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Accounting for Goodwill

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ABSTRACT

A significant portion of a merger's purchase price is allocated to goodwill. Currently, goodwill is not amortized but rather tested annually for impairment. When managers of acquiring firms care about earnings, goodwill's accounting treatment can have large effects on future earnings and may influence how much a manager will bid for a target company. We quantify the effects of goodwill accounting by estimating a structural model of corporate takeovers. Our estimates suggest accrual accounting increases buyout premia by an average of approximately 11 percentage points. If firms needed to amortize goodwill over 10 years, we estimate premia would reduce by 4.9 percentage points and M&A volume would shrink by 4.1% or $67 billion per year.

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Furthermore, the fraction of private equity acquirers would increase by 6.9 percentage points, shifting control over productive assets to the private and financial sector. Our results suggest the accounting treatment for goodwill has a meaningful effect on the market for corporate control.

JEL codes: D44, G32, G34, M40, M41

Keywords: goodwill; mergers and acquisitions; buyout premia; structural modeling

1. *Introduction*

Corporate mergers and acquisitions ("M&A") are some of the most important corporate activities, yet nearly half of the aggregate deal value is assigned to nonidentifiable intangible assets, which are represented as goodwill. As a result, goodwill has become the largest intangible asset on companies' balance sheets, resulting in 6.9% of total assets or $4.9 trillion in 2021. The size of goodwill suggests its accounting treatment can have significant implications for the combined company's future earnings and may alter an acquirer's willingness to pay (e.g., Graham, Harvey, and Rajgopal [2005], Darrough, Guler, and Wang [2014]). In this paper, we examine the economic consequences of goodwill accounting on the market for corporate control.

Current accounting standards treat goodwill as an indefinitely lived intangible asset tested annually for impairment. However, this accounting treatment is not without controversy. Standard setters have debated how to treat goodwill since at least the 1960s because it has the potential to significantly affect merger activity (Seligman [1982], Rayburn and Powers [1991], Ramanna [2015]). Most recently, the Financial Accounting Standards Board (FASB) considered changing the accounting of goodwill to amortization before deciding to drop the matter because amortization did not appear to be a clear improvement.[1]

Measuring the effect of goodwill accounting on the M&A market is challenging because how accounting treats goodwill can affect acquirers' private values for a target. But we do not observe these underlying private values—only the realized transaction prices. The transaction price, however, is an equilibrium outcome determined by the interplay between the valuation of the acquirer and the competition from other potential buyers. As a result, disentangling the competition effect from the valuation effect is necessary to recover the underlying values and quantify the role of goodwill accounting. To address these difficulties, we develop and estimate a model of corporate takeovers whereby potential acquirers offer bids based on their private values and the competition from others. Following Gorbenko and Malenko [2014] and Haile and Tamer [2003], we model takeovers as auc-

[1] See https://www.fasb.org/Page/ProjectPage?metadata=fasb-IdentifiableIntangibleAssetsandSubsequentAccountingforGoodwill-022820221200.

tions and assume the current market value serves as a reserve price, bidders do not bid above their private values, and bidders do not permit another bidder to win if they could have bid more and maintained a positive surplus. Using bid-level information for each takeover, this structure allows us to disentangle the competition effects from the underlying valuations of the bidders.

Our model distinguishes between two types of bidders: strategic and financial. Financial bidders, often private equity investors, seek to maximize fundamental value, that is, expected future cash flows.[2] Strategic bidders, such as competitors, suppliers, or customers, also want to maximize fundamental value but care about earnings as well. This preference for high earnings has been shown by prior research to affect takeover valuations (Lys and Vincent [1995], Andrade [1999], Ayers, Lefanowicz, and Robinson [2002]). Our model is agnostic about the precise reasons underlying these preferences and captures them in reduced form. Theoretically, such preferences may arise if a strategic bidder's manager is compensated based on reported earnings—either through explicit earnings targets or stock-based pay, given that stock prices are influenced by earnings. Thus, these bidders care about the accounting for goodwill because it influences reported earnings.

We allow the relative preference of earnings to cash flows to vary within the group of strategic bidders to account for the presence of private strategic bidders (who may care less about earnings) and differential earnings preferences among managers of public acquirers. As such, a strategic bidder's valuation depends not only on the fundamental value of the target, but also on the amount of goodwill created and its subsequent accounting treatment.[3]

We estimate our model using simulated maximum likelihood on 860 all-cash deals executed as takeover auctions on public targets from July 2001 until September 2022. Following Gorbenko and Malenko [2014], we allow the distribution of fundamental valuations to differ between financial and strategic bidders to account for potential differences in synergies. In line with prior literature, we find effective valuations of strategic bidders are higher and more dispersed than those of financial bidders. When we disaggregate these effective valuations into fundamental and accounting-driven components, we find the fundamental value that strategic bidders assign to a target is in expectation higher, owing to potentially higher synergies. Strategic bidders' accounting preferences further strengthen their willingness to pay because the acquisition cost relating to goodwill will not affect earnings until an uncertain later date when an impairment occurs. Because

[2] Throughout the paper, we use the terms "financial bidders" and "private equity bidders" interchangeably.

[3] Fundamental value refers the additional discounted cash flows that a target would generate for an acquirer. We use the terms fundamental and cash-based valuation interchangeably throughout the paper.

of discounting, strategic bidders value earnings in the near term more than later, so they do not internalize the full purchase price under goodwill impairment. Our estimates imply that, under the current impairment-only accounting regime, the average strategic bidder acts as if she only internalizes 86% of the acquisition price. Consequently, a strategic bidder has an effective valuation that exceeds her fundamental valuation and can therefore bid more aggressively.

An important reason why we estimate a model of merger activity is to quantify how the merger market would change under hypothetical accounting regimes. To do so, we simulate counterfactual takeover auctions to quantify both deal-level changes, such as deal premia, and broader distributive effects, such as the value of assets controlled by private equity investors. To understand how accounting influences takeovers, we compare the current regime with a benchmark where all bidders care only about their fundamental value, that is, cash flows. In this counterfactual, no bidder cares about future earnings and all bidders fully internalize the purchase price. Without the ability to delay recognizing some of the acquisition costs, strategic bidders' valuations fall by about 14%. After taking into account competition between different types of bidders, the average takeover premium declines by 11.3 percentage points, and aggregate deal values decrease by 10.1%.

Having demonstrated the sizable effect of accrual accounting on takeovers, we also compare the current regime with alternative regimes that would amortize goodwill. We focus on the hypothetical accounting regime where firms must amortize goodwill over 10 years, and goodwill is subject to annual impairment testing. Relative to the current accounting regime, we estimate that with a 10-year amortization schedule, the average bid premium declines by 4.9 percentage points and the number of deals failing increases by 13%. Together, these two effects reduce aggregate deal value by 4.1%. Overall, this reduction would equate to a reduction of $67 billion in deal value for 2021.

Under this alternative accounting standard, not only do transaction prices and aggregate deal values change, but so does the type of winners. Such changes in the makeup of winners can influence the ownership of a substantial portion of the economy and the economic surplus generated by mergers. Adopting an accounting standard that amortizes goodwill reduces the relative strength of strategic bidders because it leads to an earlier expensing of goodwill than an impairment-only standard. This earlier recognition decreases strategic bidders' target values but does not affect those of financial bidders. Our counterfactual simulations indicate this shift in strategic bidders' values increases the likelihood of a financial bidder winning the takeover from 30.4% to 37.3%. Combined with the changes in deal value, we estimate the increase in assets held by financial bidders to be 17.7%. As a result, private equity ownership of productive assets in the economy would increase, potentially heightening the SEC's existing concerns about the public investment universe shrinking. However, the weakened position of the strategic bidders with stronger earnings preferences potentially allows bidders with higher fundamental valuations to win. Taken together, our counterfactual results suggest that the welfare effect of an amortization regime are ambiguous.

Our paper makes two contributions. First, we add to the sizable takeover literature.[4] Several papers examine how takeovers are shaped by the composition of potential acquirers (Gorbenko and Malenko [2014], Gorbenko [2019]), the information environment (Gentry and Stroup [2019]), and the threat of entry (Dimopoulos and Sacchetto [2014]). However, this literature, primarily in finance and economics, often disregards the accounting for these acquisitions. Several accounting studies focus on how accounting influences the takeover market, such as the effect of firms' accounting quality on the type of acquisition (e.g., McNichols and Stubben [2015], Marquardt and Zur [2015]) and the effect of goodwill on takeover premia, but typically ignore the role of competition, for example, Robinson and Shane [1990], Bartov, Cheng, and Wu [2021]. Research on goodwill accounting documents how economic incentives shape the purchase-price allocation (PPA) (Shalev, Zhang, and Zhang 2013) and subsequent impairments (Beatty and Weber [2006], Li and Sloan [2017], Glaum, Landsman, and Wyrwa [2018]). We add to this literature in two ways: (1) We quantify how goodwill accounting affects acquirers' valuations; and (2) by explicitly modeling competition, we address not only how goodwill accounting affects deal pricing, but also how it influences economic surplus and the allocation of assets between private and public owners.

Closest to our paper is Bartov, Cheng, and Wu [2021], who provide reduced-form evidence of overpayment. However, their approach ignores the role of competition among bidders and only relies on approximations of bidders' underlying valuations from observables. By contrast, we explicitly model the competition among bidders, which we find has important effects on the merger market. Furthermore, modeling competition between different types of bidders allows us to quantify features of the M&A market beyond just takeover prices.

Second, our paper contributes to the broader literature on the economic consequences of financial reporting. A large empirical literature documents such real effects of accounting (see, e.g., Roychowdhury, Shroff, and Verdi [2019]) and surveys suggest accounting can influence firms' investment decisions (Graham, Harvey, and Rajgopal [2005]). Many studies in this area focus on intangible assets, in part because intangibles are a perennial focus of standard setters given that accounting incompletely reflects their value.[5] Several studies examine how the imprecision of accounting can alter the incentive of the firm to make value-maximizing investments (e.g., Kanodia, Sapra, and Venugopalan [2004], Kanodia, Singh, and Spero

[4] See Betton, Eckbo, and Thorburn [2008] and Eckbo [2009] for reviews.

[5] For a discussion of the considerations by standard setters, see Appleton et al. [2022].

[2005], Geng, Zhang, and Zhou [2023], McClure and Zakolyukina [2024]). However, most of this literature focuses on investment into internally generated intangibles, such as R&D and advertising, for example, Terry [2023]. We complement this literature by focusing on the largest recognized intangible asset—goodwill—and show it has a meaningful effect on the market for corporate control.

