Acquirers and Financial Constraints:
Theory and Evidence from Emerging Markets

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Abstract

Financial crises in emerging market economies induce diverging patterns of ownership stakes and subsequent divestiture rates among domestic and foreign acquirers. We rationalize these empirical findings in a tractable model where domestic acquirers are subject to borrowing constraints. In contrast to standard fire-sale effects operating for acquisitions by foreign acquirers, acquisition patterns of domestic firms are shaped by a novel counteracting selection effect, resulting in larger acquired stakes and more persistent ownership. We present empirical evidence consistent with the model's predictions using a large dataset of domestic and cross-border emerging market acquisitions over 1990-2007. The estimated contribution of selection effects is quantitatively significant, leading to 12% increases in stakes, 25% increases in full acquisitions, and 30% declines in divestiture rates among crisis-time domestic acquisitions. Our results demonstrate how financial crises can have both short- and long-run effects through the market for corporate control, by changing the set of acquirers and how long acquirers keep ownership.

Keywords: domestic mergers and acquisitions; cross-border mergers and acquisitions; emerging markets; financial crisis; financial constraints; capital reallocation.

JEL Codes: F21, G01, G34.

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1 Introduction

Aggregate financial conditions play a critical role in the market for corporate control (Harford, 2005). For emerging market economies (EMEs) in particular, their effect on *cross-border* mergers and acquisitions (M&A) has been the subject of a vibrant policy and academic debate (see Aguiar and Gopinath, 2005; Acharya et al., 2011b; Alquist et al., 2016), focussed on so-called "fire-sale FDI" during domestic financial crises in EMEs (Krugman, 2000). In this paper we provide a comprehensive theoretical and empirical analysis of the role of aggregate financial conditions in the *domestic* market for corporate control in EMEs. We focus, in particular, on two key metrics that describe corporate control and its dynamics: the level of ownership stake chosen at the time of an acquisition and the subsequent rate of divestiture of a stake. During financial crises in EMEs, we observe that these two metrics follow different paths for domestic acquirers compared to foreign acquirers. Specifically, we show in Section 2 that: (i) while acquisitions by domestic and foreign acquirers involve similar stakes acquired in normal times, they diverge sharply during crises with domestic (foreign) acquirers acquiring larger (smaller) stakes on average [*Fact 1*]; (ii) acquisitions by foreign firms, when undertaken during crises, are more likely to get divested than acquisitions in normal times, whereas no such pattern is observed for acquisitions by domestic firms [*Fact 2*]. A central insight of our paper is that these two facts can be jointly explained by the presence of *financial constraints* on the side of *acquiring firms*. More generally, we show that financial crises not only alter the set of target firms, as emphasized in the literature so far, but also impinge upon financially constrained domestic firms' ability to undertake acquisitions. Our paper shows that analyzing these two forces in a common framework is crucial to understanding how aggregate financial conditions shape the market for corporate control.

Our paper has two main contributions. The first is theoretical. We develop a simple model where potentially financially constrained acquirers engage in M&As and face a sudden aggregate tightening of financial conditions. To be clear at the outset, all firms in our model have to pay a fixed cost one period in advance in order to produce, which they pay by borrowing against future profits. Financial constraints take the form of a limit on the ability to borrow against future profits and a negative shock to aggregate financial conditions is one which tightens this limit uniformly for all firms, as in EME financial or banking crises (Laeven and Valencia, 2010; Reinhart and Rogoff, 2009). As a result of the aggregate shock, some firms face inefficient market exit, since they are unable to pay the fixed cost of operating, unless other firms with greater resources step in to acquire them. We label such acquisitions "low-value" acquisitions because they may take place even in the absence of operational synergies between acquirers and targets. "High-value" acquisitions, in contrast, involve those acquirer-target matches that are expected to be profitable due to synergies, independent of the degree of targets' financial constraints. In this framework, we study the implications of the aggregate shock on stakes acquired and subsequent divestitures.

Our analysis uncovers two counteracting effects of the aggregate shock working through the two sides of the market. First, the shock expands the pool of potential targets of acquisitions by making more firms unable to borrow, and thus unable to pay the fixed cost of producing. In equilibrium, this raises the share of low-value acquisitions in the total number of acquisitions. This channel single-handedly drives the acquisition activity of foreign, financially unconstrained *acquirers* in our model, as in other papers in the fire-sale FDI literature (see e.g. Aguiar and Gopinath, 2005; Acharya et al., 2011b; Alquist et al., 2016). Following that literature, we label this the "fire-sale" effect. For domestic acquirers, who are themselves victim of the shock, our model highlights a novel and counteracting "selection" effect based on financial constraints on the acquirer's side. Since an acquisition with higher expected gains from synergies increases the pledgable assets of the post-merger acquirer-target entity, it relieves the joint, forward-looking borrowing constraint faced by merging firms. Thus, in the face of the aggregate shock, only those acquisitions that result in higher synergies are financially viable and feasible. This leads to proportionally more acquisitions with real synergies (high-value acquisitions) being undertaken by domestic acquirers in times when aggregate financial conditions deteriorate, such as during a financial crisis. If we assume, following the literature (Chari et al., 2010; Alquist et al., 2019), that higher synergies are associated with higher stakes acquired in target firms, it is clear that for the pool of acquisitions that actually materialize during crises, the fire-sale effect will tend to lower the average stake acquired while the selection effect will increase the average stake acquired. This can explain the first stylized feature of the data mentioned earlier, which is the divergence between the average stakes acquired by domestic and foreign acquirers during crises.

To investigate if the same two mechanisms can explain the second stylized fact, which is the divergence in divestiture rates between domestic and foreign acquirers, we extend our model to allow firms to resell assets. Divestitures (or flipping) take place due to two motives in the model. First, low-value acquisitions lacking operational synergies between acquirer and target are divested as soon as a buyer can be found, i.e., when aggregate financial conditions improve and firms are able to borrow again, which we label "normal" divestiture (or "normal" flipping). Second, acquirers may also divest acquisitions if they *themselves* run into financial constraints at future dates, which we label "forced" flipping. We then show that the fire-sale and selection effects taking place during the crisis have persistent post-crisis implications for firm ownership through their influence on divestiture rates. First, all acquisitions that were driven by the fire-sale effect (i.e., which were low-value) are reversed as soon as aggregate conditions improve. This leads to larger flipping rates in the aftermath of financial crises driven by more normal flips. This channel has been emphasized so far in the fire-sale FDI literature by papers such as Acharya et al. (2011b) and Alquist et al. (2016), and drives the divestiture behavior of financially unconstrained acquirers in our model. The selection effect among financially constrained acquirers acts in the opposite direction. First, since financially constrained acquirers complete relatively more high-value acquisitions during crises due to the selection effect, they also divest less after the crisis. Added to that, only the firms with the most internal funds are able to undertake acquisitions during financial crises. These firms — assuming some persistence in internal funds across periods — are also less likely to be financially constrained at future dates, and hence, are less likely to be forced to flip their acquisitions. Thus, our model can rationalize the second stylized fact we referred to, which is the divergence in divestiture patterns between domestic and foreign acquisitions for the crisis cohort.

Our second, and empirical, contribution is to utilize Thompson-Reuters Securities Data Company (SDC) data for about 28,000 domestic and cross-border M&As in sixteen of the largest markets for corporate control in emerging economies over a long sample period (1990-2007) to provide evidence supportive of the model's predictions. While it is natural to assume that domestic acquirers in EMEs face varying degrees of financial constraints as do the potentially financially constrained acquirers in our model, we identify unconstrained acquirers to be developed market firms conducting cross-border acquisitions in EMEs.[1] Isolating the model-predicted fire-sale effect is relatively straightforward: Since the average stake acquired and divestiture rates of financially unconstrained firms are governed only by the fire-sale effect, looking at these two empirical objects for foreign acquirers in our EME sample lets us isolate the fire-sale effect empirically. To identify the selection effect empirically we adopt a difference-in-difference (DID) strategy: Since the average stake acquired and divestiture rates of financially constrained acquirers are governed by the *sum* of fire-sale and selection effects, while that of unconstrained acquirers is only governed by the fire-sale effect, looking at the *differential* effect of a financial crisis on these two objects between domestic and foreign acquiring firms yields an empirical estimate of the selection effect. Using the plausibly exogenous occurrence of country-specific banking crises in EMEs to proxy for negative shocks to aggregate financial conditions, and using panel regressions and survival analysis techniques, we find strong evidence in favor of the main predictions of the model. In addition, model-data comparisons using some key empirical first moments suggest that the model does remarkably well, given its parsimony, at capturing the effect of aggregate financial shocks on the market for corporate control in EMEs.

The rest of the paper is organized as follows. The following section briefly reviews the literature and outlines our contributions. Section 2 describes our data and describes some motivating stylized patterns. Section 3 develops our theoretical model of M&As. We compare the predictions of the model to the data using simulations and reduced-form regressions in Section 4, relating our findings to the stylized empirical patterns in Section 2. Section 5 discusses our results in light of the most relevant literature and concludes.

[1] We acknowledge that large domestic firms in EMEs that face only very loose financing constraints could also be considered as unconstrained. However balance sheet data that would let us construct measures of financial constraints at the firm level are not available for the majority of domestic acquirer-target pairs in our sample.

1.1 Related Literature

Our paper builds on a recent literature on the financial determinants of M&As, and in particular, the findings of Almeida et al. (2011) and Alquist et al. (2016). Almeida et al. (2011) show that when a key motivation of mergers is to reallocate financial resources within an industry from liquid to illiquid firms, pledgability issues may make it optimal for high-net-worth firms to use discretionary credit lines to finance mergers.[2] They also provide empirical evidence in favor of such a role using a sample of domestic deals from the United States. In contrast to Almeida et al. (2011) our theoretical focus is on the implications of fire-sale and selection effects on ownership patterns and their evolution, while our empirical analysis uses domestic and cross-border deals from emerging markets. Our work also builds on Alquist et al. (2016), who look at so-called fire-sale foreign direct investment in a model where *all* target firms are credit constrained and *all* acquiring firms are unconstrained.[3] In contrast to their paper, we develop a more general, yet tractable, framework in which all firms — acquirers or targets — may be financially constrained, with important consequences. In addition, our empirical emphasis is on the response of financially constrained domestic acquiring firms, and as such, we use foreign firms only as a benchmark group of unconstrained acquirers to isolate the effects of acquirer versus target financial constraints.

Our analysis also builds on the results of Alquist et al. (2019), which, similar to Chari et al. (2010), suggest that higher acquirer-target synergies are associated with the acquisition of larger stakes. Taking this result as a starting point, we theoretically analyze the effect of financial crises when firms differ in their financial constraints. This is in contrast to Alquist et al. (2019) who abstract from firm-level heterogeneity in financial constraints (within a country-sector unit) and instead analyze — as an optimal contracting problem — the decision of a financially unconstrained foreign firm looking to acquire a *representative* domestic target in a sector/country characterized by a given degree of financial constraints. Empirically, Alquist et al. (2019) exploit variation (mostly) across sectors and countries to show that foreign acquirers are more likely to acquire full stakes in target firms that operate in sectors that rely more on external finance and in countries that are financially less developed. In contrast, we follow Alquist et al. (2016) in utilizing the occurrence of systemic banking crises to identify the fire-sale and selection effects predicted by our theoretical model. Thus, the empirical results in Alquist et al. (2019) can be seen as speaking to long-run trends in foreign ownership due to financial underdevelopment, while our paper is about short-run changes in patterns of foreign (and domestic) ownership in response to sharp, relatively short-lived increases in financial

[2] In Almeida et al. (2011), lack of financial liquidity is measured at the firm level by lower than average interest coverage.

[3] In Alquist et al. (2016), horizontal FDI is more productive and financial crises lead to more vertical FDI. Our approach in this paper is more general in that we do not assume any particular industry patterns in the gains from acquisitions. Earlier research focused on the surge of foreign acquisitions and a concurrent decline in domestic acquisitions and portfolio investment during EME crises (Acharya et al., 2011b), and the relationship between acquisition prices or probability and target liquidity proxied by cash flow or sales (Aguiar and Gopinath, 2005). Weitzel et al. (2014) investigate the relationship between aggregate conditions, and the number of cross-border transactions and asset prices in Europe and do not find evidence in favor of significant financial frictions at work during crises. Stoddard and Noy (2015), in a study using UNCTAD data on FDI volumes, also do not find evidence of fire-sale FDI.

constraints. As such, our paper integrates the insights from Alquist et al. (2016) and Alquist et al. (2018) into a consistent framework.[4]

There is also a large — mainly empirical — literature exploring the role played by aggregate and idiosyncratic (acquirer side) financial conditions in the case of developed markets such as the United States. For example, Harford (2005), investigating the US merger waves of the 1980s and 1990s, shows that while economic, regulatory and technological shocks, i.e., those emphasized by neoclassical theories, are important for mergers, whether these real shocks lead to merger waves depends on the presence of aggregate capital liquidity.[5] Harford (1999) shows empirically that cash-rich firms are more likely to attempt acquisitions, consistent with an agency-based free-cash-flow argument. In contrast to this literature, our theoretical focus is on the average stake acquired and divestiture rates of acquisitions that take place in an environment when aggregate liquidity in the sense of Harford (2005) is arguably low, such as banking crises, while our empirical focus is on EMEs. Turning to divestitures, while there are studies that focus on domestic divestitures using US data (Ravenscraft and Scherer, 1991; Kaplan and Weisbach, 1992; Bergh, 1997), few papers have studied divestitures for the large volume of domestic M&As in emerging markets, as we do.[6]

Our paper also contributes to the large theoretical literature on the drivers of M&As. Among neo-classical theories, where optimal reallocation of capital across firms takes centre stage, prominent examples include Jovanovic and Rousseau (2002) where the highest value gains from mergers result from matches between firms with the greatest disparity in Tobin's Q; Rhodes-Kropf and Robinson (2008), who build and test a model of M&As where acquirers have higher Q than their targets, but assortative matching leads to clustering of matches between firms of similar Q; and recent contributions to this literature such as David (2019) which, similar to our paper, studies the aggregate implications of domestic M&As, or Bircan (2019), who builds a dynamic model of ownership structure based on incomplete information about target productivity. Other theories have emphasized rational managers exploiting market misvaluation (Shleifer and Vishny, 2003); asymmetric information between bidders and targets about firm valuations (Rhodes-Kropf and Viswanathan, 2004); and managerial motives such as maintaining private benefits or earning takeover premia (Gorton et al., 2009). Behavioral explanations, such as the effects of stock price reference points on aggregate M&A activity, have also found empirical support (Baker et al., 2012). In contrast to much of these two streams of literature (with the exception of Bircan, 2019), our paper seeks to explain aggregate ownership structures and their dynamics, two features of M&As that have not received as much prominence. In addition, the mechanism we explore to explain these two features is a selection effect originating in financial constraints, which

[4]In related work, Erel et al. (2014) provide evidence that both foreign and domestic acquisitions ease financial constraints and increase post-acquisition investment levels of target firms in a large sample of European acquisitions, consistent with our assumption that part of the gains from acquisitions arise out of acquirers relaxing the borrowing constraints of the targets.

[5]As measured by the spread between the average rate charged for commercial and industrial loans and the Federal Funds rate.

[6]Divestiture of cross-border acquisitions in EMEs has been studied by Acharya et al. (2011b) and Alquist et al. (2016).

is novel in this literature, to the best of our knowledge.

2 Stylized Facts

This section establishes the two motivating stylized facts referred to in the introduction. We first describe our two main data sources. We then use simple tables and graphs, along with a few statistical tests, to establish these two facts. We postpone formal regression analysis until Section 4, after we introduce our theoretical model.[7]

2.1 M&A and Crisis Data

We use a sample of 28,109 domestic and cross-border M&A transactions from the Thompson-Reuters SDC Platinum database. This database contains information on the universe of M&A transactions in a large set of EMEs. We only include sixteen of the largest markets for corporate control in EMEs that had significant activity in the M&A market over the entire sample period: Argentina, Brazil, Chile, China, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Singapore, South Africa, South Korea, Taiwan, Thailand, and Vietnam. Recall from the introduction that we intend to use foreign acquirers from developed markets as a comparison group of financially unconstrained acquirers in our analysis. At least some of these firms might have been financially constrained for a number of years post-2007 due to the Global Financial Crisis and the European debt crisis, thus making the period after 2007 less suitable for use in our analysis. Thus we only use data for the 1990-2007 period.[8]

For each transaction, we utilize a few key variables: the share of a firm acquired in an acquisition and owned after an acquisition (these two are different if the acquiring firm had a prior stake in the target), the names of the firms involved, both their primary 2-digit SIC industry classifications, the country of the acquirer and target firm, and the date on which the transaction was completed. The occurrence of a crisis is defined using the (annual) systemic banking crises dates from Laeven and Valencia (2010). Summary statistics of the M&A and crisis variables are provided in Panel A of Table 1 below. More detailed notes about the SDC M&A data are provided in the Data Description, see Appendix D. Other data used in the analysis, such as macroeconomic controls, are described in detail later in Section 4.3.

Panel A shows that 31% of our sample of 28,109 transactions involved an acquirer from a foreign developed financial market (row 1). The mean fraction of a firm acquired in all acquisitions was 66% (row 2), fairly similar for

[7]Control variables used in our more formal econometric analysis are described later when we outline our empirical strategy in Section 4.

[8]We further limit our sample in a few ways. We only use transactions in which 10% or more of a firm is acquired. This is done to keep our results comparable to the literature on FDI, since, as explained below we use foreign acquisitions as a comparison group. Since we rely on cross-border acquisitions in EMEs as a comparison group of unconstrained acquirers, we exclude cross-border acquisitions made by firms from our target countries in other EME target countries, for example, a Malaysian cross-border acquisition in Thailand. Our results are not sensitive to including these transactions partly since the vast majority of foreign acquiring firms in our sample are from developed markets.

Table 1: Data Description

Panel A: Summary Statistics of M&A and Crisis Variables (1990-2007)

		Obs.	Mean	S.D.	Q1	Median	Q3
(1)	Foreign acquisition	28,019	0.31	0.46	0.00	0.00	1.00
(2)	Fraction acquired (all)	28,019	0.66	0.35	0.33	0.71	1.00
(3)	Fraction acquired (domestic)	19,325	0.67	0.35	0.33	0.75	1.00
(4)	Fraction acquired (foreign)	8,694	0.65	0.34	0.33	0.67	1.00
(5)	Majority acquisition (all)	28,019	0.65	0.48	0.00	1.00	1.00
(6)	Majority acquisition (domestic)	19,325	0.66	0.41	0.00	1.00	1.00
(7)	Majority acquisition (foreign)	8,694	0.65	0.48	0.00	1.00	1.00
(8)	Full acquisition (all)	28,019	0.43	0.49	0.00	0.00	1.00
(9)	Full acquisition (domestic)	19,325	0.44	0.49	0.00	0.00	1.00
(10)	Full acquisition (foreign)	8,694	0.42	0.49	0.00	0.00	1.00
(11)	Banking crisis	28,019	0.12	0.33	0.00	0.00	0.00

Panel B: Ownership Stakes: Group Means and Differences in Means

		Obs.	Fraction acquired	Majority acquisition	Full acquisition
(1)	Normal: *Foreign*	7,355	0.66	0.66	0.43
(2)	Normal: *Domestic*	17,253	0.66	0.65	0.43
(3)	Difference rows (2) - (1)		0.00	-0.01	0.00
	p-value (in parentheses)		(0.555)	(0.398)	(0.506)
(4)	Crisis: *Foreign*	1,339	0.63	0.62	0.37
(5)	Crisis: *Domestic*	2,072	0.72	0.73	0.5
(6)	Difference rows (5) - (4)		0.09	0.11	0.13
	p-value (in parentheses)		(0.000)	(0.000)	(0.000)
(7)	Difference rows (4) - (1)		-0.03	-0.04	-0.06
	p-value (in parentheses)		(0.006)	(0.013)	(0.000)
(8)	Difference rows (5) - (2)		0.06	0.08	0.07
	p-value (in parentheses)		(0.000)	(0.000)	(0.000)

Notes: [Panel A] Foreign acquisition is a dummy which equals 1 if the acquirer is from a developed market. Majority acquisition is a dummy which equals 1 for acquisition in which 50% or more of a target firm is acquired. Full acquisition is a dummy which equals 1 for acquisition in which 100% of a target firm is acquired. The occurrence of crisis is defined using the (annual) systemic banking crises dates from Laeven and Valencia (2010). Source: SDC M&As Database and Laeven and Valencia (2010). [Panel B] Means of ownership stakes for four groups of transactions, differences and p-values: (1) foreign acquisitions outside of banking crises; (2) domestic acquisitions outside of banking crises; (3) mean of (row 2-row 1); (4) foreign acquisitions during banking crises; (5) domestic acquisitions during banking crises; (6) mean of (row 5-row 4); (7) mean of (row 4-row 1); (8) mean of (row 5-row 2). Two-sided p-values reported in parentheses are from t-tests of difference in means. See discussion on ***Fact 1***.

both domestic and foreign acquirers (rows 3 and 4). About 65% and 43% of all acquisitions were majority and full acquisitions respectively (rows 5 and 8), again fairly similar for both domestic and foreign acquirers (rows 6, 7, 9 and 10). The banking crisis indicator variable takes a value of 1 if a systemic banking crisis, identified by certain criteria listed in Laeven and Valencia (2010), occurred at the time of a transaction in a particular country in a particular year, and 0 otherwise. From its mean in row 11, we see that approximately 12% of our transactions occurred when (and where) there was a systemic banking crisis in progress. Further details about the incidence of these banking crises are as follows: Argentina (1990-91, 1995, 2001-03), Brazil (1990-98), Chile (no crises), China (1998), India (1993), Indonesia (1997-2001), Malaysia (1997-99), Mexico (1994-96), Peru (no crises), Philippines (1997-2001), Singapore (no crises), South Africa (no crises), South Korea (1997-98), Taiwan (1997-98), Thailand (1997-2000), and Vietnam (1997). While the Asian Financial Crisis was an aggregate shock that simultaneously affected a large part of our sample during the years 1997-98, different Asian countries had different end dates for their respective crises. In addition, the presence of Argentina, Brazil, Mexico and India, which together comprise roughly 25% of our sample of transactions, gives us meaningful variation across years in the occurrence of crises. We also include in our sample countries that never had crises as part of our control group of EME transactions.

