

# Financial Constraints, Institutions, and Foreign Ownership\*

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## Abstract

This paper examines how external finance dependence, financial development, and institutions influence brownfield foreign direct investment (FDI). We develop a model of cross-border acquisitions in which the foreign acquirer's choice of ownership structure reflects a key trade-off between easing target credit constraints and the costs of operating in an environment of low institutional quality. Using a dataset of cross-border acquisitions in emerging markets, we find evidence supporting the central predictions of the model that: (i) a foreign firm is more likely to fully acquire a target firm in sectors that are more reliant on external finance, or in countries with lower financial development/higher institutional quality; (ii) the level of foreign ownership in partially foreign-owned firms is insensitive to institutional factors and depends weakly on financial factors; (iii) the share of foreign acquisitions in all acquisition activity is also higher in external finance dependent sectors, or financially underdeveloped/high institutional quality countries; and (iv) sectoral external finance dependence accentuates the effect of country-level financial development and institutional quality. The theory and empirical evidence provide insight into the interaction between the financial, institutional and technological determinants of North-South brownfield FDI.

**Keywords:** Foreign direct investment; foreign ownership; cross-border mergers and acquisitions; financial development; external finance dependence; institutional quality; emerging markets.

**JEL Codes:** F21, F23, G34, L24, L60.

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# 1 Introduction

Since the early 2000s, there has been a rapid increase in cross-border mergers and acquisitions (M&As) around the world, and North-South flows have been a key element of this trend. According to the 2017 World Investment Report (UNCTAD, 2016), during the period 2010-2016, on average 20% of the world's cross-border M&A transactions in terms of value involved purchases of firms from the developing world, with most of the capital originating in developed nations. Such acquisitions entail both benefits and costs for developed market acquirers. On the one hand, the relative scarcity of capital due to low financial development depresses the internal valuations of target firms in the developing world, making them attractive to foreign acquirers seeking higher returns.<sup>1</sup> On the other hand, operating firms in these markets involves sourcing local inputs in an unknown environment, as well as the risks associated with expropriation, contract repudiation, weaker law enforcement, and higher levels of corruption. We show in this paper that the choice of *ownership structure* in cross-border M&As is critical in balancing these benefits and costs, and as such, is an endogenous response of multinational corporations to the particular operating environment they face in developing countries.

Our first contribution is to document a set of facts about foreign ownership of firms in emerging market economies (EMEs). While a large literature shows that the level of foreign ownership in FDI projects is crucial in determining the extent of technology transfer, productivity, wages, export participation, as well as the nature and extent of spillovers to local firms, our interest lies in understanding what determines the sector and country-level variation in ownership structures. Hence, our second contribution is to develop a model that clarifies how the competing economic forces – provision of capital versus mitigation of local risks – jointly determine the optimal degree of foreign ownership and the relative volumes of brownfield FDI investment across different countries and sectors. Finally, we provide empirical evidence in favor of the key predictions of the model, complementing a large empirical literature on the determinants of FDI (Di Giovanni, 2005; Desbordes and Wei, 2017, among others).

To highlight the trade-offs facing a foreign acquirer, our theoretical model assumes that production in the emerging market requires capital and a local input. The foreign acquirer solves for an optimal ownership contract between itself and the domestic target firm that captures its advantage in having greater access to capital markets relative to the credit-constrained target, and the potential disadvantages of operating a firm in an emerging market. The foreign owner is at a disadvantage over local firms in that it pays a markup on local inputs, making local production more expensive and reducing profits. The local input can be interpreted as a proxy for the features of emerging markets that make having a domestic co-owner valuable. The prospective foreign acquirer thus faces a choice between obtaining full control of the credit-constrained target, in which case it is compelled to pay a higher price for the local input, or to take partial ownership, in which case the domestic partner can provide the local input at the lower price.

Three sets of predictions emerge from the model. The first and second pertain to the ownership structure chosen by the foreign acquirer, conditional on entry. To the best of our knowledge,

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<sup>1</sup>Up to 46% and 34% of South Asian and Latin American firms of different sizes reported difficulties in obtaining their desired levels of credit (WBES, 2013).

these are novel in the literature in their emphasis on the interaction of financial, institutional and technological factors in determining the choice between full and partial ownership, as well as ownership structures within the set of partial acquisitions. Full foreign acquisitions (relative to minority foreign ownership) of emerging market targets are more likely in sectors that have a greater dependence on external finance, and in countries that are less financially developed: At the margin, the differential payoff to the foreign firm from a full versus a partial acquisition rises with the severity of the target's credit constraint. A lower markup on the local input tilts the ownership structure towards full foreign ownership by increasing the marginal payoff from a full acquisition. The effects of the local input price markup and financial development are also predicted to be the largest for the most external dependent sectors of the economy.

The second set of predictions relate to the case when the foreign acquirer takes a partial stake and the local input is provided by the domestic owner. Here, a trade-off arises between acquiring greater ownership and leaving the domestic owner with enough equity to motivate the optimal provision of the local input. The model predicts that the size of a foreign stake in a partial acquisition is larger in industries that are more dependent on external finance and in less financially developed countries, but that this dependence is tempered by technological factors. The intuition for this result is as follows. Since the importance of the local input varies across industries, the optimal equity share that motivates the domestic owner to provide it optimally also varies. In industries where the domestic equity share in profit is high enough to exceed the stand-alone value of the firm (the domestic owner's outside option), the share is governed by technological factors rather than either of the two financial factors. This weakens the influence of finance in determining the precise size of partial stakes. At the same time, since all partial acquisitions involve local input provision by the domestic agent, the input price markup is predicted not to influence the ownership structure in partial acquisitions.

Our final predictions relate to the overall likelihood of foreign acquisitions across different countries and sectors. Foreign acquisitions are predicted to be more likely in sectors that have a greater dependence on external finance, in countries where financial markets are less developed, and when the markup paid by foreign firms for the local input is lower. Lack of access to finance lowers the value of the target to the domestic owner, while a low markup on the local input increases its value for the foreign firm. Both factors thus increase profits to the foreign owner and therefore make foreign acquisition more likely.

We test the predictions of the model in a panel of cross-border M&As by developed market firms in fifteen emerging markets over the 1990-2007 period. We use the Rajan and Zingales (1998) measure of external finance dependence and commonly used proxies for financial development as our main financial indicators, and various measures of local institutional weakness, such as anti-corruption indices, to proxy for the comparative disadvantage that foreigners face in providing our broadly-defined local input. First, we test whether there is evidence in favor of the predictions regarding the likelihood of full versus partial foreign acquisitions. The regression evidence confirms the main predictions of the model. There is a positive relationship between the probability of a full foreign acquisition and dependence on external finance of a target, financial underdevelopment, and measures of institutional quality. External finance dependence is found to accentuate the latter two effects, also consistent with the model. Second, we examine

the relationship between ownership structures in the subset of partial acquisitions and financial development, institutional quality, and the target’s dependence on external finance. Consistent with the model, we find that institutional quality plays no role in ownership structure choice in partial foreign acquisitions, and uncover a weak positive relationship between the average sizes of minority foreign acquisitions and our financial indicators. Finally, we also find strong evidence consistent with the predictions of the model regarding the variation across sectors and countries in the overall probability of foreign acquisitions.

The remainder of the paper is organized as follows. We review the existing literature and relate it to our work in the next subsection. In Section 2 we describe some prominent features of cross-border acquisitions in the manufacturing sector of emerging markets. We then describe our theoretical model and establish some empirical hypotheses in Section 3. Section 4 reports our main empirical results while Section 5 provides robustness checks and some additional results. Section 6 concludes.

## 1.1 Related literature

The focus of this paper – the determination of optimal foreign ownership structure in cross-border M&As – brings together different strands of literature in international economics and finance. The first is the international finance literature on the determinants of cross-border M&As. This is exemplified by papers such as Aguiar and Gopinath (2005), Acharya et al. (2011) and Alquist et al. (2016) that have examined how liquidity-provision by foreign firms drives so-called fire-sale FDI during financial crises in EMEs. Others have documented that foreign acquisitions also relax credit constraints in domestic targets outside of crisis periods: Wang and Wang (2015) provide evidence on the ability of cross-border M&As to relax credit constraints in a sample of Chinese firms, while Erel et al. (2014) provide similar evidence from the European market for corporate control.<sup>2</sup> We build on the main finding of this literature, that easing credit constraints is a key function of cross-border M&As, to examine its effects on foreign ownership patterns. Our results provide a unifying rationale for findings of positive abnormal acquirer returns associated with the acquisition of controlling stakes in EME firms by developed-market firms in settings with intangible assets and incomplete contracts (Chari et al., 2010).

Second, for the broader group of FDI including greenfield investments, recent work such as Desbordes and Wei (2017) show that both source and destination countries’ financial development are important factors affecting the *volumes* of different types of FDI, including cross-border M&As. Davies et al. (forthcoming) reach a similar conclusion. They find that financial development and institutional factors are relatively more important for the volume of foreign M&As than they are for greenfield FDI.<sup>3</sup> In related work, Javorcik and Wei (2009) find that corrup-

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<sup>2</sup>Other non-financial drivers of the likelihood of foreign acquisitions have been documented in Erel et al. (2012). Recent contributions to this literature look at the role of intellectual property rights protection (Alimov and Officer, 2017) and the cross-border deployment of industry-country-specific intangible assets (Frésard et al., 2017).

<sup>3</sup>The role of financial development and external finance dependence has also been explored in related contexts for individual countries: Manova et al. (2015) show that firm-level financial frictions restrict the volume of trade and, in a sample of Chinese firms, find that foreign affiliates and joint ventures have better export performance than private domestic firms; Bustos (2007) finds that Argentine firms in external-finance dependent industries are more likely to be foreign owned and to finance their operations with funds from their parent company.

tion reduces the volume of inward FDI to emerging markets and shifts the ownership structure toward joint ventures, and Kesternich and Schnitzer (2010) document the influence of political risk on multinationals' choice of capital structure, specifically the leverage ratio, in FDI projects. While these papers have so far treated each of these factors in isolation, our contribution is to provide a unified theoretical framework to analyze the trade-off faced by foreign acquiring firms when they might have a comparative advantage in providing finance and technology, yet face a handicap when it comes to institutional factors. Building on earlier work on joint ventures (Asiedu and Esfahani, 2001) and the role of financial constraints in M&As (Alquist et al., 2016), we show that the choice of ownership structure resolves this tension and maximizes the value of the firm.<sup>4</sup> As such, our analysis shows that focussing on this trade-off and its effects on foreign ownership structures provides additional insights into the motives for brownfield FDI, beyond that provided by the analysis of FDI volumes or each of these underlying drivers in isolation.<sup>5</sup>

Our paper is also related to a recent literature on international intra-firm trade and the boundaries of multinational enterprises (MNEs). This literature, which is extensively surveyed in Antràs and Yeaple (2014), has explored a number of mechanisms by which firm boundaries are extended using FDI. A non-exhaustive list of forces that have been shown to be important in recent work includes the relative location of firms along a global value chain and the elasticity of final demand (Antràs and Chor, 2013), final product prices (Alfaro et al., 2016), the relative contractibility of upstream and downstream production stages (Alfaro et al., forthcoming), and intangible assets and intellectual property rights protection (Bolatto et al., 2017). The paper most related to ours in this body of work is that of Antràs et al. (2009).<sup>6</sup> Our paper, however, relies on a different mechanism – the interaction of financial constraints and local inputs – to deliver two key complementary insights: the presence of local inputs makes full foreign ownership a distinctive organizational form that is strongly influenced by local institutions at the margin; and this stands in contrast to the determinants of the size of minority stakes, which we show to be dictated either by financial constraints or technology. Interestingly, while weak investor protection increases foreign equity ownership in Antràs et al. (2009), the alternative mechanism highlighted in our paper leads to lower foreign equity participation when general institutions in a country are weaker. In addition, our empirical tests utilize a complementary source of data on cross-border M&As conducted by acquiring firms from a large set of advanced nations.

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<sup>4</sup>Asiedu and Esfahani (2001) focus on the role of partner-specific inputs and infrastructure in a model of greenfield joint ventures based on Eswaran and Kotwal (1985). They solve for the amount of input provided by each agent as well as the level of government infrastructure and taxation. Since the foreigner starts a new joint venture with a domestic partner, the authors normalize the outside option of the domestic agent to zero. In contrast, the domestic agent in our model owns a going concern and hence has an outside option whose value depends on financial constraints. This outside option is central to our analysis and results. Alquist et al. (2016) analyze changes in the industry composition of foreign ownership during financial crises and in related work Mukherjee and Proebsting (2017) examine how the composition of the pool of domestic acquiring firms changes during financial crises. Neither of these papers address the optimal ownership structure problem of an individual firm, which is the distinctive focus of the present paper.

<sup>5</sup>For example, our results shed light on why foreign ownership structures may be insensitive to institutional factors for minority stakes while external finance matters for all levels of foreign ownership. Note that we abstract from the choice between greenfield FDI and M&As that has been explored in Nocke and Yeaple (2007, 2008).

<sup>6</sup>Antràs et al. (2009) develop a model in which MNEs have expertise in monitoring the deployment of proprietary technologies on behalf of external investors. This makes MNE co-investment in the form of FDI, as opposed to arms-length technology transfer, the optimal way to finance foreign projects in a setting of weak investor protection. Using data on U.S. MNEs they find that the share of affiliate equity owned by the parent firm is higher in countries with weak investor protection and shallow financial markets.

