{\partial\lambda}{\partial\gamma} < 0$.

A.2 Lemma 2

In this appendix, we show that $\lambda(0)\phi(d) = \phi(d)$ and $\lambda(1)\phi(d) < 1$ for all d and β. To begin, since $\lambda(0) = 1$ from above, the first result is immediate. In terms of the section, note that

$\lambda(1)\phi(d) < 1$ can be written as follows:

$$\lambda(1)\phi(d) = \frac{1-\frac{\beta}{2}}{1-\beta}\left(\frac{1}{2}\right)^{\frac{\beta}{1-\beta}}\exp\left(\frac{\beta}{1-\beta}\frac{d(1-d)}{2}\right). \tag{A-1}$$

Clearly, as a function of d, $\lambda(1)\phi(d)$ is maximized when $d = \frac{1}{2}$. Plugging in $d = \frac{1}{2}$, we have:

$$\lambda(1)\phi(1/2) = \frac{1-\frac{\beta}{2}}{1-\beta}\left(\frac{1}{2}\right)^{\frac{\beta}{1-\beta}}\exp\left(\frac{\beta}{1-\beta}\frac{1}{8}\right).$$

Next, to show that $\lambda(1)\phi(1/2) < 1$ for all β, take logs to get:

$$\log\left(\lambda(1)\phi(1/2)\right) = \log\left(1-\frac{\beta}{2}\right) - \log\left(1-\beta\right) + \frac{\beta}{1-\beta}\log\left(\frac{1}{2}\right) + \frac{\beta}{1-\beta}\frac{1}{8}.$$

Substituting $\beta = 0$ we get:

$$\log\left(\lambda(1)\phi(1/2)\right) = \log\left(1\right) - \log\left(1\right) + \frac{0}{1}\log\left(\frac{1}{2}\right) + \frac{0}{1}\frac{1}{8} = 0.$$

Clearly, $\log\left(\lambda(1)\phi(1/2)\right)|_{\beta=0} = 0$, or put differently, $\lambda(1)\phi(1/2)|_{\beta=0} = 1$. Next differentiating $\log\left(\lambda(1)\phi(1/2)\right)$ with respect to β, we get:

$$\frac{\partial \log\left(\lambda(1)\phi(1/2)\right)}{\partial\beta} = -\frac{1}{2-\beta} + \frac{1}{1-\beta} + \frac{1}{(1-\beta)^2}\left(\log\left(\frac{1}{2}\right) + \frac{1}{8}\right).$$

Factoring out $\frac{1}{(2-\beta)(1-\beta)}$, we get:

$$\frac{\partial \log\left(\lambda(1)\phi(1/2)\right)}{\partial\beta} = \frac{1}{(2-\beta)(1-\beta)}\left(1 + \underbrace{\left(\log\left(\frac{1}{2}\right) + \frac{1}{8}\right)}_{<-\frac{1}{2}} \cdot \underbrace{\frac{(2-\beta)}{(1-\beta)}}_{\in(2,\infty)}\right) < 0.$$

Hence, given that $\left(\lambda(1)\phi(1/2)\right)|_{\beta=0} = 1$, and $\frac{\partial \log(\lambda(1)\phi(1/2))}{\partial\beta} < 0$, it must be the case that $\lambda(1)\phi(d) < 1$ for all $d \in [0, 1/2]$ and $\beta \in (0, 1)$.

B Comparative Statics

B.1 Lemma 3: Match Quality Cutoffs

To solve for the changes to match quality cutoffs, recall that :

$$\begin{aligned}\phi_J &= \frac{1}{\lambda}\frac{2\pi_0^j - \psi_G \cdot d_{k,j}}{\pi_0^j} \\ \phi_A &= \frac{\tilde{F}_A + \psi_A \cdot d_{k,j}}{(1-\lambda)\pi_0^j}.\end{aligned}$$

Differentiating with respect to π_0^j, we get:

$$\begin{aligned}\frac{\partial \phi_J}{\partial \pi_0^j} &= \frac{\psi_G d_{k,j}}{\lambda\left(\pi_0^j\right)^2} > 0 \\ \frac{\partial \phi_A}{\partial \pi_0^j} &= -\frac{\tilde{F}_A + \psi_A d_{k,j}}{(1-\lambda)\left(\pi_0^j\right)^2} < 0.\end{aligned}$$

Next, we differentiate with respect to λ to obtain the second set of results:

$$\begin{aligned}\frac{\partial \phi_J}{\partial \lambda} &= -\frac{1}{\lambda^2}\frac{2\pi_0^j - \psi_G d_{k,j}}{\pi_0^j} < 0 \\ \frac{\partial \phi_A}{\partial \lambda} &= \frac{\tilde{F}_A + \psi_A d_{k,j}}{(1-\lambda)^2\pi_0^j} > 0.\end{aligned}$$

Note that $\frac{\partial \phi_J}{\partial \lambda} < 0$ only if $\phi_J > 0$, which is guaranteed since we assume $\pi_0 > F_G$.

Finally, differentiating the cutoffs with respect to $d_{k,j}$, we get:

$$\begin{aligned}\frac{\partial \phi_J}{\partial d_{k,j}} &= -\frac{\psi_G}{\lambda\pi_0^j} < 0 \\ \frac{\partial \phi_A}{\partial d_{k,j}} &= \frac{\psi_A}{(1-\lambda)\pi_0^j} > 0.\end{aligned}$$

Note that $\frac{\partial \phi_J}{\partial \lambda} < 0$ only if $\phi_J > 0$.

B.2 Proposition 2: Acquisition Share

Defining the share of acquisitions as S and the distribution of match qualities by the twice differentiable CDF $G(\phi)$ (pdf $(g(\phi))$) we have:

$$S = \frac{1 - G(\phi_A)}{1 - G(\phi_J)}.$$

First, by differentiating S with respect to π_0^j, we get:

$$\frac{\partial S}{\partial \pi_0^j} = \frac{1}{\left(1 - G(\phi_J)\right)^2} \left(-g(\phi_A) \underset{-}{\frac{\partial \phi_A}{\partial \pi_0^j}} \left(1 - G(\phi_J)\right) + g(\phi_J) \underset{+}{\frac{\partial \phi_J}{\partial \pi_0^j}} \left(1 - G(\phi_A)\right) \right) > 0.$$

Next, differentiating S with respect to λ, we get:

$$\frac{\partial S}{\partial \lambda} = \frac{1}{\left(1 - G(\phi_J)\right)^2} \left(-g(\phi_A) \underset{+}{\frac{\partial \phi_A}{\partial \lambda}} \left(1 - G(\phi_J)\right) + g(\phi_J) \underset{-}{\frac{\partial \phi_J}{\partial \lambda}} \left(1 - G(\phi_A)\right) \right) < 0.$$

Finally, we differentiate S with respect to $d_{k,j}$:

$$\frac{\partial S}{\partial d_{k,j}} = \frac{1}{\left(1 - G(\phi_J)\right)^2} \left(-g(\phi_A) \underset{+}{\frac{\partial \phi_A}{\partial d_{k,j}}} \left(1 - G(\phi_J)\right) + g(\phi_J) \underset{-}{\frac{\partial \phi_J}{\partial d_{k,j}}} \left(1 - G(\phi_A)\right) \right) < 0.$$