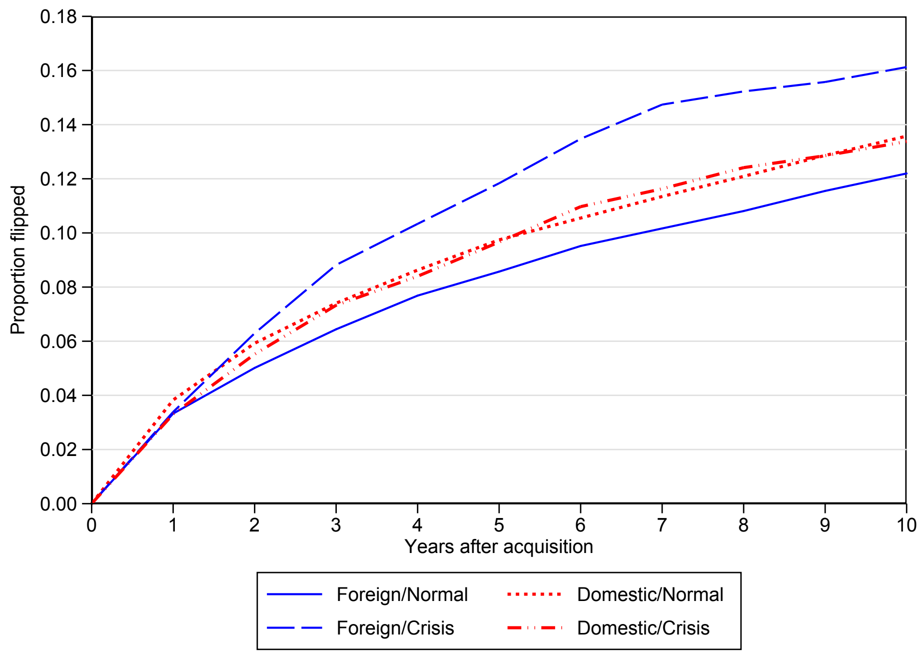


Figure 1: Cumulative Proportion of Acquisitions Flipped

Notes: Cumulative proportion of acquisitions that were divested (vertical axis) a certain number of years after the acquisition (horizontal axis) for four groups of transactions: foreign acquisitions outside of banking crises; domestic acquisitions outside of banking crises; foreign acquisitions during banking crises; and domestic acquisitions during banking crises. Graphs generated using the Kaplan-Meier technique. See discussion on ***Fact 2***.

For further comparison, Panel B of Table 1 breaks down the point estimate of the mean fraction acquired and the percentage of acquisitions that are majority and full, by type of period (normal time or crisis) and type of acquirer (foreign or domestic). It also provides two-sided p-values from t-tests of difference in these means. Focussing first on normal periods, from rows 1, 2 and 3 of Panel B we see that foreign and domestic acquisitions are practically indistinguishable during normal times. However, the effect of the crisis is quite different on foreign and domestic acquirers: Comparing rows 1 and 4 shows that foreign stakes decline by all three metrics during crises, while comparing rows 2 and 5 shows that domestic stakes increase by all three metrics during crises. These differences are statistically significant, as shown in rows 7 and 8. In turn, the mean difference between foreign and domestic acquirer stakes during times of crisis — the difference of rows 4 and 5 — is reported in row 6. The divergence in behavior between domestic and foreign acquirers shows up starkly in a comparison of rows 3 and 6: It reveals that while foreign and domestic acquirers acquire very similar stakes during normal times, they diverge sharply during crises in terms of average stakes acquired [***Fact 1***]. For example, while 43% of acquisitions completed by both domestic and foreign firms are full acquisitions during normal times, the proportion of full acquisitions is 13 percentage points higher in the crisis sample for domestic acquisitions, which is roughly a 30% increase. We provide more rigorous statistical comparisons between these different categories of acquisitions using regression analyses in Section 4.

Next, we ask whether the four groups of acquisitions for which we showed the stakes acquired in Panel B of Table 1 also have different divestiture or flip rates. For this purpose, Figure 1 plots the cumulative proportion of these acquisitions that were divested (vertical axis) a certain number of years after the acquisition (horizontal axis). Note that these plots are meant to motivate our theoretical model, and do not control for a number of relevant issues such as the changing industry composition of acquisitions during crises (this would matter if different industries have different flip rates), different stake sizes (large-stake acquisitions usually have lower flip rates), or natural business-cycle variation in flip rates. We address these issues later using survival analysis techniques in Section 4. Yet, these rudimentary graphs are illuminating. Flip rates across the groups appear to differ for horizons longer than 3 years.[9] For example, we see that about 12% of normal-time acquisitions by foreign acquirers are divested 10 years after the acquisition, while this number jumps to 16% for crisis-time acquisitions. Together, the four lines show that the subsequent flip rates of foreign and domestic acquisitions look more dissimilar in the crisis-time cohort than the normal-time cohort at longer time horizons. This leads to our second stylized fact that the divestiture rates of domestic and foreign acquirers diverge for the acquisitions conducted during crises [***Fact 2***].

3 A Model of Fire-Sale and Selection Effects in M&As

This section builds on Alquist et al. (2016) to present a simple model where financially constrained firms can become targets of acquisitions, or acquire other firms themselves if they have enough resources. The purpose of the model is to replicate the diverging patterns of domestic and foreign acquisitions during financial crises documented in

[9] A log-rank test of the null hypothesis of equality of all of the "survivor functions" rejects the null with a p-value of 0.0006. Some pairs of survivor functions in Figure 1 also differ statistically: normal-time domestic acquisitions have weakly significantly (p-value=0.045) higher flip rates than normal-time foreign acquisitions; crisis-time domestic acquisitions have weakly significantly (p-value=0.018) lower flip rates than foreign acquisitions; foreign acquisitions have significantly higher flip rates in crisis times versus normal times (p-value=0.0001); domestic acquisitions do not have significantly different flip rates between normal and crisis times (p-value=0.64). Note that these tests simply compare the distribution of flip rates underlying the graphs in Figure 1 and do not control for any other factors. Some of the conclusion from these tests change when we control for industries being different, macroeconomic factors, size of the stake acquired etc., but the headline message is that the flip rates are sufficiently different to merit further investigation.

the previous section and derive testable hypotheses. We focus on a single source of difference between domestic and foreign acquirers, which is the extent of their own financial constraints. By definition, financial crises tighten financial constraints for domestic acquirers, but not for foreign firms, which, as we show, helps explain the diverging patterns of their acquisitions during crises. While we are sympathetic to the view that additional differences, such as asymmetric information between domestic and foreign acquirers about the target's prospects or search costs could capture differences in domestic and foreign acquisitions during normal times, we show that a simpler, more parsimonious model where both domestic and foreign firms have the same information regarding the targets and face no search costs is sufficient to rationalize the empirical regularities.

3.1 Two-Period Model Setup

The economy is populated by a continuum of firms indexed by i. Figure 2 depicts the timeline in the model. Firms in the baseline version of the model last for two periods 0 and 1. In period 0, firms produce and generate profits. To simplify expressions, and without loss of generality, we normalize these net profits to zero. We first discuss the firm's problem in period 1 in the absence of acquisitions. In a second step, we allow for acquisitions.

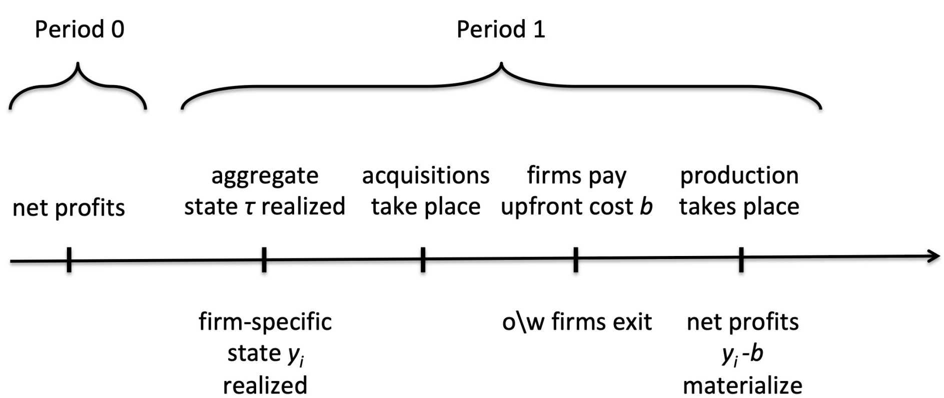


Figure 2: Model Timeline

Notes: Figure displays the timeline of the two-period model.

3.1.1 A Firm's Problem Without Acquirers

At the beginning of period 1, firms learn their potential profits y_i, which are i.i.d. across firms. These profits are "potential" because firms only earn them if they are able to pay an upfront cost b required for production. We assume that $y_i > b$ for all i so that all firms prefer production to non-production. Since firms' period-0 profits are normalized to 0, firms have to take out a loan at the beginning of period 1 to pay for the upfront cost b. But the loan size cannot exceed a certain fraction τ of potential gross profits:[10]

$$b \leq \tau y_i. \tag{3.1}$$

So $\tau \in (0, 1]$ measures the degree of credit frictions in the economy common to all firms.[11] In an economy without credit frictions, $\tau = 1$. One can interpret τ as a measure of the maximum 'debt-to-value' ratio because b corresponds to a firm's debt, and y_i is a firm's gross profits that is available to pay off the debt. When we later discuss the effect of financial crises on acquired shares and divestiture rates, we model financial crises through changes in τ.[12]

The value for τ gets realized at the beginning of period 1 together with the value for y_i. If a firm lacks the capacity to pay for the upfront cost — that is if $y_i < \frac{b}{\tau}$ — it cannot produce in period 1 and the value of the firm is 0. These firms either immediately exit the market or become targets of acquisitions. Market exit of this kind is inefficient since the firm would always prefer production to non-production. If a firm's potential profits are high enough, it can secure a loan and produce, which raises its value by the potential profit net of the upfront costs, $y_i - b$. These firms can stay in the market as stand-alone entities, can be targets of acquisitions or can be acquirers themselves. The total value of a (potential target) firm i can then be summarized as

$$V_i^{tar} = \begin{cases} 0 & \text{if } y_i < \frac{b}{\tau} \\ y_i - b & \text{if } y_i \geq \frac{b}{\tau}. \end{cases} \tag{3.2}$$

3.1.2 Profitability of an Acquisition and the Target's Financial Position

Any pair of firms, denoted by i for a target and j for an acquirer, from the population described above can potentially meet in the market for corporate control. These meetings take place after states τ and y_i have realized and before firms have to pay an upfront cost b and start production (see the timeline in Figure 2). We assume that i and

[10]The form of the borrowing constraint captures a common prediction from models of limited contract enforcement: The amount of credit is limited by the borrower's potential profits. That is, the debt limit is forward-looking, as e.g. in Albuquerque and Hopenhayn (2004) or Kehoe and Perri (2002). This forward-looking feature of the debt limit is a crucial element of our model. Brooks and Dovis (2013) provide an empirical analysis of both forward- and backward-looking credit frictions and find evidence in favor of the forward-looking debt limit, which we adopt here.

[11]We choose a common τ across all firms to avoid introducing too many dimensions of heterogeneity because our interest lies in aggregate figures such as the average acquired share across all firms. In earlier versions of this paper, we considered differences in a firm's period-0 profits and a firm's borrowing constraint parameter, τ. Adding either alternative would yield differences in financial constraints across firms, which we already capture through firm-specific potential profits, y_i. Adding these dimensions therefore did not deliver any additional results, and we therefore dropped them for the sake of a more parsimonious model.

[12]We follow a large literature in macroeconomics and on M&A that models financial crises as a change only in the ability to borrow and abstracts from additional exogenous shifts, such as e.g. an average decline in potential profits, y_i (see e.g. Bernanke and Gertler, 1989; Aguiar and Gopinath, 2005; Alquist et al., 2016). This does not mean that financial crises have no real effects. As we will see, financial crises will reduce economy-wide profits because profitable firms become financially constrained and exit the market. Assuming a concurrent decline in average potential profits would strengthen our results because a fall in potential profits would tighten the borrowing constraint, all else being equal.

j are randomly matched in this market.[13] As soon as they are matched, they draw an i.i.d. *synergy* parameter, $\phi_{i,j} > 0$. The parameter $\phi_{i,j}$ is a stand-in for well-known factors that influence the payoff from an acquisition net of acquisition costs.[14] If it is acquired, the target firm i pays for the upfront cost, produces and receives *net* profits $\phi_{i,j}(y_i - b)$. The value of an acquired target firm i to an acquirer j is then

$$V_{i,j}^{acq} = \phi_{i,j}(y_i - b). \tag{3.3}$$

A necessary condition for an acquisition to take place is that it is profitable. Following Aguiar and Gopinath (2005) and Alquist et al. (2019), we maintain the assumption that the stand-alone value of the *acquiring* firm does not change after the acquisition.[15] In that case, the surplus or profit generated for an acquirer is simply the difference between the value of the target firm after and before the acquisition, i.e. $S \equiv V_{i,j}^{acq} - V_i^{tar}$, which will be different depending on whether the target firm is cons(trained) or uncons(trained). Combining the expressions (3.2) and (3.3), we obtain that the surplus of acquiring a constrained firm exceeds the surplus of acquiring an unconstrained firm, all else being equal:

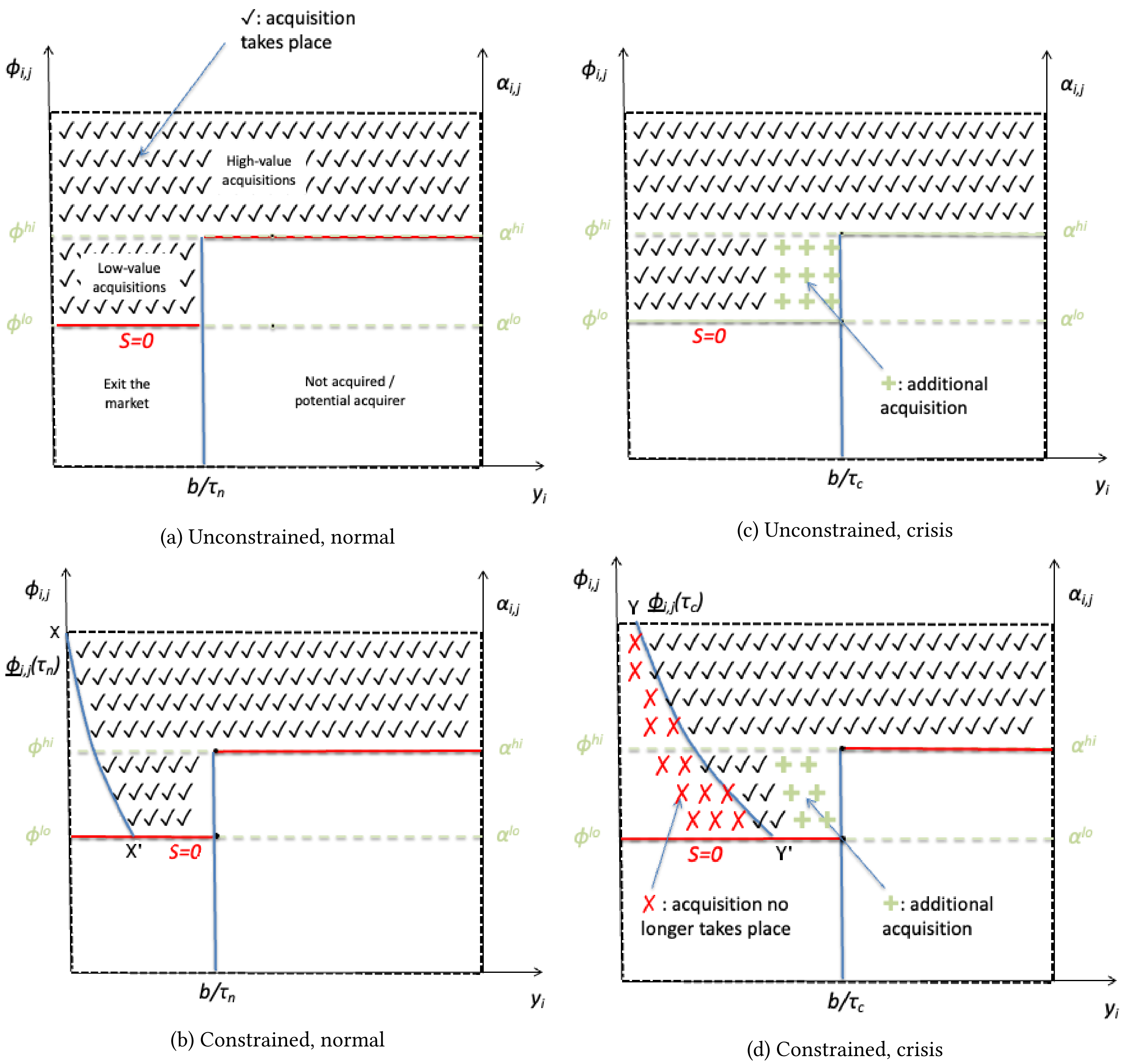
$$S_{i,j} = \begin{cases} S_{i,j}^{cons} = \phi_{i,j}(y_i - b) & \text{if } y_i < \frac{b}{\tau} \\ S_{i,j}^{uncons} = (\phi_{i,j} - 1)(y_i - b) & \text{if } y_i \geq \frac{b}{\tau}. \end{cases} \tag{3.4}$$

Figure 3a shows the zero-surplus line $S = 0$, which is defined as the locus of points on the plane of the synergy parameter $\phi_{i,j}$ and the target firm's potential stand-alone profit y_i, that yield a surplus (as defined in equations

[13] Following Aguiar and Gopinath (2005) and Alquist et al. (2016), we rule out incentives of acquiring firms to actively search for targets (and vice versa) by our assumption that the profitability of a match is stochastic and cannot be influenced ex-ante by firms. David (2019) shows that random matches of this kind can arise in a special case when firms search for merging opportunities but the joint value of post-merger entity is additive in the value of the merging entities. We believe that many mergers are the result of (directed) search processes, as emphasized in Rhodes-Kropf and Robinson (2008) or David (2019) among others. We chose, however, to abstract from directed search to focus on the aggregate effects of financial constraints on the acquisition process. However, we capture search costs in reduced form through the possibility that mergers can be value destroying net of acquisition costs (see discussion about $\phi_{i,j} < 1$ below). Importantly, if we assume that search costs are upfront expenditures that, similar to b, are subject to a borrowing constraint, a financial crisis will raise the shadow value of these search costs for domestic acquirers (while foreign acquirers are assumed to be unaffected). This will hurt domestic acquirers even more than foreign acquirers and lead to a starker contrast between the two types of acquirers during financial crises, i.e., strengthen our main results.

[14] Note in particular that we only impose $\phi_{i,j} > 0$, i.e., $\phi_{i,j}$ can increase or decrease the value of the target firm *net* of acquisition costs above ($\phi_{i,j} > 1$) or below ($\phi_{i,j} < 1$) its stand-alone value. A non-exhaustive list of factors that may push $\phi_{i,j}$ beyond unity are: increased productivity stemming from more efficient use of inputs by acquirers (Li, 2013), or restructuring the target firm (Maksimovic et al., 2011); and transfer of superior corporate governance practices (Wang and Xie, 2008) or organizational knowledge (Golubov et al., 2015) from acquirers to targets. Empirical evidence for the case of $\phi_{i,j}$ less than unity, which implies that acquisitions can be value-destroying net of the costs of acquiring is provided by Moeller et al. (2005), and can result when acquisitions are driven by overvalued acquirer stock (Shleifer and Vishny, 2003) or managerial hubris (Roll, 1986).

[15] Though most of the empirical evidence about productivity gains from acquisitions focuses on gains to the target, acquirers can gain as well. For example, Devos et al. (2008) report gains from economies in capital expenditures or investments in working capital for the post-acquisition joint entity. Assuming that all the productivity gains accrue to the target, as we do, simplifies our analysis. Allowing instead synergies to raise acquirers' profits (in a multiplicative way) would skew the set of acquiring firms towards high-profit firms, especially for constrained firms because the synergy-induced higher profits would relieve their borrowing constraints. This seems particularly relevant in shaping differences between constrained and unconstrained acquisitions during normal times, but it is less clear that this extension can explain the differential evolution of ownership patterns and divestiture rates between domestic and foreign acquirers during financial crises, which is the focus of this paper.



(a) Unconstrained, normal

(c) Unconstrained, crisis

(b) Constrained, normal

(d) Constrained, crisis

Figure 3: Acquisitions

Notes: Shows the range of values for the target's net profits, y_i, that define low- and high-value acquisitions for acquisitions for unconstrained and constrained firms during normal periods and crisis periods. These ranges are $\underline{\phi}_{i,j}^{-1} \leq y_i \leq \frac{b}{\tau}$ for low-value and $y_i \geq \underline{\phi}_{i,j}^{-1}$ for high-value acquisitions, with the subscript on the τ indicating (n)ormal or (c)risis periods, and $\underline{\phi}_{i,j}^{-1}$ being the inverse of the function defined in equation (3.5) solved for y_i.

(3.4)) of zero.[16] We denote the levels of $\phi_{i,j}$ that solve $S^{cons} = 0$ and $S^{uncons} = 0$ by $\phi^{lo} = 0$ and $\phi^{hi} = 1$.

[16] Note that the way in which the surplus from an acquisition is split between the acquirer and target is immaterial in our model: since all the element which determine the surplus in equation (2.4) – $\phi_{i,j}$, y_i and b – are fixed once the random match materializes, the acquirer bases its decision only on the total surplus from the acquisition and does not care about the split. It would care about its share in equity if the choice of input was endogenous (as in Alquist et al., 2019), which we abstract from in our model because we want to focus on the effect of the acquirer's financial constraint.

For $\phi_{i,j} > \phi^{hi} = 1$, an acquisition always generates positive surplus because the net benefits from the resulting technological synergies are positive. This is true irrespective of the target firm's potential stand-alone profits y_i and the tightness of the borrowing constraint. These acquisitions occur in the upper region of the diagram. We refer to them as "high-value" acquisitions. If the two firms draw a synergy parameter $\phi^{lo} \leq \phi_{i,j} < \phi^{hi}$, technological synergies are not sufficient to make an acquisition profitable. However, if the target firm is financially constrained (i.e. its potential profits are too low, $y_i < \frac{b}{\tau}$), so that the firm would otherwise exit, an acquisition generates additional benefits from relaxing the borrowing constraint of the target and is therefore profitable. Firm pairings with $\phi^{lo} < \phi_{i,j} \leq \phi^{hi}$ (i.e., $0 < \phi_{i,j} \leq 1$) and $y_i < \frac{b}{\tau}$ are therefore profitable, and are referred to as "low-value" acquisitions.