Finally, our results also relate to the literature studying how the extent of foreign ownership affects domestic outcomes. Existing research has shown that the degree of foreign ownership (as opposed to the presence of foreign ownership) affects, among others, the productivity of the targets, their export participation, or the nature of FDI spillovers.<sup>7</sup> Hence, by improving our understanding of sector and country-specific determinants of foreign ownership shares, our results also shed light on the distribution of gains from FDI across EMEs, as well as across sectors within a particular country.

## 2 Stylized facts

In this section, we present the data and document several characteristics of foreign acquisitions of manufacturing firms located in emerging markets – namely, the heterogeneity across industries and target countries in the probability of both partial and full foreign acquisitions and, within the set of partial acquisitions, the sizes of the stakes acquired. We also provide preliminary evidence relating these patterns of M&A to sectoral external finance dependence and country-specific financial development. These findings motivate the model we use to guide our empirical analysis. Section 2.1 of the online appendix provides information about the sources of each variable used in the paper.

### 2.1 M&A transaction data

The transactions data are from a sample of foreign acquisitions that occurred in fifteen emerging-market economies between 1990 and 2007. We use a subset of the data available from the Securities Data Company (SDC) Thompson’s International Mergers and Acquisitions database, which reports public and private merger and acquisition transactions involving at least a 5% ownership stake in the target company. The sample includes all of the domestic and foreign acquisitions that occurred over the period in manufacturing industries (SIC codes 2000-4000) in the following countries: Argentina, Brazil, Chile, China, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Singapore, South Africa, South Korea, Thailand, and Vietnam.<sup>8</sup> For each transaction, we have information about the sectors and countries of both the target and the acquirer, the year, and the share acquired.<sup>9</sup>

### 2.2 Descriptive statistics

Table 1 presents descriptive statistics of M&A transactions in emerging markets and splits the transactions by country of origin and sector of the target. The online appendix provides

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<sup>7</sup>See, for example, Greenaway et al. (2014), Javorcik and Spatareanu (2008), Bircan (2017), Chhibber and Majumdar (1999), or Havránek and Iršová (2011, 2013).

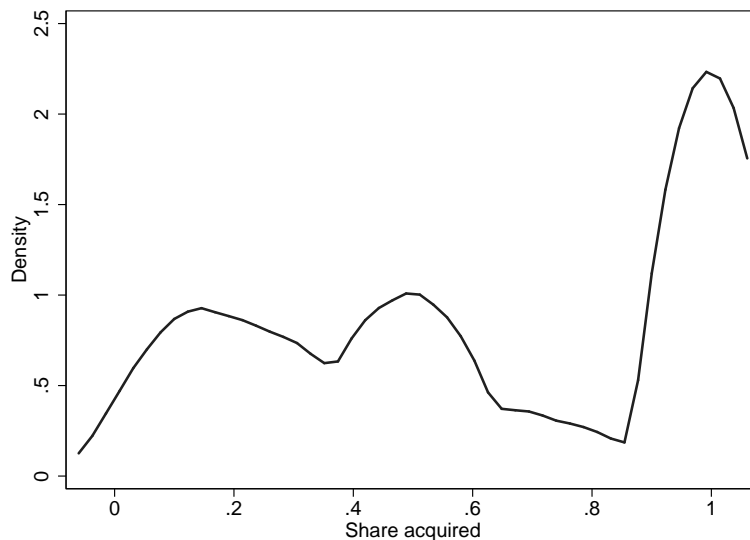
<sup>8</sup>An alternative source of data on M&As is the Zephyr dataset available from Bureau Van Dijk. The SDC data set has better coverage of corporate transactions, both in terms of years covered and in terms of geographic coverage. In particular, the coverage of Zephyr for emerging market M&A transactions is sparse till the mid-2000s. Bollaert and Delanghe (2015) discusses the advantages of SDC over Zephyr for research questions related to foreign ownership structures.

<sup>9</sup>See the online appendix to this paper for more details about the SDC data. The database is an exhaustive list of the mergers and acquisitions that occurred in those countries. The information about the transactions is obtained from a variety of news sources, regulatory agencies, trade publications, and surveys. We exclude the period after 2007, which was characterized by the global financial crisis and significant variation in the liquidity constraints faced by acquirers based in developed markets.

additional figures that depict the transactions by year (Figure A.1) and year  $\times$  target country (Table A.1), as well as by country of origin and sector of the acquirer (Table A.2 and A.3), and by fraction acquired (Table A.4).

Foreign acquisitions represent 40% of the transactions in our sample. The geographic breakdown of the acquirers is diverse, although most are based in developed countries (Table A.2): about 90% of the foreign transactions in the manufacturing sector involve an acquirer from a developed economy. Over the sample period, the United States accounts for 27% of foreign acquisitions, and Europe and Asia for 31% each. Table A.3 shows that foreign acquirers are generally firms in the manufacturing sector (62%) or the finance, insurance and real estate (FIRE) sectors (25%).

Figure 1: Distribution of fraction acquired



Note: This figure represents the Kernel density of the fraction acquired by foreign firms in our sample.

We are primarily interested in the role of country and sectoral characteristics of the target on cross-border M&As. Our data suggests that there is significant heterogeneity in the location of the target and its sector of operation. Out of a total of 10,597 transactions, the largest number of acquisitions occur in China, Malaysia, India, South Korea and Brazil. Over the sample period, more than 70% of acquisitions occurred in Asia and about 22% in Latin America. As shown in Table 1, however, the acquisitions in Latin America are more likely to involve a foreign acquirer (44% of the transactions) than their Asian counterparts (35% of foreign acquisitions). Acquisitions are more common in the food products (15%), chemicals (18%) and electric/electronic equipment (12%) sectors, while *foreign* acquisitions are more common in the tobacco, transportation, and the measuring, analyzing and controlling instruments sectors. Foreign acquisitions account for more than 46% of the total number of acquisitions in these industries. The presence of foreign acquirers thus does not appear to be concentrated in the sectors that account for more acquisitions overall. Conversely, foreign acquisitions are the least common in the leather, wood, and furniture sectors.

Table 1: Acquisitions by country of target

Acquisitions		# transactions	Share foreign	Share full	Share acquired	Share acquired
			All		Foreign	Foreign & partial
<b>Full sample</b>		10597	0.40	0.39	0.62	0.38
<b>Region</b>	<b>Country</b>					
Latin America						
	Argentina	534	0.61	0.49	0.70	0.42
	Brazil	930	0.52	0.53	0.75	0.47
	Chile	186	0.61	0.40	0.63	0.38
	Mexico	637	0.64	0.57	0.75	0.42
	Peru	94	0.48	0.33	0.65	0.48
	Total	2381	0.58	0.52	0.73	0.43
Asia						
	China	2443	0.43	0.32	0.59	0.39
	India	955	0.31	0.19	0.39	0.24
	Indonesia	270	0.57	0.18	0.48	0.37
	Korea. Rep.	948	0.29	0.39	0.61	0.37
	Malaysia	1449	0.16	0.37	0.60	0.36
	Philippines	192	0.48	0.23	0.52	0.39
	Singapore	672	0.37	0.39	0.59	0.33
	Thailand	505	0.44	0.19	0.47	0.34
	Vietnam	67	0.69	0.22	0.55	0.43
	Total	7501	0.35	0.30	0.55	0.36
South Africa		715	0.32	0.60	0.77	0.41
<b>SIC</b>	<b>Industry</b>					
20	Food products	1615	0.40	0.40	0.63	0.38
21	Tobacco	44	0.48	0.29	0.50	0.30
22	Textile	360	0.32	0.44	0.65	0.37
23	Apparel	131	0.32	0.45	0.63	0.33
24	Wood Products	174	0.22	0.50	0.76	0.52
25	Furniture	78	0.19	0.47	0.74	0.51
26	Paper Products	421	0.42	0.39	0.62	0.37
27	Printing and Publishing.	343	0.33	0.39	0.60	0.34
28	Chemicals	1869	0.42	0.41	0.65	0.41
29	Petroleum Refining	124	0.41	0.29	0.52	0.31
30	Rubber and Plastics Prod.	416	0.44	0.42	0.67	0.43
31	Leather and Leather Prod.	62	0.29	0.28	0.62	0.47
32	Stone. Clay. Glass Prod.	597	0.39	0.26	0.52	0.35
33	Primary Metal Industries	735	0.33	0.26	0.54	0.37
34	Fabricated Metal Prod.	401	0.42	0.41	0.64	0.40
35	Machinery and Computer	835	0.44	0.44	0.66	0.40
36	Electronic and Electrical	1307	0.40	0.41	0.62	0.35
37	Transportation Equip.	717	0.47	0.30	0.53	0.34
38	Professional / Scientific	219	0.46	0.46	0.68	0.41
39	Miscellaneous Manuf.	149	0.37	0.44	0.65	0.39

Source: Authors' computation from Thompson's International Mergers and Acquisitions database. # transactions is the total number of transactions (domestic and foreign). Share foreign is the share of transactions with a foreign acquirer. Share full is the share of full acquisitions (100% stake) in total number of foreign acquisitions. Share acquired is the average share acquired among foreign acquisitions or foreign partial acquisitions (last column).



There is also substantial variation in the size of the stake acquired by foreign acquirers. On average across target countries and sectors, 39% of transactions are full acquisitions (i.e., transactions in which the acquirer purchases 100% of the target), and this share is similar for both foreign and domestic acquisitions (Table A.4 in the online appendix). Partial acquisitions are therefore an important characteristic of the data, something already documented in Alquist et al. (2016). Within the subset of foreign partial acquisitions, the average share acquired is relatively low (38%). As can be seen from Figure 1, which plots the density of the distribution of shares acquired in foreign acquisitions between 0 and 1 inclusive, the distribution for partial acquisitions is bimodal, with many transactions involving a small share acquired and a second peak right above the 50% cutoff.

The size of the stakes acquired in foreign acquisitions varies widely across target countries. In Mexico and South Africa, about 60% of foreign transactions are full acquisitions. By contrast, in Thailand and Indonesia, more than 80% of acquisitions are partial. Likewise, there is heterogeneity across target sectors, with some industries experiencing a larger share of partial acquisitions (e.g., 74% for primary metals) and others more full acquisitions (e.g. 50% in wood products). These differences suggest that the incentives affecting an acquirer’s decision to purchase part of a firm in a foreign country and those determining the size of the stake are to some extent distinct. Interestingly, countries and sectors in which full acquisitions are more common are not necessarily those in which the stake acquired is large when the acquisition is partial. Full acquisitions in Vietnam and Indonesia, for example, make up a small share of total acquisitions, but within the subset of partial acquisitions in those two countries, the size of the stake acquired tends to be relatively large. It thus seems that the determinants of the decision to purchase a target firm fully and the ones governing the size of the stake acquired in partial acquisitions are distinct. Our model clarifies the role of different factors in determining whether a foreign acquisition occurs and whether it is full or partial.

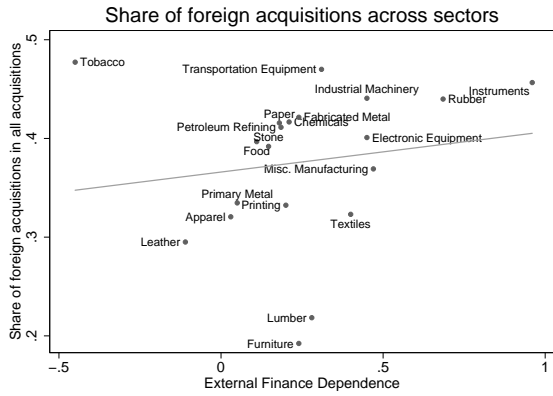
### 2.3 A first look at the role of financial constraints

These patterns suggest that the likelihood of foreign acquisitions and their average size may be driven by both industry- and country-level factors for the target, a view consistent with the results of Moeller et al. (2005) and Erel et al. (2012). Figures 2.a to 2.d show that an industry’s level of external finance dependence and the target country’s level of financial of development are plausible candidates for these common driving forces. To draw these figures, we use Rajan and Zingales’s measure of external finance dependence at the SIC 2-digit level Rajan and Zingales (1998) and the average ratio of private credit to GDP over the period from the World Bank Development Indicators as a measure of financial development.

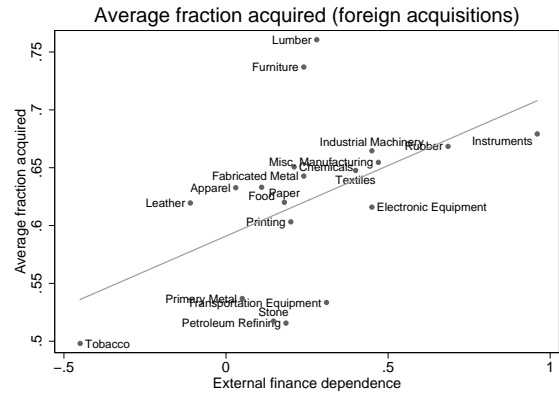
Both the probability of foreign acquisition and the size acquired are positively correlated with the Rajan-Zingales measure of external finance dependence. That is, credit constraints seem to be an important friction that affects the pattern of foreign acquisitions. On the other hand, target countries with a lower level of financial development tend to experience more foreign acquisitions.