By doing so, our paper may interest regulators and standard setters. We show the accounting for goodwill has a sizable impact on the market for corporate control. Furthermore, our findings indicate amortizing goodwill can shift more assets toward financial bidders, who are often private equity funds. These results speak directly to the SEC's concerns over the public's inability to invest in large portions of the economy because of the rise of private funding.[6] Our results offer an additional consideration for standard setters as they continue to debate how to account for intangible assets.

2. *Institutional Background*

2.1 ACCOUNTING FOR TAKEOVERS

In an acquisition, the acquirer values the identifiable assets and liabilities at their fair value. The difference between the purchase price and the fair value of the assets, less the liabilities, is classified as goodwill.[7] Effective December 15, 2001, Statement of Financial Accounting Standards (SFAS) 142 specified the accounting for goodwill.[8] Under SFAS 142, goodwill is not subject to amortization but is tested annually for impairment. One challenge with impairing goodwill is that a firm cannot directly determine the fair value of goodwill because it cannot be separately identified. Instead, a firm first needs to qualitatively assess whether an impairment is likely. If this assessment suggests an impairment is warranted, the firm needs to

[6] See, for instance, https://www.sec.gov/news/speech/lee-sec-speaks-2021-10-12.

[7] Note significant differences exist between the initial recognition of goodwill under IFRS and U.S. GAAP (see, e.g., Zeng, Zhang, and Zuo [2023])

[8] Before the adoption of SFAS 142, takeovers were accounted for under Accounting Principles Board (APB) 16 and APB 17. If a takeover satisfied 12 criteria, APB 16 permitted firms to use the pooling-of-interests method, where the target's assets and liabilities are carried forward at their recorded amounts and the retained earnings of the two companies are combined. If a takeover did not satisfy these criteria, APB 16 required firms to use purchase accounting, which entails valuing the target's assets and liabilities at their fair value. The difference between the purchase price and the fair value of the target's net assets was classified as goodwill. APB 17 required firms to amortize goodwill for a period of less than 40 years. There are three reasons why inferences using observations when APB 16 and 17 were in effect provide limited insight into the effect of SFAS 142. First, pooling only applied to certain deals, and for those that did, firms could select either of the two methods. Second, pooling does not step up the value of any assets and liabilities, so estimating the effect of accounting on goodwill would be commingled with the depreciation and amortization of other assets and liabilities. Finally, the importance of goodwill has significantly increased since 2001, increasing from $771.1 bn to $4.9 trillion in 2021.

determine the fair value of the reporting unit to which the goodwill is assigned. If the fair value is less than the carrying value of the reporting unit, the firm must recognize a goodwill impairment equal to the difference.[9]

How to account for goodwill has been a perennial topic of interest to standard setters (Seligman [1982], Rayburn and Powers [1991]), and the current reporting regime is no exception. The preliminary draft of SFAS 142 required firms to amortize goodwill, which met strong opposition from industry leaders and investment banks that worried the "earnings drag" from amortizing goodwill would chill the M&A market (Ramanna [2015]). These concerns led to congressional hearings about purchase accounting. During these hearings, William Lewis, CEO of Prospect Technologies, speaking on behalf of the Chamber of Commerce, testified that

> [Amortizing goodwill] may well have a substantial negative impact on both the economy and my company's ability to grow…I am looking to combine with other businesses in the near future … with its adverse effects on reported earnings, I may have second thoughts… Moreover, if in the future, I were to decide to 'go public,' artificial reductions of net income due to the use of purchase accounting could make such an offering less appealing. (Lewis [2000])

This pressure led the FASB to adjust the rule to an impairment-only approach (Ramanna [2008]).[10]

In 2018, the FASB re-examined the accounting for goodwill, because many considered the current regime of annual tests for impairments costly to perform and subjective in nature (Maurer [2022]). In its place, the FASB contemplated whether to require firms to amortize goodwill over a 10- to 25-year period. Ultimately, the FASB decided to drop the matter in 2022, with the FASB chair, Richard Jones, citing uncertainty about whether amortization would lead to a meaningful improvement given the significance of the change (Lugo [2022]).

2.2 CORPORATE TAKEOVER AUCTIONS

A takeover auction usually starts when the target decides to sell itself to a potential buyer.[11] To facilitate the process, the target retains an investment bank to create a list of potential acquirers, whom the bank contacts to solicit their interest in acquiring the target. Interested parties sign confidentiality agreements, allowing them access to nonpublic information about the target, which assists them in determining their value for the target.

[9] This description outlines the simplified impairment test introduced in ASU 2017-04. In the earlier version, the goodwill amount was determined through a final step, involving the calculation of the fair value of identifiable assets in the reporting unit to establish goodwill's fair value and adjusting the carrying value accordingly.

[10] This extent of political pressure also suggests that firms could not circumvent the effect of amortizing goodwill with non-GAAP reporting.

[11] For a more detailed description, see Hansen [2001] and Boone and Mulherin [2007].

The bidding process typically proceeds in multiple rounds. In the early rounds, bidders submit nonbinding bids, which can change in each round and may be withdrawn at any point. After each round of bidding, the target may select a subset of bidders to continue to the next round and provide these bidders with additional information for due diligence. At the end of this process, the target invites the remaining bidders to a final round of bidding. Final-round bids are typically binding, but the target may negotiate with some of the bidders to raise the price further. Within a few days of receiving the final-round bids, the target chooses an acquirer, and a takeover agreement is signed. Until the agreement is signed and the merger is publicly announced, the bidding process and bidders' identities are kept private.[12] However, the target must disclose the bidding process when it puts the buyout to a shareholder vote. This background is disclosed as part of the Merger Background in either the DEF14A or SC-TOT documents, which allows us to observe the bids and the type of each bidding participant.

Takeover auctions are most similar to an (ascending) English auction, with bidders offering higher prices until only a single winner remains. However, a few differences exist between takeover auctions and English auctions. Unlike an English auction, takeover auctions have several rounds of bidding during which bidders can exit and reenter the bidding process or revise their bids downwards. Bidders often do not know the identity of all other bidders or the value of their bids. However, bidders are likely able to infer the value of the highest bid, because of indications the target gives between rounds of bidding and during interspersed negotiations. Finally, targets design their own process, which may have such interspersed rounds of negotiations. One consequence of these negotiations is they can induce bidders to jump their bids and bypass intermediate bids that we would expect from a pure English auction. As such, no theoretical auction model perfectly describes the process of a takeover auction. Therefore, we build upon the approach developed by Gorbenko and Malenko [2014] to estimate bidders' valuations from the unstructured bidding process.

3. *Stylized Facts and Sample Data*

To motivate the importance of goodwill and subsequent impairments, we report several stylized facts. Table 1 reports the fraction of the PPA for public acquirers from June 2001 until December 2021 that is attributed to goodwill. The data to construct this table are from BVWire's DealStat database, and hand-collected data are from public acquirers' subsequent filings and the disclosed PPA. This table shows nearly half (43.6%) of the purchase price is allocated to goodwill. Table 1 also shows this fraction varies

[12] In some instances, a target will preempt this takeover announcement and issue a press release that they are in the process of looking for acquirers.

TABLE 1
Purchase-Price Allocation to Goodwill

Target Industry	Mean	StDev	$p^{10\%}$	$p^{25\%}$	$p^{50\%}$	$p^{75\%}$	$p^{90\%}$	*N*
All	0.436	0.223	0.130	0.266	0.453	0.602	0.711	860
Manufacturing	0.454	0.187	0.204	0.334	0.474	0.585	0.673	61
Wholesale and Retail	0.464	0.201	0.264	0.365	0.462	0.570	0.681	44
Oil and Gas	0.237	0.206	0.000	0.065	0.204	0.370	0.502	43
Communication	0.386	0.187	0.173	0.256	0.383	0.486	0.635	39
Business Equipment	0.501	0.219	0.196	0.356	0.538	0.657	0.743	308
Consumer Nondurables	0.424	0.206	0.153	0.293	0.468	0.593	0.669	30
Utilities	0.319	0.202	0.055	0.188	0.305	0.479	0.540	25
Medical and Pharma	0.375	0.218	0.094	0.197	0.366	0.530	0.656	176
Chemicals	0.365	0.229	0.127	0.204	0.383	0.506	0.565	14
Consumer Durables	0.486	0.184	0.289	0.392	0.458	0.601	0.608	11
Other	0.460	0.223	0.141	0.322	0.494	0.614	0.719	109

This table summarizes descriptive statistics on the fraction of the purchase price of a takeover that is allocated to goodwill. The data include all M&A transactions with a public acquirer and a public target between June 2001 and September 2022 that are available from the DealStat database.

TABLE 2
Goodwill Impairments

		Impairment Magnitude							
Industry	P(Impairment)	*N*	Mean	StDev	$p^{10\%}$	$p^{25\%}$	$p^{50\%}$	$p^{75\%}$	$p^{90\%}$
All	0.129	6,394	0.358	0.352	0.008	0.043	0.218	0.622	0.999
Consumer Nondurables	0.169	525	0.271	0.326	0.003	0.018	0.109	0.433	0.906
Consumer Durables	0.159	249	0.292	0.315	0.010	0.031	0.168	0.459	0.861
Manufacturing	0.140	910	0.307	0.320	0.010	0.040	0.181	0.497	0.889
Oil and Gas	0.162	227	0.547	0.395	0.033	0.133	0.532	1.000	1.000
Chemicals	0.135	217	0.257	0.314	0.008	0.021	0.111	0.366	0.869
Business Equipment	0.107	1,315	0.442	0.363	0.015	0.090	0.372	0.802	1.000
Communication	0.173	325	0.297	0.326	0.004	0.025	0.161	0.553	0.876
Utilities	0.084	93	0.387	0.359	0.018	0.054	0.222	0.687	0.998
Wholesale and Retail	0.131	835	0.337	0.351	0.007	0.034	0.185	0.604	0.983
Medical and Pharma	0.094	530	0.432	0.393	0.007	0.058	0.294	0.884	1.000
Other	0.144	1,168	0.333	0.332	0.011	0.049	0.206	0.567	0.943

This table summarizes descriptive statistics on the occurrence and magnitude of goodwill impairments in the universe of Compustat firms and broken down by Fama-French 12 industries for fiscal years ending after June, 2001. *P(Impairment)* is the unconditional probability of observing a goodwill-impairment charge for a fiscal year of a firm. *Impairment Magnitude* is the proportion of beginning-year goodwill impaired during a fiscal year with an impairment.

substantially across industries. Oil and gas firms have the lowest average goodwill allocation (23.7%), whereas business-equipment firms have the highest, with over half of the purchase price allocated to goodwill (50.1%).