Firms in the region in the bottom left of Figure 3a are forced to exit because they cannot pay the fixed cost of production and their realized $\phi_{i,j}$ with the acquirer they have been randomly paired with is too low for an acquisition to be profitable. The firms in the bottom right region of Figure 3a remain stand-alone entities or become acquirers themselves: They are neither financially constrained nor have they drawn a $\phi_{i,j}$ high enough (>1) for them to be acquired on the basis of technological synergies alone.

3.1.3 Feasibility of an Acquisition and the Acquirer's Financial Position

The previous section describes how the surplus generated from an acquisition depends both on the synergies it creates and on the financial position of the target firm. However, besides generating a positive surplus, an acquisition also has to be *feasible*. This depends, in addition, on the *acquirer's* financial position.

Financially Constrained Acquirer. Acquirers with low realizations of y_j are potentially constrained. Like their targets, they face borrowing constraints, which reduces their ability to perform acquisitions. As a consequence, some acquisitions that would generate a positive surplus do not take place because the acquirer himself lacks resources to finance the acquisition.

Since the acquirer as well as the target are financially constrained, we need to consider both of their borrowing constraints and keep track of both of their potential profits post acquisition, which are y_j and $\phi_{i,j} y_i$, respectively. Generally, the borrowing constraint for the post-acquisition entity states that total upfront costs, $2b$, cannot exceed some value $2\tau B(\phi_{i,j} y_i, y_j)$:

$$b \leq \tau B(\phi_{i,j} y_i, y_j). \tag{3.5}$$

Here, the function B, together with τ, determines this upper limit, which we assume to depend positively on both the acquirer's potential profits, y_j, and the target's post-acquisition potential profits, $\phi_{i,j}y_i$. Assuming that this function is invertible in $\phi_{i,j}y_i$, it is convenient to denote the minimum values for $\phi_{i,j}$ and y_i that satisfy this borrowing constraint as $\underline{\phi}_{i,j}(y_i, y_j)$ and $\underline{y}_i(\phi_{i,j}, y_j)$. We also refer to this joint borrowing constraint as a *feasibility constraint* in the context of an acquisition.

The impact of this feasibility constraint on acquisitions is illustrated in Figure 3b. In addition to the synergy cut-offs that characterize the set of points where acquisitions are profitable already present in panel (a), there is now an additional downward sloping curve XX' describing the joint borrowing constraint of the target firm and the acquirer. XX' shows the target's minimum potential profits, $\underline{y}_i$, for each $\phi_{i,j}$ (or the minimum synergy level $\underline{\phi}_{i,j}$ at each level of y_i) that makes acquisitions feasible, given an acquirer's potential profits, y_j, and aggregate financial conditions, τ. For a given $\phi_{i,j}$ of a match, only acquisitions to the right of XX' can potentially take place, even if they are profitable, because the acquirer himself faces financial constraints. The negative slope of the XX' line can be understood as follows. Because low $\phi_{i,j}$ acquisitions have lower potential profits, the feasibility constraint is tighter for these acquisitions. These acquisitions therefore need larger target firm profits, y_i, to make them feasible.

Figure 3b illustrates that the feasibility constraint restricts the mass of acquisitions that can actually place in this market. For an acquisition by a constrained firm to take place after it is matched with a target, the following two conditions have to be met: i) it generates positive surplus, i.e., $\phi_{i,j} \geq \phi^{hi}$ for productive targets $\left(y_i \geq \frac{\tau}{b}\right)$, and $\phi^{lo} \leq \phi_{i,j} < \phi^{hi}$ for less productive targets $\left(y_i < \frac{\tau}{b}\right)$; and ii) both firms together have enough resources to pay for their upfront costs, which can be expressed using the feasibility constraint as $y_i \geq \underline{y}_i(\phi_{i,j}, y_j)$. Based on these conditions, the mass of low- and high-value acquisitions are

$$n^{lo} \equiv \int_{\phi^{lo}}^{\phi^{hi}} \int \int_{min\left(\frac{b}{\tau}, \underline{y}_i\right)}^{\frac{b}{\tau}} dG_i dG_j dF \qquad \text{and} \qquad n^{hi} \equiv \int_{\phi^{hi}} \int \int_{\underline{y}_i} dG_i dG_j dF, \tag{3.6}$$

where F, G_j and G_i denote the distributions of $\phi_{i,j}$, y_j and y_i.

Limiting Case: Unconstrained Acquirer. When an acquirer's profits tend towards infinity, $y_j \to \infty$, it does not face any borrowing constraints, so that acquisitions are always feasible and take place whenever they generate a positive surplus, i.e. whenever $S \geq 0$. For this set of unconstrained acquirers, denoted by an asterisk, the mass of low- and high-value acquisitions are

$$n^{lo^*} \equiv \int_{\phi^{lo}}^{\phi^{hi}} \int^{\frac{b}{\tau}} dG_i dF \qquad \text{and} \qquad n^{hi^*} \equiv \int_{\phi^{hi}} dF. \tag{3.7}$$

In Figure 3a, these sets of acquisitions correspond to the area marked with checks (sum of the areas labelled "low-value" and "high-value").

3.2 Financial Crises and the Average Acquired Share

In this section, we ask whether an aggregate financial shock to the economy, modeled as a decrease in τ from τ_n to τ_c at the beginning of period 1, affects the *average* ownership structure in the market for corporate control (which is the empirical object that we observe in our data). We denote by $\hat{\alpha}$ the average acquired share for the set of acquisitions made by constrained firms, and by $\hat{\alpha}^*$ the average acquired share for the set of acquisitions made by unconstrained firms. The average share for the set of acquisitions by constrained acquirers is defined as the sum of all acquired shares (with each share measured in %), α, divided by the number of acquisitions, $n = n^{lo} + n^{hi}$:

$$\hat{\alpha} = \frac{\alpha}{n} = \frac{\int_{\phi^{lo}}^{\phi^{hi}} \int \int_{min(\frac{b}{\tau}, \underline{y}_i)}^{\frac{b}{\tau}} \alpha_{i,j} dG_i dG_j dF + \int_{\phi^{hi}} \int \int_{min(\frac{b}{\tau}, \underline{y}_i)} \alpha_{i,j} dG_i dG_j dF}{\int_{\phi^{lo}}^{\phi^{hi}} \int \int_{min(\frac{b}{\tau}, \underline{y}_i)}^{\frac{b}{\tau}} dG_i dG_j dF + \int_{\phi^{hi}} \int \int_{min(\frac{b}{\tau}, \underline{y}_i)} dG_i dG_j dF}.$$

The intuition behind the limits of the integrals in the numerator of this expression are similar to those for n^{lo}, n^{lo^*}, etc. provided earlier. An equivalent expression holds for the average share acquired by unconstrained acquirers, $\hat{\alpha}^*$ (see Technical Appendix for more details).

Assumption 1: To evaluate the integrals for the averages $\hat{\alpha}$ and $\hat{\alpha}^*$, we need to make assumptions about the relationship between the acquired share in an individual acquisition (the variable $\alpha_{i,j}$ within the integrals in the above expression), and the variables over which the integrals are taken. These latter variables are the synergy parameter $\phi_{i,j}$ for an acquisition involving target i and acquirer j, the target's financial position y_i, and the acquirer's financial position y_j. In particular we assume that the share acquired $\alpha_{i,j}$ is increasing in the synergy parameter $\phi_{i,j}$, i.e., $\alpha'(\phi_{i,j}) > 0$, and unrelated to the financial factors y_i and y_j. Assuming that $\alpha_{i,j}$ depends only on $\phi_{i,j}$ is a simplification that lets us isolate the part of the relationship between aggregate financial conditions and the average share acquired that is due to selection effects (as opposed to changes in stakes acquired at the level of individual firms).

While this positive relationship arising endogenously in the model could be an interesting extension, it would dilute the focus of the analysis, which is on selection effects. We thus remain agnostic about the reasons behind $\alpha'(\phi_{i,j}) > 0$. However, the literature offers both theoretical and empirical justification for firms acquiring larger stakes in targets in expectation of larger synergies, or larger stakes leading to higher synergies. For example, both these forces arise in contracting models of joint ventures (Asiedu and Esfahani, 2001) or acquisitions (Alquist et al., 2019) when owners co-invest in inputs. A positive relationship could also arise due to majority control facilitating transfer of intangible assets across firm boundaries (see Antràs, 2003; Antràs et al., 2009), or resolving agency issues in target firms as in Acharya et al. (2011b). The assumption is also natural in the context of EMEs, where Chari et al. (2010) find that acquisitions of majority ($\geq$ 50%) stakes are associated with positive abnormal returns of 1.16%, on average. Crucially, our assumption implies that low-value acquisitions ($\phi^{lo} \leq \phi_{i,j} < \phi^{hi}$) feature lower acquired stakes than high-value acquisitions ($\phi_{i,j} \geq \phi^{hi}$).

We would like to emphasize that Assumption 1 states that the acquired share at the firm level simply depends on the synergy parameter and that there is no interaction with financial constraints. Importantly however, as the discussion in Section 3.1.3 clarifies, firms in our model do make optimal decision on *whether* to acquire or not and this decision does in fact interact with financial constraints. For example, financially constrained domestic firms in our model might optimally decide to forego an acquisition opportunity if their available funds are low (Figure 3a versus Figure 3b). However, once firms optimally decide whether to acquire or not, Assumption 1 asserts that *how much* to acquire does not depend on its own or aggregate financial conditions but only on the synergy parameter. Continuing the previous example, as an individual domestic firm becomes financially more constrained during a crisis, it might decide not to make an acquisition guided by its weak financial position; but if it decides to go through with an acquisition, how much of the target it acquires depends only on the level of synergies.

Despite this assumed insensitivity of acquired shares to financial conditions at the level of an individual acquisition, we show below that the *average* acquired share across all domestic (or foreign) acquisitions observed in the data is sensitive to aggregate financial constraints. This is due to a selection effect driven by a compositional change in the underlying set of acquisitions, i.e., which acquirers and targets are able to match under different aggregate financial conditions.[17]

Panels (c) and (d) in Figure 3 display the set of acquisitions during crisis periods. Notice that the figures include a second y-axis (on the right) to indicate the acquired share. As the synergy parameter goes up, the acquired share goes up, and, in accordance with our Assumption 1, this relationship is unaffected by the target's expected profits, a firm's financial conditions or aggregate financial conditions.[18]

For unconstrained acquirers (panel (c)), the negative financial shock unambiguously lowers the average acquired share. This is entirely driven by a relative increase of low-value acquisitions, as a larger proportion of potential target firms find themselves unable to raise enough external debt financing to cover the upfront cost of operating in the second period, and thus face market exit. Coupled with our assumption that low-value acquisitions feature lower acquired shares, $\alpha'(\phi_{i,j}) > 0$, this implies a decline in the average share. Following Alquist et al. (2016), we label this the *fire-sale* effect of financial crises.[19]

[17] In reality, an individual firm's decision on how much to acquire (conditional on acquiring) might actually depend on the firm's financial constraints. For example, it is conceivable that, facing tighter financial constraints, firms might decide to go through with a planned acquisition, but choose to lower the share they acquire because they lack the necessary resources to finance a larger stake. As we will see below, such interactions between firm level acquired shares and financial conditions are not necessary to rationalize the patterns observed in the EME data around the time of financial crises. Such firm level interactions have been studied in complementary papers (such as Alquist et al., 2019).

[18] Notice that in Assumption 1 we do not necessarily assume a linear relationship between synergy parameters and acquired share.

[19] Other papers in the fire-sale FDI literature such as Aguiar and Gopinath (2005) and Acharya et al. (2011b) do not specifically analyze the

Table 2: Ownership Stakes: Summary of Changes During Financial Crises

	Unconstrained (α^*)	**Constrained** (α)
Fire-Sale Effect	↓	↓
Selection Effect	0	↑
Fire-Sale + Selection = Crisis Effect	↓	?

Notes: Table summarizes the direction of the fire-sale and selection effects predicted by the model when the financial constraint becomes tighter, i.e, τ declines. Upward pointing arrow (↑) denotes increase; downward pointing arrow (↓) denotes decrease; "0" denotes no change; "?" denotes uncertain. The total crisis effect for constrained is uncertain because under the assumptions about G and $B_{i,j}$ listed for Proposition 1, the fire-sale and selection effects cancel each other out, so that the net effect is 0, while under alternative assumptions on G and $B_{i,j}$ the selection effect might dominate the fire-sale effect.

For constrained acquirers (Figure 3d), this fire-sale effect is counterbalanced by a second effect, which we call a *selection* effect. For constrained acquirers, a financial shock also tightens the joint borrowing constraint. In Figure 3d, aggregate financial conditions, τ, (and acquirer's potential profits, y_j) act as "shifters" for the XX' curve. A financial crisis shifts the $\phi_{i,j} = \underline{\phi}(y_i, y_j, \tau)$ line up from XX' to YY' and makes it harder for firms to acquire targets. This dampens the increase in the share of low-value acquisitions because some low-value acquisitions cannot take place as acquirers find themselves unable to raise sufficient funds. Borrowing constraints skew the distribution of acquired firms further towards acquisitions with higher synergies. Some low-synergy acquisitions that might still be profitable, suddenly become *infeasible* if neither the target nor the acquirer has enough potential profits to pledge. The shift towards low-value acquisitions stemming from the fire-sale effect is therefore counterbalanced by a shift towards higher synergy acquisitions through the selection effect. The direction of these changes are summarized in the first two rows of Table 2. Note that for constrained acquirers, the response to a crisis of the average stake acquired depends on the relative size of the two counteracting effects. Thus the direction and extent of the change in stakes acquired by constrained acquirers is a purely empirical question. This is a key insight of our analysis.

A key question then is how to measure the fire-sale and selection effects in the model, as well as in the data. For unconstrained acquirers, only the fire-sale effect is present. We can therefore measure this effect directly by looking at the response to the crisis of the average stake acquired by unconstrained acquirers, i.e., the derivative $\frac{\partial \hat{\alpha}^*}{\partial(-\tau)}$, where we model a financial crisis as a decrease in τ, or, equivalently, an increase in $(-\tau)$. For constrained acquirers, both the fire-sale effect and the selection effect are present, hence the response of constrained acquirer stakes to the crisis, $\frac{\partial \hat{\alpha}}{\partial(-\tau)}$, measures the sum of the two effects. To isolate the selection effect, we can therefore look at the *difference* between the response of the average share acquired by constrained firms, and the response of the average share acquired by unconstrained firms, i.e., $\frac{\partial(\hat{\alpha}-\hat{\alpha}^*)}{\partial(-\tau)}$. This procedure of isolating the selection effect is

stake acquired.

valid in our model since the fire-sale effect is the same for constrained and unconstrained firms. When a financial shock affects both acquirers and targets, such as in the case of a decline in aggregate τ, the differencing thus cancels out the component of the shock that works through the financial constraints of targets alone (the fire-sale effect), and what remains is how financial constraints of the *acquiring* firms shape the aggregate effect of the shock (the selection effect). This can be easily seen from Table 2. Our later empirical test of the model follows this analysis closely, using a difference-in-difference strategy.

The sign of the fire-sale effect is unambiguously negative under our assumption that $\alpha'(\phi_{i,j}) > 0$ (see *Assumption 1*). In addition, in order to attribute a sign to the selection effect analytically, we have to make assumptions on the distribution of potential profits in the economy, G, as well as the precise form of the joint borrowing constraint, $B_{i,j}$.

Assumptions 2-3: Assuming that G is Pareto (*Assumption 2*), and that $B_{i,j}$ is multiplicative in the potential profits of both acquirer and target (*Assumption 3*), we can derive closed-form solutions of the changes in $\hat{\alpha}$ and $\hat{\alpha}^*$, and hence to $\frac{\partial(\hat{\alpha}-\hat{\alpha}^*)}{\partial(-\tau)}$.[20] In the following proposition we state our analytical results that the fire-sale effect is negative, whereas the selection effect is positive:

Proposition 1 ***Fire-sale and selection effects for acquired shares during financial crises***

Under Assumptions 1 through 3, the average share acquired by unconstrained firms decreases during crises (fire-sale effect), i.e. if $\tau_c < \tau_n$, then $\hat{\alpha}_c^* < \hat{\alpha}_n^*$, whereas the average share acquired by constrained firms relative to the average shares acquired by unconstrained firms become larger during financial crises (selection effect), i.e., if $\tau_c < \tau_n$ then $\hat{\alpha}_c - \hat{\alpha}_c^* > \hat{\alpha}_n - \hat{\alpha}_n^*$.

Proof: See Technical Appendix.

In the Appendix we show that under our assumptions for G and $B_{i,j}$, the magnitude of the two counteracting effects for constrained acquirers — the fire-sale and the selection effects — exactly cancel each other out, so that the average acquired share remains unaffected by the change in the constraint parameter τ. In a later section we simulate the model numerically under alternative assumptions on G and $B_{i,j}$ and find that the selection effect might dominate the fire-sale effect, in which case the average share acquired by constrained acquiring firms goes up in the aftermath of an aggregate financial shock. Our empirical implementation later will clarify and estimate the size of the two effects, using Proposition 1 as the benchmark.

[20] The assumption of a Pareto distribution for firm profits is analytically convenient and is based on empirical evidence on the size distribution of firms (e.g. Di Giovanni et al., 2011). We assume that the borrowing constraint is given by $b \leq \tau\phi_{i,j} y_i y_j^{\beta}$. This multiplicative form implies that investors consider the two firms' potential profits as neither substitutes nor complements. This assumption is mostly done for analytical convenience. We later explore the case where both firms' potential profits are seen as perfect substitutes.

3.3 Three-Period Model Setup

The analysis so far has been static. To study the effect of a financial shock on the *dynamics* of ownership, we now allow for the possible resale of firms after an acquisition. We show that the selection effects based on technological synergies and financial constraints that influence average ownership structures might also influence post-acquisition ownership dynamics. In particular, we show that in the presence of asset sales driven by idiosyncratic shocks to potential profits of the owner of the asset, an aggregate financial shock leads to the selection of relatively financially *unconstrained* acquirers into the market for corporate control, thereby lowering asset ownership turnover. In this section we briefly outline the steps used to solve the dynamic (three-period) version of the model and provide intuition behind the main results. Detailed statements and proofs of the underlying propositions are relegated to the Online Appendix.

We extend the model in the previous section by an additional period, period 2. When we later analyze the effects of financial crises on divestiture rates, we model period 1 as a crisis period with tighter borrowing constraints and period 2 as a "normal" period, where financial conditions have returned to their previous state. Period 2 follows the same timing as period 1. At the beginning of period 2, after states have been realized (including firms' potential profits for period 2), the acquirer j receives an all-or-nothing offer for her entire share of the firm that was purchased in period 1. Following Alquist et al. (2016), we make two main assumptions to simplify the analysis substantially: (i) every prospective seller in period 2 can find a new acquirer to buy back his initial period-1 acquisition, and similarly, every target firm that was not acquired in period 1 can find a new acquirer in period 2; and (ii) the new acquirer making the buy-back offer operates the firm using the same technology as the original owner of the firm (i.e. $\phi_{i,j} = 1$). These two assumptions together allow for a simple diagrammatic analysis of the resale decision.[21] In the static model, acquisitions occurred simply on the basis of profitability and feasibility. However, since resale of the asset involves comparing the payoff from the resale to the payoff from retaining ownership of the asset, we need additional assumptions on the division of the surplus from an acquisition as well as the stochastic process of profitability in periods 1 and 2. These latter assumptions — Nash bargaining between acquirers and targets over surplus and an autoregressive process for profits — are relatively standard and are discussed in the Online Appendix.

In period 2, it is optimal for the initial acquirer j to resell the firm i whenever the value of reselling exceeds the value of holding onto the firm. The resale value depends on the net profits from production in period 2 for the new

[21] The assumption that every target firm that was not acquired in period 1 can find a new acquirer implies that the outside options for target firms and acquirers in period 2 are the same and therefore do not affect the surplus of the initial acquisition. This assumption together with the assumption that the new acquirer has $\phi_{i,j} = 1$ keeps the relevant acquisition cutoffs ϕ^{lo} and ϕ^{hi} the same as in the static model. One can relax the assumption that sellers find a buyer with certainty. Reducing this probability is similar to introducing a discount factor. This being said, it is true that these assumptions are less innocuous if we believe that parameters are changing over the business cycle. For example, the probability of finding a buyer or the potential outside offer can change over the business cycle. These extensions might give us additional insights on flipping behavior, but we believe that they are orthogonal to the mechanism discussed in this section. Note that we no longer require the assumption that the acquired share α positively depends on the synergy parameter $\phi_{i,j}$.

acquirer who makes the offer to buy. The value of holding onto the firm depends on the financial position of the post-acquisition entity (i.e. the acquirer-target entity resulting from the period 1 acquisition), since this entity will become financially constrained at the beginning of period 2 with some probability, and thus be unable to produce.

3.3.1 Motives Behind Asset Resales: Normal and Forced Flips

Combining the period 2 resale decision with the initial period 1 acquisition decision, we obtain five cases, illustrated in Figure 4. As discussed in Section 3.1.2, no initial acquisition takes place in Cases 1 and 3 because synergies are too low.[22] Initial acquisitions — some of which will be resold — take place in the remaining cases. Resales happen under two circumstances. First, all initial acquisitions that were driven purely by the relieving of financial constraints (low-value acquisitions) get resold because the target firm no longer requires financial support for production in period 2. These "normal flips" happen if $\phi_{i,j} < \phi^{hi}$ (Case 2 in Figure 4).

Second, even some high-synergy acquisitions with $\phi_{i,j} \geq \phi^{hi}$ might get flipped (Cases 4 and 5). This happens whenever the post-acquisition entity becomes financially constrained at the beginning of period 2. The probability of this "forced flipping" coincides with the probability of the post-acquisition entity not having enough expected profits at the beginning of period 2, conditional on having had enough at the beginning of period 1. Since unconstrained acquirers always have "enough" expected profits by definition, forced flipping is only relevant for financially constrained acquirers.

