

Corporate Takeovers: Theory and Evidence

Finance Working Paper N° 1030/2025

January 2026

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Abstract

In this essay, we review theories and empirical evidence describing how bidders and targets navigate the takeover process from the decision to initiate through bid revisions and final acceptance (or rejection) of the offer. This navigation involves complex decisions where potential rival bidders are jockeying for competitive advantage through multiple strategic decisions. Sequentially, these involve (1) Whether to initiate the takeover process (exploiting a first-mover advantage); (2) purchase target shares in the target prior to the first bid (toehold bidding); (3) how to respond to a prebid target stock price runup (markup pricing); (4) optimal bid revisions (jumps) following rival competition and target management resistance; and (5) deal financing and a strategic payment method choice under information asymmetries and a potential for bidder opportunism. We also address more policy-oriented issues related to (6) merger-driven listing dynamics and (7) antitrust policy towards horizontal mergers. We apply the standard auction framework with a single (pivotal) seller as our main theoretical workhorse, which we explain with a set of largely unified variable notations across takeover models. This auction framework, which helps identify theoretical puzzles, is also useful for explaining the outcomes of merger negotiations as it effectively describes the outside option during bargaining.

Keywords: Takeover initiation, auction, negotiation, rational bidding, markup pricing, payment method, bidder opportunism, U.S. listing gap, market power

JEL Classifications: D21, D44, G34, G40

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Corporate Takeovers: Theory and Evidence*

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Abstract

In this essay, we review theories and empirical evidence describing how bidders and targets navigate the takeover process from the decision to initiate through bid revisions and final acceptance (or rejection) of the offer. This navigation involves complex decisions where potential rival bidders are jockeying for competitive advantage through multiple strategic decisions. Sequentially, these involve (1) whether to initiate the takeover process (exploiting a first-mover advantage); (2) purchase target shares in the target prior to the first bid (toehold bidding); (3) how to respond to a prebid target stock price runup (markup pricing); (4) optimal bid revisions (jumps) following rival competition and target management resistance; and (5) deal financing and a strategic payment method choice under information asymmetries and a potential for bidder opportunism. We also address more policy-oriented issues related to (6) merger-driven listing dynamics and (7) antitrust policy towards horizontal mergers. We apply the standard auction framework with a single (pivotal) seller as our main theoretical workhorse, which we explain with a set of largely unified variable notations across takeover models. This auction framework, which helps identify theoretical puzzles, is also useful for explaining the outcomes of merger negotiations as it effectively describes the outside option during bargaining.

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“[T]ake-overs, like bankruptcy, represent one of Nature’s methods of eliminating deadwood in the struggle for survival. A more open and more efficiently responsive corporate society can result.”
—Nobel Laureate Paul Samuelson, *Economics*, 1970 (McGraw-Hill, NY).

1 Introduction

Over the past century, waves of US corporate mergers and acquisitions (M&A) activity have resulted in industrial reorganization on a massive scale. As Nobel Laureate Paul Samuelson suggested in the above opening quote, this important business activity may be thought of as a form of Darwinian industrial selection promoting greater social welfare—a conjecture supported by much empirical evidence. The main engine for this selection process is competition between managerial teams to control target firms’ resources in what Manne (1965) dubbed the market for corporate control. Over the past five decades, the managerial competition model spawned a large literature examining the role of corporate governance and compensation contracts in inducing self-interested managers to relinquish control. Moreover, the literature places takeovers in the context of industrial organization, tracing who buys who up and down the supply chain and within industrial networks, and asks whether pressures from the market for corporate control stifle or promote long-term investments in research and development.¹

In this essay, we continue to stress descriptive research that explains industry-specific motivations for M&A activity (who buys who), how firms are sold (auction and deal protection procedures), and everyday strategic decisions made by both parties to the transaction (deal initiation and financing, optimal bidding, and the allocation of synergy gains). As in much of the theoretical takeover literature, we draw, in particular, on auction-theoretic propositions with a single (pivotal) seller to test whether targets are transferred to the most efficient buyer. We prefer the auction mechanism with pivotal sellers since it corresponds to most actual share-ownership structures, as well as to the board of the target often being a de facto auctioneer on behalf of all shareholders of the target.² Moreover, as will become clear throughout, in several places this auction setting has been used to provide potential answers to apparent empirical puzzles where the data appear to be at odds with simple economic intuition, which is a central focus of this review.

¹For earlier extensive reviews of the empirical evidence on the market for corporate control, see Jensen and Ruback (1983), Roll (1986), Shleifer and Vishny (1997), Becht, Bolton, and Roell (2003), Betton, Eckbo, and Thorburn (2008), Eckbo and Thorburn (2013), and Eckbo (2014).

²Burkart and Panunzi (2008) and Burkart and Lee (2008) review implications of the alternative auction setting with free-riding (atomistic) target sellers, which originate with Grossman and Hart (1980).

Figure 1 summarizes key strategic decision points throughout the takeover process. The decisions are separated into early-stage and later-stage along the timeline from the initial to the final outcome in the takeover auction. Note that the figure depicts an exhaustive list of possible bid-outcomes in *any* takeover auction, regardless of whether the initial bid is in the form of a merger agreement or a tender offer, or whether the bid is made public or in a private setting. Throughout, we therefore use terms like ‘takeover’, ‘takeover contest’, and ‘takeover auction’ interchangeably to describe any acquisition of corporate control through the purchase of the voting stock of the target firm.

The first bid—whether private or public, or bidder- or target-initiated—may be accepted (single-bid contest), rejected outright, or generate additional competing bids after alerting potential rivals of a profit opportunity. The first bid may be a friendly merger proposal, which can be followed by a tender offer, as a bidder initiating merger negotiations has no guarantee that the takeover process will not turn into an open auction for the target. Indeed, in deals containing a so-called ‘go-shop’ clause, checking for potential higher bids is explicitly required even after the target board has agreed to a merger proposal. As first documented by Betton and Eckbo (2000), bid revisions may also occur in the absence of rival bidders (in some cases reflecting target management resistance), and the auction may fail altogether (all bids rejected) as target shareholders sometimes reject bids that the board has recommended.

The early-stage strategic decisions listed in Figure 1 begin with identifying a suitable merger partner (who buys whom) and whether to initiate a transaction. Whether it is the bidder or the target that initiates is likely to have important consequences for both the choice of auction design and the choice between auction and negotiation.³ There is also growing empirical evidence that the selling process is initiated not only by a potential acquirer (the traditional view) but that the target firm itself frequently initiates a sale.⁴ Recently, initiations are also increasingly prompted by active outside investors.⁵ Moreover, target deal initiation under time pressure, such as when the seller is in Chapter 11 bankruptcy, may raise concerns with “fire-sale” prices.⁶ Also, to increase competition, subsidizing the financing of weaker bidders may benefit the seller despite losing on the financing discount.⁷ Overall, both deal initiation and competition are core economic factors that help determine ultimate takeover outcomes.

³Bulow and Klemperer (1996, 2009), Gentry and Stroup (2019), Gorbenko and Malenko (2024).

⁴Aktas, de Bodt, and Roll (2010), Masulis and Simsir (2018), Eckbo, Norli, and Thorburn (2023), Liu, Officer, and Tu (2023).

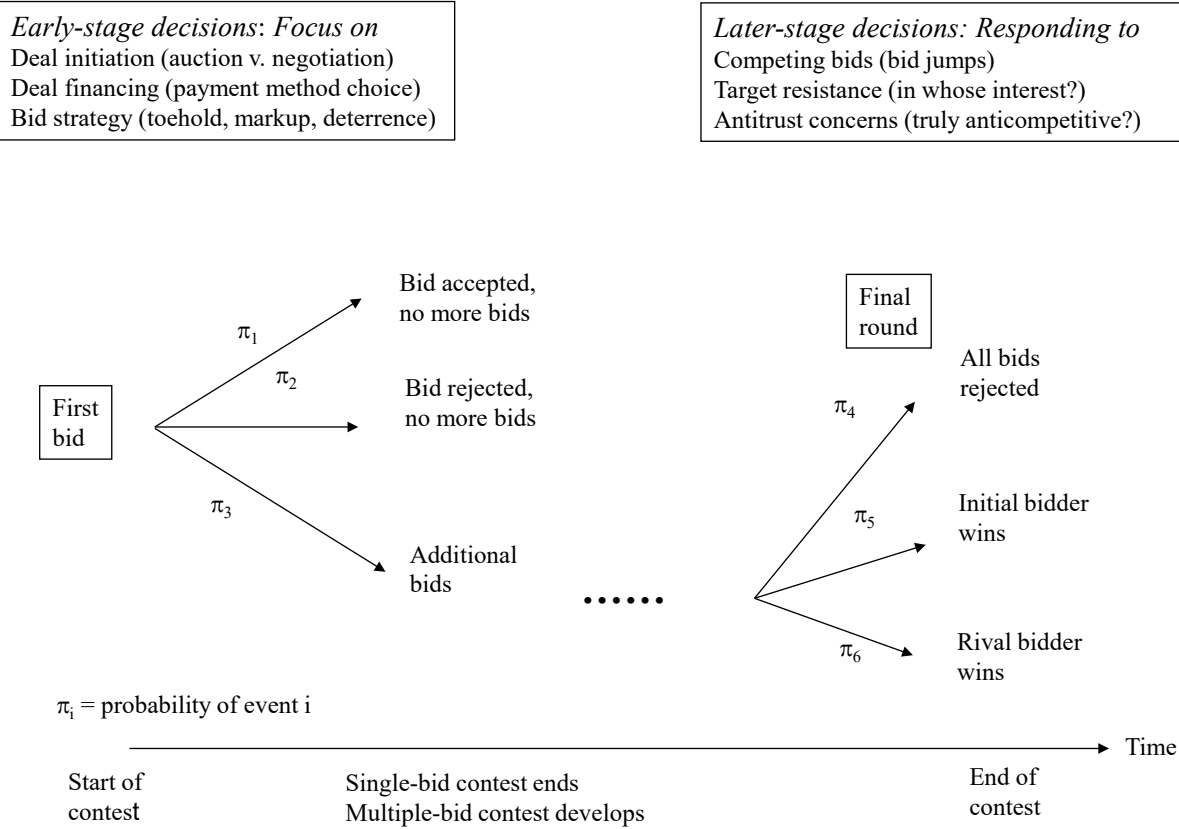
⁵Brav, Jiang, and Kim (2014) and Corum and Levit (2019).

⁶Shleifer and Vishny (1992), Pulvino (2002), Stromberg (2000), Eckbo and Thorburn (2009).

⁷Eckbo and Thorburn (2009), Povel and Singh (2010).

Figure 1: **Strategic decisions and outcomes in takeover contests**

The figure shows the potential outcomes of an initial bid for the target firm. In the first round of bidding, one of three outcomes will occur: (1) the bid is accepted by the target and the contest ends (no more bids); (2) the bid is rejected and the takeover contest ends (no more bids); or (3) the bid is followed by one or more rival bids and/or bid revisions before the contest ends. After two or more additional rounds of bidding, one of three final outcomes will occur: (4) no bidder wins control (all bids are rejected and the target remains independent); (5) the initial bidder wins control; or (6) a rival bidder wins control. The parameter π_i represents the conditional probability of outcome i ($i = 1...6$). The strategic decisions are influenced by the expected outcome payoffs.



For bidders, another important early-stage strategic decision is whether to purchase target shares in the open market (under the radar)—a target toehold—prior to launching the takeover bid. The toehold purchase decision is determined jointly with the decision to initiate bid negotiations. Auction theory holds that a prospective bidder may benefit from acquiring a target toehold—particularly in so-called common-value settings.⁸ Empirically, toehold bidding has been shown to be associated with lower offer premiums (Betton and Eckbo, 2000). Notwithstanding such benefits, it continues to be the case that surprisingly few bidders acquire target toeholds. Similarly, at the extensive margin, firms holding blocks of shares in other companies rarely move to bid for those firms.

Following bid initiation, we discuss deal financing issues and optimal bid strategies in the presence of costly bidding. Jointly with the offer price, the bidder and targets must agree on the method of payment (the financing of the offer): all-cash, all-stock, or some combination of cash and stock. When the two parties to the deal are symmetrically informed about true deal values, the choice of payment method reduces to a capital structure decision for the bidder, as payment in cash depletes cash holdings and increases leverage. However, when both sides are uncertain about the other side’s true value (two-sided information asymmetry), theory has shown that the payment method choice also takes on a signaling or sorting function, addressing issues of adverse selection on both sides of the deal. In models with fully rational parties, the choice of payment method resolves this concern and produces deal terms that are fair to both sides.⁹ This contrasts with behavioral models, in which the primary focus is on targets receiving overpriced bidder shares (Shleifer and Vishny, 2003). However, recent empirical evidence tends to resolve this important debate in favor of fair deal terms on average (Eckbo, Makaew, and Thorburn, 2018; Li, Taylor, and Wang, 2018a).

Moreover, in auction theory, bidding costs drive bid jumps as opposed to smoothly increasing auction bids. Strategically, jump bidding may deter entry by potential rival bidders (Fishman, 1988). Such preemptive bidding receives some empirical support (Betton and Eckbo, 2000; Dimopoulos and Sacchetto, 2014). Also, in negotiated transactions, bid premiums are determined so as to share the expected dollar synergy gains between the two parties. While the true magnitude of the deal synergies is unobservable to the econometrician, target synergies are, in practice, measured as the deal premium: the offer price per share in percent of the target’s stock price sometime prior to the transaction announcement. There is

⁸Burkart (1995), Singh (1998), Bulow, Huang, and Klemperer (1999), Goldman and Qian (2005).

⁹Hansen (1987), Fishman (1989), Eckbo, Giammarino, and Heinkel (1990), Berkovitch and Narayanan (1990), Rhodes-Kropf and Viswanathan (2004), Morellec and Zhdanov (2008), Gorbenko and Malenko (2018).

growing empirical research attempting to disentangle changes in the target’s true stand-alone value from the synergies embedded in the deal premium in the presence of rational market deal anticipation. The issue is not only one of assessing the true deal synergies but also whether the winning bidder is forced to “pay twice” for the pre-bid runup in the target stock price (Schwert, 1996; Betton, Eckbo, Thompson, and Thorburn, 2014).

We begin the essay with a brief summary of industrial merger waves (who buys whom) before addressing the specifics of the sales process. This includes deal protection devices, auction formats, bid strategies (including the deal initiation decision), and offer price evidence. The majority of successful tender offers record only a single *public* bid for the target (Betton and Eckbo, 2000), which remains the major source of offer price evidence. However, there is substantial evidence that many of these public bids are preceded by a months-long *private* sales process (Boone and Mulherin, 2007; Brown, Liu, and Mulherin, 2022). Moreover, about half of the sales processes involving public targets are initiated by the target itself (Eckbo, Norli, and Thorburn, 2023).

After describing deal structures and how firms are sold, we address various controversial topics or empirical puzzles, including the low measured bidder announcement returns (bidder competition); why toehold bidding is so rare (target toehold resistance); whether bidders pay for the target with overpriced shares (bidder opportunism); whether bidders end up paying twice for pre-bid target stock price runups (costly markup pricing); whether international merger-driven listing dynamics is de facto evidence of a relative US *listing advantage*; and whether the stock market’s assessment of whether horizontal mergers challenged by the Department of Justice with violating Section 7 of the Clayton Act would have had significant anti-competitive effects.

With the exception of Section 12, our review focuses primarily on takeovers between US-domiciled firms since these underlie most of the available empirical evidence and tests.¹⁰ Also important, as we review and summarize in some detail several original takeover models with largely varying variable notations, we have created a unified set of notations. Having said that, the context of each section will also remind the reader of the variable notation specific to that section.

¹⁰For comprehensive reviews of European takeover regulations and M&A activity, see, e.g., Berglof and Burkhardt (2003) and Martynova and Renneboog (2008, 2006).

Part I

The Takeover Process and Deal Outcomes

2 Who buys who¹¹

2.1 Brief history of merger waves

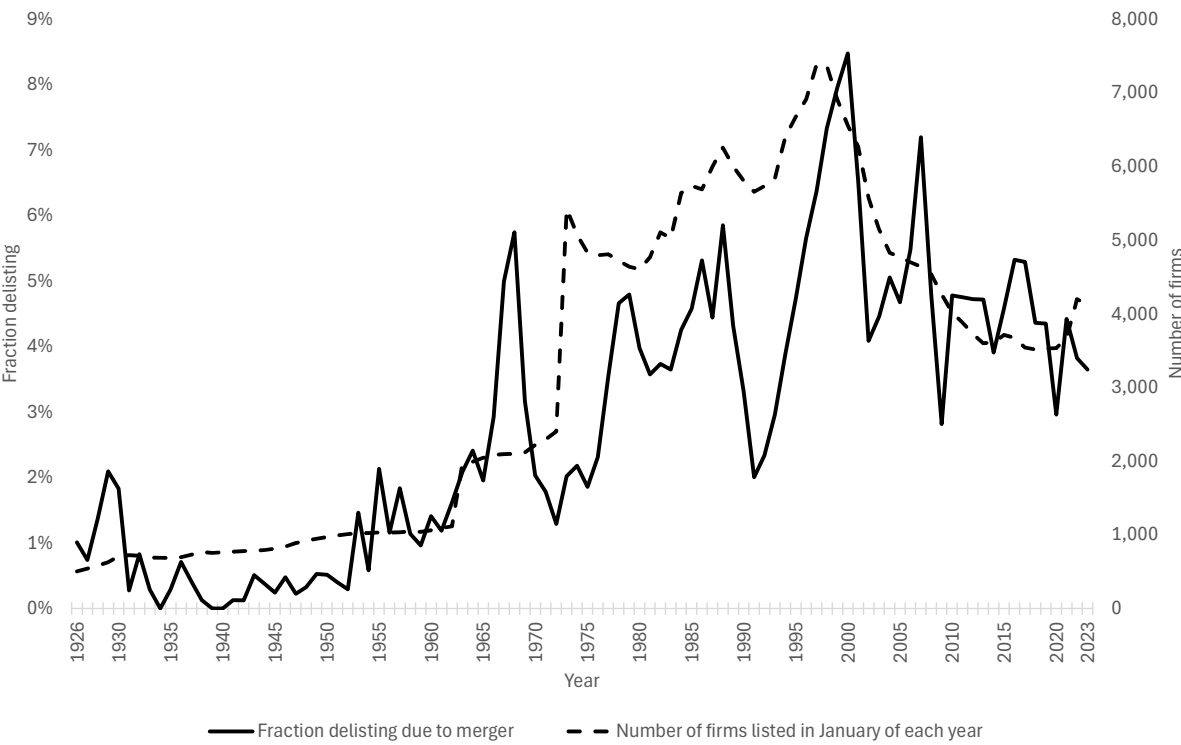
Merger waves are the sequences of peaks and troughs in the time-series dynamics of aggregate merger activity. The solid line in Figure 2 shows the fraction of firms listed on the three major US stock exchanges that are delisted each year due to a merger, 1926–2023 (source: CRSP). There is substantial evidence that the gradual industrial deregulation over the past century—including airlines, telecommunications, railroads, utilities, financial institutions, etc.—has helped to fuel the industry-specific merger waves underlying this aggregate figure.¹² Moreover, while the large number of merger transactions covers a wide spectrum of motivating factors at the firm level, access to capital (lack of liquidity constraint) is likely a common driver across many deals. As put by Harford (2024): “the bulk of the evidence points to the conclusion that merger waves are the response to shocks to industries’ operating environments, facilitating efficient asset reallocation, where the clustering is largely driven by the necessity of conducive financing conditions for the mergers” (abstract).

The great merger waves of the past century helped trigger—and were in part affected by—changes in the statutory and regulatory constraints governing the market for corporate control (Jensen, 1993; Becht, Bolton, and Roell, 2003). For example, the so-called “Great Merger Wave” towards the end of the 19th century (spanning the 1890s through the 1900s), which coincided with the rapid growth of the New York Stock Exchange (NYSE), created large industrial voting trusts such as Standard Oil of New Jersey, the United Fruit Company, and US Steel. This, in turn, triggered “antitrust” concerns (Stigler, 1950): the US Congress introduced in rapid succession 45 different antitrust legislative acts to limit monopoly power. These acts include the Sherman Antitrust Act, the Clayton Antitrust Act, the creation of the Federal Trade Commission, and increased regulation of railroads through the Interstate Commerce Act.

¹¹This section draws on and updates Eckbo (2014)

¹²See, e.g., Jarrell, Brickley, and Netter (1988), Mitchell and Mulherin (1996), Boone and Mulherin (2000), Maksimovic and Phillips (2001), Harford (2005), Becher, Mulherin, and Walkling (2012) and Ovtchinnikov (2013). Golbe and White (1988) and Town (1992) apply time-series econometrics (respectively, a sine wave function and a two-stage Markov switching-regime model) to confirm that aggregate merger activity back to 1985 is indeed best characterized by “waves”.

Figure 2: **Annual fraction of all publicly traded (CRSP) firms in January of each year which delist due to a merger during the year, 1926-2023**



The new antitrust constraints on horizontal mergers caused the next wave, fueled by the industrial boom in the 1920s, to largely concentrate on vertical integration and scale economies.

Importantly, subsequent legislation also affected the disciplinary function of the market for corporate control. For example, the Glass-Steagall provisions of the US Banking Act of 1933 (repealed with the Gramm-Leach-Bliley Act of 1999) and the 1940 Investment Company Act placed restrictions on share ownership and the exercise of voting rights by financial institutions. An unintended consequence of such restrictions is to reduce shareholder activism in the monitoring of corporations, which is a cornerstone of an active corporate control market (Jensen, 1993). Lack of monitoring in part explains the “conglomeration merger wave” of the 1960s, in which corporate executives often built “empires” consisting of unrelated divisions.

Moreover, the conglomeration wave triggered the 1968 Williams amendment to the Securities and Exchange Act of 1933. The Williams Act was, in part, a response to the emergence and frequent use of the cash tender offer, which avoided federal and state regulations governing proxy solicitations in security-exchange deals. In an all-cash offer, the bidder bypassed the need for the target board to approve the offer, paving the way for quick-to-execute unsolicited offers made directly to target shareholders on a first-come-first-serve basis. These cash tender offers resulted in so-called “Saturday night specials” or “midnight mergers,” which the Williams Act sought to regulate by introducing stringent disclosure rules, a minimum tender offer period, and pro-rata purchase of tendered target shares (Jarrell and Bradley, 1980; Eckbo and Langohr, 1989).

The 1970s and the 1980s saw “refocusing merger waves”, which sought to downsize many of the large and complex corporate structures created by the conglomeration wave of the 1960s, as well as by the economic downturn triggered by high oil prices (following the formation of the OPEC cartel), and excess industrial capacity created by dramatic innovation in computer- and communication technology. This period also saw the emergence of a culture of shareholder activism not previously seen since the beginning of the century. With it came unsolicited or “hostile” takeovers, which were followed by sophisticated target takeover defenses (see Section 7.4 below).

Many managements responded positively to external restructuring initiatives in the 1980s and helped facilitate a wave of divisional buyouts (MBOs) and of leverage buyouts of entire public companies (LBOs), largely financed with high-risk high-yield (“junk”) debt capital (Eckbo and Thorburn, 2013). This restructuring activity prompted court rulings that established stronger minority shareholder protection in

the minority “freeze-outs,” including rules governing anti-coercion and the right to a judicial review and fairness opinion (Bates, Lemmon, and Linck, 2006). The past two decades have also seen the emergence of a strong corporate governance movement, which is driven by private equity investors, hedge funds, large pension funds, as well as sovereign wealth funds worldwide.¹³

As we discuss in detail in Section 12 below, the surge in delistings during the late 1990s, which reduced the number of US-listed firms by nearly 50% from its peak in 1996, coincides with increased globalization and cross-border mergers. It has also prompted an ongoing debate over the relative net benefits of being listed in the US (Doidge, Karolyi, and Stulz, 2017). Gao, Ritter, and Zhu (2013) shows that this reduction coincides with a similar-sized reduction in the number of initial public offerings (IPOs).

However, Eckbo and Lithell (2025) show that adjusting for the merger-driven delistings goes a long way in explaining the post-peak listing decline. Moreover, after comparing merger-driven delistings internationally, they conclude that mergers between public acquirers and targets are uniquely high in the US. In other words, US stock exchanges are unique in their ability to both attract and retain corporate resources under public ownership, where public targets simply join the ownership umbrella of their public parents.

2.2 Who buys who in terms of Tobin’s Q and M/B

Economic theory provides broad strokes in terms of understanding the incentives to merge or restructure within an industry, exploiting valuation discrepancies reflected in Tobin’s Q (Kaldor, 1966). For example, in Gort (1969) and Jovanovic and Rousseau (2002, 2008), capital is reallocated from under-performing, low-q targets to high-q bidders with superior management skills and productive resources. The associated empirical prediction is that “high buys low” in terms of market-to-book ratios (M/B). Yang (2008) refines this prediction to one where firms with rising productivity buy assets of firms with falling productivity, or “rising buys falling”.

Rhodes-Kropf and Robinson (2008) use the idea that bidders search for targets with complementary assets. Classical property rights theory holds that when there are significant complementarities among assets (e.g., upstream oil field and downstream pipeline), placing these assets under the control of a single firm reduces the hold-up problem and underinvestment that results from incomplete contracting (Klein,

¹³The late 1990s and early 2000s also saw a wave of mergers with global strategic partners, in part triggered by foreign deregulation activity. See, e.g. Powel and Yawson (2005), Martynova and Renneboog (2008), Erel, Liao, and Weisbach (2012), and Erel, Jang, and Weisbach (2024) for cross-border M&A.

Crawford, and Alchian, 1978; Hart, 1995). Depending on the relative bargaining power of the bidder and target, their model suggests that merging firms will have similar M/B ratios, or “like buys like,” which receives some empirical support.

Levis (2011) also builds on the idea of complementarities: firms with high revenue growth opportunities but high operating costs become targets of firms with lower growth prospects but higher cost efficiency. A related complementarity can be generated by financial constraints: getting acquired may help a financially-constrained target with good investment opportunities to alleviate its financial constraints—Erel, Jang, and Weisbach (2015) provide evidence for this mechanism. In Gomes and Livdan (2004), synergies emanate from economies of scope, which allow merged firms to lower their fixed cost of production by eliminating redundant and inefficient activities. Morellec and Zhdanov (2005) model the option value of merger in industry equilibrium, while Dimopoulos and Sacchetto (2016) examine industry dynamics resulting from mergers, exit, and entry. While much of the literature focuses on mergers as a way to combine capital and investment projects of two firms, mergers may also be motivated by labor considerations, such as a way to acquire employees of the target firm (Ouimet and Zarutskie (2020)) or to perform a labor reorganization (Lagaras, 2019).

Figure 3 shows the time series of the average bidder M/B (Panel A) and of the average ratio of the bidder to target M/B for listed firms, 1980–2023. Panel B shows that “high buy low” as the average bidder to target M/B hovers around 2.5 over the entire period. Also, Panel A shows a dramatic peak in the average bidder M/B in the year 2000, with the highest peak value for high-tech bidder firms. This fact prompted some researchers to suggest that some bidders who used their own stock as payment for the target shares may knowingly have been selling overpriced shares to the target (bidder opportunism).

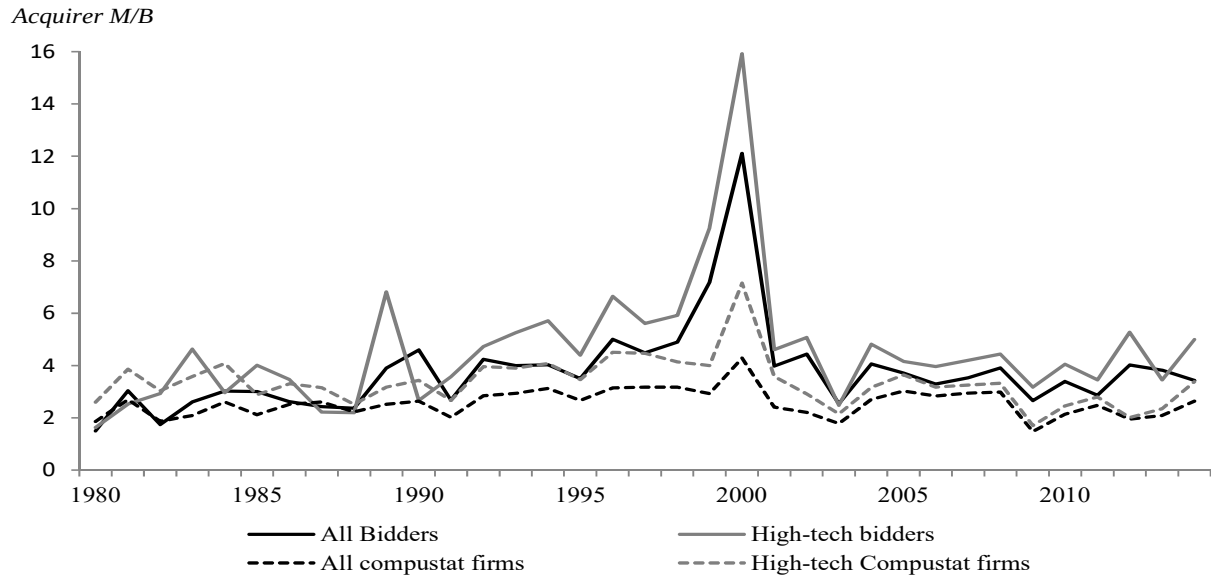
However, Panel B of Figure 3 shows that the targets’ average M/B also peaked in 2000, so the ratio of the bidder to target M/B hardly changed. This naturally raises the question: why would a high market pricing of *both* bidder and target firms favor the bidder when setting the terms of trade between the two firms? We return to large-sample examinations of this fundamental question in Section 10 below,

Finally, a comment on the strong empirical association between M/B and takeover likelihood. Standard (rational) asset pricing theory holds that when the cost of capital is relatively low, market values (M) become relatively high. At the individual firm level, a reduced cost of capital may imply that the firm’s access to investment projects with a positive net present value also increases. For the firm to undertake new projects in this increased investment opportunity set, it must also have access to capital.

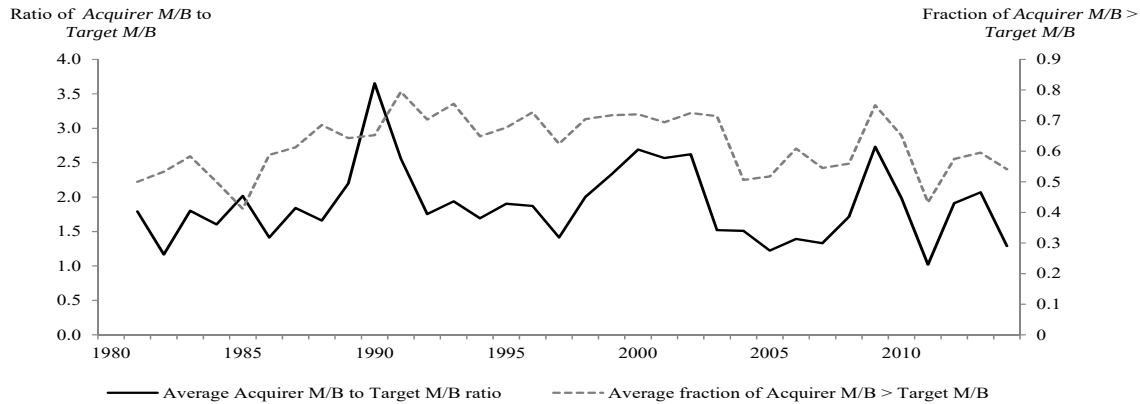
Figure 3: **Average bidder M/B and ratio of bidder M/B to target M/B , 1980-2014**

Panel A plots the annual average ratio of bidder market-to-book (M/B) for the Compustat population and our sample firms, 1980-2014. Panel B plots the annual average ratio of the bidder to target M/B and the fraction of deals in which Acquirer $M/B >$ Target M/B . The sample contains 6,200 merger bids for US targets by US public bidders, 1980-2014. Figure adapted with permission from Eckbo, Makaew, and Thorburn (2018)

A: Annual average bidder M/B



B: Annual average ratio of bidder to target M/B



Some highly liquid firms may finance the new investments internally, while others may issue securities (debt and/or equity) to fund the additional investments. This suggests that rational corporate investment activity—including M&A—will be positively associated with market upturns, as will the likelihood of observing both high cash balances and frequent security sales, which is supported by the empirical evidence (Eckbo, Masulis, and Norli, 2007). On the other hand, if one chooses to interpret a high M/B as an index of relative market mispricing, then it is also possible that the risk of targets receiving overpriced bidder shares in stock-swap deals may be increasing the acquiring firm’s M/B relative to that of the target. We return to theoretical and empirical analyses of this “bidder opportunism” argument in Section 10.

2.3 The role of industrial networks and supply chains

Recent work has also substantially broadened our empirical understanding of the industrial links that may give rise to takeover activity. Ahern and Harford (2014) broaden the standard industry analysis—much of which has been based on Standard Industrial Classification (SIC) codes—to also include a network of customer-supplier relationships. The idea is that merger waves motivated by economic efficiency could propagate from one industry to related industries through customer and supplier links in the overall network. They identify industry networks using text-based product identification (Hoberg and Phillips, 2010) and input-output accounts from the Bureau of Economic Analysis at the US Department of Commerce. They find that the average industry engages in mergers with a small set of local industries that are closely related through customer-supplier links. Within the network, stronger product-market connections lead to a greater incidence of cross-industry mergers.

Ahern and Harford (2014) complement the findings of Hoberg and Phillips (2010), who use network techniques to group firms based on textual product market descriptions. They conclude that the “best” mergers, i.e. mergers with the highest ex-post cash flows and new product introductions, are “similar but different”: (1) the acquirer and target are similar in the product space, (2) the target is different from the acquirer’s nearest rivals, and (3) the target has unique assets (in the form of patents).

Finally, as we discuss in greater detail in Section 13 below, starting with Eckbo (1983), there is substantial evidence that a merger transaction, where the bidder and target are either horizontally or vertically related, also causes the stock market to increase the value of the merging firms’ product market rivals. Song and Walkling (2000) view this positive market reaction as a potential target-in-play effect, as some of the rival firms may own resources specialized to the creation of, say, takeover synergies originating

in new cost-reducing technologies. Recently, de Bodt, Eckbo, and Roll (2024) present evidence indicating that competition shocks (caused by lowering import duties) tend to cause within-industry rival firms (particularly the weaker industry “followers”) to react by adopting operational changes that make these industry rivals “more similar” as measured by their within-industry idiosyncratic return comovement. This is further confirmation of the strong within-industry technological links among rival firms. Srinivasan (2020) and de Bodt and Eckbo (2024) also show that increased competition caused by the lowering of import duties is subsequently associated with a significant increase in M&A activity.

2.4 Plant-level efficiency effects of takeovers

Maksimovic and Phillips (1998) and a series of subsequent papers exploit the Longitudinal Research Database maintained by the Center for Economic Studies at the Census Bureau (McGuckin and Pascoe, 1988). This high-quality plant-level data covers manufacturing industries (SIC 2000-3999) and includes all firms with more than 250 employees, as well as a sample of small firms on a rotating 5-year panel. The data includes plant-level input and output information, value of shipments, and labor, material, and capital costs. The database covers both private and public firms, where public status is determined by matching with Compustat. Importantly, by estimating plant productivity and tracking plant ownership changes, it is possible to test directly whether plant-level acquisitions enhance productive efficiency.

Maksimovic and Phillips (1998) estimate total factor productivity (using a translog production function), which takes the actual amount of output produced for a given amount of inputs and compares it to a predicted amount of output. They first predict plant output—what the plant should have produced given the amount of inputs it used. A plant is subsequently classified as having higher than average productivity if the difference between actual and predicted outputs is positive, given the actual use of inputs. They find that the productivity of plants sold out of Chapter 11 bankruptcy tends to increase under the new ownership. Maksimovic and Phillips (2001) find that plant sales, more generally, also tend to improve the allocation of resources, consistent with a simple neoclassical model of profit maximization.

Maksimovic, Phillips, and Yang (2013) use the plant-level data to explore differences between merger waves involving public and private firms from 1972-2004, for a total of 665,000 firm-industry-years and more than one million plant-years. The public status of a firm is determined from Compustat, and 20% of the sample plants are held by publicly traded companies, producing 35% of total output. They find that firms with higher productivity are more likely to buy plants, while firms with lower productivity are

more likely to sell. Plant productivity tends to increase after the transaction. Moreover, accounting for the endogeneity of the decision to go public, they find that firms with higher productivity and greater anticipation of future growth choose to become public and later participate more in acquisitions when opportunities arise. Moreover, consistent with Maksimovic and Phillips (2001, 2002), Yang (2008) Yang (2008), and Li (2013), they also show that mergers that occur on the industry merger wave are associated with greater efficiency improvements.

Studying post-merger restructuring activity, Maksimovic, Phillips, and Prabhala (2011) track plant sales following 1,483 mergers and acquisitions over the period 1981-2000. They find that acquirers of full firms sell 27% and close 19% of the plants of the target firms within three years of the acquisition. Relatively efficient acquirers tend to retain more acquired plants. More retained plants tend to increase in productivity, whereas sold plants do not, suggesting that acquirers restructure targets in ways that exploit their comparative advantage.

2.5 Takeovers and innovation activity

Does the threat of an unwanted takeover promote or stifle “long-term” corporate investment in R&D and innovative activity? Economic theory provides arguments for both sides of this issue. On the one hand, the agency cost view holds that absent the disciplinary effect of an active market for corporate control, managers may shirk, innovate less, and create less valuable innovations (Jensen, 1986; Fulghieri and Sevilir, 2009). Thus, in this view, the threat of a takeover tends to promote valuable innovation activity. On the other hand, economic theory also recognizes that with incomplete contracting, the threat of ex-post rent appropriation through unwanted takeover may reduce managerial incentives to develop valuable firm-specific human capital ex-ante (Williamson, 1985; Shleifer and Summers, 1988; Burkart, Gromb, and Panunzi, 1997), including the type driving a successful innovation program. Innovation activity may also be deterred if the stock market tends to undervalue hard-to-assess payoffs from R&D investments (Stein, 1988).

The recent empirical merger literature sheds interesting light on this important issue. The studies combine samples of completed and withdrawn mergers (SDC) and matched non-merging companies with data on R&D expenditures (Compustat), patent counts in different technology classes, and patent citations (European Patent Office Worldwide Patent Statistical Database, US Patent and Trademark Office), product market relatedness and technological proximity, and the passage of state antitakeover legislation

and business combination laws.

There is evidence that post-acquisition, larger firms innovate less. For example, Seru (2014) finds that patenting goes down post-acquisition (relative to targets of failed bids). He uses a quasi-experimental approach involving failed merger bids to generate exogenous variation in the acquisition outcomes of target firms. A difference-in-difference estimation reveals that relative to failed targets, firms acquired in a diversifying merger produce both a smaller number of innovations and also less novel innovation. He also finds that conglomerates are more likely to outsource R&D through alliances and joint ventures.

There is also evidence that in the pharmaceutical industry, acquirers often shut down the innovation of targets when it harms the existing operations of the acquirer. Specifically, Cunningham, Ederer, and Ma (2021) find that the drug projects of the target are less likely to be developed if they overlap more with the existing drug portfolio of the acquirer. They conclude that a fraction of acquisitions may be “killer acquisitions” in the sense of being motivated by the objective to shut down some of the projects of the target to preserve the competitive position of the acquirer. While such “killer acquisitions” reduce innovation ex-post, their effect on total welfare can be ambiguous - it is possible that shutting down many of these projects was efficient (e.g., if they duplicate development costs).

Phillips and Zhdanov (2013) present model-based tests indicating that an active acquisition market positively affects small firms’ incentives to innovate. In their model, which emphasizes asset complementarities and product market synergies, acquiring innovation through merger is a substitute for in-house R&D. Some large firms let small firms innovate and subsequently acquire successful innovators. The prospect of becoming a target, in turn, increases the incentives for small firms to innovate as it amplifies the potential gain from successful R&D. Thus, profit maximization leads larger firms to innovate less than smaller firms.

Like Edmans, Goldstein, and Jiang (2012), Phillips and Zhdanov (2013) employ shocks to aggregate mutual fund net asset values (fund flows) to generate variation in firm valuation and thus acquisition activity that is exogenous to firm fundamentals and innovation. They find evidence that R&D activity by small firms responds positively to a greater probability of becoming the target of a larger firm. Thus, rather than stifling innovation as interpreted by Seru (2014), large firms may actually be promoting greater innovation through their acquisition activity and through the ability of the merged firm to apply innovation to both the bidder’s and the target’s product ranges.

The evidence in Bena and Li (2014) further supports the notion that synergies obtained from com-

binning innovation capabilities are important drivers of acquisitions. They show that technological overlap between firms' innovation activities positively impacts the likelihood of a merger pair formation. Moreover, based on a quasi-experiment involving withdrawn bids that fail for reasons exogenous to innovation, they find a positive treatment effect of a merger on post-merger innovation output when there is a pre-merger technological overlap between the merging firms. They conclude that synergies obtained from combining innovation activities are an important acquisition impetus.

Fresard, Hoberg, and Phillips (2020) use 10-K text-based measures of product market relatedness and find that firms in high R&D industries are less likely to vertically integrate or engage in vertical mergers and are more likely to initiate customer and supplier relationships outside the firm. They interpret these findings in light of the contracting theory of Grossman and Hart (1986): firms with unrealized innovation avoid integration in order to maintain ex-ante incentives to make relationship-specific investments and maintain residual control rights. In contrast, they find that firms in high patenting industries (industries with high levels of realized innovations) are more likely to vertically integrate. The latter firms obtain control rights to facilitate the commercialization of realized innovations.

Lerner, Sorensen, and Stromberg (2011) study innovation activity in firms following LBOs, and conclude that firms do not sacrifice long-term investments after the buyout: LBO firm patents are more cited, show no shifts in the fundamental nature of the research, and become more concentrated in important areas of companies' innovative portfolios. The paper does not argue causality—whether private equity investors cause these changes or selectively invest in firms that are ripe for an improvement in innovation activity.

Atanassov (2013) employs panel data on 13,000+ firms over the 1976-2000 period to examine whether the enactment of state antitakeover laws—representing an exogenous reduction in the threat of hostile takeovers—affects innovation. He finds a decline in innovation for firms incorporated in states that pass antitakeover laws relative to firms incorporated in states that do not. Moreover, most of the impact of antitakeover laws on innovation occurs two or more years after they are enacted, which suggests a causal effect of the law on innovation. He also finds that the negative effect of antitakeover laws is somewhat mitigated by the presence of firm-level governance mechanisms.

3 Sales process and deal structuring

Before turning to the various strategic choices made by bidder and target firms during a takeover contest, this section provides a brief institutional summary of legal constraints and contractual deal-protection devices characterizing the sales process. We then motivate the pervasive role played by auctions in the sales process itself.

3.1 A private followed by a public sales process

As detailed in Section 5 below, the typical takeover procedure starts with a private sales process that is initiated by a prospective buyer or the seller itself. As first documented by Boone and Mulherin (2007), in order to participate in the private sales process, prospective bidders must first sign a nondisclosure agreement (NDA). The NDA also binds the target board of directors. Offers received while a deal is negotiated privately may be binding or non-binding. However, as soon as the target signs a merger agreement with a bidder, it must disclose this highly price-sensitive information publicly. This starts the public part of the takeover process, which is still open to new and competing bids and/or bid revisions.

The 1986 Revlon decision¹⁴ strengthened the directors' fiduciary duty to sell to the highest bidder (Gilson and Kraakman, 1990; Gilson, 1990). That is, once the board has decided to sell the firm, it must obtain the highest possible price. Hence, this landmark decision further formalized the auction nature of the sales process. Driven by this fiduciary obligation, the standard for merger agreements essentially contain a 'fiduciary out' allowing the target board to evaluate new and material bids, as well as a "go shop" provision that encourages the target to check within a certain period whether there are competing bidders with higher valuations. Hence, the public part of the sales process does not end until target shareholders have voted in favor of the final merger agreement.

3.2 Restrictions from federal and state takeover laws

Jensen and Ruback (1983) point to a central judiciary role of target shareholders: selling to the highest bidder in the auction for control of the target resources. As an efficient takeover mechanism, the structured auction gained in importance with the 1968 US Williams Act and its 1970 Amendments.¹⁵ As detailed by Jarrell and Bradley (1980), the major provisions of the Williams Act, which cover both public and private

¹⁴Revlon v. MacAndrews and Forbes, 506 A.2d 173 (Del 1986).

¹⁵Pub. L. No. 90-439, 82 Stat. 454 (July 29, 1969) and Pub. L. No. 91-567, 84 stat. 1497 (December 22, 1970).

cash takeover bids, are its disclosure requirements, its regulated minimum tender period, and its anti-fraud provisions that give the target management standing to sue for injunctive relief.¹⁶ Shares tendered during the first ten days of the offer must be purchased pro rata, and “short-tendering” (tendering more shares than you own) is also prohibited. The 1970 Amendments included lowering the threshold percentage of stock ownership that triggers disclosure requirements from 10% to 5% and expanding the scope of the law to cover exchange offers where the target shareholders are paid in the bidder’s stock or bonds.¹⁷

While the federal Williams Act likely increases the cost of a takeover (Jarrell and Bradley, 1980; Eckbo and Langohr, 1989), potential buyers also have to deal with a myriad of so-called business combination laws at the state level, which explicitly restrict takeover activity. As documented by Karpoff and Wittry (2018), 33 states (including Delaware) have some version of a business combination law. These include control share acquisition laws (29 states), fair price laws (27 states), poison pill laws (35 states), and directors’ duties or constituency laws (35 states). US Supreme and Appellate Court decisions treat state antitakeover laws as part of each state’s authority to regulate firms that are incorporated in the state. Also, most states allow firms to opt out of or suspend the provisions of these laws if the target firm’s board approves the takeover bid.

Karpoff and Wittry (2024) provide a detailed discussion of the origin and definition of state antitakeover laws (see their Appendix for a comprehensive list of definitions). They also discuss firms’ voluntary adoptions of takeover charter provisions, such as anti-greenmail provisions (blocking the firm’s ability to execute a targeted share repurchase from a potential acquirer); blank-check preferred stock authorizations; classified (staggered) board election; super-priority voting requirements; fair price provisions; limits on corporate charter amendments; and limits on shareholder actions by written consent; etc. In Section 7.4 below, we address how certain defensive tactics, in particular the adoption of poison pills, may affect takeover likelihood and offer premiums.

¹⁶The Williams Act requires the purchaser within ten days of purchase to file a Schedule 13(D) with the SEC. It contains information about the purchaser’s identity, associates, occupation, sources of funds, and the purposes of the transaction. If the purpose is to acquire control of the issuer or the acquirer has plans to liquidate the issuer, sell its assets, merge it, or make any change in its basic corporate structure, this must be disclosed.

¹⁷Following the federal Williams Act, most states have introduced their own restrictive state takeover laws, basing their jurisdiction on the relationship between the target corporation and the state.

3.3 The right to ‘just say no’ to unsolicited bids

Another important landmark decision that modified the corporate sales process is *Paramount Communications, Inc. v. Time Inc.* (Del 1989)). This decision permits a board to privately ‘just say no’ to an unsolicited (initial) offer for control—without even informing its shareholders. The central qualification behind this modification of the Revlon duty (discussed in Section 3.1 above) is that the board has not (yet) signaled that it intends to abandon its status as a stand-alone firm. More specifically, the Supreme Court of Delaware, which subsequently upheld the Time Inc. court decision on appeal, held that when a board’s reaction to a hostile tender offer only constitutes a defensive response and not an abandonment of the corporation’s continued strategy and existence, the Revlon duty is not triggered.

The Paramount-Time decision also upheld the use of target defensive measures to advance the long-term goals of the target corporation. Time Inc. had a range of defenses, including a staggered board, a 50-day notice period for any shareholder motion, and a poison pill plan with a 15% trigger. However, with the Paramount threat, Time went further. Initially, Time Inc. and Warner Communications were planning to merge as Time wanted to make a strategic change into the television business. While Time’s shares had been trading at \$120 at the time, Paramount made an unsolicited all-cash bid for \$200 per share for 100% of Time’s outstanding shares. Time Inc. got around the Revlon duty by changing the deal structure from a stock-for-stock merger to a leveraged purchase transaction. While the initial stock-for-stock deal would have triggered a vote by Time’s shareholders under the rules of the New York Stock Exchange (NYSE), which requires a vote when the stock issue is at least 20%, this deal change eliminated the need for that vote.

The effectiveness of the just-say-no defense has been further enhanced by a takeover defense such as the poison pill, which became legal after a number of challenges in the late 1980s and early 1990s. This development significantly strengthened the right of target boards to self-select the initiation of the sales process via the auction mechanism. As discussed further in Section 5.2 below, Eckbo, Norli, and Thorburn (2023) find that, of nearly 5,000 publicly traded target firms that reported their entire bid process to the US Securities and Exchange Commission (SEC) between 1996 and 2016, as many as one-half were initiated by the target itself. Liu and Mulherin (2018) and Brown, Liu, and Mulherin (2022) also associate the strengthening of target boards’ rights to defend against unsolicited takeover bids (the just-say-no defense) with a gradual increase in the importance of the private bid process.

3.4 Contractual deal protection devices

In a typical seller-initiated deal, to start the sales process, the target’s investment bank contacts several potentially interested parties. To participate in the bid process, these parties sign an NDA (confidentiality agreement) allowing access to non-public information about the target, including site visits and documents assembled by the target in a data room, and agree to non-solicitation (preventing the hijacking of key target employees) and a standstill (blocking market purchases of target shares). After the initial rounds of preliminary bidding in a private process, the seller selects its preferred negotiating party for a merger agreement, which may be followed by a public bidding process.

The merger proposal sets out the form of the acquisition (merger, tender offer); the total consideration and how it is to be settled via cash, stock swap, collar, clawback and earnout (Officer, 2004; Cain, Denis, and Denis, 2011); material adverse change (MAC) clauses (Denis and Marcias, 2013); lockup provisions (Burch, 2001) and provisions for deal termination with associated termination or breakup fee anywhere from two to five percent of the deal value (Officer, 2003; Bates and Lemmon, 2003; Boone and Mulherin, 2007; Betton, Eckbo, and Thorburn, 2009; Chen, Mahmudi, Virani, and Zhao, 2022); and to organize shareholder voting—including the NYSE listing rules requiring a bidder shareholder vote on the takeover whenever the bidder issues 20% or more of its stock to pay for the target (Li, Liu, and Wu, 2018b). Theoretical rationales for deal protection devices are based on the idea that discrimination between the initial and the subsequent bidders in a sequential bidding context can be optimal to the shareholders of the target. Che and Lewis (2007) show that the use of breakup fees often results in the optimal degree of competition and an efficient allocation of the target. In contrast, the use of stock lockups can induce a socially undesirable degree of competition while still being beneficial to the target. In a mechanism design framework, Chen and Wang (2023) show that deal protection devices can arise as part of the optimal selling mechanism for the target in the presence of costly due diligence.