Table 2 reports summary-statistics data of goodwill impairments from Compustat over the sample period of June 2001 through December 2021. The first column shows the probability a firm recognizes a goodwill impairment in a given year is 12.9%. This percentage varies by industry, with communication firms having the highest probability (17.3%) and utilities having the lowest (8.4%). The remaining columns in table 2 show the fraction of the beginning-year goodwill amount that is impaired, conditional on the firm recognizing an impairment. Although the mean is 35.8%, the skew is significant because the median is only 22%. For instance, nearly 10% of all impairments are for the entire goodwill amount. This table shows impairments are not infrequent, and when they do occur, they are often a large fraction of goodwill. Overall, tables 1 and 2 show goodwill is a sizable fraction of the purchase price, and subsequent impairments account for significant reductions in goodwill's carrying value.

We analyze 860 corporate-takeover auctions that were effective from July 1, 2001, to September 2022. The sample start date ensures all takeovers are subject to SFAS 142.[13] We identify takeover auctions and collect the data following Gorbenko and Malenko [2014].[14] Briefly, we identify all takeovers of publicly traded nonfinancial firms in the Refinitiv SDC Platinum data with a nonmissing deal value and where the acquirer sought 100% of the target's shares. We further restrict the sample to deals that were completed with an all-cash consideration.[15] We use the deal background section of the SEC merger filings of the target company (PREM14A, DEFM14A, SC-TOT, and S4) to identify whether a deal was an auction. Consistent with prior literature (Boone and Mulherin [2007], Gorbenko and Malenko [2014]), we classify a deal as an auction if two or more potential bidders execute confidentiality agreements with the target. These agreements are intended to prevent the bidder from disclosing material nonpublic information about the target company. For the sample of deals classified as auctions, we hand-collect comprehensive information on the bidding process from the merger background. This information includes the type of bidder (i.e., strategic or financial), the nature of their bid (i.e., formal, informal, no bid, or drop out), the value of each formal bid, and the dates of any press releases relating to the takeover auction.

Table 3 presents the summary statistics of our sample. The average bid premium is 42.7% above the stock price four weeks before the takeover announcement or the stock price one day before the first press release about the auction, whichever is earlier. The average number of bidders is 11; however, significant skew exists because the median is only six. On average, 29% of bids in an auction are formal bids. Within the set of bidders, approximately 41% are strategic, 29% are financial, and the remainder are of unknown type. This split also manifests in the distribution of winners,

[13] Although SFAS 142 went into full effect for fiscal years ending after December 15, 2001, it already applied to all deals completed after June 30, 2001. See https://www.fasb.org/page/PageContent?pageId=/reference-library/superseded-standards/summary-of-statement-no-142.html&bcpath=tff.

[14] Alexander Gorbenko and Andrey Malenko generously provided the data from September 2001 to 2012.

[15] This restriction is necessary because the identification strategy relies on the value of the winning bid. The value of a (partial) stock bid is to some extent uncertain when the merger is consummated (Gorbenko and Malenko [2014]). Note, however, that we keep non–cash-losing bids.

TABLE 3
Descriptive Statistics

	Mean	StDev	$p^{10\%}$	$p^{25\%}$	$p^{50\%}$	$p^{75\%}$	$p^{90\%}$	*N*
Premium (%)	42.716	36.403	12.789	21.212	34.139	52.587	83.782	860
No. of Bidders	10.598	12.432	2.000	3.000	6.000	13.000	23.000	860
Strategic Bidders	0.410	0.356	0.000	0.100	0.333	0.667	1.000	860
Financial Bidders	0.290	0.337	0.000	0.000	0.143	0.524	0.844	860
Formal Bid	0.295	0.223	0.056	0.125	0.250	0.478	0.500	860
Strategic Winner	0.633	0.483	0.000	0.000	1.000	1.000	1.000	860
Financial Winner	0.370	0.483	0.000	0.000	0.000	1.000	1.000	860
Goodwill PPA	0.463	0.224	0.156	0.297	0.478	0.623	0.715	304
Size	5.670	1.550	3.680	4.534	5.551	6.719	7.795	860
Leverage	0.174	0.229	0.000	0.000	0.078	0.304	0.500	860
Q-ratio	1.602	1.427	0.599	0.866	1.252	1.835	2.926	860
Cash Flow	0.007	0.250	−0.175	0.003	0.063	0.107	0.154	860
Cash	0.243	0.229	0.014	0.055	0.174	0.377	0.574	860
R&D	0.018	0.033	0.000	0.000	0.005	0.028	0.050	860
Intangbiles	0.205	0.213	0.000	0.013	0.137	0.351	0.536	860
S&P 500	0.086	0.150	−0.124	0.024	0.109	0.155	0.227	860
Credit Spread	0.026	0.007	0.017	0.019	0.026	0.030	0.033	860

This table shows summary statistics on the takeover auctions studied in this paper. *Premium (%)* is the premium that the acquirer paid for the target relative to the target's stock price four weeks before the takeover announcement or on the day before the target issued a press release that they were engaged in a takeover process—whichever is earlier. *No. of Bidders* is the number of parties that have signed a confidentiality agreement to participate in the auction. *Strategic Bidders, Financial Bidders,* and *Formal Bid* are indicator variables equal to 1 if the bidder is strategic, financial, or provides a formal bid. *Strategic Winner* and *Financial Winner* are indicator variables equal to 1 if the winning bidder is a strategic company or a financial sponsor. *Goodwill PPA* is the fraction of the purchase price the acquirer allocated to goodwill. *Size* is the log of total assets of the target in the last quarter before the takeover announcement. *Leverage* is the target company's leverage ratio in the last quarter before the takeover announcement. *Q-Ratio* is the target company's Tobin's q in the last quarter before the takeover announcement. *Cash Flow* is the target company's total cash flow over the last four fiscal quarters scaled by total assets in the last quarter before the takeover announcement. *R&D* is the target company's R&D expense over the last four fiscal quarters scaled by total assets in the last quarter before the takeover announcement. *Intangibles* is the target company's total intangible assets scaled by total assets in the last quarter before the takeover announcement. *S&P 500* is the annualized return on the S&P 500 over the last fiscal quarter of the target before the takeover announcement. *Credit Spread* is the spread between Baa-rated corporate bonds and the rate on 10-year U.S. treasuries on the day before the merger announcement.

because we find strategic bidders win 63% of deals. For the auctions with a public acquirer, we collect the PPA from BVWire DealStats and complement this information with hand-collected data whenever missing. Among the 304 deals for which we can find the PPA, the average allocation to goodwill equals 46.3%. The large fraction of deal value allocated to goodwill suggests the accounting treatment of goodwill can meaningfully influence the takeover market. The remaining summary statistics largely comport to findings in prior research.

4. *Model*

Bidders decide how much to bid for the target company based on their private value from acquiring it, which is a combination of cash flows and earnings generated from the acquisition, and the competition from other bidders. Bidders are the managers of either strategic acquirers (e.g., competitors) or financial sponsors (e.g., private equity funds), and their values are drawn from a distribution specific to their type.[16] We make this distinction because prior research observes that these two types of acquirers value targets differently (e.g., Gorbenko and Malenko [2014], Gorbenko [2019]).

We assume a bidder will bid such that she receives a positive surplus from acquiring the target. Thus, bidder i will only acquire target j if the expected benefits, $\tilde{v}_{i,j}$, from acquiring the target exceed the cost of the acquisition, $b_{i,j}$, namely, $\tilde{v}_{i,j} - b_{i,j} \geq 0$. How close the bid, $b_{i,j}$, is to $\tilde{v}_{i,j}$ is determined by the number of bidders, because bidder i does not allow another to acquire the target with a bid that is less than $\tilde{v}_{i,j}$. Consequently, more competition means bidders must bid higher to win, and therefore receive a smaller surplus in expectation, namely, $b_{i,j} \rightarrow \tilde{v}_{i,j}$.

4.1 ACCOUNTING IMPACT ON VALUATION

Each bidder's value is based on a combination of the discounted stream of expected cash flows and earnings. As a result, accounting influences how much bidders value the target and what they are willing to pay (Baiman et al. [2007], Marinovic [2017]). Let $S_{i,j}$ be the surplus bidder i receives from winning the auction and acquiring a target j. We assume the discounted stream of expected cash flows, d_t, and earnings, e_t, enter the surplus with differential weights, which may vary among bidders.[17] Therefore, the bidder's surplus is

$$S_{i,j} = (1 - w_i) \sum_{t=0}^{\infty} \mathbb{E}[d_t]\delta^t + w_i \sum_{t=0}^{\infty} \mathbb{E}[e_t]\delta^t, \tag{1}$$

where δ is the discount factor and w_i is the relative weight on earnings.

The initial cash outlay to acquire the target reduces cash flow by $b_{i,j}$ in period 0, so $d_0 = -b_{i,j}$. However, this cash outflow does not impact earnings, because cash used for acquisitions does not affect the income statement in period 0. Therefore, $e_0 = 0$. Separating the cash outflow from the discounted stream of future expected cash flows, we recharacterize the bidder's surplus as

$$S_{i,j} = (1 - w_i)\left(\sum_{t=1}^{\infty} \mathbb{E}[d_t]\delta^t - b_{i,j}\right) + w_i \sum_{t=1}^{\infty} \mathbb{E}[e_t]\delta^t. \tag{2}$$

Cash flows differ from earnings by the noncash charges that result from the acquisition. Therefore, we disaggregate earnings, e_t, into cash flows, d_t,

[16] Throughout the paper, when we discuss the "manager," we refer to the manager of the bidding company. The target firm's manager preferences are less relevant because we focus on a sample of cash-only deals where the "Revlon rule" likely applies. This rule requires the target firm's management and board to accept the highest bid, regardless of their preferences.