We define flipping, or divestiture, rates as the number of acquisitions flipped in period 2, n^{flip}, over the number of total acquisitions made in period 1, n. Unconstrained acquirers only flip low-value, fire-sale acquisitions (normal flips), so that their flipping rate is simply

$$\frac{n^{flip^*}}{n^*} = \frac{n^{lo^*}}{n^{lo^*} + n^{hi^*}} \equiv \underbrace{\omega^*}_{\text{normal}},$$

where ω^* is the share of low-value acquisitions for unconstrained acquirers. Constrained acquirers might, in addition, be forced to flip some of their high-value acquisitions:

$$\frac{n^{flip}}{n} = \frac{n^{lo} + (1-p)n^{hi}}{n^{lo} + n^{hi}} = \frac{n^{lo}}{n^{lo} + n^{hi}} + \frac{(1-p)n^{hi}}{n^{lo} + n^{hi}} = \underbrace{\omega}_{\text{normal}} + \underbrace{(1-p)(1-\omega)}_{\text{forced}}, \tag{3.8}$$

where ω is the share of low-value acquisitions for constrained acquirers, i.e. $\omega \equiv \frac{n^{lo}}{n^{lo}+n^{hi}}$, and p is the share of high-value post-acquisition entities that are not financially constrained in period 2 (out of the total mass of high-

[22] In Case 1, the target firm exits the market because it lacks resources to pay for the upfront cost of production; in Case 3, the target firm has enough resources to produce by itself, but the synergies are too low to justify an acquisition.

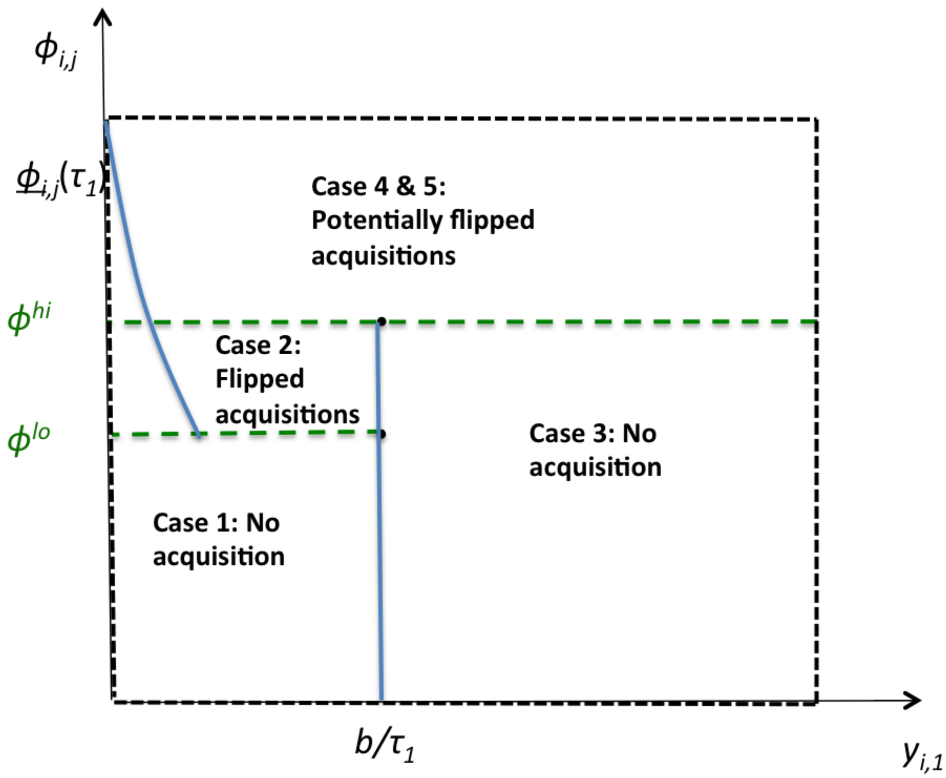


Figure 4: Resale of Acquired Firms

Notes: Figure displays combinations of the synergy parameter $\phi_{i,j}$ and the potential profits $y_{i,1}$ of a target firm, which can be initially acquired and then resold ('flipping'). The joint borrowing constraint $\underline{\phi}_{i,j}$ is drawn for a constrained acquirer with a given level of potential profits $y_{j,1}$. See text and Online Appendix for further details on the different cases.

value post-acquisition entities).[23] The mass of asset resales for constrained acquirers is thus made up of a mass ω of normal flips and a mass $(1-p)(1-\omega)$ of forced flips.

3.4 Financial Crises and Asset Resales

We now ask how financial crises affect these flipping rates by considering two scenarios. In scenario 1, all periods are normal periods with $\tau_1 = \tau_2 = \tau_n$. In scenario 2, the financial crisis occurs in period 1, but is over by period 2, i.e. $\tau_1 = \tau_c < \tau_2 = \tau_n$. As with the acquired share, we initially focus on the effects on unconstrained acquirers, which captures the fire-sale effect, and then study the selection effect working through the financial constraints of the acquiring firm by looking at the difference in flipping rates between constrained and unconstrained acquirers.

Since unconstrained firms only flip low-value acquisitions (i.e., perform "normal" flips), the change in the proportion of flipped unconstrained acquisitions is simply equal to the change in the share of low-value acquisitions in

[23] In particular, it is defined as

$$p_{i,j} \equiv \begin{cases} Pr\left(\phi_{i,j} \geq \underline{\phi}_{i,j,2} \quad | \quad \phi_{i,j} \geq \underline{\phi}_{i,j,1}\right) & y_{j,2} < \infty \\ 1 & y_{j,2} \to \infty. \end{cases}$$

.

all acquisitions by unconstrained acquirers, ω^*. This, as shown earlier, increases when there is an adverse aggregate financial shock due to more potential target firms hitting the financial constraint and being unable to pay the fixed cost of producing. This is the fire-sale effect on divestiture rates that has been emphasized so far in the literature (Acharya et al., 2011b; Alquist et al., 2016), and is driven entirely by there being more financially distressed target firms during crises.

Relative to unconstrained acquirers' flipping rates, the case of constrained firms displays two differences: First, a main insight from our discussion of Proposition 1 in Section 3.2 was that this share of low-value acquisitions does not change as much for constrained acquirers during crises due to the selection effect counterbalancing the fire-sale effect. This keeps their "normal" flipping rates low relative to unconstrained acquirers.

Second, the number of "forced" resales caused by acquirers running into financial constraints (a motive that is absent for unconstrained acquirers) is likely to decline for the following reason. As emphasized in Section 3.2, only firms with large potential profits can raise sufficient funds to undertake acquisitions during financial crises. To the extent that firms' profits are somewhat persistent, it is less likely that these firms will be financially constrained in the aftermath of the crisis, which will drive down the post-crisis "forced" flipping rates for acquisitions made by constrained acquirers during the crisis.[24]

Assumption 4: Assuming an AR(1) process of second-period potential profits with some positive persistence ρ (*Assumption 4*), as well as a Pareto distribution of profits and a joint borrowing constraint that is multiplicative in the two firms' profits (as for Proposition 1, see *Assumptions 2-3*), we analytically prove the following proposition in the Technical Appendix:[25]

Proposition 2 ***Fire-sale and selection effects for flipping rates of acquisitions made during financial crises***

Under Assumptions 2 through 4 (listed in the Online Appendix), flipping rates of acquisitions made by unconstrained firms increase (fire-sale effect), i.e., if $\tau_c < \tau_n$ *then* $\frac{n_c^{flip^*}}{n_c^*} > \frac{n_n^{flip^*}}{n_n^*}$*, whereas flipping rates of acquisitions made by constrained firms relative to those made by unconstrained firms become smaller for acquisitions made during financial crises (selection effect), i.e. if* $\tau_c < \tau_n$ *then* $\frac{n_c^{flip}}{n_c} - \frac{n_c^{flip^*}}{n_c^*} < \frac{n_n^{flip}}{n_n} - \frac{n_n^{flip^*}}{n_n^*}$.

[24]More formally, $\partial p/\partial(-\tau_1)|_{\tau_2} > 0$: Given a borrowing constraint level in the second period, τ_2, a tighter borrowing constraint in the first period ($-\tau_1 \uparrow$) raises the probability that the post-acquisition entity has enough expected profits at the end of the second period, p. Importantly, it is the *increase* of τ from a low crisis value $\tau_1 = \tau_c$ to a high value $\tau_2 = \tau_n$ that raises this probability p.

[25]In particular, we assume that y_i and y_j follow an AR(1) process of the form $y_{i,2} = 1 - \rho + \rho y_{i,1} + \varepsilon_i$ with $\rho > 0$. As discussed above and analytically shown in the Appendix, the positive persistence ensures that the number of "forced" resales is lower for the cohort of domestic crisis-time acquisitions compared to the cohort of domestic normal-time acquisitions.

4 Model Versus Data

In this section we compare the predictions of the model with the data by simulating the model in Section 4.1 to obtain shares acquired and divestiture rates, and then comparing these to their empirical counterpart in Section 4.2.

4.1 Simulating the Model

We simulate the model to analyze the reaction of the average acquired share and flipping rates to a tightening of the borrowing constraint. We first have to choose functional forms and parameters. Some of these parameters are chosen to match certain features of the data on emerging market acquisitions described above. Here, we only briefly discuss some key parameters and refer the reader to the Online Appendix for a more detailed discussion.

We had previously assumed that acquirer's and target's potential profits enter multiplicatively in the joint borrowing constraint. This choice was mostly motivated by analytical convenience. As a plausible alternative, we now assume that banks consider acquirer's and target's potential profits as perfect substitutes:

$$2b \leq \tau \left(\phi_{i,j} y_i + y_j \right).$$

We choose $\tau_n = 0.75$ during normal times and $\tau_c = 0.6$, translating into a 25 percent decline in the maximum debt-to-value ratio. As we will see, the simulation results hold for a wide range of values for τ_n and τ_c, at least qualitatively. For the distribution of expected profits, y_i and y_j, we choose a log-normal distribution (instead of the Pareto distribution assumed earlier) because empirical research has recently advocated that the log-normal distribution, although analytically less convenient, provides a somewhat better fit for the size distribution of firms (see Head et al., 2014). We assume that the distribution of synergies, $\phi_{i,j}$, is normally distributed with mean 1, meaning that half the firm pairs draw synergy parameters that *lower* the net productivity of the target firm. We assume a constant elasticity between the synergy parameter and the acquired share, α, in the range where $\alpha \in [0; 1]$. This elasticity, together with the standard deviation of the distribution of $\phi_{i,j}$ are calibrated to roughly match the share of acquisitions below 50%, the fraction of full acquisitions, and the average acquired share that we observe in the data.

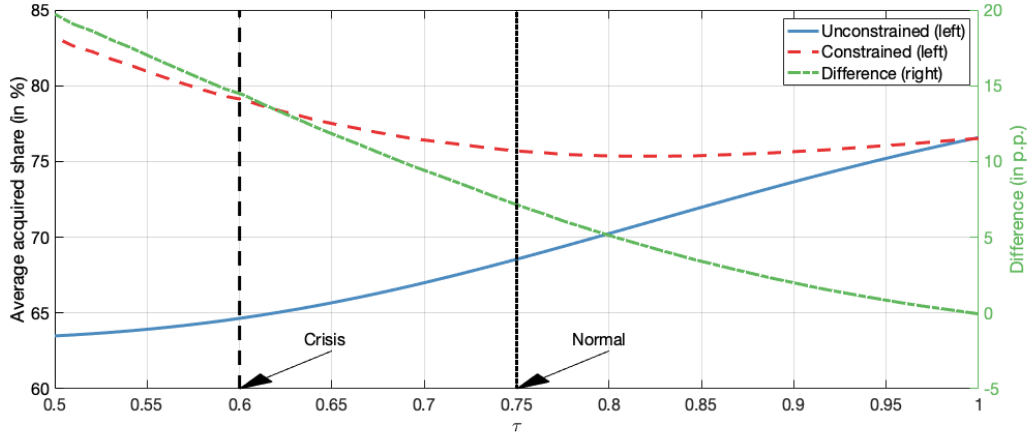
4.1.1 Simulated Average Acquired Shares

Figure 5(a) plots the simulated average acquired share of both unconstrained and constrained acquirers for different values of the maximum debt-to-value ratio, τ, in our 2-period model from Section 3.2. The horizontal axis in the figure shows τ; the left vertical axis shows the average acquired share for each type of acquirer; the right vertical axis shows the difference (constrained - unconstrained). During normal times (calibrated as $\tau_n = 0.75$), the average acquired share is somewhat higher among constrained firms (0.76 on the red dashed line) versus unconstrained firms (0.68 on the blue solid line). The difference (constrained - unconstrained) in average acquired share during normal times can be read off the green line labeled "difference" (approx. 8 percentage points when $\tau_n = 0.75$). In crises periods ($\tau_c = 0.6$), the average share falls by about 4 percentage points (moving along the red dashed line). This is consistent with the fire-sale effect in Proposition 1. For constrained firms, however, the average share moves up (moving along the red dashed line by almost 3 percentage points). Consequently, the gap between the two in crisis times is about 15 percentage points (see again the green line), widening by almost 7 percentage points. This is in line with the selection effect predicted by Proposition 1, as well as the stylized empirical evidence presented in Panel B of Table 1. Recall that under the specific assumptions underlying Proposition 1 (in particular the form of the joint borrowing constraint and the distribution of potential profits), the average acquired share for constrained acquirers stays constant. Using alternative assumptions for our simulation, we observe that this share becomes sensitive to τ, generally going up as we lower the value of τ, i.e. it goes up during financial crises. And even though the relationship between average share and τ is non-monotonic over the range depicted in Figure 5(b), we never found a combination of parameters for which the share went down more for constrained firms than for unconstrained acquirers, i.e. for which the selection effect would have been negative.

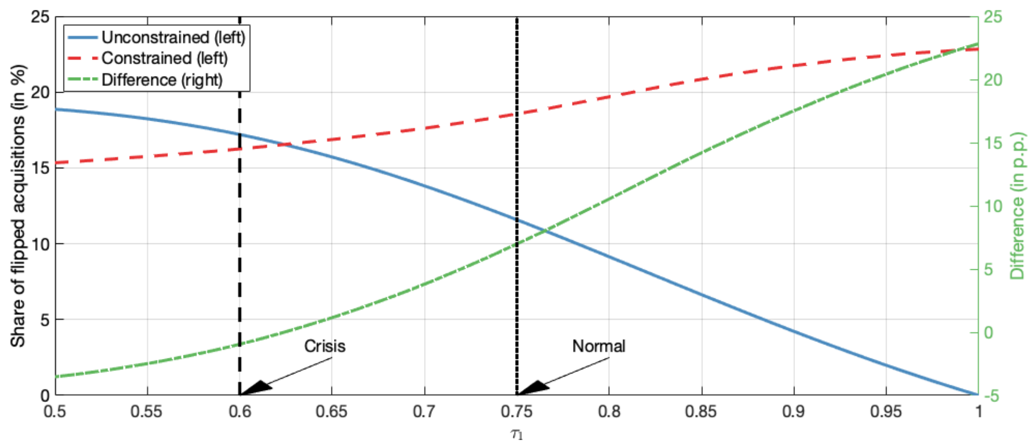
4.1.2 Simulated Flipping Rates

An additional parameter of our three-period model, that we did not need in the two-period calibration discussed in Section 4.1, is the persistence of the temporary productivity, ρ. There is little guidance in the literature on this parameter, but it is probably uncontroversial to assume some persistence. We set $\rho = 0.5$, which, if we think of one period in our model corresponding to roughly four years, is in line with an annual persistence of about 0.85. Note that our results remain robust even for $\rho = 0$.

Let τ_1 and τ_2 denote the borrowing constraint parameter in the first and second periods respectively. The horizonal axis of Figure 5(b) shows different values of τ_1; the left horizontal axis shows flipping rates for both constrained and unconstrained acquirers; and the right horizontal axis shows the difference between these two rates. The figure plots model-predicted flipping rates as a function of τ_1, the first-period borrowing constraint parameter, i.e., it shows the flipping rates generated by the model as we vary τ_1 while keeping $\tau_2 = 0.75$ in all simulations. While the axes show different quantities for 5(b) compared to 5(a), the interpretation is quite similar. For the chosen parameters, post-crisis flipping rates increase for unconstrained acquirers by 6 percentage points from 11.5 to 17.2 percent along the blue solid line going from $\tau_1 = 0.75$ to $\tau_1 = 0.6$. In other words, the model



(a) Average Acquired Share



(b) Share of Flipped Acquisitions

Figure 5: Simulation Results

Notes: Panel (a) shows the simulated average acquired share of firms as a function of the borrowing constraint parameter τ. A financial crisis is modeled as a decrease of τ. The figure displays the averaged acquired share for unconstrained acquirers, constrained acquirers and their difference (i.e. the share acquired by constrained acquirers less the share acquired by unconstrained acquirers). Panel (b) shows the simulated share of flipped acquisitions as a function of the borrowing constraint parameter τ, again broken down by type of acquirer and their difference.

predicts that 11.5 percent of acquisitions by unconstrained acquirers are flipped subsequently if they are undertaken during normal periods; while 17.2 percent of acquisitions by unconstrained acquirers are flipped subsequently if they are undertaken during crisis periods. This represents the fire-sale effect that has been emphasized in papers such as Acharya et al. (2011b) and Alquist et al. (2016). In contrast, the flipping rate decreases for constrained acquirers from 18.5 to 16.3 percent along the red dashed line, i.e., 18.5 and 16.3 percent of acquisitions by unconstrained acquirers are flipped subsequently if they are undertaken during normal and crisis periods, respectively. In line with the selection effect, the difference in flipping rates between the two types of acquisitions (the green line) therefore becomes smaller and even changes signs.

4.2 Regression Analysis of Average Acquired Share and Flipping Rates

To provide empirical evidence on the acquirer financial constraint channel, we now adopt the same difference-in-difference (DID) strategy that formed the basis of Propositions 1 and 2 in the model section.

4.2.1 Average Acquired Share: Empirical Strategy, Hypotheses and Results

Following Proposition 1 we first estimate the magnitude of the differential effect of the crisis on ownership shares acquired by domestic and foreign acquiring firms. For easy interpretability of the coefficients we use a simple OLS specification as our baseline. Results using a Generalized Linear Model (to take into account the bounded nature of our dependent variables) are similar and can be found in the Online Appendix. The OLS specification is as follows:

$$fracacq_{kjct} = \beta_0 + \beta_D D_D^{kjct} + \beta_C D_C^{ct} + \beta_{D,C} D_C^{ct} \times D_D^{kjct} + controls' \beta_{controls} + \epsilon_{kjct}. \quad (4.1)$$

The subscripts k, j, c, and t stand for transaction, 2-digit SIC industry of the target firm, target country, and time, respectively. The dependent variable in this regression, $fracacq_{kjct}$, is the fraction of the target firm acquired in a transaction ("fraction acquired"). The two independent variables of interest are D_D^{kjct} and D_C^{ct}. The variable D_D^{kjct} indicates whether the acquirer involved in transaction k is from the same country as the target, i.e., a "Domestic" firm. In terms of the model, these acquirers are identified as financially constrained. The transactions for which $D_D^{kjct} = 0$ naturally denote foreign acquiring firms, which in our data are firms from developed markets. These correspond to unconstrained acquirers in our theoretical model. The variable D_C^{ct} indicates whether an acquisition took place during a period when there was an aggregate adverse financial shock in the target country ("Crisis"). Our crisis dummy D_C^{ct} is defined using the (annual) systemic banking crises dates from Laeven and Valencia (2010). Since our main explanatory variables are binary, the baseline group in the above regression, as well as all subsequent ones, is identified by setting $D_D^{kjct} = 0$ and $D_C^{ct} = 0$ simultaneously, which is the subset of foreign acquisitions during normal times. This is in line with our overall approach of treating acquisitions by financially unconstrained acquirers as the comparison group. The vector of independent variables labelled "*controls*" includes fixed effects (at the country×2-digit SIC target industry level in our baseline specifications) and a set of lagged country-level macroeconomic variables, varying at the country×year level. These variables are motivated and discussed in detail later in Section 4.3.

It is useful to interpret the coefficients associated with the variable D_C^{ct} and the interaction term $D_C^{ct} \times D_D^{kjct}$ in equation (4.1), based on Proposition 1 and our earlier discussions. First, note that β_C corresponds to the "fire-sale effect" on average acquired shares. To see this recall that the comparison group in the regression (4.1) is the average stake acquired during normal times by foreign (i.e., unconstrained) acquirers, so β_C denotes the difference between the average share acquired by unconstrained acquirers between crisis and normal times. Then, under our identifying assumption that foreign acquirers were unconstrained throughout the sample period (see earlier for a discussion about the empirical plausibility of this assumption), β_C captures only the effect of having a pool of distressed target firms, i.e., what the literature (Aguiar and Gopinath, 2005; Acharya et al., 2011b; Alquist et al., 2016) has identified as the effect of fire sales.

In contrast, the difference-in-difference coefficient $\beta_{D,C}$ in equation (4.1) corresponds to what we label the "selection effect" on average acquired shares. To see this, first note that the effect of the crisis on average shares acquired in acquisitions by domestic (constrained) acquirers is $\beta_C + \beta_{D,C}$ (i.e., their average share acquired during crisis times, $\beta_D + \beta_C + \beta_{D,C}$, less their average share acquired during normal times, β_D, both in terms of their difference from the baseline group of course). This total effect of the crisis, as discussed earlier (see Table 2), comprises the fire sale and selection effects in the case of constrained acquirers. Since, as discussed in the preceding paragraph, β_C provides an empirical estimate of the fire-sale effect, then $\beta_{D,C}$ captures the selection effect.

Bearing these interpretations in mind, Proposition 1 implies the following testable hypotheses for the coefficients β_C and $\beta_{D,C}$.

Hypothesis 1 *Financial crises have different impacts on average ownership structures chosen by (financially constrained) domestic, and (financially unconstrained) foreign acquirers. Specifically, crises lead to: (i) a* decline *in the average ownership stakes acquired by (financially unconstrained) foreign acquirers,* $\beta_C < 0$*, corresponding to the fire-sale effect in Proposition 1; and (ii) a* relative increase *in the average ownership stakes acquired by domestic acquirers in comparison to foreign acquirers, i.e.,* $\beta_{D,C} > 0$*, which corresponds to the selection effect in Proposition 1.*

We estimate equation (4.1) using our EME data (Panel A of Table 3) and using simulated data from the theoretical model (Panel B of Table 3). The two hypotheses outlined above can be tested using the coefficients reported in Column (1) of both panels of Table 3. In qualitative terms, Panel A shows strong empirical support for our two key hypotheses. First, we find that $\beta_C < 0$ and is statistically significant at the 1% level, which implies that crises lead to a *decline* in the average stake acquired by financially unconstrained foreign acquirers. This corresponds to the fire-sale effect in Proposition 1, and verifies more robustly the pattern noted earlier in Panel B of Table 1. Furthermore, $\beta_{D,C} > 0$ and statistically significant at the 1% level, which implies that crises lead to a *relative increase* in the average stake acquired by domestic firms in comparison to the average stake acquired by foreign firms, which corresponds to the selection effect in Proposition 1.