The target purchases a fairness opinion of the target’s valuation as part of the due diligence process (Kisgen, Qian, and Song, 2009; Cain and Denis, 2013; Liu, 2020), and of the acquirer’s valuation if the bidder offers stock. Moreover, the merger proposal may include a “go shop” provision allowing the target to actively signal to other potential bidders that it is “in play”. Some bidders obtain tender agreements from target insiders (“shareholder agreements”), under which these insiders forsake the right to tender to a rival bidder (Bargeron, 2012). Also, Delaware case law suggests that a merger agreement would benefit

from a “fiduciary out” clause explicitly enabling the target board to agree to a superior third-party offer should one materialize (Gaughan, 2011).

When merger negotiations close, the bidder seeks SEC approval for any share issue required in the deal, and a merger prospectus is worked out. Writing the prospectus typically takes from 30 to 90 days, so the target shareholder vote is typically scheduled three to six months following the signing of the initial merger proposal. During this wait period, the bidder also performs due diligence on key assumptions behind the merger agreement. If the bidder receives 90% of the target shares in a prior tender offer, the bidder can force a merger without calling for a vote among the remaining minority target shareholders—so-called “short-form” merger (Bates, Lemmon, and Linck, 2006).

Several studies confirm that the choice of deal advisors matters for deal terms. Kale, Kini, and Ryan (2003) and Golubov, Petmezas, and Travlos (2012) find that using top-tier investment banks is associated with higher bidder returns (but also with higher advisory fees), and Bao and Edmans (2011) document a significant investment bank fixed effect in the announcement returns of M&A deals. Krishnan C.N.V. (2013) find that using a top-tier law firm as a deal advisor for the bidder significantly increases the deal completion rate. Moreover, top-tier target law firms lower the completion rate while increasing the deal premium (raising the expected deal premium). They also report that top law firms have a stronger effect on M&A outcomes than top investment banks. Agrawal, Cooper, Lian, and Wang (2013) find that deals tend to take longer to complete and to provide lower premiums to targets when the bidder and targets use common advisors.

3.5 Sales process when the target is bankrupt

Companies that operate under bankruptcy protection may initiate a sale of the firm as a going concern rather than restructuring the firm’s securities. Since operating in bankruptcy alters the bargaining position of the target, the expected outcome for bidders is likely different from that of out-of-court acquisitions. An important aspect of acquiring a bankrupt target is that the bankruptcy court’s approval of the acquisition automatically extinguishes all claims on the target firm’s assets beyond those already recognized by the court proceedings.

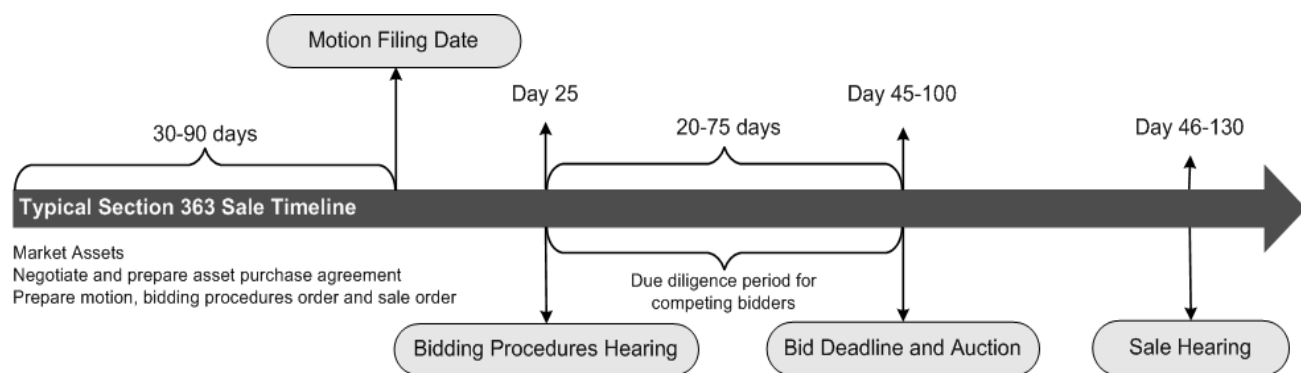
In the US, an in-court acquisition of a bankrupt firm often occurs under section 363 of the Bankruptcy Code, where the firm is sold free of any liens and liabilities.¹⁸ The sale is subject to the approval of both

¹⁸The firm can also be sold as part of the reorganization plan.

creditors and the court. Figure 4 shows a typical timeline for a 363 sale. To initiate such a 363 sale, the debtor must find a potential bidder—a so-called “stalking horse”— who is willing to undertake the necessary due diligence to be able to value the target and, perhaps, act as a reserve bid. The stalking horse

Figure 4: **Typical timeline of section 363 sales under the US bankruptcy code**

Ordinarily, the total time from commencement of preparations through approval of a section 363 sale typically ranges from 75 to 150 days. Courts and creditors may prefer longer timelines in order to ensure sufficient time for a debtor to market the assets to be sold. Shorter timelines may be approved if debtors are able to show that asset values may deteriorate in bankruptcy and/or where a stalking horse bid is conditioned on a quick sale process.



gets an inside track and may be able to impact the bidding procedure itself. On the other hand, while the

debtor may reimburse some of the due diligence costs, the stalking horse’s bid is necessarily transparent to subsequent rival bidders. However, this disadvantage may be mitigated by the use of explicit overbid protection devices and a breakup fee (which typically ranges from 2% to 4% of the purchase price).

Also, if a potential buyer is already a secured creditor, she can use her impaired debt claim to “credit bid” for the collateral that secures the claim. That is, notwithstanding that the debt claim itself is impaired, the bid may reflect the full face value of the debt claim rather than the lower value of the collateral. Credit bidding enhances the investor’s ability to negotiate with other parties and with the debtor because rival bidders must raise their bids so as to match the size of the credit bid.¹⁹

Notwithstanding the formal nature of the sales process when the target is in bankruptcy, there is a concern that the time pressure to find a qualified stalking horse and organize an open auction may be so short as to risk a “fire sale”. A fire sale discount means that the final auction price is lower than what perhaps could have been obtained outside bankruptcy. A discount would occur if the buyer who appears within the auction time frame is not the highest-valued bidder. For example, Shleifer and Vishny (1992) conjecture that one reason for this may be that the higher-value buyers are industry competitors who themselves are financially distressed at the same time. We return to this issue in Section 7.3 in a discussion of evidence on offer premiums in bankruptcy auctions.

4 Modeling takeovers as auctions

In this section, we summarize key auction-theoretic elements commonly used to model takeover auctions and which are helpful in understanding later empirical tests. As empirical testing has so far been largely restricted to data on public takeover bids, the auction framework discussed here does not itself distinguish between the private and public phases of the takeover process. One notable distinction in practice is that bids in the private phase are more non-binding in nature than are public bids. Having said that, the directors’ fiduciary duty to seriously consider any new and higher bid (the so-called Revlon duty, see sections 3.1 and 3.3 above) is present regardless of where in the takeover phase a bid is submitted.

¹⁹The right to credit bid under a plan of reorganization has been confirmed by SCOTUS. See *Radlax Gateway Hotel, LLC v. Amalgamated Bank*, 132 S.Ct. 2065 (2012). Most collateral agreements provide that exercising remedies (including directions to credit bid) may be directed by lenders holding at least 50% of the loan value. The right of lenders holding at least 50% of the loan value to direct an agent to exercise remedies on behalf of 100% of lenders has been upheld by case law. See e.g., *In re Metaldyne Corp.*, 409 B.R. 671 (Bankr. S.D.N.Y. 2009).

4.1 Auction with a single seller

There are two potential acquirers (bidders) indexed $i \in \{1, 2\}$ and one target. Each bidder i knows her private signal s_i , which is relevant for her valuation of the target v_i and potentially for the valuation of the rival bidder v_{-i} . Each signal s_i is an independent draw from a uniform distribution over $[0, 1]$. Conditional on both signals, the value of the target to bidder i is:

$$v_i = \alpha s_i + (1 - \alpha) s_{-i}, \tag{1}$$

where s_{-i} is the signal of the rival bidder. The parameter $\alpha \in [\frac{1}{2}, 1]$ measures the degree of commonality of valuations of the two bidders. At one extreme, $\alpha = 1$ captures the case of independent private values. In this case, each bidder's private valuation is independent of the other bidder's private valuation, and each bidder knows her valuation but not the valuation of the other bidder. A classic example of a private value asset is a piece of art by an unknown artist (so that the resale opportunity is not a consideration). In the context of corporate takeovers, private values can be generated by technological synergies. For example, if the target has patents whose usefulness is very bidder-specific, the synergies will have a significant private-value component.

At the other extreme, $\alpha = \frac{1}{2}$ captures the case of pure common values. In this case, the two bidders have exactly the same valuation of the target: $\frac{1}{2}(s_1 + s_2)$. However, since each bidder knows only its own signal, the two bidders have different estimates of their valuation of the target. A classic example of a common-value asset is an oil well. The value of oil is very similar to all major oil-producing companies, but they may have different estimates of how much oil the well contains. The value of the target under its current management is x_T . In many applications of the model, it is not relevant, so we normalize it to zero. In this case, the valuation of the target by bidder i entirely captures the additional value that the bidder adds to the target.

The two bidders compete for the target in an auction. We consider two auction formats, the first-price auction and the English (ascending-price) auction. In the first-price auction, bidders simultaneously submit bids in a concealed fashion. The bidder with the highest bid wins and pays their bid. In the English auction, the price continuously increases from a low level, and each bidder decides whether to confirm participation at the current price.²⁰ Once one bidder drops out, the remaining bidder wins and

²⁰In the auction theory literature, this model is called the "clock" model of the English auction.

pays the price at which the rival bidder exited.

Both of these auction formats are intuitive but stylized representations of the takeover process in practice. The actual process, reviewed in Hansen (2001), has features of both first-price and English auctions. Unlike the first-price auction, there are often multiple rounds of bidding. In fact, a rival bidder can submit a higher bid even after the merger agreement is signed. Malenko and Tsoy (2019) show that dynamic bidding can be used strategically by the seller to exploit conflicts of interest between bidders and their biased M&A advisors: a dynamic auction process allows biased advisors to persuade bidders to stay in the auction for too long. Unlike the clock model of the English auction, bid revisions are not continuous, and the number of bidding rounds is usually small: jump bids are very common (Betton and Eckbo, 2000), and there is commonly a “final round” of formal bidding, as designated by the target, after which the merger agreement is quickly signed, and further bid revisions are more costly. Hansen (2001), Quint and Hendricks (2018), and Daniel and Hirshleifer (2018) develop models with realistic institutional features of the takeover process.²¹ However, they are quite involved and do not admit easy extensions, so for most of the essay, we focus on the first-price and English auction as auction formats, keeping in mind that the actual process has features of both.

Both auction formats also assume that the winning bidder buys the target with certainty at the price determined in the auction. In practice, some time passes between the date at which the target accepts the offer and the date at which the deal gets executed, and shocks during this time period sometimes lead to the deal being canceled. Daley, Geelen, and Green (2024) model this post-offer acceptance learning process and show that it is inefficiently too long in equilibrium. The intuition for this result comes from the fact that the acquirer and the target cannot commit to the specific execution date as a function of information to be revealed between acceptance of the offer and the execution date, and since the acquirer captures only part of the surplus from the deal, it does not internalize the cost that additional waiting imposes on the target.

²¹For instance, in Hansen (2001) the target’s board uses the initial round of bidding to screen bidders to find the most motivated ones. This allows for limiting costly information disclosure to a small set of bidders. It is plausible that the popularity of this mechanism arose out of the desire of the target to simultaneously satisfy the Revlon duty and limit the number of bidders who have access to detailed confidential information about the target.

4.2 English auction

Consider, first, the English auction. Let $b(s)$ denote the price at which a bidder with signal s drops out in a symmetric equilibrium, i.e., in an equilibrium where both bidders use the same bidding strategies.

If values are private ($\alpha = 1$), a bidder has a weakly dominant strategy to bid until her valuation: $b(s) = s$. Indeed, bidding $b > s$ is weakly dominated by bidding s because the outcome when the rival bidder bids below s is exactly the same (the bidder wins and pays the bid of the rival bidder), while the outcome when the rival bidder bids between s and b will be better (the bidder will lose rather than winning and paying above s). Similarly, bidding $b < s$ is weakly dominated by bidding s , because the outcome when the rival bidder bids below b is the same, while the outcome when the rival bidder bids between b and s will be better: the bidder will win and pay below s .

If values have a common component ($\alpha < 1$), bidding s is no longer a dominant strategy. Nevertheless, $b(s) = s$ is still a symmetric equilibrium (all players use the same bidding strategy). To see this, suppose that bidder 1 follows this strategy and stays in the auction until s_1 . Bidder 2 with signal s_2 must be indifferent between winning and losing at her exit price b_2 . Winning is bad news for the bidder in the sense that it means that the opponent is more pessimistic about the value of the target, a phenomenon called the “winner’s curse”. If bidder 2 wins exactly at price b_2 , bidder 2 infers that bidder 1’s signal is b_2 and therefore values the target at $\alpha s_2 + (1 - \alpha) b_2$. Intuitively, bidder 2 rationally adjusts for the winner’s curse, valuing the target at $\alpha s_2 + (1 - \alpha) b_2$ rather than at s_2 . If bidder 2 loses, she gets zero. It is easy to see that at price $b_2 = s_2$, bidder 2 is exactly indifferent between winning and losing.

4.3 First-price auction

Next, consider the first-price auction. Now, $b(s)$ denotes the equilibrium bid, rather than the exit price, of a bidder with signal s . Consider a bidder with signal s who submits a bid $b(s')$ that corresponds to the bid of type s' . Her expected payoff is:

$$s' \left[\alpha s + (1 - \alpha) \frac{s'}{2} - b(s') \right]. \quad (2)$$

Intuitively, when the bidder bids $b(s')$, they win if the opponent’s signal is below s' . Thus, the probability of winning the auction with such a bid is s' , and conditional on winning, the bidder’s valuation is, on average, $\alpha s + (1 - \alpha) \frac{s'}{2}$. Maximizing (2) with respect to s' and using the equilibrium condition that the

maximum must be reached at $s' = s$,²² we obtain the differential equation for $b(\cdot)$:

$$b'(s) = \frac{s - b(s)}{s}. \quad (3)$$

Combining with the initial condition that $b(0) = 0$ (if $b(0)$ were positive, the low types would get negative payoffs from winning, which cannot be optimal), we obtain

$$b(s) = E[x|x \leq s] = \frac{s}{2}. \quad (4)$$

It is interesting that in this simple framework, the degree of commonality of valuations has no effect on equilibrium bidding strategies in the English and first-price auctions. This will be useful in the extensions below.

4.4 Auction or negotiation?

An important strategic choice that sellers often face is whether to conduct an auction among multiple potential buyers or to negotiate with a single buyer. Which is a better way to sell a company?

To see the key theoretical trade-offs, start with the following simplified version of Bulow and Klemperer (1996). There are two bidders with independent private values. Suppose that the seller decides to negotiate with one bidder, denoted as bidder 1. The optimal mechanism in this case is to commit to a take-it-or-leave-it offer of some price $p \in [0, 1]$. The bidder will accept it if and only if $s_1 \geq p$. The implied expected revenues of the seller will be

$$E(\pi_S^N) = \Pr(s_1 \geq p) p = (1 - p) p. \quad (5)$$

Maximizing over p yields the optimal price of $p = \frac{1}{2}$ and the seller's expected payoff of $E(\pi_S^N) = \frac{1}{4}$. Clearly, in practice, the seller is unlikely to have such commitment power, so the outcome of the negotiation is likely to be different. However, regardless of the negotiation protocol, the seller cannot do better than the expected payoff of $\frac{1}{4}$ since this is the best she can do when she has full commitment and bargaining power.

Suppose that instead of negotiating with a single bidder, the seller holds a simple English auction

²²That is, the bidder with signal s finds it optimal to bid $b(s)$.

without a reservation price among two bidders.²³ In this case, bidder $i \in \{1, 2\}$ will bid up to their valuation s_i , implying the expected revenues of:²⁴

$$E(\pi_S^A) = E(\min\{s_1, s_2\}) = \int_0^1 2(1-v)vdv = \frac{1}{3}. \quad (6)$$

As we can see, the seller's expected payoff from a simple English auction ($\frac{1}{3}$) exceeds the seller's expected payoff from the best possible negotiation format ($\frac{1}{4}$), so, given the choice, the seller would always go for the former. Bulow and Klemperer (1996) show that this insight is not specific to the case of two bidders or uniformly distributed valuations: the seller always gets higher expected revenues from the English auction with $N + 1$ bidders than from the English auction with N bidders followed by an optimal take-it-or-leave-it offer to the highest bidder. In other words, competition is a more important consideration than negotiation skills.

This insight is not specific to independent private values. To illustrate, suppose that bidders' values are common and equal $\frac{1}{2}(s_1 + s_2)$. In the case of a negotiation, bidder 1's best guess of her valuation is $\frac{1}{2}s_1 + \frac{1}{4}$. Hence, the expected revenues of the seller from a take-it-or-leave-it offer of price $p \in [\frac{1}{4}, \frac{3}{4}]$ is:

$$E(\pi_S^N) = \Pr\left(\frac{1}{2}s_1 + \frac{1}{4} \geq p\right)p = \left(\frac{3}{2} - 2p\right)p, \quad (7)$$

which implies that the optimal offer is $p = \frac{3}{8}$ and the seller's expected payoff is $E(\pi_S^N) = \frac{9}{32}$. In the case of an English auction with two bidders, each bidder i bids until the price equals s_i . Hence, the expected revenues are $\frac{1}{3} > \frac{9}{32}$.

One concern with an auction is that bidders may be reluctant to participate because of the significant costs of doing due diligence and submitting offers. So, one could expect high participation costs to favor negotiation. Bulow and Klemperer (2009) show that the answer is not so simple. Adding participation costs and putting more structure on the negotiation, they compare a standard simultaneous auction (now with an endogenous number of bidders) with a sequential sale process in which potential bidders enter the process sequentially after observing the current highest bid (a generalization of Fishman (1988)). Surprisingly, the sequential sale process allocates the target more efficiently than the auction (in the

²³Since the setting is symmetric, the revenue equivalence theorem holds: any other auction from a very large class is equivalent to the English auction (e.g., Krishna (2010)).

²⁴The minimum of two i.i.d. random variables distributed with cumulative density F and probability density function (p.d.f.) f is distributed with p.d.f. $2(1 - F(v))f(v)$.

sense of the expected value of the winning bidder net of expected participation costs of all bidders), but the auction usually generates higher expected revenues for the seller.

Intuitively, the higher efficiency of the sequential process comes from more efficient entry by bidders. In the sequential sale process, a new bidder enters when existing bidders reveal themselves to be weak through low offers, while in simultaneous auctions, entry is not contingent on the strength of other bidders. At the same time, the sequential sale process transfers additional rents to the buyers by giving them the ability to preempt entry (see the discussion of Fishman (1988) in Section 7.1 below for the mechanism). Higher competition in the auction generates higher expected revenues despite lower efficiency.

Overall, both Bulow and Klemperer (1996) and Bulow and Klemperer (2009) show the power of competition for the seller. Why are negotiations popular despite these theoretical results? One assumption that is very important for these results is that the bidders are symmetric. If bidders' valuations are drawn from different distributions, the seller may be better off negotiating with a stronger bidder rather than conducting a simple auction among multiple bidders. To see this, consider the simple model outlined above, but suppose that the valuation of bidder 2 is drawn from a uniform distribution over $[0, \hat{s}]$ for $\hat{s} < 1$, while the valuation of bidder 1 is still drawn from a uniform distribution over $[0, 1]$. In this case, the English auction results in the expected revenues of:

$$\begin{aligned} E(\pi_S^A) &= E(\min(s_1, s_2)) = \Pr(s_1 \leq \hat{s}) E(\min(s_1, s_2) | v_1 \leq \hat{s}) + \Pr(s_1 \geq \hat{s}) E(s_2) \\ &= \hat{s} \frac{1}{3} \hat{s} + (1 - \hat{s}) \frac{\hat{s}}{2} = \hat{s} \left(\frac{1}{2} - \frac{\hat{s}}{6} \right), \end{aligned} \quad (8)$$

where we used the fact that the expectation of the minimum of the two random variables, distributed uniformly over $[0, \hat{s}]$, is $\frac{\hat{s}}{3}$.²⁵

In particular, $E(\pi_S^A)$ is strictly increasing in $\hat{s} \in (0, 1)$, taking values from zero to $\frac{1}{3}$. Clearly, if $\hat{s}$ is sufficiently low (specifically, $\hat{s} < \frac{3-\sqrt{3}}{2}$), then the seller's expected payoff from the auction is below $\frac{1}{4}$ (the seller's payoff from negotiation). Thus, negotiation can be optimal for the seller if the seller has reasons to believe that one bidder is significantly stronger than the others and can identify this bidder. Gentry and Stroup (2019) estimate an auction model that allows for bidder asymmetries on a sample of companies that were sold using a simultaneous auction procedure. They then use the estimates to

²⁵To see why, recall that in (6) we have shown this for $\hat{s} = 1$. Since going from uniform distribution over $[0, 1]$ to uniform distribution over $[0, \hat{s}]$ simply scales all expressions by $\hat{s}$, we obtain that the expectation is $\frac{\hat{s}}{3}$.

see what expected revenues a sequential negotiation procedure of Bulow and Klemperer (2009) would have generated. They find that for an average target in their sample, expected revenues under these two formats are quite similar. However, for subsets of targets, the sale format is quite important.

Overall, the implication of these papers is that the seller is better off conducting a simple simultaneous auction when potential buyers are symmetric. In contrast, if the target believes that one potential buyer is likely to value it significantly more than others, then a negotiation may be preferred. Interestingly, in a recent paper Hoffmann and Vladimirov (2025) show that this logic breaks down if the sale can occur in stock instead of cash. In this case, the target may actually prefer negotiation with a single bidder even if potential bidders are symmetric. We discuss this result in more detail in a section on the payment method choice.

4.5 Deals involving financial buyers

An important dimension of corporate takeovers is that potential buyers come from two distinct groups, strategic buyers and financial buyers. Strategic buyers are typically companies in business areas related to the operations of the target. Their primary interest in the acquisition arises due to potential synergies. After the acquisition, a strategic buyer would integrate the target into its own operations. In contrast, financial buyers are typically private equity firms. Their primary interest in the acquisition arises not due to synergies but rather due to the potential to improve the operations of the target. After the acquisition, a financial buyer would treat the target as a part of its portfolio and exit it in several years.

Given that the motivations of strategic and financial buyers are quite distinct, it is interesting to analyze whether they value target companies differently. This question is analyzed by Gorbenko and Malenko (2014). Using detailed bidding data on auctions of companies, they estimate the distribution of maximum willingness to pay of strategic and financial bidders. They uncover three empirical patterns. First, even though a typical target is valued more by an average strategic bidder than by an average financial bidder, there is a sizable group of targets, around 20-25% of the sample, that are valued more by financial bidders. These targets appear to be mature and poorly performing companies. This suggests that it is not true that strategic buyers can replicate everything that financial buyers do and add some synergies on top. Instead, it suggests that financial buyers bring some advantage to the table that strategic buyers do not possess, such as expertise in restructuring targets or cheaper access to debt capital due to the reputation of the financial sponsor (Demiroglu and James, 2010; Ivashina and Kovner, 2011; Malenko

and Malenko, 2015)

Second, they find that maximum willingness to pay (relative to the market value of the target) is sensitive to economy-wide credit spreads for financial, but not strategic bidders, which is in line with the empirical finding of Axelson, Jenkinson, Stromberg, and Weisbach (2013) that financial bidders lever up their targets more when credit is cheap and conforms the theory of leverage in LBO deals of Axelson, Stromberg, and Weisbach (2009).

Lastly, Gorbenko and Malenko (2014) find that valuations of strategic bidders are significantly more dispersed from each other than valuations of financial bidders. This suggests that financial bidders are more interchangeable from the target’s point of view, while each strategic bidder is relatively unique in its ability to bring synergies with the target. In fact, as Gorbenko (2019) shows, it is exactly the higher dispersion of valuations of strategic bidders (and not higher average valuations) that primarily explains the empirical fact that strategic acquirers pay, on average, more in deals than financial acquirers.

To summarize, it is important to recognize the heterogeneity of the two classes of bidders. This heterogeneity also relates to the large literature on private equity that studies sources of value creation and agency problems in private equity deals, as well as to the large literature on the determinants of synergies in strategic mergers. In Section 8.5 below, we further discuss the uniqueness of publicly listed strategic bidders in creating synergy gains.

4.6 Buying from multiple sellers

So far, we have assumed that the acquirer buys the firm from a single seller. This model captures well a situation in which the board of the target acts as a de facto auctioneer, running the sale process on behalf of all target shareholders. However, a potential bidder can bypass the board and instead make a tender offer to buy shares from shareholders of the target directly. If sufficiently many shareholders sell their shares, the bidder will get control over the target. For example, this may be an attractive option if the board of the target is captured by entrenched management and the takeover is hostile. If the board of the target is opposed to the deal, then acquiring shares from shareholders directly is de facto the only possibility for a potential acquirer to get control of the target outside of a costly proxy fight. When a potential acquirer buys shares directly from shareholders, we have a case of buying from multiple sellers.

In a seminal paper, Grossman and Hart (1980) show that in an environment with infinitely many dispersed shareholders of the target (“sellers”) and common knowledge of improvements in the value of

the target that the acquirer will bring, the acquirer will be unable to make a tender offer that allows her to keep any positive surplus. Intuitively, there is a free-rider problem among shareholders of the target in their decisions to tender shares: Shareholders that do not tender their shares “free ride” on shareholders that tender shares at a price below the post-takeover value of the target. When ownership of the target is infinitely dispersed, each shareholder ignores the possibility that her decision to tender changes the probability of the acquisition and thus is willing to tender only at a price that weakly exceeds the post-takeover value of the target. Thus, to acquire the target, the acquirer needs to pay at least the post-takeover value of the target, leaving no surplus to the acquirer. If submitting a takeover bid is costly, the acquirer would not bother submitting a bid, resulting in efficient transfers of control not happening.

The second contribution of Grossman and Hart (1980) is to point out the valuable role of diluting non-tendering shareholders. If the acquirer is able to dilute the post-takeover value of shares that do not get tendered, then shareholders of the target will be willing to tender their shares at a lower price, leaving the acquirer with a positive surplus. The greater the ability to dilute non-tendering shareholders, the higher the probability of a successful takeover. The optimal (from the point of view of shareholders of the target) amount of dilution solves the trade-off between promoting ex-post efficient takeovers and preserving the surplus of shareholders of the target. How can the acquirer dilute non-tendering shareholders? There are several possibilities. One option, discussed by Grossman and Hart (1980), is for shareholders to allow the acquirer to sell a firm’s assets to another firm controlled by the acquirer at a price below the asset’s value. Another option could include excessive compensation of the management of the joint firm. Muller and Panunzi (2004) show how dilution of non-tendering shareholders can be implemented via a leveraged “bootstrap acquisition”: The acquirer would set up an acquisition subsidiary, issue debt backed by the assets of the target to finance the acquisition, and merge the target with the acquisition subsidiary. Since debt is senior to equity, the acquirer effectively pledges a fraction of the benefits of the takeover to the debtholders, lowering the value that goes to the shareholders of the target.

The Grossman and Hart (1980) “free-rider” model has been a workhorse framework to explore a number of issues in the takeover setting, such as the role of large shareholders (Shleifer and Vishny, 1986b), the role of bidder’s private information and signaling (Hirshleifer and Titman, 1990; Burkart and Lee, 2015), post-takeover moral hazard of the acquirer (Burkart, Gromb, and Panunzi, 1998), choice between block trades and tender offers (Burkart, Gromb, and Panunzi, 2000; Stepanov, 2019), communication from the board of the target to its shareholders (Levit, 2017), and the choice between proxy fights and

takeover bids (Bebchuk and Hart, 2001). This literature is quite large and goes beyond the scope of this survey. We refer the reader to an excellent survey by Burkart and Panunzi (2008) for more detailed coverage of this topic.

Another line of work that builds on Grossman and Hart (1980) relaxes the assumption of an infinitely dispersed ownership structure. While Grossman and Hart (1980) assume that the target firm has infinitely many shareholders, Bagnoli and Lipman (1988) consider the case of a finite number of shareholders. In this case, a tender offer does have a pivotal shareholder who realizes that if she does not tender, then the acquisition may not occur and, as a result, is willing to tender at a price below the post-acquisition value of the share. Bagnoli and Lipman (1988) show that having a finite number of shareholders alleviates the free-rider problem studied by Grossman and Hart (1980), and successful takeovers are possible without the dilution of non-tendering shareholders. Nevertheless, as the number of shareholders grows to infinity, the expected profits of the acquirer converge to zero. As Marquez and Yilmaz (2008) show, the ability of the acquirer to make a positive profit is inhibited by private information of shareholders of the target about the acquirer’s ability to improve value. Such private information creates a “lemons” problem: For a given bid, only the relatively pessimistic shareholders tender their shares, which makes it too costly for the acquirer to induce shareholders of the target to sell. In contrast, Ekmekci, Kos, and Vohra (2016) show that if the ownership structure of the target includes a minority blockholder and a mass of small shareholders, then the acquirer can make a positive profit. Voss and Kulms (2022) show that an ownership structure in which an informed insider owns a minority stake while uninformed outside shareholders collectively own a majority stake results in an efficient transfer of control, while an ownership stake in which an informed insider owns a majority stake does not.

5 Deal initiation and final outcomes

In the vernacular of Manne (1965) and Jensen and Ruback (1983), bidder management teams are the primary activist entities in the market for corporate control. Traditional bidding theory has also adopted this convention more generally when it endows buyers with private information about synergistic opportunities with targets or about target mispricing of bidder shares, giving rise to bidder first-mover advantages. However, recent research broadens this perspective to include incentives for targets to initiate the deal (beyond targets that are in financial distress and so need cash to survive). Below, we

review theoretical determinants of bidder versus seller-initiated deals and new evidence on deal initiation frequencies.

5.1 Modeling the initiation decision

Gorbenko and Malenko (2024) develop a theory of endogenously initiated auctions to study why some auctions are bidder-initiated while others are seller-initiated. In their model, there is a target and two potential buyers with private signals about their valuations of the target. Every period, each bidder can approach the target indicating an interest, and the target has an option to put itself up for auction. Formally, an indication of interest is a binary cheap talk message (Crawford and Sobel, 1982) that communicates that the signal of the bidder is sufficiently high. In equilibrium, an expression of a bidder’s interest leads the target to sell itself immediately, in which case the auction is called bidder-initiated. If the target decides to sell itself without any bidder sending an indication of interest, the auction is called seller-initiated. Once the target places itself up for auction, the bidders compete for it in the first-price auction.

The model set-up is dynamic in discrete time, and the benchmark model has two periods, $t = 0$ and $t = 1$. At $t = 0$, each bidder randomly draws a private signal about her valuation of the target, which is modeled as in Section 4.1. To model the possibility that valuations can change over time due to either an external economic shock or a change in the business nature of the target, they assume that a shock arrives at time $t = 1$ with probability $\lambda > 0$. This shock makes previous signals irrelevant; new signals are drawn, and the bidders’ valuations change. In addition to this shock, each period with some probability $\nu > 0$, the target experiences a liquidity shock, in which case it has no choice but to sell itself immediately.

Gorbenko and Malenko (2024) show that the key determinants of whether auctions are bidder- or seller-initiated in equilibrium are the degree of commonality of valuations, α , and the likelihood that a seller receives a liquidity shock, ν . If valuations have a sufficiently high common component (i.e., if α is sufficiently close to $\frac{1}{2}$) or if the probability of a liquidity shock is sufficiently high, then bidders never approach the seller in equilibrium, and the only possible equilibrium outcome is that the seller initiates the auction. In contrast, if valuations are close to private (i.e. if α is quite high) and liquidity shocks of the target are rare, then both bidder- and seller-initiated auctions can occur in equilibrium.

To see where these results come from, consider, first, the effect of the commonality of valuations.

Consider the incentives of type $\hat{s}$ of the bidder, who is indifferent between approaching the seller and indicating the interest today and awaiting for the future when the auction gets initiated by someone else (by the seller or by another bidder).

First, consider the case of pure common values. If the bidder initiates the auction, the non-initiating bidder learns that the signal of the initiating bidder, s_I , is distributed on $[\hat{s}, 1]$. In addition, the non-initiating bidder knows the signal, call it s_{NI} , so they update their valuation of the asset to at least $\frac{1}{2}(\hat{s} + s_{NI})$. Since it becomes common knowledge that the signal of the initiating bidder is at least $\hat{s}$, and since the only source of rents of a bidder in the common value setting is private information, the initiating bidder with type $\hat{s}$ must get zero rents from the bidder-initiated auction. Consequently, they prefer to wait. Since this argument holds for any $\hat{s}$, there is unraveling: No bidder indicates their interest to the seller, and the auction can only be seller-initiated. Intuitively, the bidder does not want to initiate the auction because initiation conveys information that the bidder is bullish about the target, which erodes their rents when values are common. Gorbenko and Malenko (2024) show that this is not a knife-edge result: It also holds when valuations have a private component, as long as the common component is sufficiently important.

Second, consider the case of pure private values. In this case, although the non-initiating bidder knows that the signal of the initiating bidder is at least $\hat{s}$, it does not lead to the non-initiating bidder updating their valuation. Consequently, the non-initiating bidder with sufficiently low signals loses, and the initiating bidder of type $\hat{s}$ gets high rents. Thus, when valuations have a significant private component, auctions can be both bidder-initiated and seller-initiated.

The second result is that if the probability with which the seller is forced to sell the firm is sufficiently high, bidders will choose not to approach the seller in any valuation environment. Intuitively, while the initiating-bidder gets high rents in a bidder-initiated auction in the case of private values, waiting for the seller-initiated auction is even more profitable when the bidder expects the seller to sell itself soon: In a seller-initiated auction, the bidder will be able to hide their high valuation from the rival bidder, who will therefore bid less aggressively.

Valuations of financial bidders, such as private equity firms, arguably have a much higher common component than valuations of strategic bidders. Intuitively, different financial bidders get their rents from leverage, managerial incentives, and exploiting misvaluation of the target, all of which have significant commonality across many possible financial acquirers. In contrast, strategic bidders get their rents

primarily from synergies, which are significantly more acquirer-specific. Therefore, the implication of the above analysis is that contests by financial bidders should be primarily seller-initiated, while deals done by strategic bidders will often be bidder-initiated. Similarly, if a target is expected to be put up for sale in the near future, such as when it is close to bankruptcy, the above analysis predicts that deals will unlikely be bidder-initiated.

In practice, the board of the target sometimes initiates the takeover auction because it gets pressured by a shareholder activist to do so. In this respect, the activist investor “brokers” the takeover process. Several recent papers explored this role of shareholder activists. Corum and Levit (2019) ask the question what puts a shareholder activist into a better position to pressure the board of the target to sell the firm than a potential bidder, even though the potential bidder, like the activist, can seemingly also threaten to run a proxy fight campaign if the board of the target decides to sell. They show that the fact that a potential bidder wears two hats (that of a bidder who wants to pay less and that of a proxy fight sponsor who wants to convince shareholders to support her) in a hypothetical proxy fight makes the proxy fight threat less credible when it is run by the bidder. Intuitively, shareholders of the target are more reluctant to support the bidder in a proxy fight than a shareholder activist, because they expect the latter to be a better negotiator of deal terms on behalf of shareholders. Since the proxy fight threat by a shareholder activist is more credible, the shareholder activist is more effective at pressuring the board to put the firm up for sale in the first place.

Burkart and Lee (2022) compare shareholder activism and takeovers in the multiple-seller setting of Grossman and Hart (1980) by examining the interplay between two different free-rider problems: the free-rider problem in shareholder activism with respect to the activist’s effort to improve firm value (the activist pays the cost but shares the benefit with the other shareholders) and the free-rider problem in takeovers (the bidder pays the price that reflects the anticipated value improvement, because non-sellers free-ride on the sale decisions of sellers at the tender offer stage). A takeover alleviates the former free-rider problem at the cost of creating the latter free-rider problem. They show that takeover activism, whereby a large shareholder incurs effort to obtain control over the board of the target and uses this control to negotiate a merger on behalf of all shareholders, achieves the best of both worlds by avoiding both free-rider problems. Burkart, Lee, and Voss (2024) study a setting related to Burkart and Lee (2022) but introduce private information of a large shareholder of the target. As a result of private information, takeovers and takeover activism can coexist in equilibrium, because a large shareholder with

very favorable private information may prefer to acquire the whole firm herself. They use this setting to provide a theory of how the mode of control change has evolved over time.

5.2 Evidence on deal initiation frequencies

Although they do not analyze deal initiation *per se*, Boone and Mulherin (2007) are the first to present evidence of a competitive sales process, suggesting that targets may be promoting deals more extensively than previously thought. They describe a private auction process prior to the first public deal announcement, in which the M&A advisor of a target firm often solicits bids from several potential acquirers. Their evidence suggests a greater degree of bidder competition than what the takeover literature regularly deduces from the population of public takeover bids in the SDC database. Moreover, Aktas, de Bodt, and Roll (2010), Masulis and Simsir (2018) and Boone, Maeseneire, Dereeper, Luypaert, and Nguyen (2024) collect information on deal initiations directly and find that about one-third of public transactions are seller-initiated.

Eckbo, Norli, and Thorburn (2023) and Eckbo, Makaew, and Thorburn (2025) provide the most extensive information on the scale of seller-initiation in takeovers of public targets. Eckbo, Norli, and Thorburn (2023) determine the initiating party for a total of 4,787 public targets from 1996 to 2016. Much of this information is made available by Regulation 14D9 of the 1933 Securities Act, which requires public targets to file a proxy statement soliciting target-shareholder votes. The section “background of the merger” in this filing, which provides a detailed description of the process leading up to the proposed merger agreement, is increasingly used by researchers interested in how firms are sold.²⁶

Figure 5, which we have replicated here from their data, shows that a surprisingly large percentage—42%—of these deals were initiated by the seller board. Moreover, if we also include the categories “Seller shareholders”, “Joint effort”, and “Merger of equals” in the seller-initiated calculation, the percentage rises to 56%.²⁷ Eckbo, Norli, and Thorburn (2023) argue that, from the point of view of takeover initiation, the seller is as active as the buyer in a merger of equals, and when the SEC labels the deal process as a joint effort. In sum, it appears that about one-half of takeover bids for public targets are initiated by the target, which organizes an auction-like process to solicit potential bids. The remaining

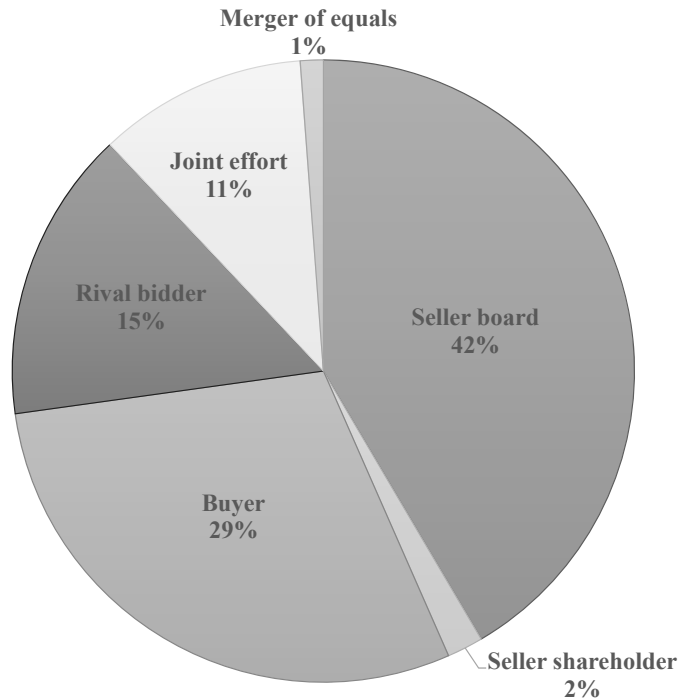
²⁶Useful SEC filings include DEFMA14A (definitive proxy statement for M&A), PREM14A (preliminary proxy statement for M&A), schedule TO-T (third party tender offer), 14D9 (management tender offer recommendation), and S-4 (registration of securities issues in business combination transactions).

²⁷In joint efforts and merger of equals, the SEC documents do not explicitly specify who initiates the transaction.

contests are initiated by the bidder making the first (private) offer for the target or (to a much lesser extent) by a rival bidder.

Figure 5: The initiating party in takeover initiations.

The data are from Eckbo, Norli, and Thorburn (2023), who classify takeover initiations based on the section “Background of the Merger” in the SEC merger filings. In the category labeled “Rival bidder,” a bidder other than the one eventually acquiring the target initiated the transaction. In the category “Joint effort”, the merger documents do not specify who initiated the transaction. In the category “Merger of equals,” the merger documents explicitly refer to a merger of equals. The sample includes a total of 4,787 completed and not completed transactions, 1996–2016.



Finally, the role of investment banks as intermediaries in the initiation process is unclear. While they do not examine who initiates the transaction, Golubov, Petmezas, and Travlos (2012) find evidence that, in a sample of about 2,000 public targets (1996–2009), top-tier-ranked M&A advisors are associated with higher bidder returns than their non-top-tier counterparts (a \$66 million shareholder-value improvement for an average-sized acquirer, net of a top-tier investment banking fee premium). Hence, the assistance of a reputable intermediary in the M&A process is valuable. What remains unclear, however, is the incentive of investment banks to help initiate the sell-side versus the buy-side of the M&A market. While sourcing a potential target for a client may be relatively routine for a reputable investment bank, anecdotal evidence

suggests that initiating a recommendation to a client firm that it may be better off selling itself is much more sensitive. Hence, research is needed to accurately sort out the overall role played by intermediaries in sourcing M&A deals.

5.3 Contest duration, time to second bid, and success rates

As described in Section 3 above, the process leading to a merger deal starts with one or more rounds of *private* negotiations and/or bidding, followed by the signing of the merger agreement. This signing triggers a public announcement of what is conventionally labeled the *initial public offer* for the target. The SDC records premiums and other key offer characteristics in public offers. Therefore, with the exception of the evidence on deal initiations discussed above, this review is restricted to discussing empirical results based on the public rounds of bidding, starting with the initial public bid.

Moreover, in order to closely mimic the theoretical timeline of events depicted in Figure 1 above, we emphasize empirical evidence that is based on sorting all observed public bids for a given target into a single takeover contest. This empirical approach—first implemented by Betton and Eckbo (2000)—is necessary to identify differences between the initial and the final bid in public rounds of bidding. As discussed in Section 7 below, this is also key to making inferences about competition preemption and jump bidding.²⁸

The following is a summary of how the individual public bids can be organized into takeover contests:

- (1) From SDC, download all mergers (deal form M) and acquisition of majority interest (AM) where the bidder holds less than 50% of the target shares prior to the bid announcement.
- (2) Organize the bids into public control contests for a given target. The control contest begins with the first control bid for the target and continues until a fixed number of trading days have passed without any additional offers.²⁹ Each time an additional offer for the target is identified, the fixed trading-day search window rolls forward.

²⁸Note also that we adopt the convention of using the term takeover contest as synonymous with all forms of takeover processes, whether it starts out as an auction or a merger negotiation and whether or not the number of publicly announced bids exceeds one. Even a situation in which the target board has signed a merger agreement *de facto* opens up a contest period since, as pointed out in Section 3.2 above, directors of the target board have a fiduciary duty to consider any competing bid that occurs before the final vote.

²⁹Betton and Eckbo (2000) use 60 trading days (three months), while Betton, Eckbo, and Thorburn (2008) and Betton, Eckbo, Thompson, and Thorburn (2014) use 120 days (six months).

- (3) Determine the contest ending date. When SDC’s deal status variable states “completed,” the contest ending date is the earlier of SDC’s effective conclusion date and the target delisting date. When SDC’s status is “incomplete” (no bid is accepted), the contest ends with the offer date of the last control bid plus the fixed trading-day search window.
- (4) Classify each control contest as a single bid, multiple bids by a single bidder, or multiple bidders. A multiple-bid contest occurs either because the initial bidder submits bid revisions or because there are multiple bidders.
- (5) Identify the contest duration as the period from the date of the initial bid to the ending date of the takeover.

As summarized next, having organized bids for the same target into a contest, it is possible to measure contest duration, time to the second bid (if any), bid jumps, final offer premiums, the likelihood that the first bidder wins, etc.

Starting with the first public offer for the target firm, Betton, Eckbo, and Thorburn (2008) provide evidence on the duration of 25,166 ex-post successful takeover contests initiated by a merger or a tender offer, 1980–2006. Duration is measured from the date of the initial bid to the “effective” date of the takeover. The effective date is the day the target shareholder approves the deal. Given the stringent disclosure rules governing public offers, it is important to separate public from private firms. In the group where both the initial bidder and the target are public, the duration averages 108 trading days (median 96) when the initial bid is a merger offer and 71 days (median 49) when the initial bid is a tender offer. This confirms the conventional view that tender offers are “quicker” than merger negotiations.³⁰

The evidence in Betton, Eckbo, and Thorburn (2008) also shows that a public target slows down the takeover process, whether or not the initial bid is a merger or a tender offer. Contests have the shortest duration when the two firms are both private: 27 days (median 0) for mergers and 67 days (median 41) for tender offers. A contest duration of zero results when the initial offer is announced and accepted on the same day. This is possible in some private deals, provided bidder shareholders do not need to vote on a share issue to pay for the target and provided the target vote is quick, due, say, to a high

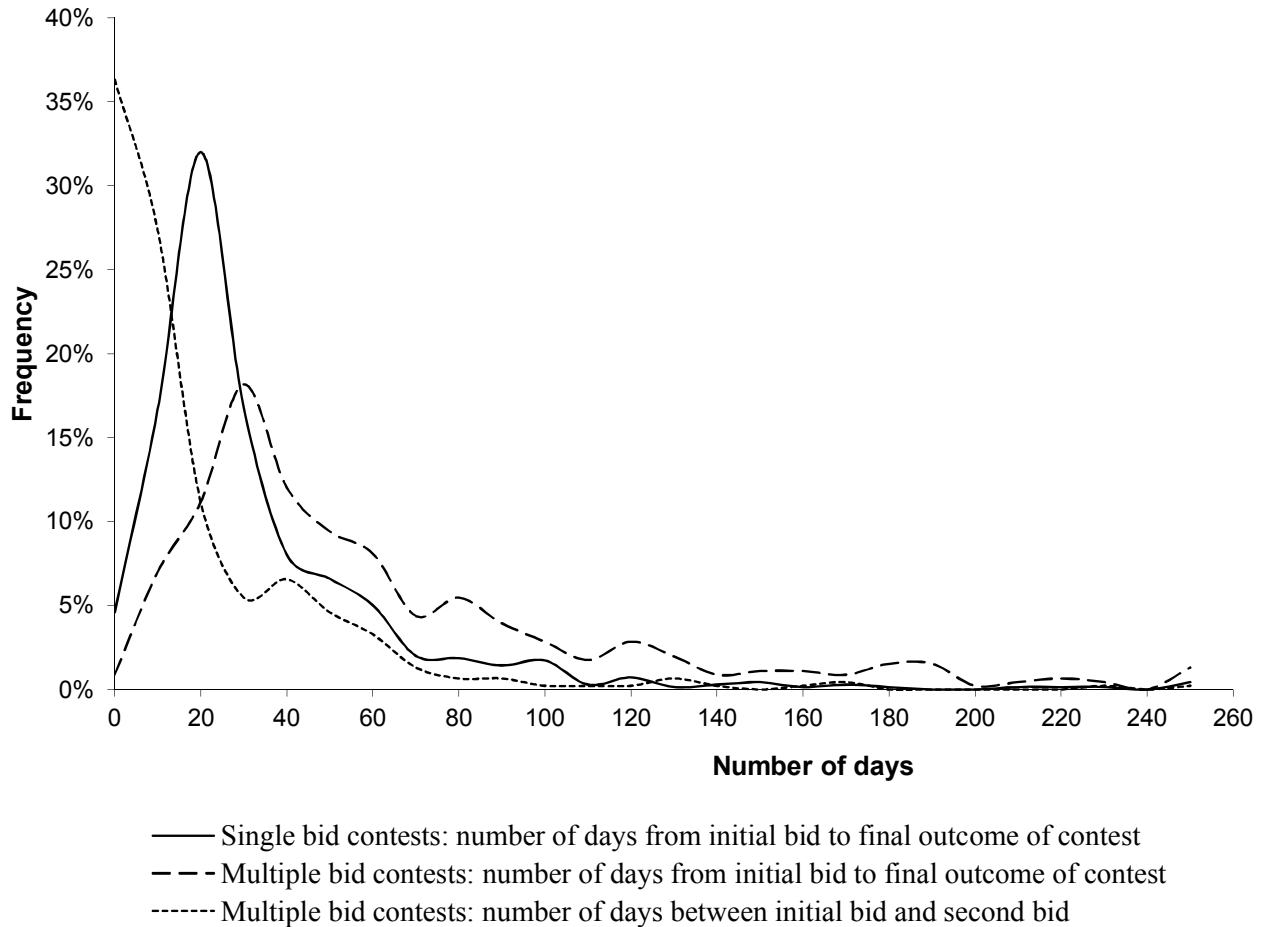
³⁰These results are comparable to those of Betton and Eckbo (2000), who report contest durations for 1,353 pure tender offer contests, 1971-1990. Among those contests, 62% are single-bid with an average duration of 40 trading days (median 29 and highest quartile 52 days). For the multi-bid tender offer contests, the average (median) duration is 70 (51) days. Thus, there is very little change in durations from the 1980s.

share-ownership concentration.

Figure 6, which is adapted from the data in Betton and Eckbo (2000), shows the distribution of the number of days from the initial to the second bid multi-bid contests. In general, the expected time to arrival of a second bid depends on the cost to rival bidders of becoming informed of their own valuation of the target, as well as the time it takes to file a formal offer. For some rival bidders, the initial bid may have been largely anticipated based on general industry developments or prior rumors of the target being in play. However, in general, the observed time to the second bid sheds some light on the likelihood that rival bidders have ready access to the resources required to generate takeover gains.

Figure 6: **Contest duration and days from the first to the second public bid**

Conditional on the presence of at least two public bids, the figure shows the number of days from the initial bid to the second bid and to the final contest outcome in 1,353 tender offer contests for US public companies, 1971-1990. Figure adapted with permission from Betton and Eckbo (2000).



Recall that, under the 1968 Williams Act, a tender offer must be open for at least twenty days, and

a new bid extends the minimum period accordingly. As shown in Figure 6, for contests with multiple bidders, the second bid arrives quickly, on average, after two to three weeks. Moreover, the time to the second bid is, on average, shorter when a rival bidder enters than when the second bid represents a bid revision by the initial bidder.