The correlation between the share acquired by foreign firms and financial development is less clear. The model in the next section provides a framework that directly relates the size

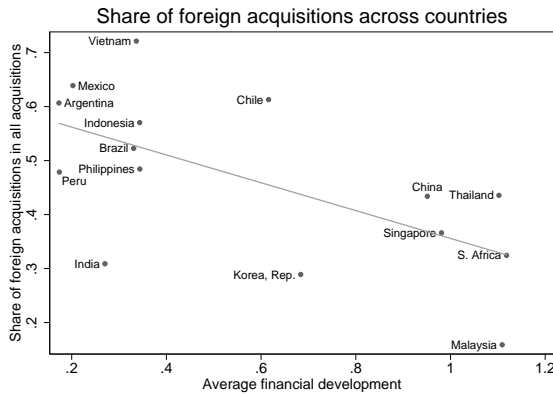
Figure 2: Liquidity and foreign acquisitions: correlations



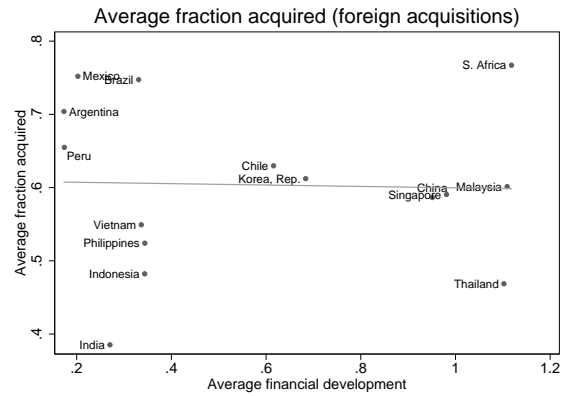
(a) Foreign acquisitions and external dependence



(b) Share acquired and external dependence



(c) Foreign acquisitions and financial development



(d) Share acquired and financial development

Note: These figures plot the ratio of foreign acquisitions over all acquisitions (Figures (a) and (c)) and average share acquired conditional on a foreign acquisition being observed (Figures (b) and (d)) against the target industry's external finance dependence (Figures (a) and (b)) or the target country's average ratio of private credit over GDP over the period (Figures (c) and (d)).

of a foreign acquisition to the credit constraints facing the target as well as to country-level financial frictions. We find that institutional quality matters for the share acquired above and beyond the effect of the level of financial development. In countries with better institutions, foreign acquirers are more likely to purchase all of the target firm. Our model suggests that the relationships shown in Figure 2 omit an important factor, institutional quality, which also affects the size of acquisitions. In our empirical analysis, we do indeed find that controlling for institutional quality, the correlation between the share acquired by foreign firms and financial development becomes much clearer.

### 3 A model of cross-border acquisitions

We next develop a simple two-period model of cross-border acquisition that provides a number of testable implications. The model highlights the interaction between three factors that determine the ownership structure of the acquired firm. The first factor is the extent of the target firm's

dependence on external finance. Second is the role of technology; in particular, the average productivity of the target firm and the importance of local inputs in production. Third is the role of institutional factors; namely the barriers that foreign owners face in operating a firm in an emerging market. Since the purpose of the model is to provide a framework for the empirical analysis, we provide a brief description of the key mechanisms of the model, while statements and proofs of propositions are relegated to an online appendix.

### 3.1 Model description

The model consists of a domestic firm operating in an emerging market (the target) and a foreign firm (the acquirer) that has the choice of obtaining full ownership of the target, a partial stake in the target or no stake in the target. While the model has some auxiliary predictions for the “no acquisition” decision (i.e., the probability of a foreign acquisition), we focus our analysis on the trade-offs involved in choosing between full or a partial stake in the target.<sup>10</sup>

To start the analysis, consider the investment decision facing the target firm in country  $c$  in industry  $i$  that is fully owned by domestic residents.<sup>11</sup> The firm operates for two periods. The analysis starts at the end of period 1 when the firm has profits  $\pi_{i,1}$  from operating the firm in period 1 and must choose the level of investment in physical capital,  $I_{ic}$ , to produce in period 2. Capital fully depreciates within a period so all capital needed for production must be obtained before period 2. Production requires capital as well as a “local” input  $L_{ic}$ . We assume the production function is Cobb Douglas,  $F(I_{ic}, L_{ic}) = A_{ic,2} I_{ic}^{\beta_I} L_{ic}^{\beta_L}$  where  $A_{ic,2}$  denotes the productivity of the firm in period 2. There are decreasing returns ( $\beta_I + \beta_L < 1$ ), which could be due to the presence other inputs such as local infrastructure provided by the government (Asiedu and Esfahani, 2001).

Capital investment is financed out of firm profits,  $\pi_{i,1}$ , and if that is not sufficient, by external borrowing up to  $\bar{D}_{ic}$ . We assume that a firm in country  $c$  can only borrow up to a fraction  $\tau_c$  of capital  $I_{ic}$ , i.e.,  $\bar{D}_{ic} = \tau_c I_{ic}$ . The transaction cost  $\tau_c$  is specific to country  $c$  and captures differences in financial development across countries. We interpret high values of  $\tau_c$  as higher financial development in  $c$ , in the sense that its financial system is more efficient in creating loans from available collateral. We then have  $I_{ic} \leq \bar{D}_{ic} + \pi_{i,1} \equiv l_{ic}$  which by substitution yields the investment constraint

$$I_{ic} \leq \frac{\pi_{i,1}}{(1 - \tau_c)} \equiv l_{ic}. \quad (3.1)$$

Firm liquidity in period 1 is defined as  $l_{ic} \equiv \bar{D}_{ic} + \pi_{i,1} \in [l, \bar{l}]$ .

The amount of liquidity available to firm thus depends on  $\pi_{i,1}$  and  $\tau_c$ . An industry that is dependent on external finance has a ratio of profits to the firm’s need for capital that is low; i.e., firms in that industry must rely more heavily on other sources of finance. Following Rajan and

<sup>10</sup>Empirically, studying the binary decision of the foreign firm to acquire a domestic one would require observing the full set of potential targets. We do not observe such a set, and therefore concentrate on the share of foreign acquisitions in all acquisitions. On the other hand, our data enables us to cleanly identify the stake acquired by foreign firms within the set of actual transactions, which is why our theory mostly focuses on these predictions. In addition, while most of the theoretical literature has focussed on the probability of foreign acquisitions, the determination of foreign ownership structures in M&As has received scant theoretical attention.

<sup>11</sup>Variables are subscripted by  $i$  denoting industry and  $c$  denoting country to conform to our later empirical implementation, where the data varies along the industry, country  $\times$  time, and industry  $\times$  country  $\times$  time dimensions.

Zingales (1998), we assume that external finance dependence is the same across countries for a particular sector  $i$ . Equation 3.1 also shows that liquidity of the firm is increasing in  $\tau_c$ ; the higher is financial development, the more the firm will be able to borrow to finance investment. We consider the problem of a constrained firm that invests up to its liquidity constraint, where  $l_{ic} = \frac{\pi_{i,1}}{(1-\tau_c)}$ . Taking that level of investment as given, the firm then chooses the local input to maximize its value  $V_{ic}^{D,0}$ ,

$$V_{ic}^{D,0} \equiv \max_{L_{ic}} \{ \pi_{i,1} + A_{ic,2} l_{ic}^{\beta_I} L_{ic}^{\beta_L} - l_{ic} - pL_{ic} \} \quad (3.2)$$

where  $p$  is the price the domestic agent pays for the local input, and the “0” superscript denotes the amount of foreign ownership in the firm. The stand-alone value of the domestic firm  $V_{ic}^{D,0}$ , which represents the outside option for the domestic owners of the firm when faced with an acquisition offer, is increasing in liquidity, first-period profits and in the level of financial development  $\tau_c$  when the constraint binds. The direction of these effects is intuitive and so to conserve space, the proof of these results are shown in the appendix.

The domestic firm may be the target of a foreign acquisition at the end of period 1 in which a fraction  $\alpha_{ic} \in [0, 1]$  of the firm is acquired. We assume for simplicity that first-period profits of the domestic firm,  $\pi_{i,1}$ , do not change hands. We also assume that foreign acquirers have greater access to funds and therefore do not face the financing constraints that confront the emerging market target. The acquisition requires a fixed cost  $\Gamma$  for the acquirer for any level of ownership,  $\alpha_{ic} > 0$ . The fixed cost represents costs that influence the overall profitability of entering the international market for corporate control, such as search and due diligence costs, but do not affect decisions at the margin.

We assume that acquisition by a foreign firm brings with it some productivity gains for the target, so that post-acquisition productivity is  $\phi A_{ic,2}$  with  $\phi > 1$ . This is consistent with a large body of empirical evidence about the productivity or value gains from FDI in general (see Yasar and Morrison Paul, 2007; Blalock and Gertler, 2008; Arnold and Javorcik, 2009), and emerging market acquisitions in particular (see Chari et al., 2010; Bris and Cabolis, 2008). These two elements of the model,  $\Gamma$  and  $\phi$ , are not necessary for our main results but are included for the sake of realism.<sup>12</sup>

A key difference between full and partial acquisitions is the assumption that when the target is acquired in its entirety ( $\alpha_{ic} = 1$ ), the foreign owner is at a comparative disadvantage in procuring the local input. This could be due to a lack of knowledge about local labor and product markets, weaker political connections, or a domestic bias in the preferences of bureaucrats or regulators. We model this by assuming that the foreign firm pays a markup for the local input,  $\omega_c > 1$ , denoting comparative disadvantage.

### 3.1.1 Foreign acquirer’s problem (full acquisition)

Given our assumptions, a full acquisition is basically the purchase of rights to produce using the technology of the domestic firm. The value of the domestic firm to a foreign owner who

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<sup>12</sup>When  $\Gamma = 0$ , it is feasible for the foreign firm to buy any domestic firm. When  $\phi = 1$  the only gains from foreign acquisitions come from relieving financial constraints.  $\Gamma \neq 0$  and  $\phi \neq 1$  are thus meant to capture that (a) not all firms in emerging markets come to be owned by foreigners, and (b) not all gains from foreign ownership come from the provision of financing.

undertakes a full acquisition ( $\alpha_{ic} = 1$ ) is given by

$$V_{ic}^{F,1} \equiv \max_{I_{ic}, L_{ic}} \{ \phi A_{ic,2} I_{ic}^{\beta_I} L_{ic}^{\beta_L} - I_{ic} - \omega_c p L_{ic} - \Gamma \}. \quad (3.3)$$

Denote by  $S_{ic}^{F,1}$  the profit accruing to the foreign acquirer from the acquisition when it acquires full ownership ( $\alpha_{ic} = 1$ ). We assume that the price paid in the acquisition,  $P_{(1)}$ , is such that the domestic firm's payoff is its reservation value  $V_{ic}^{D,0}$ . Thus  $P_{(1)} = V_{ic}^{D,0} - \pi_{i,1}$ . For the foreign firm, then,  $S_{ic}^{F,1} = V_{ic}^{F,1} - P_{(1)} = V_{ic}^{F,1} + \pi_{i,1} - V_{ic}^{D,0}$ . A necessary (but not sufficient) condition for a full acquisition to be optimal for the foreign acquirer is thus:

$$S_{ic}^{F,1} \geq 0. \quad (3.4)$$

### 3.1.2 Foreign acquirer's problem (partial acquisition)

The foreign firm might instead choose to acquire partial ownership if it finds direct procurement of the local input too costly. In this case, it buys an equity claim on a share  $\alpha_{ic} < 1$  of second period profits and provides all of the capital,  $I_{ic}$ . A share  $(1 - \alpha_{ic})$  of second period profits, as well as any liquid assets from period 1, are retained by the domestic owner, who also provides the local input at the price  $p \leq \omega_c p$ .

Under partial foreign ownership, the second period payoffs for the foreign acquirer and the domestic owner are given by  $V_{ic}^{F,\alpha_{ic}} \equiv \alpha_{ic} \left( \phi A_{ic,2} I_{ic}^{\beta_I} L_{ic}^{\beta_L} \right) - I_{ic} - \Gamma - P_{(\alpha_{ic})}$  and  $V_{ic}^{D,\alpha_{ic}} \equiv (1 - \alpha_{ic}) \left( \phi A_{ic,2} I_{ic}^{\beta_I} L_{ic}^{\beta_L} \right) - p L_{ic} + P_{(\alpha_{ic})}$ , respectively.  $P_{(\alpha_{ic})}$  is the price paid by the foreign acquirer to the domestic owner for  $\alpha_{ic}$  of the equity of the firm. To simplify the problem, we follow Asiedu and Esfahani (2001) in assuming  $P_{(\alpha_{ic})}$  to be a fixed proportion  $\kappa$  of the foreign acquirer's share in the period 2 revenues of the acquired firm, so that  $P_{(\alpha_{ic})} = \kappa \alpha_{ic} \left( \phi A_{ic,2} I_{ic}^{\beta_I} L_{ic}^{\beta_L} \right)$ .<sup>13</sup> The parameter  $\kappa$  can be thought of as summarizing the features of the market for corporate control that affect the price paid in acquisitions, such as the thickness of the market and other institutional or regulatory details. The game between the acquiring and target firm is solved by backward induction starting from the second (production) stage to the first (acquisition) stage.

**Second Stage:** The foreign acquirer maximizes  $V_{ic}^{F,\alpha_{ic}}$  with respect to  $I_{ic}$  taking  $L_{ic}$  and  $\alpha_{ic}$  as given, while the domestic co-owner maximizes  $V_{ic}^{D,\alpha_{ic}}$  with respect to  $L_{ic}$  taking  $I_{ic}$  and  $\alpha_{ic}$  as given. The first order conditions to this pair of input choice problems gives reactions functions  $I_{ic} = I_{ic}(L_{ic}, \alpha_{ic})$  and  $L_{ic} = L_{ic}(I_{ic}, \alpha_{ic})$ . From these we can solve for the Nash-equilibrium levels of inputs supplied as functions  $I_{ic}(\alpha_{ic})$  and  $L_{ic}(\alpha_{ic})$  of the equity stake  $\alpha_{ic}$ . Intuitively, varying ownership of the revenue stream changes the incentives to provide the input.