[17] We suppress i and j subscripts on earnings and cash flows in this section for readability.

and the fraction of the purchase price recognized as an expense in period t under the accounting regime a, α_t^a.[18] Thus,

$$e_t = d_t - \alpha_t^a b_{i,j}. \tag{3}$$

The fraction of the purchase allocated to the target's net assets with a finite life will lead to future amortization expenses. For net assets with an indefinite life and goodwill, as $t \to \infty$, a negative shock will eventually occur that is sufficiently large such that these assets will require an impairment. Therefore, $\sum_{t=0}^{\infty} \alpha_t^a = 1$, so that all of the purchase price eventually impacts earnings. Using this identity and equation (3), we can rewrite equation (2):

$$\begin{aligned} S_{i,j}(b_{i,j}; s) &= \underbrace{\sum_{t=1}^{\infty} \mathbb{E}[d_t]\delta^t}_{\equiv v_{i,j}} - (1 - w_i) b_{i,j} - w_i b_{i,j} \sum_{t=1}^{\infty} \alpha_t^a \delta^t \\ &= v_{i,j} - b_{i,j}\left[1 - w_i + w_i \sum_{t=1}^{\infty} \alpha_t^a \delta^t\right]. \end{aligned} \tag{4}$$

Bidder i allocates a fraction $g_{i,j}$ of the total purchase price to goodwill and the remaining $1 - g_{i,j}$ to net identifiable assets. Therefore, we disaggregate the earnings impact of the bid into its portion of goodwill, $g_{i,j}$, and net identifiable assets, $n_{i,j} = 1 - g_{i,j}$. Given that the purchase price is divided between identifiable assets and goodwill, we similarly disaggregate the amortization schedule into the effects specific to identifiable assets, $\alpha_t^{a,id}$, and goodwill, $\alpha_t^{a,gw}$. Thus, we can characterize the impact of the bid on the bidding manager's utility as

$$b_{i,j}\left[(1 - w_i) + w_i \sum_{t=1}^{\infty} \alpha_t^a \delta^t\right] = b_{i,j}\left[1 - w_i + w_i \sum_{t=1}^{\infty} \left(\alpha_t^{a,id} n_{i,j} + \mathbb{E}[\alpha_t^{a,gw}] g_{i,j}\right)\delta^t\right],$$

and rewrite the bidding manager's surplus from equation (4) as

$$\begin{aligned} S(b_{i,j}; s) &= v_{i,j} - b_{i,j}\left[1 - w_i + w_i \sum_{t=1}^{\infty} \left(\alpha_t^{a,id} n_{i,j} + \mathbb{E}[\alpha_t^{a,gw}] g_{i,j}\right)\delta^t\right] \\ &= v_{i,j} - b_{i,j} A_{i,j}^a. \end{aligned} \tag{5}$$

The term $A_{i,j}^a$ is the proportion of the bid that a bidder internalizes in her utility. For a cash-focused bidder, $w_i = 0$, which implies $A_{i,j}^a = 1$, because this bidder cares about the initial cash outlay to acquire the target. For bidders who care about earnings, $w_i > 0$, which implies $A_{i,j}^a < 1$. These bidders impound a smaller amount of the bid into their utilities because the bidder incurs the acquisition cost during future-period amortization

[18] For example, if the firm must amortize the purchase price over 10 years, $\alpha_t = 0.1$ for $t \in \{1, \ldots, 10\}$, and 0 afterward.

and impairment expenses, which are discounted to the present by the discount factor δ.[19] Thus, a bidder who at least partially cares about earnings does not fully internalize the purchase price at the time of payment. Having this bidder *fully* care about the initial cash outlay *and* future accrual expenses would double-count the purchase price because the bidder would internalize both the cash payment and the purchase price's eventual impact on earnings from amortizations and impairments.[20] Although the bidder's preference for earnings may result in her not fully internalizing the purchase price, it does not mean she is irrational and ignores the time value of money. She is maximizing her personal utility, which may be a function of discounted future compensation sensitive to earnings and cash flows.

4.2 THE BIDDER'S PROBLEM

We can now write the bidder's problem. Bidder i chooses a bid $b_{i,j}$ for target j to maximize her expected surplus, multiplied by the probability of winning the takeover auction,

$$\max_{b_{i,j}} (v_{i,j} - A^a_{i,j} b_{i,j}) Pr(b_{i,j} \geq b_{k,j} \forall k \neq i). \tag{6}$$

To characterize this problem in the usual auction framework, we reformulate the bidder's problem as

$$\max_{b_{i,j}} \left(\tilde{v}_{i,j} - b_{i,j}\right) Pr(b_{i,j} \geq b_{k,j} \forall k \neq i), \tag{7}$$

where $\tilde{v}_{i,j} = \frac{v_{i,j}}{A^a_{i,j}}$ is the pseudo-value of bidder i for target j.

4.3 MODEL DISCUSSION

4.3.1. Preference for Earnings. Prior literature suggests strategic bidders appear to prefer high earnings (Skinner [2008]). Empirical and anecdotal evidence from the pre-SFAS 142 period supports this notion (Lys and Vincent [1995], Andrade [1999], Ayers, Lefanowicz, and Robinson [2002]).[21]

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[19] For example, consider the case where the identifiable assets in an acquisition are depreciated or amortized over the next T periods, whereas goodwill is indefinitely lived and subject to annual impairment testing. Hence, $\alpha^{a,id}_t = \frac{1}{T}$, $t \in 1, \ldots, T$, and 0 otherwise, whereas $\alpha^{a,gw}_t$ is generated stochastically. Bidder i with a given w would therefore internalize $A^a_{i,j} = 1 - w\left[1 - n_{i,j}\frac{\delta(1-\delta^T)}{1-\delta} - g_{i,j}\mathbb{E}\left(\sum_{t=0}^{\infty} \tilde{\alpha}^{a,gw}_t \delta^t\right)\right]$.

[20] Our assumption is that this bidder is not constrained by shareholders who may focus on cash flows and could veto the acquisition because the deal does not align with their objectives. This possibility is unlikely for two reasons. First, we focus on cash deals, the majority of which are financed with internally generated funds (Bessler, Drobetz, and Zimmermann [2011]), or if those are insufficient, by issuing new debt (Harford, Klasa, and Walcott [2009]). Financing a cash deal with equity (Martynova and Renneboog [2009]), where dissenting shareholders can more easily express their displeasure, is far less common. Second, as we discuss in section 6.1, bidders place more weight on cash flows than earnings, suggesting a substantial focus on cash flows by management.

[21] Acquirers regularly approached the SEC before deal closing to determine whether the deal fulfills the requirements for pooling of interests, and the merger agreements often

Consistent with such earnings preferences, we find that in 10% of our takeover sample, the acquiring firm explicitly rationalizes the acquisition in press releases that it is expected to increase earnings.[22] Thus, earnings seem to matter for at least some bidders.[23]

Our modeling approach is agnostic about the precise reason underlying the preferences for earnings. We capture them in reduced form and rely on a revealed preference argument to empirically recover them. Although microfounding earnings preferences, for example, through a rational expectations equilibrium or a compensation contract, is theoretically appealing, prior research suggests there are many factors driving the preference for earnings (Skinner [2008]). Consequently, microfounding these preferences would risk empirically misspecifying the model by selecting the wrong mechanism and therefore jeopardize the validity of the counterfactuals. Additionally, it would add unnecessary complexity that would detract from the paper's primary objective of quantifying the interaction between accounting standards and bidder competition in corporate takeovers. Such revealed-preference approaches underlying demand estimation methods are often used in structural industrial organization and quantitative marketing (e.g., Berry, Levinsohn, and Pakes [1995], Nevo [2001]). These methods have enabled novel research in a wide range of topics in those fields, like media and social security markets (e.g.,Gentzkow and Shapiro [2010], Crawford and Yurukoglu [2012], Hastings, Hortaçsu, and Syverson [2017]), as well as more recently in accounting (e.g.,Gerakos and Syverson [2015], Zhou [2021]).

Although we do not microfound the earnings preferences, a necessary condition for our reduced-form approach to be valid is that the manager's utility varies with both cash flows and earnings. In untabulated analysis, we therefore examine whether the manager's compensation is sensitive to earnings and cash flows. Following analyses in Gao and Li [2015] and Banker, Huang, and Natarajan [2009], we find evidence consistent with CEO compensation in Execucomp firms since 2001 to be increasing in both earnings *and* cash flows.[24] These findings lend credibility to our

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specified different purchase prices depending on the outcome of that assessment. Ayers, Lefanowicz, and Robinson [2002] report that acquirers were often willing to pay a premium of 10% for the pooling treatment to avoid the earnings drag over the purchase treatment.

[22] An example of a quote is from Terresa's CEO, Tom Lacey, regarding the company's acquisition of DTS that was announced on September 20, 2016, when he said, "We expect this acquisition to be immediately accretive to Tessera's earnings and accelerate growth." https://www.businesswire.com/news/home/20160920005673/en/Tessera-Technologies-to-Acquire-DTS.

[23] When we use the term "bidder," we implicitly assume that the preferences of the bidding firm's manager translate into the firm's behavior. This assumption is grounded in the observation that in a sample of all takeovers by firms covered by Execucomp, 43% of acquiring CEOs remain CEO four years after the acquisition. This fraction is even higher in our sample (50%). These statistics suggest that managers' preferences are likely reflected in the firm's decision making.

[24] This finding is consistent with the fact that bonuses, which often are based on earnings (Shalev, Zhang, and Zhang [2013]), are a prevalent form of CEO compensation. In fact, in

reduced-form specification that earnings matter, even if it does not point to a specific reason for why it does.

4.3.2. Limitations of the Model. We simplify several aspects of our model to facilitate the estimation of goodwill accounting's impact on merger outcomes. First, our model does not permit managers to opportunistically delay goodwill impairments. However, Beatty, Liao, and Weber [2024] find little evidence of reporting opportunism in goodwill impairments, which suggests this reporting decision is second order. Furthermore, we estimate our model using observed impairment rates, so it implicitly incorporates the average opportunistic delay.

Second, we assume the preferences for accounting information do not vary as the information environment changes. Under alternative accounting regimes, such as one that removes impairments and instead requires a deterministic amortization schedule, the information content of earnings can change, which may have implications for capital market efficiency. Such a change may lead to adjustments to the compensation contract, which could alter the weight on earnings, w_i. However, the renegotiation costs related to goodwill seem nontrivial because compensation reacts strongly to impairments (Darrough, Guler, and Wang [2014]), suggesting sizable fixed costs to changing w_i. Nevertheless, we explore the economic effects of changing w_i in section 7.5.

Finally, the model is limited to only analyzing takeover outcomes and does not consider spillovers to other investment decisions. For instance, we do not consider the trade-off between organic growth through internal investment and growth through acquisitions, and how that trade-off would change under alternative accounting treatments. We leave these extensions for future research.

5. *Empirical Strategy*

This section describes how we identify and estimate the primitives of the model. To do so, we need to estimate the parameters governing the distribution of valuations, including bidders' earnings preferences relative to cash flows.