While several studies provide estimates of the probability that the target is being successfully acquired by *some* bidder (be it the initial or a rival bidder), the likelihood that the *initial* bidder wins is of particular interest as it reveals additional information on the risk of initiating a contest. Betton, Eckbo, and Thorburn (2009) and Betton, Eckbo, Thompson, and Thorburn (2014) estimate this probability using initial merger bids and tender offers. The conditional success probability for the initial bidder increases when

- the initial bidder has a toehold in the target;
- the initial bid is all-cash (rather than all-stock or mixed cash-stock);
- the bid is a tender offer (rather than a merger);
- the bidder is a public company;
- the higher the prebid target stock price runup
- the target is traded on the NYSE or the AMEX;
- the bidder and target are horizontally related in product markets.

Finally, the probability that the initial bidder wins the contest is lower if a rival bidder enters the contest (which happens in less than ten percent of the contests) and when the target has a poison pill and reacts with hostility. The negative impact of the presence of a poison pill is interesting as it suggests that pills deter some bids (we return to this issue in Section 7.4 below). Moreover, the data shows that the unconditional probability that *all bids fail* in a contest is about 20% and higher when the contest is initiated by a tender offer rather than a merger. Also, the probability that all bids fail is highest when the initial bidder is private and approaches a publicly listed target with a merger offer.

5.4 Deal voting

Target shareholders must, as a rule, approve a sale of their shares and usually do so by voting (or tendering in a tender offer). In a long-form merger, the acquirer and target boards sign a merger agreement on which the shareholders vote. Most long-form mergers require approval by at least 67% or 75% of the shareholders, depending on state laws and company bylaws. If the acquirer owns at least 90% of the target shares, it can bypass the target shareholder vote and freeze out the minority in a short-form merger. Shareholders who are dissatisfied with the price can file for appraisal rights with the court after rejecting the bid.

For a large sample of takeover contests for public targets, 1973-2002, Betton, Eckbo, and Thorburn (2009) report that 30% of the bids ultimately fail. Their sample includes control bids (merger or acquisition of majority control) from SDC, where some recorded bids are based on rumors. Limiting the sample to 4,280 merger bids with a filing in EDGAR, necessary for a shareholder vote, Eckbo, Norli, and Thorburn (2023) document that only 7% fail. However, they do not report whether the transaction failed due to regulatory hurdles, the target shareholder vote, or the acquirer shareholder vote.

US listing rules require a shareholder vote in acquisitions involving the issuance of at least 20% new shares. Examining acquisitions close to this threshold, Li, Liu, and Wu (2018b) show that acquirers with high deal risk and high agency costs are more likely to substitute stock with cash to avoid triggering a shareholder vote, but less so when institutional ownership is high. Moreover, the bidder announcement returns are 3% lower in the deals without a vote. They conclude that the prospect of a shareholder vote serves as a disciplinary device, inducing the acquirer's management to choose better targets or pay less than in cases without shareholder voting. Becht, Polo, and Rossi (2016) find a similar effect on bidder returns in the UK, where all large takeovers require a shareholder vote, irrespective of the payment method choice.

6 Deal financing and payment method choice

The choice of deal financing and payment method constitutes important economic decisions for the bidding firm. Technically, the payment method ranges from all cash to any mix of cash and bidder

shares.³¹ As buyers assume or refinance the target’s outstanding debt, the payment method directly affects the combined firm’s leverage ratio. Irrespective of the target’s leverage ratio, and unless the cash bid is financed with an equity issue, the post-takeover leverage of the combined firm is always lower for a stock bid than for a cash bid. Tax considerations may also play a role in the payment method choice.

For example, de Bodt, Cousin, and Roll (2018) argue that the abolishment of the pooling and goodwill amortization rules by the Financial Accounting Standards Board in 2001 may have impacted the use of stock as a payment method. Also, according to the US Internal Revenue Code, a cash acquisition is a taxable event to shareholders of the target, who must immediately pay capital gains taxes. In contrast, a stock acquisition is not a taxable event, so shareholders of the target can defer capital gains taxation until they sell their stock. Thus, personal tax considerations may also play a role in the payment method decision. Having said that, since a majority of investors are tax-exempt, taxation is unlikely to play an important role in the payment method choice.

In this section, we first show the time trends in how bidders fund the cash portion of the deal. We then discuss various theoretical issues that arise when the payment method decision is impacted by information asymmetries between rational bidders and targets. We return to the potential impact of information asymmetry in Section 10 below, which addresses the controversy over behavioral arguments based on the market misvaluation of one or both firms and under which opportunistic bidders may be able to pay with overpriced shares.

6.1 Payment method time trends

As shown in Figure 7, there is substantial heterogeneity in the payment method both across mergers and across time. Panel A of the figure shows the annual distribution of their 6,200 bids for US targets by US nonfinancial acquirers, 1980–2014, classified by payment method. In Panel B, the fraction of all-stock bids is shown to drop dramatically after 2000, from 53% in the 1990s to 16% afterward. At the same time, the average annual fraction of all-cash bids increases from 21% before 2000 to 50% afterward. The fraction of mixed offers remains relatively stable over the entire sample period.

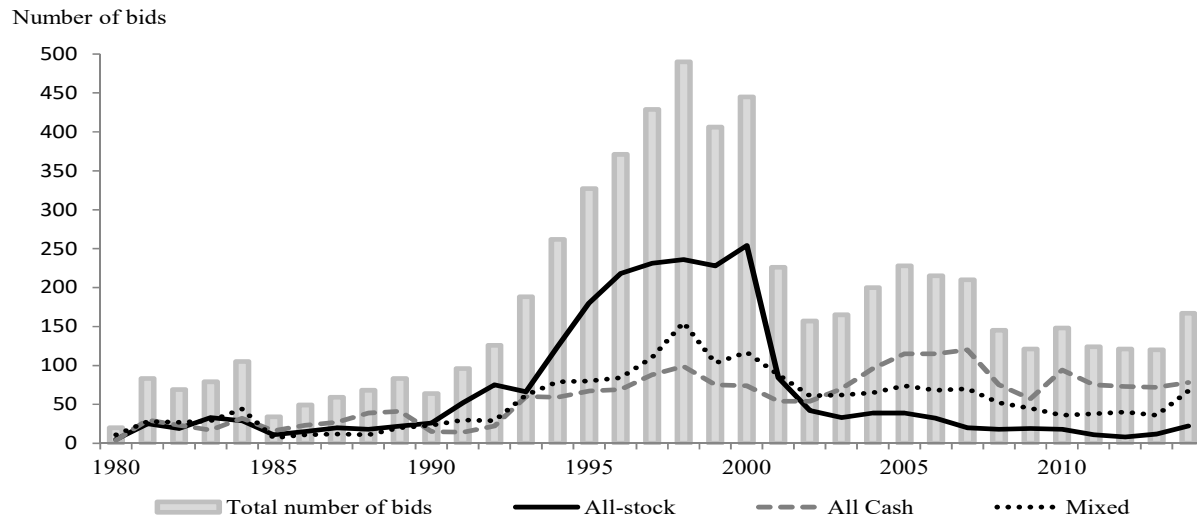
In light of the significant (50%) reduction in the total number of listed firms on the three major US stock exchanges after 1996 (discussed in Section 12 above), the shift in payment method likely

³¹In a bid where the acquirer issues more than 19.9% of its own outstanding shares to pay for the target, NYSE rules require a vote by the acquiring firm’s shareholders to authorize the share issue. Li, Liu, and Wu (2018b) analyze this voting restriction.

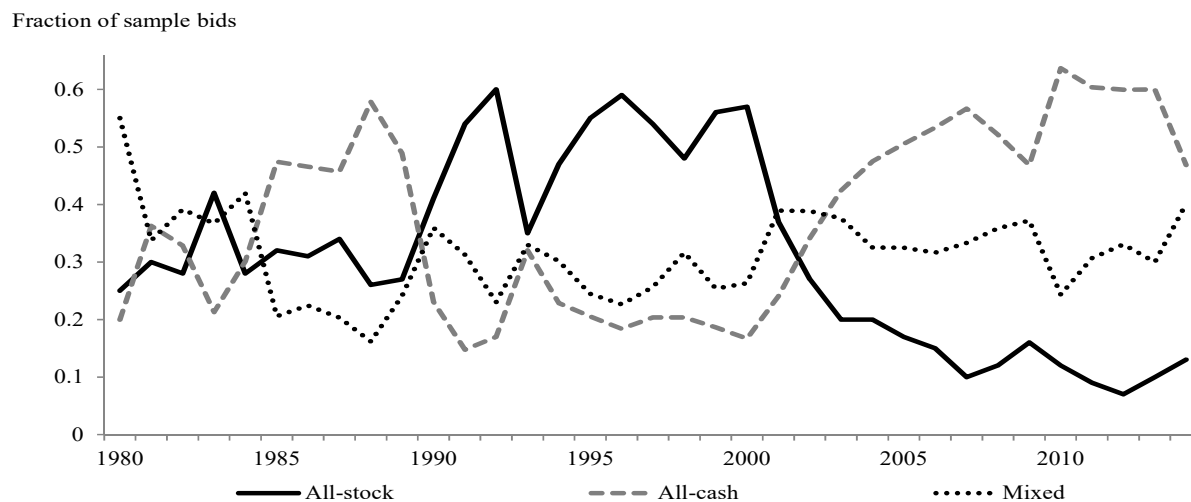
Figure 7: **Number of takeover bids and their distribution across payment methods, 1980-2014**

Panel A shows the annual number of bids and their distribution across payment methods (all-stock, all-cash, and mixed bids). Panel B shows the annual fraction of all-stock, all-cash, and mixed bids. The sample contains 6,200 merger bids for US targets by US non-financial public bidders, 1980-2014. Figure adopted with permission from Eckbo, Makaew, and Thorburn (2018)

A: Annual total number of bids and the distribution across payment methods



B: Annual fraction of all-stock, all-cash, and mixed bids



reflects a combination of changing firm characteristics and a given public bidder's propensity to pay with cash. The literature suggests that financing large investments such as M&A can trigger post-merger leverage adjustments (Harford, Klasa, and Walcott, 2009) and a deliberate payment method choice reflecting capital structure considerations and liquidity constraints (Faccio and Masulis, 2005; Uysal, 2011; Karampatsas, Petmezas, and Travlos, 2014; de Bodt, Cousin, and Officer, 2022).

Moreover, since the shares of unlisted bidders are relatively illiquid, deals involving private acquirers tend to be paid in all cash. (Eckbo, Makaew, and Thorburn, 2018) also show that deals involving public acquirers are more likely to be paid in cash when the public acquirer faces greater potential competition from private bidders. Furthermore, they show that the size of the acquirer's cash holding (normalized with total assets) does *not* affect the fraction of stock in the payment method, which suggests that liquidity constraints may play less of a role than previously thought.

6.2 Rational payment method under asymmetric information

A large class of theories develops rational payment method choices based on information asymmetries between the bidder and the target. In a world of symmetric information, cash and stock offers would be equivalent. However, if information is asymmetric, they are not, because the valuation of a stock offer now becomes non-trivial.

The point that stock bids are conceptually different from cash bids when information is asymmetric was first made by Hansen (1985). To illustrate, consider the baseline model for the case of independent private values ($\alpha = 1$) and English auction. Suppose that bidder i has a stand-alone value of 1 and values the target at s_i . As shown in Section 2, if the two bidders compete with cash offers, each bidder i will bid up to s_i . The seller's revenues are $\min\{s_1, s_2\}$, and the expected revenues are $E(\pi_S^{cash}) = \frac{1}{3}$.

In contrast, if the two bidders compete with stock offers, bidder i will be willing to bid up to a fraction $\lambda(s_i)$ of her shares, at which point they are indifferent between winning and losing:

$$(1 - \lambda)(1 + s_i) = 1 \Rightarrow \lambda(s_i) = \frac{s_i}{1 + s_i}. \quad (9)$$

The seller's payoff from the auction is therefore

$$\frac{\min\{s_1, s_2\}}{1 + \min\{s_1, s_2\}} (1 + \max\{s_1, s_2\}) \geq \min\{s_1, s_2\}, \quad (10)$$

with strict inequality whenever $s_1 \neq s_2$.

Intuitively, the same stock bid λ is worth more if the acquirer's valuation is higher. Since the winning bid is determined by the second highest bidder, while the actual valuation post-merger is determined by the highest bidder, which is higher, the seller is better off under stock offers than cash offers. Quantitatively, the difference can be significant. For example, in the case of uniformly distributed bidder valuations, the seller's expected revenue from the auction with stock bids is

$$\begin{aligned} E\left(\pi_S^{stock}\right) &= \int_0^1 \int_0^{s_{\max}} \frac{s_{\min}}{1+s_{\min}} (1+s_{\max}) \frac{1}{s_{\max}} 2s_{\max} ds_{\min} ds_{\max} \\ &= \frac{19 - 24 \ln(2)}{6} \approx 0.394, \end{aligned} \quad (11)$$

which is about 20% higher than from the auction with cash bids. DeMarzo, Kremer, and Skrzypacz (2005) generalize this insight along multiple dimensions. Most importantly, they show how revenues from security-bid auctions can be compared for different securities from a large class.³²

This argument suggests that, given the choice between cash and stock bids, bidders with private information about their valuations of the target would always prefer to bid in cash. However, since stock bids are frequently observed, this theory is incomplete. There are two ways to enrich it to make both cash and stock bids equilibrium outcomes. The first way is to address information imperfections, for example, by making the target privately informed about its assets in place. Hansen (1987), Fishman (1989) and Eckbo, Giammarino, and Heinkel (1990) explore this possibility. We discuss this literature below.

The second way is to introduce financial constraints on the side of bidders. In this case, there is the following trade-off between cash and stock offers. On the one hand, cash bids have the advantage to bidders in that they allow them to keep higher information rents from winning the auction. On the other hand, stock bids have the advantage of circumventing the financial constraints of bidders. Gorbenco and Malenko (2018) introduce this trade-off into a dynamic model of acquisitions, in which bidders decide both when to approach the target and how much to bid and in what currency once the target has been put up for sale. In equilibrium, the use of cash as a means of payment is positively associated with synergies and the acquirer's gains from the deal, and negatively associated with the financial constraints of the acquirer.

³²For additional results on this topic, see a paper by Rhodes-Kropf and Viswanathan (2000) and a review of the literature by Skrzypacz (2013).

The negative association of the use of cash as a method of payment with the financial constraints of the acquirer is obvious. The positive association of the use of cash as a payment method with synergies is more subtle and arises for the following reasons. If a bidder has very high synergies with a target, it is more likely to acquire the target when it is relatively small in size, i.e., before it has grown. The acquirer will prefer to acquire it for cash, both because the financial constraints are unlikely to be binding due to the small size of the target and because acquiring it for stock is expensive since the acquirer then has to share the high synergies with the target shareholders.

Another rationale for the use of stock bids is the target's private information about the value of assets in place (rather than bidders' private information about synergies). This idea was explored in Hansen (1987) and Eckbo, Giammarino, and Heinkel (1990). To illustrate this idea, consider the following simplified version of Hansen (1987). Suppose there is one bidder and the target. The target has a stand-alone value of x_T , which is uniformly distributed over $[0, 1]$. The value of the target to the acquirer is $x_T + s$, where $s > 0$ is a constant. Thus, the change of ownership generates synergy of $s > 0$, regardless of the value of the target x_T , so an efficient outcome is a sale for any x_T . However, x_T is private information of the target. Assume that the acquirer has a stand-alone value of x_A . Suppose that the bidder makes a take-it-or-leave-it offer to the target, which the target can accept or reject.

Consider two scenarios. In the first scenario, the bidder makes a cash offer of $b > 0$. In the second scenario, the bidder makes a stock offer of fraction λ of the combined company. If the bidder makes a cash offer of b , shareholders of the target accept it if and only if $x_T \leq b$, which happens with probability b (assuming $b \in [0, 1]$, which is without loss of generality). Conditional on getting the offer accepted, the expected value of the target to the acquirer is $s + E[x_T | x_T \leq b] = s + \frac{b}{2}$. Therefore, the optimal cash offer is

$$b^* = \max_b b \left(s + \frac{b}{2} - b \right) = s. \quad (12)$$

The trade-off is quite clear. On the one hand, a higher cash offer increases the probability of acceptance. On the other hand, it reduces the payoff to the acquirer, conditional on acceptance. This optimal offer gets accepted with probability s . The bidder's expected payoff from the optimal offer is $\frac{s^2}{2}$.

In contrast, if the bidder makes a stock offer of λ , shareholders of the target accept it if and only if

$$\lambda(x_T + s + x_A) \geq x_T. \quad (13)$$

Here, the left-hand side is the value of the fraction λ of the combined company, and the right-hand side is the stand-alone value of the target. Thus, shareholders of the target accept the offer if and only if

$$x_T \leq \frac{\lambda}{1-\lambda} (s + x_A). \quad (14)$$

Therefore, the probability of getting the offer λ accepted is $\frac{\lambda}{1-\lambda} \frac{s+x_A}{2}$, and the expected value of the combined firm (acquirer and the target), conditional on acceptance, is³³

$$x_A + s + E \left[x_T | x_T \leq \frac{\lambda}{1-\lambda} (s + x_A) \right] = x_A + s + \frac{\lambda}{1-\lambda} \frac{s + x_A}{2}. \quad (15)$$

Since the acquirer will keep only fraction $1 - \lambda$ of this value, the acquirer's optimal stock offer solves

$$\lambda^* = \max_{\lambda} \frac{\lambda}{1-\lambda} (\lambda + x_A) \left((1-\lambda) \left(x_A + s + \frac{\lambda}{1-\lambda} \frac{s + x_A}{2} \right) - x_A \right). \quad (16)$$

The term before the brackets reflects the probability of getting the offer accepted, which is increasing in λ . The term in brackets reflects the NPV of the deal captured by the acquirer, which is decreasing in λ . Taking the first-order condition, Eq. (16) is solved by

$$\lambda^* = 1 - \sqrt{\frac{x_A - s}{s + x_A}}. \quad (17)$$

At this offer, the deal happens with probability

$$\frac{\lambda^*}{1-\lambda^*} (s + x_A) = \left(\sqrt{\frac{s + x_A}{x_A - s}} - 1 \right) (s + x_A). \quad (18)$$

Plugging Eq. (17) into the bidder's expected payoff Eq. (16) and simplifying, we obtain that the bidder's expected payoff from the optimal stock offer is

$$\left(\sqrt{\frac{s + x_A}{x_A - s}} - 1 \right)^2 \frac{x_A^2 - s^2}{2}. \quad (19)$$

It can be verified that (19) is higher than $\frac{s^2}{2}$, the expected payoff of the bidder under the optimal cash offer. To see the intuition, consider stock offer λ' such that $\lambda' (s + \frac{s}{2} + x_A) = s$. Intuitively, this

³³As above, we restrict attention to offers for which $\frac{\lambda}{1-\lambda} (s + x_A) \leq 1$, which is without loss of generality.

is an offer that is worth exactly s (the optimal cash offer) if it were accepted by the target types s and below. This stock offer would get accepted by types

$$x_T \leq \frac{\lambda'}{1 - \lambda'} (s + x_A) = \frac{s}{\frac{1}{2}s + x_A} (s + x_A) > s. \quad (20)$$

Thus, this offer also gets accepted by some types higher than s , which, in turn, increases the value to the bidder. Since the bidder does better under a stock offer λ' than under the optimal cash offer s , the bidder does even better under the optimal stock offer λ^* .

Intuitively, the problem with cash offers is that they result in adverse selection. As in Akerlof (1970), the target accepts a cash offer only if it is a “lemon”, which in this context means target assets of sufficiently low value. In contrast, a stock offer leaves the target with some exposure to its private information about its assets. As a consequence, the adverse selection problem is reduced. This leads to a higher probability of acceptance of a stock offer (it is now accepted also by some higher types), benefiting both parties.

Quantitatively, this effect can be significant. As an illustration, consider a simple parametric example with bidder stand-alone value $x_A = 0.5$ and synergies $s = 0.3$. Intuitively, $x_A = 0.5$ means that, on average, the stand-alone value of the target equals the stand-alone value of the bidder, whereas $s = 0.3$ means that synergies are 60% of the average stand-alone value of the target (recall that $x_T \in [0, 1]$). Under these parameters, the optimal cash offer is $b^* = s = 0.3$. It gets accepted with probability 30% and yields the expected payoff to the bidder of $\frac{s^2}{2} = 0.045$. In contrast, the optimal stock offer is $\lambda^* = \frac{1}{2}$. It gets accepted with probability 80% and yields the expected payoff to the bidder of 0.08, which almost doubles her expected payoff from the optimal cash offer.

If the bidder has private information about its assets in place, i.e., if x_A is a random variable whose realization is privately known by the bidder, then the bidder with valuable assets in place will be reluctant to make a stock offer and share the valuable assets in place with shareholders of the target, despite the benefits of the stock offer in reducing adverse selection on the target side. Thus, allowing for two-sided information asymmetry generates rich implications. Bidders whose assets in place are not very valuable will make stock offers. In contrast, bidders whose assets in place are valuable will make cash offers despite the higher probability of rejection. In this case, the announcement of a cash offer is positive news about assets in place of the bidder, while the announcement of a stock offer is negative news. Consequently,

the acquirer's stock price goes up upon the announcement of a cash deal but may decline upon the announcement of a stock deal, even though all deals are efficient.

To illustrate the role of two-sided information asymmetry, consider a variation of the model above. Suppose that x_A can take one of the two values, x_l and x_h , with $x_l < x_h$. Suppose that the bidder chooses between a cash offer and a stock offer and decides on the offer amount, λ , if the offer is in stock or b if the offer is in cash. In this case, if the gap between x_l and x_h is not too small (i.e. if information asymmetry is sufficiently important), there is a signaling equilibrium in which type x_h of the bidder submits the optimal cash offer of $b^* = s$, while type x_l of the bidder submits a stock offer of $\lambda_l^* = 1 - \sqrt{\frac{x_l - s}{s + x_l}}$. This equilibrium exists if and only if type x_h does not benefit from deviating from a cash offer, which happens whenever the cost of giving a higher fraction of the combined company to the target (since shareholders of the target expect that stock bids come from type x_l) is more important than the benefit of getting the offer accepted with a higher probability. This happens whenever x_h is sufficiently high relative to x_l .

In independent work, Fishman (1989) develops a related theory of the payment method that combines the insight that bids in securities lead to more efficient accept/reject decisions by the target with the idea of Fishman (1988) that a high bid credibly signals strength of the bidder and deters potential competition. In Fishman (1989), the advantage of a securities bid (debt secured in the target's assets in his model) is that it leads to more efficient accept/reject decisions by the target, as is the case in Hansen (1987). The target accept/reject decision is efficient because the target knows the value of its own assets, which secures the debt instrument used by the bidder as payment. The advantage of a cash bid is, however, different: In Fishman (1989), the advantage of a cash bid is that it serves to preempt potential competition from rival bidders. Thus, in equilibrium, bidders with positive information make cash bids, while bidders with less positive information make bids with payment in the debt security. The unique implication of this model is that the choice of payment method should be related to the likelihood that competing bids are observed: It is higher for bids paid in the debt security than for cash bids since the latter preempts competition by signaling the aggressiveness of the initial bidder.

About a third of mergers and acquisitions transactions involve payments that feature a mix of cash and stock components. The papers discussed above are mostly silent on this possibility. Eckbo, Giammarino, and Heinkel (1990) are the first to show how mixed offers can be obtained as an equilibrium outcome in a model with two-sided private information between the bidder and the target. Their model is related to Hansen (1987), but an important point of departure is that they allow the bidder to select a mix

between cash and stock. In their model, the bidder has private information about her assets in place and synergies (both are driven by a single random variable), while the target has private information about its reservation value.

Eckbo, Giammarino, and Heinkel (1990) show that there exists a separating equilibrium in which different types of bidders fully separate by choosing different mixes of cash and stock in the offer, with higher types including relatively more cash in the mix. They also test their model and find that deal announcement returns are broadly consistent with this equilibrium implication: bidder abnormal announcement returns are, on average, highest in all-cash offers and lowest in all-stock offers, with mixed cash-stock offers in between. We return to the cross-sectional empirical implications of the model of Eckbo, Giammarino, and Heinkel (1990) in Section 10 below, where those implications are tested against alternative “bidder opportunism”.

Another interesting paper on deals in mixes of cash and stock is Liu and Bernhardt (2021), who show that when the target has bargaining power in the sense of being able to commit to accept combinations of cash and stock that it wants, it can extract full surplus from the bidders under some conditions, in spite of bidders having private information about their stand-alone values and synergies. To see the argument, consider the following example, which builds on Liu and Bernhardt (2021). There is one bidder with private information about its stand-alone value x_A , which is a random draw from a uniform distribution over $[0, 1]$. The target has a known stand-alone value of x_T . If the bidder acquires the target, it generates a stochastic synergy of $\Delta \in [0, 1]$, whose expected value is $\Delta(x_A)$, increasing in x_A . Thus, if the bidder has a stand-alone value of x_A , the expected value of the combined entity is $x_A + x_T + \Delta(x_A)$.

The main result is that if $\Delta(x_A)$ is increasing and concave in x_A , then the target can extract the full surplus from the bidder by committing to accept only offers from a certain set of cash and stock combinations. When such commitment is possible, higher bidder types will pick options with more cash and less stock, but each bidder type will be exactly indifferent between buying the target at the bidder’s preferred offer (from the set accepted by the target) and not acquiring the target at all. The intuition is as follows. Conditional on cash bids, higher types are willing to pay more for the target because of synergies. Conditional on stock bids, there are two opposite effects. On the one hand, higher types are willing to pay more because of higher synergies. On the other hand, the fact that the bidder has private information about assets in place creates an adverse selection problem similar to Myers and Majluf (1984). If synergies increase in the value of assets in place but at a decreasing rate, the second effect dominates

the first effect. As a result, the target can fully screen the bidder’s type via combinations of equity and cash and extract full surplus from the auction. Liu and Bernhardt (2021) show that this intuition generalizes beyond cash and equity to other securities of varying information sensitivity.

In a recent paper, Hoffmann and Vladimirov (2025) show that the presence of stock bids can overturn the result of Bulow and Klemperer (1996) that the seller can get higher expected revenues from running a simple auction with two bidders than from the most elaborate negotiation with a single bidder. To see the intuition, consider the example we used to illustrate Liu and Bernhardt (2021). Suppose that the target negotiates with a single bidder, bidder 1. If the bidder’s synergies from the deal increase in the value of its assets in place but at a decreasing rate, the target can costlessly screen the bidder via combinations of cash and equity, because the bidder with lower assets in place likes paying in stock due to adverse selection but dislikes paying in cash due to lower synergies. As a result, if the target has bargaining power, it can extract the full surplus from the deal by committing to accept only combinations of cash and stock from a certain set. Recall from our discussion of Bulow and Klemperer (1996) that this was not feasible when bids must be made in cash. Thus, the expected payoff of the target from the optimal negotiation equals the expected valuation of the target by the bidder, i.e., the target’s stand-alone value plus the bidder’s expected synergies, $x_T + E[\Delta(x_{A,1})]$, where $x_{A,1}$ is the stand-alone value of bidder 1. In contrast, if the target were to hold a simple cash auction with two bidders and no reserve price, its expected payoff would be the expected valuation of the target by the second-highest bidder, $x_T + E[\Delta(\min(x_{A,1}, x_{A,2}))]$, where $x_{A,2}$ is the stand-alone values of bidder 2. Since $x_{A,1}$ weakly exceeds $\min(x_{A,1}, x_{A,2})$, the target is better off from an optimal negotiation with a single bidder, in contrast with the insight of Bulow and Klemperer (1996).

6.3 Financing cash bids: Stapled loan commitments

Another interesting aspect of the design of the sale process that the seller and its investment bank face is whether to provide financing to potential bidders. Very often, the investment bank advising the seller provides potential buyers with a loan commitment that is “stapled” to the M&A transaction. Simply put, the investment bank commits to giving a loan at certain terms to finance the purchase price to whoever wins the takeover contest, and the winning bidder has no obligation to take it.

What is the rationale for doing this? One possible rationale is that some potential bidders are financially constrained, so by committing to a loan, the investment bank of the seller makes the transaction

affordable. This rationale is sensible, of course, but it relies on the assumption that whatever the friction causing financial constraints is, the investment bank of the seller has some ability to alleviate it that competitive capital markets do not. For example, this is the case if the investment bank of the seller has some proprietary information about the bidders that the market does not.

Povel and Singh (2010) give another argument for the use of stapled finance, which has nothing to do with the financial constraints of bidders or information of the investment bank: By committing to a loan, the investment bank of the seller subsidizes weak bidders and thereby increases competition for the target, leading to higher takeover premium. Since the winning bidder will only take the stapled loan when its terms are better than what the market can offer, in equilibrium, the loan must be subsidized. However, the increase in the takeover premium more than makes up for the loan subsidy, so the target and its investment bank are better off.

To see the argument, consider the following special version of the model in Povel and Singh (2010). Consider our model with $\alpha = 1$, i.e., the case of independent private values, and suppose that the auction format is English. If there is no loan, then as we showed above, each bidder bids her own valuation, $b(s_i) = s_i$, and therefore the expected payment to the seller is

$$E[\min\{s_1, s_2\}] = \int_0^1 2(1-s) s ds = \frac{1}{3}, \quad (21)$$

where we used the fact that the probability density function of a minimum of two independently uniformly distributed on $[0, 1]$ random variables is $2(1-s)$.

Now, suppose that the bidders are given a loan commitment that allows them to borrow L in exchange for a promise to repay D . The NPV of taking the loan for the winning bidder with signal s_i is $x(s_i) = L - \min\{s_i, D\}$. The winning bidder will take the loan if $x(s_i)$ is positive and not otherwise. Since this loan is more attractive for lower types of acquirers, it will be taken by the winning bidder if and only if its valuation is below some cut-off $\hat{s}$. Without loss of generality, we will consider the case of $L \geq D$. Then, $\hat{s} = L$.³⁴ Recall that in the English auction, each bidder bids up to the point of indifference between winning and losing. Compared to the setting without a stapled loan, winning now brings two benefits: valuation of the target and a subsidized loan. Therefore, type s_i of a bidder will bid up to price

³⁴If $L > D$, then $\hat{s} = \infty$, i.e., all types of the winning bidder take the stapled loan. It can be shown that this case brings the same total payoff to the seller as the case of $L = D$.

$s_i + \max \{x(s_i), 0\}$. To sum up, the equilibrium bid becomes:

$$b(s_i|L, D) = \begin{cases} L, & \text{if } s_i \leq L, \\ s_i, & \text{if } s_i > L. \end{cases} \quad (22)$$

Intuitively, a stapled loan leads to more aggressive bidding by low types of bidders because it is more valuable to them.

Consider now the revenues of the seller. The expected payment of a bidder with a valuation $s > L$ is:

$$\Pr(s_{-i} \leq L) L + \int_L^s s_{-i} ds_{-i} = \frac{1}{2} (L^2 + s^2). \quad (23)$$

Intuitively, she wins if the valuation of the rival bidder s_{-i} is below s . If $s_{-i} \leq L$, she pays L , since this is the maximum willingness to pay of the rival bidder in this case. If $s_{-i} \geq L$, she pays s_{-i} . The expected payment of a bidder with valuation $s \leq L$ is

$$\Pr(s_{-i} \leq L) \frac{1}{2} L = \frac{1}{2} L^2. \quad (24)$$

Intuitively, she wins only if the valuation of the rival bidder is below L , in which case both bidders bid the same amount L , so the probability of winning is $\frac{1}{2}$. Integrating over all possible valuations, we obtain the expected payment of a given bidder:

$$\frac{1}{2} L^2 + \int_L^1 \frac{1}{2} (L^2 + s^2) ds = \frac{1}{2} L^2 + \frac{1}{6} - \frac{1}{6} L^3. \quad (25)$$

Since there are two bidders, the expected payment to the seller (the expected takeover premium) is

$$L^2 + \frac{1}{3} - \frac{1}{3} L^3. \quad (26)$$

However, the loan is costly for the seller whenever it is taken out. This happens when the winning bidder's type is below L (prob. $\Pr(s \leq L)^2 = L^2$). When the type of the winning bidder is s , the loss on the loan is $L - s$. Since the winner is randomly chosen when the winning bidder's type is below L , the distribution of the winning bidder's valuation is uniform over $[0, L]$. Hence, the expected loss on the loan

is:

$$L^2 \times \left(L - \frac{L}{2} \right) = \frac{L^3}{2}. \quad (27)$$

Subtracting from the expected takeover premium (26) the cost of the loan subsidy (27), which the target must compensate its investment bank via higher fees, we obtain the net payoff to the target:

$$L^2 + \frac{1}{3} - \frac{5}{6}L^3. \quad (28)$$

Maximizing over L , we obtain that the optimal loan commitment is $L = \frac{4}{5}$. This loan will be taken with probability $0.8^2 = 64\%$, and will result in the payoff to the target (net of the cost of financing) of

$$\left(\frac{4}{5} \right)^2 + \frac{1}{3} - \frac{5}{6} \left(\frac{4}{5} \right)^3 = \frac{41}{75}, \quad (29)$$

which is 64% higher than the expected takeover premium without the stapled loan ($\frac{1}{3}$).

This argument shows that it may be in the seller's interest to provide financing to potential bidders to promote their competition. In addition, bidders themselves may raise financing from the external capital market to finance their cash bids. This topic is explored in Rhodes-Kropf and Viswanathan (2005) and Vladimirov (2015). Rhodes-Kropf and Viswanathan (2005) study the implications of bidders' financing their cash bids for efficiency of the auction and show that a competitive capital market leads to auction outcomes being inefficient if bidders have asymmetric cash positions. Vladimirov (2015) studies the acquirer's choice of securities to issue to finance its cash bids and shows that it is related to the competitiveness of the capital market. If the capital market is competitive, acquirers finance their bids with debt and overbid. In contrast, if the capital market is not competitive, modeled as a monopolistic financier making a take-it-or-leave-it offer, then acquirers finance their bids with equity and underbid.

7 Preemptive bidding, defenses, and takeover premiums

Although the basic ascending auction with the equilibrium we described above is a popular model of takeover contests, it does not anticipate the substantial bid jumps first documented by Betton and Eckbo (2000). In this section, we present modified auction settings that allow for jump bidding and competition preemption strategies (Fishman, 1988; Avery, 1998; Horner and Sahuguet, 2007; Daniel and Hirshleifer,

2018). Such strategies further help explain the relation between single- and multiple-bidder contests and observed bids.

7.1 Preemptive bidding theory

Fishman (1988) shows that a high initial bid can preempt a potential rival bidder from acquiring information about her valuation and participating in the auction. To illustrate this, consider our baseline setting for the case of independent private values ($\alpha = 1$). However, rather than analyzing a simultaneous auction, suppose that the sale procedure is sequential. Bidder 1 knows her valuation s_1 and chooses to submit the initial bid b . Having observed this bid, bidder 2, who does not yet know their own valuation, decides whether or not to pay a cost $c > 0$ to learn this valuation (s_2) and, if sufficiently high, participate in the auction. If bidder 2 does not pay the cost, bidder 1 acquires the target for price b and gets $s_1 - b$. If bidder 2 pays the cost, the two bidders compete in the English auction. As we know, the highest type wins and pays the valuation of the losing bidder, i.e., $\min \{s_1, s_2\}$.

In this game, a higher initial bid is a credible, costly signal of bidder 1's higher valuation. The single-crossing condition comes from the fact that lower types of bidder 1 find it costlier to pay the same bid since they value the asset less. There will be some "preemptive" bid, denoted $\hat{b}$, at which it becomes suboptimal for bidder 2 to become informed and participate in the auction. Let $\hat{s}$ denote the lowest type of bidder 1 that wants to submit this bid. The pair $(\hat{b}, \hat{s})$ can be solved from the following two equilibrium conditions.

First, type $\hat{s}$ of bidder 1 must be indifferent between preempting bidder 2 and accommodating bidder 2's participation. The advantage of preemption is that it ensures that bidder 1 wins the auction with certainty. The disadvantage of preemption is that it is potentially costly. Bidder 1's payoff from preemption is $s_1 - \hat{b}$. Bidder 1's payoff from accommodating bidder 2's participation is:

$$\int_0^{s_1} (s_1 - s_2) ds_2 = \frac{s_1^2}{2}. \quad (30)$$

Intuitively, if bidder 2 enters, bidder 1 wins if and only if bidder 2's valuation s_2 is below s_1 , and in these cases, bidder 1 pays s_2 . Thus, type $\hat{s}$ is indifferent between preempting and not if and only if

$$\hat{s} - \hat{b} = \frac{\hat{s}^2}{2}. \quad (31)$$

Second, bidder 2 must be indifferent between participating in the auction after paying c and not, given her information that bidder 1's valuation is above $\hat{s}$:

$$\int_{\hat{s}}^1 \int_{\hat{s}}^{s_2} (s_2 - s_1) \frac{1}{1 - \hat{s}} ds_1 ds_2 - c = 0. \quad (32)$$

The first term is the expected payoff of bidder 2 from the auction: she wins only if $s_2 > s_1$ and knows that s_1 is distributed uniformly over $[0, 1]$. Integrating, we obtain:

$$(1 - \hat{s})^2 = 6c. \quad (33)$$

Combining the two equilibrium conditions (31)–(33) and assuming $c < \frac{1}{6}$,³⁵ we obtain the equilibrium preemptive bid $\hat{b}$ and the lowest type $\hat{s}$ submitting it:

$$\hat{s} = 1 - \sqrt{6c}, \quad (34)$$

$$\hat{b} = \hat{s} - \frac{\hat{s}^2}{2}. \quad (35)$$

Thus, the equilibrium takes the following intuitive form. If the valuation of bidder 1 exceeds $1 - \sqrt{6c}$, bidder 1 submits an initial bid of $\hat{b}$, bidder 2 does not enter, and bidder 1 acquires the target for $\hat{b}$. If the valuation of bidder 1 is below $1 - \sqrt{6c}$, she submits a zero initial bid, bidder 2 enters the auction, and the highest of the two bidders acquires the target for the valuation of the losing bidder. Thus, the model is capable of simultaneously explaining the prevalence of high initial public bids, low participation rates of bidders in some takeover contests, and low correlation between takeover premiums and the number of bidders participating in the contest. In fact, in this model, this correlation is negative: the takeover premium is, on average, higher if bidder 2 does not enter.

Dimopoulos and Sacchetto (2014) fit to the data a variant of Fishman's model, which allows for asymmetries between bidder 1 and bidder 2 and target resistance (the possibility that the target rejects the bid if it does not offer a sufficient premium). Interestingly, they find that the preemption channel explains a lower fraction of the high premium on initial bids compared to the target resistance channel. Intuitively, this result is due to the fact that they estimate bidder 2 to be significantly weaker, on average,

³⁵If $c \geq \frac{1}{6}$, information acquisition is so costly for bidder 2 that she never enters the auction. In this case, bidder 1 acquires the target for the price of zero.

than bidder 1. Thus, bidder 1 is able to preempt bidder 2 with a relatively small bid.

While Fishman (1988) explains high initial bids with a desire to preempt the rival bidder from acquiring information, several other papers show that jump bids can arise without relying on costly information acquisition. Daniel and Hirshleifer (2018) show that a sequential bidding process with private values has multiple equilibria. One equilibrium, termed the ratchet solution, is identical to the equilibrium of Section 4.2: the bidders increase bids in infinitesimal increments until only one of them is left. Another equilibrium features a jump bid by the initial bidder that reveals her valuation. Daniel and Hirshleifer (2018) show two interesting properties of this equilibrium. First, the bid of the initial bidder is identical to her bid in the first-price auction. Thus, although the auction format is English, there is an equilibrium in which the initial bidder behaves as in the first-price auction. Second, the equilibrium with jump bids becomes unique if there are positive bidding costs, even if they are arbitrarily small. Thus, jump bids are natural even if bidding is essentially costless.³⁶

The jump bidding strategy in all of these papers is monotone in the sense that a higher bid signals the aggressiveness of the bidder. Horner and Sahuguet (2007) show that signaling can be non-monotone: a high type of the initial bidder may bluff and bid little in the first round to fool the rival bidder into believing that the initial bidder is weak. The initial bidder may benefit from this because it leads to less aggressive bidding by the rival bidder in the subsequent round. This effect arises in Horner and Sahuguet (2007) but not in Fishman (1988) because of a different sale mechanism in the second round: Horner and Sahuguet (2007) use the first-price sealed-bid auction, where bidders shade their bids and beliefs about the valuation of the rival are important.

7.2 Offer premiums and bid jumps

As discussed above, the process leading to a merger deal starts with one or more rounds of private negotiations and bidding, followed by the signing of the merger agreement. This signing triggers a public announcement of the initial public offer for the target. Since SDC records premiums and other offer characteristics beginning with this initial public offer, evidence on offer premiums is largely restricted to public rounds of bidding, for which the bidding data is extraordinarily rich in detail.

Figure 8 shows the average values of pre-offer target runups (in excess of the market), offer price

³⁶Avery (1998) studies the case of common valuations and shows that bidders can use jump bids to discourage competition. These equilibria produce transaction prices that lie between prices in the first-price and the second-price auctions.

markups (the offer price less the runup), and the *initial* offer premium (the sum of the runup and markup) in the sample of 6,150 control bids for US public targets (1980–2008) studied by Betton, Eckbo, Thompson, and Thorburn (2014). The offer premium averages 45%, while the pre-offer target stock price runup averages 7%. Following the runup, the market reacts to the deal announcement (on day 0) by increasing the target stock price a further 22% on average, for a total cumulative abnormal stock return of $CAR=29\%$ over the period from day -41 through day +1.

The difference between the average offer premium of 42% and the average target CAR of 29% is primarily due to the residual uncertainty concerning the likelihood that the acquisition will be completed successfully. Again, as in Figure 1, for some targets, all bids may be rejected. While the (unconditional) rejection rate is only about 10%, a rejection may also cause the market to lower its estimate of the target’s stand-alone value, in particular, if the target management caused the rejection (Bradley, Desai, and Kim, 1983; Betton, Eckbo, and Thorburn, 2009). The product of the rejection probability and the lower stand-alone value likely causes the wedge between the average premium and target CAR in the figure.

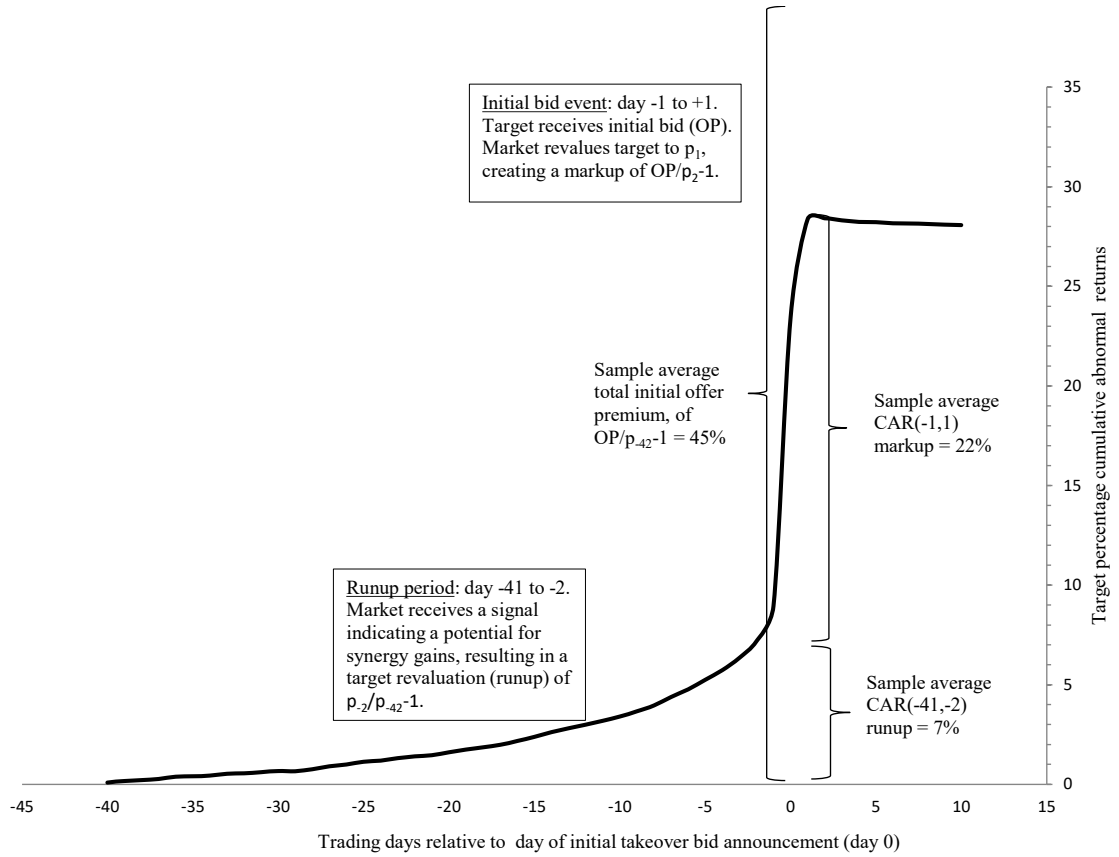
The high average offer premium evidenced by Figure 8 is consistent with the hypothesis that takeover benefits are partly common to several potential bidders—so competition among bidders drives much of the gains to the target side of the deal. This is likely when takeover benefits emanate, e.g., replacing inefficient target management or using voting control to extract value from ex-post minority shareholders in the merged firm. These and other forms of bidder-target complementarities often do not require specialized resources owned by a single potential bidder firm. As a result, the first bidder is concerned that the initial bid will alert potential rivals to a profit opportunity. As discussed above (Fishman, 1988), if potential bidders must pay an investigation cost to identify their respective private valuations of the target, there exists an initial bid that deters the second bidder from paying the investigation cost and entering the auction.³⁷

The empirical issue is whether such preemption strategies are reflected in the average offer premium. Testing is difficult since one obviously cannot observe deterred bids. One must look to auxiliary or related predictions, and the following four categories of results seem relevant: First, as discussed above, entry is rapid when it occurs. Generally, the expected time to arrival of a second bid depends on the cost to rival

³⁷The high initial (all-cash) bid signals that the bidder has a relatively high private valuation for the target, which reduces rival bidders’ expected value of winning. For a sufficiently large investigation cost, the expected value is negative, and the rival does not enter.

Figure 8: **Percent average target runup, markup, and total offer premium in event time.**

The figure plots the percent average target abnormal (market risk-adjusted) stock return (CAR) over the runup period (trading day -41 through day -2), the announcement period (day -1 through day 1), and the total initial offer premium $\frac{OP}{p_{-42}} - 1$ where OP is the initial offer price and p_{-42} is the target closing price on day -42. Total sample of 6,150 US public targets, 1980-2008. Figure adapted with permission from Betton, Eckbo, Thompson, and Thorburn (2014).



bidders of becoming informed of their own valuation of the target, as well as the time it takes to file a formal offer. For some rival bidders, the initial bid may have been largely anticipated based on general industry developments or prior rumors of the target being in play. Also, when rival bidder valuations are correlated, observing the initial bid event may produce a sufficient target valuation estimate for the rival to make a bid. Therefore, the time to the second bid sheds light on the likelihood that rival bidders have ready access to the resources required to generate takeover gains.

Second, auction outcomes are sensitive to bidder asymmetries. One important form of bidder asymmetry is the size of the bidder's toeholds. Even small toehold differences can have a large impact on entry and competition. Empirically, Betton and Eckbo (2000) find that when a rival bidder enters a takeover contest with a positive toehold, the toehold size is, on average, of roughly the same size as that of the initial bidder (for this small subsample of takeover contests, the average toehold is approximately 5%). It is as if the rival bidder realizes the initial bidder's toehold advantage and wants to neutralize it upon entry.

Third, both Betton and Eckbo (2000) and Betton, Eckbo, and Thorburn (2009) report that the average offer premium in single-bidder successful tender offer contests (the first node in Figure 1) is marginally higher than the average *initial* offer premium in contests that develop into multiple bids. This is consistent with the argument that the premiums in single-bid successful contests are preemptive in the sense of Fishman (1988). However, the premium effect is weak: the probability of rival bidder entry appears unaffected by the initial offer premium (Betton, Eckbo, and Thorburn, 2009).

Fourth, as shown in Table 1, Betton and Eckbo (2000) report evidence of significant bid jumps throughout the tender offer contests. For example, the average jump from the initial to the second bid price in the contest is 10 percentage points (p.p.), implying a 31% change in the initial offer premium. The jump from the first to the final bid averages 14 p.p. (a 65% revision in the initial offer premium), and the premium increments throughout the entire contest average 17 p.p. The evidence of significant bid jumps throughout the contest is consistent with the presence of bidding costs (Aktas, de Bodt, and Roll, 2010, 2013). This, in turn, supports the notion in Fishman (1988) that initial bidders may strategically raise the first bid in an attempt to deter competition.

Table 1: Median percentage bid-jumps in multi-bid tender offer contests, 1971-1990.

$p_{initial}$ is the initial bid price, and p is either the second or the final bid price (as indicated by the first column). Thus, the third column shows the percent change in the initial bid price. p_{-60} is the target share price 60 days prior to the initial bid. Thus, the fourth column shows the percent change in the initial bid premium. Table adapted with permission from Betton and Eckbo (2000).

	Sample size	% Offer price revision $(p - p_{initial})/p$	% Premium revision $(p - p_{initial})/(p_{initial} - p_{-60})$
I. All multi-bid contests			
Jump from first to second bid	454	10.00	30.77
Jump from first to final bid	457	14.29	65.08
Average bid-jump throughout contest	457	5.43	16.67
II. Contests where the second bid is by the initial bidder			
Jump from first to second bid	264	7.91	24.40
Jump from first to final bid	264	13.21	35.93
Average bid-jump throughout contest	264	5.00	14.97
III. Contests where the second bid is by a rival bidder			
Jump from first to second bid	190	13.90	45.20
Jump from first to final bid	193	17.86	59.70
Average bid-jump throughout contest	193	6.67	22.99

7.3 Offer premiums when the target is bankrupt

With reference to Section 3.5 above, we begin with targets in Chapter 11 of the US Bankruptcy Code, where a decision to put the bankrupt firm up for a 363 sale is driven jointly by incumbent management and creditor committee votes. We then consider evidence based on targets sold in the mandatory auction bankruptcy system in Sweden. This code essentially eliminates the target's bargaining opportunities and relies on bidder competition to maximize debt recovery and an efficient reallocation of the target assets.

As surveyed by Hotchkiss, John, Mooradian, and Thorburn (2008), bid premiums observed in the mandatory auction bankruptcy system in Sweden provide an important empirical perspective on the viability of auctions as a mechanism for resolving bankruptcy. Proponents of the market-oriented auction system point to costs associated with conflicts of interests and excessive continuation of operations due to managerial control over the restructuring process in Chapter 11.³⁸ These costs most likely explain the trend toward increased use of market-based mechanisms in the US. On the other hand, opponents of an auction-based system argue that the time pressure of an auction system is costly, as it may cause excessive liquidation and fire-sales of economically viable firms when potential bidders in the auction are themselves financially constrained.