During normal times, firms acquire on average about a 66% share in their targets (see row 2 of Panel A in the summary statistics Table 1). The point estimate of $\beta_C = -0.03$, i.e., a 3 percentage points decline, then implies an

Table 3: Ownership Stakes: Fire-Sale and Selection Effects During Financial Crises

	Panel A: Baseline Results			Panel B: Simulated Data		
	Share	Maj.	Full	Share	Maj.	Full
	(1)	(2)	(3)	(4)	(5)	(6)
Domestic (β_D)	0.01	-0.00	0.01	0.11	0.14	0.08
	(0.01)	(0.01)	(0.01)			
Crisis (β_C)	**-0.03**^{a}	**-0.03**^{c}	**-0.05**^{a}	-0.04	-0.05	-0.03
Fire-Sale Effect	(0.01)	(0.02)	(0.02)			
Domestic × Crisis ($\beta_{D,C}$)	**0.08**^{a}	**0.09**^{a}	**0.10**^{a}	0.07	0.06	0.06
Selection Effect	(0.01)	(0.02)	(0.02)			
No. obs.	28,019	28,019	28,019			
R^2	0.13	0.11	0.13			

Notes: The table reports the point estimate of the coefficient associated with the domestic acquisition dummy β_D, the banking crisis dummy β_C, and their interaction $\beta_{D,C}$ obtained from an OLS estimation on the SDC dataset (Panel A) and simulated data (Panel B). For both panels, the specifications in columns 1-3 are as follows. Column (1) corresponds to equation (4.1); columns (2) and (3) corresponds to equation (4.2) with the dependent variables being indicator that are 1 when an acquisition involves a majority and full stake, respectively. a, b and c indicate statistical significance at the 1%, 5% and 10% levels, respectively. Robust standard errors reported in parentheses. Standard errors and R^2 not reported for regressions using simulated data. All columns in Panel A have macroeconomic controls and country×2-digit SIC target industry fixed effects, the coefficients of which are omitted from the table to conserve space.

approximately 5% decline driven by the fire-sale effect (i.e., driven by an increase in the pool of target firms in distress bought up by financially unconstrained foreign acquirers). The estimated selection effect is large quantitatively: $\beta_{D,C} = 0.08$ implies that the increase in the acquired ownership stake that we can attribute to the selection effect is approximately 12% of normal-time stakes.

To compare the model's predictions to the empirical results in quantitative terms, we present in Panel B of Table 3 the coefficients from identical estimations performed on a data set with a total of 300,000 observations simulated using the procedure outlined in the previous section. We only report and discuss the point estimates of the coefficients from the simulated data.[26] Looking at column 1, Panel B, we see that the simulated crisis leads

[26]The point estimates are effectively the coefficients from a linear approximation of the data generating process implied by the theoretical model, and are meant to provide a sense of the quantitative performance of the model. We do not have data that would let us precisely estimate the firm-specific idiosyncratic shocks, which, in the data are likely to affect the precision of our estimates. This makes it difficult to compare standard errors between the estimates based on actual and simulated data and we therefore refrain from reporting standard errors for our regressions based on simulated data.

to a fire-sale effect of 4 percentage points and a selection effect of 7 percentage points. Note from Figure 4 that this 4 percentage point decline driven by the fire-sale effect corresponds to a movement down the line labelled "unconstrained acquirer" (solid blue line) between the points $\tau = 0.75$ (normal times) and $\tau = 0.6$ (crisis times). Similarly, the 7 percentage point increase driven by the selection effect corresponds to a movement up the line labelled "difference" (green line) between the points $\tau = 0.75$ and $\tau = 0.6$. The predicted magnitudes of the coefficients are remarkably similar in the simulated and actual data for such a parsimonious model.[27]

In the model we identify high value acquisitions as those associated with higher stakes and assume a continuous relationship between the two. The literature supports this positive relationship, but has emphasized that particularly majority and full acquisitions are related to higher value creation (Chari et al., 2010; Alquist et al., 2019). Accordingly, we now replace our continuous measure (fraction acquired) by a dummy that reflects either majority ($D^{kjct}_{maj.}$) or full acquisitions (D^{kjct}_{full}).

$$D^{kjct}_{maj./full} = \beta_0 \ + \ \beta_D D^{kjct}_D \ + \ \beta_C D^{ct}_C \ + \ \beta_{D,C} D^{ct}_C \times D^{kjct}_D + \ controls' \beta_{controls} \ + \ \epsilon_{kjct}. \tag{4.2}$$

Note that the coefficients on these regressions can be interpreted as changes in the proportion of majority and full acquisitions. For these regressions, we expect to find the proportion of majority and full acquisitions to change in the same directions as suggested by Proposition 1 in the context of fire-sale and selection effects, i.e. $\beta_C < 0$ and $\beta_{D,C} > 0$. The results of these two alternative estimations of equation (4.2) are shown in columns (2) and (3) of Panel A, Table 3. Overall, both definitions of high-value acquisitions yield similar results: the coefficients β_C and $\beta_{D,C}$ are always of the correct sign and statistically significant, providing evidence consistent with the fire-sale and selection effects on acquired stakes working through changes in the shares of high- and low-value acquisitions in the market for corporate control.

Quantitatively, roughly 65% (43%) of normal-time acquisitions comprise majority (full) acquisitions (see row 5 and 7, summary statistics Table 1). The fire-sale effect in terms of the decline in the likelihood of completing majority (full) acquisitions is 3 (5) percentage points or about 5% (8%) lower than the proportion of majority (full) acquisitions in normal times. The selection effect in terms of the increase in the likelihood of completing majority (full) acquisitions is 9 (10) percentage points or about 14% (25%) higher than the proportion of majority (full) acquisitions in normal times. Columns 2 and 3 together suggest that the mechanism behind the fire-sale and selection effect highlighted by our theoretical analysis — changes in the composition of acquisitions between low- and

[27] One caveat to this particular comparison between the model and the data is that we do not calibrate our financial friction parameter τ, but simply model the aggregate financial shock as a decline in τ from 0.75 to 0.6, resulting in a 25 percent decline in the maximum debt-to-value ratio of all firms. Both the initial value of τ and its drop determine the relative magnitudes of the fire-sale and selection effect in the model, as can be seen in the simulation results (Figure 5a). However, it is notable that the model gets quite close to the magnitude of *both* the fire-sale and selection effects.

high-value, i.e., minority and majority acquisitions — is quantitatively important. Columns 2 and 3 in Panel B of Table 3 present the same regressions using simulated data from the theoretical model. Comparing the coefficients, we find that while the fire-sale effect is roughly of similar magnitude, the selection effect is much more important empirically. In other words, the selection effect in the data works more through domestic acquirers switching to high-value majority or full acquisitions during crises.[28]

4.2.2 Divestiture Rates: Empirical Strategy, Hypotheses and Results

Our model also has predictions on the subsequent resale of acquisitions. To remind the reader, Proposition 2 predicted the effects of a financial shock on the divestiture rates of acquisitions by unconstrained acquirers (fire-sale effect), and the difference in the divestiture rates of constrained and unconstrained acquirers (selection effect). In particular, Proposition 2 predicted that the fire-sale effect should increase flips and the selection effect should reduce flips. To test this empirically, we estimate a Cox proportional hazards model of the following form:

$$\ln[h_{kjc}(\tau|\cdot)] = \ln[h_{jc}(\tau)] \ + \ \beta_D D_D^{kjct} \ + \ \beta_C D_C^{ct} \ + \ \beta_{D,C} D_C^{ct} \times D_D^{kjct} + \ controls' \beta_{controls} \ + \ \epsilon_{kjct}. \tag{4.3}$$

where the independent variables are as before, and duration τ of an acquisition is measured as the distance in time between the acquisition of a firm and the immediately preceding acquisition of that same firm.[29] The estimated "hazard" function, $h_{kjc}(\tau|\cdot)$, is the probability density that the average firm experiences an acquisition event in a small interval of time $\Delta\tau$, conditional on it not having been the target of an acquisition for τ units of time since the last acquisition event (see Kalbfleisch and Prentice, 1980, for details of the notation). It comprises two parts: a "baseline hazard" $h_{jc}(\tau)$, and the terms encompassed by the Cox coefficients and the independent variables, which shift the baseline hazard log-linearly. We allow the baseline hazard $h_{jc}(\tau)$ to differ across countries indexed c and

[28] The reader might also notice that the magnitude of the coefficient associated with the domestic acquirer dummy β_D is large and positive, in contrast to a near zero coefficient in the data. Our model therefore implies that domestic acquirers acquire larger stakes than foreign ones during normal times. This is not surprising because our model assumes that foreign and domestic acquirers only differ in their access to finance. Low-synergy (and hence, small-share) acquisitions are not feasible for domestic, constrained acquirers in our model, even in normal times. This leads to the prediction that domestic acquirers acquire larger stakes in normal times. One could easily align the model's predicted β_D with that found in the data by assuming that foreign and domestic acquirers also vary along other dimensions, such as in the distribution of synergy parameters (specifically, the distribution for foreign acquirers has a lower average or is stochastically dominated by the domestic acquirer's synergy parameter distribution. This modification, however, would have little effect on the model's predictions about our main coefficient of interest, $\beta_{D,C}$.

[29] For our baseline estimations, the duration τ of an acquisition is measured as follows. We identify target firms that appear at least twice in our data. Let such a target firm be indexed by k. The first transaction involving k identifies the beginning of the relationship between the first acquirer and the target. The second transaction involving k is assumed to mark the end of the immediately preceding ownership relationship, and so on for subsequent appearances by the same target k in the data. Since our data does not allow us to identify the direct seller of a share in a transaction, the duration of acquisitions involving target k is defined as the distance in time between each transaction involving k. While this scheme has the limitation that an acquisition event involving k always assumes the seller of the stake to be the previous acquiring firm (which may not be the case due to partial ownership), it has two advantages. First, it lets us keep the same sample of firms for which we estimated our ownership regressions. Second, it makes the performance of the theoretical model easier to compare to the data for reasons that are explained later. However, we show in the Online Appendix that an alternative way of defining duration – using only the sample of majority acquisitions – that is immune to the issue described above leaves our conclusions unchanged qualitatively.

2-digit SIC target industries indexed j, consistent with the country×2-digit SIC target industry fixed effects used in the analysis of acquired shares. The purpose of the stratification is to take into account divestiture patterns that might be unique to certain countries and industries, say due to government regulations.

In the model above, the *hazard ratio* $\frac{h_{kjc}(\tau|\mathbf{X})}{h_{jc}(\tau)}$ is the ratio between the hazard rate when the covariates take a vector of values $\mathbf{X}$, and the baseline hazard. It is a measure of the extent to which the independent variables $\mathbf{X}$ shift the baseline hazard. Our two hypotheses from Proposition 2 are that the fire-sale effect should lead to an increase in the flipping hazard (i.e., $\beta_C > 0$) and that the selection effect should drive the flipping hazard in the opposite direction (i.e., a relative decline in the hazard of flipping for the crisis cohort of domestic acquisitions, or the coefficient $\beta_{D,C} < 0$).

Hypothesis 2 *Financial crises have different impacts on the flip rates of the crisis cohort of acquisitions by (financially constrained) domestic and (financially unconstrained) foreign acquirers. Specifically, crises lead to: (i) an* increase *in the flip rates for foreign acquirers, i.e., $\beta_C > 0$, corresponding to the fire-sale effect in Proposition 2; and (ii) a* relative decline *in the flip rates for the crisis cohort of domestic acquisitions in comparison to foreign acquisitions, i.e., $\beta_{D,C} < 0$, which corresponds to the selection effect in Proposition 2.*

The results of estimating equation (4.3) are shown in Panel A of Table 4, column (1). For ease of exposition the table displays the point estimates of the coefficients in equation (4.3), their standard errors in parentheses, and in square brackets the percentage changes in the hazard rate, e.g., $(e^{\beta_C} - 1) \times 100$. We find evidence in favor of Proposition 2: The point estimate of the coefficient β_C is positive, though statistically insignificant; while that of $\beta_{D,C}$ is negative and statistically significant at 1%. The magnitude of the coefficients imply a small fire-sale effect but a large selection effect. Quantitatively, the flip hazard for foreign acquisitions undertaken during crises is higher by $\left(e^{\beta_C} - 1\right) \times 100 = 10\%$ compared to normal times, while the relative flip rates of domestic acquisitions versus foreign acquisitions for the crisis cohort changes by $\left(e^{\beta_{D,C}} - 1\right) \times 100 = -30\%$ compared to the normal-time cohort (these two percentages are shown in square brackets below the corresponding coefficient).[30] Comparing the magnitudes of these hazard ratios to those derived from the simulated model (see Panel B, column (2)), it is clear that the theoretical model overstates the fire-sale effect at the 4-year horizon for which the model is calibrated (10% in the data, 49% in the model), while the selection effect is of comparable magnitude in the data and model (-30% and -41%).

[30]The other estimated coefficients corroborate the motivating stylized Fact 2 noted earlier: β_D is statistically insignificant, which shows that flip rates for the normal-time cohort of domestic and foreign acquisitions are statistically indistinguishable; while $(e^{\beta_D+\beta_{D,C}} - 1) \times$ 100=-23% (significant at 1%) shows that the flip rates of the crisis-time cohort of domestic acquisitions is 23% lower than the crisis-time cohort of foreign acquisitions. Thus the flip rates of domestic and foreign acquirer diverge for the crisis cohort of acquisitions (Fact2). Note that the order of the flip rates are somewhat different from those presented in Figure 1 since that figure did not control for a number of important considerations such as different industries having different flip rates.

Table 4: Flipping Hazard Coefficients and Percentages Changes: Fire-Sale and Selection Effects During Financial Crises

	Panel A: Baseline Results (1)	Panel B: Simulated Data (2)	Panel C: Flipping Motive (3)
Domestic (β_D)	0.09		0.12^c
	(0.07)		(0.06)
	[9%]	[60%]	[12%^{c}]
Crisis (β_C) **Fire-Sale Effect**	**0.10**		0.10
	(0.09)		(0.09)
	[**10%**]	[49%]	[11%]
Domestic × Crisis ($\beta_{D,C}$) **Selection Effect**	**-0.35**^{a}		-0.22^c
	(0.11)		(0.11)
	[**-30%**^{a}]	[-41%]	[-19%^{c}]
Majority ($\beta_{50\%}$)			-1.53^a
			(0.05)
			[-78%^{a}]
No. obs.	28,019		28,019
Log L	-14,719.8		-13,792.8

Notes: Baseline estimates for the coefficients associated with the domestic acquisition dummy D_D, banking crisis dummy D_C, their interaction $\beta_{D,C}$, and a dummy for 50% acquisitions $D_{50\%}$, obtained from a Cox duration model. Panel A, column (1) corresponds to equation (4.3). Percentage changes of the hazard compared to the baseline group (hazard rate for normal-time cohort of foreign acquisitions) shown in square brackets. For purposes of quantitative comparison to the theoretical model, Panel B, column (2), shows the corresponding percentage changes of the hazard rate from the theoretical model. These percentages are calculated as follows. Recall that the model can be simulated to predict the share of various cohorts of acquisitions that are flipped. Figure 5 in the simulation section displayed these simulated flipping rates for constrained and unconstrained acquirers as a function of the borrowing constraint parameter, τ. In our benchmark calibration the crisis is modelled as a change in τ from 0.75 to 0.6, and then reversion to its normal value of 0.75 after the crisis. For the chosen parameters, it is straightforward to find the share of crisis-time foreign acquisitions that are flipped and the share of normal-time foreign acquisitions that are flipped. The hazard ratio e^{β_C} for the model is then calculated as ratio of these two shares. Similarly, $e^{\beta_{D,C}}$ for the model is calculated as $e^{\beta_{D,C}} = \frac{\frac{\text{share of crisis−time domestic acquisitions flipped}}{\text{share of normal−time domestic acquisitions flipped}}}{\frac{\text{share of crisis−time foreign acquisitions flipped}}{\text{share of normal−time foreign acquisitions flipped}}}$. Percentages are then calculated as $\left(e^{\beta_C} - 1\right) \times 100$ and $\left(e^{\beta_{D,C}} - 1\right) \times 100$. Panel C, column (3) corresponds to equation (4.4). The baseline hazards are stratified by country×2-digit SIC target industry. The dates for the domestic banking crises are from Laeven and Valencia (2010). a, b and c indicate statistical significance at the 1%, 5% and 10% levels, respectively. Standard errors clustered at the level of country×2-digit SIC target industry are reported in parentheses. Columns (1) and (3) include macroeconomic controls whose coefficient estimates are omitted from the table to conserve space.

The preceding results establish the relative empirical contribution of the fire-sale and selection effects to subsequent flip rates. We can alternatively decompose the *motive* of the flip rates into what we label as "normal" and "forced" flips. Recall that in our model unconstrained firms retain high-value acquisitions and flip low-value acquisitions (which we call "normal" flips). Constrained acquirers, in addition, are also "forced" to divest a number of their acquisitions due to unexpectedly running into financial constraints. If we interpret the data strictly in terms of our model, the marginally higher flip rate we find for foreign acquirers is due to an increase in normal flips, while the significantly lower flip hazard we find for domestic acquirers is due to fewer normal flips driven by a compositional shift towards high-value acquisitions, as well as fewer financial-constraints-based forced flips. We attempt to disentangle these two channels by using a majority acquisition as the empirical counterpart for a high-value acquisition, as in our baseline estimates for ownership acquired.[31] Accordingly, we add to the model of equation (4.3) a dummy independent variable $D_{50\%}^{kjct}$ indicating whether a transaction resulted in majority ownership:

$$\ln[h_{kjc}(\tau|\cdot)] = \ln[h_{jc}(\tau)] + \beta_C D_C^{ct} + \beta_D D_D^{kjct} + \beta_{D,C} D_C^{ct} \times D_D^{kjct} + \beta_{50\%} D_{50\%}^{kjct} + \boldsymbol{controls}'_{c,t-4}\beta_{controls} + \epsilon_{kjct}. \tag{4.4}$$

The idea behind regression (4.4) is to proxy for a high-value acquisition (which are guided by the normal flipping motive) using $D_{50\%}^{kjct}$. In regression (4.4), we expect: the estimate of $\beta_{50\%}$ which picks up the normal flipping motive to be negative and significant (i.e., high-value acquisitions have lower flipping rates in general); and $\beta_{D,C}$ which picks up the forced flipping motive (once the normal flips are controlled for using $D_{50\%}^{kjct}$) to be of lower absolute magnitude than in our baseline.

The results of estimating equation (4.4) are shown in Panel C, column (3) of Table 4. First, note that the coefficient associated with $D_{50\%}^{kjct}$ in column (3) shows that majority acquisitions indeed have lower divestiture rates (78% lower) in general, consistent with the behavior of high-value acquisitions in the model. Second, the estimate of $\beta_{D,C}$ is lower in magnitude than in column (1) as expected (significant at 10%). These two results, coupled with our earlier finding that there is a shift towards majority acquisitions for domestic acquirers (column (2) of Table 3) suggests that both the normal and financial-constraints-based forced flipping motives contribute to post-crisis flips.[32]

4.3 Discussion of Control Variables and Robustness Checks

Our baseline regressions control for a number of business cycle determinants of acquisitions identified by earlier work using a set of lagged country-level macroeconomic variables. Real GDP growth (annual) is used to proxy for normal business cycle variation in M&A activity (Brown and Dinc, 2011) and real GDP per capita (annual) to control for the level of development of the target country (Erel et al., 2012). Nominal exchange rate depreciation

[31] As explained earlier, this builds on the idea in Chari et al. (2010) that majority acquisitions create real value gains in emerging markets for both domestic and foreign acquirers.

[32] Table C.10 in the Online Appendix replicates Table 4 using the sample of acquisitions in which at least 51% of a firm was owned after a transaction, and using full acquisitions to proxy high-value acquisitions. Since we only use majority-owned firms in this estimation, we are confident that the original buyer of the firm is the subsequent seller, thereby ensuring it is a true flip. The results remain qualitatively unchanged in this smaller sample.

(quarterly) is included to control for the effect of exchange rates on the value of collateral (Froot, 1991) and the use of IMF credit and loans as a percentage of a country's quota (quarterly) to account for stress factors in the balance of payments.[33] Our benchmark specification also includes 2-digit SIC *target*-industry×target-country fixed effects to control for slow-moving characteristics of specific countries or time-invariant characteristics of specific sectors. Note that this specification accounts for differences arising from the *targets* being from specific sectors, such as the financial sector, and countries. In addition we verify (see Table C.2) that these baseline results are robust when using different control and fixed effect combinations.[34] These estimations control for many different sector-specific (e.g. external finance dependence, capital intensity, asset tangibility) or country-specific (average financial development or institutional quality) determinants of firm boundaries (see Antràs and Yeaple, 2014; Alquist et al., 2015, 2019). These alternative estimates show that the baseline estimates form a lower bound: in Table C.2, estimates of the fire-sale effect range from 5%-9% declines in stakes, while estimates of the selection effect range from 11%-15% increases in stakes. Table C.3 in the Online Appendix shows that all our results, including those using different fixed-effect specifications, are robust to using a Generalized Linear Model (GLM) that explicitly accounts for the fact that the stake acquired, as well as the proportion of majority and full acquisitions, are bounded between 0 and 1. In addition, we find that our empirical results are robust to a large number of checks. In the interest of space, we offer a brief discussion of these results and relegate the corresponding tables to an Online Appendix.

The motives behind or legal restrictions on acquisitions by domestic and foreign firms might differ systematically. Zhu et al. (2011) find evidence that firms in EMEs acquire partial stakes in other domestic firms to gain corporate control, while foreign firms use acquisitions as a strategic tool to enter foreign markets. We control for these possible dynamic differences in motives by controlling for pre-existing partial ownership (at the time of an acquisition) of the acquiring firm in the target firm in Table C.4. The table shows that acquirers are likely to acquire smaller stakes when they already own a stake in firm. However, controlling for pre-existing ownership keeps our results qualitatively unchanged. A large literature has recently analyzed the unique characteristics of banking sector acquisitions (see Acharya et al., 2011a, 2008; Acharya and Viswanathan, 2007, for example) that are driven by the relative opacity of their assets, and the non-pledgable nature of some of their intangible capital (such as customer relationships). Since these characteristics are likely to differ among foreign and domestic acquiring banks, our results might be mainly driven by changes in the importance of financial sector acquisitions during crises. Hence we include an indicator variable control in our baseline specification for transactions where *both* acquirer and target are from the financial sector (see Table C.5). The features we uncover also appear to be valid both for financial

[33]These variables are introduced in single-period lags, following Brown and Dinc (2011). The sources of these data are the Penn World Tables, the IMF's *International Financial Statistics*, Taiwan's National Statistical Office, and the Central Bank of the Republic of China. Summary statistics are provided in the Online Appendix (Table C.1).