**First Stage:** The acquirer takes these incentive compatible input decisions in the second stage as given when choosing the optimal ownership share,  $\alpha_{ic}$ , in the first stage of the game, while satisfying the participation constraint of the domestic owner.<sup>14</sup> Formally, the foreign firm

<sup>13</sup>The precise form of the restriction on the acquisition price is assumed for simplicity. See Asiedu and Esfahani (2001) for a complete discussion.

<sup>14</sup>This constraint is one of the key differences between our paper and Asiedu and Esfahani (2001). The outside option of the domestic firm in Asiedu and Esfahani (2001) is normalized to zero and does not play any role in their results. In contrast, the liquidity-dependent outside option of the domestic owner is central to our analysis.

maximizes its own profits from the acquisition in the first stage:

$$S_{ic}^{F,\alpha_{ic}} \equiv \max_{\alpha_{ic}} \left\{ \alpha_{ic}(1 - \kappa)(\phi A_{ic,2} I_{ic}(\alpha_{ic})^{\beta_I} L_{ic}(\alpha_{ic})^{\beta_L}) - I_{ic}(\alpha_{ic}) - \Gamma \right\}, \quad (3.5)$$

subject to the domestic agent's participation constraint,

$$\begin{aligned} V_{ic}^{D,\alpha_{ic}} &\equiv (1 - \alpha_{ic}(1 - \kappa))(\phi A_{ic,2} I_{ic}(\alpha_{ic})^{\beta_I} L_{ic}(\alpha_{ic})^{\beta_L}) - pL_{ic}(\alpha_{ic}) \geq V_{ic}^{D,0} - \pi_{i,1}, \\ \text{or, } S_{ic}^{D,\alpha_{ic}} &\equiv V_{ic}^{D,\alpha_{ic}} + \pi_{i,1} - V_{ic}^{D,0} \geq 0. \end{aligned} \quad (3.6)$$

A necessary condition for full ownership to be chosen by the foreign acquirer is that

$$S_{ic}^{F,1} \geq S_{ic}^{F,\alpha_{ic}}. \quad (3.7)$$

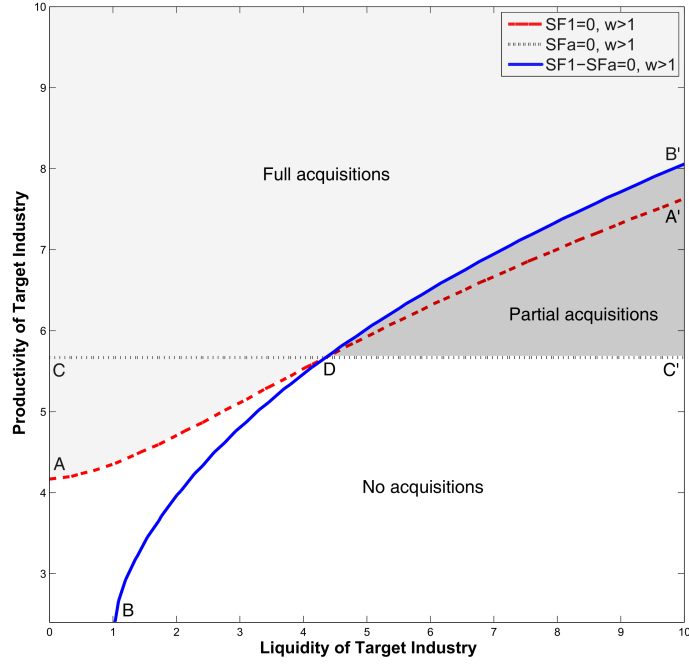
If  $S_{ic}^{F,1} < S_{ic}^{F,\alpha_{ic}}$ , the foreign acquirer prefers partial ownership as long as  $S_{ic}^{F,\alpha_{ic}} \geq 0$ .

### 3.2 Economic intuition and empirical hypotheses

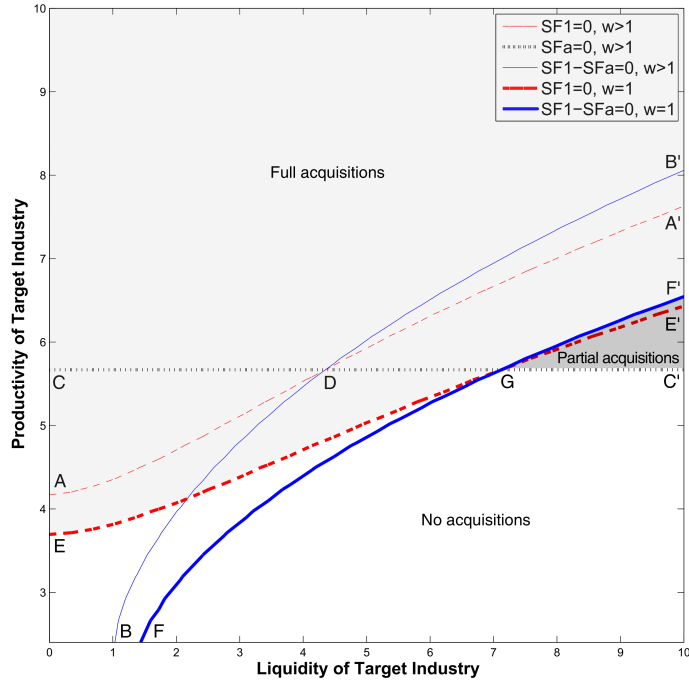
In an accompanying appendix we provide a detailed analysis of foreign acquisitions across different countries and industries using the model sketched above. The main comparative statics we perform relate to changes in: (i) the degree of external finance dependence of an industry (the first period profit of the representative firm in industry  $i$ ,  $\pi_{i,1}$ ); (ii) the productivity of the representative firm in the industry-country  $ic$ ,  $A_{ic,2}$ ; (iii) the financial development of country  $c$  (the pledgability parameter  $\tau_c$ ); and (iv) the relative disadvantage the foreign firm faces in operating a fully owned firm as opposed to owning it partially in country  $c$  (the markup  $\omega_c$ ). The complete statement of these results, and their proofs, are provided in the appendix. We state a few empirical hypotheses originating in these results and clarify the intuition behind them using Figure 3 below.

The main choices facing the foreign firm are: (a) whether to buy a domestic target at all; if yes, (b) whether to take full or partial ownership; if the latter, (c) how much partial ownership to acquire. When making these decisions, it is useful from the point of view of the foreign firm to evaluate targets according to their liquidity and technology level because these two characteristics are key in determining whether each of the above choices are profitable. Accordingly, Figure 3 plots the foreign acquirer's iso-profit curves on the plane of *target industry* liquidity  $l_{ic}$  (on the horizontal axis) and productivity  $A_{ic,2}$  (on the vertical axis). Before describing the iso-profit curves, we note that any point on the plane should be thought of as a representative firm in a sector of the economy that has a particular combination of average productivity and external finance dependence.<sup>15</sup> In our regression analysis we will use empirical proxies for all the key elements included in Figure 3, such as sectoral external finance dependence and productivity. Since the purpose of Figure 3 is to provide intuition, it is generated by simulating the model for parameter values that ease exposition. Thus the reader should not attach particular significance to the cardinal aspects of Figure 3 such as the origin and scale of the axes.

<sup>15</sup>For example, points in the southwest corner of Figure 3 represent sectors that, in our sample of emerging markets, are external finance dependent and whose firms have low productivity on average (e.g. "professional and scientific equipment"), while those to the northeast denote productive sectors whose firms are relatively less external finance dependent (e.g. "apparel").



(a)  $S_{ic}^{F,1} = 0$ ,  $S_{ic}^{F,\alpha_{ic}} = 0$  and  $S_{ic}^{F,1} - S_{ic}^{F,\alpha_{ic}} = 0$  for  $\omega_c > 1$



(b) Shifts in  $S_{ic}^{F,1} = 0$  and  $S_{ic}^{F,1} - S_{ic}^{F,\alpha_{ic}} = 0$  for  $\omega_c = 1$

Figure 3: Liquidity, Productivity and Ownership Structure

**Notes:** Panel (a) shows combinations of target industry liquidity  $l_{ic}$  (plotted on the horizontal axis) and productivity  $A_{ic,2}$  (on the vertical axis) that result in  $S_{ic}^{F,1} = 0$ ,  $S_{ic}^{F,\alpha_{ic}} = 0$  and  $S_{ic}^{F,1} - S_{ic}^{F,\alpha_{ic}} = 0$  when  $\omega_c > 1$ , i.e., foreign firms pay a markup for the local input above the price paid by domestic firms. Panel (b) shows the shifts in  $S_{ic}^{F,1} = 0$  and  $S_{ic}^{F,1} - S_{ic}^{F,\alpha_{ic}} = 0$  when there is no markup ( $\omega_c = 1$ ).

We now discuss two key iso-profit curves for the foreign acquirer in turn.

**The curve  $AA'$ :** This depicts combinations of  $l_{ic}$  and  $A_{ic,2}$  that result in zero profits from a full acquisition, i.e.,  $S_{ic}^{F,1} = 0$ . Since higher productivity of the target industry is associated with higher profits on average,  $S_{ic}^{F,1} > 0$  for all combinations of  $l_{ic}$  and  $A_{ic,2}$  to the north of the curve  $AA'$ .

**The straight line  $CC'$ :** This depicts combinations of  $l_{ic}$  and  $A_{ic,2}$  that result in zero profits from a partial acquisition, i.e.,  $S_{ic}^{F,\alpha_{ic}} = 0$ . Following the same logic as for  $AA'$ ,  $S_{ic}^{F,\alpha_{ic}} > 0$  for all combinations of  $l_{ic}$  and  $A_{ic,2}$  north of  $CC'$ .

The combinations of  $l_{ic}$  and  $A_{ic,2}$  for which either  $S_{ic}^{F,1} > 0$  or  $S_{ic}^{F,\alpha_{ic}} > 0$  defines the region in which the foreign acquirer finds it profitable to acquire a domestic firm, either fully or partially. In panel (a) of Figure 3, this set is represented by the shaded regions above  $ADC'$ . The unshaded area of Figure 3(a) depicts those combinations of  $l_{ic}$  and  $A_{ic,2}$  where no foreign acquisitions take place: Domestic firms in that region are either too liquid or too unproductive to make them worthwhile targets.

Now, conditional on an acquisition being profitable (i.e., within the shaded areas above  $ADC'$ ), the foreign acquirer decides to acquire the firm fully if  $S_{ic}^{F,1} \geq S_{ic}^{F,\alpha_{ic}}$ , and partially otherwise. This choice is depicted using the curve  $BB'$ .

**The curve  $BB'$ :** This depicts combinations of  $l_{ic}$  and  $A_{ic,2}$  that result in the same level of profit from a full or partial acquisition, i.e.,  $S_{ic}^{F,1} - S_{ic}^{F,\alpha_{ic}} = 0$ . On this curve the foreign acquirer is *indifferent* between these two options. It is shown in the appendix that a full acquisition dominates partial acquisitions north of  $BB'$ . Thus, full acquisitions are optimal for combinations of  $l_{ic}$  and  $A_{ic,2}$  on or above the curve  $ADB'$ , shown in Figure 3 as the light-shaded area. Alternately, partial acquisitions are preferred to full acquisitions in the dark-shaded triangular region  $B'DC'$ .

It is instructive to focus on the economic intuition at a few key points in the figure. At points below the line  $AD$ , targets are in illiquid sectors, yet not productive enough to make it worthwhile for the foreign acquirer to pay the fixed cost of an acquisition. Starting at point  $A$  and moving along  $AD$ , full acquisitions are optimal for any point on or vertically above  $AD$  because the targets in those sectors are productive enough on average. The  $AD$  line is positively sloped because a more liquid target has to be bought at a higher price and hence needs to be more productive to make the acquisition worthwhile. Points to the right of the line  $DB'$  represent sectors with relatively low need for external finance, and where existing firms would be more expensive to buy outright. Hence a foreign acquirer prefers a partial acquisition in those sectors when it is able to cover the fixed cost of an acquisition. At points below  $DC'$ , however, sectors are not productive enough even for partial acquisitions to be worthwhile.

We show in the appendix that a decline in the local input price markup shifts the  $S_{ic}^{F,1} = 0$  curve downwards and towards the right. This shift is shown in panel (b) of Figure 3 as  $AA'$  moving to  $EE'$ . Intuitively, a decrease in the local input price markup increases the profit from a full acquisition for each level of liquidity of the target, thereby lowering the productivity threshold of the target sector for which an acquisition is profitable to the foreign acquirer. Of note, since the domestic owner provides the local input at the lower price when an acquisition is partial, a change in the markup does not affect the payoffs from a partial acquisition, leaving



the  $S_{ic}^{F,\alpha_{ic}} = 0$  line unchanged. The downward shift of the  $S_{ic}^{F,1} = 0$  line and the unchanged  $S_{ic}^{F,\alpha_{ic}} = 0$  line in turn imply that the  $S_{ic}^{F,1} - S_{ic}^{F,\alpha_{ic}} = 0$  curve also shifts downward. This is depicted in panel (b) of Figure 3 as  $BB'$  moving to  $FF'$ . As a consequence, a lower  $\omega_c$  is associated with a larger full foreign acquisition set, the light shaded area above  $EGF'$ , and a smaller partial acquisition set  $F'GC$  (dark shaded).

Based on these insights, we use Figure 3 to explain our first set of empirical hypotheses concerning the effects of external finance dependence, productivity, financial development, and the local input price markup on the likelihood of full versus partial foreign acquisitions. The formal proofs of the propositions underlying these hypotheses can be found in the appendix.