Foroughi, Gilson, Hotchkiss, and Waldock (2021) study sales of firms and assets in Chapter 11. They report that sales under section 363 of the bankruptcy code are common. 21% of the bankrupt firms sell substantially all their assets as a going concern, and another 30% sell a portion of their assets, either as part of a successful reorganization plan (22%) or in a Chapter 7 liquidation (8%). Foroughi, Gilson, Hotchkiss, and Waldock (2021) find no difference in recovery rates or post-bankruptcy survival rates across firms sold as going concerns and those successfully reorganized and suggest that the asset sales result in efficient outcomes. This inference is consistent with the earlier evidence in Hotchkiss and Mooradian (1998) that firms auctioned in Chapter 11 subsequently report large operating gains.

Meier and Servaes (2019) study the stock price response to asset acquisitions from companies in bankruptcy or undergoing a debt restructuring. They show that acquirers of distressed targets have two percentage points higher announcement returns than acquirers of non-distressed firms. They suggest that these bidder gains come at the expense of the target shareholders. In particular, the bidder returns to

³⁸See, e.g., Baird (1986), Bebchuk (1988), Jensen (1989), Aghion, Hart, and Moore (1992), Bebchuk and Chang (1992), Bradley and Rosenzweig (1992), and Baird (1993). Hotchkiss (1995) finds that firms emerging from Chapter 11 tend to underperform their industry rivals, which is consistent with excessive continuation.

acquisitions of distressed targets are higher when the target’s industry rivals are financially constrained and during economic contractions, when there are fewer potential buyers with deep pockets. The bidder returns are also higher when the target’s assets have fewer alternative uses, reducing the bargaining power of the seller. Meier and Servaes (2019) further show that the total bidder and target gains are similar across distressed and non-distressed targets, as are their subsequent accounting performance and media reports, and conclude that the distressed assets are allocated efficiently.

Turning to asset sales, Pulvino (1998) and Pulvino (1999) examine the aircraft sales by distressed airlines. Building a hedonic price model accounting for type, age, engine stage, and quarter, he finds that distressed airlines sell airplanes at a 15% discount. Franks, Seth, Sussman, and Vig (2022) improve on this pricing model by including new measures for quality impairments due to under-investment in maintenance by distressed airlines. They first document that aircrafts with distressed owners have shorter expected lives to retirement and lower future utilization. Controlling for this lower quality, they find that the fire-sale discount is reduced to 9%. Importantly, the productivity (airline utilization) of the buyers of the aircraft is higher than that of the distressed sellers, and in line with other users, suggesting an efficient asset allocation. Moreover, financial buyers reduce the time it takes to sell the aircraft and buy at a discount, which may represent a form of convenience yield.

Ma, Tong, and Wang (2022) focus on the sale of innovation portfolios in bankruptcy. Firms sell a substantial portion of their patents relatively soon after their bankruptcy filing. Interestingly, they show that firms tend to sell their core patents rather than peripheral patents. This results from pressure by secured creditors exercising their control rights on collateralized patents. The creditor-driven sales potentially have negative implications for the efficiency of the asset allocation. Specifically, the patent citations drop under the new ownership, and the acquirer is often a patent troll, litigating rather than using the patent.³⁹

A series of papers studies the Swedish auction system using a sample of 260 auctioned firms.⁴⁰ The average auctioned firm has \$5 million in sales and assets of \$2 million (\$8 million and \$4 million, re-

³⁹Granja, Matvos, and Seru (2017) examine mandatory auctions of failed banks by the Federal Deposit Insurance Corporation (FDIC). They show that the FDIC experiences a 28% loss on average when selling failed banks. Local banks and banks with similar loan portfolios and services are the most likely acquirers. When these banks are well capitalized, they tend to be the winning bidders. When these bidders are poorly capitalized, however, the failed banks tend to be acquired by similar banks further away. Granja, Matvos, and Seru (2017) argue that the 15% of sales where the acquirer is geographically distant represents a misallocation, which can explain FDIC’s losses.

⁴⁰Thorburn (2000), Stromberg (2000), Eckbo and Thorburn (2003, 2008, 2009).

spectively, in 2007 dollars), and it has an average of forty-five employees.⁴¹ Thorburn (2000) report that the auctions are quick—lasting an average of two months—and relatively cost-efficient. Moreover, three-quarters of the filing firms survive the auction as a going concern, which is similar to the survival rate of Chapter 11 cases. In going-concern sales, the buyer typically rehires lower-level employees. Top management fares less well: Eckbo and Thorburn (2003) find that while the buyer rehires the old management to run the restructured company in about one-half of the going-concern sales, the old management typically experiences a median wealth decline of -47% relative to managers of non-bankrupt firms matched on size and industry. They argue that this expected personal bankruptcy cost, along with the loss of private benefits of control, counteract shareholder risk-shifting incentives when the firm is in severe financial distress (Jensen and Meckling, 1976). That is, if the CEO’s objective includes being rehired by the buyer in the auction, she may implement a relatively conservative investment policy to preserve the possibility of a going-concern sale in the auction.

Does the Swedish auction mechanism induce an efficient reallocation of the resources of the bankrupt firm? First, Eckbo and Thorburn (2003) show that firms sold as going-concern typically perform at par with industry rivals. Second, Eckbo and Thorburn (2008) fail to find auction fire-sale discounts in going-concern sales. They show that the auction setting produces auction premiums (and post-bankruptcy operating performance) in going-concern sales that are independent of fire-sale conditions such as industry-wide financial distress, industry leverage, and whether or not the buyer is an industry insider or outsider.

Third, Eckbo and Thorburn (2008) find that prepackaged auctions (where the buyer has been identified prior to filing) tend to produce prices consistent with the hypothesis that the contracting parties are concerned with preempting piecemeal liquidation. Stromberg (2000) shows that salebacks to the previous owner-manager tend to increase during periods of high industry financial distress, which further helps preempt liquidation. Eckbo and Thorburn (2008) document that prices paid in salebacks are as high as prices in non-saleback going concern transactions, which fails to support arguments that salebacks carry an inherent conflict of interest with junior creditors.

⁴¹ A majority of Chapter 11 filings are also by small private firms: Bris, Welch, and Zhu (2006) report that the median firm filing for Chapter 11 has assets of \$1 million.

7.4 Takeover defenses and offer premiums

Since target “hostility” may simply represent posturing to improve the target’s bargaining position, several definitions of hostility exist (Schwert, 2000). The SDC definition probably casts a relatively wide net, as all it ensures is that (1) the bidder (and not the target) initiates the takeover and (2) the target board is initially unprepared and/or unwilling to enter into merger negotiations. Specifically, the SDC classification does *not* necessarily mean that the target is dead set against negotiations nor that it is going to implement defensive tactics. However, target defensive actions are more likely in this sample than in cases where initial bids are classified by SDC as solicited or friendly. Notice also that the SDC definition allows a hostile initial bid to be in the form of either a merger or a tender offer (although, as shown in Figure 9, unfriendly initial bids are typically in the form of a tender offer). An example of an initially hostile merger bid is a “bear hug”, in which the bidder invites the target to negotiate while reminding the target board that the bidder is likely to pursue a tender offer should the board refuse negotiations.

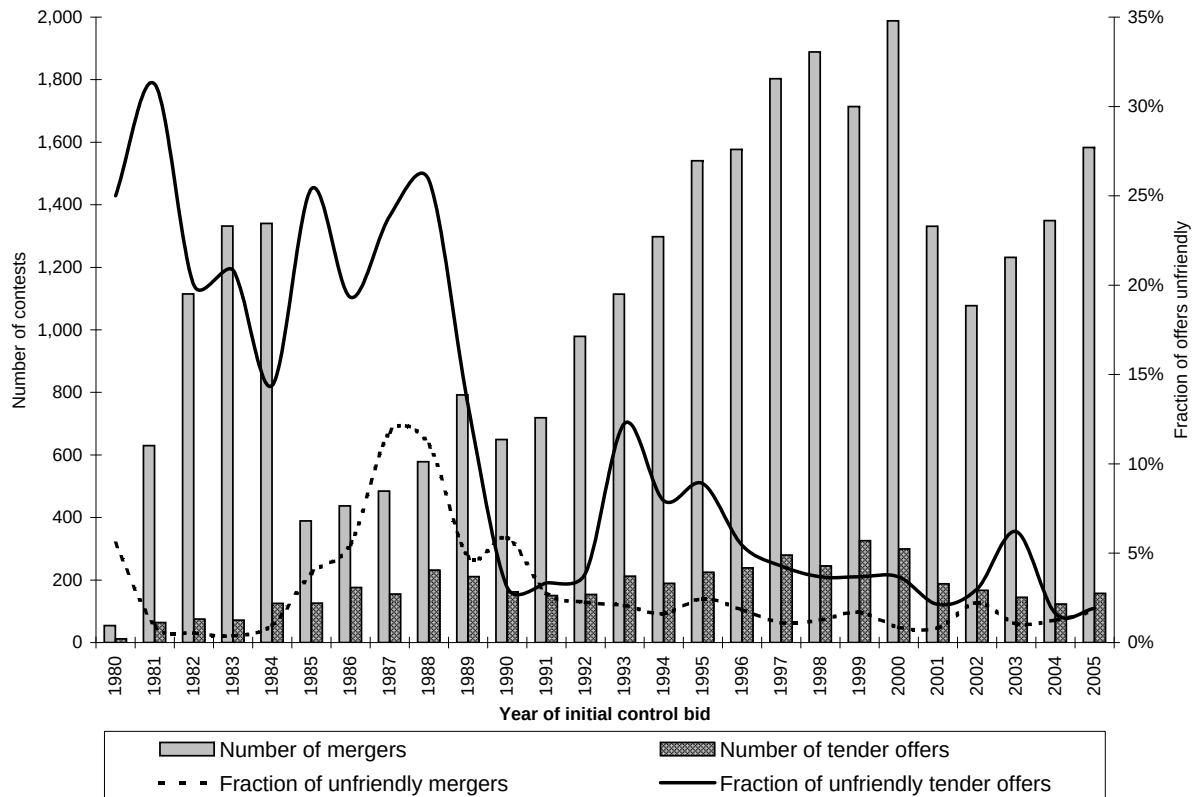
As shown in Figure 9, the fraction of bids that are unfriendly is relatively high throughout the 1980s and then drops sharply after 1989. Comment and Schwert (1995) analyze the drop in hostility, which is closely associated with the spread of takeover defenses and the development of state antitakeover statutes (control share and business combinations laws). Given this close association, it is natural to view the drop as being caused by increased managerial entrenchment afforded by strong takeover defenses.

Comment and Schwert (1995), however, argue that the emergence of takeover defenses played only a minor role in ending the 1980s merger wave. They point instead to the development of a general economic recession beginning in 1989, which caused a collapse in net new lending to the non-financial sector by commercial banks from \$33 billion in 1989 to \$2 billion in 1990. Commercial banks were the dominant providers of bridge or transaction financing for large cash acquisitions at the time. Takeover activity was also generally reduced as a result of a drop in the availability of long-term and subordinated financing, in part due to government intervention in junk bonds in 1989.⁴² While the overall credit crunch undoubtedly slowed the economy and reduced takeover activity, there is also little doubt that the sharp reduction in *unfriendly* takeovers in large part reflects the legal certification and spread of

⁴²“In August 1989, Congress passed the Financial Institutions Reform, Recovery and Enforcement Act (FIRREA), which penalized savings and loans for holding junk bonds and mandated their sale, while regulators issued guidelines barring commercial bank participation in highly leveraged transactions (including all acquisition loans that raised liabilities to 75% of assets, or doubled the debt ratio while raising it to 50% of assets). The junk bond market crashed in September 1989” (Comment and Schwert, 1995, p.9).

Figure 9: **Target attitude towards the initial control bidder in mergers and tender offers.**

The attitude is shown as “unfriendly” (N= 1,025) if the SDC lists the offer as either hostile or unsolicited. All other offers are shown as “friendly” (N=34,702). US targets, 1980-2005. Figure adapted with permission from Betton, Eckbo, and Thorburn (2008).



strong antitakeover measures. Indeed, Jensen (1993) argues that the regulatory attack on the junk bond market around 1989 in of itself may be understood as a broadly organized defensive tactic against unwanted takeovers.⁴³ While the combination of a poison pill and staggered board is not viewed as a “draconian” defense in the eyes of the law, there can be no question that these measures, when used in combination, effectively bar or seriously delay a hostile bid. As discussed below, however, the overall degree of deterrence remains unclear from the empirical literature.

The development of the poison pill is tied directly to the history of the so-called ‘greenmail’ payment. A greenmail payment occurs when the target firm repurchases shares held by a potential but unwanted bidder (often referred to as a ‘corporate raider’) at a premium, in return for which the bidder signs a ‘standstill’ agreement—committing not to purchase any target shares over, say, the next ten years. As other shareholders are prevented from participating in the share repurchase, the premium is tantamount to a targeted dividend payment the the potential raider, paid for by the other shareholders of the target firm.

Following several occurrences of greenmail payments during the late 1970s and early 1980s, Unocal instead *reversed* the greenmail payment—the precursor of the “shareholder rights plan” also called the poison pill. In 1983, Mr. T. Boone Pickens Jr. and his Mesa Partners II, who held 13.6% of Unocal’s stock, made an \$8.1 billion takeover bid for Unocal. The offer was for \$54/share cash for 37% of Unocal’s stock and \$54 a share in junior securities for the rest. Unocal’s board responded by offering to exchange \$72/share in senior securities for 50.1% of the company’s total shares, but barred the Mesa group from participating in the stock repurchase.

In *Unocal Corp. v. Mesa Petroleum Co.*, 493 A.2d 946 (Del. 1985), the Delaware Supreme Court upheld Unocal’s right to undertake the targeted repurchase. Also in 1985, the Delaware Supreme Court upheld Household International’s adoption of a shareholder rights plan as reasonable under the Unocal standard, even though that company did not face a hostile threat.⁴⁴ Attorney Martin Lipton of Wachtell, Lipton, Rosen & Katz, who acted as the key legal strategist working for Unocal, subsequently proceeded to develop the shareholder rights plan (poison pill), which is essentially a permanent commitment to trigger

⁴³The critical view many business leaders had of the junk bond market is illustrated by the sentiment expressed by J. Richard Munro, Chairman and CEO of Time Inc., in a speech in 1989: “*Notwithstanding television ads to the contrary, junk bonds are designed as the currency of “casino economics” ... they’ve been used not to create new plants or jobs or products but to do the opposite: to dismantle existing companies so the players can make their profit This isn’t the Seventh Cavalry coming to the rescue. It’s a scalping party*”—(Munro, 1989, p. 472).

⁴⁴*Moran v. Household International, Inc.* 500 A.2d 1346 (Del. 1985).

a reverse greenmail payment. As reviewed by Karpoff and Wittry (2024), the legality of the poison pill defense has since been unsuccessfully challenged on multiple occasions and has become generally accepted as a takeover defense since the mid-1990s.

In 1995, the Delaware Supreme Court also upheld the right of a board to refuse to redeem a pill in the face of an all-cash, non-coercive tender offer, even though a majority of the company’s stockholders had tendered their shares to the bidder.⁴⁵ On the other hand, Delaware courts have invalidated the so-called “dead-hand” poison pill, which provides that only directors in a staggered board that are *not* up for election can redeem the pill.⁴⁶ This is an important decision as one (although costly) way to circumvent the pill is to launch a proxy contest simultaneously with the hostile offer in the hope of winning enough board seats to have the board rescind the pill and let the offer go through.

Technically, when adopting the poison pill, the corporation issues to its stockholders (usually by means of a dividend) certain rights to purchase stock (typically preferred). The rights are out of the money (the exercise price exceeds the then-market price) and are not exercisable until a triggering event. The triggering event is that someone acquires a certain percentage (e.g., 15%) of the firm’s voting shares. Pending their exercise, the rights may be redeemed for a nominal value by the board. If triggered, the rights give each holder, other than the stockholder that triggered the pill, the right to purchase shares of the issuing corporation (“flip-in”) or of the acquirer (“flip-over”) at a deep discount (e.g., 50%) to the market price. Pills may be issued by the board without prior stockholder approval, and they may be issued after having received a hostile bid (“morning after” pill). A pill adoption does not require a shareholder vote since it is akin to a dividend payment, which is under the purview of the board. Over the past two decades, however, there has been a growing demand from large institutional shareholders, such as pension funds, to allow shareholders to vote on pill adoptions.

As indicated above, the combination of a hostile bid and a proxy contest does not work if the target board is classified or staggered. For example, if only one-third of the board is up for election, the hostile bidder cannot win the majority needed to rescind the pill. Indeed, as argued by Bebchuk, Coates, and Subramanian (2002), Bebchuk and Cohen (2005), and Bebchuk, Cohen, and Ferrell (2009), board classification may in of itself constitute an antitakeover device. Bebchuk and Cohen (2005) examine the cross-sectional relationship between board classification and firm value and find that board classification

⁴⁵Moore Corp., Ltd. v. Wallace Computer Services, Inc., 907 F. Supp. 1545 (D. Del. 1995),

⁴⁶Quickturn Design Systems, Inc. v. Shapiro 721 A.2d 1281 (Del. 1998). This version of the pill had been upheld under Georgia Law but also invalidated under New York law.

is negatively correlated with industry-adjusted Tobin’s Q. Also, Masulis, Wang, and Xie (2007) find that acquisition announcement-period stock returns are significantly lower for bidders with staggered boards, possibly because board classification reduces forced board turnover and quality. On the other hand, Bates, Becher, and Lemmon (2008) find that board classification does not reduce the probability that a firm, once it is targeted, is ultimately acquired. Moreover, targets with classified boards appear to extract premiums equivalent to those of single-class boards. However, they do find that board classification is associated with a small reduction in the probability of receiving a takeover bid. Rose (2008) also concludes that the presence of staggered boards has more of a detrimental impact on firm value when management is relatively entrenched.

The ambiguities in interpreting the overall consequence for shareholders of a defensive measure, such as staggered boards, are also present in the debate over poison pill defense. There is mixed empirical evidence on the question of whether targets with poison pills receive higher offer premiums than non-pill targets. Comment and Schwert (1995), Cotter, Shivdasani, and Zenner (1997), and Heron and Lie (2006, 2015) find that poison pills increase firms’ expected takeover premiums. Bates and Becher (2017) estimate “bid quality” as the difference between the actual and an estimated offer premium. They find that the likelihood of the initial bid being contested by management decreases in bid quality, which is consistent with a price improvement motive (as opposed to managerial entrenchment) for bid resistance. Cuñat, Giné, and Guadalupe (2020) use a regression discontinuity framework to identify causal linkages between takeover premiums and shareholder proposals to repeal takeover defenses (including the poison pill). They conclude that a shareholder vote to decrease a firm’s takeover defenses causes both an increase in takeover likelihood and a higher expected takeover premium—perhaps because fewer defenses attract more bidders who compete up the offer premium.

Also, a number of early papers examine the valuation effects of greenmail itself—the precursor to the poison pill—and of anti-greenmail charter amendments. Bradley and Wakeman (1983), Dann and DeAngelo (1983), Mikkelsen and Ruback (1991) find that the announcement of greenmail transactions is associated with significantly negative abnormal stock returns of approximately -2%. Mikkelsen and Ruback (1991) find that the market reaction is negative only if the stockholder signs a standstill agreement or if it aborts a control contest.⁴⁷ Mikkelsen and Ruback (1985) show that the total abnormal stock return

⁴⁷They also report that even with the standstill, 40% of the firms paying greenmail experience a control change within the subsequent three years.

from the initial 13D filing by the toehold investor until he receives the greenmail payment is significantly positive. In other words, the greenmail payment and standstill do not eliminate all gains from having a significant blockholder in the firm's ownership structure.

Eckbo (1990b) and Bhagat and Jefferis (1991) present evidence on anti-greenmail charter amendments. The typical amendment prohibits the firm from repurchasing some or all of the common (voting) stock of an "interested" shareholder, normally defined as a shareholder who owns five percent or more of the outstanding common stock and who acquired this ownership position within the past 2-3 years. Virtually all firms retain the option to pay greenmail as long as (1) two-thirds or more of the "disinterested" shareholders approve of the action, or (2) if the shares are repurchased at a "fair" price, usually defined as an average of the stock's trading prices over the 90 days immediately preceding the share repurchase.

The market reaction to greenmail prohibitions represents the value of the *option* to pay greenmail in the future. If the option value is negative, the market reaction to the amendment will be positive. The option value is negative if the sum of the repurchase premium (greenmail payment), the marginal increase in agency costs from successfully rebuffing future hostile takeover bids, and the increased likelihood of receiving purely extortive bids (bids designed exclusively to generate greenmail payments) exceeds the expected benefits. Thus, evidence of a positive market reaction to the greenmail prohibition would support the widely held view that greenmail payments harm non-selling shareholders.⁴⁸

For a subsample where the anti-greenmail amendment is proposed by itself (without other simultaneous antitakeover proposals), Eckbo (1990b) find the average market reaction to the charter amendments to be weakly negative. The market reacts negatively to the greenmail prohibition if the value of the unrestricted option to pay greenmail is positive. However, cross-sectional regressions further indicate that the market reaction is strongly positive when the firm has experienced a recent stock price runup along with takeover rumors. Eckbo (1990b) concludes from this that the option to pay greenmail is costly when the firm is likely to be identified as a target, in which case the anti-greenmail amendment removes a possible barrier to the pending takeover.

⁴⁸It is not, however, the only possible interpretation: In the asymmetric information model of Shleifer and Vishny (1986a), greenmail payments increase the intrinsic value of the firm while at the same time causing the firm's stock price to fall.

7.5 The redemption price in minority freezeouts

In a minority freezeout, the majority shareholder forces a conversion of the remaining minority shares into what is effectively a debt claim on the company's cash flow, with full redemption awaiting a decision process. In most Western countries, corporate laws allow this forced conversion when the majority shareholder's ownership reaches 90% of the outstanding voting shares. The economic reason for permitting this conversion option is that the 10% minority might otherwise prevent a full consolidation of the firm into one privately held company, which may impose significant costs on the majority—both economic and accounting-related. Harford, Stanfield, and Zhang (2019) provide evidence that the frequency of freezeout transactions tends to increase during periods of industry-wide downturns. Moreover, there is little evidence that minority freezeout transactions tend to occur on terms that are detrimental to outside minority shareholders (Bates, Lemmon, and Linck, 2006; Harford, Stanfield, and Zhang, 2019).

Should the minority refuse to accept the conversion price, it has the right to have it tested in court—with the court costs borne in full by the majority shareholder. Since the firm is no longer publicly traded at the time of conversion, and since the majority shareholder now controls the board and its pricing decisions, the court is asked to assess the fair redemption price as either the offer price itself or some model-based valuation estimate such as one based on the discounted-cash-flow (DCF) method. Hence, if the court, for some reason, sets aside the offer price itself, the parties to the court case are left with arguing based on individual parameter-specific DCF estimates. Since the court cost is borne by the majority owner, getting the court to accept a higher DCF value than the premium offer is tantamount to a free option, which may lead to speculative lawsuits.⁴⁹

Figure 10 illustrates a quite typical situation that gave rise to an actual court case (all names are anonymized). AM is the firm that the major shareholder is attempting to take private through a tender offer at a dividend-adjusted offer price of EUR 17.84 per share for 100% of the outstanding AM shares (there were two dividend payments during the tender offer period, hence the adjustment). Following the tender offer period during which 90% of the shares were tendered, the 90% owner offers a redemption price equal to the offer price. The offer is rejected, and the case goes to arbitration. In this particular

⁴⁹With heterogeneous target shareholder expectations, the supply of tendered target shares is upward-sloping, possibly causing some shareholders to reject even a high premium offer. In practice, it is therefore difficult to attract 100% of the shares (see also Grossman and Hart, 1980). Moreover, it is common for a professional investment company to bet on a positive court decision by purchasing the 10% minority stake as soon as the tender offer is announced and sue for a higher redemption price.

case, the arbitration tribunal set aside the offer price and instead used the model-based DCF estimate of the plaintiff, which was EUR 21.55—an increase of 21% over the tender offer price. However, the redemption price was brought back down to EUR 17.84 on appeal.

To understand the economics behind these two court decisions, it is instructive to consider, in principle, AM's sequence of market price prior to and during the tender offer period, using the following notation:

p_H = AM's *Historical* market price just prior to the date when rumors cause the market to anticipate a tender offer to take AM private.

p_R = AM's market *Runup* price after anticipation that a successful tender offer to take AM private will occur with probability $0 < \pi < 1$.

p_O = The *Offer* price.

p_I = AM's *Interim* market price between the announcement of the tender offer and the end of the offer period.

p_F = AM's (counterfactual) market *Fallback* price conditional on the tender offer failing and AM remaining a public firm.

As shown in Figure 8 above, it is typical for the market to start anticipating a tender offer for control—based on public and non-public information and rumors—several months prior to the offer date. In Figure 10, it appears that such rumors may have begun to impact AM's market price on August 1, 2020. Therefore, during the runup period from August 1 until the day prior to the offer date (September 24, 2020), the market price of AM is as follows:

$$p_R = \pi E(p_O | bid) + (1 - \pi)p_F, \quad (36)$$

where $\pi E(p_O | bid)$ is the expected offer premium conditional on a bid.

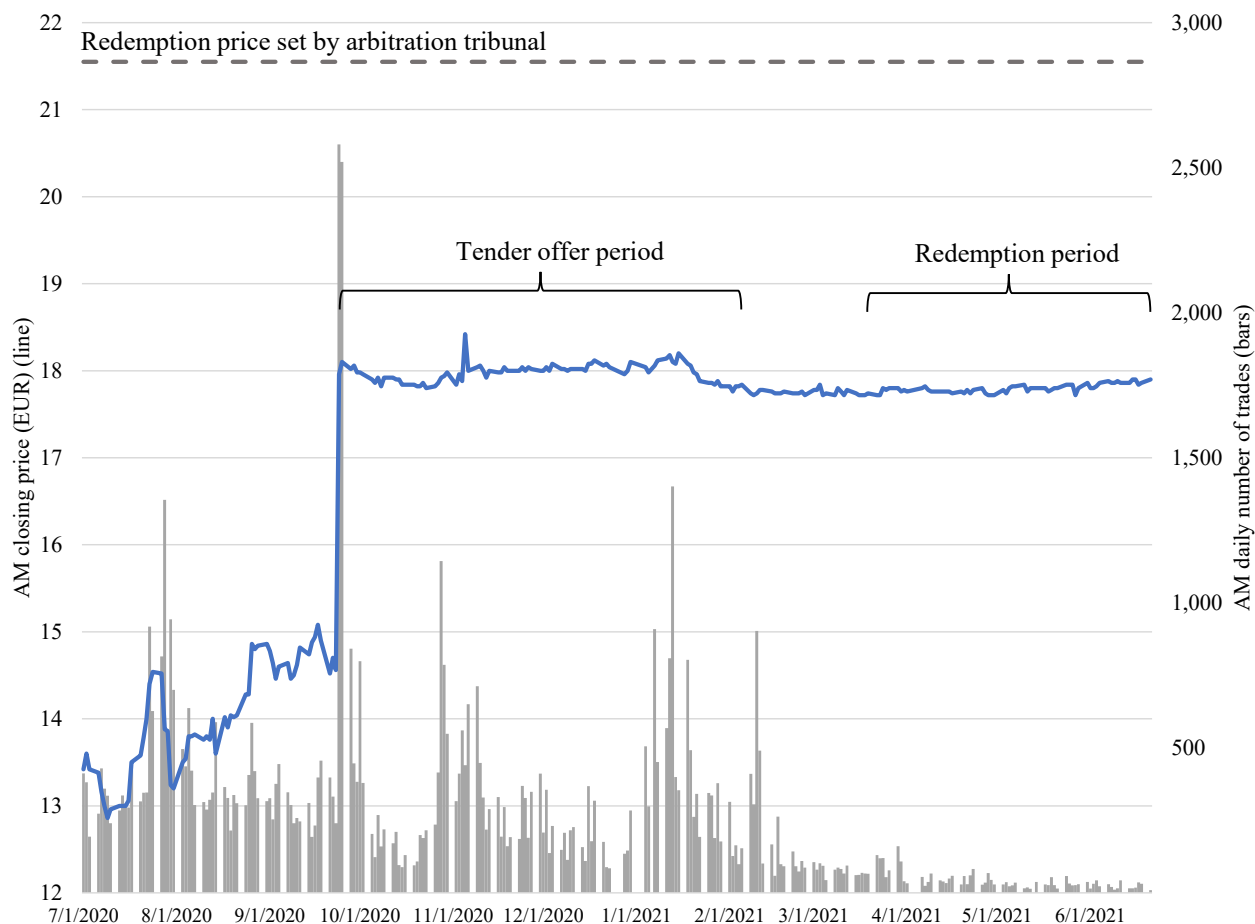
Note that, in Eq. (36), the fallback price p_F may differ from the pre-runup price p_H as news that the offer fails may also convey new information about the economic viability and management of AM. For example, $p_F < p_H$ if the offer fails due to excessive target management resistance to the bid (Goldman and Qian, 2005; Betton, Eckbo, and Thorburn, 2009). Empirically, the early evidence in Bradley, Desai, and Kim (1983) shows that $p_F \approx p_H$. while Malmendier, Opp, and Saidi (2016) show that the price drop

Figure 10: **Daily AM trades and market prices from 7/1/2020 through delisting on 6/30/2021**

The AM tender offer period starts on October 22, 2020, and ends on February 4, 2021. The redemption period starts on March 19, 2021, and AM was delisted by June 30, 2021. The dividend-adjusted tender offer price was $p_O \equiv \text{EUR } 17.84$.

AM's market price three months prior to the start of the tender offer period is $p_H \equiv \text{EUR } 13.9$ (shown at the far left of the graph), which represents the fair market value of AM before the market begins to anticipate that a tender offer will be made. The offer premium relative to this market price is $(17.8 - 13.9)/13.9 = 28\%$, which is a typical offer premium in tender offers.

The daily number of trades (shown in bars) is by far the highest on the day when the market learns of the tender offer and drives the market price (labeled the interim price p_I) to approximately the tender offer price ($p_I \approx p_O$). The fair market price of AM necessarily equals p_O when the market expects the tender offer to succeed with a probability close to one ($\pi \approx 1$), where success means receiving 90% or more of AM's outstanding shares. This subsequently triggers forced redemption for the remaining non-tenured shares, where the proposed redemption price is set equal to p_O .



is somewhat less dramatic (but still below p_O) when the bid is an all-cash offer rather than paid in bidder stock.

In Figure 8, on September 23, p_{runup} = EUR 14.56. The following day, AM shareholders receive an all-cash tender offer for 100% of the shares with p_O = EUR 17.84 (dividend-adjusted). This causes the stock market to reprice AM to $p_I \approx p_O$, which means that the market believes the offer will succeed with a probability close to one ($\pi \approx 1$). Moreover, p_I remains approximately at that price level throughout the entire tender offer period, which ends on February 4, 2021. On March 19, the minority is offered a redemption price equal to the offer price, which they refuse and instead call for arbitration.

Scientifically speaking, for the “fair value” redemption price to truly exceed p_{offer} , it must be that the counterfactual (unobservable) fallback price exceeds p_O . To make this claim, the plaintiff must convince the court that, notwithstanding the significant offer premium relative to p_{before} , the observable interim price p_I does not fully reflect the fair value of the firm if it were to continue as a continued *public* company. This is because the minority does not have a further legal claim on the synergy gain from taking the firm private, which is the property of the majority owner and is already shared with the minority through the offer premium.

For the condition $p_F > p_O$ to be satisfied, it must be that the bidder had private information prior to making the tender offer that the market undervalued the target firm. In the vernacular of Bradley, Desai, and Kim (1983), this would be as if AM was “sitting on a gold mine” without the market or the other AM shareholders being aware of this extra value. As pointed out above, this speculative theory receives little support in studies of ex-post failed tender offers. Also, since p_I hovered around the tender offer price through the entire process, it cannot be that this information leaked out during the tender offer period before a controlling stake in AM was tendered to the buyer. After receiving full control, however, the “sitting on a gold mine” hypothesis implies that the buyer will always block any higher bid. While such higher “shadow bids” are never observed, in virtually all freezeout cases, the plaintiff must convince the court that they exist to succeed with the lawsuit.

A natural way for the court to address the plaintiff’s “sitting on a goldmine” claim is to estimate the fallback price p_F using standard asset pricing theory. Recall that the latest time when the market prices the target as a stand-alone public company—“uncontaminated” by takeover rumors—is the day before takeover rumors emerge (here, July 31, 2020, with p_H = EUR 13.20). In an informationally efficient market, this price contains a rational estimate of all publicly available information at the time. Since the

mandatory redemption period starts later, on March 19, 2020¹, a natural estimate of p_F is obtained by bringing the stand-alone value forward from 07/31/2020 to 03/19/2021 using the realized value of risk factors driving expected stock returns,

To illustrate this conditional fallback price, assume for simplicity the following one-factor market model as the return-generating time-series process:⁵⁰

$$r_{AMt} - r_{ft} = \alpha_{AM} + \beta_{AM}r_{mt} + \epsilon_{AMt}, \quad t = 1, \dots, T, \quad (37)$$

Here, r_{ft} is the daily risk-free rate, and r_{mt} is the theoretical value-weighted market portfolio, for which we use the float-weighted MSCI World Index (AM itself is an international company operating in 13 different countries). To generate a reasonably stable estimate of the risk-factor sensitivity parameter β_{AM} , the estimation period runs from January 1, 2019, through July 31, 2020, which yields an estimate of β_{AM} of 0.69 while the estimate of α_{AM} is very close to zero.

Using Eq. (37) to project AM's historical market price p_H forward to the start of the redemption period (using stock daily returns) gives the following counterfactual fall-back price estimates:

$$\text{Excluding AM's price runup: } \Rightarrow \widehat{p}_F = p_{080120} \left\{ \prod_{t=073120}^{t=031921} (1 + 0.69r_{mt}) \right\} = \text{EUR } 14.89.$$

$$\text{Including AM's price runup: } \Rightarrow \widehat{p}_F = p_{092320} \left\{ \prod_{t=092420}^{t=031921} (1 + 0.69r_{Mt}) \right\} = \text{EUR } 16.40.$$

Here, $p_{080120} = \text{EUR } 13.20$ is p_H at the start of the target's runup period, while $p_{092320} = \text{EUR } 14.56$ includes the target stock price runup, respectively. Since the latter price includes the rumor-generated expected offer premium, it exceeds the true stand-alone value of AM as a public company, leading to a projected fallback price that is biased upwards. Nevertheless, $\widehat{p}_F < p_O$, which implies that $p_O = \text{EUR } 17.84$ may be considered a fair redemption price (a conclusion ultimately reached also by the court in this case).

⁵⁰This linear regression model is consistent with expected stock returns being generated by the classical (equilibrium) Capital Asset Pricing Model (CAPM), which itself is the typical pricing assumption underlying price estimates based on DCF analysis. Using a multifactor model such as the five-factor model of Fama and French (2015) does not materially alter the estimates below.

Part II

Takeover Issues and Puzzles

8 Why are acquirer returns so low?

In their reviews of first-generation empirical estimates of takeover gains, Jensen and Ruback (1983) made three important conclusions: (1) Acquirer announcement returns are positive but small on average (about 1% on average). (2) Target shareholders appear to capture the lion’s share of synergy gains, with average offer premiums for public targets around 40%. (3) While the sources of the synergy gains remain elusive, stock market evidence rejects that changes in industry rents caused by horizontal mergers emanate from expectations of increased market power—even in samples of mergers challenged by antitrust authorities.⁵¹

An extensive literature, which since the late 1990s has benefited from access to large-scale electronic databases—largely confirms conclusions (1) and (2) above. As we have already addressed conclusion (2), we focus in this section on (1) and return to the specifics behind conclusion (3) in Section 13.

8.1 Large-sample announcement return (CAR) estimates

It is generally agreed that the event-study methodology pioneered by Fama, Fisher, Jensen, and Roll (1969) is the most powerful econometric technique to pinpoint the market value of M&A investments for bidder firms.⁵² In an informationally efficient market, investors react quickly to news about M&A, leading the econometrician to use the resulting stock price change over a short event period (typically within one week) to infer the unanticipated portion of the net present value of the investment project. The cumulative announcement return over the event period, CAR , is then measured after subtracting a risk-adjusted estimate of the expected stock return going into that period. Focusing on studies exceeding 10,000 M&A transactions, the consensus is that the average sample-wide acquirer CAR is a significant 1% when the event period is centered on the first public deal announcement.⁵³

⁵¹Eckbo (1983) provide a new empirical test that nests competing market-power and economic-efficiency hypotheses to explain product-specific industry wealth effects of horizontal mergers challenged by US antitrust authorities. Based on this evidence, Jensen and Ruback (1983) conclude that “The evidence reviewed...indicates that the merger gains do not come from the creation of product market power.” (p. 9).

⁵²Thompson (1985, 1995), MacKinlay (1997), Kothari and Warner (2007) and Betton, Eckbo, and Thorburn (2008) provide expansive summaries of this basic methodology.

⁵³Moeller, Schlingemann, and Stulz (2004, 2005), Betton, Eckbo, and Thorburn (2008, 2009), Netter, Stegemoller, and Wintoki (2011), Golubov, Yawson, and Zhang (2015), Alexandridis, Antypas, and Travlos (2017), Dessaint, Eckbo, and

Figure 11: **Cumulative abnormal stock returns to targets and initial bidders**

Percent cumulative abnormal stock returns to targets and initial bidders from day -40 through day 10 relative to the initial control bid. US targets 1980-2012. Figure adapted with permission from Eckbo (2014).

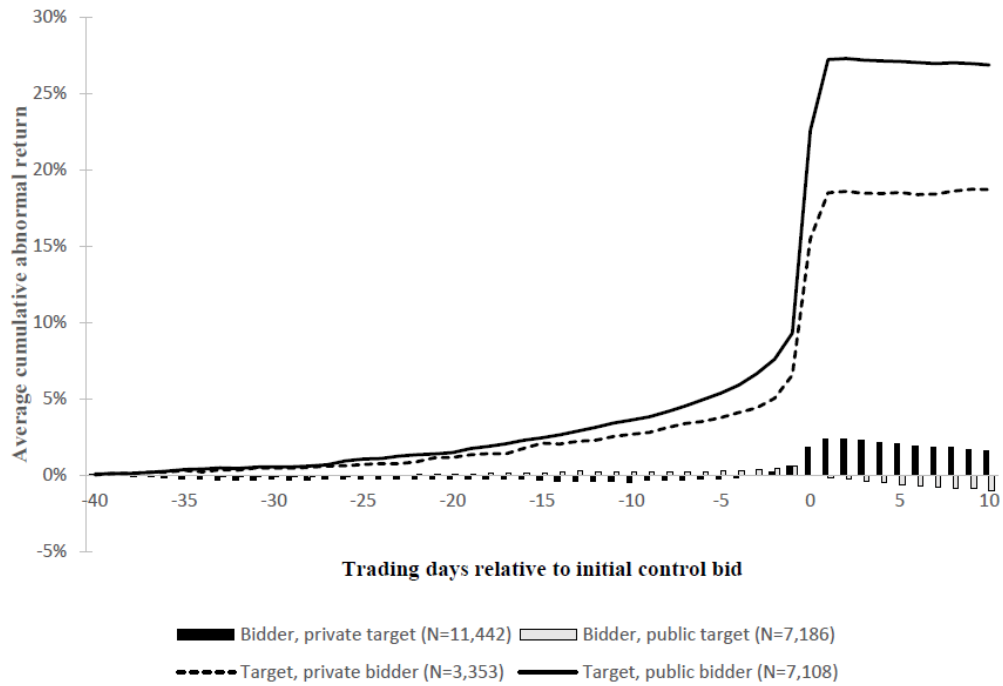


Figure 11, which is from Eckbo (2014), shows that this conclusion also holds for the 18,500 publicly traded bidders available on the SDC merger database over the period 1980–2012. The figure plots the daily average cumulative CAR from day -40 through day 10 relative to the offer announcement, classified by the public status of the bidder and target. The abnormal returns are estimated as the prediction errors of the one-factor market model that uses the value-weighted market index to adjust for firms’ systematic risk exposure. The sample is restricted to the initial control bid for a US target firm, and the form of the deal is either a merger or acquisition of a majority interest. The event study requires at least 100 days of trading in the 255 trading days ending 42 days before the announcement of the initial control bid.

As shown, the average bidder CAR is somewhat greater when the target is private than when the target is public. For the target firms, however, the reverse finding holds: cumulative abnormal returns to targets are, on average, somewhat greater when the bidder is public than when the bidder is private. Taken together, this is consistent with the hypothesis that public targets are able to extract a somewhat greater share of the total merger-generated synergy gains than private targets. Also important, while not shown in Figure 11, restricting the sample to mergers between publicly listed firms, the evidence shows that the *value-weighted sum* of the CAR to the bidder and target is on average positive and statistically significant (Betton, Eckbo, and Thorburn, 2008; Dessaint, Eckbo, and Golubov, 2024). In other words, even if bidders overpay in some deals—causing a wealth transfer from the bidder to the target—the M&A activity generates sufficient synergies to be classified as socially efficient investments on average.

A large literature studies the cross-sectional association between bidder and target takeover gains and firm- and deal characteristics (see, e.g., the references in footnote 53 above). In Table 2, we use the sample in Dessaint, Eckbo, and Golubov (2024) to single out two such characteristics that have been shown to be of particular interest in studies of bidder announcement returns: target status (public/private/subsidiary) and the method of payment (all-cash, all-stock or mixed cash-stock). Notice first from the first column (all targets) that the average bidder $CAR(-3,3)$ is positive and highly significant, with 0.9% across the 15,368 deals, ranging from a low of 0.21% when the payment method is all-stock to 1.32% in mixed cash-stock deals and 1.26% when the payment method is all cash.

Second, bidder announcement returns are, on average, negative and significant when the target firm

Golubov (2024), Schneider and Spalt (2025), Ben-David, Bhattacharya, Huang, and Jacobsen (2025). As discussed further below, beyond price effects of merger arbitrage activities and latent information signals about bidder stand-alone values, the short-term CAR captures the bidder’s share of the expected value of the synergies from the merger transaction itself. Hence, short-term CAR -estimates need not be cross-sectionally correlated with subsequent firm-level accounting measures (e.g., return on assets and values of intangibles).

is public and the payment method includes some bidder shares: $CAR(-3, 3)$ averages -2.16% in the 2,339 all-stock deals, while the average is -1.54% across the 799 mixed-cash stock deals. While not shown in the table, it is important to also note that the value-weighted sum of the bidder and target announcement returns is positive and significant in these subsamples Dessaint, Eckbo, and Golubov (2024). Hence, while the market may believe that some bidders overpay for the publicly traded target assets, these investments nevertheless represent socially efficient corporate restructurings. Also, as discussed further below, public targets raise measurement issues for bidder announcement returns (partial anticipation and short-selling activity) that in themselves can create negative bidder CAR .

Third, regardless of the payment method, the average bidder $CAR(-3, 3)$ is significantly positive when the target is a private stand-alone company ($N=6,755$) or a subsidiary ($N=3,819$). Comparing columns (3) and (2) in Table 2, and since bidders of private targets are on average smaller than bidders of public targets, the sign-switch in bidder average $CAR(-3, 3)$ from positive for private targets to negative for public targets has been interpreted as “smaller bidders make better acquisitions” (Moeller, Schlingemann, and Stulz, 2004; Betton, Eckbo, and Thorburn, 2008; Gorton, Kahl, and Rosen, 2009). However, Schneider and Spalt (2025) argue that the effect of bidder size on bidder CAR is more complex. They show that bidder CAR changes sign also *within* each of the two subsamples of public and private targets—and then with *opposite* sign: For private targets, bidder CAR decreases with bidder size and increases with target size while, for public targets, this sign-switch is the opposite (bidder CAR increases with bidder size but decreases with target size). They suggest that, while factors such as bidder overconfidence and agency costs are difficult to square with such sign-switches, they are consistent with a mechanical “scale factor” in bidder CAR and, therefore, recommend including target size as a control variable in cross-sectional regression of bidder CAR .⁵⁴

Overall, the evidence in Figure 11 and Table 2 suggests a competitive market for corporate control that transfers most, if not all, of the rents from takeover activity to the seller, with acquirer shareholders on average making relatively small percentage gains after transaction costs. In the next three sections, we discuss why even the negative estimate of average bidder CAR for the public targets in Table 2 need not mean that the acquisitions themselves represent negative NPV projects. These sections address the

⁵⁴Schneider and Spalt (2025) write the post-announcement bidder size as $B_{post} = B + NPV(Deal) = B + RT$, where B is the pre-bid bidder (stand-alone) size, T is the target size, and $R \equiv NPV(Deal)/T$ is the bidder’s return per dollar paid for the target. Hence, the bidder announcement return can be written as $CAR \equiv (B_{post} - B)/B = R(T/B)$, and $\frac{\partial CAR}{\partial B} = \frac{\partial R}{\partial B}(\frac{T}{B}) - \frac{RT}{B^2}$, where the second term in this partial derivative represents their “scale factor”.

Table 2: **Percent $CAR(-3, 3)$ to acquiring firms classified by target status and payment method**

The estimation of the seven-day cumulative abnormal stock return $CAR(-3, 3)$, where day 0 is the first announcement of the initial bidder's bid for control, uses the one-factor 'market model' to generate expected stock returns. Target firms are classified as public, private, or subsidiary, while the payment method is either all-cash, all-stock, or mixed cash-stock. t -value of CAR is the student t -value for the average $CAR(-3, 3)$. The sample includes 15,368 deals of the 23,533 US M&A deals in Dessaint, Eckbo, and Golubov (2024), 1981–2017.

Public bidder	All targets (1)	Public targets (2)	Private targets (3)	Subsidiary (4)
All deals				
% Average CAR	0.90%	-1.14	1.61	2.21
t -value of CAR	[11.4]	[-9.0]	[12.6]	[14.4]
Sample size	15,368	4,799	6,755	3,814
All-cash deals				
% Average $CAR(-3, 3)$	1.26	0.50	1.18	1.77
t -value of CAR	[13.7505]	[2.8353]	[7.7527]	[11.8887]
Sample size	7,290	1,661	2,713	2,916
All-stock deals				
% Average $CAR(-3, 3)$	0.21	-2.16	1.82	3.28
t -value of CAR	[1.3557]	[-10.7083]	[7.7786]	[4.9962]
Sample size	5,390	2,339	2,616	435
Mixed cash-stock deals				
% Average $CAR(-3, 3)$	1.32	-1.54	2.05	3.99
t -value of CAR	[6.2743]	[-5.4552]	[6.6888]	[7.1634]
Sample size	2,688	799	1,426	

potential for (i) attenuation bias in bidder announcement returns, (ii) a decline in the acquirer’s market value as a stand-alone firm, and (iii) short-selling of bidder shares by merger arbitrageurs.

8.2 Attenuation bias in *CAR* from partial anticipation

While estimating total merger-related *target* takeover gains is relatively simple (see the offer premiums in Section 7 above), identifying true bidder gains is much more difficult. For example, as the typical target is about one-tenth the size of the bidder, the measured percentage bidder gain is by construction one-tenth that of the target return, even if the two firms share the total takeover gains equally. Because the normal variation in the dollar value of bidder returns is also larger, identifying merger-induced expected synergy gains in bidder returns is a bit like looking for a needle in a haystack. Consistent with this measurement issue, cross-sectional regressions with the bidder announcement return as a dependent variable typically show bidder gains increasing in the relative size of the target.

A second and more difficult measurement issue arises due to partial anticipation of the future merger activity of frequent acquirers. The conventional view is that event-induced stock returns measure only the unanticipated component of the total economic effect of the event (this view is discussed in more detail in Section 11 below on the so-called “markup pricing phenomenon”. For target firms, this is typically not much of an issue given the low degree of predictability of becoming a target, which ranges (unconditionally) between two and three percent a year for listed firms. Therefore, at the intrinsic margin, the conventional method of identifying the target stand-alone value that is likely free of partial anticipation of a forthcoming takeover bid has been to look back over the pre-offer period until the sample average target *CAR* becomes insignificantly different from zero.

In Figure 11 above, this occurs on day -42, which is then used as the cross-sectionally fixed event day just prior to the start of the offer-induced target stock price runup period (possibly affected by rumors that drive the takeover likelihood from zero to a positive number). Some studies prefer to use day -60 as this event day, typically without affecting the conclusions. On the other hand, in a sample of 1,391 US M&A transactions, Eaton, Liu, and Officer (2021) show that using the initiation date of the private takeover period found in target S4 disclosure forms (when interested bidders sign a non-disclosure agreement to begin the due diligence process, see Section 5.2 above) on average raises a target runup such as the one in Figure 11 by a significant 8%. While it is difficult to generalize, this suggests that target stock prices two to three calendar months prior to the first public bid may also contain traces of

a positive takeover probability.

As illustrated in Figure 11, while rumor-induced stock price runups are sufficiently large and pervasive to be relatively easily identified for target firms, no such clear runup period exists for bidder firms. Hence, if takeover gains are partially embedded in the pre-bid stock price of the acquirer, this partial anticipation most likely occurred much earlier in the takeover process. For example, many large bidder firms are frequent acquirers, which gives rise to market anticipation of a series of future acquisitions and associated bidder stock price adjustments long before each of the actual takeover events actually take place—attenuating the surprise effect of the bid announcement accordingly. In an early study of this attenuation bias, Schipper and Thompson (1983) show that the announcement of entire acquisition programs, which causes the market to capitalize the value of a series of future acquisitions, significantly increases the equity market value of the announcing companies. Conversely, Song and Walkling (2000) and Cai, Song, and Walkling (2011) find that bidder announcement returns are significantly greater when they follow a “dormant” (inactive) acquisition period.

Moreover, assuming that expected stock returns are generated by the Sharpe-Lintner Capital Asset Pricing Model (CAPM), Malatesta and Thompson (1985) offer an interesting econometric approach to detect evidence of prior deal anticipation permanently embedded in bidder stock returns. Under the CAPM, the expected stock return to firm i at time t can be written as $E(r_{it} - r_{ft}) = \beta_i[E(r_{mt}) - r_{ft}]$, where r_{mt} and r_{ft} are the realized returns on the value-weighted market portfolio and the risk-free asset, respectively. Malatesta and Thompson (1985) consider the following time-series regression function:

$$r_{it} - r_{ft} = \beta_i(r_{mt} - r_{ft}) + \epsilon_{it}. \quad (38)$$

Under market efficiency, the error term is mean zero unconditionally: $E(\epsilon_{it}) = 0$. Suppose it is commonly known that the market in each period embeds a constant takeover probability π into firm i 's stock price and that a takeover, if it is announced at time t , will increase firm i 's market value by v_i (the economic value of the merger). Let d_t be a dummy variable that takes on a value of one if a merger is announced by firm i in period t and zero otherwise. In equilibrium, we can expand the unconditional error term as follows:

$$E(\epsilon_{it}) = (1 - \pi)(v_i | d_t = 1) + \pi(-v_i | d_t = 0) = -\pi v_i + (v_i | d_t = 1) = 0. \quad (39)$$

Here, $(1-\pi)(v_i|d_t = 1)$ is the expected value of the merger embedded in the stock price at the beginning of period t , while $\pi(-v_i|d_t = 0)$ is the corresponding drop in value if there is no merger announcement during the period. Since the term $-\pi v_i$ is a constant, the following regression produces the same equilibrium expected return as the CAPM Eq. (38) above:

$$r_{it} - r_{ft} = -\pi v_i + \beta_i(r_{mt} - r_{ft}) + v_i d_t + u_{it}. \quad (40)$$

Hence, the parameter multiplying the dummy variable represents a direct estimate of the economic value of the merger, while the sum of this parameter and the regression constant provides the merger announcement effect. A test of the joint hypothesis that (1) merger-value is positive and (2) mergers are partially anticipated, therefore amounts to testing whether the dummy parameter in Eq. (40) is positive and the constant term negative. Malatesta and Thompson (1985) and Eckbo and Thorburn (2000) both present large-sample evidence consistent with this joint hypothesis.