[34]Specifically: (i) no fixed effects or macro controls; (ii) macro controls and target country fixed effects; (iii) macro controls, target country, and 2-digit SIC target industry fixed effects; and (iv) macro controls, target country, and 2-digit SIC acquirer industry fixed effects.

and non-financial sector acquisitions since dropping all financial sector transactions keeps our results unchanged (see Table C.6). We control for the possibility that foreigners may have been facing different ownership restrictions over time (say, restrictions on majority stakes during crises, which could explain our results) using the Chinn-Ito index of financial integration (see Chinn and Ito, 2006) for the set of target countries with the rest of the world between 1990-2007.[35] The results of including the Chinn-Ito index as a control are reported in Table C.7. Our conclusions remain unchanged. The coefficient on the Chinn-Ito index itself is negative, i.e., capital account openness is associated with smaller, non-controlling stakes, though the point estimates are small.

Our baseline results use crisis dates from Laeven and Valencia (2010) and a sample that includes acquisitions in EMEs that did not experience any banking crisis, as part of the control group. Since the crisis variable is critical for empirical identification, we check if the results in Table 3 are robust to using only the sample of countries that experienced at least one crisis, i.e. excluding Chile, Peru, Singapore and South Africa (see Table C.8), and using alternative crisis dates from Reinhart and Rogoff (2009) (see Table C.9). Table C.11 reports the precise crisis years for each country for both crisis proxies. Our conclusions are insensitive to these alternative definitions of a crisis.

5 Conclusion

This paper provides a simple analytical framework for assessing the effects of adverse aggregate financial shocks on the market for corporate control when both acquirer and target firms face financial constraints. Our analysis identifies two channels — fire-sale and selection effects — that counteract each other to lead to a divergence, in response to large aggregate financial shocks such as financial crisis, of two key metrics, stakes acquired and divestiture rates, between financially constrained and unconstrained acquiring firms. Interpreting financially constrained and unconstrained acquiring firms, respectively, as domestic and developed-market foreign acquirers in a large dataset of emerging market acquisitions spanning the years 1990-2007, we provide robust evidence in favor of the predictions of the model.

Our model has important macroeconomic implications that are worth exploring further. For example, the selection effects described in this paper have direct consequences for an economy's aggregate productivity. Since Joseph Schumpeter's classic work (Schumpeter, 1934), it is well understood that recessions or financial crises lead to higher average productivity through a so-called "cleansing" effect that forces the exit of the least productive firms. Our model suggests that such a cleansing effect might also be present in the market for corporate control, where it shifts resources towards the most productive M&As. Since these M&As are also shown to be longer lived, these effects

[35] The Chinn-Ito index varies across countries and years, and is a de jure measure of restrictions on cross-border financial transactions compiled from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). While an imperfect measure since it is not specifically about FDI restrictions, other finer measures such as those from the OECD are only available for a few years from 1997 onwards. Note that the sample size for this estimation is lower since the Chinn-Ito measure is unavailable for Taiwan.

are likely to endure beyond the financial crisis itself. A careful analysis of these effects requires a dynamic model and is beyond the scope of this paper, but we already point towards selection effects that are likely to be critical in such a model.

The model also has a rich set of firm-level predictions regarding the joint distribution of productivity and financial constraints for acquirers and targets that we do not test partly because, to the best of our knowledge, high-quality balance sheet data for a large set of acquirers and target firms do not exist in the case of EMEs (since, for example, many transactions involve privately- or family-owned firms) for most years. Using firm-level balance-sheet data from select EMEs, years and firms to explore these predictions is a fruitful direction for future work. Also, while applied to the data in the context of EMEs, the model in this paper is equally applicable to acquisitions in developed markets, for which better quality and more extensive firm-level data exist, and where financial constraints have also been shown to be important for the M&A process (e.g., Harford, 1999; Almeida et al., 2011; Erel et al., 2014). The model can thus help guide future empirical work on the role of productivity and financial constraints in the market for corporate control. These and other investigations are left for future work.

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References

V. V. Acharya and S. Viswanathan. Moral Hazard, Collateral and Liquidity. *London Business School and Fuqua School of Business Working Paper*, 2007.

V. V. Acharya, H. S. Shin, and T. Yorulmazer. Banks's Choice of Liquidity: The Role of Fire Sales and Entry. *London Business School Working Paper*, 2008.

Viral V Acharya, Hyun Song Shin, and Tanju Yorulmazer. Crisis resolution and bank liquidity. *Review of Financial studies*, 24(6):2166–2205, 2011a.

V.V. Acharya, H. Shin, and T. Yorulmazer. Fire-sale FDI. *Korean Economic Review*, 27(2):163–202, 2011b.

M. Aguiar and G. Gopinath. Fire-Sale Foreign Direct Investment and Liquidity Crises. *Review of Economics and Statistics*, 87:439–452, 2005.

Rui Albuquerque and Hugo A. Hopenhayn. Optimal Lending Contracts and Firm Dynamics. *The Review of Economic Studies*, 71(2):285–315, 2004.

Heitor Almeida, Murillo Campello, and Dirk Hackbarth. Liquidity Mergers. *Journal of Financial Economics*, 102(3): 526–558, 2011.

Ron Alquist, Rahul Mukherjee, and Linda L Tesar. Liquidity-driven fdi. Technical report, The University of Michigan, 2015.

Ron Alquist, Rahul Mukherjee, and Linda Tesar. Fire Sale FDI or Business as Usual? *Journal of International Economics*, 98:93–113, 2016.

Ron Alquist, Nicolas Berman, Rahul Mukherjee, and Linda Tesar. Financial Constraints, Institutions, and Foreign Ownership. *NBER Working Paper No. w24241*, 2018.

Ron Alquist, Nicolas Berman, Rahul Mukherjee, and Linda Tesar. Financial constraints, institutions, and foreign ownership. *Journal of International Economics*, (118):63–83, 2019.

Pol Antràs. Firms, Contracts, And Trade Structure. *The Quarterly Journal of Economics*, 118(4):1375–1418, 2003.

Pol Antràs and Stephen Yeaple. Multinational firms and the structure of international trade. *Handbook of International Economics*, 4:55, 2014.

Pol Antràs, Mihir Desai, and C Fritz Foley. Multinational Firms, FDI Flows and Imperfect Capital Markets. *Quarterly Journal of Economics*, 124(3), 2009.

Elizabeth Asiedu and Hadi Salehi Esfahani. Ownership Structure in Foreign Direct Investment Projects. *Review of Economics and Statistics*, 83(4):647–662, 2001.

Malcolm Baker, Xin Pan, and Jeffrey Wurgler. The effect of reference point prices on mergers and acquisitions. *Journal of Financial Economics*, 106(1):49–71, 2012.

D. D. Bergh. Predicting Divestiture of Unrelated Acquisitions: An Integrative Model of Ex Ante Conditions. *Strategic Management Journal*, 18:715–731, 1997.

Ben Bernanke and Mark Gertler. Agency costs, net worth, and business fluctuations. *The American Economic Review*, 79(1):14–31, 1989.

Çagatay Bircan. Ownership structure and productivity of multinationals. *Journal of international economics*, 116: 125–143, 2019.

Arturo Bris and Christos Cabolis. The value of investor protection: Firm evidence from cross-border mergers. *Review of Financial Studies*, 21(2):605–648, 2008.

Wyatt Brooks and Alessandro Dovis. Credit Market Frictions and Trade Liberalization, 2013.

C.O. Brown and I.S. Dinc. Too Many to Fail? Evidence of Regulatory Forbearance When the Banking Sector is Weak. *Review of Financial Studies*, 24(4), 2011.

A. Chari, P. P. Ouimet, and L. L. Tesar. The Value of Control in Emerging Markets. *Review of Financial Studies*, 23 (4), 2010.

Menzie D Chinn and Hiro Ito. What matters for financial development? capital controls, institutions, and interactions. *Journal of Development Economics*, 81(1):163–192, 2006.

Joel David. The aggregate implications of mergers and acquisitions. 2019.

Erik Devos, Palani-Rajan Kadapakkam, and Srinivasan Krishnamurthy. How do mergers create value? a comparison of taxes, market power, and efficiency improvements as explanations for synergies. *The Review of Financial Studies*, 22(3):1179–1211, 2008.

Julian Di Giovanni, Andrei A Levchenko, and Romain Ranciere. Power laws in firm size and openness to trade: Measurement and implications. *Journal of International Economics*, 85(1):42–52, 2011.

I. Erel, R. C. Liao, and M. S. Weisbach. Determinants of Cross-Border Mergers and Acquisitions. *Journal of Finance*, 67(3), 2012.

Isil Erel, Yeejin Jang, and Michael S Weisbach. Do Acquisitions Relieve Target Firms Financial Constraints? *The Journal of Finance*, 2014.

Kenneth A Froot. Exchange Rates and Foreign Direct Investment: An Imperfect Capital Markets Approach. *The Quarterly Journal of Economics*, 1991.

Andrey Golubov, Alfred Yawson, and Huizhong Zhang. Extraordinary acquirers. *Journal of Financial Economics*, 116(2):314–330, 2015.

Gary Gorton, Matthias Kahl, and Richard J Rosen. Eat or be eaten: A theory of mergers and firm size. *The Journal of Finance*, 64(3):1291–1344, 2009.

Jarrad Harford. Corporate cash reserves and acquisitions. *The Journal of Finance*, 54(6):1969–1997, 1999.

Jarrad Harford. What drives merger waves? *Journal of financial economics*, 77(3):529–560, 2005.

Keith Head, Thierry Mayer, and Mathias Thoenig. Welfare and trade without pareto. *American Economic Review*, 104(5):310–16, 2014.

B. Jovanovic and P. L. Rousseau. The Q-Theory of Mergers. *American Economic Review*, 92:198–204, 2002.

J. D. Kalbfleisch and R. L. Prentice. *The Statistical Analysis of Failure Time Data*. Wiley, New York, 1980.

S. N. Kaplan and M. S. Weisbach. The Success of Acquisitions: Evidence from Divestitures. *Journal of Finance*, 47: 107–138, 1992.

Patrick J. Kehoe and Fabrizio Perri. International Business Cycles with Endogenous Incomplete Markets. *Econometrica*, 70(3):907–928, 2002.

P. Krugman. *Fire-Sale FDI*. University of Chicago Press, 2000.

L. Laeven and F. Valencia. Resolution of Banking Crises: The Good, the Bad, and the Ugly. *IMF Working Paper*, 10/146, 2010.

Xiaoyang Li. Productivity, restructuring, and the gains from takeovers. *Journal of Financial Economics*, 109(1): 250–271, 2013.

Vojislav Maksimovic, Gordon Phillips, and Nagpurnanand R Prabhala. Post-merger restructuring and the boundaries of the firm. *Journal of Financial Economics*, 102(2):317–343, 2011.

Marc J Melitz. The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6):1695–1725, 2003.

S.B. Moeller, F.P. Schlingemann, and R.N. Stulz. Wealth destruction on a massive scale? a study of acquiring-firm returns in the recent merger wave. *Journal of Finance*, 60:757–782, 2005.

D. J. Ravenscraft and F. M. Scherer. Divisional Sell-Off: A Hazard Function Analysis. *Managerial and Decision Economics*, 12:429–438, 1991.

C. M. Reinhart and K. S. Rogoff. *This Time is Different: Eight Centuries of Financial Folly*. Princeton University Press, Princeton, N.J, 2009.

M. Rhodes-Kropf and D. T Robinson. The Market for Mergers and the Boundaries of the Firm. *Journal of Finance*, 63(3):1169–1211, 2008.

Matthew Rhodes-Kropf and Steven Viswanathan. Market valuation and merger waves. *The Journal of Finance*, 59 (6):2685–2718, 2004.

Richard Roll. The hubris hypothesis of corporate takeovers. *Journal of business*, pages 197–216, 1986.

Joseph Alois Schumpeter. *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*, volume 55. Transaction publishers, 1934.

A. Shleifer and R. W. Vishny. Stock Market Driven Acquisitions. *Journal of Financial Economics*, 70:295–311, 2003.

Olga Stoddard and Ilan Noy. Fire-sale fdi? the impact of financial crises on foreign direct investment. *Review of Development Economics*, 19(2):387–399, 2015.

Cong Wang and Fei Xie. Corporate governance transfer and synergistic gains from mergers and acquisitions. *The Review of Financial Studies*, 22(2):829–858, 2008.

Utz Weitzel, Gerhard Kling, and Dirk Gerritsen. Testing the fire-sale fdi hypothesis for the european financial crisis. *Journal of International Money and Finance*, 49:211–234, 2014.

Peng Cheng Zhu, Vijay Jog, and Isaac Otchere. Partial acquisitions in emerging markets: A test of the strategic market entry and corporate control hypotheses. *Journal of Corporate Finance*, 17(2):288–305, 2011.

Acquirers and Financial Constraints:

Theory and Evidence from Emerging Markets

Online Appendix

A Proofs of Propositions

A.1 Acquired Share

A.1.1 Set of Assumptions for Proposition 1

Here, we analyze how the difference in acquired shares, $\hat{\alpha} - \hat{\alpha}^*$ varies with the borrowing constraint parameter τ. To obtain an unambiguous sign for this derivative, the following three assumptions are sufficient:

Assumption 1 ***Acquired share and synergy parameter***

The acquired share α is increasing in the synergy parameter $\phi_{i,j}$:

$$\alpha'(\phi_{i,j}) > 0. \tag{A.1}$$

Assumption 2 ***Pareto distribution for profits***

Profits y_i and y_j are distributed according to the Pareto distribution with shape parameter θ over the interval $[1; \frac{b}{\tau}\bar{y}]$.

$$G(y) = \frac{1 - y^{-\theta}}{1 - \left(\frac{b}{\tau}\bar{y}\right)^{-\theta}}. \tag{A.2}$$

This assumption is motivated by empirical studies showing that a Pareto distribution matches well the size and profit distribution of firms in both developed and developing countries (e.g. Di Giovanni et al., 2011). Its analytical convenience has also been emphasized in the international trade literature (e.g Melitz, 2003). We do not need to make any functional form assumption on the distribution of the synergy parameter, F.[1]

Assumption 3 ***Joint borrowing constraint***

The joint borrowing constraint is given by

$$b \leq \tau \phi_{i,j} y_i y_j^{\beta}, \tag{A.3}$$

with β satisfying $\bar{y} \leq \left(\frac{b}{\tau_n}\frac{1}{\bar{\phi}}\right)^{\frac{1}{\beta}}$, where $\bar{\phi} \geq \phi^{hi}$ is the upper limit of the support of the synergy distribution F.[2]

There is little guidance in the literature on how lenders evaluate the solvency of firms involved in acquisitions. Lenders might only focus on the total of the two firms' involved profits. Here, we assume that the borrowing limit depends on the product of the two firms' profits, that is one firm's profits do not perfectly substitute for the other firm's profits. This assumption allows us to prove the following proposition, but we later show that our results are

[1]We do, however, assume that all distributions are independent of each other.

[2]Intuitively, we assume that the joint borrowing constraint is binding whenever $y_i = 1$, no matter the values for y_j and $\phi_{i,j}$.

robust to alternative forms of this borrowing constraint, e.g. where the borrowing constraint is additive in the two firms' profits.

A.1.2 Notation

We use the following notation: The number of low- and high-value acquisitions for unconstrained acquirers are

$$n^{lo*} \equiv \int_{\phi^{lo}}^{\phi^{hi}} \int^{\frac{b}{\tau}} dF = G_i(b/\tau)F(\phi^{hi}) \tag{A.4}$$

$$n^{hi*} \equiv \int_{\phi^{hi}} dF = 1 - F(\phi^{hi}). \tag{A.5}$$

Similarly, for constrained acquirers, the numbers are

$$n^{lo} \equiv \int_{\phi^{lo}}^{\phi^{hi}} \int \int_{min\left(\frac{b}{\tau}, \underline{y}_i\right)}^{\frac{b}{\tau}} dG_i dG_j dF = \int_{\phi^{lo}}^{\phi^{hi}} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \int_{\underline{y}_i}^{\frac{b}{\tau}} dG_i dG_j dF \tag{A.6}$$

$$n^{hi} \equiv \int_{\phi^{hi}} \int \int_{\underline{y}_i} dG_i dG_j dF, \tag{A.7}$$

where

$$\underline{y}_i = \frac{b}{\tau} \frac{1}{\phi_{i,j} y_j^{\beta}}.$$

To understand the equality in the expression for n^{lo}, notice that the last integral is zero whenever $\underline{y}_i \geq b/\tau$. So we only need to keep track of instances, where $\underline{y}_i < b/\tau$, which is true whenever $y_j > \left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}$. Notice that our restriction on β ensures that $\underline{y}_i > 1$ for any values of $\phi_{i,j}$ and y_j.

Acquired shares are

$$\alpha^{lo*} \equiv \int_{\phi^{lo}}^{\phi^{hi}} \int^{\frac{b}{\tau}} \alpha_i dG_i dF = G_i(b/\tau) \int_{\phi^{lo}}^{\phi^{hi}} \alpha_{i,j} dF \tag{A.8}$$

$$\alpha^{hi*} \equiv \int_{\phi^{hi}} \alpha_{i,j} dF \tag{A.9}$$

$$\alpha^{lo} \equiv \int_{\phi^{lo}}^{\phi^{hi}} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \int_{\underline{y}_i}^{\frac{b}{\tau}} \alpha_{i,j} dG_i dG_j dF \tag{A.10}$$

$$\alpha^{hi} \equiv \int_{\phi^{hi}} \int \int_{\underline{y}_i} \alpha_{i,j} dG_i dG_j dF. \tag{A.11}$$

A.1.3 Proposition 1

Proposition 1 ***Fire-sale and selection effects for acquired shares during financial crises***

Under Assumptions 1 through 3 (listed in the online appendix), the acquired share of unconstrained firms decreases *during crises (fire-sale effect), i.e. if $\tau_c < \tau_n$, then $\hat{\alpha}^*_c < \hat{\alpha}^*_n$, whereas the shares acquired by constrained firms relative to the shares acquired by unconstrained firms become larger during financial crises (selection effect), i.e. if $\tau_c < \tau_n$ then $\hat{\alpha}_c - \hat{\alpha}^*_c > \hat{\alpha}_n - \hat{\alpha}^*_n$.*

Proof: The average share acquired by constrained firms minus the average share acquired by unconstrained firms is

$$\hat{\alpha} - \hat{\alpha}^* = \left(\omega\hat{\alpha}^{lo} + (1-\omega)\hat{\alpha}^{hi}\right) - \left(\omega^*\hat{\alpha}^{lo^*} + (1-\omega^*)\hat{\alpha}^{hi^*}\right). \tag{A.12}$$

Taking the partial derivative with respect to τ gives

$$\begin{aligned} \frac{\partial\left(\hat{\alpha} - \hat{\alpha}^*\right)}{\partial\tau} = &\left[\left(\hat{\alpha}^{hi^*} - \hat{\alpha}^{lo^*}\right) - \left(\hat{\alpha}^{hi} - \hat{\alpha}^{lo}\right)\right] \underbrace{\frac{\partial\omega}{\partial\tau}}_{=0} + \underbrace{\left(\hat{\alpha}^{hi^*} - \hat{\alpha}^{lo^*}\right)}_{>0} \underbrace{\left(\frac{\partial\omega^*}{\partial\tau} - \frac{\partial\omega}{\partial\tau}\right)}_{<0} \\ &+ \underbrace{\left[\omega\frac{\partial\hat{\alpha}^{lo}}{\partial\tau} + (1-\omega)\frac{\partial\hat{\alpha}^{hi}}{\partial\tau}\right]}_{=0} - \underbrace{\left[\omega^*\frac{\partial\hat{\alpha}^{lo^*}}{\partial\tau} + (1-\omega^*)\frac{\partial\hat{\alpha}^{hi^*}}{\partial\tau}\right]}_{=0} < 0. \end{aligned} \tag{A.13}$$

We prove the 5 signs step by step.