### **Hypothesis 1 Likelihood of Acquiring Full Ownership**

**(a) Direct effects:** *The probability of a full acquisition, conditional on a foreign acquisition taking place, is higher in: (i) external finance dependent target sectors, (ii) more productive sectors, (iii) in countries with lower levels of financial development, and (iv) in countries that have a lower local input price markup.*

**(b) Interaction effects:** *Domestic financial development lowers the likelihood of a full foreign acquisition by more in external finance dependent sectors. A lower local input price markup increases the likelihood of a full foreign acquisition by more in external finance dependent sectors.*

The intuition for these hypotheses can be most easily grasped from Figure 3 by examining the area above  $DC'$  where either full or partial foreign acquisitions can take place depending on the values of  $l_{ic}$  and  $A_{ic,2}$ . First, starting on any point above  $C'$  on the boundary of the figure, moving horizontally (i.e., for a given level of average productivity) from right to left towards more external finance dependent sectors moves us into the zone of full foreign acquisitions. In other words, conditional on a foreign acquisition, full or partial, taking place, the representative firm in a more external finance dependent sector is more likely to be acquired fully, ceteris paribus. Second, starting on any point on the segment  $DC'$ , moving up vertically (for a given level of external finance dependence of a sector) from less to more productive sectors moves us into the zone of full foreign acquisitions. In other words, conditional on a foreign acquisition taking place, the representative firm in a more productive sector is more likely to be acquired fully, ceteris paribus. Third, holding both external finance dependence and productivity fixed, higher financial development leads to the representative firm in *all* sectors to move towards higher values of liquidity since  $l_{ic} = \frac{\pi_{i,1}}{(1-\tau_c)}$ , i.e., more developed financial systems can transform the same amount of pledgable internal funds into a higher quantity of available liquidity. This moves the representative firm into the zone of *partial* acquisitions to the right. Thus full foreign acquisitions are *less* likely in countries that are more financially developed. Fourth, it is also clear from inspection of panel (b) of Figure 3 that a lower local input price markup increases the region in which full foreign acquisitions are chosen over partial acquisitions from the area above  $ADB'$  to the area above  $EGF'$ , thereby increasing the proportion of full acquisitions within the pool of foreign acquisitions. Intuitively, a lower local input price increases the relative surplus from a full acquisition and makes it more likely for the foreign acquirer to dispense with a local owner.

The interaction effect of external finance dependence with financial development can be

understood as follows. Recall that  $l_{ic} = \frac{\pi_{i,1}}{(1-\tau_c)}$ , where higher  $\tau_c$  implies higher financial development. It is apparent on inspection that changes in external finance dependence  $\pi_{i,1}$  get magnified by a factor  $\frac{1}{(1-\tau_c)}$ , which captures the effect of financial development. Specifically, countries with the lowest  $\tau_c$  will see the largest differentials across sectors in the effects of external finance dependence. Intuitively, the lower pledgability of assets in less financially developed countries strengthens the effect of external financial dependence on the probability of a full foreign acquisition. In turn, the interaction effects of external finance dependence with the local input price markup can be understood as follows. Panel (b) of Figure 3 shows that, since a greater proportion of partial acquisitions take place at higher levels of  $l_{ic}$ , a effect of a change in  $\omega_c$  is focussed on the lower ranges of  $l_{ic}$  values, i.e., in more external finance dependent sectors.<sup>16</sup>

Next, we outline the hypotheses regarding the determinants of the size of the stake acquired within the subset of partial foreign acquisitions.

### **Hypothesis 2 *Size of Stakes in Partial Foreign Acquisitions***

*The size of stakes in partial foreign acquisitions is weakly higher in (i) external finance dependent and (ii) less productive target sectors, and in (iii) countries with lower financial development, and (iv) is not sensitive to the local input price markup.*

In the appendix we show that the *unconstrained* problem (i.e., ignoring the domestic firm's participation constraint equation 3.6) of the determination of an optimal partial foreign ownership share has an analytical solution, which is  $\alpha_{ic} = \frac{1-\beta_L}{1-\kappa}$ . In words, foreign ownership is negatively related to the factor elasticity (or share) of the local input in the production process as in Asiedu and Esfahani (2001). Intuitively, the foreign acquirer takes a lower equity stake the more important the local input is in production, leaving a higher stake for the domestic owner. However, there arise two cases, one in which financial factors are important and one in which they are not, depending on whether or not the participation constraint binds. The first case occurs when the local input is of sufficient importance in the production process so that the equity share in profits that motivates the domestic firm to provide it optimally is also sufficient to satisfy her participation constraint. The resulting ownership structure in this case is dictated by the technological solution above and not dictated by financial considerations. Figure 3 shows  $S_{ic}^{F,\alpha_{ic}} = 0$  for this case to simplify the graphical exposition of the model.

The second case occurs when the participation constraint binds. This may happen when the local input is of relatively low importance. In this case, the technological optimum shown above will dictate a low ownership share, and hence a low share of the surplus, for the domestic owner, which however may not be enough to satisfy her participation constraint. If it binds, the equity shares are dictated only by the domestic agent's participation constraint and is simply the solution that guarantees the domestic owner her reservation value (i.e., the solution to  $S_{ic}^{D,\alpha_{ic}} = 0$ , see equation 3.6). It is shown in the appendix that in this case the foreign ownership share depends negatively on liquidity, which in turn implies that higher foreign stakes are more

<sup>16</sup>The shift displayed in panel (b) of Figure 3 is for a reduction of  $\omega_c$  to a value of 1, i.e., the foreign firm pays exactly the same price for the local input as the domestic firm. Yet, there remains an area  $GF'C'$  where partial acquisitions are still optimal. These partial acquisitions involve high-liquidity targets that are productive enough to be acquired, but not productive enough to justify buying out the domestic owner completely. This extreme case shows that partial acquisitions are not driven purely by the desire to have a local partner to mitigate the effects of the higher local input price, but by the interaction between technological and financial forces as well.

likely in external finance dependent sectors and less financially developed countries.

Since the technological importance of the local input is likely to vary across sectors, the average estimated relationship between liquidity and the size of partial ownership stakes will be an average over sectors in which target liquidity is immaterial and for which it is not. Empirically, we therefore expect a weak positive relationship between the size of foreign stakes acquired in partial acquisitions, and the degree of external finance dependence of a sector (or a weak negative one with the financial development of a country).

The intuition behind the weak negative relationship between the size of partial stakes and the average productivity of a sector is as follows. In the first case above when the ownership shares are dictated by the input shares in the production process, the average productivity plays no role. In the second case, when the participation constraint binds, since more productive representative firms provide a higher outside option to the domestic owner, she requires more equity as compensation. Thus more productive sectors should see smaller partial foreign stakes. This result runs counter to the higher likelihood of full foreign acquisitions in more productive sectors.

Regarding the relationship between the local input price markup and the size of stakes, recall from the discussion of panel (b) of Figure 3 that a change in  $\omega_c$  is not reflected in the  $S_{ic}^{F,\alpha_{ic}} = 0$  curve. Intuitively, within the subset of foreign acquisitions where having partial domestic ownership is optimal and the price paid for the local input is always  $\omega_c$ , the *size* of the stake given to the domestic owner will not depend on the local input price at the margin.

In the discussions of all the hypotheses above, we conditioned the outcome variables on a foreign acquisition – full or partial – taking place. In other words, our model also has implications for the overall likelihood of foreign acquisitions. However, as explained at length in a later section, we only have an imperfect empirical proxy to pin down this likelihood, and hence consider the following hypotheses as interesting corollaries to our central results on the determinants of foreign ownership structure.

### **Hypothesis 3 Corollary on the Overall Likelihood of Foreign Acquisitions**

**(a) Direct effects:** *The probability of a foreign acquisition is higher in: (i) external finance dependent target sectors, (ii) more productive sectors, (iii) in countries with lower levels of financial development, and (iv) in countries that have a lower local input price markup.*

**(b) Interaction effects:** *Domestic financial development lowers the likelihood of a foreign acquisition by more in external finance dependent sectors. A lower local input price markup increases the likelihood of a foreign acquisition by more in external finance dependent sectors.*

First, recall that the set of  $(l_{ic}, A_{i,2})$  values for which foreign acquisitions, either full or partial, are optimal is given in panel (a) of Figure 3 by the region above  $ADC'$ . This is the union of the areas where full and partial acquisitions are individually optimal. This area can be expressed as a proportion of the total area within the entire range of  $l_{ic}$  and  $A_{i,2}$  values in Figure 3. It is easy to see that this proportion is weakly larger, i.e., foreign acquisitions overall are more likely, for external finance dependent sectors since the vertical distance above  $ADC'$  is weakly higher for lower values of  $l_{ic}$ .<sup>17</sup> Similarly, the horizontal distance to the left of  $ADC'$

<sup>17</sup>The qualifier *weakly* is due to the flat part ( $DC'$ ) of this set.

is weakly higher for more productive sectors, i.e., foreign acquisitions overall are more likely in more productive sectors. It can be similarly reasoned that higher financial development leads to a lower likelihood of foreign acquisitions. As discussed earlier, a lower local input price markup increases the surplus from foreign acquisitions in the cases where full acquisitions are optimal, thereby increasing the region where foreign acquisitions are optimal by the area  $ADGE$ . This leads to a higher likelihood of foreign acquisitions. The reasoning for the sign of the interaction effects for the overall likelihood of foreign acquisitions is analogous to that for the probability of full foreign acquisitions, and is omitted for brevity.

## 4 Empirical methodology and main results

In this section, we present our econometric strategy for testing the hypotheses in section 3.2. We describe the empirical counterparts to the variables used in the model (section 4.1), before discussing our main empirical specifications and the results (sections 4.4 to 4.6).

### 4.1 Main variables

For the empirical analysis, we need measures of the three main parameters of the model that affect the likelihood and size of foreign acquisitions – financial development ( $\tau_c$  in the model) and local input price markup ( $\omega_c$ ) at the country level and external finance dependence ( $\pi_{i,1}$ ) at the industry level.

Our measures of external finance dependence and financial development are standard.<sup>18</sup> The external finance dependence variable is from Rajan and Zingales (1998) and is defined as the ratio of capital expenditures minus cash flow from operations to capital expenditures. The ratio is calculated for each industry using U.S. data from the 1980s. Using this measure for a sample of emerging markets, as we do, assumes that it reflects intrinsic technological features of these industries that are pervasive across countries. Because U.S. financial markets are well developed, external finance dependence should reflect the demand for credit rather than its supply. The key premise is that the supply of credit in the United States is flat and that the data for equilibrium levels of capital expenditures are solely related to the demand for credit.

We measure financial development as the private credit-to-GDP ratio from the World Bank’s Global Financial Development Database. Larger values of the variable indicate lower levels of credit constraints. As our model relates cross-country differences in financial development to foreign acquisitions, we use the average of the private credit-to-GDP ratio over the period for each country. We show that the results obtained using the time-varying version of this variable and those obtained using a pre-sample period measure are consistent with the baseline regressions.<sup>19</sup>

To measure the markup on the price of the domestic input empirically, we use several indices that measure corruption. In the baseline, we use the index of *control-of-corruption*, from the Worldwide Governance Indicators (WGI) dataset (Kaufmann et al., 2013). This variables

<sup>18</sup>Section 2.1 of the online appendix contains the sources and description of all the variables used in the paper.

<sup>19</sup>Apart from consistency with the model, the time-invariant version of the financial development variable is our preferred measure for several reasons. First, variation in the variable within countries over time may be driven by unobserved factors, which would create an endogeneity problem. Second, the other variables we use as regressors – external finance dependence and our proxy for the local input price – are time-invariant.

captures several dimensions of corruption that may affect the overall business environment. We postulate that lower levels of corruption – that is, higher values of the control-of-corruption index – are associated with greater transparency in the target country and with a comparative disadvantage of the foreign acquirer in procuring the local input. Put differently, higher levels of the anti-corruption index represent a lower markup on the local input price and make it cheaper for the foreign acquirer to procure the local input. Again, we use the country average over the period, because this variable exhibits little variation over time and because it contains many missing values. We also show specifications using alternative measures, such as an alternative anti-corruption measure from Transparency International; an indicator of the quality of government from the International Country Risk Guide; and a rule of law index from the WGI. The results obtained in the baseline specification are insensitive to changing the specific measure of corruption.

## 4.2 Additional variables

We add several controls to our dataset. First, the model assumes that we control for the productivity of the target country-industry. We add to our dataset the measure of industry-level productivity relative to that of the United States from Levchenko and Zhang (2011) for each of the countries in the sample. Second, we include in some of the specifications a set of lagged macroeconomic covariates that may be correlated with financial development and institutions and affect foreign acquisitions. In our baseline specifications, we control for real GDP and GDP per capita. In our robustness exercises, we include additional controls such as the change in the nominal exchange rate, the use of IMF credit and loans as a percentage of a country’s quota, and the growth of real GDP. All variables relate to the target country.<sup>20</sup> In the sensitivity analysis, we also use proxies for trade costs and industry characteristics (e.g., the capital-to-labor ratio and R&D intensity). These are detailed in the corresponding section, as well as in section 2.1 of the online appendix.

## 4.3 Sample statistics

In the baseline analysis, we aggregate the data by target sector, target country and year and therefore use the share of foreign acquisitions, full acquisitions, and the average stake acquired as the dependent variables. We do so because the model has predictions about the effect of target countries’ and sectors’ characteristics on foreign acquisitions. Moreover, our dataset does not include transaction-level covariates other than the size and type of acquisitions. In the empirical robustness exercises, we will show that the results are similar when the regression model is estimated at the transaction-level.

Table 2 contains statistics about the final sample.<sup>21</sup> The average level of the ratio of private credit to GDP is equal to 0.68, with the lower ratio being observed in Peru (0.17) and the highest in South Africa (1.11). The control-of-corruption data display important cross-country

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<sup>20</sup>The data are from the Penn World Tables, the IMF’s *International Financial Statistics*, Taiwan’s National Statistical Office, and the Central Bank of the Republic of China. We exclude the real interest rate because of data availability. Annual and quarterly real interest rate data are unavailable for several countries in the early years of the sample period.