8.3 Is *CAR* low due to changes in bidder stand-alone values?

Announcing a takeover bid may provide new information not only about expected takeover synergies but also about the stand-alone value of the bidder firm. This effect may arise for two reasons: signaling and a change in the industry equilibrium. The signaling effect has been shown theoretically by McCardle and Viswanathan (1994) and Jovanovic and Braguinsky (2004). In McCardle and Viswanathan (1994), the announcement of a takeover reveals to the market the inability of the bidder to enter the product market of the target organically. In Jovanovic and Braguinsky (2004), the announcement of a takeover reveals that the bidder has a low-quality internal project. The idea of the industry equilibrium effect is that bid announcements inform investors about important aspects of the changing state of the industry. As the industry equilibrium changes, so does the bidder's stand-alone value, undermining the typical interpretation of statistics such as the bidder *CAR* as reflecting takeover synergies only.⁵⁵

To illustrate the general idea, suppose losing the acquisition attempt to an industry rival places the initial bidder at a competitive disadvantage. The market reaction to the initial bid announcement then involves first lowering the stand-alone value of the bidder (conditional on losing) and adding the expected synergy gains (conditional on winning). While the takeover, in this case, is value-increasing for the

⁵⁵See Section 13 below for evidence on intra-industry wealth effects of merger activity.

winning bidder, the net announcement effect may be positive or negative depending on the size of the decrease in the bidder's stand-alone value. The empirical challenge is, therefore, to properly estimate the successful acquirer's counter-factual stand-alone value (i.e., if the bid had failed).

Wang (2018) presents a particularly interesting analysis of this challenge. He first implements the quasi-experimental approach also used by Savor and Lu (2009) and Seru (2014), where the counter-factual stand-alone value of successful acquirers is identified using the abnormal returns to acquirers in exogenously failed bids (presumed exogenous to acquirers' actions). In his sample, failed acquirers earn significantly negative CARs, averaging -8% from bid announcement to bid withdrawal (successful acquirers earn CARs averaging 2%), suggesting that acquirer takeover gains are substantial and bid failure is costly. Wang (2018) further identifies successful acquirers' counter-factual stand-alone values in a structural estimation of a dynamic search model. In this model, firms endogenously self-select to pursue takeovers in order to catch up with their competitors, which results in a negative revelation effect of some bid announcements. The structural estimation (simulated to match key data moments) suggests that the negative revelation effect may be as large as -16% (and a positive synergy effect of 12%). In sum, traditional bidder gains estimates, which fail to identify the revelation of a negative stand-alone value change, may seriously underestimate true bidder takeover gains.

8.4 Merger arbitrage and short-selling of bidder shares

After the announcement of a takeover bid, the target stock price adjusts upwards but typically still trades at a discount from the offer price. The difference between the offer price and the post-announcement market price is called the arbitrage spread. Merger arbitrage (or risk arbitrage) is a specialized investment strategy that tries to profit from this spread. Specifically, it is a bet on the likelihood that the proposed transaction closes. If the bid (or a rival bid) is successful and the target is acquired, the arbitrageur captures the price difference. If the takeover fails and the target remains independent, however, the target stock tends to fall back to prebid levels, and the arbitrage position has to be closed at a loss. Since the position carries the transaction risk, it is not an arbitrage in the true (riskless) sense of the word. It is, however, designed to be neutral to subsequent market movements and to price fluctuations between the bidder and the target, should the deal succeed.

For a cash bid, a merger arbitrage position simply involves a long position in the target stock. When the acquisition is consummated, the target stock is exchanged for cash. With a positive arbitrage spread,

the cash received at closing will exceed the initial investment in the target stock, hence generating a profit. In contrast, if the takeover fails and the target stock price falls, the speculative position has to be sold at a loss equal to the price decline in the target stock.

The arbitrage position in a stock-for-stock transaction is more complex since target shareholders are offered acquirer stock as payment. Here, the arbitrage position consists of a long target stock and a short acquirer stock in the same proportion as the exchange ratio.⁵⁶ If the bid is subsequently revised, the arbitrage position must be adjusted to reflect the new exchange ratio. When the transaction closes, the arbitrageur receives in return for the target share the promised number of acquirer shares, which are used to cover the short position. The profit from a successful arbitrage position in a stock deal is the difference between the price of the short acquirer stock and the target stock price when the position is established. If the bid fails, the arbitrageur will likely incur a loss from selling its target shareholdings. The effect of closing out the short position in the acquirer is more uncertain: if the bidder's stock falls, there may be an offsetting gain, and if the bidder's stock appreciates, there may be additional losses.

Trading volumes typically increase in connection with the announcement of a takeover offer. Mitchell, Pulvino, and Stafford (2004) study the effects of merger arbitrage for 2,130 mergers announced between 1994 and 2000. They document a substantial arbitrage activity after the announcement of a takeover offer. In the announcement month, the acquiring firm's short interest increased with a median of 40% in fixed-exchange-ratio stock mergers (i.e., where the exchange ratio is determined in the merger agreement). Interestingly, there is no corresponding change in the short interest for mergers where the arbitrage position does not involve a concurrent shorting of the acquirer stock, such as cash mergers or floating-exchange-ratio mergers (where the acquirer offers stock equivalent to a specific dollar value). The level of short interest falls dramatically when the merger closes. Also, the announcement effect of stock mergers is related to the change in short interest that occurs in the month of the announcement, suggesting that the price pressure from merger arbitrage may affect bidder CAR.

To examine the effect of arbitrage trading activity, Mitchell, Pulvino, and Stafford (2004) focus on a subsample of 64 floating-exchange-ratio mergers. In this type of merger, information about the deal is revealed separately from the merger-induced shorting of the acquirer's stock. Specifically, the exchange ratio is determined during a pricing period, which typically lasts for ten days and ends five days prior to

⁵⁶For example, with an offer of two acquirer shares for each target share, the arbitrage position is long one target share and short two acquirer shares.

the merger closing, when most of the deal uncertainty has already been resolved. Importantly, the short interest increases significantly during the pricing period, and there is a negative abnormal drift in the acquirer stock price of 3% for the floating-exchange-ratio mergers. Mitchell, Pulvino, and Stafford (2004) conclude that the short-selling by merger arbitrageurs causes downward price pressure that accounts for almost half of the negative announcement return for acquirers in stock-financed mergers.

8.5 Evidence of declining uniqueness in bidder-generated synergies

As discussed above, hypotheses designed to explain the low average bidder announcement return range from competition among bidder firms to more complex explanations involving measurement issues due to market deal anticipation and revelations about bidder stand-alone values. Moreover, no single view has yet emerged as the dominant explanation for continued lackluster bidder performance over the past four decades. This is surprising since, as Dessaint, Eckbo, and Golubov (2024) point out, the market for corporate control has seen profound changes since the late 1970s. For example, empirical evidence suggests that corporate governance practices in listed firms have improved (Gillan and Starks, 2007), that executives and directors are now more highly educated (Krueger, Landier, and Thesmar, 2015), and that financial markets may have become more open and informative (Bai, Phillipon, and Savov, 2016). While it is reasonable to expect that such broad-based developments may have resulted in improved corporate decision-making, including acquisition decisions as one of the most prominent and consequential forms of corporate investment, there is little evidence of any such improvement reflected in acquirer announcement returns.

Dessaint, Eckbo, and Golubov (2024) offer a new perspective by studying the evolution of announcement returns over time. In a comprehensive sample of 23,553 deals by 5,356 distinct bidders, they first confirm that the annual average *CAR* is about 1% (statistically significant) during their 37-year sample period (1981–2017). However, they then show that this largely constant total average acquirer returns masks two fundamental but opposing underlying trends in the data. Their starting point is the observation that the composition of listed firms—the focus of all studies of acquirer returns—has changed dramatically over the last decades (Fama and French, 2004; Doidge, Karolyi, and Stulz, 2017; Eckbo and Lithell, 2025). Such changes may have profound implications for the evolution of acquirer returns because much of the variation in bidder takeover gains is firm-specific (Golubov, Yawson, and Zhang, 2015). Indeed, they demonstrate that a change in the *composition* of bidders has confounded a general

trend toward higher acquirer returns. Specifically, after controlling for bidder composition, they find that the *common component* of acquirer returns has increased over time by five percentage points relative to the 1980s. The average bidder-specific component has declined enough to offset this increase—a decline that has gone undetected until their study.

Dessaint, Eckbo, and Golubov (2024) argue that the temporal decline in the bidder-specific component in the average *CAR* likely reflects a decline in the importance of bidder-specific skills in generating takeover synergies. They then develop a simple theoretical framework that links announcement returns to merger-induced synergies and how unique they are to the winning bidder. Bidder uniqueness in this theory represents the degree of substitutability between potential rival bidders. For example, synergies are more bidder-specific when the bidder contributes a unique distribution network for the target’s product and less bidder-specific when the target sells itself to a cash-rich buyer to fund its continued operations. Because cash is fungible, synergies in the latter case are not unique to any particular bidder, and competition among perfect substitute bidders drives down the share of synergies the ultimate buyer can extract. Their main insight is that acquirer returns increase with the uniqueness of the winning bidder in terms of the resources it brings to the deal. Whereas prior studies have focused on the role of similarity between the bidder and the target in determining synergies (e.g., Hoberg and Phillips, 2010), the theory in Dessaint, Eckbo, and Golubov (2024) highlights the role of similarity between potential rival bidders in determining bargaining power.

Consistent with their argument, using several empirical measures of bidder uniqueness in the time series, the evidence in Dessaint, Eckbo, and Golubov (2024) suggests that merger synergies (whatever their source) have become less unique to the winning bidder over time. In other words, acquirers appear to have become less differentiated from their latent competition in the takeover market. This evidence, in turn, raises another important question: How can the average bidder *CAR* remain at about 1% throughout the entire time series if bidder uniqueness has declined? Using the public target subsample as their laboratory, Dessaint, Eckbo, and Golubov (2024) answer this question by showing evidence that total merger synergies appear to have contemporaneously increased: The combined bidder-target abnormal returns and operating performance improvements—proxies for total merger synergies—have indeed increased over time. Moreover, target firm returns have also increased, in line with declining bidder uniqueness, benefiting targets through an improvement in their outside option. Overall, the evidence is consistent with a general increase in merger synergies that have become less bidder-specific over time.

Dessaint, Eckbo, and Golubov (2024) also undertake a search for the economic drivers of declining bidder uniqueness and rising merger synergies. They find that, over time, bidders have fallen somewhat behind in terms of the uniqueness of the resources they bring into the deal. For example, closer to the end of their sample period, financing power is no longer limited to bidders. Perhaps more importantly, using the measure of hard-to-replicate “knowledge capital” (both tangible and intangible) developed by Peters and Taylor (2017), they show that bidders are falling behind non-bidders (all other Compustat firms in the same year) in terms of knowledge capital. While the fraction of knowledge capital that bidders have prior to making a bid has increased, it has increased less than that of the average non-bidder firm. This knowledge-capital gap has, in fact, widened considerably over the sample period, suggesting an erosion in terms of the ability of acquirers to contribute hard-to-replicate assets to the merger.

Finally, the fundamental drivers of the rise in total synergy gains continue to elude the authors, as they find no support for channels such as learning, improved corporate governance, or increased industry concentration. As concluded by Jensen and Ruback (1983) as well, the main source of takeover synergies continues to elude research on takeovers.

8.6 Long-run performance of merged firm⁵⁷

Some studies report evidence of post-merger underperformance, particularly when using the matched-firm buy-and-hold technique (implemented below). For example, Rau and Vermaelen (1998) report that merged firms with a low book-to-market ratio tend to underperform, while Loughran and Vijh (1997) report underperformance when the merger is paid in stock (while all-cash mergers overperform). Moeller, Schlingemann, and Stulz (2004) report insignificant long-run (36-month) post-merger performance. Harford (2005) finds some evidence suggestive of relatively poor post-merger performance for the largest bidders. Moeller, Schlingemann, and Stulz (2005) find significantly negative long-run buy-and-hold returns to portfolios of “large loss deal” bidders. Rosen (2006) reports evidence that mergers that take place during periods of high general merger activity tend to have high pre-merger share prices followed by low post-merger performance.

There are at least three possible explanations for this finding. First, under behavioral arguments, the market slowly corrects its overvaluation of the merged firms’ shares (Shleifer and Vishny, 2003; Baker,

⁵⁷This section is reproduced from Betton, Eckbo, and Thorburn (2008) as the empirical arguments and main conclusions continue to be valid today.

Ruback, and Wurgler, 2007). Second, as discussed in Section 8.3 above, a neoclassical argument is that the merger is a response to a negative industry shock and that the merged firm performs better than what it would have done without the merger—which may still be worse than the pre-merger performance (Harford, 2005). Third, the apparent underperformance is an artifact of the econometric methodology itself. The rest of this section sheds light on the third hypothesis.

We begin the long-run abnormal return analysis with the matched firm technique and then show results when returns are risk-adjusted using factor regressions applied to portfolios of merged firms. Our sample drops to 15,298 mergers after imposing the following additional restrictions: (1) The sample period is 1980–2003 to allow a minimum of three years of post-merger stock returns. (2) The merged firm is found on CRSP and listed on NYSE/AMEX/Nasdaq for at least one year following the year of the effective date of the merger. (3) the merged firm must have Compustat information on equity book-to-market ratio (B/M) to allow selection of a matched firm based on size and B/M.⁵⁸

The typical buy-and-hold experiment involves buying the merged firm’s stock in the month following the merger completion month (effective merger date) and holding the stock for a period of three to five years or until delisting, whichever comes first. In a sample of N issues, the average return over a holding period of T months is computed as the average cumulative (T-period) return, also referred to as *BHR* (for “buy-and-hold return”):

$$BHR \equiv \frac{1}{\omega_i} \sum_{i=1}^N \left[\prod_{t=\tau_i}^{T_i} (1 + R_{it}) - 1 \right], \quad (41)$$

where R_{it} denotes the return to stock i over month t , and ω_i is stock i ’s weight in forming the average holding-period return ($\omega_i = 1/N$ when equal-weighting). The effective holding period for stock i is T_i , where T_i in the analysis below is either five years or the time until delisting or the occurrence of a new merger, whichever comes first).^{59,60} The matched-firm technique equates the *expected* return to merged firms with the *realized* return to a non-merging firm, usually matched on firm characteristics such as

⁵⁸Book value is defined as “the Compustat book value of stockholders equity, plus balance sheet deferred taxes and investment tax credits (if available), minus the book value of preferred stock. Depending on availability, we use the redemption, liquidation, or par value (in that order) to estimate the value of the preferred stock.” (Fama and French, 1993, p.8). If available on Compustat, the book value of equity is also measured at the end of the year prior to the year of the acquisition. If this book value is not available, we use the first available book value on Compustat, starting with the acquisition year and ending with the year following the acquisition year.

⁵⁹Kothari and Warner (1997), Barber and Lyon (1997) and Lyon, Barber, and Tsai (1999) provide simulation-based analysis of the statistical properties of test statistics based on long-run return metrics such as *BHR*. Kothari and Warner (2007) survey the main statistical conclusions from this analysis.

⁶⁰An alternative to *BHR* is to estimate the average monthly return to a strategy of investing in the stocks of merged firms and holding these for up to T periods. The T -period return would then be formed as the *cumulative average* (portfolio)

industry, size, and book-to-market ratio. The abnormal or unexpected return $BHAR$ is then

$$BHAR_{\text{Issuer}} \equiv BHR_{\text{Issuer}} - BHR_{\text{Matched firm}}. \quad (42)$$

Table 3 shows average five-year percent buy-and-hold returns for our sample and for firms matched on size and B/M. The matched firms are selected from all CRSP-listed companies at the end of the year prior to the year of the merger completion, and that are not in our sample of mergers for a period of five years prior to the offer date. Moreover, the matching procedure is as follows: We first select the subset of firms that have equity market values within 30% of the equity market value of the merged firm. This subset is then ranked according to book-to-market ratios. The size and book-to-market matched firm is the firm with the book-to-market ratio, measured at the end of the year prior to the merger year, that is closest to the merged firm’s ratio. Matched firms are included for the full five-year holding period or until they are delisted, whichever occurs sooner. If a match delists, a new match is drawn from the *original* list of candidates described above.

Table 3 shows that when using either the total sample period 1980–2003 or the subperiod 1990–2003, merged firms, on average, underperform their matched firms, whether BHR is formed using equal-weights or value-weights. For the total sample period, the difference between the equal-weighted BHR for merged and matched firms is -21.9% and -17.1% with value-weighting, both with p-values of 0.00. About twenty percent of the sample mergers took place in the 1980s, and here, the underperformance is evident only for equal-weighted BHR . For the subperiod 1990–2003, the underperformance estimates are again highly significant and slightly greater than for the total period—25.4% using the equal-weighted estimate of BHR .

An alternative to the buy-and-hold matched firm technique is to form portfolios of event firms rolling

return, or

$$CMR \equiv \prod_{t=\tau}^T \left[1 + \frac{1}{\omega_t} \sum_{i=1}^{N_t} R_{it} \right] - 1.$$

As noted by Kothari and Warner (2007), depending on the return generating process, the statistical properties of BHR and CMR can be very different. Notice also that while CMR represents the return on a feasible investment strategy, BHR does not. You obtain CMR by investing one dollar in the first security issue at the beginning of the sample period, and then successively rebalancing this initial investment to include subsequent issues as they appear (and N increases), all with a T -period holding period. In contrast, BHR is formed in event time—and thus presumes prior knowledge of the magnitude of N . Thus, estimates of CMR are better suited than estimates of BHR to address the question of whether investors have an incentive to take advantage of a potential market mispricing of merged firms’ securities. Most of the empirical studies using the matched firm technique report results based on BHR , which we follow here. In the subsequent section, we discuss portfolio benchmark returns based on asset pricing models, which use the return concept CMR on a monthly basis, i.e., without the T -period cumulation.

Table 3: **Five-year buy-and-hold stock returns for merged and non-merging matched firms**

The table shows the percent average five-year buy-and-hold stock returns (BHR) for merged firms, non-merging matched firms, and the difference between merged and matched firms, 1980–2006. Buy-and-hold percent returns are defined as:

$$BHR \equiv \omega_i \sum_{i=1}^N \left[\prod_{t=\tau_i}^{T_i} (1 + R_{it}) - 1 \right] \times 100.$$

The sampling of merged firms starts in February 1980 and ends in December 2003, while the return holding period is allowed to continue to December 2006. The total sample of merged firms with information on matched firms is 15,298. The non-merging matched firms are firms that did not merge in the previous five-year period and have similar total equity size and book-to-market ratio. When equal-weighting, $\omega_i \equiv 1/N$, and when value-weighting, $\omega_i = MV_i/MV$, where MV_i is the firm’s common stock market value at the start of the holding period and $MV = \sum_i MV_i$. The abnormal buy-and-hold returns shown in the column marked “Diff” represent the difference between the BHR in the “Merged” and “Match” columns. “N” is the total number of issues. The p -values for equal-weighted abnormal returns are p -values of the t -statistic using a two-sided test of no difference in average five-year buy-and-hold returns for issuer and matching firms. The p -values for the value-weighted abnormal returns are computed using $U \equiv \omega'x/(\sigma\sqrt{\omega'\omega})$, where ω is a vector of value weights, and x is the corresponding vector of differences in buy-and-hold returns for issuer and match. Assuming that x is distributed normal $N(\mu, \sigma^2)$ and that σ^2 can be consistently estimated using $\sum_i \omega_i(x_i - \bar{x})^2$, where $\bar{x} = \sum_i \omega_i x_i$, U is distributed $N(0, 1)$. Table adapted with permission from Betton, Eckbo, and Thorburn (2008).

Sample period	N	Equal-weighted BHR				Value-weighted BHR			
		Merged	Matched	Diff	$p(t)$	Merged	Matched	Diff	$p(t)$
1980-2003	15,298	62.6	84.6	−21.9	0.000	32.6	49.6	−17.1	0.000
1980-1989	3,815	83.6	95.1	−11.5	0.003	102.0	113.9	−12.0	0.120
1990-2003	11,483	55.7	81.1	−25.4	0.000	26.7	44.2	−17.5	0.000

forward in calendar time and to estimate portfolio performance. Monthly portfolio (excess) returns are regressed on a set of risk factors presumed to generate expected returns. The regression intercept—or "alpha"—is the measure of the average monthly abnormal return. We estimate alphas in a model with the following five risk factors:

$$r_{pt} = \alpha_p + \beta_1 RM_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD + \beta_5 LMH + e_{pt}, \quad (43)$$

where r_{pt} is the excess return to an equal-weighted portfolio of issuers, RM is the excess return on the CRSP value-weighted market index. SMB and HML are the Fama and French (1993) size and book-to-market factors. UMD is a momentum factor inspired by Carhart (1997) and constructed as the returns difference between the one-third highest and the one-third lowest CRSP performers over the past 12 months. LMH is the Eckbo and Norli (2005) turnover factor, defined as a portfolio long in low-turnover stocks and short in high-turnover stocks.

We report estimates for three different portfolios: (1) the merging firms, (2) the non-merging matched firms, and (3) the zero-investment portfolio that is long in merged firms and short in matched firms. The zero-investment portfolio has the advantage that it controls for any omitted risk factor with identical factor betas across issuer and matched firm, effectively combining the matched-firm and asset pricing techniques. To illustrate, suppose the true set of risk factors is given by the vector F , and that only a subset F_1 of this vector is included in the regression model, with the complement vector F_2 omitted. Let "B" denote the merged firm and "M" the matched firm. The "merger-match" zero-investment portfolio regression is then

$$r_B - r_M = (\alpha_B - \alpha_M) + (\beta_{1B} - \beta_{1M})F_1 + \epsilon, \quad (44)$$

where $\epsilon = (\beta_{2B} - \beta_{2M})F_2 + u$, where u is a white noise error term. The definition of a "good" match is that β_B is close to β_M . Given a good match, the zero-investment portfolio will have both a small alpha and values of beta close to zero. Alternatively, if the matching technique fails to control for important risk factors, then the zero-investment portfolio will contain significant factor loadings.

Table 4 reports the alphas and factor loadings (betas) for our three portfolios and the five-factor model. Portfolio formation starts in 1980 and ends in 2003. The table shows estimates for both equal-weighting and value-weighting of the firms in the portfolios. Given the large portfolios, the R^2 s are high,

approximately 0.94. Notice also that the zero investment portfolios receive R^s of close to 0.20, with several significant factor loadings, indicating that the usual size and B/M matching procedure typically yields firms that have different expected returns than the event firms. This, in turn, means that the "abnormal" return reported earlier in Table 4 in part reflects differences in *expected* returns for merged and matched firms.

Table 4: **Alphas and factor loadings for five-year rolling portfolios of merged and non-merging matches**

The table shows alphas and factor loadings for five-year rolling portfolios of merged firms, non-merging matched firms, and long-short merged-matched firms, 1980–2006. The merged-matched portfolio is a zero-investment portfolio that is long in the merged firms and short in the non-merging matched firms. The portfolios are either equal-weighted ("EW") or value-weighted ("VW"). The non-merging matched firms are firms that did not merge in the previous five-year period and have similar total equity size and book-to-market ratio. The portfolios are formed starting in February 1980: a firm is added to the portfolio in the month following the month of the effective merger date and held for a minimum of five years until delisting. The merger sampling stopped in 12/2003, yielding a total of 15,298 successful mergers with data on size- and book-to-market matched firms. The abnormal return estimation ends in December 2006. Abnormal returns are estimated using the following asset pricing model:

$$r_{pt} = \alpha_p + \beta_1 RM_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 UMD + \beta_5 LMH + e_{pt}$$

where r_{pt} is the portfolio excess return, RM is the excess return on the CRSP value-weighted market index, SMB and HML are the Fama and French (1993) size and book-to-market factors, UMD is a momentum factor constructed as the returns difference between the one-third highest and the one-third lowest CRSP performers over the past 12 months, and LMH is the Eckbo and Norli (2005) turnover factor (a portfolio long in low-turnover stocks and short in high-turnover stocks). The coefficients are estimated using OLS. Standard errors are computed using the heteroscedasticity-consistent estimator of White (1980). The numbers in parentheses are p -values. R^2 is the adjusted R-squared. Table adjusted with permission from Betton, Eckbo, and Thorburn (2008).

Portfolio	α_p	RM	SMB	HML	UMD	LMH	R^2
EW-merger	0.08 (0.434)	1.05 (0.000)	0.62 (0.000)	0.26 (0.000)	-0.28 (0.000)	-0.13 (0.070)	0.943
EW-match	0.23 (0.003)	0.97 (0.000)	0.52 (0.000)	0.24 (0.000)	-0.19 (0.000)	-0.14 (0.019)	0.949
EW-zero	-0.15 (0.050)	0.09 (0.000)	0.11 (0.000)	0.02 (0.333)	-0.09 (0.000)	0.01 (0.785)	0.239
VW-merger	0.02 (0.838)	1.07 (0.000)	-0.08 (0.029)	-0.10 (0.016)	-0.05 (0.028)	-0.01 (0.828)	0.935
VW-match	0.11 (0.076)	1.00 (0.000)	-0.14 (0.000)	-0.06 (0.016)	-0.02 (0.266)	0.07 (0.100)	0.949
VW-zero	-0.09 (0.288)	0.06 (0.017)	0.06 (0.027)	-0.03 (0.386)	-0.03 (0.181)	-0.09 (0.071)	0.170

The key result in Table 4 is that the alphas for the portfolio of merged firms are small and statistically

insignificant for both equal- and value-weighted portfolios. Thus, we cannot reject the hypothesis of zero abnormal post-merger performance. Four of the five factor-mimicking portfolios have significant factor loadings, with the turnover-based factor producing a factor loading that is significant at the 10% level for equal-weighted portfolio returns.

Table 4 also shows that the empirical factor model misprices the equal-weighted portfolio of matched firms. The alpha of this portfolio is 0.23 with a p-value of 0.003. As a result, the portfolio of merged firms underperforms the matched portfolio (the alpha for the zero-investment portfolio is -0.15 with a p-value of 0.05). When equal-weighting returns, the factor model’s mispricing of the matched-firm portfolio is less significant, and now the alpha of the zero-investment portfolio is insignificantly different from zero.

In sum, when using the rolling portfolio technique, there is no evidence of abnormal stock returns following mergers. Moreover, our evidence that the matched firms have significantly different factor loading than the merged firms undermines the notion that the ”underperformance” reported in Table 3 represents truly negative abnormal stock returns.

9 Why is bidding with a target toehold so rare?

9.1 Motivation

One important decision that a potential buyer needs to make before approaching the target is whether to acquire an initial stake in the target in the financial market, hence referred to as a target ‘toehold’. Given the significant initial control premiums, the case for acquiring a toehold ownership position in the target firm prior to bid initiation is compelling: If the toehold bidder succeeds or if the toehold is sold to a rival bidder, the return on the toehold investment is close to the takeover premium itself. The expected return on the toehold investment increases the bidder’s valuation of the target and, therefore, the likelihood of winning the takeover auction.⁶¹ Empirically, Jennings and Mazzeo (1993), Betton and Eckbo (2000), Betton, Eckbo, and Thorburn (2009), and Betton, Eckbo, Thompson, and Thorburn (2014) all show that toehold bidding increases the likelihood of winning the target. Consistent with the entry deterrence effects of toeholds, there is also substantial evidence that toehold bidding is associated with lower offer

⁶¹For models discussing the role of toeholds in the context of free-riding target shareholders, see, e.g., Grossman and Hart (1980), Shleifer and Vishny (1986b), Hirshleifer and Titman (1990), Chowdry and Jegadeesh (1994), and Goldman and Qian (2005). For models involving toehold bidding in auctions, see, e.g., Burkart (1995), Singh (1998), Bulow, Huang, and Klemperer (1999), Ettinger (2009), Hotchkiss and Mooradian (2003), Dasgupta and Tsui (2004), Eckbo and Thorburn (2009), and the review in Dasgupta and Hansen (2007).

premiums in winning bids.

However, notwithstanding the strong case for the existence of bidder-specific toehold benefits, toehold bidding has declined since the 1980s to the point of being rare today. With a sample of 3,056 tender offers and 7,750 merger bids, 1980-2002, Betton, Eckbo, and Thorburn (2009) identify only 1,363 long- and short-term toeholds.⁶² The solid line in Figure 12 shows the time series of the average percentage of toehold bidders in their sample of tender offers., which declines sharply after a peak in the early 1980s. For merger bids, the toehold frequency also peaks in 1980 and again in 1986-1988, and then falls steadily towards 4% towards the end of the sample period. Averaged over the entire sample period, 13% of the 10,806 initial bidders have toeholds, of which only 3% are acquired within six months of the initial bid. In sum, bidders, by and large, reject the idea of acquiring toeholds. This conclusion is also confirmed at the extensive margin: Betton, Eckbo, and Thorburn (2009) report that the likelihood of a corporate shareholding in another company leading to a takeover bid for that company over the next three years is less than 4%.

However, the toehold puzzle identified by Betton and Eckbo (2000) does not stop there. As shown in Panel A of Figure 13, when bidders *do* have toeholds, the toeholds are large—averaging as much as 20%. Importantly, Betton, Eckbo, and Thorburn (2009) further show that bidders submitting unsolicited or hostile bids are four times more likely than friendly bidders to have toeholds (almost 50% of hostile bids have toeholds). Thus, a viable explanation of actual toehold strategies must produce a form of threshold bidding centered on either zero (for the most part) or a large toehold, primarily when the bid is perceived to be hostile by the target. We next review alternative theoretical propositions involving toehold bidding and end with a possible empirical resolution of the toehold puzzle.

9.2 Theoretical propositions

9.2.1 Auction-theoretic toehold benefits

Burkart (1995) and Bulow, Huang, and Klemperer (1999) show theoretically that toeholds can have important effects on bidding and auction outcomes. The key difference between Burkart (1995) and

⁶²A short-term toehold is a toehold acquired within six months of the bid. See Table VIII in Betton, Eckbo, Thompson, and Thorburn (2014) for a breakdown of short-term toeholds (partial acquisitions in SDC) into those purchased within two months of and one day of the initial bid. Toehold acquisitions close to the initial bid are limited by the common practice for bidders to sign a standstill agreement at the start of takeover negotiations. The length of these negotiations typically ranges from two to six months (Bruner, 2004; Boone and Mulherin, 2007). In light of this, long-term toeholds are highly relevant when deciphering actual toehold strategies.

Figure 12: **Annual percentage of toehold bidders**

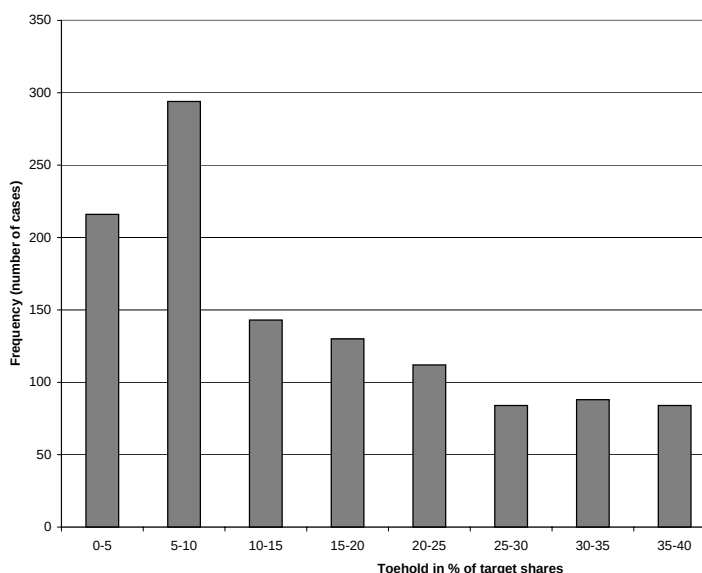
Percentage initial control bidders with a positive toehold in the total sample of 3,056 tender offers over the period 1973-2002 and in 7,750 merger bids over the period 1980-2002. Targets are US-domiciled and publicly traded. Figure is adapted with permission from Betton, Eckbo, and Thorburn (2009).



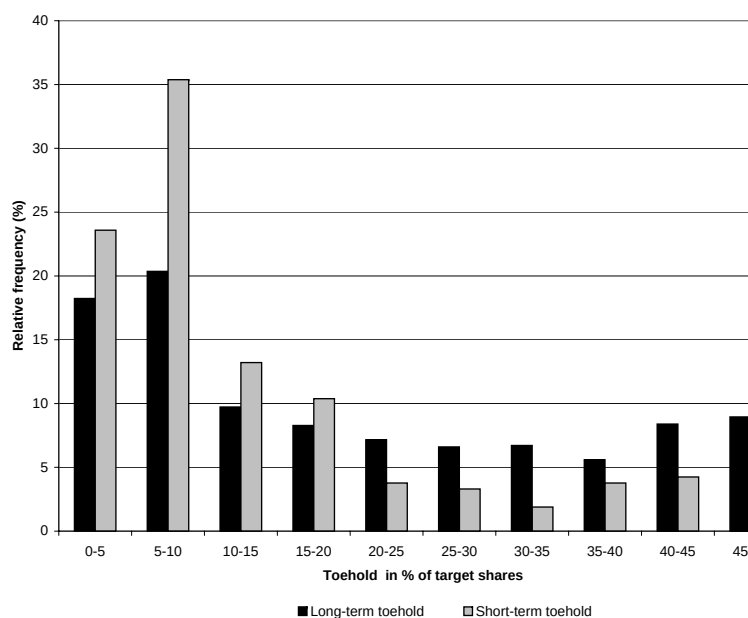
Figure 13: **Frequency distribution of the initial control bidder's toehold size when positive**

Panel A uses the total sample of 1,363 initial control bidders with positive toeholds for US public targets, 1972-2002 (with merger bids sampled from 1980-2002). A toehold with a size equal to the boundary between two intervals is included in the lower interval. Panel B is for the subsample of 970 initial control bidders whose toeholds could be classified as long-term and short-term. A long-term toehold is purchased more than six months prior to the announcement of the initial control bid. A short-term toehold is purchased within six months of the initial bid. Figure adapted with permission from Betton, Eckbo, and Thorburn (2009).

A: Frequency distribution of the total toehold size



B: Frequency distribution of long-term and short-term toehold size



Bulow, Huang, and Klemperer (1999) is that the former analyzes the case of independent private values (captured by $\alpha = 1$ in our simple model, see Eq. 1 above), while the latter analyzes the case of common values (captured by $\alpha = \frac{1}{2}$). Thus, the analysis of Burkart (1995) can be interpreted as more relevant for battles among strategic bidders, whereas the analysis of Bulow, Huang, and Klemperer (1999) can be more relevant for competition among financial bidders. The resulting implications have some similarities but also important differences.

Consider, first, a simplified version of Burkart's model. Two bidders with independent private values compete in an English auction for a target. The target has a unit mass of shares. However, different from the model of Section 2, assume that bidder 1 already owns a fraction $\theta \in (0, 1)$ of the target. In contrast, bidder 2 does not have any toehold. The winning bidder acquires all remaining shares, i.e., bidder 1 acquires $1 - \theta$ shares and bidder 2 acquires 1 share.

Since bidder 2 has a weakly dominant strategy to bid her value, her bid is the same as in the baseline model: $b_2(s_2) = s_2$. Consider now the incentives of bidder 1. If bidder 1 stays in the auction until price $b_1 \in [0, 1]$, her expected payoff is

$$\int_0^{b_1} (s_1 - (1 - \theta) s_2) ds_2 + \theta b_1 (1 - b_1). \quad (45)$$

The intuition for (45) is as follows. If the valuation of the rival bidder s_2 is below b_1 , bidder 1 wins the auction, obtains valuation s_1 , and pays the price at which the rival bidder exited (s_2) for the $1 - \theta$ remaining shares. This case is captured by the first term of Eq. (45). If the valuation of the rival bidder s_2 is above b_1 , which happens with probability $1 - b_1$, bidder 1 loses the auction, the rival bidder buys all shares at the price at which bidder 1 quits (b_1), so bidder 1 obtains the payoff of θb_1 . This case is captured by the second term of Eq. (45). The optimal exit price maximizes Eq. (45), yielding

$$b_1(s_1, \theta) = \frac{s_1 + \theta}{1 + \theta}. \quad (46)$$

Notice that the optimal bid Eq. (46) is increasing in the toehold θ :

$$\frac{\partial b_1(s_1, \theta)}{\partial \theta} = \frac{1 - s_1}{(1 + \theta)^2} > 0 \quad \forall s_1 \leq 1. \quad (47)$$

Consequently, a toehold increases the bidder's maximum willingness to pay above and beyond s_1 , con-

ventionally referred to as (rational) overbidding. The intuition is as follows. While a bidder without a toehold gets nothing from losing, a bidder with a toehold gets the price that the winning bidder pays for her toehold. By increasing the bid a little, a bidder with a toehold also increases the payoff that she gets in case of losing, since the rival bidder will pay a higher price. Consequently, a toehold leads to overbidding. To put it differently, a bidder with a toehold has two hats: on the one hand, she is a potential buyer of $1 - \theta$ shares, but on the other hand, she is a potential seller of θ shares. This seller's hat gives an incentive to bid more.

The equilibrium bid (46) has three other interesting properties. First, asymmetric toeholds lead to the possibility of a misallocation, which is when bidder 1 wins the auction even though bidder 2 has a higher valuation. Misallocation is a direct consequence of bidder 1's overbidding. Second, the degree of overbidding increases in the size of the toehold θ . Finally, if a toehold is infinitesimal, $b_1(s_1, \theta)$ approaches s_1 , i.e., the bid without the toehold. Thus, in a private-value setting, very small toeholds have very small effects, both on the extent of overbidding and on the extent of misallocation.

Bulow, Huang, and Klemperer (1999) analyze the model with common valuations. In this case, a toehold has another interesting effect: it exacerbates the winner's curse of bidders without a toehold (or, more generally, of bidders with lower toeholds). Recall that the winner's curse means that winning the auction conveys information that all other bidders bid less aggressively, which is a negative signal about the valuation of the auctioned asset when valuations have a common component. Since a toehold causes bidder 1 to bid more aggressively, winning an auction conveys negative information to bidder 2: it means that bidder 1 is pessimistic about the value of the target. Being rational, bidder 2 conditions her bidding strategy on this information and consequently bids less aggressively. Thus, not only does a toehold lead to more aggressive bidding by a bidder with a toehold, but it also causes less aggressive bidding of the rival bidder by scaring her off. Interestingly, Bulow, Huang, and Klemperer (1999) show that even very small toeholds can have profound effects in this environment.

To illustrate these insights, consider the same model in which bidder 1 has a toehold of θ shares, and bidder 2 has no toehold. Suppose now that bidders' valuations are common: the target is worth $\frac{1}{2}(s_1 + s_2)$ to either bidder, bidder 1 knows s_1 but not s_2 , and bidder 2 knows s_2 but not s_1 . Consider bidder 2 with signal s_2 . If she stays in the auction until price b_2 , her expected payoff will be

$$\int_0^{b_1^{-1}(b_2)} \left(\frac{1}{2}(s_1 + s_2) - b_1(s_1) \right) ds_1. \quad (48)$$

Intuitively, she wins if the bid of bidder 1, $b_1(s_1)$, is below b_2 , which means that the signal of bidder 1, s_1 , is below $b_1^{-1}(b_2)$. Expression (48) implies that bid b_2 must be such that bidder 2 is indifferent between winning and losing, conditional on what she infers about bidder 1's signal s_1 from the fact that she wins at this price. Therefore,

$$b_2(s_2) = \frac{1}{2} (b_1^{-1}(b_2(s_2)) + s_2). \quad (49)$$

Second, consider bidder 1 with signal s_1 . If she stays in the auction until price b_1 , her expected payoff will be:

$$\int_0^{b_2^{-1}(b_1)} \left(\frac{1}{2} (s_1 + s_2) - (1 - \theta) b_2(s_2) \right) ds_2 + (1 - b_2^{-1}(b_1)) \theta b_1. \quad (50)$$

The reasoning for Eq. (50) is similar to that for (45). Bidder 1 wins if bidder 2's bid is below b_1 , which is equivalent to bidder 2's signal being below $b_2^{-1}(b_1)$. In this case, the target is worth $\frac{1}{2}(s_1 + s_2)$, and bidder 1 pays $b_2(s_2)$ per share to acquire the remaining $1 - \theta$ shares of the target. In contrast, if bidder 2's bid is above b_1 , which happens with probability $1 - b_2^{-1}(b_1)$, bidder 2 acquires all shares for the price of b_1 , so bidder 1 gets θb_1 for her toehold. Differentiating Eq. (50) in b_1 , we get that bidder 1 prefers to stay in the auction whenever

$$\left(\frac{1}{2} (s_1 + b_2^{-1}(b_1)) - b_1 \right) + \theta (1 - b_2^{-1}(b_1)) b_2'(b_2^{-1}(b_1)) > 0. \quad (51)$$

By comparing (51) with (49), we see that if bidder 1 prefers to stay in the auction, then bidder 2 prefers to do it even more. For example, if each bidder s_i followed the strategy of staying in the auction until the price hits s_i , then the second term of (51) implies that bidder 1 would want to deviate and increase the price a little more to profit from selling the toehold at a higher price. Thus, winning the auction means to bidder 2 that bidder 1's signal must be the lowest possible, so (49) reduces to $b_2(s_2) = \frac{1}{2}s_2$. Winner's curse scares off bidder 2, persuading her to bid very conservatively. Thus, in a common-value setting, even a very small toehold gives a significant strategic advantage to bidder 1.

9.2.2 A toehold-induced bidding cost

A notion often heard among practitioners is that toehold bidding is "aggressive". Betton, Eckbo, and Thorburn (2009) (henceforth BET09) suggest that this negative view possibly reflects the fact that a bidder's toehold benefit is a transfer from target shareholders. This is understood most directly when

toehold bidding lowers competition from rival bidders with zero toeholds, as theory suggests. It is also possible that a toehold-induced increase in the probability of winning triggers resistance by entrenched target management. In other words, toehold bidding *per se* may trigger costly target resistance to a deal.

As illustrated in Figure 14, BET09 build a sequential (dynamic) bidding game in which a bidder's toehold cost arises endogenously. The idea is that, notwithstanding target management's security benefits from receiving a large takeover premium, some targets optimally choose to oppose a hostile takeover that threatens to eliminate their non-pecuniary private benefits of control. In the sequential bidding model, the toehold itself may trigger target resistance because it increases the likelihood of winning the auction. The level of target resistance to a bidder may range from low (refusing to open a data room, refusing a termination fee, etc.) to the near-prohibitive cost of triggering a poison pill. BET09 assumes the former: that the target simply refuses to enter into a termination agreement with the initial bidder.⁶³

The takeover game has three players and two stages. The pregame target takeover value is normalized to $p = 0$. The players are the target, the initial bidder (B_1), and a rival bidder (B_2). The target management has private benefits of control $\beta \in [0, 1]$, which will be removed in a takeover by B_1 . Bidders have private valuations $v \in [0, 1]$ of the target, and B_1 also has a toehold of $\theta \in [0, 0.5)$ acquired at the pregame target share price of zero. If the target agrees to merge, B_1 receives a termination agreement promising a breakup fee of $t \in [0, v]$ that is payable if the target withdraws. Under the termination agreement, target withdrawal takes place if B_2 wins or if *all* bids fail, which in this model happens with probability π .

In the first stage of the game, B_1 offers to negotiate a merger, and the target accepts or rejects the merger proposal. The target decision is always followed by an auction where B_1 competes with B_2 (second stage).⁶⁴ Moreover, if the target rejects B_1 's initial merger proposal, B_1 launches a hostile tender offer (auction). B_2 's role is as follows: If the auction follows merger negotiations, B_2 will remove β . However, when B_1 launches a hostile bid, target management brings in B_2 as a white knight and gets to keep its

⁶³As discussed in Section 3.4 above, a termination fee—a standard contractual feature in merger agreements—protects the initial bidder from losses should a rival bidder win the target. The termination agreement provides the bidder with compensation in the form of a fixed fee (breakup fee) or an option to purchase target shares at a discount (lock-up option) should the target withdraw from the agreement. Essentially, the termination fee reimburses the initial bidder for the cost of having identified the target as an investment opportunity and, by initiating the bidding process, having made that information freely available to potential rivals.

⁶⁴As discussed in Section 3.1 above, the inevitability of the auction after a merger agreement has been signed is the result of the fiduciary-out requirement under US corporate law: while the negotiated merger agreement awaits a final shareholder vote, the target board must consider any competing bids. Final approval requires a target shareholder vote, a bidder shareholder vote if the bidder issues new shares of 20% or more to pay for the target, and antitrust and regulatory approval. This process may take several months, and it averages five months for the successful initial bidders in BET09.

Figure 14: **The BET09 takeover game: private merger bid followed by public auction**

The pregame target share price is normalized to $p = 0$. The payoff to target management is $\beta + p$, where β is a private benefit of control and p is the offer price. The initial bidder B_1 's private valuation of the target is v , and B_1 has a toehold $\theta \in [0, 0.5)$. B_1 initiates the game with a merger offer which stipulates removal of β and a termination fee t payable if B_1 does not win. The target's decision is always followed by a sealed-bid second-price public auction with a rival bidder B_2 , where B_1 bids p^* and B_2 bids p_2 . If the target accepts the merger proposal, the winning bidder removes β . If the target rejects B_1 's initial merger proposal, however, B_1 initiates a hostile tender offer, and B_2 acts as a "white knight" that allows the target management to retain β . Moreover, in the hostile auction, the target imposes a bidder-specific resistance cost r on B_1 . If all bids fail, which happens with probability π , the target stock price falls back to zero. Figure adapted with permission from Betton, Eckbo, and Thorburn (2009).

STAGE 1: Merger bid		STAGE 2: Public auction			
Target's decision	Target is acquired ($1-\pi$), or all bids fail (π)	Who wins the auction?	Retention of private benefits β ?	Target management total utility	Initial bidder payoff $E[\Pi(p)]$
Accept merger bid	$1-\pi$	Initial bidder wins:	no (no resistance)	p_2	$v-(1-\theta)p_2$
		Rival bidder wins:	no (breakup)	p^*	$\theta p^* + t$
	π	No bidder wins	yes	$\beta - t$	$t(1-\theta)$
Reject merger bid	$1-\pi$	Initial bidder wins:	no (target resists)	p_2	$v-r-(1-\theta)p_2$
		Rival bidder wins:	yes (white knight)	$\beta + p^*$	θp^*
	π	No bidder wins	yes	β	0

private benefits of control.

For tractability, BET09 assume that bidders are risk-neutral and have unaffiliated private valuations in an open ascending second-price (English) auction. Let p^* and p_2 denote the optimal auction bids of B_1 and B_2 in stage 2 of the game, respectively. The auction has three outcomes: B_1 wins, B_2 wins, or no-bidder wins, where the latter occurs with probability π_f . If the auction follows merger negotiations (upper branch in Figure 14), the payoff to B_1 is as follows. If B_1 wins, it pays p_2 for the remaining $1 - \theta$ target shares, for a net payoff of $v - (1 - \theta)p_2$.

If B_2 wins, it pays p^* for the target shares, and the target pays t to B_1 , for a net payoff to B_1 of $\theta p^* + t$. If neither B_1 nor B_2 wins, the target pays t to B_1 , the target share price falls to $-t$, and B_1 's net payoff is $t(1 - \theta)$. If the auction follows target rejection of merger negotiations (lower branch in Figure 14), B_1 makes a hostile tender offer without a termination agreement, and the target imposes a bidder-specific resistance cost $r \in [0, v]$ on B_1 . The value of r , which is an important parameter in this model, captures costs ranging from a refusal to provide B_1 with information required to perform due diligence of the target, to the cost of the much more serious poison-pill defense. The resistance cost reduces B_1 's valuation from v to $v - r \geq 0$.

To derive the optimal bids in stage 2, BET09 start with B_2 : If the target rejects B_1 's initial invitation to negotiate a merger, B_1 does not receive a termination agreement and, therefore, B_2 's optimal bid is its private valuation ($p_2 = v_2$). On the other hand, if the target accepts B_1 's initial merger invitation, B_1 receives a termination agreement, which B_2 must pay for if it wins. In this case, B_1 's claim of t on the target reduces B_2 's valuation to $v_2 - t$, which is then B_2 's optimal bid.

Turning to B_1 's optimal bid, BET09 denote the distribution and density functions over B_1 's private valuation v as $G(v)$ and $g(v)$, respectively. If the target accepts B_1 's initial merger invitation, B_1 receives a termination agreement. Hence, B_1 's expected profit from bidding p given that B_2 's optimal bid is $v_2 - t$ is:

$$\begin{aligned} E[\Pi(p)] &= \{(v)G(p+t) - (1-\alpha) \int_0^{p+t} (v_2 - t)g(v_2)dv_2 + (t + \theta p)[1 - G(p+t)]\}(1 - \pi_f) + t(1 - \theta)\pi_f \\ &= [v(p+t) - \frac{1}{2}(1 - \theta)p^2 + (t + \theta p)(1 - (p+t))](1 - \pi_f) + t(1 - \theta)\pi_f, \end{aligned} \quad (52)$$

where the second equation invokes the uniform distribution, $G(v) \sim U[0, 1]$.⁶⁵ The right-hand side of the

⁶⁵To ensure uniqueness, $G(v)$ must be twice continuously differentiable and satisfy the monotonicity condition $\partial(1 -$

first equation is the sum of four components. The first three (inside the curly bracket) are, respectively, B_1 's expected private value, the expected payment for the target, and the expected value from selling the toehold θ to B_2 and receiving t when B_2 wins the auction. The fourth term is the expected payoff when no bidder wins.