5.1 IDENTIFICATION

The unstructured nature of takeovers does not allow us to impose a standard auction format to identify the distribution of bidder valuations. Instead, we follow an approach developed by Haile and Tamer [2003] and adjusted by Gorbenko and Malenko [2014] to estimate the distribution of bidder valuations in nonstandard auctions. In particular, identification comes from three assumptions:

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a sample of all mergers by Execucomp firms since 2001, around half of the acquiring firm CEOs received a bonus, which constitutes approximately 20% of their total compensation. The statistics are similar in our sample, corresponding to 35% and 18%, respectively.

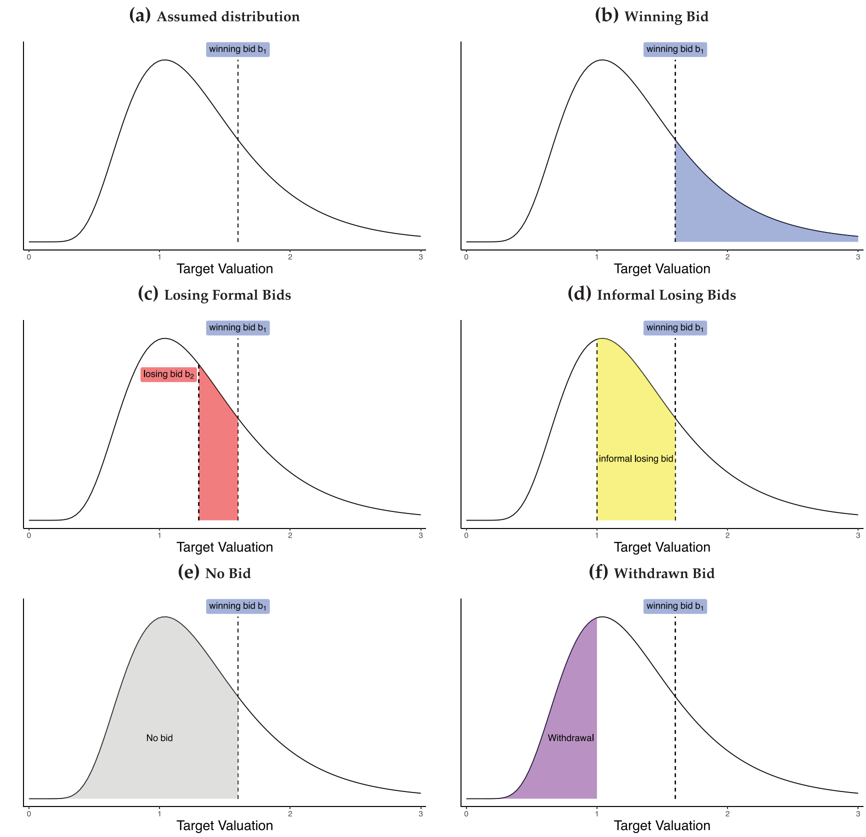

FIG. 1.—Identification of pseudo-values: An example. This figure shows an example of how the restrictions described in section 5.1 induce ranges for the pseudo-values of bidders based on the different types of bids. In each panel, the solid line is the distribution and the dashed vertical line is the winning bid.

1. A bidder does not submit a bid that would leave her with a negative surplus, that is, bid more than her value for the target.
2. A bidder does not allow a bid to win that she could beat with a non-negative surplus.
3. A bidder does not make informal, noncommittal bids if her value is below the target's standalone value.

These assumptions provide five nonparametric restrictions that help us identify the distribution of bidder pseudo-values, $\tilde{v}_{i,j}$. To see how these restrictions aid in identifying the distribution, suppose bids for target j are sorted in decreasing order so that $b_{1,j}$ is the winning bid. Further, supposing the distribution of pseudo-values is represented by the black line in panel a, figure 1, and the dashed vertical line is the winning bid,

- A winning bid implies $b_{1,j} < \tilde{v}_{1,j}$. Thus, this bidder's pseudo-value must be in the shaded region in panel b of figure 1.
- A formal losing bid from bidder i implies $b_{i,j} < \tilde{v}_{i,j} < b_{1,j}$. Thus, this bidder's pseudo-value must be in the shaded region in panel c.
- An informal losing bid from bidder i implies $1 < \tilde{v}_{i,j} < b_{1,j}$. Thus, this bidder's pseudo-value must lie within the shaded region in panel d.
- If a bidder makes neither a formal nor an informal bid, that is, this bidder declines to bid, $0 < \tilde{v}_{i,j} < b_{1,j}$. Thus, this bidder's pseudo-value is in the shaded region of panel e.
- If a bidder states her value is below the market value, $0 < \tilde{v}_{i,j} < 1$. Thus, this bidder's pseudo-value is in the shaded region in panel f.

By knowing the regions in the distribution where pseudo-values are located and incorporating additional parameterization assumptions (discussed below), we can trace the distribution of pseudo-values. We can isolate the accounting component in pseudo-valuations by observing how pseudo-valuations vary with goodwill allocations and the subsequent probability of impairment. Thus, our model parameters are identified from bidders' valuations and the competition within the auction. Specifically, bidder preferences, which are functions of their preference for earnings versus cash flow and the characteristics of the target firm, give shape to the distribution of bidders' values. Competition, that is, the number of bidders, determines the location in that distribution of the winning bid.

5.2 PARAMETRIC ASSUMPTIONS

On their own, the assumptions of the previous section only provide set identification (Haile and Tamer [2003]). Therefore, we impose parametric assumptions of bidders' valuations to achieve point identification. We follow Gorbenko and Malenko [2014] and assume the bidders' values follow a log-normal distribution with a common and an idiosyncratic component:

$$v_{i,j} = \exp\{X_j \beta_i\} \exp\{\epsilon_{i,j}\}, \tag{8}$$

with $\epsilon_{i,j} \sim N(0, \sigma_i)$. The vector X_j corresponds to the observable target and time characteristics, representing the target's common-value component. The term $\epsilon_{i,j}$ corresponds to the idiosyncratic component of value and represents bidder i's preferences for target j that are unobservable to the econometrician. We assume two types of bidders exist: financial and strategic. Within each type $z \in \{Financial, Strategic\}$, the parameters that determine $v_{i,j}$, β_i, and σ_i are the same.[25] Thus, $\beta_i = \beta_z$ and $\sigma_i = \sigma_z$.

We assume financial bidders only care about cash flows, so if i is a financial bidder, $w_i = 0$ and $A_{i,j} = 1$. We make this assumption because prior

[25] SEC filings that describe the merger history typically only distinguish between financial and strategic bidders. We can only infer whether a bidder was a public or private firm for winning bids, which is not enough variation to estimate a separate valuation distribution for public and private bidders.

literature suggests financial bidders—predominantly private equity firms—focus on cash flows when operating their acquisitions (Gompers, Kaplan, and Mukharlyamov [2016], Zimmerman [2016]). This focus on cash flows is natural given private equity firms' performance is assessed in terms of cash returned to investors, either through continued operations or an exit (Kaplan and Sensoy [2015]), and because private-equity buyouts are financed with significant debt, requiring steady cash flows to service this debt (Brown, Harris, and Munday [2021]).[26] Furthermore, when we examine quotes from press releases and news articles announcing the merger, we find no instances where financial bidders discuss earnings to justify the merger. This lack of discussion by financial bidders contrasts with strategic bidders, who mention earnings in 14.4% of the deals.[27] Therefore, we assume strategic bidders have some preference for future earnings, so if i is a strategic bidder, $w_i \geq 0$ and $A_{i,j} \leq 1$.

However, we do not assume all strategic bidders are alike in their preferences for earnings. We assume strategic bidders have heterogeneous preferences, because strategic bidders contain both private and public bidders, who are known to value earnings differently.[28] Furthermore, even among public acquirers, preferences for future earnings vary, such as for management-compensation reasons (Healy [1985]). We therefore assume the accounting preference of strategic bidder i is drawn from a beta distribution with shape parameters $a = 1$ and $b = \theta$. Thus, $w_i \sim h(\theta)$, where $h(\cdot)$ is the beta density function.

The beta distribution offers two desirable properties that make it well suited as a parametric assumption for $h(\cdot)$.[29] First, beta distributions have support over the interval $[0, 1]$, which ensures a bidder's weight on earnings relative to cash flows does not exceed 1 or is negative. Second, the beta distribution is flexible, and depending on the shape parameters, the resulting distribution can be unimodal, U-shaped, or left or right skewed. We assume a right-skewed distribution for w_i by requiring $\theta > 1$. This skewness allows a sizable fraction of strategic bidders to have w_i near zero, to reflect that some strategic bidders, such as private firms, strongly prefer cash flows

[26] Although a potential exit for the PE firm could reintroduce earnings preferences through the acquirer, goodwill would reset based on the acquisition price paid to the PE firm.

[27] In untabulated analysis, we re-estimate our model but allow financial bidders to also care about earnings. These estimates are qualitatively similar to table 5. In addition, we find financial bidders care about cash flows about four times more than earnings, which is significantly more than strategic bidders. However, we find that simulated data from this untabulated estimation fit empirical data worse than our reported estimates, which is why we do not use it as our main estimation.

[28] We assume private and public strategic bidders bid as if they must treat goodwill under an impairment-only regime. This assumption ignores the alternate accounting treatment for private firms under ASU-2014-02, where private firms can elect to amortize goodwill on a straight-line basis over 10 years.

[29] For other examples that use the beta distribution in structural models in accounting, see Huber [2024] and McClure [2023].

to earnings. It also allows for the possibility that strategic bidders do not have a preference for earnings as we allow for the possibility of $\theta \to \infty$, which would result in $w_i \to 0$.

5.3 ESTIMATION

Bids are a function of bidder, target, and time characteristics and the structural parameters β_i, θ, and σ_i. We estimate the structural parameters with simulated maximum likelihood estimation (SMLE). Briefly, SMLE is used when estimating parameters by maximum likelihood estimation is infeasible because no closed-form solution exists for the likelihood function. SMLE simulates a large number (in our case, 500) of observations for a guess of parameter values, computes the likelihood function, and compares it with the observed data. SMLE iterates these steps by changing parameter values until the simulated likelihood converges. See Cameron and Trivedi [2005] for details on the method.