<sup>21</sup>Table A.5 in the online appendix provides equivalent statistics at the transaction level.

Table 2: Final sample statistics

	Obs.	Mean	S.D.	Q1	Median	Q3
Share foreign acquisitions	2429	0.45	0.40	0.00	0.43	1.00
Share full acquisitions (all)	2429	0.39	0.38	0.00	0.33	0.67
Share full acquisitions (foreign)	1673	0.38	0.41	0.00	0.25	0.80
Average fraction acquired (all)	2429	0.62	0.28	0.42	0.61	0.85
Average fraction acquired (foreign)	1673	0.61	0.30	0.38	0.60	0.95
Average fraction acquired (foreign. partial acq.)	1271	0.38	0.21	0.23	0.38	0.51
External finance dependence	2429	0.28	0.23	0.15	0.21	0.45
Private credit / GDP	2429	0.68	0.37	0.33	0.68	1.10
Anti-corruption index	2429	0.15	0.80	-0.39	-0.20	0.39
GDP per capita	2429	11569	9845	5233	8922	12995
Real GDP growth	2240	5.89	7.14	2.35	6.50	9.69
Technology relative to US	2207	0.06	0.15	0.00	0.01	0.06

Source: Authors' computation from Thompson's International Mergers and Acquisitions database, World Bank, IMF and Rajan and Zingales (1998). Variables relative to foreign acquisition are average computed Thompson's International Mergers and Acquisitions database, by target country, target industry and year. Anti-corruption index comes from the World Bank Governance Indicators and is a measure of perceptions of corruption. Technology relative to the US is from Levchenko and Zhang (2011).

heterogeneity, with the worst-rated country being Indonesia (with an index of -0.8) and the best-rated Chile (with an index of 1.4) and Singapore (2.26). Finally, the countries in the sample experienced strong positive growth on average over our time period.

We next turn to our empirical methodology to test hypotheses 1 to 3.

#### 4.4 Testing hypothesis 1: the share of full foreign acquisitions

Hypothesis 1 states that among foreign acquisitions, the share of *full* acquisitions is larger in target sectors more dependent upon external finance, in less financially developed target countries, and in target countries with a low local input price markup (hypothesis 1.a). In addition, the effects of a low local input price and financial development are exacerbated in financially dependent sectors (hypothesis 1.b).

**Hypothesis 1.a.** Let us define  $S_{ict}^F$  as the share of full acquisitions in all foreign acquisitions taking place in target industry  $i$ , target country  $c$  during year  $t$ .<sup>22</sup> The direct effect of external finance dependence is tested using the specification:

$$S_{ict}^F = \alpha_1 EF_i + \mu_{ct} + \delta A_{ic} + \epsilon_{ict} \quad (4.1)$$

where  $EF_i$  represents the industry-specific measure of external finance dependence from Rajan and Zingales (1998). Our model predicts that the estimates of  $\alpha_1$  should be positive. Full foreign acquisitions are more likely in sectors that are more dependent upon external finance. Because the model predicts that full acquisitions take place in more productive industries, we control for technology using the measure of industry-level productivity relative to that of the

<sup>22</sup>A full acquisition is defined as a 100% acquisition, as before. In our robustness analysis, we examine alternative thresholds for defining a full acquisition.

United States from Levchenko and Zhang (2011) for each of the countries in the sample. We also include a full set of target country  $\times$  year ( $\mu_{ct}$ ) fixed effects. The fixed effects are intended to account for cyclical macroeconomic conditions that may affect the foreign acquisitions, such as macroeconomic fundamentals, financial crises (e.g., the 1997-98 Asian financial crisis), or slowly evolving country characteristics such as barriers to FDI, financial development, or the quality of institutions. We therefore identify the effect of external finance dependence within country-year, across industries.

We estimate equation (4.1) and the rest of our specifications using a linear probability model, which handles better multiple fixed effects and interaction terms. We show later that our results are robust to the use of the nonlinear fractional logit estimator. The standard errors in these and the other regressions discussed in this section are clustered at the target country  $\times$  industry level. The online appendix reports the results using alternative levels of clustering.

The effect of country-specific characteristics is estimated using the specification:

$$S_{ict}^F = \alpha_2 \text{FD}_c + \alpha_3 \text{Markup}_c + \rho_i + \delta A_{ic} + \nu_t + \mathbf{C}'_{ct} \gamma + \epsilon_{ict} \quad (4.2)$$

where  $\text{FD}_c$  and  $\text{Markup}_c$  are the measures of the level of financial development and the markup over the local input price, the average levels of the ratio of private credit-to-GDP and the control-of-corruption index. We control for target sector ( $\rho_i$ ) and year ( $\nu_t$ ) fixed effects as well as for a set of lagged macroeconomic covariates (real GDP and GDP per capita) that may correlate with  $\text{FD}_c$  and  $\text{Markup}_c$  and affect foreign acquisitions ( $\mathbf{C}'_{ct}$ ). The model predicts that  $\alpha_2 < 0$  and  $\alpha_3 > 0$ . Full foreign acquisitions are more likely in countries with low levels of financial development and low markups over local input prices.

Columns (1) to (3) of Table 3 present the results. Column (1) shows the results of the estimation of equation (4.1) and columns (2) and (3) the results obtained for equation (4.2). In these regressions, we consider only foreign acquisitions and define full acquisitions as all acquisitions where the foreign acquirer purchases 100% of the target.

The estimated coefficients associated with dependence on external finance reported in the first column of the table provide evidence in favor of the model's predictions. The share of full acquisitions in foreign acquisitions is positively related to dependence on external finance, and the estimate is statistically significant at the 1% level. Targets located in industries that have a greater reliance on external finance are more likely to be acquired by foreign firms, and the effect is quantitatively meaningful. The share of foreign acquisitions is predicted to be 0.27 larger for the sector with the highest level of external finance dependence (professional and scientific equipment) compared with the sector that has the lowest level dependence on external finance (tobacco).

Columns (2) and (3) present the results on the role of cross-country differences in the level of financial development and institutional quality as drivers of full foreign acquisitions. Comparing column (2) with column (3) shows that the estimated coefficient associated with the average level of financial development becomes larger and more significant when we include the control-of-corruption index as a separate regressor. This difference points to the importance of considering both of these country characteristics simultaneously. In column (3), the estimated coefficient

Table 3: Determinants of full foreign acquisitions: baseline results

	(1)	(2)	(3)	(4)	(5)
Dep. var.	Share full foreign acquisitions				
Test of	— Hypothesis 1.a —			– Hypothesis 1.b –	
External finance dependence	0.197 <sup>a</sup> (0.065)				
Average financial development		-0.098 <sup>b</sup> (0.041)	-0.143 <sup>a</sup> (0.043)		
Control of corruption index			0.094 <sup>b</sup> (0.044)		
External dep. × average fin. dev.				-0.192 (0.155)	-0.431 <sup>a</sup> (0.141)
External dep. × control of corruption					0.471 <sup>a</sup> (0.096)
Tech. relative to US	0.125 (0.095)	0.067 (0.088)	0.038 (0.083)	0.051 (0.111)	0.106 (0.112)
Observations	1529	1529	1529	1529	1529
$R^2$	0.291	0.113	0.119	0.318	0.329
Macroeconomic Controls	No	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	No	No
Target sector FE	No	Yes	Yes	Yes	Yes
Target country × Year FE	Yes	No	No	Yes	Yes

**Notes:** <sup>c</sup> significant at 10%; <sup>b</sup> significant at 5%; <sup>a</sup> significant at 1%. OLS estimations. Standard errors clustered by target country × target industry. Estimations at the target country × target industry × year. These estimations are restricted to the sample of foreign acquisitions. Compared to the baseline results, the sample has been aggregated by target country, target sector and year. External dependence target is the level of external finance dependence of the target country from Rajan and Zingales (1998). Financial development is the average ratio of private credit over GDP over the period of the target country from the World Bank GFDD. Control of corruption index is the average country-level score of control of corruption from the WGI dataset. Macroeconomic controls include the lagged real GDP and GDP per capita, both in logs. Technology relative to the US is from Levchenko and Zhang (2011).

associated with financial development is negative – that is, higher levels of financial development are correlated with smaller shares of full acquisitions – and the coefficient is statistically significant at the 1% level. This finding matches what the model predicts. What’s more, the positive coefficient estimate associated with the corruption index is also consistent with what the model predicts. Full acquisitions occur more in countries with low markups over local input prices (i.e., low levels of corruption). Conditional on a foreign acquisition taking place, the probability that the target is fully acquired is 0.21 percentage points lower in the country with the lowest anti-corruption index (Indonesia) than in the least corrupt country (Chile) of the sample. In comparison, the difference in probability between the top and the bottom countries in terms of financial development (South Africa, for which the ratio is slightly above 1, and Peru, for which the ratio is only 0.17) is around 0.14. These results help to explain why full acquisitions are seldom observed in countries that feature both developed financial markets and institutions of limited quality. In our sample, Thailand is such a country, and the share of full acquisitions in foreign transactions is one of the lowest of the sample, at 0.19.

Finally, the technology variable exhibits a positive sign in columns (1) to (3) as expected, but its coefficient is not statistically significant at conventional levels. These regressions include either country × year fixed effects (col. 1) or controls for GDP and GDP per capita, both of



which have estimated coefficients that are positive and highly significant. Most of the variation in the Levchenko and Zhang (2011) measure is observed across countries and is correlated with GDP and GDP per capita, so that removing these variables from the regression restores the significance of the technology measure.

**Hypothesis 1.b.** We now study whether the effect of financial development and markup over local input price on full foreign acquisitions are magnified in sectors with high external finance dependence. To do so, we include interaction terms in equation (4.1):

$$S_{ict}^F = \beta EF_i \times FD_c + \gamma EF_i \times Markup_c + \mu_{ct} + \rho_i + \epsilon_{ict} \quad (4.3)$$

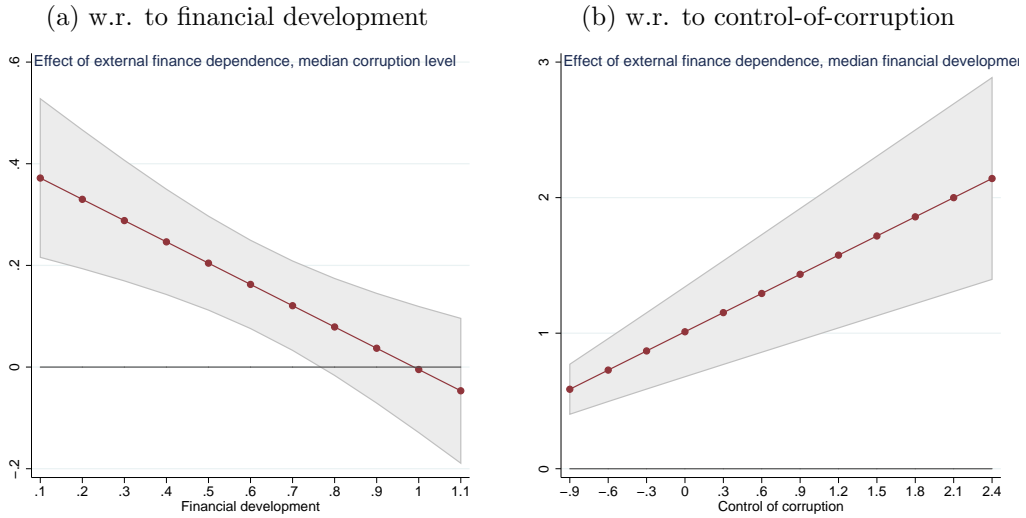
The model predicts that  $\beta < 0$  and  $\gamma > 0$ . Foreign acquisitions are less likely in financially developed countries and in countries with high levels of corruption, especially in financially dependent sectors. We include country  $\times$  year ( $\mu_{ct}$ ) and sector ( $\rho_i$ ) fixed effects, which implies that only the coefficients on the interaction terms can be identified, as in Rajan and Zingales (1998). This specification is the cleanest one as it controls for unobserved country or sector characteristics that affect foreign M&A. In the online appendix, we report results of specifications that do not include sector fixed effects in order to estimate the average effect of external finance dependence.

The results are shown in columns (4) and (5) of Table 3. Once again, it is important to control for the quality of institutions to obtain coefficient estimates on the interaction terms that are consistent with the model. Although the estimated coefficient on the interaction term  $EF_i \times FD_c$  in column (4) has the negative sign that the model predicts, it is not statistically significant at conventional levels. However, when the interaction term  $EF_i \times Markup_c$  is included in the regression, the estimated coefficient associated with the interaction of dependence on external finance and financial development almost doubles in economic significance and becomes statistically significant at conventional levels. In addition, the positive coefficient estimate associated with the interaction term between dependence on external finance and institutional quality shows that higher quality institutions mitigate the negative effect of being more reliant on external sources of finance for investment.

Figure 4 depicts these results graphically. We estimate a specification akin to column (5) of Table 3 but without sector fixed effects. This specification enables us to estimate the average effect of external finance dependence. In Figure 4.a, we plot the estimated effect of external finance dependence, as a function of financial development, and holding the corruption index constant at its median value. While external dependence has a strong effect in financially underdeveloped countries, the estimates become statistically insignificant when the ratio of private credit over GDP exceeds 0.7. In the same vein, Figure 4.b shows that external finance matters roughly three times more in countries with the highest levels of control-of-corruption than in more corrupt countries.