Taking the first-order condition of the second equation in Eq. (52) yields the following optimal bid for B_1 :

$$p^* = \frac{v + \theta}{1 + \theta} - t. \quad (53)$$

Interestingly, as Eq. (53) shows, the termination fee t modifies the optimal bid with a toehold in Burkart (1995): While the toehold induces overbidding (relative to v), the breakup fee induces underbidding just as it does for B_2 . If B_1 has a zero toehold ($\theta = 0$) but a termination agreement ($t > 0$), B_1 walks away from the target when rival bids exceed $p_2 - t$ since walking away means receiving t while continued bidding implies an expected profit of less than t . Since B_2 's bid is also reduced by t (B_2 finances the termination fee), t is effectively paid by target shareholders.⁶⁶ Notice also that the optimal bids do not include the probability of no-bidder wins π because there are no price-dependent payoffs to any of the bidders in the no-bidder wins outcome.

Next, suppose the target rejects negotiations, so there is no termination agreement ($t = 0$), and the target imposes $r > 0$. Since B_2 now optimally bids v_2 , the expected profit to B_1 is

$$\begin{aligned} E[\Pi(p)] &= \{(v - r)G(p) - (1 - \theta) \int_0^p v_2 g(v_2) dv_2 + \theta p[1 - G(p)]\}(1 - \pi) \\ &= [(v - r)p - \frac{1}{2}(1 - \theta)p^2 + \theta p(1 - p)](1 - \pi), \end{aligned} \quad (54)$$

which leads to an optimal bid of:

$$p^* = \frac{v - r + \theta}{1 + \theta}. \quad (55)$$

As illustrated in figure 15, given the above optimal bids, the target responds in stage 1 to B_1 's invitation to merge by trading off the potential loss of private benefits (β) with the potential gains from the security benefits (target management's equity ownership fraction τ). In region I, β is so large relative to τ that the target always rejects B_1 's invitation to merge. In Region III, the security benefits dominate

$G(v))/\partial g(v) \geq 0$. With the uniform distribution, this condition is satisfied.

⁶⁶Since including a termination fee t does not affect B_2 's incentive to bid in the auction, it does not act as a bid deterrent.

the private benefits of control, so target management will always accept B_1 's invitation to merge. In Region II, however, the optimal target response depends on whether B_1 has a positive toehold or not. If B_1 has a zero toehold ($\theta = 0$), the security benefits dominate, and target management will accept merger negotiations. In contrast, if B_1 has a positive toehold ($\theta > 0$), the control benefits dominate, and management will resist.

Figure 16 shows B_1 's optimal toehold strategy—whether or not to purchase a toehold θ —given target management's optimal accept/reject response. As shown in Panel B, in Regions I and III, it is optimal for the bidder to always acquire a toehold $\theta > 0$. This is because the target's response is independent of B_1 's toehold, while B_1 gains the usual benefit from toehold bidding. In Region II, however, the target will resist only if the bidder has a toehold ($\theta > 0$). BET09 derives a so-called toehold threshold, which makes the bidder indifferent between (i) bidding without a toehold and receiving a termination agreement (since the target does not resist) and (ii) acquiring a certain minimum-sized toehold to compensate for the loss of a termination agreement (since the target resists). Hence, in Region II, the bidder will either approach with a zero toehold or acquire a toehold that exceeds the threshold $\hat{\theta}$.

9.3 Empirical evidence

9.3.1 Does toehold-threshold bidding exist?

BET09 take the above toehold threshold theory to the data using 10,806 control contests. To estimate the putative toehold threshold, they use the initial offer premium as a proxy for bidder private valuations ($v \sim U[0, 1]$), the average termination fee for control bids in the same industry and year for t , and an estimate of the probability π for the outcome that no-bidder-wins the target.

The distribution of toehold-threshold estimates is shown in Panel B of Figure 17. Interestingly, the toehold threshold estimate is as high as nine percent for the average initial bidder. Moreover, BET09 show that the size of the toehold threshold is a statistically significant negative determinant of the likelihood that the initial bidder has a positive toehold. This supports the hypothesis that bidders are concerned with a possible decision by target management to resist the offer based on a positive toehold when inviting the target to negotiate a merger.

Note also that, much like the distribution of the toehold threshold in Figure 17, the distribution of actual toeholds shown in Panel A of Figure 13 is also bimodal, centering on large toeholds: on average 15%

Figure 15: **The target's optimal response**

The figure shows how the target's optimal response (accept or reject) to Bidder 1 (B_1)'s invitation to merge varies with the relative size of management's private benefits β and the security benefits from its equity ownership fraction τ . In Region II, the optimal response depends on whether B_1 has a positive or zero toehold θ .

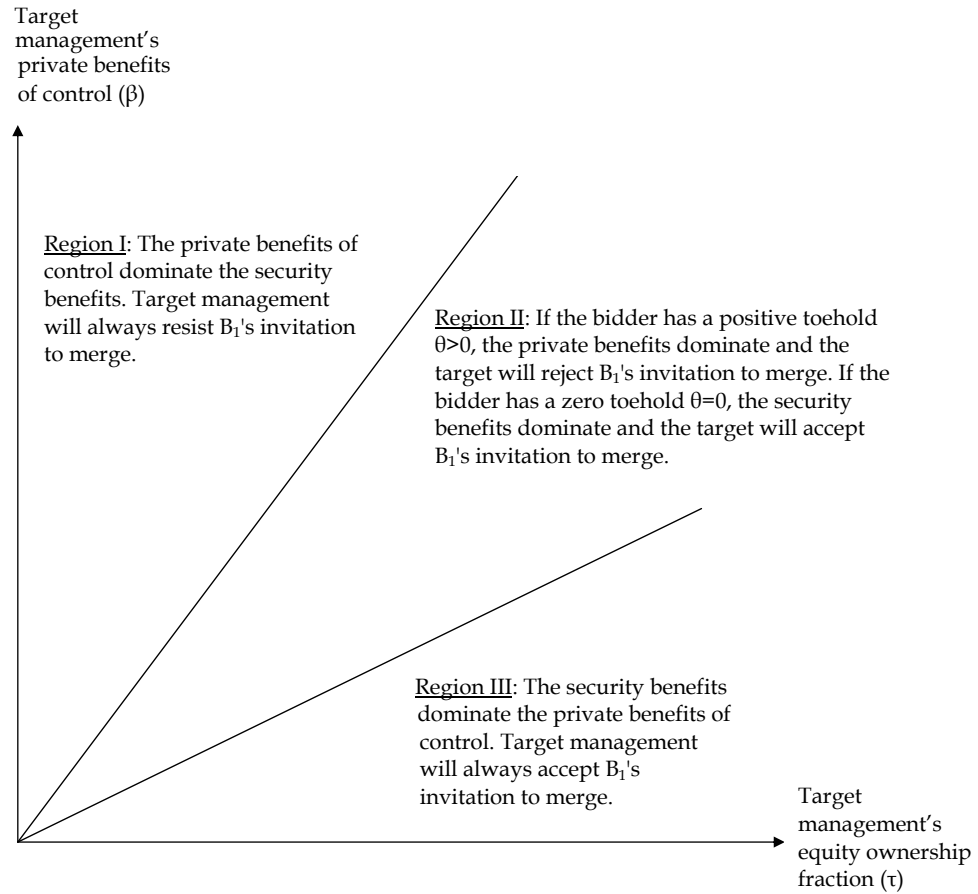
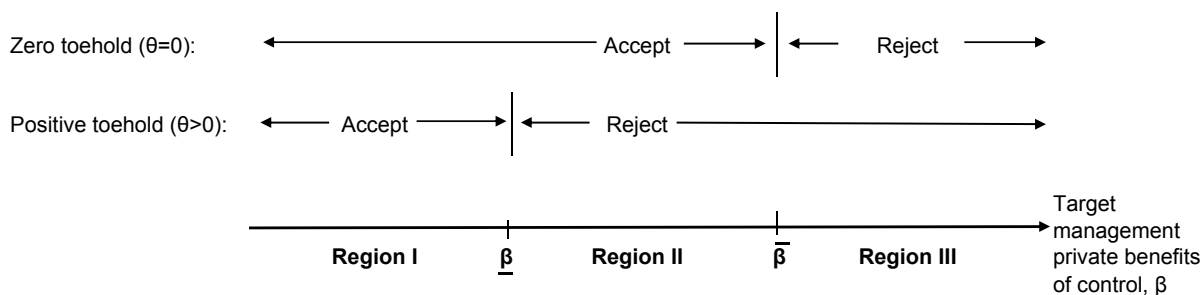


Figure 16: **Bidder 1's optimal toehold decision given the target's optimal response**

Bidder 1 (B_1)'s optimal toehold decision given the target's optimal accept/reject decision in Stage 1 of the takeover game. Panel A shows target management's optimal response as a function of the relative size of its control benefits and the bidder's toehold. Panel B shows the bidder's optimal toehold strategy, given the target's optimal response in Panel A. Figure adapted with permission from Betton, Eckbo, and Thorburn (2009)

A. Target management's optimal response conditional on the bidder's toehold θ



B. Bidder's optimal toehold strategy θ given the target's optimal response

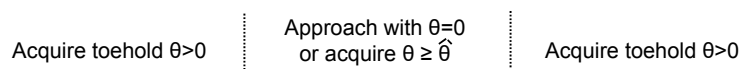
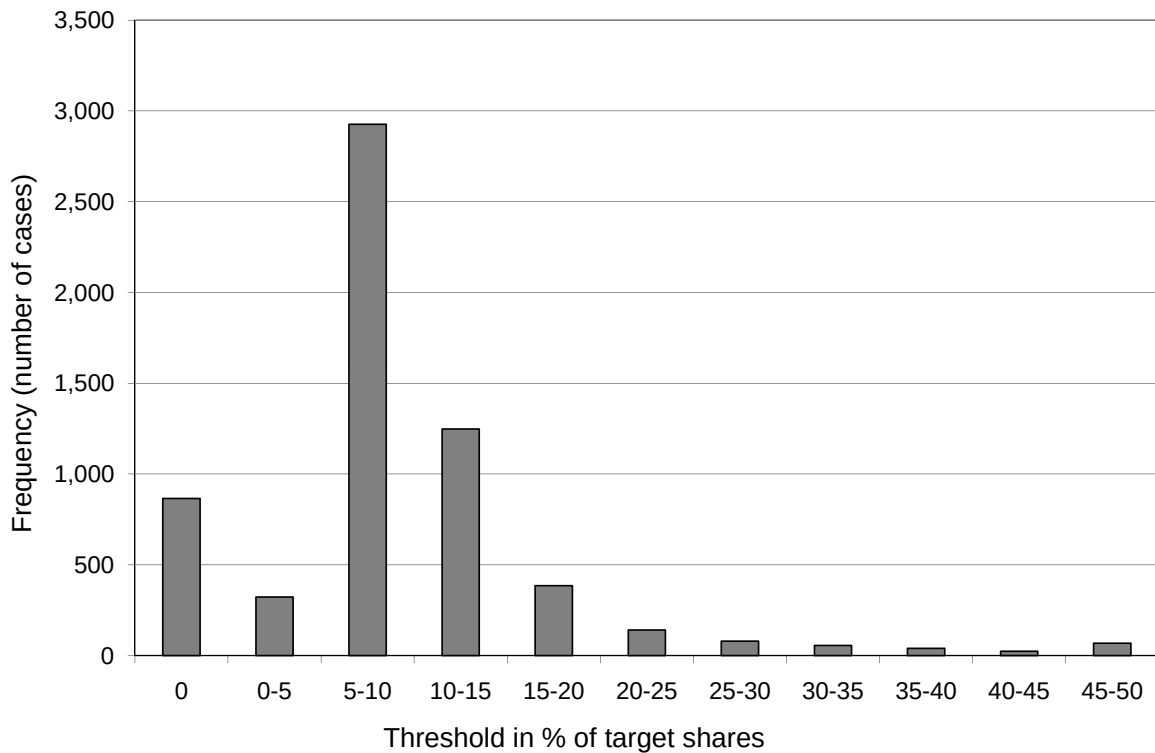


Figure 17: **Frequency distribution of the theoretical toehold-threshold size**

The theoretical toehold threshold is estimated as a sequential auction structure in which the target resists a toehold bidder who threatens to remove the target management's private benefits of control by refusing a termination fee arrangement. The theoretical toehold threshold is the minimum toehold size where the bidder is indifferent between purchasing a toehold and, as a result, foregoing the termination fee. The threshold, which is estimated for each of the 10,806 control contests in the sample, uses the initial offer premium as a proxy for bidder private valuations, the average termination fee for control bids in the same industry and year, and an estimate of the probability that no bidder wins the target. Figure adapted with permission from Betton, Eckbo, and Thorburn (2009).



when positive, and most frequent in hostile bids. In other words, the BET09 model delivers predictions that are consistent with the fact that toeholds are more frequent and larger in hostile than in friendly bids. The toehold threshold model of BET09 is also consistent with the gradual decline in the frequency of toehold bidding shown above in Figure 12—as strong takeover defenses such as poison pills have also increasingly deterred hostile bids.

Finally, since asymmetric toeholds between potential rival bidders may give the bidder with the largest toehold a competitive advantage in the auction, the target may consider leveling the playing field by inducing the zero-toehold bidder to acquire a toehold (Bulow, Huang, and Klemperer, 1999). As discussed in Section 6 above, yet another way to level the playing field is to provide subsidized financing to the relatively low-valuation bidder (Betton and Eckbo, 2000; Eckbo and Thorburn, 2009; Povel and Singh, 2010).

9.3.2 Do creditor toeholds cause overbidding?

Since the bidder’s private valuation is unobservable, toehold-induced overbidding is also not an observable quantity. However, Eckbo and Thorburn (2009) (henceforth ET09) develop an indirect test of overbidding using what they label creditor toeholds. Their unique setting is bankruptcy auctions in Sweden, where firms filing for bankruptcy are automatically turned over to a bankruptcy trustee who organizes an open, first-price, and cash-only auction of the firm. In this auction, the highest bid determines whether the firm will be continued as a going concern or liquidated piecemeal.⁶⁷ At the start of the auction, the trustee publishes a list of the second-hand values of the firm’s major assets (properties, plants, equipment, etc.)—as assessed by industry experts as the piecemeal liquidation value of the auctioned firm.

As ET09 point out, when the bankrupt firm’s main creditor is a single bank (which is always the case in their sample), and if the creditor’s debt is impaired at filing (which is also always the case), the bankruptcy filing effectively creates an instant creditor toehold of $\theta = 1$. This follows because the bank, being the sole secured creditor with an impaired debt claim with a face value of f , is now effectively the seller of the auctioned firm. As shown theoretically by Hotchkiss and Mooradian (2003) as well (in the context of Chapter 11 sales), a creditor toehold can induce overbidding in much the same manner as a bidder toehold outside of bankruptcy.

⁶⁷Thorburn (2000) shows that these auctions are quick—lasting an average of two months only—and relatively cost-efficient.

ET09 model the bank as a monopolist seller who sets a reserve price in a bankruptcy auction with private bidder valuations v that are distributed uniformly ($v_i \in U[0, 1]$ ($i = 1, 2$)). While Swedish bank regulations prevent the bank from bidding directly (to support a reserve price), there are no regulatory restrictions on the bank's ability to finance a bidder, which ET09 find is actually the case.

In their model, two bidders (B_1, B_2) bid for the bankrupt target as a going concern. Prior to the start of bidding, the bank approaches a randomly selected bidder (B_1) and offers to finance the acquisition should B_1 win. While B_1 's optimal bid equals v_1 without a coalition, the quid pro quo is that B_1 agrees to an optimal bidding strategy from the joint bank- B_1 coalition's point of view. Assuming for simplicity a piecemeal liquidation value of $l = 0$, ET09 prove that the coalition's optimal bid strategy, b_c^* , is as follows:

$$b_c^* = \begin{cases} v_1 + h(b_c) & \text{if } v_1 \leq f - h(b_c) & (\text{unconstrained overbidding}) \\ f & \text{if } f - h(b_c) < v_1 < f & (\text{constrained overbidding}) \\ v_1 & \text{if } v_1 \geq f, & (\text{no overbidding}), \end{cases} \quad (56)$$

where $h(b_c)$ is the inverse of the hazard function at b_c that causes overbidding (as in Eq. (46) above with a toehold equal to one).⁶⁸

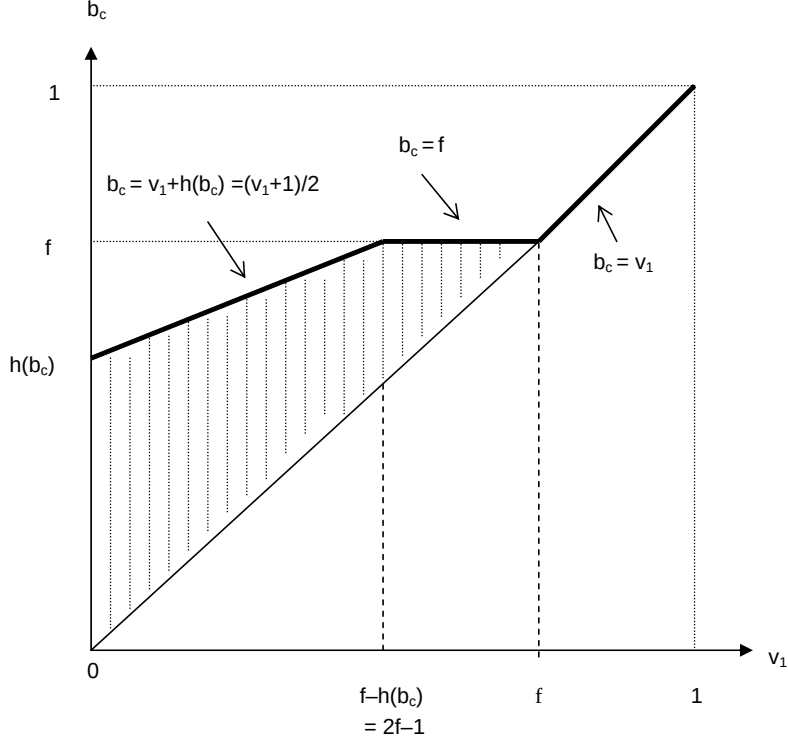
This optimal bid strategy is illustrated in Figure 18 as a function of B_1 's private valuation v_1 (the horizontal axis). The shaded area gives the amount of overbidding, given the face value f , for different values of v_1 . The first segment in the figure is the unconstrained overbidding price. Constrained overbidding begins when v_1 is such that the unconstrained bid price equals the face value f . The third segment starts when $v_1 > f$. Here, the bank's debt is fully paid off without overbidding, so that $b_c^* = v_1$. In sum, the coalition optimally overbids *only* if the bank's debt claim is impaired at the outset of the auction, as further overbidding just benefits junior creditors.

Since the creditor toehold is equal to one across all banks in this setting, it is the cross-sectional variation in the constraining effect of the face value f that makes this theory testable. To develop the overbidding test, ET09 use the bankrupt firm's ex-ante piecemeal liquidation value l , which is available to all bidders at the start of the auction and, therefore, effectively plays the role of a price floor for bidders attempting to purchase the firm as a going concern. The testable prediction is that larger values of l

⁶⁸Overbidding forces a wealth transfer from B_2 to B_1 's bank-bidder coalition whenever B_2 wins the auction, thus raising expected auction revenue and the bank's expected debt recovery rate. ET09 also proves that this bidding strategy is incentive compatible for B_1 should the overbidding cause B_1 to win when $v_1 < v_2$. For example, in this case, the bank may compensate B_1 for the cost of overbidding by granting a lower interest on the loan.

Figure 18: **The bank-bidder coalition's optimal bid $b_c(v_1)$.**

The figure is drawn assuming bidder valuations are distributed uniformly, $v_i \sim U[0, 1]$, and that the piecemeal liquidation value l is zero. The coalition-bidder's private valuation is v_1 , f is the face value of the bank's debt, and $h(b_c)$ is the inverse hazard rate at b_c . The horizontal axis plots v_1 , and the bold-faced line shows the coalition bids b_c . Each bold-faced segment corresponds to the optimal bids in Eq. (56) in the text. When $v_1 \leq 2f - 1$, the coalition fully overbids: $b_c = (v_1 + 1)/2$. When $f > v_1 > 2f - 1$, the coalition partially overbids: $b_c = f$. When $v_1 \geq f$, the coalition does not overbid and $b_c = v_1$. The shaded area is the amount of overbidding, given f , for alternative values of v_1 . Figure adapted with permission from Eckbo and Thorburn (2009).



relative to f lower the coalition's overbidding incentive. That is, as l lowers the constrained overbidding price from f to $f - l$, it also lowers the expected amount of overbidding.

To test this cross-sectional prediction, ET09 scale f with l and regress the winning auction premiums on the bank's debt recovery rate r if the firm were to be liquidated piecemeal, where $r \equiv \min[l/f, 1] \in [0, 1]$. Since r captures the degree of ex-ante bank-debt impairment (at the beginning of the auction), the bank's incentive to form a coalition and overbid is increasing in r . Therefore, with overbidding, observed auction premiums will decrease in r , a cross-sectional prediction that ET09 supports in the sample of bankrupt firms that are purchased as going concerns in the auction. Also important, the same test rejects overbidding when the theory says there should be none, such as for auctions where the bank's debt is unimpaired ex-ante ($l \geq f$) or when the outcome of the auction is piecemeal liquidation of the firm.

The empirical analysis in ET09 is only a first step towards testing for the existence of overbidding based on auction prices. Because it is not possible to directly verify the existence of the hypothesized bank-bidder coalitions, one also cannot rule out the possibility that the auction-premium evidence in ET09 is the result of other forms of bidding incentives. They do, however, formulate but rule out *one* such alternative: that entrenched bank managers attempt to hide non-performing loans from their superiors by colluding with the acquirer to simply roll over the debt.

Finally, overbidding may (but need not) result in allocative inefficiency. In this setting, the inefficiency occurs when the bank-bidder coalition wins against a higher-valuation bidder. To examine this possibility, ET09 estimate the post-bankruptcy operating performance of firms sold as a going concern. Consistent with efficient auction outcomes, postbankruptcy operating performance is independent of overbidding incentives and at par with that of the bankrupt firms' industry rivals.

10 Do bidders pay for targets with overpriced shares?

10.1 Motivation

The dot.com bubble burst two months after the 2000 AOL and Time Warner merger, causing a reduction of more than \$100 billion in the market value of the new firm. This dramatic price decline has made the AOL Time Warner Inc. merger a poster child for the notion that opportunistic bidder firms can succeed in selling overpriced shares to target shareholders:

“[The AOL TimeWarner deal] was done on terms that were insane ... AOL stock was ridiculously overvalued ... [AOL’s CEO Steve Case] chose the moment, almost to the day, when his stock was most valuable and then used it as currency.”

—Geoffrey Colvin, *Fortune*, February 3, 2003.

“[T]he central feature of this acquisition is not technological synergies, but rather the attempt by the management of the overvalued AOL to buy the hard assets of Time Warner to avoid even worse returns in the long run.”

—Shleifer and Vishny (2003), p.295.

With bidder opportunism, the larger concern is that the most overvalued, not the most efficient, bidder could win the target, potentially distorting the disciplinary role of the takeover market. The empirical relevance of bidder opportunism in merger and acquisition activity is therefore central to the debate over the efficiency of the market for corporate control.

In Section 6.2 above, we discussed how bidders rationally choose the payment method (all-cash, all-stock, or mixed cash-stock) under conditions of information asymmetries. Those theories do not address bidder opportunism, as the resulting terms of trade are always fair to both parties to the deal. Below, we introduce theories in which the outcome of the deal is that some targets in stock swaps receive overvalued bidder shares. We then turn to the empirical evidence, where the bidder opportunism hypothesis is tested against rational payment design.

10.2 Related theories of the payment method choice

Another motive for the payment method choice is market misvaluation. The idea is that the market may undervalue or overvalue shares of the acquirer, and consequently, the value of the acquirer’s stock bid may be affected by this misvaluation. This idea is explored in Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004). Intuitively, if the stock market is overvalued, the acquirer will be tempted to use stock as the payment method to capitalize on this overvaluation. Why does the target accept the stock bid, given that she knows about the acquirer’s incentives? In Shleifer and Vishny (2003), it happens because managers of the target have short horizons, while in Rhodes-Kropf and Viswanathan (2004), the bidder is unable to distinguish firm-specific misvaluation from sector-wide misvaluation, which affects both the acquirer and the target.

To illustrate, consider the following simplified version of Shleifer and Vishny (2003). Take the identities of the bidder and the target as given (they can be endogenized) and assume that the bidder and the target

have a unit amount of capital each (in the model, they are parameters). The bidder and the target have stand-alone market valuations v_B and v_T . Assume that $v_B > v_T$.⁶⁹ If the firms merge, the short-run market valuation will be $v_B + v_T + s$, where s is the perceived synergy of the combination. Assume that in the long run, each firm is worth q , and the combined entity is worth $2q$. Thus, the merger is a zero-NPV transaction, although the market investors perceive it as positive-NPV whenever $s > 0$. Also, assume that the acquirer must pay the price p to acquire the target. Parameter p can be interpreted as a measure of the relative bargaining power between the acquirer and the target.

If the merger occurs, the immediate effect on the combined market value of the two firms is s , the immediate effect on the short-run value of the target is $p - v_T$, and the immediate effect on the short-run value of the acquirer is $v_T + s - p$. The effect of a cash transaction on the long-run value of the acquirer is $q - p$. Thus, if the companies care about short-run market valuations, takeover activity will be affected by them, and the perception of synergies s .

Consider a cash transaction. In this case, the bidder pays p in cash to the shareholders of the target. The short-run effects on the value of the target and the acquirer are $p - v_T$ and $v_T + s - p$, respectively, and there are no long-term profitability gains from the acquisition. In contrast, consider a stock transaction. In this case, the bidder needs to offer a fraction x of the combined entity, whose market value is equal to p : $x = \frac{p}{v_B + v_T + s}$. In the long run, the value of this stake is $\frac{2pq}{v_B + v_T + s}$. Thus, the bidder's change in the long-run value from the stock transaction is $q \left(1 - \frac{2p}{v_B + v_T + s}\right)$, and the target's change is the opposite.

Now, consider the acquirer's decision whether to make a transaction and which method of payment to choose under the assumption that the acquirer maximizes its long-run value and the shareholders of the target are dogmatic and learn nothing from the acquirer's choice. A stock transaction occurs if and only if it dominates not acquiring the target ($1 > \frac{2p}{v_B + v_T + s}$) and it is cheaper for the bidder than the cash transaction ($\frac{2pq}{v_B + v_T + s} < p$). Thus, a stock transaction occurs if and only if

$$v_B + v_T + s > 2 \max \{p, q\}, \quad (57)$$

where $p \in [v_T, v_T + s]$. Thus, acquisitions for stock are more likely to occur when valuations are high, particularly when the bidder is overvalued relative to the target (high v_B relative to v_T and p). Similarly,

⁶⁹Shleifer and Vishny (2003) show that it is weakly optimal for the relatively more overvalued firm to acquire the relatively less overvalued firm rather than the other way around. It is strictly optimal in a stock transaction and does not matter in a cash transaction. Thus, this assumption is without loss of generality in the following sense.

a cash transaction occurs if and only if it dominates not acquiring the target ($p < q$) and it is cheaper for the bidder than the stock transaction ($p < \frac{2pq}{v_B + v_T + s}$). Thus, a cash transaction occurs if and only if

$$q > \max \left\{ p, \frac{v_B + v_T + s}{2} \right\}, \quad (58)$$

which implies that acquisitions for cash are more likely when valuations are low, particularly when targets are undervalued relative to fundamentals (low v_T and p). The paper also implies differential return dynamics: Long-run returns to bidders are negative in stock acquisitions but positive in cash acquisitions.

This theory relies on the assumption that the target is willing to accept the stock offer from the acquirer with market value p , even though it knows that the acquirer's stock is overvalued by the market. In principle, it can be justified by the short horizons of the managers of the target. Rhodes-Kropf and Viswanathan (2004) build a related theory of merger waves that does not make this assumption. They show that market misvaluation can generate the result that periods of high valuations are correlated with waves of stock mergers, even if bidders and targets are fully rational and maximize the long-run values of their firms.

In their model, the market valuation of each firm can differ from the fundamental value due to the firm-specific component and due to the market-wide component. The former reflects excessive optimism or pessimism of investors in the market about the specific firm, while the latter reflects excessive optimism or pessimism about the whole sector. While each firm knows if it is over-valued or under-valued by the market, it is unable to distinguish the market-wide component from the firm-specific component of misvaluation. When market (or sector) misvaluation is high, the target is willing to accept the acquirer's stock bid because the target puts some probability on the acquirer's high bid reflecting high synergies rather than the acquirer's overvaluation. Thus, periods of market or sector overvaluation are associated with stock merger waves. Unlike stock bids, cash bids are not affected by misvaluation. As a consequence, the acquirer uses cash as a method of payment when its stock is not overvalued.

Overall, the key implication of Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) is that market (or sector) misvaluation is an important driver of the means of payment in mergers and acquisitions. These theories also share the prediction of models based on information frictions, discussed earlier in Section 6.2 above, that stock mergers underperform cash mergers. However, here, this result

is driven not by stock deals being inherently worse than cash deals but because they are more likely to happen in overvalued markets and sectors. As overvaluation corrects over time, stock deals may do poorly ex-post. We turn to tests of these predictions next.

10.3 Are stock-financed deals opportunistic? Empirical tests

Much of the empirical literature on bidder opportunism makes inferences based on the cross-sectional variation in bidder M/B . The basic idea is that a high M/B increases the chance that the market is overpricing the bidder shares. Empirically, at the intensive margin, the likelihood that the deal payment includes bidder stocks is positively and significantly correlated with M/B at year-end prior to the year of the deal announcement. One interpretation of this evidence is that high-growth (high M/B) acquirers tend to be cash-constrained beyond what is explicitly captured by the control factors included in the analysis (Harford, 2005). Another interpretation is that M/B is positively correlated with unobservable market pricing errors and that opportunistic bidders are successful in exploiting this mispricing despite the price discovery process afforded by merger negotiations.

Several papers rely on the behavioral interpretation of the positive correlation between stock payment and M/B . Some examples: “short-run misvaluation...rather than neoclassical motivations [are] responsible for merger waves” (Rhodes-Kropf, Robinson, and Viswanathan, 2005); “inefficient mispricing of the stocks of targets and bidders influences their takeover-related decisions” (Dong, Hirshleifer, Richardson, and Teoh, 2006); “firm managers are able to identify and exploit overvaluation” (Khan, Kogan, and Serafeim, 2012); and “overvalued firms self-select to become stock acquirers, while undervalued firms engage in cash acquisitions” (Ben-David, Drake, and Roulstone, 2015).

However, when judging the potential for the bidder to pay with overpriced stock, it is important to keep in mind that non-disclosure and non-compete agreements backed up by state law protection of trade secrets all pave the way for a mutually beneficial exchange of proprietary information during merger negotiations. If successful, this process can unravel much of the initial information asymmetry between the two parties, including that reflected in relative market value and M/B at the start of the negotiations. Fu, Lin, and Officer (2013) show that high ratios of the bidder to target M/B prior to the price discovery process typically do not translate into favorable deal terms for acquirers. Instead, bidders with greater M/B relative to the target ex-ante tend to end up paying higher takeover premiums (less favorable exchange ratios) than what is implied by an extrapolation of the pre-bargaining M/B values.

It is as if targets are able to reverse-engineer the initial market mispricing of the bidder shares, if any.

It is also important to keep in mind that what counts for the bidder is the *relative* M/B ratios of the two firms, not the bidder's M/B by itself. That is, at a time when the market may be overpricing the bidder shares, it may overprice target shares as well, so it becomes a question of which shares are more overpriced. Recall from Figure 3 above that while market valuations were extraordinarily high in the period 1996–2000 (Panel A), the average annual ratio of the bidder to target M/B did not also peak in that period. This raises a legitimate question as to why the high market valuation in that subperiod should somehow benefit the bidder more than the target in merger negotiations. In sum, the positive association between M/B and the propensity to pay for the target in stock is neither necessary nor sufficient to infer bidder opportunism.

In one of their tests, Eckbo, Makaew, and Thorburn (2018) instrument the bidder's M/B ratio with aggregate mutual fund outflows. The instrumentation produces a M/B ratio that is exogenous to the value of the takeover but not to the payment method choice under bidder opportunism. They find that the likelihood a deal is paid in stock is unrelated to the instrumented M/B , which fails to support the notion that the bidder's choice of stock as the payment method is driven by market mispricing.

Next, we turn to a more powerful test of the bidder opportunism hypothesis performed by Eckbo, Makaew, and Thorburn (2018) (henceforth EMT18), which does not require conditioning on a pre-specified pricing model but instead works directly with the degree of information asymmetry in the deal. Recall that with bidder opportunism, the target is concerned about adverse selection on the bidder side of the transaction. Thus, from the bidder's standpoint, the more informed the target is about the true value of the bidder, the less likely the bidder will succeed in selling overpriced stock, and so the *lower* is the bidder's incentive to use stock in the deal payment. Conversely, the bidder may be concerned with adverse selection on the target side of the deal, which creates a preference for using stock over cash as a deal payment. However, if the target is misinformed and undervalues the bidder, paying with shares is costly. The cross-sectional implication of this hypothesis, which EMT18 label “rational payment design”, is that bidders are *more likely* to pay with stock when the target is *better informed* about the bidder's true value.⁷⁰

⁷⁰This cross-sectional implication is a direct extension of the optimal payment-method choice under two-sided information asymmetry developed by Eckbo, Giammarino, and Heinkel (1990). As discussed in Section 6.2 above, the model in Eckbo, Giammarino, and Heinkel (1990) is the first to allow a mix of cash and stock as payment for the target in a rational equilibrium setting. This is important since acquirers use mixed stock-cash offers to pay for the target in about one-third of the total number of takeovers.

With this motivation, EMT18 empirically test the following two nested hypotheses, neither of which requires a pricing model for the valuation of the bidder shares. Rather, what the test needs is a quantification of how well-informed T is about B at the time of the deal, which can be assessed using objective and observable firm characteristics:

H1: Rational payment design: *The better informed the target is about bidder value, the higher is the fraction of bidder stock in the offer.*

H2: Bidder opportunism *The better informed the target is about bidder value, the lower is the fraction of bidder stock in the offer.*

EMT18 test H1 and H2 by estimating the probability that the deal is paid in stock as a function of variables indicating how well-informed the target is about the bidder. The key information proxies, which are shown in Table 5, are as follows:

Industry relatedness: Maps 4-digit SIC codes into BEA Input/Output industry matrices and uses the average correlation between the bidder and target industries' input and output matrices.

Local deal: A dummy variable that takes on a value of one if the target is physically located within 30 miles of the bidder, and zero otherwise.⁷¹

Urban deal: A dummy that takes a value of one if the bidder is located in the 10 largest US metropolitan areas, and zero otherwise.⁷²

Recent SEO: A dummy that equals one if the bidder undertook a seasoned equity offering in the 18 months prior to the deal, and zero otherwise.

Recent acquirer: A dummy that equals one if the bidder did an acquisition in the prior 18 months and zero otherwise.

The variables *Recent SEO* and *Recent acquirer* capture valuation-related information disclosed publicly by the bidder prior to the merger negotiations and are, therefore, available to the target. Whatever the

⁷¹Distance is computed using Zip codes from SDC, latitude and longitude coordinates computed based on US Census Gazetteer Files, and the spherical law of cosines formula (Cai, Tian, and Xia, 2016).

⁷²Boston, Chicago, Dallas, Detroit, Houston, Los Angeles, New York, Philadelphia, San Francisco, Washington DC.

outcome of these earlier transactions, the information disclosure enhances the target’s ability to value the bidder’s shares, presumably increasing the difficulty of selling overpriced shares in the current merger transaction.⁷³

As shown in Table 5, the information variables receive positive and statistically significant coefficient estimates in all regressions (with the exception of *Urban Deal*, as it turns out that this variable is highly collinear with *Local Deal*). These coefficient estimates show that the more the target knows about the bidder, the more likely it is that the deal is paid in bidder stock (either in all-stock or in an increasing mixed stock-cash proportion). A similar inference emerges from Table 6, which adds alternative measures for the information asymmetry that exists between the bidder and the target firms (including vertical relatedness, the degree of overlapping industries, and the stock return correlation between the two firms).

Note also that tables 5 and 6 include a large number of (the usual) firm- and deal characteristics (see EMT18 for details), as well as two new variables: *Competition from private buyers* and *Cash-Only seller*. The former variable is the fraction of all merger bids in the target’s Fama-French 49 (FF49) industries and the year in which the bidder is private (with data from SDC). Controlling for this fraction is important since settlement in cash almost always dominates using the relatively illiquid shares of a private bidder as the payment method. As shown, the coefficient estimate for this variable is negative and significant, which has little to do with the two main hypotheses, H1 and H2, above. Moreover, *Cash-Only seller* is a dummy variable that takes on a value of one when the target firm is owned by a financial sponsor (e.g., a private equity fund that, as a rule, demands cash as payment) or is a subsidiary, and zero otherwise. Again, as for *Competition from private buyers*, this ownership characteristic, which also receives a highly significant coefficient estimate, represents a force for cash payment that is outside of the forces driving H1 and H2 and should therefore also be controlled for.

EMT18 also examine the abnormal performance of portfolios that are long in all-cash acquirers and short in all-stock acquirers (where an acquirer enters the portfolio in the month following the bid announcement and is held for 36 months). The abnormal performance parameter—the constant term α in the risk factor model generating expected returns—is statistically insignificant at conventional levels for the long-short portfolio as well as for the long and short portfolios individually. Moreover, the

⁷³The sampler average value of *Recent Acquirer* is 25%, and *Recent SEO* averages 26%. Note also that the market reaction to the information in the prior SEO, which is typically negative (Eckbo, Masulis, and Norli, 2007), could itself have reduced (or even eliminated) any mispricing of the bidder shares. Moreover, the *Recent SEO* dummy could also capture bidder fundamentals dictating a preference for financing with stock not already explained by our baseline capital structure controls in Table 5.

Table 5: **Regressions for information asymmetry and payment method choice.**

The table reports the coefficient estimates from Tobit regressions for the fraction of stock in takeover bids (Columns 1–2) and multinomial probit regressions for the choice of payment method, where the outcomes are all-stock, mixed, and all-cash (baseline) bids (Columns 3–6). The explanatory variables are measures for information asymmetry about bidder valuation based on bidder and target industry complementary (*Industry Complementarity*), geography (*Local Deal*, *Urban Deal*), and recent transactions (*Recent CEO*, *Recent Acquirer*), as well as measures for external pressures to pay in cash. All variables are defined in the Appendix. The regressions also include controls for bidder capital structure and deal, industry, and time period characteristics from Column 3 of Table 3. Firm-level variables are lagged by one year. A constant term is included but not reported. The sample contains 6,200 merger bids for US targets by US nonfinancial public acquirers, 1980–2014. Columns 1–2 show *t*-statistics in parentheses, and Columns 3–6 show *Z*-statistics, all using robust standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Table adapted with permission from Eckbo, Makaew, and Thorburn (2018).

Variable	Tobit regression		Multinomial probit regression			
	(1)	(2)	Model I		Model II	
			All-stock	Mixed	All-stock	Mixed
	(3)	(4)	(5)	(6)		
Information asymmetry						
<i>Industry Complementarity</i>	0.31 (3.88)***	0.231 (3.27)***	0.302 (3.63)***	0.226 (2.68)***	0.235 (2.52)**	0.2 (2.23)**
<i>Local Deal</i>	0.595 (8.44)***	0.459 (7.33)***	0.617 (8.34)***	0.392 (5.17)***	0.595 (7.17)***	0.361 (4.44)***
<i>Urban Deal</i>	-0.004 (0.08)	0.007 (0.15)	0.008 (0.15)	0.075 (1.35)	0.054 (0.87)	0.115 (1.92)*
<i>Recent CEO</i>	0.583 (9.50)***	0.273 (4.94)***	0.624 (9.81)***	0.375 (5.72)***	0.3 (4.07)***	0.189 (2.62)***
<i>Recent Acquirer</i>	0.46 (7.64)***	0.298 (5.35)***	0.454 (7.31)***	0.044 (0.67)	0.368 (5.14)***	0.189 (2.63)***
External pressure to pay in cash						
<i>Competition from Private Buyers</i>		-1.432 (9.36)***			-1.839 (8.91)***	-0.609 (3.34)***
<i>Cash-Only Seller</i>		-0.371 (4.40)***			-0.511 (4.39)***	-0.111 (1.12)
<i>HHI</i>	1.604 (3.86)***	-0.63 (1.52)	1.651 (3.98)***	-0.172 (0.37)	-0.793 (1.49)	-1.225 (2.25)**
Bidder capital structure	No	Yes	No	No	Yes	Yes
Deal characteristics	No	Yes	No	No	Yes	Yes
Industry and time period	No	Yes	No	No	Yes	Yes
Pseudo <i>R</i> -squared / log likelihood	0.02	0.14	-5,482		-4,651	
<i>N</i>	4,872	4,764	5,128		5,014	

Table 6: **Alternative measures for information asymmetry and payment method choice.**

The table reports the coefficient estimates from Tobit regressions for the fraction of stock in takeover bids (Columns 1–5) and multinomial probit regressions for the choice of payment method, where the outcomes are all-stock, mixed, and all-cash (baseline) bids (Columns 6–7). The explanatory variables are measures for information asymmetry about bidder valuation based on bidder and target industry relatedness (*Vertical Relatedness*, *Acquirer-Target Return Correlation*, *Same Primary SIC Dummy*, *Overlapping Industries/Acquirer Industries*, and *Overlapping Industries/Target Industries*). All variables are defined in the Appendix. The regressions also control for the information asymmetry measures from Table 6 as well as measures for external pressures to pay in cash, bidder capital structure, and deal, industry, and time period characteristics from Column 3 of Table 3. Firm-level variables are lagged by one year. A constant term is included but not reported. The sample contains 6,200 merger bids for US targets by US nonfinancial public acquirers, 1980–2014. Columns 1–5 show *t*-statistics in parentheses, and Columns 6–7 show *Z*-statistics, all using robust standard errors. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Table adapted with permission from Eckbo, Makaew, and Thorburn (2018).

Variable	Tobit regression					Multinomial probit regression	
	(1)	(2)	(3)	(4)	(5)	All-stock (6)	Mixed (7)
Information asymmetry							
<i>Vertical Relatedness</i>	1.058 (2.78)***					1.272 (2.40)**	1.648 (3.30)***
<i>Same Primary SIC Dummy</i>		0.152 (3.13)***					
<i>Overlapping Acquirer Industries</i>			0.174 (2.40)**				
<i>Overlapping Target Industries</i>				0.131 (2.26)**			
<i>Acquirer-Target Return Correlation</i>					1.595 (6.09)***		
<i>Local Deal</i>	0.46 (7.33)***	0.455 (7.25)***	0.454 (7.22)***	0.456 (7.26)***	0.533 (4.50)***	0.592 (7.15)***	0.357 (4.39)***
<i>Urban Deal</i>	0.006 (0.12)	0.012 (0.25)	0.009 (0.20)	0.008 (0.18)	-0.064 (0.73)	0.053 (0.85)	0.113 (1.87)*
<i>Recent SEO</i>	0.27 (4.89)***	0.267 (4.85)***	0.263 (4.76)***	0.271 (4.90)***	0.469 (4.34)***	0.296 (4.02)***	0.18 (2.49)**
<i>Recent Acquirer</i>	0.282 (5.06)***	0.281 (5.05)***	0.284 (5.09)***	0.282 (5.07)***	0.383 (3.78)***	0.354 (4.96)***	0.202 (2.80)***
External pressure to pay in cash							
<i>Competition from Private Buyers</i>	-1.417 (9.22)***	-1.437 (9.39)***	-1.46 (9.54)***	-1.448 (9.45)***	-1.725 (6.13)***	-1.826 (8.82)***	-0.57 (3.09)***
<i>Cash-Only Seller</i>	-0.373 (4.42)***	-0.371 (38.03)***	-0.374 (38.03)***	-0.372 (38.03)***	0.294 (0.73)	-0.514 (4.42)***	-0.109 (1.10)
<i>HHI</i>	-0.634 (1.53)	-0.606 (1.46)	-0.627 (1.51)	-0.651 (1.57)	-1.281 (1.51)	-0.778 (1.47)	-1.188 (2.18)**
Other controls							
Bidder capital structure	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Deal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry and time period	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo <i>R</i> -squared / log likelihood	0.14	0.14	0.14	0.14	0.12		-4,650
<i>N</i>	4,764	4,764	4,764	4,764	2,078		5,014

same conclusion emerges after restricting the portfolios to acquirers with above- or below-median M/B . Again, these results fail to support the bidder opportunism hypothesis, which predicts negative long-run abnormal performance ($\alpha < 0$).

Li, Taylor, and Wang (2018a) use a structural model to quantify the likelihood of an inefficient takeover—the result of the most overvalued rather than the most efficient bidder winning the target. Not unlike Rhodes-Kropf and Viswanathan (2004) (discussed in Section 10.2 above), they construct a model with one-sided information asymmetry where the target value is known to all parties while the true bidder value is private information known by the bidder only. Moreover, when the bidder offers stock as payment for the target shares, it may be for one of two reasons that are unobservable to the target: (1) Market overvaluation of the bidder shares (bidder opportunism), or (2) a bidder’s liquidity constraint (lack of access to cash, similar to Gorbenko and Malenko (2018)).⁷⁴ For reasonable parameter values, they also conclude that the M&A market, for the most part, allocates resources efficiently: Overvalued (opportunistic) bidders are likely to crowd out high-synergy bidders in only 7% of transactions. Moreover, in those inefficient deals, the resulting average synergy loss equals only 9% of the target’s value. With these numbers, the implied average loss across all deals is only 0.63%.⁷⁵

Finally, Eckbo, Makaew, and Thorburn (2025) empirically exploit the theoretical possibility that overpriced bidder shares may present a bidder with a first-mover advantage (increased informational rents). That is, since new price-sensitive information arrives randomly, a bidder receiving information that the market is (temporarily) overpricing its shares may have a greater incentive to initiate a takeover than a potential bidder without such information. Based on this simple argument, and using nearly 3,000 takeovers of public targets (2000–2020), they then compare deal outcomes in bidder-initiated and target-initiated takeovers using *both* the reduced-form regressions of EMT18 and the structural estimation of Li, Taylor, and Wang (2018a).

Applying the EMT18 test, Eckbo, Makaew, and Thorburn (2025) find that bidder-initiated deals are *less* (not more) likely to use shares as acquisition currency and *more* (not less) likely to use shares the better informed the target is about the bidder. Moreover, their application of the structural model of Li, Taylor, and Wang (2018a) shows that bidder deal-initiation does *not* increase the fraction of inefficient

⁷⁴This contrasts with the reason to use stock in models of two-sided information asymmetry, where stock bids lead to more efficient accept/reject decisions by a privately informed target.

⁷⁵Li, Taylor, and Wang (2018a) also make the interesting point that, when opportunistic bidders lose the contest to an efficient rival bidder, they nevertheless drive up prices, imposing a negative externality or wealth transfer on the winning synergistic bidders.

deals or the average synergy loss in inefficient deals. They also show that bidder-initiated transactions cause a significant increase in the market values of the bidders' close industry peers—not a decrease as predicted when bidder shares possibly reflect market overpricing of the bidder's entire industry sector (Rhodes-Kropf, Robinson, and Viswanathan, 2005).

This most powerful evidence further rejects bidder opportunism as a relevant concern and favors rational payment design (hypothesis H1 above). The increased power comes from conditioning the timing of the takeover to be self-selected by the bidder. The endogenous timing naturally increases the likelihood that the self-selection may be based not only on expected synergy gains but also on private bidder information about market overpricing. The large-sample tests instead suggest that the extensive use of bidder shares as acquisition currency reflects bidder concerns with target adverse selection or internal cash constraints rather than attempts to pay with overpriced shares.

11 Are target stock price runups costly for bidders?

11.1 Motivation

A growing literature asks whether asset prices can provide useful signals to corporate decision-makers when facing a choice between real investment opportunities (see Goldstein, 2003, for a review). While traditional asset pricing theories treat firms' underlying cash flows as exogenous and unaffected by the financial market (Grossman and Stiglitz, 1980; Kyle, 1985), the literature on feedback effects instead holds that firms take corrective actions based on the information in market prices—hence, market prices play an active role in affecting those cash flows.

Acquisition decisions are a fertile area to explore the potential for a feedback loop. There is typically a deal announcement followed by a stock market reaction to that announcement—after which the firm may decide to undertake a corrective action. The empirical issue, then, becomes whether the corrective action (if observed) is caused by new information only available to the firm or by information that the firm's decision-makers extract from changes in the firm's market price itself. For the latter to be the case, the firm's insiders must believe that the market knows more about the value of certain aspects of the firm's investment than do insiders. Of course, since prices and corporate decisions are both affected by the same fundamentals, the research challenge is to identify situations where market prices—not just fundamentals—appear to play an active role in shaping corporate decisions.

Schwert (1996) is the first to present evidence consistent with the notion that bidder and target firms learn from pre-bid target stock-price runups. In a sample of about 1,500 takeovers, he regresses the cumulative abnormal target stock return from the day of the bid announcement (event day 0) through day 252, which typically covers the final contest outcome. He then regresses this 'markup' of the target stock price on the target's abnormal stock price runup from day -126 through day -1. For most cases, this runup period covers new information (if any) about a forthcoming (and lucrative) takeover bid leaked to the market that, in turn, may give rise to the abnormal target stock price increase. He postulates that, in this regression, if the target runup simply reflects market deal anticipation, the slope coefficient on the markup return will be -1: The runup and the markup are substitutes that sum to the total (unaffected) offer premium. Conversely, if the parties to the deal learn new information from the target runup, the slope coefficient will be less negative and +1 if the entire runup is added to the markup (presumably in the form of a higher offer price), which he labels the 'markup pricing hypothesis'.

Schwert (1996)'s main finding in the above markup regression—a slope coefficient estimate of +1 for the target runup—is as surprising as it is important. As he concludes: “With little substitution between the runup and the markup, the runup is an added cost to the bidder...It also raises interesting questions about the role of information from public capital markets in private takeover negotiations.” (abstract). In other words, a literal interpretation of Schwert (1996)'s regression coefficient estimate of +1 is that bidders, on average, pay twice for the target's portion of the deal-specific synergies embedded in the runup. If correct, and since the extra payment must be financed by the bidder from its share of the takeover synergies, this bargaining outcome deters marginally profitable takeovers *ex-ante*. Hence, empirical evidence on whether there exists such a costly feedback loop is of first-order importance for parties to merger negotiations as well as for the debate over the efficiency of the takeover mechanism.

Schwert (1996)'s finding is surprising in light of what is otherwise known about the market for corporate control. While the target's incentive is always to push for a higher offer price when negotiating with the acquirer, arguing that the bidder ought to increase the offer by the target runup may work if the two parties interpret the runup as a change in the target's stand-alone value as opposed to simply market anticipation of the offer premium. Paying the full stand-alone value of the target (or any asset) does not increase the acquisition cost—paying twice for market anticipation of the offer premium does. However, an assumption that the full runup reflects increased target stand-alone value ignores the frequent public rumors preceding takeover bids. Moreover, as Bradley, Desai, and Kim (1983) were the first

to show, when acquisition bids fail, and the target remains independent (i.e., stand-alone), the runup is fully reversed—and even more than reversed in Betton, Eckbo, and Thorburn (2009). Hence the puzzle.