Using the distributional assumptions from section 5.2 and the five restrictions from section 5.1, every observed bid maps into a well-defined contribution to the likelihood. For example, Assumption 1 implies the winning bidder needs to have a pseudo-valuation weakly greater than her winning bid. Let $L^z(b_{i,j}; X_j, \beta_z, \sigma_z | w_i)$ be the likelihood contribution from bidder i of type z, which is conditional on the characteristics, X_j, structural parameters, β_z and σ_z, and preference for earnings, w_i. Then, the likelihood for the winning bidder, $i = 1$, is

$$L^z(b_{1,j}; X_j, \beta_z, \sigma_z | w_1) = 1 - \Phi\left(\frac{\log(b_{1,j}) - X_j\beta_z + \log(A^a_{1,j}(w_1))}{\sigma_z}\right),$$

where $\Phi(\cdot)$ is the cdf of the standard normal distribution. The likelihood contributions of all other bids can be constructed similarly and are reported in appendix A.

To arrive at the unconditional likelihood contribution, note that for financial bidders, $A_{i,j} = 1$ because $w_i = 0$. For strategic bidders, because $w_i \geq 0$ is drawn from the distribution $h(\theta)$ and we do not observe it directly, we need to take the integral over the support of $h(\theta)$. Accordingly, the likelihood contribution becomes

$$L^{strategic}(b_{i,j}; \cdot) = \int_0^1 L^z(b_{i,j}; x, \beta_z, \sigma_z | w) h(\theta)\, \mathrm{d}w. \tag{9}$$

To estimate the parameters, we maximize the following log-likelihood:

$$\max_{\beta,\sigma,\theta} \sum_j \sum_i \log\left(\prod_z p^z_{i,j} L^z\big(b_{i,j}\big)\right), \tag{10}$$

where p^z is the probability of bid $b_{i,j}$ being submitted by a bidder with type z. Including p^z allows us to include losing bids where the type of bidder is unknown.

Three complications arise in our estimation. First, when bidders determine the expected value of a target, they do not know whether goodwill will need to be impaired in the future and, if so, by how much. We assume rational expectations by the bidder, so the bidder's belief regarding the likelihood and size of a goodwill impairment mirrors the realized distribution of impairments in table 2.

The stochastic nature of goodwill impairments requires us to model the evolution of the target's value in the years after it is acquired. We simulate the evolution of goodwill over the next 200 fiscal years for each of our 500 simulated observations. When discounting future cash flows, earnings, and the effect of goodwill's accounting treatment on the acquiring firm's utility, we follow prior research and set the discount rate $\delta = 0.9$ (e.g., Taylor [2013], Zakolyukina [2018]). In each year, an impairment occurs with the empirically observed probability of the target firm's industry. If an impairment occurs, the size of the impairment, relative to the firm's overall goodwill amount, is randomly drawn from the empirical distribution of impairment charges.

The second complication occurs because we only observe PPAs when the winning bidder is a public company. Hence, we have to impute the fraction of the goodwill allocation, $g_{i,j}$, when the winning bidder is a privately held strategic bidder and for all losing bids. To approximate the allocation of goodwill when the winning bid is a private firm, we assume the bidder allocates goodwill according to the mean allocation to goodwill in the target firm's Fama-French 12-industry classification. For losing bids, we impute the minimum of the industry mean and the allocation of the winning bidder (if observable).[30]

The third complication is we do not observe every losing bidder's type. Although many SEC filings distinguish between financial and strategic bidders for losing bids, this distinction is not universal, especially not in the early stages of a takeover auction. When we do not observe the bidder type, we follow Gorbenko and Malenko [2014] and infer it using a determinants model with the sample of losing bids where the type is known. Specifically, we estimate the following logistic regression:

$$Strategic_{i,j} = X_j'\beta + \varepsilon_{i,j}, \tag{11}$$

[30] When we observe a formal bid, we could have instead assumed the fair value of identifiable assets would be the same as for the winning bid (if the winning bid is public) and imputed the goodwill allocation as the remainder. Such an approach would still leave the problem of informal bids, which constitute most of the bids. For consistency, we impute the goodwill allocation for all losing bids similarly. Such an assumption is consistent with bidders bidding before allocating the purchase price to individual assets and therefore bidding with an expectation over the percentage of goodwill rather than based on how much identifiable assets are worth. This distinction matters for whether 100% of a marginal increase of the bid or only a fraction of it is allocated to goodwill.

TABLE 4
Determinants of Bidder Type for Losing Bids

	Bidder Type = Strategic	
	(1)	(2)
Constant	2.608***	
	(0.292)	
Size	−0.059*	−0.100***
	(0.032)	(0.034)
Q-ratio	0.068*	0.095**
	(0.039)	(0.040)
Leverage	−0.260	−0.047
	(0.198)	(0.205)
Cash Flow	−1.015***	−1.046***
	(0.296)	(0.301)
Cash	0.334	0.531**
	(0.228)	(0.248)
Intangibles	−0.275	−0.104
	(0.170)	(0.204)
R&D	6.060***	3.934*
	(2.069)	(2.051)
S&P 500	−0.205	−0.240
	(0.286)	(0.298)
Credit Spread	−17.981***	−19.087***
	(5.911)	(6.067)
Log(# of bidders)	−0.651***	−0.657***
	(0.043)	(0.044)
Financial Winner	−0.984***	−0.965***
	(0.070)	(0.073)
Winning Bid	−0.006***	−0.006***
	(0.002)	(0.002)
Industry fixed effects	No	Yes
Observations	4,659	4,659
Pseudo R^2	0.164	0.180

This table summarizes the estimation results of a logit model that estimates the determinants of whether a losing bid is from a strategic firm or a financial sponsor. The sample of bids used to estimate this logit model is those losing bids where the bidder type is known. All variables are defined in table 3. We cluster standard errors by target industry. Levels of significance are presented as follows: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

where $Strategic_{i,j}$ is an indicator for whether bidder i for target j is a strategic bidder and X_j is a vector of deal and target-firm characteristics that follows Gorbenko and Malenko [2014]. We use the results from this regression with industry fixed effects to assign type probabilities (i.e., p^z) to a losing bidder with an unknown type.

Table 4 reports the results from this regression. This finding shows strategic bidders are more likely to target firms with a higher Tobin's Q and R&D, smaller size, and lower cash flows, and credit spreads. Strategic bidders are also more likely to bid when fewer bidders are present and when a financial bidder does not make the winning bid. Overall, these results are consistent with the findings in Gorbenko and Malenko [2014].

TABLE 5
Estimation Results

	Strategic	Financial	Strategic	Financial
Intercept	0.047	−0.015	−0.090	−0.098
	(0.012)	(0.015)	(0.059)	(0.074)
θ	2.457		2.213	
	(0.313)		(0.190)	
σ	0.183	0.242	0.173	0.224
	(0.012)	(0.017)	(0.010)	(0.015)
Size			0.004	−0.007
			(0.007)	(0.009)
Leverage			0.071	0.088
			(0.114)	(0.136)
Leverage^2			0.078	0.017
			(0.166)	(0.171)
Q-ratio			0.005	−0.022
			(0.011)	(0.009)
Cash Flow			−0.169	0.043
			(0.090)	(0.042)
Cash			0.027	0.065
			(0.050)	(0.052)
R&D			0.805	1.187
			(0.761)	(0.496)
Intangibles			−0.035	−0.085
			(0.041)	(0.053)
S&P 500			0.116	0.087
			(0.076)	(0.079)
Credit Spread			3.525	3.874
			(1.369)	(1.673)
Observations	9,113	9,113	9,113	9,113

This table summarizes the estimation results from estimating equation (10), using simulated maximum likelihood. Details of the approach are described in section 5.3 and the likelihood contributions are detailed in appendix A. Columns 1 and 2 (3 and 4) report estimates without (with) control variables. Columns 1 and 3 are parameter estimates for strategic bidders. Columns 2 and 4 are parameter estimates for financial bidders. θ is the β parameter from the beta distribution that determines the distribution of strategic investors' sensitivities to accounting, w. The next set of coefficient estimates summarize the impact of observable characteristics on takeover valuations, denoted X in equation (8). *Intercept* is the coefficient for the intercept. *Size* is the coefficient on the target's log of total assets, measured the quarter before the takeover announcement. *Leverage* and *Leverage*^{2} are the coefficients on the target's leverage and leverage squared, measured the quarter before the takeover announcement. *Q-ratio*, *Cash Flow*, *Cash*, *R&D*, and *Intangibles* are the coefficients on the target's Tobin's Q, operating cash flow over the previous four quarters before the takeover announcement, cash balance, R&D expense over the previous four quarters before the takeover announcement, and total intangibles. These amounts are scaled by total assets and measured the quarter before the takeover announcement. *S&P 500* is the coefficient on the annualized market return during the last fiscal quarter before the merger announcement. *Credit Spread* is the coefficient on the spread between Baa-rated corporate bonds and the 10-year U.S. treasures, measured the day before the merger announcement. σ is the variance of the bidders' valuation. Standard errors are block-bootstrapped by deal using 500 draws.

6. *Results*

6.1 DISTRIBUTION OF TAKEOVER VALUATIONS

Our estimates from the simulated likelihood model are summarized in table 5. In columns 1 and 2, we present estimates from a reduced model that excludes target and deal characteristics for strategic and financial

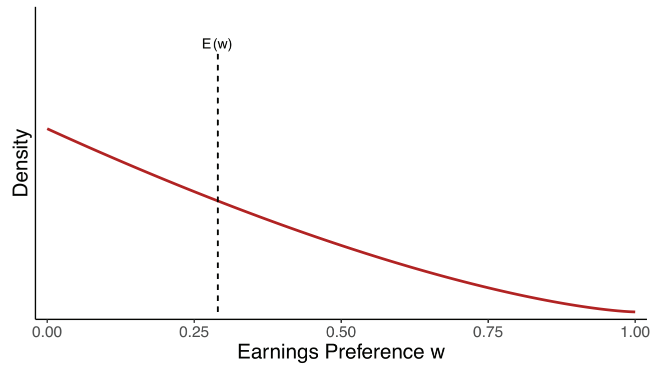

FIG. 2.—Distribution of earnings preferences. This figure shows the distribution of strategic bidders' preference for earnings, w, based on the estimate of θ from column 4 of table 5. The dashed vertical line is the mean value of w.

bidders. Columns 3 and 4 display estimates from the full model for both bidder types. Similar to Gorbenko and Malenko [2014], we observe the average valuation of strategic bidders is higher than that of financial bidders. In columns 1 and 2, the estimates suggest strategic bidders, on average, value a target at approximately 1.07 times its market value, not taking into account the accounting preferences, whereas financial bidders value it at around 1.01 times market value.[31] Columns 3 and 4 show financial bidders prefer smaller targets with lower market-to-book ratios and higher cash amounts. Both strategic and financial bidders' valuations are higher when the market return in the previous month is higher. Contrary to intuition, valuations also increase with larger credit spreads, which can be attributed to credit spreads showing little variation over the sample period but significantly increasing during the financial crisis when other indicators decrease. Therefore, the coefficient on credit spread becomes important for the model to explain acquisition activity during that period.