Another way to gauge the quantitative implications of our results is shown in Figure 5. Here we plot the predicted change in the share of full acquisition that would occur if all countries moved to the top level of financial development (Panel a) or corruption (Panel b) observed in our sample. The results are expressed in percentage changes. A country like China, for instance,

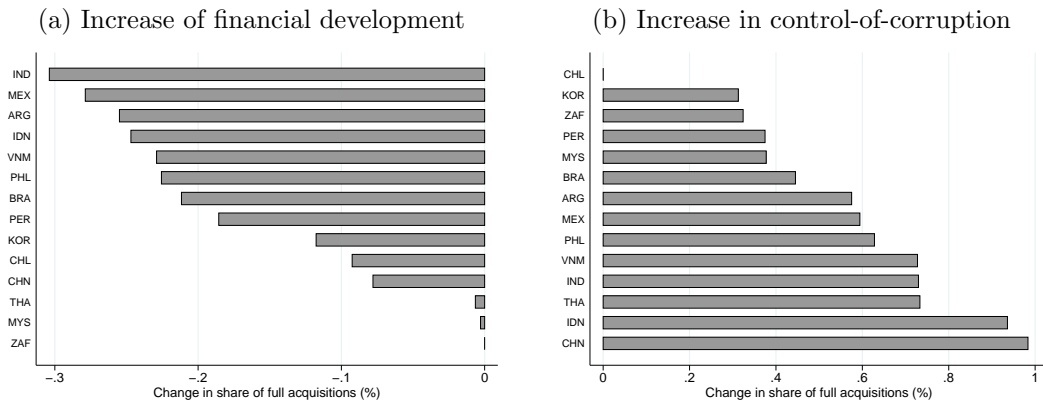
Figure 4: Effect of external dependence on full acquisitions



Note: These figures represent the effect of external finance dependence on the share of full foreign acquisitions, for different levels of financial development and control-of-corruption. Figure (a) assumes a median level of level of corruption; Figure (b) assumes a median level of financial development. The estimated effects are obtained from a specification similar to column (5) of Table 3, except that sector dummies are not included to allow the effect of external finance dependence to be identified. Grey area represent 90% confidence bands.

would experience a doubling in the share of full acquisitions if it were to reach the level of control-of-corruption of Chile.

Figure 5: Counterfactuals



Note: These figures represent the effect of increases in financial development and control-of-corruption on the share of full foreign acquisitions. Figure (a) compares the predicted share of full foreign acquisitions if all countries had the highest value of financial development in the sample (South Africa, 1.04); Figure (b) compares the predicted share of full foreign acquisitions if all countries had the highest value of control-of-corruption in the sample (Chile, 1.42 – we exclude Singapore, which is an outlier). The estimated effects are obtained from a specification similar to column (5) of Table 3, except that sector dummies are not included to allow the effect of external finance dependence to be identified. We first predict the share of full acquisitions with the actual value of financial development/control-of-corruption; then with the counterfactual value; then we average over the period by country and compute the change in the predicted share.

#### 4.5 Testing hypothesis 2: the size of partial foreign acquisitions

Hypothesis 2 predicts that among partial foreign acquisitions, the average share acquired is not sensitive to local input price markup, and weakly affected by external finance dependence and financial development. To test these predictions, we confine the analysis to partial foreign

acquisitions, i.e., transactions for which the share acquired by foreign investors is strictly larger than 0 and less than 1. We replace the dependent variable in equations (4.1), (4.2) and (4.3) with  $S_{ict}^P$ , the average share acquired.

Table 4 shows the results obtained when projecting the size of the stake acquired on the financial factors and institutional quality index suggested by the model. The structure is the same as in Table 4: We first consider the effect of external finance dependence in column (1), before analyzing the effect of country characteristics – financial development and corruption – in columns (2) and (3). Columns (4) and (5) look at the interaction between external finance dependence and country characteristics, controlling for sector and country unobservables.

Table 4: Determinants of the size of partial foreign stake: baseline results

	(1)	(2)	(3)	(4)	(5)
Dep. var.	Size of foreign stake (only partial acquisitions)				
Test of	— Hypothesis 2 —				
External finance dependence	0.049 <sup>c</sup> (0.028)				
Average financial development		-0.053 <sup>a</sup> (0.018)	-0.039 <sup>c</sup> (0.021)		
Control of corruption index			-0.033 <sup>c</sup> (0.019)		
External dep. × average fin. dev.				0.014 (0.076)	0.030 (0.077)
External dep. × control of corruption					-0.038 (0.065)
Tech. relative to US	-0.054 (0.078)	0.022 (0.053)	0.036 (0.054)	-0.035 (0.085)	-0.039 (0.086)
Observations	1163	1163	1163	1163	1163
$R^2$	0.257	0.099	0.102	0.308	0.309
Macroeconomic Controls	No	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	No	No
Target sector FE	No	Yes	Yes	Yes	Yes
Target country × Year FE	Yes	No	No	Yes	Yes

**Notes:** <sup>c</sup> significant at 10%; <sup>b</sup> significant at 5%; <sup>a</sup> significant at 1%. OLS estimations. Standard errors clustered by target country × target industry. Estimations at the target country × target industry × year. These estimations are restricted to the sample of foreign acquisitions. Compared to the baseline results, the sample has been aggregated by target country, target sector and year. External dependence target is the level of external finance dependence of the target country from Rajan and Zingales (1998). Financial development is the average ratio of private credit over GDP over the period of the target country from the World Bank GFDD. Control of corruption index is the average country-level score of control of corruption from the WGI dataset. Macroeconomic controls include the lagged real GDP and GDP per capita, both in logs. Technology relative to the US is from Levchenko and Zhang (2011).

External financial dependence and financial development display the expected signs, but they are generally statistically significant at the 10% level only (columns (1) and (3)). The interaction between financial development and external finance dependence turns out insignificant, as do the corruption index and its interaction with external finance dependence. Taken together, these results match the model’s predictions. It predicts that the markup over the local input price should have no effect – hence control-of-corruption and its interaction with external finance dependence should have insignificant coefficients. The model also predicts that financial factors

should have an effect only in some sectors, depending on the technological importance of the local input. On average, the effect of such factors on partial acquisitions should therefore be weaker than for full acquisitions, which is what table 4 suggests.

#### 4.6 Testing hypothesis 3: the share of foreign acquisitions

The last testable hypothesis of the model relates the probability of foreign acquisitions to financial factors, local input prices, and the interaction between the two variables. More precisely, (a) foreign acquisitions are predicted to occur more in external finance dependent sectors, in countries with lower levels of financial development, and in countries that have a lower local input price markup; and (b) both the effects of domestic financial development and local input prices are magnified in more external finance dependent sectors. These predictions are a direct consequence of the effect of financial factors and local input prices on full and partial acquisitions.

To test these predictions, we consider the both domestic and foreign acquisitions and use as a dependent variable in equations (4.1), (4.2) and (4.3) the share of foreign acquisitions among all acquisitions taking place in a given country, sector, and year. We would ideally like to use the ratio of the number of foreign acquisitions over the total number firms that can be acquired, but we do not have time-varying information on the number of firms by market and sector. This is a limitation of the exercise presented in this section, and the main reason why we restrict our attention to hypotheses 1 and 2 in the robustness exercises. They can be more cleanly tested.

Table 5 presents the results. As before, we sequentially consider external finance dependence (col. (1)), country-specific factors (cols. (2) and (3)) and their interaction (cols. (4) and (5)). The estimated coefficients associated with dependence on external finance reported in the first column of the table provide evidence supporting the model's predictions. The coefficient is precisely estimated and statistically significant at the 1% level. The effect is quantitatively similar to the one found in Table 3. Moving from the bottom to the top external finance dependent sector raises the share of foreign acquisitions by 0.24. In conjunction with the results for the sample of partial and full acquisitions reported in Table 3 and 4, this evidence underscores the economic importance of dependence on external finance as a determinant of foreign acquisitions.

Columns (2) and (3) report the results of the regressions that relate the share of foreign acquisitions to cross-sectional differences in the average levels of financial development and the control-of-corruption index. The probability of a foreign acquisition is negatively related to cross-country differences in financial development, and the coefficient estimates in both regressions are statistically significant at the 1% level. Foreign acquisitions are less likely in countries with more developed financial sectors. Compared to the least financially developed country (Peru), the share of foreign acquisitions is predicted to be 0.27 lower for targets located in the most financially developed countries (South Africa). By contrast, in column (3) the coefficient on the control-of-corruption index is positive but statistically insignificant. Finally, the results shown in columns (4) to (5) are also more supportive of the role of financial factors than corruption.

The evidence presented in this subsection favors the substantive predictions of hypothesis 3 regarding the relationship between the probability of a foreign acquisition, the target's de-

Table 5: Determinants of overall foreign acquisitions: baseline results

	(1)	(2)	(3)	(4)	(5)
Dep. var.	Share foreign acquisitions in all acquisitions				
Test of	— Hypothesis 3.a —			– Hypothesis 3.b –	
External finance dependence	0.170 <sup>a</sup> (0.038)				
Average financial development		-0.292 <sup>a</sup> (0.029)	-0.281 <sup>a</sup> (0.037)		
Control of corruption			-0.024 (0.043)		
External dep. × average fin. dev.				-0.190 <sup>c</sup> (0.102)	-0.185 <sup>c</sup> (0.112)
External dep. × control of corruption					-0.007 (0.082)
Tech. relative to US	-0.028 (0.066)	-0.086 (0.073)	-0.077 (0.074)	0.026 (0.065)	0.025 (0.066)
Observations	2207	2207	2207	2207	2207
$R^2$	0.338	0.142	0.142	0.357	0.357
Macroeconomic Controls	No	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	No	No
Target sector FE	No	Yes	Yes	Yes	Yes
Target country × Year FE	Yes	No	No	Yes	Yes

**Notes:** <sup>c</sup> significant at 10%; <sup>b</sup> significant at 5%; <sup>a</sup> significant at 1%. OLS estimations. Standard errors clustered by target country × target industry. Estimations at the target country × target industry × year. External dependence target is the level of external financial dependence of the target sector from Rajan and Zingales (1998). Financial development is the average ratio of private credit over GDP over the period of the target country from the World Bank GFDD. Control of corruption index is the average country-level score of control of corruption from the WGI dataset. Macroeconomic Controls include the lagged real GDP and GDP per capita, both in logs. Technology relative to the US is from Levchenko and Zhang (2011).

pendence on external finance, the country’s level of financial dependence, and the interaction between these two financial factors. It is less supportive of the prediction that the probability of a foreign acquisition is positively associated with strong institutions, which make procuring the local input less costly for the foreign acquirer. A conclusion that can be drawn from these results is that, since local input prices have a different effect on partial and full acquisitions, pooling all types of transactions together is problematic as it masks these different dynamics. An important caveat to these results is that we do not have the perfect data at hand to study the determinants of the overall probability of foreign acquisitions.

## 5 Additional results and sensitivity analysis

In this section we test the sensitivity of our empirical tests of hypotheses 1 and 2 to several modifications of the baseline regression model. Most of the tables are relegated to section 4 of the online appendix, where we provide further discussion.

### 5.1 Transaction-level estimates

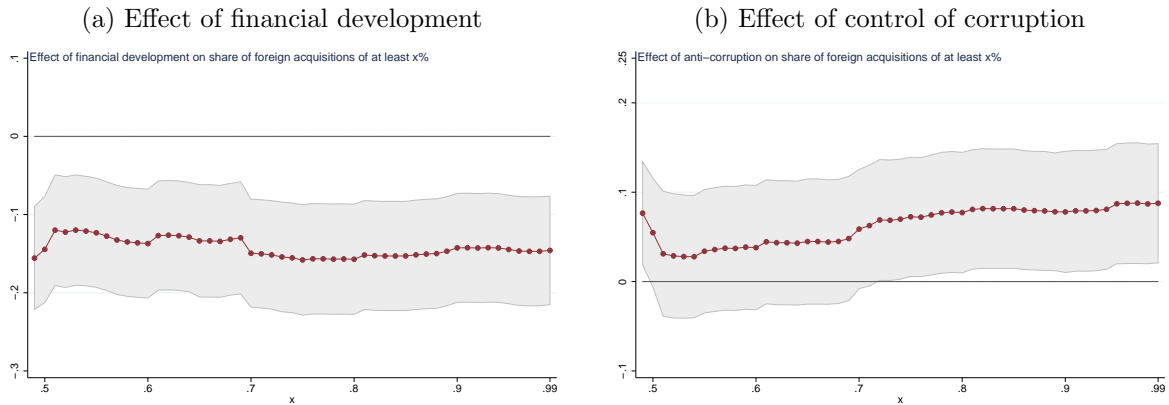
Our baseline data is at the transaction level, however we do not have transaction-level information other than the type and size of acquisitions and therefore cannot include control variables

at the level of individual transactions. For this reason, we aggregated the data for the baseline specification at the target sector-country-year level. Our results are, however, robust to using the transaction-level data. In this case, the dependent variable for the counterpart of hypothesis 1 becomes a dummy that takes the value 1 if the foreign acquirer purchases 100% of its target, 0 otherwise. Similarly, the dependent variable for hypothesis 2 is the size of the stake acquired, conditional on the share being strictly larger than 0 and lower than 1 and on the acquisitions being made by a foreign firm. Descriptive statistics about this sample are presented in Table A.5 and the regression results are shown in Tables A.6 and A.7. The results are similar to those obtained using the aggregated data.

## 5.2 Full acquisition threshold

We have assumed thus far that an acquisition was a “full” one when the share acquired was 100%. In the model, a full acquisition is essentially the purchase of rights to produce using the technology of the domestic firm. In practice, the threshold at which this occurs may be lower than 100%. This issue is an important one for results on the markup over the local input price (i.e., the control-of-corruption index), which is predicted to affect only the likelihood of full foreign acquisitions.