In the following, we detail a possible resolution of the puzzle provided by the structural and empirical analysis of Betton, Eckbo, Thompson, and Thorburn (2014), henceforth BETT14. They study actual offer premiums for a sample of 6,100+ listed targets, 1980–2008. As shown in Figure 8 above, takeover bids are, on average, preceded by a pre-offer target stock-price runup of 7%. Under rational deal anticipation, this runup is the discounted value of target deal synergies triggered by takeover rumors. As such, the runup is exogenous to the deal and should not affect deal terms. Alternatively, under their ‘costly feedback hypothesis’, the bargaining outcome is one where the target forces the bidder to pay twice for the target’s portion of deal-specific synergies embedded in the runup. We first explain the (nested) theoretical predictions of these two alternative hypotheses, which also clarifies the implicit assumption underlying Schwert (1996)’s interpretation of his own regression coefficient, and then turn to the empirical tests that ultimately reject the strong form of the costly feedback hypothesis.

11.2 Theoretical propositions

11.2.1 A generalized markup projection

Recall from Eq (1) above that the signal s_i informs bidder i about the total synergy S from the takeover, which in turn determines the optimal bid $b(s)$. When modeling rational deal anticipation, BETT14 instead assume that the value of S is already known to both bidder and target firms and that it is the market participants who receive the information signal (rumor) s , causing the market to update the probability $\pi(s)$ that a bid will occur. BETT14 further assume that the market knows the distribution $G(S|s)$ and that higher signals s shift $G(S|s)$ to the right so that a stronger rumor causes the market to infer that the takeover is also more valuable in terms of expected synergies. It is also known that the bidder receives the fraction $\omega \in (0, 1)$ of S but bears the bidding cost C . Hence, a value-maximizing acquirer will make a bid only if $\omega S \geq C$.⁷⁶

Let p_O denote the market revaluation of the target conditional on the bid and the signal s . Moreover,

⁷⁶The bidding costs C may include things like advisory fees and litigation risk, as well as any opportunity cost of expected synergy gains from a better business combination than the target under consideration. The assumption of a positive bidder entry cost ensures that the market remains uncertain about whether a bidder will eventually materialize even after receiving takeover rumors. Note also that, under rational market deal anticipation, the size of the target runup is irrelevant for the deal outcome itself.

for notational simplicity, normalize to zero the target’s standalone value prior to the takeover signal occurring. The target’s rumor-driven market price “runup” is $p_R = \pi p_O$, while the subsequent bid-driven “markup” is $p_O - p_R = (1 - \pi)p_O$, which implies the following generalized markup projection:

$$p_O - p_R = \frac{1 - \pi}{\pi}(p_R - x_T). \quad (59)$$

Here, x_T is the change (if any) in the target’s standalone value during the runup period.⁷⁷

As shown in Panel A of Figure 19, the slope of the markup projection is highly non-constant and with a single maximum (see BETT14 for a formal proof). The slope in the left tail of the markup projection starts positive for low p_R and reaches a maximum before trending negative. This is because low takeover signals imply low expected bidder synergy gains. Given the bidding costs, this, in turn, implies a low takeover probability π and a correspondingly high surprise effect when a bid materializes. The slope at the right tail drops towards zero because higher takeover signals mean both higher deal probabilities (lower surprise effects) and greater conditional deal values.

11.2.2 Adding the runup to the markup

In Eq. (59), the rumor-driven target stock price runup rationally anticipates both the likelihood of a takeover and the conditional expected synergy gain, while the markup is just the surprise effect conditional on the bid. In this setting, the target runup simply reflects information already known to the bidder and target firms and is, therefore, irrelevant to the bargaining process.

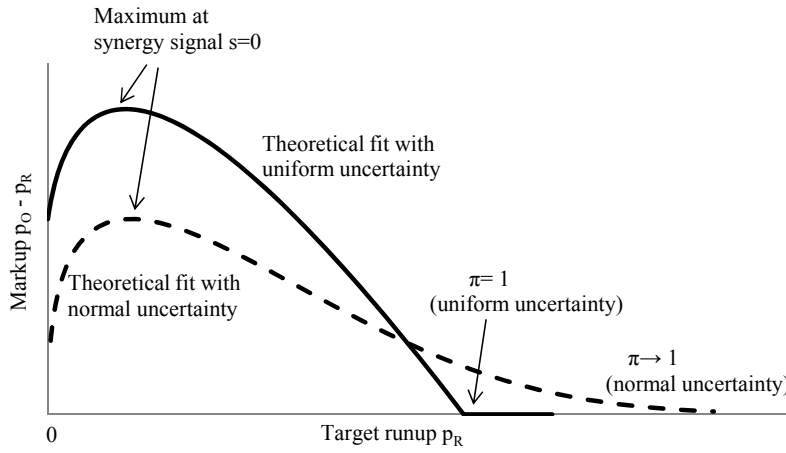
However, while maintaining the assumption of market rationality, BETT14 also examine a scenario in which the runup is costly. Specifically, they propose a costly feedback loop in which a confused bidder, in the extreme, agrees to add the entire runup p_R to the markup $p_O - p_R$. This confusion arises because the bidder cannot separate the two components— x_T and the target synergy gains driving the runup. Hence, a bidder eager to close a valuable deal may yield to a target that demands a higher offer price—perhaps claiming that the runup reflects a greater increase in the standalone value than anticipated. Of course, if this claim is wrong, and the bidder agrees to the extra transfer, the bidder effectively pays twice for

⁷⁷Since paying for the target’s stand-alone value x_T does not require a premium above x_T itself, the right-hand side of Eq (59) is restricted to the target’s expected synergy component that is priced into p_R as the market receives the takeover signal s . Also, the form of Eq. (59) is general in that it does not depend on the form of the target benefit function, the size of the threshold value for a bidder to step up and make a bid, or the distributional properties of the conditional synergy gains $G(S|s)$.

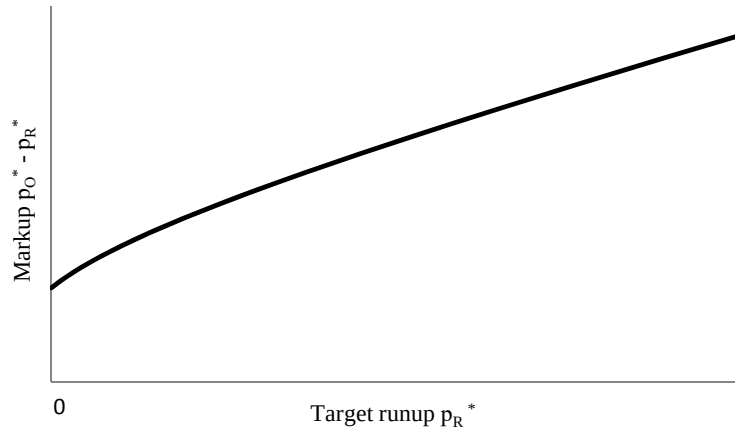
Figure 19: **Theoretical markup projection with and without a costly feedback loop**

Panel A plots the theoretical markup projection without a costly feedback loop (Eq (59) in the text) and assumes no change in the target's standalone value during the runup period ($x_T = 0$). The market receives a signal s about a potential takeover with synergy S . p_R is the target runup, p_O is the offer price, $p_O - p_R$ is the markup, and π is the probability of a takeover bid. The solid curve is the markup projection assuming a uniform distribution for $S|s$, while the broken curve assumes a normal distribution. Assuming a uniform distribution, Panel B plots the implied markup projection when the bidder also raises the offer price by the target runup p_R^* (a costly feedback loop indicated by “*”). Figure adapted with permission from Betton, Eckbo, Thompson, and Thorburn (2014) (see their Appendix for the functional forms).

A: Markup projection without costly feedback loop



B: Markup projection with costly feedback loop



some of the synergy gains already embedded in the target runup.

Using superscript “*” to denote prices with a costly feedback loop and using the uniform distribution for $S|s$, Panel B of Figure 19 illustrates the change in the markup projection: It becomes a positive and monotonic function of the runup (see BETT14 for a formal proof). That the markup must be monotonically increasing in the runup is intuitive: It now consists of the surprise target deal value (as before) *plus* the surprise runup transfer, which adds up to the total deal value itself. That is, while the takeover likelihood declines ($\pi^* < \pi$ since the bidder must finance the extra runup transfer to the target from its own takeover synergies), the markup now equals the target’s entire portion of the total synergy gains.

11.2.3 Restricting the markup projection to be linear

It is useful to contrast the general markup projection in Eq. (59) with the linear regression function originally proposed and estimated by Schwert (1996). To illustrate, start by writing the markup projection in a linear form:

$$p_O - p_R = a + b * p_R, \quad (60)$$

where a and b are cross-sectional regression constants. Under rational deal anticipation, Schwert (1996) predicts that $b = -1$, i.e., a dollar increase in the runup is offset by a dollar decrease in the markup. Equating (60) and (59), and replacing p_R with πp_O , yields

$$\frac{1}{\pi} - 1 = \frac{a}{\pi p_O} + b. \quad (61)$$

What Eq. (61) says is that, under rational deal anticipation, for the value of b to equal -1, it must also be that target deal values are cross-sectionally constant: $p_O = a$. In terms of the information environment, this is equivalent to assuming that the takeover signal received by the market in the runup period is uninformative about the takeover synergies created by the deal, and so the derivative $\partial p_O / \partial s = 0$.

In contrast, BETT14 allows investors to use the strength of the signal s to assess the total takeover synergies and, therefore, the target’s share of the takeover gains ($\partial p_O / \partial s > 0$). They also show formally that when the true markup projection is given by Eq. (59), then a linear regression such as Eq. (60) will produce a slope coefficient b that must be strictly greater than -1. Moreover, with a costly feedback

loop, the linearized markup regression in Eq. (60) above is predicted to produce a strictly positive slope coefficient ($b > 0$).

11.3 Empirical tests

BETT14 use Eq. (59) to address two empirical questions: (1) Is the actual projection of the markup on the runup consistent with rational deal anticipation? (2) Is there evidence that the bidder pays twice for the target runup (which they label “costly markup pricing”), as suggested by Schwert (1996)? Beginning with Question (1), they first simplify the empirical analysis by assuming that $x_T = 0$, which means that the entire target runup represents the market’s expectation of the target synergy gains ($x_T > 0$ is reintroduced in the empirical Section 11.3 below).

11.3.1 The nonlinearity of the markup projection

BETT14 apply the flexible beta function, $\Lambda(v, w)$, to empirically identify the form of the markup projection in their sample of 6,146 bids for public targets (1980–2008). The beta function allows the data cluster itself to determine the best empirical shape:

$$p_{Oj} - p_{Rj} = a + b \frac{(p_{Rj} - \min)^{(v-1)}(\max - p_{Rj})^{w-1}}{\Lambda(v, w)(\max - \min)^{v+w-1}} + \epsilon_j, \quad j = 1, \dots, N. \quad (62)$$

Here, p_{Rj} is the observed runup of the j ’th target (which may include a nonzero change in the target’s standalone value x_T), and $p_{Oj} - p_{Rj}$ is the markup (which, again, nets out any nonzero x_T). Moreover, $\Lambda(v, w)$ is the beta distribution with shape parameters v and w , and $\max$ and $\min$ are the maximum and minimum p_R in the data, respectively. The parameter a is an overall intercept, b is a scale parameter, and ϵ_j is a residual error term.⁷⁸

Figure 8 above describes the average values of central variables in event time (relative to the day of the initial bid announcement, day 0) used in the estimation of Eq. (62). On average, the target runup is $p_R = CAR(-41, -2) = 7\%$ and the offer premium is $p_O = \frac{OP}{p_{-42}} - 1 = 45\%$, where OP is the actual offer price.⁷⁹ As shown in Panel A of Figure 20, the estimated empirical function when using the most flexible

⁷⁸When constraining $\Lambda(v, w)$ to be linear, the projection delivers OLS estimates of a and b . The projection uses as starting values $v = 1, w = 2$ (for which the beta density is linear downward sloping) and the OLS estimates of a and b (for α and β), followed by a least squares fit over all four parameters to identify the best nonlinear shape.

⁷⁹The markup $p_O - p_R$ is 22% when measured using the market reaction to the bid announcement ($CAR(-1, 1)$) and 38% when measured using the offer price OP . Although their conclusions are robust to using either definition of the markup, we

form of $\Lambda(v, w)$ corresponds closely to the theoretical, nonlinear form in Figure 19.⁸⁰ Most importantly, the Best linear fit has a slope coefficient of $b = -0.24$, which directly rejects the costly feedback loop hypothesis and reinforces the conclusion that the target runup reflects rational deal anticipation.

11.3.2 Adjusting for changes in target's stand-alone value

Panel B of Figure 20 is also interesting as it repeats the estimation of Eq. (62) with the runup adjusted for an estimate of the change x_T in the target stand-alone value during the runup period. This adjustment is of interest since as many as 30% of the target runups in Panel A are negative (i.e., *run-downs* prior to the bid announcement). Since expected synergies are positive, a negative runup necessarily means a decline in the target's stand-alone value ($x_T < 0$)—perhaps driven by relatively poor target operating performance and/or financial distress. Hence, Panel B isolates the expected synergy component of the target runup from the value of T and repeats the cross-sectional estimation of the flexible form in Eq. (20).

To empirically isolate the expected synergy component in p_R , BETT14 employ the following linear estimator for the latent conditional value of x_{Tj} :

$$E(x_{Tj}|p_{Rj}) = \alpha_j + \beta_j * p_{Rj}, \quad (63)$$

i.e., the greater the total target runup, the greater is both the synergy component and the target stand-alone value change embedded in the runup p_{Rj} . This estimator is consistent with market efficiency since it assumes that $E(x_{Tj}) = 0$ unconditionally. Assuming also that x_{Tj} is uncorrelated with the synergy gains S , we have that

$$\alpha_j = -\beta_j E(p_{Rj}) \quad \text{and} \quad \beta_j = \frac{Cov(x_{Tj}, p_{Rj})}{Var(p_{Rj})} = \frac{Var(x_{Tj})}{Var(x_{Tj}) + Var(p_{Rj} - x_{Tj})}. \quad (64)$$

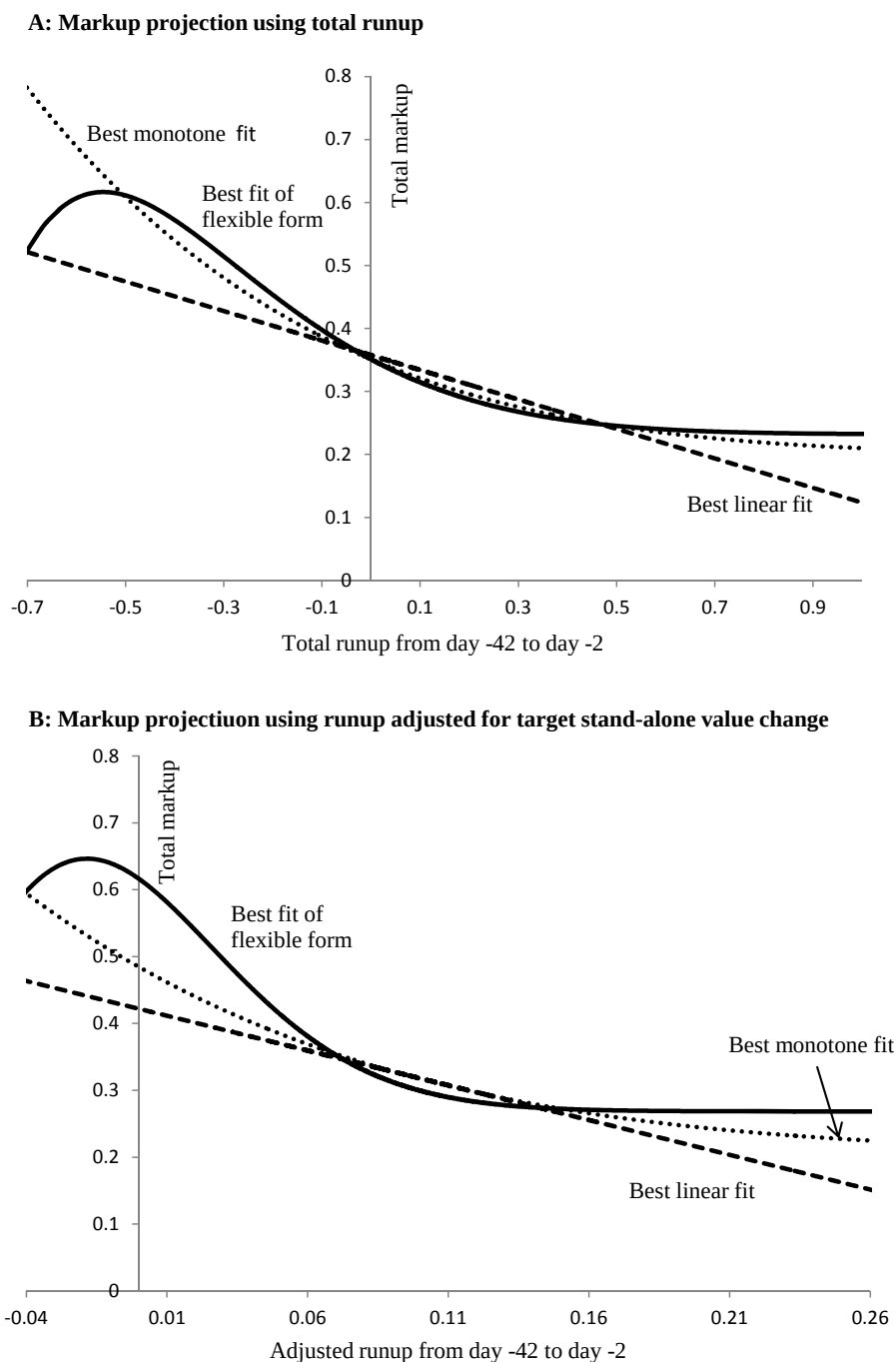
BETT14 use the target's time-series stock return volatility prior to the first bid announcement as a proxy for $Var(x_{Tj})$, and the cross-sectional variance of the observed stock price runups as a proxy for

focus below on the markup definition using the offer price, as it is closer to the theoretical variable $p_O - p_R$. The difference between the two measures of the markup is driven by the market's assessment of the probability of offer success, which depends on potential rival bids arriving after the initial bid and on shareholders voting on the final deal. While $CAR(-1, 1)$ embodies market expectations of these future events, the markup definition using OP is more direct as it does not depend on this market judgment.

⁸⁰Based on a likelihood ratio test statistic (distributed χ^2), BETT14 report that the Best fit of the flexible form (solid curve) has greater statistical significance than either the Best linear fit or the Best monotone fit shown in the figure.

Figure 20: Markup projections estimated using offer prices

This figure plots markup projections estimated using offer prices. The total markup is $p_O = (OP/p_{-2}) - 1$, where OP is the offer price and p_{-2} is the target closing price on day -2 relative to the first offer announcement date (day 0). In Panel A, the total runup is $p_R = (p_{-2}/p_{-42}) - 1$. In Panel B, the adjusted runup is the total runup in Panel A minus the BLUE estimate of the target's stand-alone value change x_T over the runup period. For expositional purposes, Panel B plots the functions using the middle 98% of the adjusted runups. All forms are estimated using the beta function. The sample comprises 6,146 bids over the 1980 to 2008 period. Figures adapted with permission from Betton, Eckbo, Thompson, and Thorburn (2014).



$Var(p_{Rj} - x_{Tj})$. The partially anticipated synergy component of the target runup is then measured as the observed runup minus the estimated value of $E(x_{Tj}|p_{Rj})$ from Eq. (63).

As shown in Panel B of Figure 20, with this adjustment for x_T , only 3% of the target runups are negative (down from 30%). Moreover, the Best of flexible form (solid black curve) is again consistent with rational deal anticipation in the adjusted target runup. Also, the Best linear fit again has a significantly *negative* slope. This means that there is a significant degree of substitution between runups and markups in the data, which contrasts with the conclusions of Schwert (1996). Most importantly, the uniformly negative linear slope rejects the costly feedback loop hypothesis.⁸¹

11.3.3 Impact of target runups on bidder gains

It is also interesting to consider the direct impact of a costly feedback loop on the takeover gains to the *bidder*. Given the fixed synergy sharing rule θ , and since stronger rumors signal greater total synergies $S|s$ (recall that $\delta p_O/\delta s > 0$ in the model), bidder and target gains are positively correlated absent a costly feedback loop. With the costly loop, however, bidder and target gains are negatively correlated since a greater runup transfers a greater portion of the synergy gains to the target. Moreover, the costly feedback rule also implies that total bidder gains will be negatively correlated with p_R .

As shown in Figure 21, which is based on the 3,689 publicly traded bidders in BETT14, bidder acquisition returns (CAR) are increasing in the target runup—not decreasing as predicted by the costly feedback loop hypothesis (a finding that is also strongly supported by linear regressions). Moreover, as predicted under rational deal anticipation, the empirical projections in Figure 21 are increasing and concave over the entire range of the target runup for both runup measures.

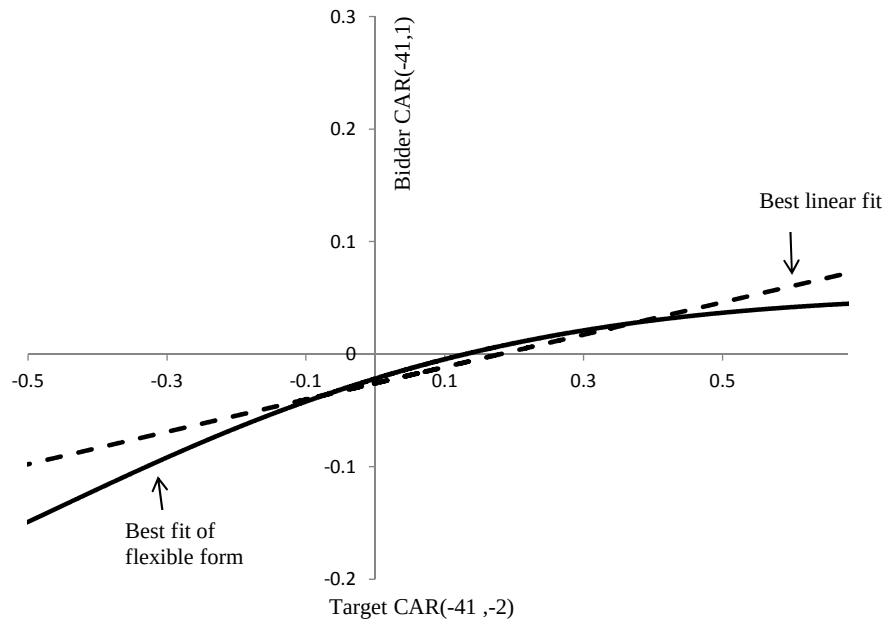
Overall, the significantly positive correlations between bidder and target gains strongly support the joint hypothesis that takeover signals inform rational investors about potential deal synergies and that bidders and targets share in the takeover gains. Conversely, the same evidence rejects the alternative hypothesis that the takeover signal is uninformative about potential deal values, which predicts a zero correlation between bidder and target gains. The same evidence also rejects a second alternative hypothesis: that bidders systematically accept value-decreasing deals.

⁸¹BETT further complement this conclusion by showing that premium effects of shocks to the target runup, exemplified by large block (toehold) purchases and large market movements, do not alter their main conclusion.

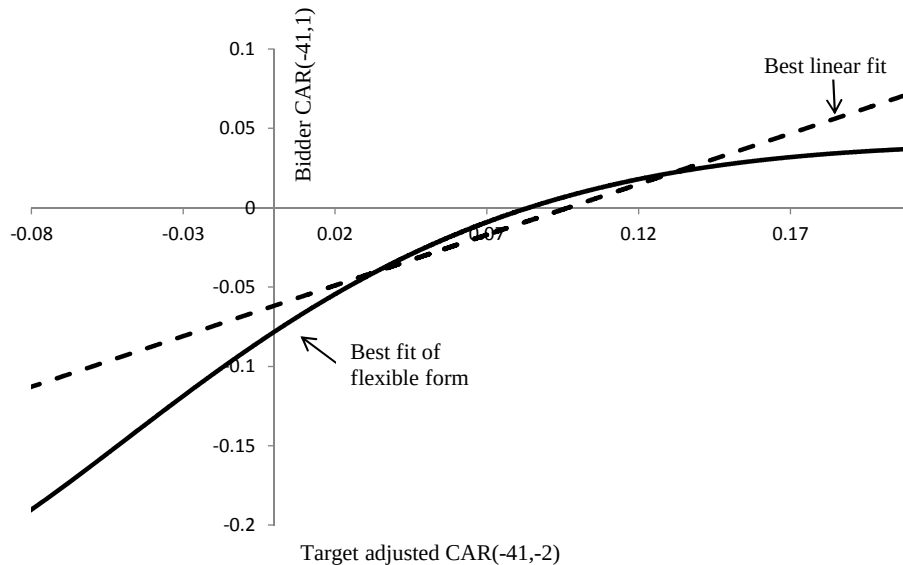
Figure 21: **Projections of total bidder gains on target runups.**

Bidder takeover gains are bidder cumulative abnormal stock returns from the beginning of the runup period and through the day after the bid announcement, $Bidder\ CAR(-41,1)$. The target runup is $Target\ CAR(-41,-2)$. Abnormal returns are estimated using the market model, while the forms shown in the figure are estimated using equation (62) in the text. For expositional purposes, the figure plots the functions over the middle 98% of the adjusted runups. A likelihood-ratio (goodness-of-fit) test rejects linearity in favor of the nonlinear form in the data. Total sample of 3,689 public bidders, 1980-2008. Figure adopted with permission from Betton, Eckbo, Thompson, and Thorburn (2014).

A: Total bidder gains on target CAR runups



B: Total bidder gains on adjusted target CAR runups



12 Is there a merger-adjusted ‘US listing gap’?

12.1 The dramatic post-1996 US listing decline

As shown in Figure 22, the total number of firms listed on the three major US stock exchanges (Nasdaq, NYSE, and AMEX) peaked in 1996 at close to 8,000 firms. However, this number drops by approximately 50% to about 4,000 firms over the next few years and has since remained at that level. Understandably, this dramatic decline has prompted substantial interest in the major drivers of listing dynamics.

There was also a similar-sized reduction in initial public offerings (IPOs), the majority of which took place on the Nasdaq exchange throughout the 1990s (Fama and French, 2004; Eckbo and Norli, 2005). Gao, Ritter, and Zhu (2013) carefully consider several potential drivers of this reduction, including increased costs of investment-banking services and the 2002 Sarbanes Oxley Act (SOX). While they conclude that these cost increases are unlikely explanations, they suggest that many high-technology startups may have chosen to rapidly scale up through a sellout (merger) rather than undertaking an IPO.⁸² Ewens and Farre-Mensa (2020), Kwon, Lowry, and Qian (2020), and Dathan and Xiong (2022). The sharp decline in IPOs has also caused concern among US financial market regulators: “[When]...our most exciting young companies...raise private capital rather than go public, retail investors are left out of a significant part of the Nation’s economic growth”. US Securities and Exchange Commission (SEC) Commissioner Robert J. Jackson Jr., *The Middle-Market IPO Tax*, 2018.

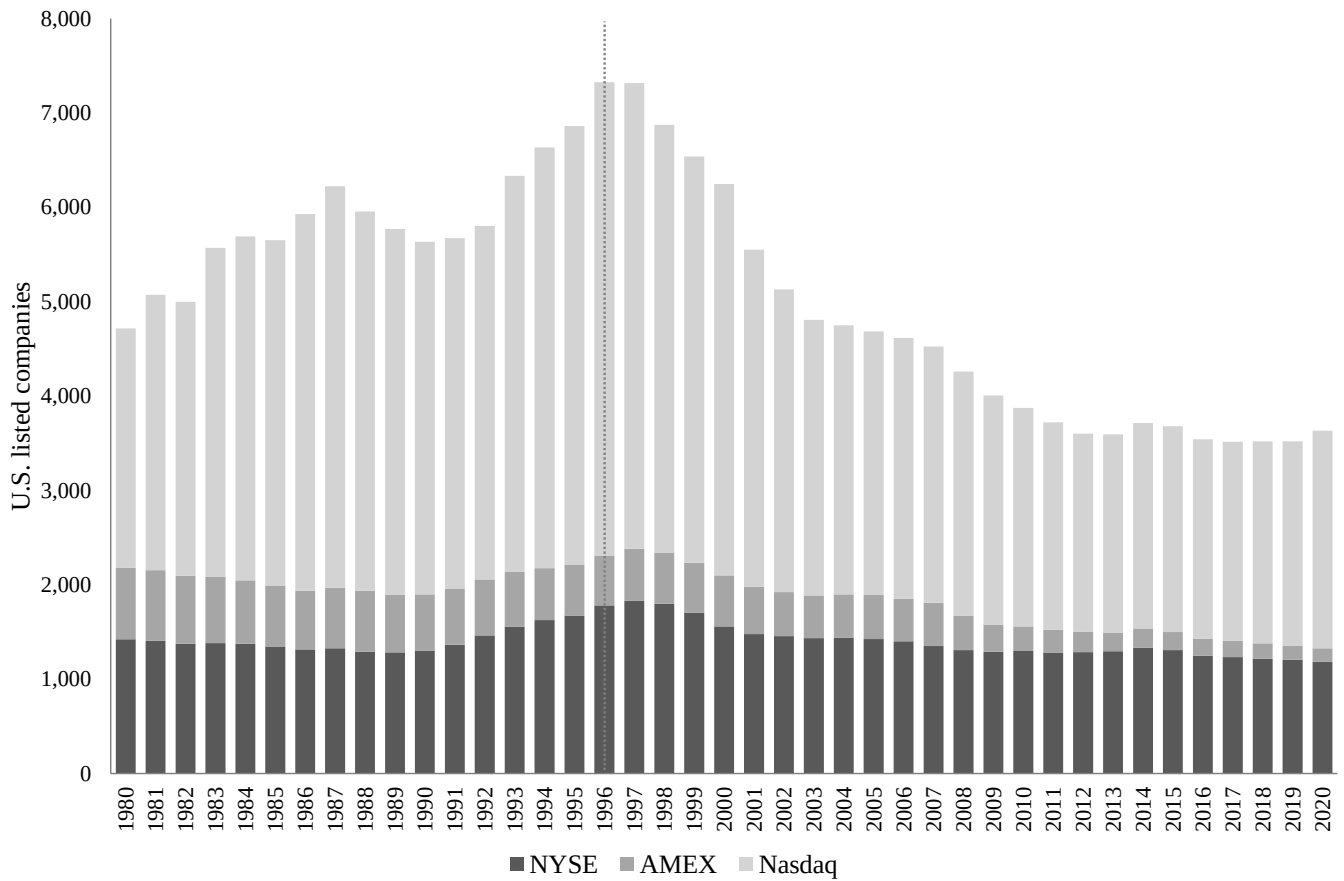
Moreover, Doidge, Karolyi, and Stulz (2017) point to a positive trend in aggregate international listings and estimate a significant ‘US listing gap’ measured as the number of “missing” listed firms relative to an international trend line. They argue that such a gap is consistent with a decrease in the net benefits of a listing for US firms, while Doidge, Kahle, Karolyi, and Stulz (2018) go as far as suggesting that this may be evidence of a relative international disadvantage of listing in the major US stock markets.

However, Eckbo and Lithell (2025) reach a fundamentally different conclusion after tracking how the listing dynamic itself is driven by merger activity where the buyer is a publicly traded firm. Most important for the debate, they show that the post-1996 US listing decline need not at all be driven by lower net listing benefits (that are unobservable to the econometrician)—it may even indicate a relative

⁸²For some firms, an IPO poses a greater risk of publicly disclosing valuable private information. Also, two decades of increased funding from private equity and other financial institutions have enabled young firms to delay going public and hence increased the age of firms undertaking IPOs. For analyses of the decision to go public, see, e.g., Poulsen and Stegemoller (2008), Da Rin, Hellmann, and Puri (2013), Doidge, Karolyi, and Stulz (2013), Dambra, Field, and Gustafson (2015)

Figure 22: Annual number of listed US firms, 1980–2020

The figure plots the annual number of firms listed in the US on Nasdaq (top), NYSE (bottom), and AMEX (middle), 1980–2020. Data from CRSP.



US listing—it advantage. They point out that delisted firms are “missing” from the US stock market *only* if one disregards target firms acquired by already listed companies. That is, listing dynamics is affected by *both* changes in net listing benefits and expected gains from merger transactions, where the latter can be substantial in magnitude.⁸³ Hence, before drawing inferences about potential changes in net listing benefits, one must account for listing changes caused by mergers.

12.2 The merger-adjusted US listing count

By integrating merger activity directly into the listing dynamics, Eckbo and Lithell (2025) (henceforth EL25) are in effect refocusing the listing debate towards a broader issue that cannot be addressed by the actual listing count itself: The ability of stock markets to attract and retain firms under public ownership—arguably a fundamental objective of any public market. Since the listing count only tracks the number of stand-alone listed firms, it does not accurately gauge this broader issue. Specifically, because targets give up their stand-alone status, they are either ignored by the actual listing count (when the target is private) or, in the case of public targets, even treated as having *left* the stock exchange.

In reality, these former stand-alone public companies continue under public ownership—likely deriving some of the parent company’s listing benefits (access to public debt and equity, ‘acquisition currency’, improved managerial incentives, etc.)—while the private targets further expand the investment opportunities available to public-equity investors. EL25 solve this measurement problem by treating a stand-alone listed company as a nexus of the firm itself and its de facto consolidated targets since going public. They, therefore, merger-adjust the listing count by simply adding the targets of listed acquirers back into the actual listing count.⁸⁴

With this simple approach, and as illustrated in their Figure 3 (reproduced here as Figure 23), EL25 document that mergers involving US public acquirers are nearly as important as IPOs in impacting listing dynamics—both in number and value. Specifically, over the period 1980–2020, US listed companies acquire, on average, one public or private target firm, bringing the annual average number of companies

⁸³Alexandridis, Antypas, and Travlos (2017) and Dessaint, Eckbo, and Golubov (2024) document positive average bidder and target abnormal returns over the past four decades. Offer premiums in deals where both the bidder and the target firms are public, average 40% (Betton, Eckbo, Thompson, and Thorburn, 2014). We return to a discussion of the magnitude of likely synergy benefits below.

⁸⁴For internal consistency, when a listed firm leaves the exchange, this merger adjustment requires lowering the listing count by one plus the sum of its targets. They show that their size-based selection of relevant private targets produces ‘listable’ firms both in terms of value and age relative to the median listed firm. For example, the average private target is about the same size and only slightly younger than the median listed firm in the same industry and acquisition year.

from 5,108 to 10,907 after adding back the target firms. As shown by the top line in the figure, this merger adjustment reverses almost the entire post-1996 listing decline. That is, accounting for acquisitions by public firms of other public companies and of private targets—some of which might otherwise have chosen to go public themselves—is sufficient to eliminate the listing decline. Moreover, adding back the public targets alone (the middle line) goes a long way in reducing the peak.

The role of this merger activity is also striking in dollar terms relative to IPOs. While IPOs brought in 10,567 firms valued at \$6 trillion over the same period, the total transaction value of the acquisition targets was nearly \$13 trillion—twice that of the IPOs. Since the average expected synergy gains created by merger activity are most likely much larger than any reasonable estimate of net listing benefits, there is simply no way to conclude from the data that the post-1996 listing decline is driven by lower net listing benefits rather than by expected synergy gains.

This point is also supported by Figure 10 in EL25, which is reproduced here as Figure 24. Panel A shows what John, Kadyrzhanova, and Lee (2024) label a ‘synergy wave,’ which is based on the frequency of merger transactions with a positive combined bidder and target wealth effect. It shows that the merger activity that drove much of the post-1996 listing decline was predominantly value-increasing. Perhaps even more important, Panel B shows that firms that remain listed after 1996 have maintained or even improved on the pre-1996 contribution to aggregate US employment and GDP and expanded R&D and patenting activity (and presumably with the help of their respective targets).

Surprisingly, EL25 further report that as much as four-fifths of the 74 countries represented in this analysis experience a listing peak followed by a decline that averages nearly 50%—much like in the US after 1996. What this means is that a ‘US style’ listing peak is the rule rather than the exception internationally. They then use their merger-adjusted listing series to show that, during the first five years of the post-peak period of listing decline, the merger channel works to retain targets under public ownership significantly more strongly in the US than elsewhere.

In other words, following listing peaks, public firms on foreign exchanges tend to *exit* their respective stock markets—instead of being *retained* under public ownership by public acquirers as is the tendency in the U.S—which points to what the authors refer to as a merger-driven US listing advantage. The advantage lies in providing access to a legal and regulatory system that promotes relatively cost-efficient complex corporate control transactions involving public companies.⁸⁵

⁸⁵See, e.g., Coffee (1984), Bebchuk, Cohen, and Ferrell (2009), and Coates (2018) for discussions of legal rules and

Figure 23: **Actual and Merger-Adjusted US Listing Counts, 1980–2020**

The figure plots the annual levels of the actual (L_t) and merger-adjusted ($L_{A,t}$) listing counts aggregated across the three major US stock exchanges (NYSE, AMEX, and Nasdaq). As explained in Table 1 and in Eqs. (1)–(4) in the text, beginning the count at year-end 1980 (the base year for the US-specific analysis), the actual and merger-adjusted listing series in year t are constructed as follows:

$$L_t = L_{1980} + \sum_{\tau=1981}^t \Delta L_\tau$$

$$L_{A,t} = L_{1980} + \sum_{\tau=1981}^t \Delta L_{A,\tau},$$

where ΔL_τ and $\Delta L_{A,\tau}$ are the annual changes in the two listing counts, respectively, as follows:

$$\Delta L_\tau = \begin{cases} \text{NEWLISTS}_\tau(+): & \text{IPO}_\tau + \text{SPIN}_\tau + \text{MISC}_{\text{New},\tau} \\ \text{DELISTS}_\tau(-): & \text{MERGE}_{\text{Public-to-Public},\tau} + \text{MERGE}_{\text{Public-to-Private},\tau} + \text{MISC}_{\text{Del},\tau} \end{cases}$$

$$\Delta L_{A,\tau} = \begin{cases} \text{NEWLISTS}_{A,\tau}(+): & \text{IPO}_\tau + \text{MERGE}_{\text{Private-to-Public},\tau} + \text{MISC}_{\text{New},\tau}^N \\ \text{DELISTS}_{A,\tau}(-): & \text{MERGE}_{\text{Public-to-Private},\tau}^N + \text{DIVEST}_{\text{Subsidiary-to-Private},\tau} + \text{MISC}_{\text{Del},\tau}^N \end{cases}$$

Each of the components in *NEWLISTS* and *DELISTS* cumulates all the respective transactions over the year τ . The superscript N refers to the acquisition tracking index N_{it} in Eq. (4). The lowest curve in the figure is the actual annual listing count: L_t , while the two top curves plot the merger-adjusted listing count $L_{A,t}$. In the dotted curve in the middle, $L_{A,t}$ adjusts for US public targets, while the top curve also adjusts for private targets (all foreign targets are classified as private, whether or not they are publicly traded in a foreign market). Data are from CRSP and SDC. Figure adapted from Eckbo and Lithell (2025)

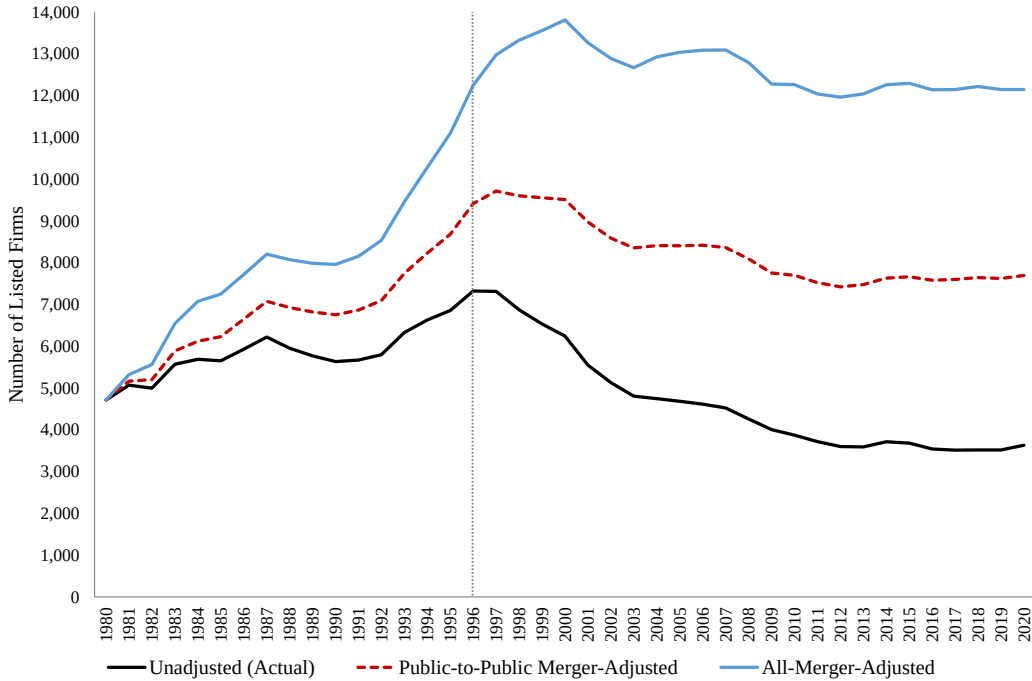
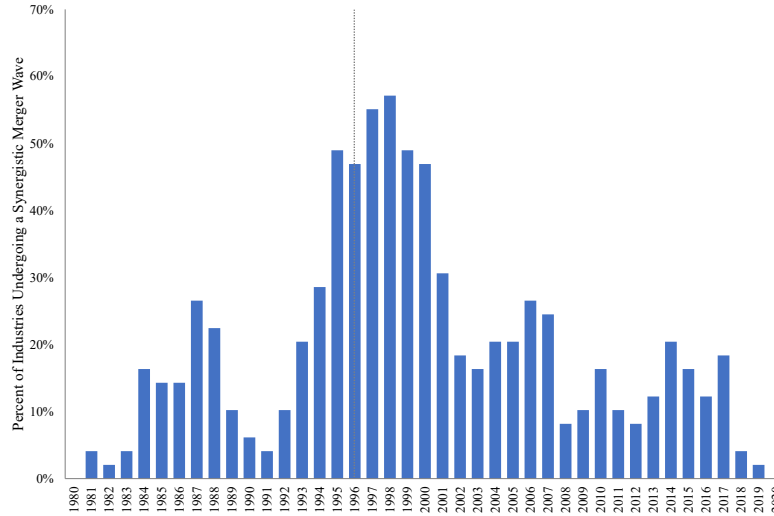


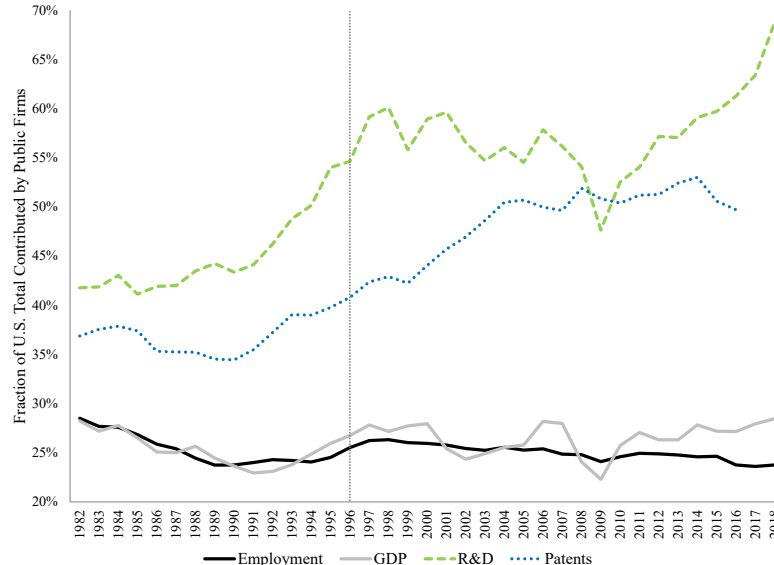
Figure 24: ‘Synergistic’ Merger Waves and Economic Contribution of Listed Firms

Panel A shows the share of industry-years undergoing a synergistic merger wave for our sample of public-to-public mergers, 1980–2020, using Fama-French 49 industries. Following John, Kadyrzhanova, and Lee (2024), industry-years are considered to undergo a synergy wave if the number of deals with a positive bidder and target combined wealth effect (CWE) in that year is one standard deviation above the industry time-series median. CWE is the value-weighted average CAR for the event period $(-3,3)$, where (0) is the announcement date. CARs are calculated as the difference between the realized and value-weighted market return. The pre-announcement market value of the bidder and the target is measured one month before the deal announcement. Both acquirer and target must be US public firms, with the bidder holding less than 50% of target shares before announcement and seeking to hold at least 50% after the transaction. Panel B shows the time series of public firms’ percent contribution to aggregate US employment, GDP, R&D spending, and patents, with data from the BEA, BLS, Compustat, GCPD, IMF, OECD, and USPTO. Figure adapted from Eckbo and Lithell (2025).

A: Share of Industry-Years With Synergistic Public-to-Public Merger Waves



B: Contribution of Listed Firms to Economic Activities



12.3 The merger-adjusted US listing gap

EL25 also use their merger-adjusted listing series to revisit the so-called ‘US listing gap’ highlighted by Doidge, Karolyi, and Stulz (2017). As illustrated in Figure 25, which was first presented by Doidge, Karolyi, and Stulz (2017) (whose sample period ends in 2012), the sharp post-1996 US listing decline is dramatically different from the time-series behavior of the aggregate foreign listing counts (where the 73 foreign countries are split into advanced and developing economies, respectively). However, as shown by EL25, the two aggregate foreign listing series mask the listing peaks of the individual foreign countries, 80% of which experience a ‘US style’ listing peak followed by a sharp (nearly 50%) decline.

In light of this fact, EL25 test whether the merger-adjusted listing series also supports a US listing gap. They do so by simply replacing each country’s listing series in Doidge, Karolyi, and Stulz (2017) with the merger-adjusted series, which adds target firms of listed acquirers around the world. As shown in their Table 3, and using their notation, they estimate the annual gap parameters $\gamma \in \Gamma$ using a panel of 74 countries and the following regression specification:

$$\ln(Y_{it}) = \alpha + \delta_i + \tau_t + \beta D_{US} + \Gamma(D_{US} \times \tau_t) + \lambda X_{it} + \epsilon_{it}, \quad t = 1990, \dots, 2020, \quad i = 1, \dots, 74, \quad (65)$$

Here, the dependent variable for country i in year t , $\ln(Y_{it})$, is the population-scaled annual actual listing count adjusted for the number of targets (public and private) of publicly traded acquirers. δ_i and τ_t are country and year-fixed effects, respectively, D_{US} is a dummy variable taking a value of 1 if the country is the US, and 0 otherwise, and X_{it} is a set of country-specific control variables (anti-self-dealing index, $\log(\text{GDP/capita})$ and GDP growth) in year t .

For a given γ_t , the merger-adjusted US listing gap in year t (expressed as the number of firms) is then computed as follows:

$$Y_{US,1990} \times POP_{US,t} \times (e^{\gamma_t} - 1), \quad (66)$$

where $POP_{US,t}$ is the US population. In other words, computing the US listing gap for year t in terms of the total number of firms involves multiplying three items: the US listing count per capita in 1990, the corresponding population or GDP scaling variable in year t , and the antilogarithm of γ_t minus one.

regulations governing US transactions in the market for corporate control. Levine (1997), La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997), and Demirguc-Kunt and Maksimovic (1998) present evidence of the high degree of minority shareholder protection afforded by the US legal system.

Figure 25: **Aggregate stock exchange listing counts around the world, 1980–2020.**

This figure, which updates Figure 1 in Doidge, Karolyi, and Stulz (2017), shows the total number of domestic listed firms in 74 of the 100 countries with the highest gross domestic product (GDP) in 2020 according to the International Monetary Fund (IMF). The 74 countries represented 96% of the world's GDP in 2020. The IMF classifies 33 countries as advanced economies and 41 as developing or emerging economies. The US listing count is from CRSP and consists of firms with common stock listed on the NYSE, AMEX, or Nasdaq. Non-US listing counts are found using the World Bank's World Development Indicators (WDI), World Federation of Exchanges (WFE), ISI Emerging Market Group's CEIC database (CEIC), and exchange homepages. Investment companies, mutual funds, real estate investment trusts, and other collective investment vehicles are excluded. The vertical dotted line in 1996 marks the year of the US listing peak. Figure adapted from Eckbo and Lithell (2025).