The crucial parameter that governs the distribution of acquirers' preferences between earnings and cash flows is θ. The estimate of $\widehat{\theta} = 2.213$ suggests a mean value for the relative weight on earnings, $E(w)$, is approximately 0.31, indicating strategic bidders, on average, assign more than twice the weight to cash flows than to earnings. We show the distribution of w and its mean based on our estimate of θ in figure 2. To help validate this estimate of $E(w)$, in an untabulated regression of the CEO's compensation on cash flows, earnings, and firm fixed effects, which we discuss in section 4.3.1, the size of the earnings coefficient is substantially smaller than the coefficient on cash flows. In particular, the coefficient on earnings is 0.061, and on cash flows, it is 0.308, which implies a relative weight on earnings of 17%. The fact a naïve regression using data that were not

[31] Note the mean of a lognormal variable is equal to $\exp(\mu + \sigma^2/2)$.

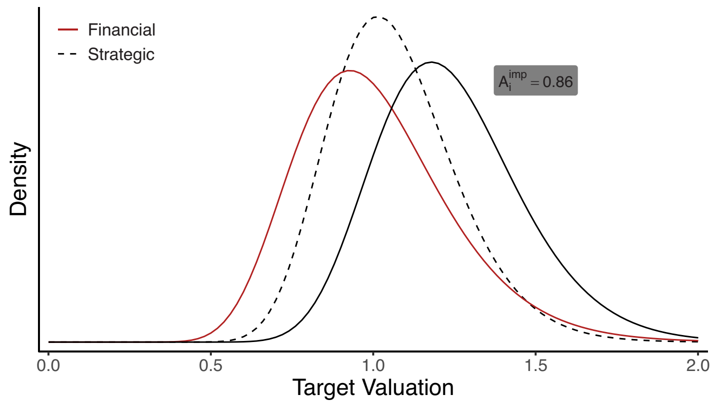

FIG. 3.—Value distributions. This figure shows the estimated value distributions of financial and strategic bidders. The red line represents the distribution of financial bidders' fundamental valuation. The dashed black line represents the distribution of strategic bidders' fundamental valuation not taking into account the accounting preferences. The solid black line shows the distribution of strategic bidders' effective valuation, taking into account the earnings preference of the average strategic bidder.

used in our estimation produces similar weights on earnings provides some external validation that our model captures the underlying economics of the manager's takeover decision. Taking into account the expected value of w and the distribution of the impairment data, we find $A^{imp} = 0.86$. In other words, strategic bidders only internalize 86% of their bids in their surplus. Consequently, they can afford to be about 14% more aggressive in their bidding than financial bidders, who are primarily concerned with the cash-flow implications of acquiring a target.

Figure 3 shows the distribution of values for strategic and financial bidders based on the estimates in columns 1 and 2 of table 5 (solid lines). In addition to strategic bidders having a higher mean value, their distribution is also wider than that of financial bidders, which comports with Gorbenko and Malenko [2014]. We remove strategic bidders' preferences for accounting and plot the distribution with the dashed line.[32] It indicates that once we eliminate accounting preferences, strategic bidders have a smaller dispersion than financial bidders, because we estimate the standard deviations of 0.197 and 0.249 for strategic and financial bidders, respectively.[33] Contrary to Gorbenko and Malenko [2014], which suggests strategic bidders' have more varied synergies, our estimates imply variation in accounting preferences is an important driver for the dispersion in strategic bidders' values. Consequently, goodwill accounting is critical in how they value targets.

[32] We remove accounting preferences by setting $w_i = 0$ for strategic bidders and redrawing the distribution of values based on column 1 in table 5.

[33] Note the variance of a lognormal variable equals $\big(\exp(\sigma^2) - 1\big)\exp(2 * \mu + \sigma^2)$.

6.2 CROSS-SECTIONAL VARIATION IN EARNINGS PREFERENCES

In the model, we assume the earnings-preference parameter, θ, solely captures strategic bidders' sensitivity to GAAP earnings. Given that all but the winning bidders are anonymous in the merger filings, we are not able to control for other bidder characteristics. Hence, we need to ascertain that our estimated $\hat{\theta}$ does not inadvertently capture other aspects of bidder characteristics. To examine this possibility, we compare how this parameter varies across industries based on the prevalence of non-GAAP reporting.[34] The assumption underlying this robustness check is that if an industry relies more on non-GAAP reporting, GAAP earnings are less relevant to the capital market, contracts, and, thus, by extension, bidders' management. As a result, a higher reliance on non-GAAP reporting would be associated with a lower sensitivity to GAAP-earnings, which implies a lower θ in high non-GAAP industries.

We implement this robustness check by re-estimating our model in two subsamples with high and low non-GAAP reliance. In particular, we compare the Business Equipment and Healthcare industries ("High non-GAAP"), the two industries with the highest non-GAAP prevalence according to Black et al. [2021], with the rest of the sample ("Low non-GAAP"). Table 6 reports that high non-GAAP industries have an estimated θ parameters that is higher than the targets in other industries ($\theta^{HighNonGAAP} = 2.387$ vs. $\theta^{LowNonGAAP} = 2.069$). This finding corresponds to an expected weight on earnings (i.e., $E(w)$) of 0.30 in comparison to 0.33. Thus, our earnings-based parameter moves as expected: Bidders' sensitivity to GAAP earnings is lower in industries with more non-GAAP reporting.

7. *Counterfactuals*

We conduct counterfactual simulations to estimate how the M&A market would change under alternative accounting rules for goodwill. To do so, we examine how accounting can affect pseudo-valuations and conduct two policy experiments. First, we consider the scenario where bidders care only about the cash effect of the acquisition and disregard the accounting implications. Second, we consider how mergers would change under various accounting regimes, including different amortization periods and amortization regimes that annually test for impairment.

We leverage the interaction between competition and valuation effects to examine the impact of alternative goodwill accounting standards on takeover outcomes. We first highlight the valuation channel, that is, how the counterfactual accounting policy changes the effective valuation of a

[34] We use the target firm's industry because we do not observe losing bidders' industry. Presumably, the target's industry is the same as or at least adjacent to strategic bidders' industries. Thus, strategic bidders likely face preferences for earnings similar to those of firms in the target's industry.

TABLE 6
Sensitivity to Non-GAAP Reporting Prevalence

	High Non-GAAP		Low Non-GAAP	
	Strategic	Financial	Strategic	Financial
Intercept	−0.034	−0.009	−0.106	−0.227
	(0.089)	(0.086)	(0.084)	(0.111)
θ	2.387		2.069	
	(0.382)		(0.240)	
σ	0.158	0.230	0.180	0.210
	(0.015)	(0.020)	(0.016)	(0.022)
Size	0.011	−0.004	0.001	−0.003
	(0.010)	(0.011)	(0.009)	(0.012)
Leverage	0.197	−0.030	−0.010	0.092
	(0.270)	(0.237)	(0.137)	(0.182)
Leverage^2	−0.089	0.402	0.168	0.042
	(0.506)	(0.344)	(0.196)	(0.212)
Q-ratio	−0.007	−0.020	0.009	0.007
	(0.013)	(0.010)	(0.021)	(0.020)
Cash Flow	−0.066	0.037	−0.247	−0.012
	(0.087)	(0.043)	(0.180)	(0.126)
Cash	−0.014	−0.018	0.068	0.047
	(0.073)	(0.066)	(0.089)	(0.130)
R&D	1.628	0.845	−0.785	2.482
	(0.777)	(0.487)	(1.545)	(1.527)
Intangibles	−0.111	−0.234	0.021	−0.003
	(0.064)	(0.078)	(0.049)	(0.068)
S&P 500	0.068	0.072	0.095	0.099
	(0.098)	(0.104)	(0.127)	(0.128)
Credit Spread	1.352	3.207	5.099	5.364
	(1.999)	(1.954)	(1.887)	(2.631)
Observations	4,242	4,242	4,871	4,871

This table summarizes the estimation results from estimating the model of bidders' fundamental valuation in two subsamples relating to the prevalence of non-GAAP reporting. *High Non-GAAP* relate to all auctions in the two industries with the highest prevalence of non-GAAP reporting, Health and Business Equipment, following Black et al. [2021]. *Low Non-GAAP* are all other industries. Columns 1 and 3 are parameter estimates for strategic bidders. Columns 2 and 4 are parameter estimates for financial bidders. *Intercept* is the coefficient for the intercept. θ is the β parameter from the beta distribution that determines the distribution of strategic investors' sensitivities to accounting. σ is the variance of the bidders' valuation. The remaining variables are defined in table 3. Standard errors are block-bootstrapped by deal using 500 draws.

bidder for a target. We then simulate the takeover outcome by considering how bidders, who may be differentially affected by the counterfactual policy, compete with each other in the takeover auction.