Figure 6: Full-acquisitions threshold



Note: These figures plot the effect of financial development and of the anti-corruption index on the probability of full acquisitions. The threshold for full acquisitions varies along the horizontal axis. Estimations are akin to column (3) of Table 3, except that the share of full acquisitions (dependent variable) is computed according to the corresponding threshold. Grey area represent 90% confidence bands.

We replicate the baseline regressions of Table 3, column (3) using different thresholds for full acquisitions. The results are depicted in Figure 6. Panel (a) shows the coefficients and confidence bands obtained for the financial development variable, as a function of the threshold; panel (b) plots the same information for the control-of-corruption variable. Each coefficient is obtained from a separate regression, where the dependent variable is the share of full acquisitions computed according to the corresponding threshold, which varies between 50 and 100%. The effect of financial development does not vary with the chosen threshold. This finding was expected because financial development is also predicted to affect the share acquired. On the other hand, only large thresholds lead to significant estimates in the case of the control of corruption variable. Put differently, the corruption level affects the share of full acquisitions only

when a full acquisition is defined as a purchase of 75% or more of the target.

### 5.3 Omitted variables and alternative theories of FDI

Causal identification in our baseline estimations might be undermined by the existence of omitted variables: factors affecting the size of foreign acquisitions and correlated with external dependence, financial development, or institutions.

Although the model omits other possible determinants of the ownership structure of inward FDI to emerging markets, theories of FDI have proposed alternative explanations for cross-border capital flows. While they are not necessarily directly related to foreign M&A or the size of the stake acquired, they may still affect our estimates to some extent. The baseline regressions control for country-industry productivity and GDP per capita and thus already account for the “cream-skimming” hypothesis — namely, that foreign acquirers generally purchase more productive firms (see Razin and Sadka, 2007, for a theoretical model).

An alternative explanation that we do not account for in the baseline regressions is the proximity-concentration theory of horizontal FDI (see Krugman, 1983, among others), which predicts that FDI is more likely in industries associated with higher variable trade costs (see Brainard, 1997) and located close to demand. When trade costs are higher, foreign firms optimally choose to circumvent them in order to take advantage of economies of scale. To control for these types of costs, we use data on average applied tariffs at the target country and two-digit SIC industry level. These data are obtained from the World Bank’s *World Integrated Trade Solution* database.<sup>23</sup> We also include a measure of market potential, at the country and industry level, from Mayer (2008).

A second set of theories explains vertical FDI based on locational advantages in emerging markets caused by lower factor prices (see Markusen, 1984; Helpman and Krugman, 1985, among others). To control for this type of locational advantage, we include a measure of labor intensity in the target sector, the capital-labor ratio at the industry level (Antràs, 2003).

A third explanation is given by the incomplete-contracting, property-rights theory of the boundaries of multinational corporations. Antràs (2003) shows that a model of international trade with incomplete contracts and a preference for variety explains that, across industries, the share of intrafirm imports in total U.S. imports is higher for more capital-intensive exporting industries. The model pins down the boundaries of the international firm and suggests that FDI is more likely in capital-intensive industries. In addition to the capital-labor ratio at the industry level, Antràs (2003) uses as a control variable the research and development (R&D) expenditures as a fraction of sales. This is especially important in the context of our model as this sector characteristic may be correlated with dependence on external finance. It is possible, for example, that dependence on external finance proxies for technologically advanced industries in which developed market firms might have an advantage.

Finally, as Asia comprises a large part of our sample, it is also possible that the probability of a foreign acquisition depends on whether the industry supplies intermediate goods to firms based in developed markets, as many Asian companies do. To control for this possibility, we

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<sup>23</sup>The data are available at the following web address: <http://wits.worldbank.org/>.

use the measure of upstreamness of industries computed by Chor et al. (2012) as an additional covariate.<sup>24</sup>

Table 6: Robustness: omitted variables and alternative theories

Dep. var.	(1)	(2)	(3)	(4)	(5)	(6)
		Full acq.		Frac. acq. (partial)		
External Finance Dependence	0.210 <sup>b</sup> (0.095)			0.013 (0.043)		
Average financial development		-0.145 <sup>a</sup> (0.043)	-0.200 <sup>a</sup> (0.044)		-0.043 <sup>b</sup> (0.021)	-0.051 <sup>b</sup> (0.022)
Control of corruption index		0.093 <sup>b</sup> (0.047)	0.113 <sup>b</sup> (0.047)		-0.032 <sup>c</sup> (0.019)	-0.032 (0.021)
K/L	-0.053 (0.036)			-0.004 (0.024)		
R&D/Sales	-1.906 (1.497)			0.526 (0.821)		
Upstreamness	0.030 (0.030)			0.035 <sup>c</sup> (0.019)		
ln(tariff+1)	-0.040 (0.040)	-0.052 (0.041)	-0.058 (0.044)	-0.020 (0.022)	-0.042 <sup>b</sup> (0.018)	-0.051 <sup>b</sup> (0.020)
ln market potential	0.025 <sup>b</sup> (0.010)	-0.048 <sup>a</sup> (0.018)	0.023 (0.024)	-0.001 (0.007)	-0.029 <sup>a</sup> (0.008)	-0.027 <sup>b</sup> (0.013)
Tech. relative to the U.S.	0.127 (0.102)	0.037 (0.088)	0.140 (0.140)	-0.003 (0.083)	0.009 (0.057)	-0.004 (0.068)
Observations	1379	1515	1401	1039	1149	1058
R <sup>2</sup>	0.322	0.126	0.152	0.300	0.116	0.121
Macro Controls	No	Yes	Yes	No	Yes	Yes
Macro Controls (extended)	No	No	Yes	No	No	Yes
Sector FE	No	Yes	Yes	No	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes
Target country × Year FE	Yes	No	No	Yes	No	No

**Notes:** <sup>c</sup> significant at 10%; <sup>b</sup> significant at 5%; <sup>a</sup> significant at 1%. OLS estimations. Standard errors clustered by target country × target industry. Estimations at the target country × target industry × year. The dependent variable is: in column (1) and (2), the share of full acquisitions among foreign acquisitions; in columns (3) and (4), the average fraction acquired among partial foreign acquisitions. Financial development is the level of private credit of GDP of the target country, averaged over the period. Anti-corruption index is the average country-level score of control of corruption from the World Bank. External dependence target is the level of external financial dependence of the target sector from Rajan and Zingales (1998). Macro controls include the lagged real GDP and GDP per capita, both in logs. Extended macro controls include the change in the nominal exchange rate, the use of IMF credit and loans as a percentage of a country's quota and the growth of real GDP. Technology relative to the US is from Levchenko and Zhang (2011).

The results are summarized in Table 6. We consider sequentially the share of full acquisitions (col. 1-3) and the size of partial acquisitions (col. 4-6). Columns (1) and (3) estimate the effect of external finance dependence. Given that we control for country fixed effects in these estimations,

<sup>24</sup>In addition to these explanations, there are theories of horizontal FDI with firm heterogeneity that relate the distribution of industry productivity in the source country to the decision to locate production abroad (see Helpman et al., 2004; Nocke and Yeaple, 2007, 2008). Such explanations rely on the stylized fact that larger firms tend to be more productive and, hence, export more. FDI is therefore more likely in sectors with less productivity dispersion across firms. But the principal focus of our analysis is the characteristics of target firms in emerging markets that make them more likely to be acquired by a foreign firm. In that respect, the dispersion of productivity in the source country is not relevant to the central point of this paper. For this reason, we do not examine the determinants suggested by this type of explanation in the empirical exercise.



omitted variables must be sector or sector-country specific. Accordingly, we include as additional controls the capital-to-labor ratio of the target industry; the ratio of R&D expenditures over sales; a measure of upstreamness from Chor et al. (2012); measures of tariff and market potential; and the measure of technology included in the baseline regressions. The first two variables are sector-specific, and the last three vary by target country and sector. Despite the inclusion of all these variables and the limited degrees of freedom – the external finance dependence variable has only twenty observations – our results remain quite stable. External dependence remains a statistically significant predictor of full foreign acquisitions, and the effect is reinforced quantitatively. In the case of partial foreign acquisitions, the magnitude of the coefficient on external finance dependence decreases slightly, and the estimate becomes substantially more imprecise, and therefore insignificant. In columns (2) and (5), we consider country-specific variables, financial development and the control-of-corruption index. As before, we include tariffs, market potential, and our technology variable. In columns (3) and (6) we also include several additional macroeconomic aggregates at the country level, which capture short-term factors affecting FDI, such as aggregate liquidity (see Aguiar and Gopinath, 2005; Alquist et al., 2016), business cycle variations (Erel et al., 2012) or exchange rate changes (Froot, 1991). The results are reinforced compared to our baseline. Financial development affects the share of full acquisitions, but also (at the 5% confidence level) the size of foreign stakes. Control-of-corruption only affects full acquisitions. Overall, these results confirm the conclusions from the baseline regressions: Financial factors affect both full and partial acquisitions, although the effect is limited in the latter case. On the other hand, institutions only affect the share of full acquisitions.

#### 5.4 Econometric issues

*Specification.* The baseline regressions in sections 4.4 and 4.5 show our preferred specifications. When the variable of interest is sector-specific, we control for country  $\times$  year fixed effects; when it is country-specific, we include sector dummies. When focusing on interaction terms, both dimensions of fixed effects are included and the non-interacted variables are omitted. In section 4.2 of the online appendix, we present additional, less demanding specifications in which some dimensions of fixed effects are omitted. The results reported there are similar to those obtained in our baseline specifications.

*Clustering.* In section 4.3 of the online appendix, we use alternative clustering strategies. We either allow the error term to be correlated within target industry or by target country  $\times$  year. The overall picture is unaffected. Clustering at the industry level results in only 20 clusters. Simulations conducted by Cameron and Miller (forthcoming) suggest that, in general, more clusters is better than fewer clusters to obtain appropriately sized tests.

*Estimation.* All of the results presented thus far assume that the empirical relationships generated by the mechanisms outlined in the model were linear, which is a strong assumption given that the relationships we estimate contain censored dependent variables. To verify that the empirical results are robust to this choice, we re-estimate the regressions predicting the share

of full foreign acquisitions and the ownership stake regressions using fractional logit models. The estimates are provided in section 4.4 of the online appendix. They show that the main conclusions remain unchanged when we use these alternative non-linear estimates.

## 5.5 Measurement issues

In the online appendix sections 4.5, 4.6 and 4.7 we perform three additional robustness exercises. First, in section 4.5 we use either a time-varying measure rather than the country average or a time-invariant pre-period measure (i.e., the average private credit to GDP ratio over the 1985-1989 period, the five years before the start of our sample period). In section 4.6 of the online appendix, we use alternative indicators of institutions and corruption (section 4.6, Table A.15): an alternative anti-corruption measure from Transparency International, an indicator of the quality of government from the International Country Risk Guide (2013), and an index of business freedom from the World Bank's Doing Business study. We focus on the results for full acquisitions because that sample is the one for which our model predicts an effect of the markup over the local input price.

Second, in section 4.7, we assess the robustness of the cross-effect of external finance dependence and financial development. We estimate the effect of external finance dependence on subsamples defined according to the level of financial development of the origin and target countries. In Table A.16, we show that the effect of external finance dependence is only significant when the level of financial development of the target country is lower than that of the acquirer country, which is the case we consider in the model. In Table A.17, we show that the effect of external finance dependence is significantly stronger in the least financially developed countries of the sample, using either the sample median or first quartile as cutoffs.

## 6 Conclusion

In this paper, we examine the choice of ownership structure in brownfield FDI projects. The analysis is motivated by the heterogeneity in such structures across manufacturing industries in emerging market economies, which we document using a large dataset of cross-border M&A transactions. While most recent research on FDI has focused on finance, local institutions, and technology separately, we use a model to show how these three factors act together in determining the degree of foreign ownership. In our model, a foreign acquirer can ease a target firm's credit constraint in a financially underdeveloped country, but due to weak institutions faces a comparative disadvantage in providing local inputs for production. As a result, a trade-off emerges between acquiring greater ownership and incentivizing local input provision by domestic equity holders. We show that the amount of foreign ownership that resolves this trade-off emerges as the solution of an optimal contracting problem between foreign and domestic agents. Hence, the ownership structure chosen in cross-border acquisitions balances the benefits and costs to foreign firms of operating in countries with low financial development and weak institutions.

The model delivers predictions regarding how the level of foreign ownership in firms should vary with external finance dependence, financial development, and institutional quality, which we test using our dataset of M&As supplemented with country- and sector-level data. We find evidence consistent with the key predictions of the model. All else equal, a firm that

is more reliant on external finance, that is based in a country with a low level of financial development, or located in a country with better institutions is more likely to be fully acquired by a foreign firm. The amount of foreign ownership within the subset of partial acquisitions is insensitive to institutional factors and weakly dependent on financial factors, a finding that is also consistent with the model. In addition, we validate the model's predictions regarding the relationship between these financial and institutional factors and the likelihood of brownfield FDI across sectors and countries. External finance dependence is found to accentuate the effects of financial underdevelopment and higher institutional quality. The conclusions of the empirical analysis are broadly robust to several sensitivity analyses such as testing the model's predictions using transaction-level data; considering different ownership thresholds beyond which the foreign firm faces an operational disadvantage; controlling for other variables suggested by existing theories of FDI and ownership structure; and alternative measures of financial development and institutions. Taken together, this evidence shows that the simultaneous interaction of financial, institutional, and technological factors plays an important role in determining the pattern of foreign ownership when FDI flows from the North to the South.

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