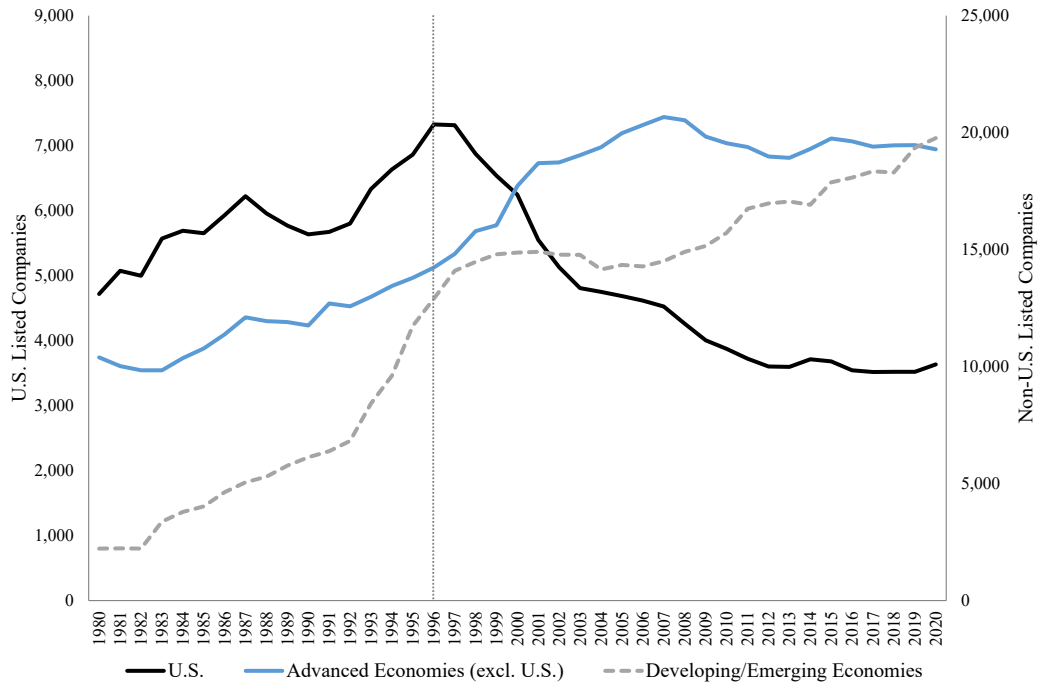
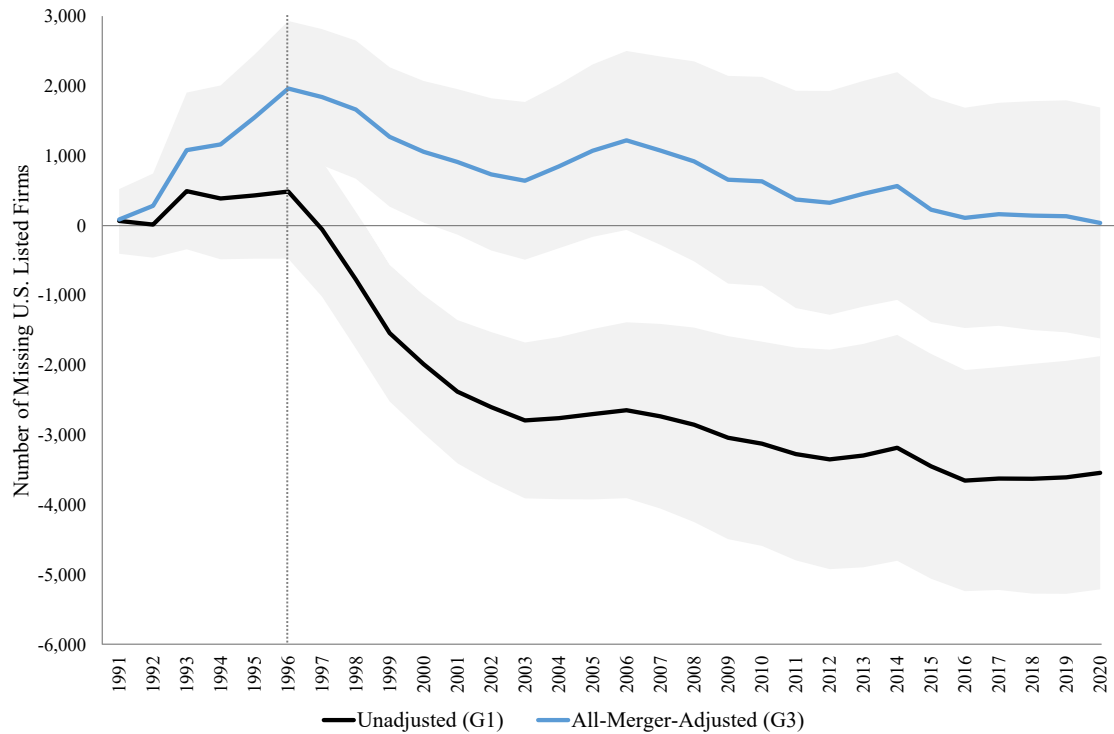


Figure 26: **Population-scaled unadjusted and merger-adjusted US listing gaps.**

The unadjusted gap uses the actual listing counts (unadjusted for merger activity). The merger-adjusted listing gap is adjusted for both public and private targets of public acquirers around the world (data from SDC). The vertical dotted line indicates the year of the US listing peak. The shaded grey area displays 90% confidence intervals. Figure adapted from Eckbo and Lithell (2025).



The annual gap estimates computed using Eq. (66) above are plotted in Figure 26. As shown, the unadjusted listing gap, first shown by Doidge, Karolyi, and Stulz (2017) (with a comparable regression specification) to be negative and statistically significant in all years 1999–2012, is negative and significant also up through 2020. However, reflecting the unique US market for corporate control, the merger-adjusted listing count is never negative—largely insignificant following a brief period after the listing peak in 1996 where it is significantly positive.⁸⁶

13 Does antitrust policy deter anti-competitive mergers?⁸⁷

As reviewed above, the bulk of the available empirical evidence shows that the typical merger produces significantly positive combined announcement-induced abnormal stock returns to bidders and targets. A standard interpretation is that the wealth effect is the present value of future expected increases in the merging firms’ operating margins (the spread between future revenues and costs). In this section, we review studies attempting to tease out whether the wealth effect predominantly originates in cost reductions (efficiency effects) or in revenue increases (market power effects).

13.1 Efficiency versus market power: predictions

Eckbo (1983) and Stillman (1983) develop a test approach based on stock prices rather than product price data to infer the anti-competitive significance of horizontal mergers.⁸⁸ On the one hand, the (combined) abnormal stock returns to the bidder and the target cannot be used to discriminate between efficiency and market power hypotheses: these returns represent the *net* effect of expected cost reductions and revenue increases. On the other hand, merger-induced changes in expected future product and factor prices

⁸⁶For the year 2012—the last year in the sample period of Doidge, Karolyi, and Stulz (2017)—the unadjusted listing gap is -5,436 firms versus -3,289 firms in Figure 26 shown here (both significant at the 1% level), respectively. As EL25 explain, this difference in the number of “missing” firms relative to the foreign stock exchanges is primarily driven by Doidge, Karolyi, and Stulz (2017)’s inclusion of the common listing trend τ_t in Eq. reg:gapreg in their estimate of the listing gap itself. The two estimates also differ somewhat because EL25 adjust for the growth in the dependent-variable scaling factor and take the antilog of γ_t (as per Eq. 66). Other differences arise because of EL25’s inclusion of country fixed effects, somewhat different data sources for the listing count, a slightly different set of sampled countries, and a longer sample period (1990–2020 instead of 1990–2012). Finally, adjusting for public targets only or scaling the listing count by GDP instead of population affects the size of the estimated listing gap, but results in the same empirical conclusions.

⁸⁷This section reproduces Section 6 in Betton, Eckbo, and Thorburn (2008) as the main empirical evidence and conclusions remain unchallenged to date and so represent an integral part of the scientific evidence on corporate takeovers.

⁸⁸Examples of merger studies examining product price and output data are Barton and Sherman (1984) on microfilm; Borenstein (1990), Werden, Joskow, and Jonhson (1991), Kim and Singal (1993) and Singal (1996) on airlines; Akhavein, Berger, and Humphrey (1997), Prager and Hannan (1998) and Focarelli and Panetta (2003) on banking; and Dafny (2009) on hospital mergers.

translate into abnormal stock returns to industry rivals (as well as upstream suppliers and downstream customers) of the merging firms. In particular, a collusive, anti-competitive merger raises the product price and thus benefits the non-merging rivals as well. This means that evidence of a negative industry wealth effect of a merger announcement is inconsistent, with the merger having collusive, anti-competitive effects on its industry.

A positive industry wealth effect is necessary but not sufficient to conclude in favor of the collusion hypothesis. The reason is that the industry wealth effect of an efficient merger may be either positive or negative. On the one hand, scale-increasing efficient mergers tend to have a negative impact on the industry's equilibrium product price, which harms rival firms and by itself causes a negative industry wealth effect.⁸⁹ On the other hand, news of the merger may reveal positive information about the value of the resources controlled by the rival firms. That is, the merger may reveal increased demand for resources owned by other firms, causing a positive revaluation of these rivals. For example, the increased demand may lead to expectations of future merger activity, resulting in a positive "in-play" effect on rival firms from the announcement of the initial merger. In sum, the efficiency hypothesis does not restrict the abnormal returns to industry rivals.

As summarized in Table 7, which is reproduced here from Eckbo and Wier (1985), these predictions can be refined further by distinguishing between public announcements that either increase or decrease the probability of a merger in the industry. The table adds predatory pricing as a variant of the market power hypothesis. The predation theory holds that the merger provides an incentive for the bidder firm to increase output and drive product prices down until rivals exit—at which point output is cut back to the monopoly level. Thus, both predation and productive efficiency arguments predict a lowering of the product price (albeit in the short run under the predation argument), which harms rivals.

An event decreasing the probability of the merger is the announcement of a decision by US antitrust authorities (Department of Justice or Federal Trade Commission) to challenge the proposed merger with violation of antitrust laws (Section 7 of the 1914 Clayton Act).⁹⁰ As is seen from Table 7, the only pattern of abnormal stock returns to rival firms at once inconsistent with the market power hypothesis

⁸⁹Rivals may minimize the negative product price impact by racing to adopt similar technological innovations as the merging firms—prompting industry merger waves.

⁹⁰Section 7 of the Clayton Act replaced Section 2 of the 1890 Sherman Act as the principal federal antitrust law regulating corporate mergers and acquisitions. A *potential* threat to competition constitutes an offense under this law, and it is not necessary to prove a horizontal relationship between the combining firms. Furthermore, anticipated or demonstrated economic efficiencies are not a defense against the illegality of a merger that may lessen competition.

Table 7: **Predicted abnormal returns to merging firms and their industry rivals**

The table shows the predicted abnormal returns to merging firms and their industry rivals under market power and productive efficiency hypotheses, classified by whether the event increases or decreases the probability of a merger in the industry. Examples of positive information effects on rival firms are the cases where the merger announcement reveals possibilities for efficiency gains that are also available to non-merging rivals, and the cases where the merger signals an increase in demand for resources generally owned throughout the industry of the merging firms. Adapted with permission from Eckbo and Wier (1985).

Theory predicting the source of the merger gains	Abnormal returns to merging firms	Abnormal returns to industry rivals
A. Events increasing the probability of merger (e.g. initial merger proposal announcement)		
Market Power:		
(1) Collusion	<i>Positive</i> (monopoly rents)	<i>Positive</i> (monopoly rents)
(2) Predatory pricing	<i>Positive</i> (monopoly rents)	<i>Negative</i> (costs of price war)
Productive Efficiency:		
(3) Productivity increase	<i>Positive</i> (cost savings)	<i>Negative</i> (competitive disadvantage)
(4) Information	<i>Positive</i> (undervalued resources)	<i>Zero or Positive</i> (undervalued resources and/or opportunities for productivity increases)
B. Events decreasing the probability of merger (e.g., antitrust complaint blocks the merger)		
Market Power:		
(1) Collusion	<i>Negative</i> (loss of monopoly rents)	<i>Negative</i> (loss of monopoly rents)
(2) Predatory pricing	<i>Negative</i> (loss of monopoly rents)	<i>Positive</i> (avoiding price war)
Productive Efficiency:		
(3) Productivity increase	<i>Negative</i> (loss of cost savings)	<i>Positive</i> (avoiding competitive disadvantage)
(4) Information	<i>Zero</i> (information already out)	<i>Zero</i> (information already out)

and consistent with the efficiency hypothesis is one where the rivals experience non-negative returns in response to *both* probability-increasing and probability-decreasing events. Moreover, the collusion hypothesis is rejected unless one observes positive rival returns to the initial merger proposal, followed by negative returns to news of the antitrust action. The predation theory is rejected unless a price pattern opposite to the pattern under the collusion theory is observed.

This shows that information on the abnormal return to rival firms in principle has the power to test market power hypotheses. This is true even if a given merger has a combination of productive efficiency and market power effects (so the rival firm's performance reflects the net effect of the two). Tests of the predictions in Table 7 do, however, presume that collusion and predation are mutually exclusive market power effects (since you would otherwise be netting out positive and negative rival effects at both announcements). It is common in the theoretical literature, as well as in the practice of antitrust policy, to treat these two market power theories as separate.

Further refinements of the predictions in Table 7 are possible. Schumann (1993) suggests that market power theories may have different implications for rivals with small versus large market shares. Fee and Thomas (2004) and Shahrur (2005) follow the suggestion of Eckbo (1983) to examine the wealth effects of mergers also for customers and suppliers. The two papers develop similar predictions, reproduced here as Table 8 from Table 1 in Shahrur (2005). The major focus in these two studies is on the "buyer power" hypothesis (last column), i.e., the possibility that the merger increases the monopsony power of the combined firm over its input suppliers. In this case, the merger benefits the merging firms and (possibly) their industry rivals at the expense of upstream suppliers. Consumers benefit as well, provided some of the increased monopsony rents are passed on downstream from the merging firms' industry. Evidence on customer performance also helps resolve a possible ambiguity from looking at rival firms' performance alone. For example, while evidence of a positive rival firm performance in response to the merger-proposal announcement does not discriminate between collusion and efficiency, collusion is rejected if customers also benefit.

Tests of predictions such as those in tables 7 and 8 are likely to pick up an "in-play" effect in the abnormal returns to rival firms in response to merger announcements. The in-play effect, which motivates the positive information effect predicted by hypothesis (4) of Table 7, occurs when the merger event increases the probability that the rivals may become targets. An in-play effect follows naturally from the fact that rival firms use similar production technologies and own some of the same (and possibly scarce)

Table 8: **Predicted abnormal returns to merging firms, rivals, customers, and suppliers**

Table adapted with permission from Shahrur (2005).

	Productive efficiency	Collusion	Buyer power
Merging firms:	<i>Positive</i> More-efficient production will result in higher inframarginal rents to the merging firms	<i>Positive</i> Higher likelihood of collusion will result in increased monopoly rents to the merging firms (Eckbo, 1983)	<i>Positive^a</i> Lower input prices due to intensified competition among suppliers (Snyder, 1996)
Rivals:	<i>Unrestricted</i> <u>Positive</u>: information regarding industry-wide restructuring. <u>Negative</u>: more intense competition in the industry due to a new, more-efficient combined firm (Eckbo, 1983)	<i>Positive</i> Higher likelihood of collusion will result in increased monopoly rents to rival firms (Eckbo, 1983)	<i>Positive^a</i> Lower input prices due to more intense competition among suppliers (Snyder, 1996)
Customers:	<i>Unrestricted^b</i> <u>Positive</u>: scale-increasing mergers. <u>Negative</u>: scale-decreasing mergers	<i>Negative</i> Restricted output in the takeover industry results in lower demand for suppliers' output	<i>Unrestricted^c</i> <u>Positive</u>: benefit from lower input costs for merging firms. <u>Negative</u>: supplier underinvestment
Suppliers:	<i>Unrestricted^b</i> <u>Positive</u>: scale-increasing mergers. <u>Negative</u>: scale-decreasing mergers and/or more-efficient combined firm	<i>Negative</i> Restricted output in the takeover industry results in lower demand for suppliers' output	<i>Negative^a</i> The increased buyer power of the merging firms will intensify competition among suppliers (Snyder, 1996)

^aEfficient mergers can be of the scale-increasing or the scale-decreasing types (see, e.g., Eckbo (1992); Andrade and Stafford (2004)). If the merger is expansionary in nature, it should benefit customers. Suppliers can benefit from a scale-increasing merger as long as the positive effect of expansion is not outweighed by the adverse effect of the increased efficiency of the combined firm. Finally, an efficient merger of the scale-decreasing type can hurt customers and suppliers.

^bSnyder (1996) shows that by creating a larger buyer, a horizontal merger can result in more intense competition among suppliers, which will benefit the merging firms and their rivals at the expense of suppliers.

^cCustomers may benefit from the increased buyer power if some of the gains resulting from lower input prices are passed on to them because of the competition in the takeover industry. Customers can also suffer if the increased buyer power induces suppliers to underinvest.

productive resources. A takeover may signal increased resource scarcity, causing a positive revaluation of every firm holding those resources. The findings of most of the studies discussed below are consistent with such a positive industry information effect.⁹¹

Banerjee and Eckard (1998) and Fridolfson and Stennek (2005) suggest that since a successful merger bid eliminates rival firms as potential merger partners for the target, there could be a negative "out-of-play" effect for these rivals. Such a negative effect might attenuate a positive effect due to market power. In their sample of largely conglomerate takeovers (where there arguably are no market power effects), Betton and Eckbo (2000) document *positive* rival firm performance when the rival learns that it has lost the target. While the idea of an out-of-play effect is interesting and consistent with formal competitive takeover models such as Akdogu (2011) and Molnar (2007), we are unaware of evidence favoring a significant out-of-play effect on rival firms.

13.2 Effects of merger on rival firms

Table 9 lists a number of empirical studies providing estimates of the industry wealth effects of horizontal mergers, beginning with Eckbo (1983) and Stillman (1983). Eckbo (1983) examines intra-industry wealth effects of 191 horizontal mergers in the US between 1963 and 1978, 65 of which were challenged by either the Department of Justice or the Federal Trade Commission for violating Section 7 of the Clayton Act. A sample of 68 vertical mergers, of which 11 were challenged, is also examined. For each merger, a set of horizontal competitors of the merging firms that were listed on the NYSE or the ASE at the time of the merger proposal announcement is identified.

The rivals are defined based on overlapping 5-digit Standard Industrial Classification (SIC) codes (identified using product-specific names of the relevant product markets). For the challenged mergers, the relevant product market is the one identified in court records as being the market 'threatened' by the 'anti-competitive' merger. For unchallenged mergers, the relevant product market is the target's major product line, as defined in the Standard & Poor's Registry of Corporations. As shown by Eckbo and Wier (1985), the empirical results based on the 5-digit SIC rivals are robust: They duplicate the tests using rivals identified by the DOJ or the FTC as being relevant competitors, and they draw the same inferences. To test the hypotheses in Table 7, the paper reports estimates of the abnormal stock returns

⁹¹Exceptions are Eckbo (1992), Akdogu (2009), and Becher, Mulherin, and Walkling (2012) who find a negative industry wealth effect of multi-industry horizontal merger announcements in Canada, and in single-industry studies of the US telecommunications and utility firms, respectively.

to the merging firms and their horizontal rivals (i) relative to the merger proposal announcement and (ii) relative to the subsequent announcement that the DOJ or the FTC has filed a Section 7 complaint against the horizontal merger.

Eckbo (1983) reports that the observed sequence of abnormal returns across the proposal and antitrust complaint announcements do not follow the pattern predicted by the collusion hypothesis. Rivals of the 65 challenged horizontal mergers earn small but significantly positive abnormal return around the merger proposal announcement, followed by zero or positive abnormal returns in response to the antitrust complaint announcement.⁹² The antitrust complaint causes a negative average abnormal return of -10%

⁹²The industry wealth effect of the merger is estimated by first forming an equal-weighted portfolio of the rivals of a given target and then estimating the portfolio abnormal return. Let $AR(t_1, t_2)$ denote the average of these portfolio estimates, where the period of cumulation is $t_2 - t_1 + 1$ days around the event-announcement day (day 0). Eckbo (1983) reports $AR(-1,1)=0.10\%$ and $AR(-10,5)=1.17\%$ relative to the merger proposal (significant at the 5% level), and an insignificant $AR(-1,1)=0.17\%$ relative to the antitrust complaint announcement. Eckbo (1983) also reports that complaints by FTC causes a significantly *positive* industry wealth effect of $AR(0)=0.74\%$.

Table 9: **Stock-market studies examining industry wealth effects of horizontal mergers**

Table adapted and extended with permission from Betton, Eckbo, and Thorburn (2008).

Study	Merger Sample	Selection of Industry Rival, Customers and Suppliers	Key Findings
Stillman (1983)	11 US horizontal mergers challenged by DOJ or FTC with violating Section 7 of the Clayton Act, 1964–72	Rival firms identified in antitrust litigation reports and antitrust enforcement agency fact memoranda	Zero average abnormal returns to rivals. Results inconsistent with market power effects of the sample mergers
Eckbo (1983)	191 US horizontal and 68 vertical mergers between mining or manufacturing firms operating nationally, 1963–78. 65 horizontal and 11 vertical mergers were challenged by DOJ or FTC under Section 7	Rival firms selected from the major target industry using a <i>five</i> -digit SIC-based product classification procedure created by the author. For challenged mergers, the relevant industry is identified using court documents	Rival firms earn zero or positive abnormal returns in response to both the initial merger proposal announcement and the subsequent antitrust complaint. Results inconsistent with the market power (collusion) effects of the horizontal mergers
Eckbo and Wier (1985)	82 US challenged horizontal mergers, 1963–81, including 65 from Eckbo (1983). 17 cases occurred after the passage of the 1978 Hart-Scott-Rodino Antitrust Improvements Act	Two sets of rivals: one based on five-digit SIC codes as in Eckbo (1983), and another identified in antitrust litigation reports	Rival firm performance inconsistent with market power either before or after 1978. This conclusion holds for both sets of rivals
Eckbo (1985)	266 US merger proposals (196 horizontal, 98 challenged), including those in Eckbo (1983) and Eckbo and Wier (1985), 1963–81	Rivals selected using the 5-digit SIC code procedure of Eckbo (1983)	Industry wealth effect <i>negatively</i> related to merger-induced increase in industry concentration. Inconsistent with predictions of the Market Concentration Doctrine
Eckbo (1992)	471 merger proposals (312 horizontal), 266 between US firms and 205 between Canadian firms, 1963–82. 80 of the US horizontal mergers were challenged under Section 7, none of the Canadian mergers were challenged	Rivals for both US and Canadian mergers were identified using the 5-digit SIC code procedure of Eckbo (1983)	No evidence of market power despite no antitrust deterrence of anti-competitive mergers in Canada until 1985. Industry wealth effect <i>negatively</i> related to a merger-induced increase in industry concentration.

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Study	Merger Sample	Selection of Industry Rivals, Customers and Suppliers	Key Findings
Schumann (1993)	37 acquisitions challenged by the FTC, 1981–87	Rival firms identified using antitrust litigation reports	Positive rival firm performance at merger proposal and zero or positive at the antitrust complaint. At the complaint, rival returns lower the greater the merger-induced change in concentration
Fee and Thomas (2004)	554 proposed (four-digit SIC) US horizontal mergers between publicly traded firms from SDC, 39 challenged under Section 7, 391 deals completed, 1981–1997	Identifies single- and multiple-segment rivals in the same 4-digit horizontal industry using Compustat industry segment information. The segment information also helps identify customers and suppliers	Evidence inconsistent with increased monopolistic collusion but consistent with improved efficiency and buying power of merged firm
Shahrur (2005)	463 successful (four-digit SIC) US horizontal mergers and tender offers from SDC, 1987–99	Identifies single-segment rivals, and customer and supplier firms, using Compustat industry segment information	Evidence inconsistent with increased monopolistic collusion, but consistent with improved efficiency and buying power of merged firm
Aktas, de Bodt, and Roll (2007)	290 proposed horizontal mergers in the European Union, of which 55 were subjected to "in-depth investigation" for potential antitrust violation. Bidder is a non-EU firm in 104 cases	Rival firms identified in same country and industrial sector as target using Hoover's Online Database, European Commission Web Site, and Datastream	Negative rival abnormal performance around merger proposal announcements. Suggests the sample mergers enhance industry competitiveness
Akdogu (2009)	N=275, of which 115 (four-digit SIC) US horizontal takeover bids in the telecommunications industry, 1996–2005	Rivals firms identified using SDC and CRSP, using SIC code 4813.	Evidence of negative industry wealth effect of the acquisition bids. Conclude that acquirers are, on average, expected to gain a competitive advantage from the takeovers.

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Study	Merger Sample	Selection of Industry Rivals, Customers and Suppliers	Key Findings
Bhattacharyya and Nain (2011)	615 successful (four-digit SIC) US horizontal mergers, 1989-2000, from SDC	Use Bureau of Economic Analysis benchmark Input-Output tables to identify the fraction of the supplier industry's output sold to the merging industry	Conclude with increased buying power based on post-merger decline in supplier product prices
Shenoy (2012)	453 successful vertical mergers, 1981-2004	Use Bureau of Economic Analysis benchmark Input-Output tables to identify the main customer industries and rivals. Customer portfolios based on single-segment firms	Evidence fail to support market power but are consistent with vertical mergers having efficiency effects
Becher, Mulherin, and Walkling (2012)	384 successful mergers between electric utilities, 1980-2004	Rival firms are all public utilities with assets > \$500 mill.	Evidence inconsistent with market power but consistent with efficiency (synergy) effects of the horizontal mergers

to the *merging* firms. This means that the antitrust complaint comes as a surprise to the market, which in turn means that the complaint announcement has the requisite power to test the market power hypothesis using rival firm returns. This pattern of abnormal return to rival firms is inconsistent with the predictions summarized in Table 7 of the collusion hypothesis but is jointly consistent with the efficiency and information arguments. Stillman (1983) performs a similar set of tests on 11 horizontal, challenged mergers from the period 1964–1972 and finds zero average abnormal rival stock returns relative to both merger announcements and antitrust complaints. Thus, both Eckbo (1983) and Stillman (1983) conclude against the market power hypothesis. Eckbo (1983) also reports that the average intra-industry wealth effect of unchallenged horizontal mergers is indistinguishable from the average intra-industry wealth effect of unchallenged vertical mergers. Since vertical mergers are unlikely to have collusive effects, this further supports the view that the horizontal unchallenged mergers in the sample were not expected to be anti-competitive.

Schumann (1993) also examines the effect on rival firms of horizontal merger proposals and antitrust complaints. His sample consists of 37 cases from 1981–1987 that were challenged by the FTC, a period with less antitrust intervention than in the sample periods of the earlier studies. Rival firms are identified

using antitrust litigation reports, much as in Eckbo and Wier (1985). The results for the total sample, which indicates significantly positive rival returns at the proposal announcement and zero at the time of the antitrust complaint, are “remarkably similar to those reported in Eckbo (1983) and Eckbo and Wier (1985)” (Schumann, 1993, p 681). For a subsample of 97 rivals with available data on market shares, Schumann also reports that rivals in the smallest market-share quartile have the largest abnormal returns and that these are significantly positive at both the proposal and complaint events. Following the predictions in Table 7, these findings contradict the collusion (market power) hypothesis.

Several studies also document significantly negative abnormal returns to rival firm portfolios in response to the announcement of horizontal mergers. Eckbo (1992) finds a negative industry wealth effect of horizontal merger announcements in Canada. Aktas, de Bodt, and Roll (2007) study horizontal mergers in the European Union, several of which several subjected to a preliminary antitrust review. They report significantly negative rival abnormal returns. Akdogu (2009) finds negative rival abnormal returns in response to horizontal takeover bids in the US telecommunications industry. Becher, Mulherin, and Walkling (2012) document a significantly negative industry wealth effect in a large sample of horizontal mergers between US electric utilities. All of these studies reject the market power hypothesis and conclude that the typical sample merger would likely enhance efficiency.

13.3 Effects of merger on suppliers and customers

Fee and Thomas (2004) and Shahrur (2005) estimate the effect of horizontal mergers on rivals and, in particular, on upstream suppliers and downstream customers, over the period 1981–99. These two studies provide new tests of market power theories based directly on the wealth effects for suppliers and customers. Moreover, by revisiting abnormal returns to rivals during a time period with relatively lax US antitrust enforcement in the merger area, they provide a perspective on the generality of the findings of earlier studies on industry wealth effects.

Starting with the evidence on rival firms, both studies report a statistically significant, positive industry wealth effect in response to the merger proposal announcement. Abnormal returns to portfolios of single-segment rival firms average 0.54% in Fee and Thomas (2004) and 0.39% in Shahrur (2005). These results are close to the early results in Eckbo (1983), and with those in Song and Walkling (2000). The evidence confirms that the composition of the rival firm portfolios in this literature yields sufficient

power to register the industry wealth effects of horizontal mergers.⁹³ Moreover, as Eckbo (1983), Fee and Thomas (2004) report significantly positive rival firm abnormal returns in response to news of antitrust action against the proposed merger.⁹⁴ Thus, consistent with the earlier literature, Fee and Thomas (2004) rejects the collusion hypothesis for the horizontal-merger gains.

Fee and Thomas (2004) and Shahrur (2005) identify customer and supplier information using Compustat's industry segment files. These files record information mandated by the Federal Accounting Standards Board (FASB) rule No. 14 during their sample period. Under this rule, firms were required to report financial information for any industry segment comprising more than 10% of consolidated yearly sales, assets or profits.⁹⁵ This reporting requirement also discloses the identity of any customer representing more than 10% of the total sales, as well as the company segment that was primarily responsible for those sales. Both studies also use sales data to identify suppliers and customers that are particularly dependent on (specialized to) the industry of the merged firm.

Under the monopoly (collusion) hypothesis, the merging firms and their rivals gain at the expense of customers. Fee and Thomas (2004) and Shahrur (2005) reject this hypothesis as they find no systematic evidence of customer losses, even for customers who are particularly reliant on the merging firm's industry. There is also evidence that the mergers with the largest gains to the merging firms also produce gains to customers. Fee and Thomas (2004) concludes that "Taken together, the customer and rival results are strongly inconsistent with the monopolistic collusion hypothesis" (p. 457). Shahrur (2005) states that "Our overall evidence suggests that the lenient antitrust policy in recent years does not appear to have resulted in predominantly anticompetitive" (p. 93). These results support the conclusion in Eckbo (1992) that, when it comes to the need for using antitrust policy to strongly deter potentially anti-competitive mergers, "Judging from the evidence, there simply isn't much to deter" (p. 1028).

Fee and Thomas (2004) and Shahrur (2005) find some evidence of losses to upstream suppliers of the merging firms and conclude that horizontal merger tends to increase buying power. Increased buying power follows if the merger increases monopsony power or if it forces upstream suppliers to be more efficient. Fee and Thomas (2004) argue that if the source of buying power is upstream efficiency, then the losses to suppliers will be asymmetric—with losses only to those suppliers that are not retained post-

⁹³See Eckbo (1983, 1989, 1992), McAfee and Williams (1988), and Schumann (1993) for discussions of power issues in the selection of rivals.

⁹⁴Shahrur (2005) does not study antitrust events.

⁹⁵After 1998, SFAS No. 131 governs required segment disclosures.

merger. That is, those suppliers that lose a bidding competition post-merger would suffer. They do, in fact, find that the wealth effect for suppliers depends significantly on the supplier's ability to retain its product-market relationship with the merged entity. Only the suppliers that are terminated experience negative abnormal returns around the merger announcement and significantly negative cash flow changes post-merger. Suppliers that are retained experience increases in market share and do not show evidence of abnormal stock returns or changes in operating performance. The authors, therefore, conclude that the effect of the merger on suppliers reflects efficiency-increasing buying power. Shahrur (2005) reaches a similar conclusion: "Along with the evidence in Fee and Thomas (2004), our results suggest that industry consolidations can help increase the efficiency of upstream industries" (p. 96).

Bhattacharyya and Nain (2011) and Shenoy (2012) also focus on vertical buying power. Bhattacharyya and Nain (2011) sample 615 successful horizontal mergers and fail to find a significant announcement effect on the horizontal rivals. However, they find evidence of a reduction in the product price paid to upstream suppliers, which is consistent with increased buying power. Moreover, they find some evidence indicating that the upstream suppliers, perhaps feeling the squeeze from the increased buying power, restructure to counter the effect of the downstream horizontal merger. The authors suggest that the net effect of all this may have been to leave the market value of the horizontal rivals of the merging firms unchanged. Finally, Shenoy (2012) studies industry wealth effects of 453 successful *vertical* mergers and concludes that these, on average, have efficiency effects. This evidence is also consistent with the effects of vertical mergers first reported by Eckbo (1983).

13.4 Some implications for antitrust policy

13.4.1 The market concentration doctrine

The US government selects Section 7 cases against horizontal mergers largely on the basis of market share and industry concentration.⁹⁶ The agencies' reliance on structural standards for the selection of merger cases is rooted in the market concentration doctrine, one of the oldest and most controversial propositions in industrial economics: the market concentration doctrine. This doctrine holds that the level of industry

⁹⁶The Justice Department's Merger Guidelines of 1968 state market shares that were likely to trigger an antitrust complaint. The critical aggregate market shares varied according to the four-firm market concentration ratios. For example, a merger between two firms, each having 4 percent of the sales in a market with a four-firm concentration ratio of 75 percent or more, was likely to be challenged. The Department's 1982 Merger Guidelines use the Herfindahl Index of concentration and are somewhat less restrictive than the old guidelines, but their focus is also on market structure.

concentration is a *reliable* index of the industry's market power. The empirical implication is that a relatively high level of industry concentration, which in the presence of entry barriers is believed to facilitate intra-industry collusion or dominant-firm pricing, should be associated with relatively large industry-wide monopoly rents.

While not reviewed here, there is a large literature in industrial economics that uses panel estimation to identify the correlation between measures of industry profitability (e.g., price-cost margins) and industry concentration. While the DOJ's merger guidelines rely heavily on this literature, it is important to note that this literature itself (1) does not exploit shocks to industry concentration and (2) does not necessarily relate to merger activity. Eckbo (1985, 1992) address this criticism. Specifically, they point out that horizontal merger produces a measurable shock to the level of industry concentration, causing a treatment effect in the form of a change in the risk-adjusted present value of industry rents. Under the market concentration doctrine, this change in industry rents is increasing due to the change in concentration caused by the merger. Hence, the value-based test in the *changes* of the two variables (industry rents and concentration) increases power to test the market concentration doctrine relative to available panel-data analyses of this important issue.

Specifically, Eckbo (1985, 1992) provide empirical tests of the market concentration doctrine by estimating cross-sectional regressions of the following form:

$$AR_i = \alpha_0 + \alpha_1 CR_i + \alpha_2 dCR_i + \beta' \mathbf{Z}_i + e_i, \quad (67)$$

where CR_i is a measure of the pre-merger level of concentration in the industry where the horizontal merger is taking place, dCR_i is the change in concentration caused by the merger, $\mathbf{Z}_i$ is a set of firm- and industry-specific control variables, and AR_i is the abnormal return to an equal-weighted portfolio of the rivals of the merging firms around the merger proposal announcement. Under the market concentration doctrine, and assuming the sample includes some anti-competitive mergers, one should find that $\alpha_2 > 0$. This is because the AR of rivals of an anti-competitive merger represents increased monopoly rents, and the market concentration doctrine holds that the increase in monopoly rents will be larger the larger the increase in concentration caused by the merger. Furthermore, under the stronger proposition embedded in the anti-merger policy, which holds that a merger is more likely to have anti-competitive effects, the larger the pre-merger *level* of concentration, one should also find evidence of $\alpha_1 > 0$.

While the form of Eq. (67) is similar in spirit to the regression models typically estimated in the “structure-conduct-performance” (industrial organization) literature, there are some notable qualitative differences: For example, while the dependent variable AR measures directly the market value of the increase in industry profits expected to follow from the (merger-induced) increase in industry concentration, the tradition has been to regress an accounting measure of the level of industry profits on the level of concentration. The traditional approach has been criticized on the grounds that accounting profits are a poor proxy for economic profits and that any cross-sectional variation in the level of industry profits can simply reflect differences in risk. This criticism does not apply here since AR is measured using market values and represents a risk-adjusted change in the level of industry rents. Equally important is the fact that since Eq. (67) is specified in the form of changes in the central variables, α_2 can be meaningfully interpreted without specifying a complete structural model relating the level of industry profits to concentration.

Eckbo (1985, 1992) use the four-firm concentration ratio (CR_4) of the major four-digit SIC industry of the target firm to represent CR , while the change in the industry’s Herfindahl index (dH) measures dCR .⁹⁷ While data on CR_4 is generally available, the market shares of the bidder and target firms, which yield dH , were collected from case-related court records and publications. In the sample of challenged mergers in Eckbo (1985), the average level of CR_4 is 58 percent (ranging from 6 to 94 percent), while the average value of dH is 3.3 percent (ranging from 0.02 to 24.2 percent).

Both studies report a statistically significant negative coefficient on dH . In Eckbo (1985), increasing dH by 1% implies a reduction of 0.42% in the abnormal returns to the average portfolio of rival firms. Similar results emerge when one uses the abnormal returns to the *merging* firms as the dependent variable. The author notes that since the regressions of the type in Eq. (67) are based on challenged mergers, the results are biased in favor of the market concentration doctrine. Despite this potential bias, there is no evidence supporting the doctrine.⁹⁸

⁹⁷ $CR_4 \equiv \sum_{i=1}^4 s_i$, and $H \equiv \sum_{i=1}^n s_i^2$, where s_i is the market share of firm i , (in CR_4 the sum is over the four firms with the largest market shares), and n is the total number of firms in the industry. The change in the Herfindahl index caused by the merger between firms i and j in the same industry is therefore given by $dH = 2s_i s_j$.

⁹⁸ “[T]he evidence systematically rejects the antitrust doctrine even for values of industry concentration and market shares which, over the past four decades, have been considered critical in determining the probability that a horizontal merger will have anti-competitive effects” (Eckbo, 1992).

13.4.2 Did the 1978 Antitrust Improvements Act improve antitrust?

The 1976 Hart-Scott-Rodino (HSR) Antitrust Improvements Act significantly increased the legal powers of law enforcement agencies to obtain private information needed for judging a merger's anti-competitive impact before filing a complaint. The HSR Act addressed two perceived handicaps borne by the agencies charged with enforcing Section 7 of the Clayton Act. First, under the 1962 Antitrust Civil Process Act, the DOJ could not require third parties, such as competitors and trade associations, to provide information about corporate acquisitions until after a Section 7 complaint had been filed. This frequently caused the DOJ to drop an investigation altogether for lack of information or to file a "skeleton" complaint based on scant data. The HSR Act established the right of the DOJ to issue Civil Investigative Demands to the merging firms and to other parties not directly involved in the merger prior to filing a complaint. Second, until the HSR Act, the government could not require postponement of proposed acquisitions pending investigation. HSR required firms planning mergers to prenotify the FTC and the DOJ of the transaction, providing the agencies with time and information to prepare a case before merger consummation.

According to the FTC,⁹⁹ the notification requirements and delay have assured that "virtually all significant mergers or acquisitions occurring in the United States will be reviewed by the antitrust agencies prior to the consummation of the transaction." Moreover, the information provided by the parties "usually is sufficient for the enforcement agencies to make a prompt determination of the existence of any antitrust problems raised by the transaction." These assurances notwithstanding, Eckbo and Wier (1985) compare the anti-competitive significance of horizontal mergers challenged before and under the HRS Act and find no significant difference in their effect on rival firms. Moreover, they conclude that the pattern of abnormal stock returns to the industry rivals is inconsistent with the mergers having collusive anticompetitive effects both before and under the HSR Act. Based on this, they argue that the HSR Act is unlikely to have significantly increased the precision with which defendants are chosen by the antitrust agencies.

Why would the antitrust process, which many believe is designed to protect consumer interests, result in efficient mergers being blocked? Bittlingmayer and Hazlett (2000) suggest bureaucratic self-interest, political extraction, and private benefits. In this context, it is important to keep in mind that, while preventing efficient mergers harms consumers, the *rivals* of the merging firms benefit as they avoid having

⁹⁹6 FTC Ann. Rep. to Cong. concerning HSR ACT 11 (1983).

to face competition from an increasingly efficient merged firm. The rivals can indeed form a politically strong interest group in situations where they perceive a significant threat to their existing industry equilibrium. This industry capture theory is highlighted by Posner (1969) who asserts that the FTC is significantly impaired in its task of promoting the public interest, and claims that its investigations are initiated “at the behest of corporations, trade associations, and trade unions whose motivation is at best to shift the costs of their private litigation to the taxpayer and at worst to harass competitors” (p.88).

A case in point is Chrysler’s vocal opposition to the joint venture between GM and Toyota in 1983. At the time the venture was announced, Chrysler demanded publicly that the FTC take action to stop the venture because it would ‘harm competition’ in the automobile industry. An alternative interpretation of Chrysler’s opposition is that he suspected the venture would make GM a tougher competitor, placing Chrysler at a competitive disadvantage. In fact, Eckbo (1990a) find significant abnormal returns of -9% to Chrysler upon the announcement of the GM-Toyota joint venture. More recent cases in point include the airline industry, where Slovin, Sushka, and Hudson (1991) conclude that Civil Aeronautics Board interventions from 1965 to 1988 reduced competition and favored collusion among existing carriers. Bittlingmayer and Hazlett (2000) study the effect on the software and computer industry of 54 antitrust enforcement actions against Microsoft over the period 1991 to 1997, and strongly reject the actions would enhance efficiency. Also, Aktas, de Bodt, and Roll (2007), who study rival firm performance to antitrust interventions against mergers in the European Union, find evidence consistent with antitrust policy being used to protect EU firms from outside competition.

Since the anticompetitive significance of a horizontal merger does not represent a directly observable characteristic, policymakers are forced to rely on largely untested theories to justify their decisions. As noted by Stigler (1982), the economics profession has supplied “precious little” in the way of *tested* knowledge to support the market share and concentration criteria which (still) form the basis for US antimerger policy. As long as those responsible for antimerger policy continue to insist on rigid structural standards for evaluating the competitive effects of mergers, it is reasonable, given the evidence, that special interest groups, including those representing relatively inefficient producers and/or a rigid workforce, will continue to exploit antitrust policy towards mergers.

14 Conclusions and directions for future research

In this essay, we review recent theories and empirical evidence describing how bidders and targets navigate the takeover process from the decision to initiate through bid revisions and final acceptance (or rejection) of the offer. The navigation involves complex decisions where potential rival bidders are jockeying for competitive advantage using toehold acquisition, jump bidding, and the choice of payment method. The theoretical focus is on the ability of first-price or English (ascending price) auctions with two competing bidders and a single (pivotal) seller to describe actual bidding outcomes. The auction framework is also useful for explaining the outcomes of merger negotiations, as it effectively describes the outside options during bargaining. The following summarizes some of the main findings discussed above and offers some directions for future research.

14.1 Deal initiation

An important recent finding is that, contrary to conventional wisdom, a surprisingly large fraction of control bids for public targets—close to 50%—are initiated by the target itself. In theory, since bidders are less likely to initiate when the initiation itself may reveal private information to potential rival bidders, this may indicate a high degree of correlated bidder valuations in a large number of takeovers, especially towards the later sample period. This possibility also finds some support by recent time-series evidence on bidder announcement returns, which shows a marked decline in the degree of bidder uniqueness (bidder fixed effects) and a corresponding increase in the common component in bidder announcement returns relative to the 1980s.

Having said that, we still know relatively little about what factors trigger deal initiation by the *seller*: Other than initiating a sale as part of a bankruptcy process, why does the seller decide to sell the firm off at a particular time? Is it driven by news about potential buyers or by changes in the seller? And does the seller's board decide to sell because it thinks the target is undervalued by potential bidders, or is it the opposite—perhaps due to pressure from large active shareholders? Also, what is the role of executive compensation in creating incentives for the target firm to initiate its own sale, and what role do financial intermediaries (investment banks) play?

While explicit deal initiation by a seller shareholder appears to be somewhat rare from Figure 5 above, implicit pressure from large active shareholders may still be important. However, to fully understand the

initiation decision, it is also necessary to map out the private phase of the process leading to a takeover, on which data is only starting to emerge.

14.2 Toehold bidding

Notwithstanding high initial offer premiums and that toehold bidding is associated with a higher probability of winning the target, toehold bidding is rare—it is observed in less than 5% of the successful bids after the 1980s. Empirical research documents that, contrary to theory, few bidders acquire a toehold in the target—except when the bid is unsolicited or deemed hostile, in which case almost half of the bidders have a toehold. Moreover, when bidders do acquire a toehold, it is typically large—averaging 20% of the target.

One suggestion for these empirical observations is that large (perhaps costly) toeholds may be necessary to overcome target management resistance to bidders who threaten to remove target executives' private benefits of control. That is, as asymmetric toeholds may provide a competitive advantage in terms of the likelihood of bid success, it may also increase the target management's expected loss of personal control benefits. This expectation may, in turn, trigger the target to impose resistance costs on toehold bidders.

An interesting area for research is whether the low frequency of toeholds and the prevalence of seller-initiated deals are related. That is, acquiring a toehold (or not) may be part of a strategy for a potential bidder to indicate an interest in a particular type of target firm. As the evidence seems to suggest, the prospect of target resistance may dissuade some potential bidders from approaching the target without a toehold.

Also, the empirical evidence on toehold bidding is primarily based on US data. Historically, it has been difficult to obtain data on US share ownership on a large scale. This has changed recently with the spread of computer programs designed to crawl web-based SEC filings for information. An interesting research question is to use information on CEO ownership data to test whether target CEOs with relatively large share ownership are less willing to forego the large takeover premium even if the bidder has a toehold. If so, one would expect a greater fraction of bidders to have toeholds when they attempt to acquire targets with relatively concentrated ownership.

14.3 Offer premiums and bidder announcement returns

Offer premiums average 40+% of the target share price two months prior to the first bid for the target. The data shows that, following the initial public bid, rival bids enter the contest for the target in less than 10% of the sample, which suggests that the initial public bid effectively deters competition. Consistent with this proposition, offer premiums in single-bid contests average slightly above the average offer premium in multi-bid contests. Moreover, there is evidence that when rival bidders do enter the open auction, they do so quickly: within two weeks of the initial bid, which suggests correlated bidder valuations in those cases. Also, by some estimates, successive bid jumps are large (around 30%), which suggests the existence of significant bidding costs.

While the evidence on offer premiums in public offers for the target is comprehensive, it has one drawback: it uses a cross-sectionally fixed look-back period (typically two or three months) to identify the target's stand-alone value. This fixed look-back period risks identifying target prices that are already affected by takeover rumors resulting from the initial private takeover phase. Not surprisingly, given positive expected stock returns, the further back one looks to identify the baseline target price used to identify an effective offer premium, the higher the premium estimate will be on average.

Observed offer price markups are consistent with both parties to the deal viewing prebid target stock-price runup as reflecting a combination of rational market deal anticipation and an increase in the target's stand-alone value. The difficult empirical challenge is to establish the exact fraction of any premium estimate that is driven by deal anticipation as opposed to a target firm's stand-alone value increase conditional on rumors of a pending takeover.

As to bidder takeover gains, the annual average bidder announcement returns have remained relatively stable at about 1% over the past four decades. This may be surprising given the positive evolution in corporate governance practices of listed firms, which may suggest increasing acquirer skills in identifying potentially synergistic targets. Instead, new evidence shows that the low average announcement returns mask important changes in bidder composition, which trend towards *declining uniqueness* of the bidders' synergy-specific resources. At the same time, total deal synergies (the sum of target and acquirer gains) have increased over time, allowing the average total bidder return to remain at 1% despite the greater competition among rival bidders that goes along with a declining uniqueness. An important area for future research is to better understand the dual observation of increased deal synergies and reduced

acquirer uniqueness when it comes to generating those synergies.

Moreover, it is important to develop a richer theory of the takeover process itself. Two interesting directions are, first, to better understand how preemptive bidding interacts with information disclosure by the seller. In models of preemptive bidding, information acquisition is the bidder's choice. In practice, it is, at least partially, controlled by the seller through the design of the due diligence process. For example, if the seller has significant confidential information, the initial bidder may be reluctant to submit a definitive preemptive bid before seeing this information. However, the seller may be reluctant to disclose information to this bidder only and, rather, may demand that a simultaneous auction take place. Analyzing these aspects may also lead to a theory of when auctions or negotiations occur in equilibrium.

Second, it is interesting to analyze theoretically how the private sales process that occurs before the first public announcement of the takeover bid interacts with the public takeover process that takes place afterward. This would include various approaches designed to level the playing field among potential bidders, ranging from strategies based on a stalking horse in bankruptcy settings and symmetric toeholds outside of bankruptcy.

14.4 The payment method choice

The evidence shows that bidders are more likely to select stock as (part of) the payment method if the target is *better informed* about the bidder's true value. This evidence, which has recently been confirmed also for cases where a publicly traded bidder initiates the deal, is consistent with rational payment design under two-sided information asymmetry. Moreover, it directly contradicts behavioral theories of bidder opportunistic behavior since it is obviously more difficult to get away with selling overpriced bidder shares to a target that is highly informed about the value of those shares.

The evidence also shows that cash-rich bidders are as likely as cash-poor bidders to pay with stock, which fails to support the notion that stock offers necessarily signal bidder illiquidity. Moreover, the propensity to pay with cash is significantly higher when there is greater potential competition from private companies acquiring firms in the main industry of the target. This finding makes sense as private bidders are often constrained by the target to pay in cash, as target shareholders are reluctant to receive illiquid bidder shares. Overall, the payment method choice appears to be driven by adverse selection, internal capital structure considerations, taxes, and the nature of external competition among potential

bidders.

An interesting but understudied factor that may help further understand the payment method choice is the target ownership structure. Of particular interest is the possibility that a stock-financed deal may create a large legacy shareholder of the acquirer's stock. Creating a large ex post legacy shareholder may constitute a disincentive for the bidder to pay with stock for two reasons. First, it may require a bidder shareholder vote, which can delay the takeover process and create uncertainty about the final outcome.

As a case in point, in the aftermath of the stock market crash of March 2000, Ted Turner, a substantial target legacy shareholder from the AOL TimeWarner merger earlier that year, complained bitterly about the terms of the all-stock deal. The dot.com bubble burst only two months after the AOL TimeWarner merger agreement, causing a reduction of more than \$100 billion in the market value of the merged firm. Steve Case, the CEO of AOL, who continued as CEO of AOL TimeWarner, ended up leaving the firm two years later. Whether Turner's complaints caused Case to leave is difficult to say. However, to the extent that Turner's complaints made it more difficult to successfully integrate the two firms, it may be necessary to also evaluate this type of risk in the decision to pay with stock.

14.5 Two policy-oriented issues

While it is well known that merger activity involving listed acquirers affects the number of listed firms, it is only recently that this merger-driven listing dynamics has been fully quantified. This quantification is important since variations in the number of listed companies tend to be viewed as driven by changes in stock exchange net listing benefits. This view is particularly evident in the debate triggered by the 50% decline in the number of firms listed on the three major US stock exchanges (Nasdaq, NYSE, AMEX) that happened shortly after 1996. Moreover, the fact that the aggregate number of firms listed on the national stock exchanges of 73 other countries did *not* decline over the same period has created speculations of a relative US stock exchange listing disadvantage.

However, recent evidence shows (1) the post-1996 decline in US listings is primarily driven by mergers between public companies, (2) 80% of the foreign stock exchanges have at some time experienced a rapid "US style" post-peak decline—but at different times so that the aggregate number of listed firms nevertheless trends upwards, and (3) unlike in the US, the post-peak decline in other countries is *not* driven by merger activity involving public acquirers. Since the evidence also shows that US mergers between two listed firms on average generate large positive synergy gains, this suggests the existence of

a US listing *advantage*: A market for corporate control that assists US stock exchanges to both attract and retain firms under public ownership.

The second policy issue concerns whether the US antitrust policy towards horizontal mergers successfully identifies and blocks truly anticompetitive (inefficient) mergers. The empirical analyses reviewed here address this important issue using the industry wealth effect caused by the announcement of horizontal mergers—including mergers successfully challenged by the DOJ or the FTC for violating Section 7 of the US Clayton Act.

As this literature shows, the merger-induced industry wealth effect, which has the power to identify changes in industry rents caused by increased market power (if any), fails to support the classical collusion theory underlying the antitrust authorities' decision to block horizontal mergers. On the other hand, the same evidence is consistent with the hypothesis that the challenged mergers would have been efficient. Specifically, the evidence shows that horizontal mergers tend to create a positive industry wealth effect, which is best interpreted as reflecting market anticipation of future takeover premiums—a within-industry rival firm in-play effect—rather than anticipated monopoly rents.

The above evidence also implies that traditional measures of industry concentration fail to properly identify truly anticompetitive horizontal mergers. An important question for future research is to apply modern data-programming techniques to better identify the relevant extent of the market that may be vulnerable to merger-driven increases in market power.

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