Step 1

The share of low-value acquisitions can be written as $\omega = \frac{n^{lo}}{n}$, where $n = n^{lo} + n^{hi}$ denote the total number of acquisitions by constrained acquirers. Then the partial derivative of the share of low-value acquisitions is:

$$\begin{aligned} \frac{\partial\omega}{\partial\tau} &= n^{-2}\left(\frac{\partial n^{lo}}{\partial\tau}n^{hi} - \frac{\partial n^{hi}}{\partial\tau}n^{lo}\right) \\ &= \frac{n^{-2}}{1-\left(\frac{b}{\tau}\bar{y}\right)^{-\theta}}\left(\theta\frac{n^{lo}}{\tau}n^{hi} - \theta\frac{n^{hi}}{\tau}n^{lo}\right) = 0, \end{aligned}$$

where we used

$$
\begin{aligned}
n^{lo} &= \int_{\phi^{lo}}^{\phi^{hi}} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \int_{\underline{y}_i}^{\frac{b}{\tau}} dG_i dG_j dF \\
&= -\frac{1}{1-\left(\frac{b}{\tau}\bar{y}\right)^{-\theta}} \int_{\phi^{lo}}^{\phi^{hi}} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \left(\left(\frac{b}{\tau}\right)^{-\theta} - \left(\frac{b}{\tau}\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta} \right) dG_j dF \\
&= -\frac{1}{1-\left(\frac{b}{\tau}\bar{y}\right)^{-\theta}} \left(\frac{b}{\tau}\right)^{-\theta} \int_{\phi^{lo}}^{\phi^{hi}} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \left(1 - \left(\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta} \right) dG_j dF \\
\frac{\partial n^{lo}}{\partial \tau} &= \frac{\theta}{1-\left(\frac{b}{\tau}\bar{y}\right)^{-\theta}} \frac{n^{lo}}{\tau}
\end{aligned}
$$

and

$$
\begin{aligned}
n^{hi} &= \int_{\phi^{hi}} \int \int_{\underline{y}_i} dG_i dG_j dF \\
&= -\frac{1}{1-\left(\frac{b}{\tau}\bar{y}\right)^{-\theta}} \left(\frac{b}{\tau}\right)^{-\theta} \int_{\phi^{hi}} \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta} \right) dG_j dF \\
\frac{\partial n^{hi}}{\partial \tau} &= \frac{\theta}{1-\left(\frac{b}{\tau}\bar{y}\right)^{-\theta}} \frac{n^{hi}}{\tau}.
\end{aligned}
$$

Step 2

It immediately follows from Assumption 1 that

$$
\hat{\alpha}^{hi^*} - \hat{\alpha}^{lo^*} > 0.
$$

Step 3

For unconstrained acquirers, we have

$$
\frac{\partial \omega^*}{\partial \tau} < 0.
$$

The share of low-value acquisitions can be written as $\omega^* = \frac{n^{lo^*}}{n^*}$, where $n^* = n^{lo^*} + n^{hi^*}$ denote the total number of acquisitions by unconstrained acquirers. Then the partial derivative of the share of low-value acquisitions is:

$$
\begin{aligned}
\frac{\partial \omega^*}{\partial \tau} &= n^{*-2} \left(\frac{\partial n^{lo^*}}{\partial \tau} n^{hi^*} - \frac{\partial n^{hi^*}}{\partial \tau} n^{lo^*} \right) \\
&= -\frac{1}{n^{*2}} \frac{b}{\tau^2} g_i\left(b/\tau\right) F(\phi^{hi}) n^{hi^*} < 0,
\end{aligned}
$$

because $\frac{\partial n^{hi^*}}{\partial \tau} = 0$. Together with the results from Step 1, it follows that

$$\frac{\partial \omega^*}{\partial \tau} - \frac{\partial \omega}{\partial \tau} < 0.$$

Step 4

$$\omega \frac{\partial \hat{\alpha}^{lo}}{\partial \tau} + (1-\omega) \frac{\partial \hat{\alpha}^{hi}}{\partial \tau} = 0.$$

For the first term we have

$$\begin{aligned}
\hat{\alpha}^{lo} &= \frac{\int_{\phi^{lo}}^{\phi^{hi}} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \int_{\underline{y}_i}^{\frac{b}{\tau}} \alpha_{i,j} dG_i dG_j dF}{\int_{\phi^{lo}}^{\phi^{hi}} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \int_{\underline{y}_i}^{\frac{b}{\tau}} dG_i dG_j dF} \\
&= \frac{\left(\frac{b}{\tau}\right)^{-\theta} \int_{\phi^{lo}}^{\phi^{hi}} \alpha_{i,j} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \left(1 - \left(\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta}\right) dG_j dF}{\left(\frac{b}{\tau}\right)^{-\theta} \int_{\phi^{lo}}^{\phi^{hi}} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \left(1 - \left(\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta}\right) dG_j dF} \\
&= \frac{\int_{\phi^{lo}}^{\phi^{hi}} \alpha_{i,j} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \left(1 - \left(\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta}\right) dG_j dF}{\int_{\phi^{lo}}^{\phi^{hi}} \int_{\left(\frac{1}{\phi_{i,j}}\right)^{\frac{1}{\beta}}} \left(1 - \left(\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta}\right) dG_j dF},
\end{aligned}$$

which is independent of τ, so that $\partial \hat{\alpha}^{lo} / \partial \tau = 0$. For the second term we have

$$\begin{aligned}
\hat{\alpha}^{hi} &= \frac{\int_{\phi^{hi}} \int \int_{\underline{y}_i} \alpha_{i,j} dG_i dG_j dF}{\int_{\phi^{hi}} \int \int_{\underline{y}_i} dG_i dG_j dF} \\
&= \frac{\left(\frac{b}{\tau}\right)^{-\theta} \int_{\phi^{hi}} \alpha_{i,j} \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta}\right) dG_j dF}{\left(\frac{b}{\tau}\right)^{-\theta} \int_{\phi^{hi}} \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta}\right) dG_j dF} \\
&= \frac{\int_{\phi^{hi}} \alpha_{i,j} \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta}\right) dG_j dF}{\int_{\phi^{hi}} \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_j^{\beta}}\right)^{-\theta}\right) dG_j dF},
\end{aligned}$$

which is independent of τ, so that $\partial \hat{\alpha}^{hi} / \partial \tau = 0$.

Step 5

$$\omega^* \frac{\partial \hat{\alpha}^{lo^*}}{\partial \tau} + (1-\omega)\frac{\partial \hat{\alpha}^{hi^*}}{\partial \tau} = 0.$$

This is true because both $\hat{\alpha}^{lo^*}$ and $\hat{\alpha}^{hi^*}$ are independent of τ:

$$\hat{\alpha}^{lo^*} = \frac{G(b/\tau)\int_{\phi^{lo}}^{\phi^{hi}} \alpha_i dF}{G(b/\tau)F(\phi^{hi})} = \frac{\int_{\phi^{lo}}^{\phi^{hi}} \alpha_i dF}{F(\phi^{hi})}$$
$$\hat{\alpha}^{hi^*} = \frac{\int_{\phi^{hi}} \alpha_i dF}{1-F(\phi^{hi})}. \qquad \blacksquare$$

The following two corrolaries immediately follow from the proof:

Corollary 1 ***Decrease in acquired shares of unconstrained firms during crises***

Under Assumptions 1, the shares acquired by unconstrained firms become smaller during financial crises, i.e. if $\tau_c < \tau_n$ *then* $\hat{\alpha}^*_c < \hat{\alpha}^*_n$.

Corollary 2 ***Constant acquired shares of constrained firms during crises***

Under Assumptions 1-3, the shares acquired by constrained firms stay constant during financial crises, i.e. if $\tau_c < \tau_n$ *then* $\hat{\alpha}_c = \hat{\alpha}_n$.

A.2 Flipping

A.2.1 Model Exposition

Here, we describe the model underlying Section 3.3. The model consists of three periods, labelled 0, 1 and 2. Periods 0 and 1 follow the same setup as the two-period model explained in Section 3.1. We extend this two-period model by an additional production period, period 2, that follows the same setup as period 1. In period 2, after states have been realized, the acquirer j receives an all-or-nothing offer $V^o_{i,j}$ for her entire share $\alpha_{i,j}$ of firm i.

We make a number of assumptions to simplify the analysis. The assumptions are that: (i) every seller can find a new acquirer to buy back his initial acquisition, and similarly, every target firm that was not acquired in period 1 can find a new acquirer; (ii) the new acquirer making the buy-back offer operates the firm using the same technology as the original owner of the firm (i.e. $\phi_{i,j} = 1$); (iii) acquirer and seller engage in Nash bargaining over any surplus of an acquisition, with $1-\sigma$ denoting the fraction of the surplus that the acquirer obtains; and (iv) profits y_i and y_j follow an AR(1) process with persistence ρ, so that

$$y_{i,2} = 1 - \rho + \rho y_{i,1} + \epsilon_i,$$

and similar for $y_{j,2}$, where $y_{i,2}$ is the target firm's profits in period 2, which is revealed at the beginning of period 2. Let the expected value for $y_{i,2}$ conditional on the realization of $y_{i,1}$ be denoted $\mathbb{E}(y_{i,2}) = 1 - (1 - y_{i,1})\rho$.

We discuss the firms' decision problems in reverse order: First, we show under which conditions acquisitions are resold at the end of the first period. Then, we study the initial acquisition decision in period 1.

Period 2: Resale. It is optimal for the initial acquirer j to resell the firm i whenever the outside offer $V_{i,j}^{o}$ exceeds the value of holding onto the firm. The outside offer is the sum of the value of holding onto the firm plus a share of the surplus from the transaction. Assuming Nash bargaining, buyer and seller share any surplus from the transaction, with share $1 - \sigma$ going to the initial acquirer. The surplus from selling is the value (under new management) if the firm is sold, V_i^{flip}, minus the value if it is not sold, $V_{i,j}^{keep}$. The outside offer is therefore

$$V_{i,j}^{o} = V_{i,j}^{keep} + (1 - \sigma)\left(V_i^{flip} - V_{i,j}^{keep}\right) \tag{A.14}$$

Then, the acquirer sells back the firm if $V_{i,j}^{o} > V_{i,j}^{keep}$, that is $V_i^{flip} > V_{i,j}^{keep}$.

The value of reselling the firm are the net profits of production in period 2, $V_i^{flip} = y_{i,2} - b$, since we assume that $\phi_{i,j} = 1$ after the flip. The value of holding onto the firm depends on the liquidity position of the post-acquisition entity. If the post-acquisition entity does not face liquidity problems in period 2 (i.e. the synergy parameter is high enough, $\phi_{i,j} \geq \underline{\phi}_{i,j,2}$), it can pay for the upfront costs of production and produces in period 2. Then, the value of holding onto the firm equals the net profits in period 2, $\phi_{i,j}(y_{i,2} - b)$. Alternatively, the firm cannot produce and exits the market, so that net profits are 0:

$$V_{i,j}^{keep} = \begin{cases} \phi_{i,j}(y_{i,2} - b) & \text{if} \quad \phi_{i,j} \geq \underline{\phi}_{i,j,2} \\ 0 & \text{if} \quad \phi_{i,j} < \underline{\phi}_{i,j,2}. \end{cases} \tag{A.15}$$

So the acquirer sells back the firm, i.e. $V_i^{flip} > V_{i,j}^{keep}$, under two cases: First, all acquisitions driven by liquidity concerns (low-value acquisitions) will be flipped because the target firm no longer requires liquidity for production in period 2. This is the case for $\phi_{i,j} < \phi^{hi} = 1$ and this type of flipping occurs even if the post-acquisition entity is liquid enough to produce in period 2.

Second, even some high-synergy acquisitions with $\phi_{i,j} \geq \phi^{hi} = 1$ might get flipped. This happens whenever the post-acquisition entity becomes liquidity-constrained in period 2. We refer to this type of flipping as "forced flipping". The probability of forced flipping is denoted $1 - p_{i,j}$, where $p_{i,j}$ is the probability that the post-acquisition entity has enough liquidity, conditional on having had enough liquidity in period 1:

$$p_{i,j} \equiv \begin{cases} Pr\left(\phi_{i,j} \geq \underline{\phi}_{i,j,2} \quad | \quad \phi_{i,j} \geq \underline{\phi}_{i,j,1}\right) & y_{j,2} < \infty \\ 1 & y_{j,2} \rightarrow \infty. \end{cases}$$

For unconstrained acquirers, $y_{j,2} \rightarrow \infty$, the probability of having enough liquidity is 1 by definition. For constrained acquirers, $y_{j,2} < \infty$, having enough liquidity means that the acquirer can pay for its own upfront fixed cost, $y_j \geq \frac{b}{\tau}$, and the target firm satisfies the joint borrowing constraint, $\phi_{i,j} \geq \underline{\phi}_{i,j}$. Importantly, forced flipping is only relevant for constrained acquirers.

Period 1: Initial Acquisition. Now that we have solved the flipping problem in period 2, we can look at the initial acquisition problem in period 1: A target firm i is acquired by an acquirer j if an acquisition generates positive surplus, i.e. if the value of a firm being acquired, $V_{i,j}^{acq}$, exceeds the value of it not being acquired, V_i^{tar}.

The value of a potential target firm i that is not acquired in period 1 is the sum of both periods' (expected) profits:

$$V_i^{tar} = \begin{cases} 0 + \mathbb{E}(y_{i,2}) - b & \text{if} \quad y_{i,1} < b/\tau_1 \\ y_{i,1} - b + \mathbb{E}(y_{i,2}) - b & \text{if} \quad y_{i,1} \geq b/\tau_1. \end{cases}$$

Period 1 profits are $y_{i,1} - b$ if the firm could pay the upfront costs and 0 otherwise. In period 2, the owner can keep or sell the firm. Either way, the firm produces and generates expected profits $\mathbb{E}(y_{i,2}) - b$.

The value of a firm i acquired in period 1 by firm j is

$$V_{i,j}^{acq} = \begin{cases} \phi_{i,j}(y_{i,1} - b) + \mathbb{E}(V_i^{flip}) & \text{if} \quad \phi_{i,j} < \phi^{hi} \\ \phi_{i,j}(y_{i,1} - b) + p_{i,j}\left[\phi_{i,j}\left(\mathbb{E}(y_{i,2}) - b\right)\right] + (1 - p_{i,j})\,\mathbb{E}(V_i^{flip}) & \text{if} \quad \phi_{i,j} \geq \phi^{hi}. \end{cases}$$

The first term, $\phi_{i,j}(y_{i,1} - b)$, is the profit from producing in period 1. In period 2, the acquirer flips the firm if synergies are low, $\phi_{i,j} < \phi^{hi}$, or if he is forced to sell, which happens with probability $1 - p_{i,j}$. Otherwise, he produces and generates expected profits equal to $\phi_{i,j}\left(\mathbb{E}(y_{i,2}) - b\right)$.

Then, after some algebra, the surplus of an acquisition in period 1, $V_{i,j}^{acq} - V_i^{tar}$, can be written as

$$S_{i,j} = \begin{cases} \phi_{i,j}(y_{i,1} - b) < 0 & \text{if} \quad y_{i,1} < b/\tau_1 \quad \& \quad \phi_{i,j} < \phi^{lo} \\ \phi_{i,j}(y_{i,1} - b) \geq 0 & \text{if} \quad y_{i,1} < b/\tau_1 \quad \& \quad \phi^{lo} \leq \phi_{i,j} < \phi^{hi} \\ (\phi_{i,j} - 1)(y_{i,1} - b) < 0 & \text{if} \quad y_{i,1} \geq b/\tau_1 \quad \& \quad \phi_{i,j} < \phi^{hi} \\ \phi_{i,j}(y_{i,1} - b) + p_{i,j}(\phi_{i,j} - 1)\mathbb{E}(V_i^{flip}) > 0 & \text{if} \quad y_{i,1} < b/\tau_1 \quad \& \quad \phi_{i,j} \geq \phi^{hi} \\ (\phi_{i,j} - 1)(y_{i,1} - b) + p_{i,j}(\phi_{i,j} - 1)\mathbb{E}(V_i^{flip}) \geq 0 & \text{if} \quad y_{i,1} \geq b/\tau_1 \quad \& \quad \phi_{i,j} \geq \phi^{hi}. \end{cases} \tag{A.16}$$

where the inequality signs follow from the restriction on $\phi_{i,j}$. Figure 4 in the main body of the text illustrates the resulting five cases.

A.2.2 Set of Assumptions for Proposition 2

Here, we analyze how the difference in flipping rates, $\frac{n^{flip}}{n} - \frac{n^{flip^*}}{n^*}$ varies with the borrowing constraint parameter τ. To obtain an unambiguous sign for this derivative, Assumptions 2, 2 and the following assumption are sufficient:

Assumption 4 ***AR(1) process for profits***

The temporary shock to profits, ϵ_i, is distributed such that

- *unconditional profits for period 2 are distributed according to the Pareto distribution with shape parameter θ over the interval $[1; \frac{b}{\tau_t}\bar{y}]$*
- *profits for period 2 conditional on profits for period 1 are distributed according to the Pareto distribution with shape parameter θ over the interval $[m(y_1); \frac{b}{\tau_t}\bar{y}]$, where $m(y_1) = \underline{m}y_1^{\eta}$ is the scale parameter with $sgn\ (\eta) = sgn(\rho)$. We assume that the persistence parameter for profits satisfies $\rho > 0$.*

The first part of the assumption simply ensures that the distribution of profits follows a Pareto distribution in every period. The second part captures the idea that the distribution of profits for period 2, $y_{i,2}$, has a minimum threshold that is increasing in the profits for period 1, $y_{1,i}$. It is intuitive that the distribution of $y_{i,2}$ conditional on a high realization of $y_{i,1}$ first-order stochastically dominates the distribution of $y_{i,2}$ conditional on a low realization of $y_{i,1}$, at least as long as profits have some persistence. Here, we use a specific example of stochastic dominance in case of the Pareto distribution.

A.2.3 Notation

Let $n = n^{lo} + n^{hi}$ denote the total number of constrained acquisitions made at the end of period 0. The number of flipped, unconstrained acquisitions in period 2 is n^{flip}. For unconstrained acquirers, we add an asterisk to these variables.

A.2.4 Proposition 2

Proposition 2 ***Fire-sale and selection effects for flipping rates of acquisitions made during financial crises*** *Under Assumptions 2 through 4 (listed in the online appendix), flipping rates of acquisitions made by unconstrained firms increase (fire-sale effect), i.e. if* $\tau_c < \tau_n$ *then* $\frac{n_c^{flip^*}}{n_c^*} > \frac{n_n^{flip^*}}{n_n^*}$, *whereas flipping rates of acquisitions made by constrained firms relative to those made by unconstrained firms become smaller for acquisitions made during financial crises (selection effect), i.e. if* $\tau_c < \tau_n$ *then* $\frac{n_c^{flip}}{n_c} - \frac{n_c^{flip^*}}{n_c^*} < \frac{n_n^{flip}}{n_n} - \frac{n_n^{flip^*}}{n_n^*}$.

Proof: The flipping rates of acquisitions undertaken by constrained firms minus the flipping rates of acquisitions undertaken by unconstrained firms is

$$\frac{n^{flip}}{n} - \frac{n^{flip^*}}{n^*} = \frac{n^{lo} + (1-p)n^{hi}}{n^{lo} + n^{hi}} - \frac{n^{lo^*}}{n^{lo^*} + n^{hi^*}}, \tag{A.17}$$

where p is the share of high-value post-acquisition entities that have enough liquidity in the second period, in the total mass of high-value post-acquisition entities.[3] Taking the partial derivative with respect to τ gives

$$\frac{\partial\left(\frac{n^{flip}}{n} - \frac{n^{flip^*}}{n^*}\right)}{\partial\tau_1} = \frac{p}{n^2}\underbrace{\left(\frac{\partial n^{lo}}{\partial\tau_1}n^{hi} - \frac{\partial n^{hi}}{\partial\tau_1}n^{lo}\right)}_{=0} - \underbrace{\frac{\partial p}{\partial\tau_1}}_{<0}\frac{n^{hi}}{n} - \underbrace{\frac{\partial\omega^*}{\partial\tau_1}}_{<0} > 0. \tag{A.18}$$

We prove the 3 signs step by step.

Step 1

In the proof for proposition 1, we have shown that under Assumptions 2 and 3,

$$\frac{\partial n^{lo}}{\partial\tau_1}n^{hi} - \frac{\partial n^{hi}}{\partial\tau_1}n^{lo} = \theta\frac{n^{lo}}{\tau}n^{hi} - \theta\frac{n^{hi}}{\tau}n^{lo} = 0.$$

Step 2

[3] It is defined as

$$p = \frac{\int_{\phi^{hi}}\int\int_{\underline{y}_{i,1}}\int\int_{\underline{y}_{i,2}} dG_{i,2}dG_{j,2}dG_{i,1}dG_{j,1}dF}{\int_{\phi^{hi}}\int\int_{\underline{y}_{i,1}} dG_{i,1}dG_{j,1}dF}.$$

According to Assumption 4, the distribution of $y_{i,2}$ depends on the realization for $y_{i,1}$. In particular, we have

$$G_{i,2}(y_{i,2}|y_{i,1}) = \frac{1 - \left(\frac{m(y_{i,1})}{y_{i,2}}\right)^{\theta}}{1 - \left(\frac{m(y_{i,1})}{\frac{b}{\tau_2}\bar{y}}\right)^{\theta}}.$$

Then, we can also write

$$\begin{aligned}
p &= \frac{\int_{\phi^{hi}} \int \int_{\underline{y}_{i,1}} \int \left(1 - G_{i,2}(\underline{y}_{i,2}|y_{i,1})\right) dG_{j,2} dG_{i,1} dG_{j,1} dF}{\int_{\phi^{hi}} \int \int_{\underline{y}_{i,1}} dG_{i,1} dG_{j,1} dF} \\
&= \frac{-\frac{1}{1-\bar{y}^{-\theta}} \left(\frac{b}{\tau_2}\right)^{-\theta} \int_{\phi^{hi}} \int \int_{\underline{y}_{i,1}} m(y_{i,1})^{\theta} \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_{j,2}^{\beta}}\right)^{-\theta}\right) dG_{j,2} dG_{i,1} dG_{j,1} dF}{-\frac{1}{1-\bar{y}^{-\theta}} \left(\frac{b}{\tau_1}\right)^{-\theta} \int_{\phi^{hi}} \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_{j,1}^{\beta}}\right)^{-\theta}\right) dG_{j,1} dF} \\
&= \left(\frac{\underline{m}\tau_2}{\tau_1}\right)^{\theta} \frac{\int_{\phi^{hi}} \int \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_{j,2}^{\beta}}\right)^{-\theta}\right) \int_{\underline{y}_{i,1}} y_{i,1}^{\eta\theta} dG_{i,1} dG_{j,2} dG_{j,1} dF}{\int_{\phi^{hi}} \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_{j,1}^{\beta}}\right)^{-\theta}\right) dG_{j,1} dF} \\
&= -\left(\frac{\underline{m}\tau_2}{\tau_1}\right)^{\theta} \frac{1}{1 - \bar{y}^{-(1-\eta)\theta}} \left(\frac{b}{\tau_1}\right)^{-(1-\eta)\theta} \frac{\int_{\phi^{hi}} \int \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_{j,2}^{\beta}}\right)^{-\theta}\right) \int_{\underline{y}_{i,1}} y_{i,1}^{\eta\theta} dG_{i,1} dG_{j,2} dG_{j,1} dF}{\int_{\phi^{hi}} \int \left(\bar{y}^{-\theta} - \left(\frac{1}{\phi_{i,j} y_{j,1}^{\beta}}\right)^{-\theta}\right) dG_{j,1} dF}.
\end{aligned}$$

Then, taking the partial derivative with respect to τ_1 yields:

$$\frac{\partial p}{\partial \tau_1} = -\eta\theta \frac{p}{\tau_1}$$

This is negative because, by Assumption 4, $\eta > 0$.

Step 3

Note that, for unconstrained acquirers, the proportion of flipped acquisitions is equal to the share of low-value acquisitions in total acquisitions, given by ω^*. In the proof for proposition 1, we have shown that $\frac{\partial \omega^*}{\partial \tau_1} < 0$. Note that this result is independent of Assumptions 1-3. ■

The following two corrolaries immediately follow from the proof:

Corollary 3 ***Higher flipping rates for unconstrained acquirers***

Acquisitions made by unconstrained firms during a financial crisis have higher flipping rates than acquisitions made by unconstrained firms during normal times, i.e., if $\tau_1 = \tau_c < \tau_1 = \tau_n$ *then* $\frac{n_c^{flip*}}{n_c^*} > \frac{n_n^{flip*}}{n_n^*}$.

Corollary 4 ***Lower flipping rates for constrained acquirers***

Under Assumptions 2 - 4, acquisitions made by unconstrained firms during a financial crisis have lower flipping rates than acquisitions made by unconstrained firms during normal times, i.e., if $\tau_1 = \tau_c < \tau_1 = \tau_n$ *then* $\frac{n_c^{flip}}{n_c} < \frac{n_n^{flip}}{n_n}$.

B Calibration

Here, we provide more details on our calibration.

We first normalize the fixed cost / debt parameter b to 1. The borrowing constraint parameter, τ, corresponds to the maximum debt-to-value in our model. We choose $\tau = 0.75$ during normal times and $\tau = 0.6$, translating into a 25 percent decline in the maximum debt-to-value ratio. In the analytical section, we had assumed a joint borrowing constraint where the two firms' profits are neither substitutes nor complements. This was partly done for analytical convenience. In our simulation, we show that our results from the analytical section are robust to an alternative, and perhaps more natural, assumption that banks consider acquirer's and target's profits as perfect substitutes:

$$2b \leq \tau \left(\phi_{i,j} y_i + y_j\right).$$

Under this formulation banks consider only the value of the joint acquirer-target entity when extending loans.

For the distribution of profits, y_i and y_j, we choose a log-normal distribution. Several studies have found that both log-normal and Pareto distributions capture reasonably well the distribution of sales and employment. For example, Di Giovanni et al. (2011) estimate that a Pareto distribution with a shape parameter close to, but above 1 captures the size distribution of firms across many countries. The distribution of sales is closely linked to the distribution of productivity and profits. For instance, in a model with monopolistic competition (see Melitz, 2003, for example), the shape parameter for the sales distribution is simply the elasticity of substitution between the products of firms less the shape parameter of the productivity distribution. Assuming an elasticity of substitution around 6, a shape parameter for the productivity of 5 is consistent with the evidence on the size distribution. We use a log-normal distribution for productivity instead of a Pareto distribution and choose its parameters to match the mean and the variance of a Pareto distribution with scale parameter 1 and shape parameter 5.[4]

We have less guidance on the distribution of synergies, $\phi_{i,j}$, which captures the technological benefits from an acquisition net of the costs of acquisitions (such as those stemming from restructuring, legal fees etc.). We assume a normal distribution with mean 1, which means that half the firm pairs draw synergy parameters that *lower* the net productivity of the target firm. There is a considerable body of literature in finance that documents value-

[4] We choose the log-normal distribution because we assume that $\log(y)$ follows an AR(1) process. If the errors of this AR(1) process are Gaussian, then $\log(y_t)$ is normally distributed as $t \to \infty$. Our simulations based on a Pareto distributions are almost identical.

Table B.1: Acquired Share in Data and Model

	< 50	$50-60$	$60-70$	$70-80$	$80-90$	$90-100$	100	$\hat{\alpha}$
Data	28.8%	8.8%	5.9%	2.5%	3.7%	2.7%	47.7%	70.2%
Model	29.7%	5.6%	5.1%	4.5%	4.1%	3.8%	47.5%	72.4%

Notes: The table reports average acquired shares for the total of acquisitions during normal times in the data and the model for different deciles (expressed in percent). For this table, we set $\tau = 0.75$.

destruction in M&As (see for example Moeller et al., 2005), as well as value gains for shareholder of both acquiring and target firms (Bris and Cabolis, 2008; Chari et al., 2010). Our assumption of a normal distribution takes both these cases into account.

We assume that the acquired share is a function of the synergy parameter[5]

$$\alpha_{i,j} = \max(0, \min(1, \psi_0 \phi_{i,j}^{\psi_1})), \qquad \psi_0 > 0\ ,\ \psi_1 > 0. \tag{B.1}$$

The form for the acquired share function ensures that the acquired share is between 0 and 1 and increasing in $\phi_{i,j}$. Recall that we provided an extensive discussion about the assumption of a continuous and positive relationship between $\alpha_{i,j}$ and $\phi_{i,j}$ in Section 3.2. The parameters ψ_0, ψ_1 and the standard deviation of the distribution of $\phi_{i,j}$ together affect the distribution of acquired shares. As the elasticity ψ_1 increases, the acquired share is more sensitive to synergies $\phi_{i,j}$, so that small variations in $\phi_{i,j}$ lead to strong variations in $\alpha_{i,j}$. Since we have to restrict $\alpha_{i,j}$ to be between 0 and 1, an increase in ψ_1 raises the share of full acquisitions. The parameter ψ_0 strongly affects the number of acquisitions below 50%. A higher value for ψ_0 lowers the share of acquisitions below 50%. Finally, the standard deviation of $\phi_{i,j}$ determines the shape of the acquired share distribution. As it increases, acquired shares $\alpha_{i,j}$ are more and more uniformly distributed.

We choose ψ_0 and ψ_1 and the standard deviation of the synergy distribution to match as best as possible the fraction of acquisition below 50%, the fraction of full acquisitions, and the average acquired share that we observe in the data. Table B.1 compares acquired shares in the data and the model. We cannot perfectly match the three moments: Whereas the fraction of acquisition below 50% is almost identical in model and data, the fraction of full acquisitions is somewhat larger in the data compared to the model, although the average acquired share is smaller. The reason for the discrepancy is that the model does not feature many small scale acquisitions with shares of less than 30%, which can be observed in the data. However, the fit is fairly good for our very parsimonious model.[6]

[5]We assume a continuous positive relationship for simplicity. We also tried $\alpha(\phi_{i,j})$ with discontinuously higher synergies at ownership shares above 50% to match the findings of Chari et al. (2010), but this does not change our results. We find in our quantitative assessments of the model that $\alpha_{i,j} = 0.5$ corresponds to $\phi_{i,j}$ well above 1, and at that level of $\phi_{i,j}$, the joint borrowing constraint is almost never binding. Thus a discontinuous increase of $\phi_{i,j}$ at the threshold of $\alpha_{i,j} = 0.5$ does not affect our results significantly.

[6]The corresponding parameter values are $\psi_0 = 0.18$, $\psi_1 = 1.75$ and a standard deviation of 2.5.

C Additional Tables

Table C.1: Summary Statistics of Macroeconomic Controls in Baseline Regressions (1990-2007)

	Obs.	Mean	S.D.	Q1	Median	Q3
Banking crisis	28,019	0.12	0.33	0.00	0.00	0.00
GDP per capita	28,019	9683	7342	5270	7968	9994
Real GDP growth	28,019	5.67	4.11	3.76	5.79	8.89
Nominal exchange rate depreciation	28,019	1.71	15.63	-0.81	0.00	1.39
Use of IMF credit and loans as % of country quota	28,019	62.39	160.81	0.00	0.00	33.75

Source: Penn World Tables, the IMF's *International Financial Statistics*, Taiwan's National Statistical Office, and the Central Bank of the Republic of China. See paper text for details.

Table C.2: Robustness of Table 3: Controls and fixed effects (OLS)

	(1)	(2)	(3)	(4)	(5)
Acquired share					
β_D	0.00	0.00	0.00	0.01^a	0.01
	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)
β_C	-0.06^a	-0.03^a	-0.02^b	-0.03^a	-0.03^a
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
$\beta_{D,C}$	0.10^a	0.08^a	0.08^a	0.08^a	0.08^a
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
No. obs.	28,019	28,019	28,019	28,019	28,019
R^2	0.0089	0.0567	0.0743	0.0755	0.1328
Majority acquisition					
β_D	-0.00	-0.01	-0.01	0.01	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
β_C	-0.06^a	-0.03^b	-0.02	-0.03^b	-0.03^c
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
$\beta_{D,C}$	0.12^a	0.10^a	0.09^a	0.10^a	0.09^a
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
No. obs.	28,019	28,019	28,019	28,019	28,019
R^2	0.0053	0.0449	0.0598	0.0627	0.1117
Full acquisition					
β_D	0.00	-0.00	-0.00	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
β_C	-0.10^a	-0.05^a	-0.05^a	-0.06^a	-0.05^a
	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)
$\beta_{D,C}$	0.13^a	0.11^a	0.10^a	0.11^a	0.10^a
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
No. obs.	28,019	28,019	28,019	28,019	28,019
R^2	0.0089	0.0557	0.0720	0.0703	0.1337
Macroeconomic Controls	Yes	Yes	Yes	Yes	Yes
Target-Country FE	No	Yes	Yes	Yes	No
Target-Industry FE	No	No	Yes	No	No
Acquirer-Industry FE	No	No	No	Yes	No
Target-Country $\times$ Target-Industry FE	No	No	No	No	Yes

Notes: Table reports robustness checks for the baseline results in Table 3 using different fixed effect constellations, namely: (1) no fixed effects (*No FE*); (2) macro controls and target country fixed effects (*country FE*); (3) macro controls, target country, and target industry fixed effects (*country & Tarin FE*); and (4) macro controls, target country, and acquirer industry fixed effects (*country & Acqin FE*). The last column reproduces our benchmark results with macro controls, and target country$\times$industry fixed effects (*Benchmark*). These five fixed effects constellations are used across three alternative model specifications, in which the dependent variable is defined either as (i) the fraction acquired (Eq. 4.1); (ii) a majority dummy (Eq. 4.2); and (iii) a full acquisition dummy (Eq. 4.2). See the text of the paper for detailed explanations.^{a} $p < 0.01$, ^{b} $p < 0.05$, ^{c} $p < 0.1$.

Table C.3: Robustness of Table 3: Controls and fixed effects (GLM)

	(1)	(2)	(3)	(4)	(5)
Acquired share					
β_D	0.02	0.00	0.00	0.06^b	0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
β_C	-0.25^a	-0.13^a	-0.11^b	-0.14^a	-0.14^a
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
$\beta_{D,C}$	0.45^a	0.37^a	0.37^a	0.40^a	0.39^a
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
No. obs.	28,019	28,019	28,019	28,019	28,019
Majority acquisition					
β_D	-0.02	-0.04	-0.04	0.03	-0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
β_C	-0.28^a	-0.14^b	-0.11	-0.15^b	-0.14^c
	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)
$\beta_{D,C}$	0.55^a	0.46^a	0.47^a	0.51^a	0.50^a
	(0.08)	(0.08)	(0.08)	(0.08)	(0.09)
No. obs.	28,019	28,019	28,019	28,019	27,987
Full acquisition					
β_D	0.02	-0.02	-0.02	0.04	0.03
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
β_C	-0.42^a	-0.24^a	-0.22^a	-0.25^a	-0.25^a
	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)
$\beta_{D,C}$	0.55^a	0.46^a	0.47^a	0.49^a	0.47^a
	(0.08)	(0.08)	(0.08)	(0.08)	(0.09)
No. obs.	28,019	28,019	28,019	28,019	27,997
Macroeconomic Controls	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	Yes	Yes	Yes
Target-Industry FE	No	No	Yes	No	No
Acquirer-Industry FE	No	No	No	Yes	No
Country × Target-Industry FE	No	No	No	No	Yes

Notes: Table reports robustness checks for the baseline results in Table 3 using the Generalized Linear Model and different fixed effect constellations. See Table C.2 for notes. ^{a} $p < 0.01$, ^{b} $p < 0.05$, ^{c} $p < 0.1$.

Table C.4: Robustness of Table 3 with pre-existing ownership

	Share	Maj.	Full
β_D	0.01^c	-0.00	0.01
	(0.00)	(0.01)	(0.01)
β_C	-0.05^a	-0.05^a	-0.07^a
	(0.01)	(0.01)	(0.01)
$\beta_{D,C}$	0.06^a	0.07^a	0.08^a
	(0.01)	(0.02)	(0.02)
$\beta_{previous}$	-0.42^a	-0.53^a	-0.48^a
	(0.00)	(0.01)	(0.00)
No. obs.	28,019	28,019	28,019
R^2	0.33	0.27	0.26

Notes: Estimates of the baseline regression in Table 3 including a dummy variable indicating previous ownership of the acquirer in the target firm. ^{a} $p < 0.01$, ^{b} $p < 0.05$, ^{c} $p < 0.1$.

Table C.5: Robustness of Table 3 with a financial sector acquirer-target dummy

	Share	Maj.	Full
β_D	0.01	-0.00	0.01
	(0.01)	(0.01)	(0.01)
β_C	-0.03^a	-0.03^c	-0.05^a
	(0.01)	(0.02)	(0.02)
$\beta_{D,C}$	0.08^a	0.09^a	0.10^a
	(0.01)	(0.02)	(0.02)
β_{fire}	-0.02^b	-0.03^b	-0.03^c
	(0.01)	(0.01)	(0.01)
No. obs.	28,019	28,019	28,019
R^2	0.13	0.11	0.13

Notes: Estimates of the baseline regression in Table 3 including a dummy variable indicating that both acquirer and target are from the FIRE (Finance, Insurance and Real Estate) sectors. ^{a} $p < 0.01$, ^{b} $p < 0.05$, ^{c} $p < 0.1$.

Table C.6: Robustness of Table 3 without financial acquisitions

	Share	Maj.	Full
β_D	-0.01	-0.02^a	-0.01
	(0.01)	(0.01)	(0.01)
β_C	-0.02^c	-0.02	-0.05^a
	(0.01)	(0.02)	(0.02)
$\beta_{D,C}$	0.08^a	0.09^a	0.10^a
	(0.01)	(0.02)	(0.02)
No. obs.	23,388	23,388	23,388
R^2	0.14	0.12	0.14

Notes: Estimates of the baseline regression in Table 3 using the subsample of non-financial acquisitions. ^{a} $p < 0.01$, ^{b} $p < 0.05$, ^{c} $p < 0.1$.

Table C.7: Robustness of Table 3 controlling for the Chinn-Ito index

	Share	Maj.	Full
β_D	0.01	-0.00	0.00
	(0.01)	(0.01)	(0.01)
β_C	-0.03^a	-0.03^b	-0.05^a
	(0.01)	(0.02)	(0.02)
$\beta_{D,C}$	0.08^a	0.10^a	0.10^a
	(0.01)	(0.02)	(0.02)
$\beta_{Chinn-Ito}$	-0.01^a	-0.02^a	-0.01^b
	(0.00)	(0.00)	(0.01)
No. obs.	27,387	27,387	27,387
R^2	0.13	0.11	0.13

Notes: Estimates of the baseline regression in Table 3 including the Chinn-Ito index (see text). ^{a} $p < 0.01$, ^{b} $p < 0.05$, ^{c} $p < 0.1$

Table C.8: Robustness of Table 3 with only target countries experiencing at least one crisis

	Share	Maj.	Full
β_D	0.01	-0.00	-0.00
	(0.01)	(0.01)	(0.01)
β_C	-0.03^b	-0.03^c	-0.05^a
	(0.01)	(0.02)	(0.02)
$\beta_{D,C}$	0.08^a	0.09^a	0.11^a
	(0.01)	(0.02)	(0.02)
No. obs.	21,611	21,611	21,611
R^2	0.14	0.12	0.14

Notes: Estimates of the baseline regression in Table 3 including only those countries that experienced a crisis. The list of countries that had never experienced a crisis during the sample period, and hence dropped from this estimation, are: Chile, Peru, Singapore, South Africa and Taiwan. ^{a} $p < 0.01$, ^{b} $p < 0.05$, ^{c} $p < 0.1$

Table C.9: Robustness of Table 3 using crisis dates from Reinhart and Rogoff (2009)

	Share	Maj.	Full
β_D	0.01	-0.01	0.00
	(0.01)	(0.01)	(0.01)
β_C	-0.01^c	-0.03^c	-0.04^a
	(0.01)	(0.01)	(0.01)
$\beta_{D,C}$	0.06^a	0.08^a	0.09^a
	(0.01)	(0.01)	(0.02)
No. obs.	28,019	28,019	28,019
R^2	0.13	0.11	0.13

Notes: Estimates of the baseline regression in Table 3 using crisis dates from Reinhart and Rogoff (2009). ^{a} $p < 0.01$, ^{b} $p < 0.05$, ^{c} $p < 0.1$

Table C.10: Flipping Hazard Coefficients and Percentage Changes: Fire-Sale and Selection Effects During Financial Crises

	Panel A: Baseline Results (1)	Panel B: Simulated Data (2)	Panel C: Flipping Motive (3)
Domestic (β_D)	0.16^c		0.16^b
	(0.08)		(0.08)
	[18%^{c}]	[60%]	[18%^{b}]
$\underbrace{\text{Crisis } (\beta_C)}$ **Fire-Sale Effect**	**0.82**		0.85
	(0.13)		(0.12)
	[-18%]	[49%]	[-15%]
$\underbrace{\text{Domestic} \times \text{Crisis } (\beta_{D,C})}$ **Selection Effect**	**-0.12**		-0.02
	(0.21)		(0.20)
	[-11%]	[-41%]	[-2%]
Full ($\beta_{100\%}$)			-1.10^a
			(0.08)
			[-67%^{a}]
No. obs.	19,329		19,329
Log L	-5,045.0		-4,914.4

Notes: Reports robustness for the results in Table 4. Compared to Table 4, Panel A, column (1) corresponds to equation (4.3), but uses the sample of acquisitions by domestic and foreign acquirers in which at least 51% is acquired. Percentage changes of the hazard compared to the baseline group (hazard rate for normal-time cohort of foreign acquisitions) shown in square brackets. Panel B, column (2) is identical compared to Table 4: For purposes of quantitative comparison to the theoretical model, it shows the corresponding percentage changes of the hazard rate from the theoretical model. See Table 4 for further details. Compared to Table 4, Panel C, column (3) corresponds to equation (4.4), but uses a dummy for 100% acquisitions $D_{100\%}$ and the sample of acquisitions by domestic and foreign acquirers in which at least 51% is acquired. The baseline hazards are stratified by country×target-industry. The dates for the domestic banking crises are from Laeven and Valencia (2010). a, b and c indicate statistical significance at the 1%, 5% and 10% levels, respectively. Standard errors clustered at the level of country×2-digit SIC target industry are reported in parentheses. Columns (1) and (3) include macroeconomic controls whose coefficient estimates are omitted from the table to conserve space.

Table C.11: Number of years target nations are in crisis during 1990-2007

Target nations	Laeven and Valencia	Reinhart and Rogoff
Argentina	6	6
Brazil	9	5
Chile	0	0
China	1	8
India	1	6
Indonesia	5	8
Malaysia	3	5
Mexico	3	7
Peru	0	1
Philippines	5	5
Singapore	0	0
South Africa	0	0
South Korea	2	6
Taiwan	0	2
Thailand	4	6
Vietnam	1	1

Notes: Number of years of domestic banking crises from Laeven and Valencia (2010) and Reinhart and Rogoff (2009). See main text of the paper for precise crisis years for each country for the Laeven and Valencia (2010) measure used in our baseline analysis.

D Data Description

Mergers and acquisitions (SDC). The M&A data for all analyses, unless otherwise noted (see exception below), come from the Securities Data Company (SDC) Thompson's International Mergers and Acquisitions database.[1] This dataset reports all public and private M&A transactions involving at least a 5% ownership stake in the target company. We focus on the acquisitions taking place between 1990 and 2007 in all sectors (in our data 78 sectors between SIC codes 1 and 97), in the following fifteen emerging-market economies: Argentina, Brazil, Chile, China, India, Indonesia, Malaysia, Mexico, Peru, Philippines, South Africa, South Korea, Taiwan, Thailand, and Vietnam. The information about the transactions is obtained from a variety of news sources, regulatory agencies, trade publications, and surveys.

For each merger or acquisition transaction, we use the following variables in our analysis: the share of a firm acquired in an acquisition, the share of a firm owned after an acquisition (different from the previous variable if a prior stake was owned by the same acquirer), the names of the acquirer and target firms involved, both their primary 2-digit SIC industry classifications, the country of the acquirer and target firm, and the date on which the transaction was completed, which restricts the sample to deals that were actually completed and eliminates those that were announced but never completed. We drop transactions that are missing any of these variables except for the share of a firm owned after an acquisition, which we use to perform the cross-checks below but are not included in the baseline regressions. The baseline results use data aggregated up to the industry-country-year level and thus are not sensitive to issues regarding precise acquisition dates (an issue in event studies) and identities of target and acquiring firms (an issue in studies about divestitures). Our main concern is regarding duplicated transactions. Hence we clean the SDC data using the following steps:

(i) We drop observations that are exact duplicates, i.e., those with the same name for the target and acquirer, date, and fraction acquired and owned after being very close each other (+/-0.001).

(ii) If for transactions that are duplicates in terms of name for the target and acquirer, and date, the sum of duplicates' fraction acquired is equal to one of the duplicates' fraction owned after, then we use

[1] https://financial.thomsonreuters.com/en/products/data-analytics/market-data/sdc-platinum-financial-securities.html.

the sum as the unique fraction acquired and drop the duplicates. This could happen, for example, when an acquiring firm completes a 50% acquisition by buying 25% each from two prior minority owners.

(iii) If in the cases above, the sum of stake acquired exceeds 1 by a small amount (0.01), we replace the fraction acquired by 1. If it exceeds 1 by greater than 0.01 we drop the transaction.

(iv) On the remaining transactions we performed the following manual check. We sorted all transactions by the target's country and date. For transactions within +/- 15 days of each other we searched for the individual parts of the target firm name (e.g., for a target firm named "Telefonica de Argentina SA", we searched for "Telefonica" and "Argentina"). In some cases, we found the same exact target firm with a separate transaction within +/- 15 days; in some other cases we discovered minor errors where the firm appeared again, but a small part of the name had been dropped (e.g., the "SA"). In both cases we treated the transaction as a duplicate in terms of target name and date, and followed steps (iii) and (iv). If the acquirer was different in the duplicate transaction, the transaction was treated as distinct.

Country and time varying macroeconomic controls. Our control variables are the change in the nominal exchange rate (quarterly), the use of IMF credit and loans as a percentage of a country's quota (quarterly), real GDP per capita (annual), and real GDP growth (annual). 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. In the robustness exercises we use two indices of capital flows restrictions: the Chinn-Ito index, which measures a country's degree of capital account openness[2]

[2] http://web.pdx.edu/~ito/Chinn-Ito_website.htm.