7.1 ACCOUNTING AND EFFECTIVE VALUATIONS

We first compare the difference in pseudo-valuations for strategic bidders under different impairment and amortization regimes with varying amortization periods. Panels a and b of figure 4 show the expected percent changes in strategic bidders' pseudo-valuations across different amortization regimes and goodwill allocations relative to the current impairment-only regime. Consistent with intuition, valuation differences increase as the

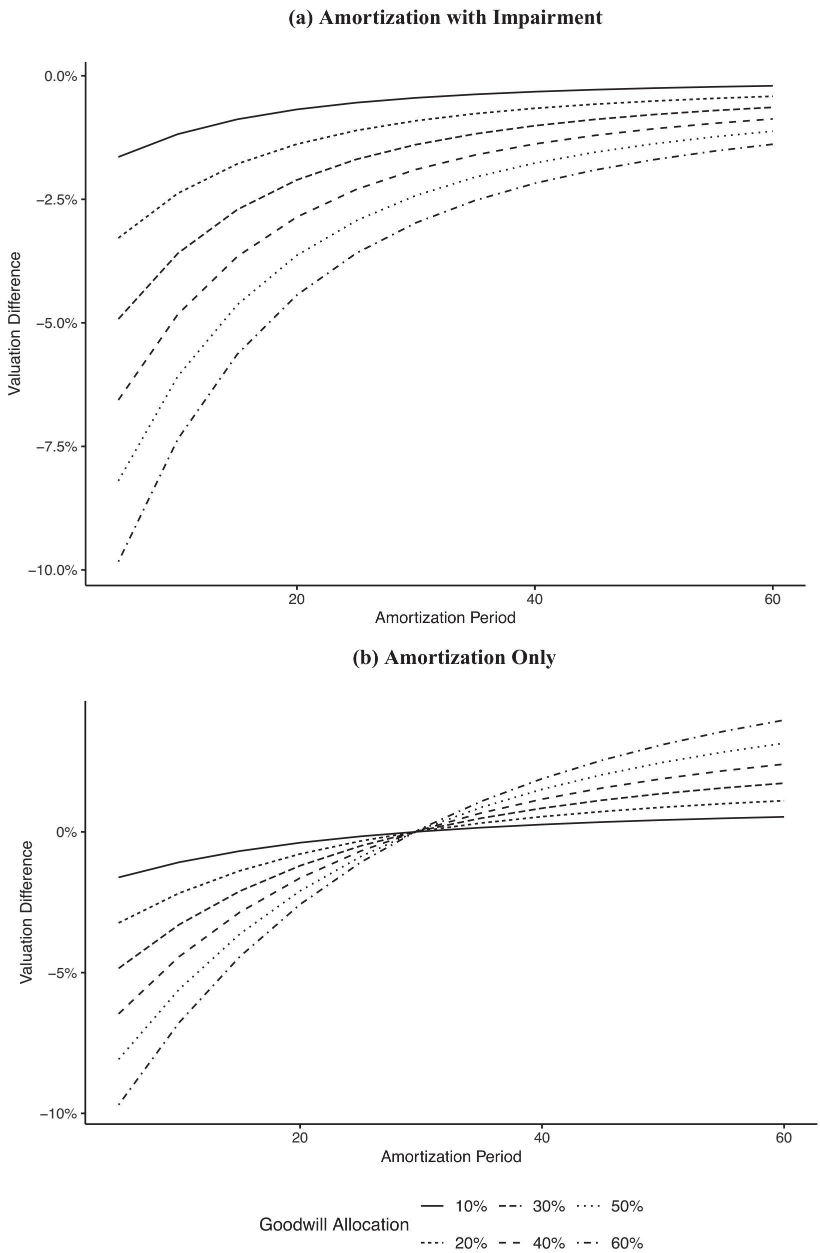

FIG. 4.—Pseudo-valuations under goodwill amortization. This figure shows the change in a strategic bidder's pseudo-valuation for a target, that is, $\tilde{v}_{i,j} = v_{i,j}/A^{a}_{i,j}$, if the bidder were subjected to amortization instead of impairment of goodwill. The *x*-axis shows how this difference in valuation changes with the amortization period and the different lines show the fraction of the purchase price allocated to goodwill. Panel a presents the valuation changes when the accounting standard requires amortization with impairments. Panel b presents the valuation changes when the accounting standard requires only amortization.

proportion of deal value allocated to goodwill in an acquisition increases. Of particular interest for our analyses are the 10-year amortization horizons. Under those policies, the effective valuation of the average strategic bidder would be between 5% and 6% lower than under the impairment-only regime, depending on whether the regime would still require annual impairment testing.

The figure further shows that as the length of the amortization period increases, the valuations under impairment and amortization converge, resulting in smaller percent differences. For amortization-only regimes, we find an inflection point at the 25-year amortization period. Considering the underlying distribution of impairment charges, we find the expected annual impairment charge of 4% of goodwill closely aligns with the annual amortization charge for a 25-year amortization policy. The alternative of amortization with impairment is strictly more conservative than an impairment-only standard, so the pseudo-valuations never fully converge.

7.2 EFFECT OF ACCOUNTING STANDARDS ON MERGER OUTCOMES

Having shown how strategic bidders' valuations relate to alternative accounting treatments of goodwill, we next examine accounting's effect on merger outcomes. This requires simulating how bidders whose effective valuations are differentially affected by the accounting rules compete with each other in a takeover auction.

7.2.1. Counterfactual Simulation Procedure. To set up our counterfactual experiments, we simulate 10,000 auctions and set the characteristics equal to the average values of target and market characteristics.[35] For each auction, we randomly draw the number of bidders from the empirical distribution in the data truncated at the 95% quantile (35 bidders). We randomly assign each bidder a type (strategic or financial) based on the actual proportion in the data. Having assigned each simulated bidder a type, we draw an idiosyncratic component of value, $\epsilon_{i,j}$, and compute the fundamental valuation, $v_{i,j}$, for each bidder based on the estimates from section 5. We then draw an accounting preference, w_i, for each strategic bidder from the beta distribution with our estimated parameter $\hat{\theta}$ and calculate their valuation adjustments, $A^a_{i,j}$. When a bidder is financial, or the counterfactual is the one where bidders only care about cash, we set the valuation adjustment equal to 1; that is, $A^a_{i,j} = 1$.

With this setup, we simulate the bidding process following Gorbenko and Malenko [2014]. This process is an ascending auction with jump bids to

[35] Lower quality goodwill requires a higher frequency of impairments because it reflects fewer synergies and more overpayment. Consequently, switching to an amortization regime would have a greater effect on mergers with higher quality goodwill because they would otherwise not need to recognize an expense. The wide variation in the incidence and size of impairment charges across industries suggests there may be substantial variation in goodwill quality across industries. We account for this possibility by simulating forward goodwill value based on the target's industry.

reflect the discrete bid increases observed in the data. In each round of bidding, a bidder is randomly selected to submit a bid. If the bidder's pseudo-value, $\tilde{v}_{i,j}$, surpasses the current highest bid, the bidder updates her bid by increasing it by a random percentage of the target's market value uniformly and discretely distributed between 1% and 10%. When this jump exceeds the bidder's pseudo-valuation, we set her bid equal to her pseudo-value. If the prevailing bid exceeds the chosen bidder's pseudo-value, the bidder drops out of the auction. If none of the bidders' pseudo-values exceed the current market value of the target, the auction fails.

For each counterfactual, we examine both the valuation and aggregate outcomes of mergers to better understand the impact of these hypothetical changes. For valuation outcomes, we focus on the deal premium, the valuation of the second-highest bidder, the percent of deals that fail, which are those deals where no winner has a bid greater than the market value, and the probability a financial bidder ("private equity" or "PE") wins the auction.[36] For aggregate changes, we examine the aggregate amount of deal volume and the change in asset value acquired by financial bidders.

7.2.2. Accounting, Valuations, and the Role of Competition. The results from our counterfactual simulations are summarized in table 7. The first row reports the simulation results that mirror the observed M&A market: Goodwill is only tested for impairment, and the composition of bidders mimics what we observe in the data. Our first counterfactual, labeled *Cash* in table 7, uses the benchmark where all bidders only care about cash. Under this counterfactual, all bidders are optimizing the fundamental value they would receive from the acquisition. By comparing this counterfactual with our as-observed outcomes (the first row of table 7), we can quantify how preferences for earnings interact with competition in determining deal outcomes.

In this counterfactual, aggregate deal valuations decline by 10.1%, and deal premiums decrease by 11.3 percentage points. Both statistics are lower (in magnitude) than the 14% decline in strategic bidders' valuations where they only care about cash, which is implied from the estimates in table 5.[37] This difference illustrates that competition from bidders less sensitive to accounting rules can partially offset the valuation change and lead to a muted response in transaction prices. It also highlights that focusing solely on public bidders' valuations and disregarding the effect of competition, as in Bartov, Cheng, and Wu [2021], provides an incomplete picture of how underlying valuations change.

In the remaining rows of table 7, we compare the as-observed results with two amortization standards that each have varying amortization

[36] The valuation of the runner-up would be the realized deal value if the takeover auction were structured as a second-price auction instead of one with jump bidding.

[37] Recall that strategic acquirers act as if they only internalize 85% of the purchase price. In other words, if they only cared about the underlying cash flows, their valuations would be 15% lower.

TABLE 7
Counterfactuals: Alternative Accounting Regimes

	Valuation Effects				Distributional Effects	
	Premium	Runner-up Valuation	% Failed	ΔM&A Dealvalue	Probability PE Winner	ΔPE Assets
Impairment	37.82%	1.309	3.65%	—	30.37%	—
Cash	26.48%	1.199	5.63%	−10.12%	53.59%	58.61%
Amortization with Impairment						
5 Years	31.28%	1.247	4.27%	−5.36%	40.58%	26.46%
10 Years	32.88%	1.263	4.13%	−4.07%	37.25%	17.67%
15 Years	34.02%	1.274	3.99%	−3.10%	35.44%	13.07%
20 Years	34.77%	1.281	3.90%	−2.47%	34.17%	9.74%
30 Years	35.84%	1.290	3.78%	−1.57%	32.77%	6.21%
40 Years	36.31%	1.295	3.73%	−1.18%	32.13%	4.55%
Amortization						
5 Years	31.38%	1.248	4.26%	−5.27%	40.36%	25.89%
10 Years	33.19%	1.267	4.08%	−3.79%	36.62%	16.01%
15 Years	34.76%	1.281	3.90%	−2.47%	34.17%	9.73%
20 Years	36.05%	1.293	3.76%	−1.39%	32.41%	5.23%
30 Years	37.85%	1.310	3.65%	0.02%	30.32%	−0.14%
40 Years	39.00%	1.321	3.62%	0.89%	29.09%	−3.37%

This table shows counterfactual results for corporate takeover auctions under different accounting treatments of goodwill. It compares M&A market outcomes for the current impairment-only regime with a cash-accounting regime, an amortization-only regime, and a regime that requires both amortization and annual impairment testing. Results are reported for amortization periods ranging between 5 and 40 years. *Premium* is the average premium of the takeover price over the market value of the target based on an ascending auction with random jump bids. *Runner-up Valuation* is the average valuation of the bidder with the second-highest valuation. *% Failed* is the probability of a takeover failing; that is, no bidder has a valuation above the market value of the target. ΔM&A *Dealvalue* is the percentage difference in aggregate deal value under an alternative accounting regime and the current impairment regime. This calculation takes into account both the change in average deal value and the probability of deals failing. *Probability PE Winner* is the percentage of auctions with a financial bidder winning. Δ*PE Assets* is the percentage difference of total assets acquired by financial acquirers under an alternative accounting regime compared with the impairment-only regime.

periods. The block of rows labeled *Amortization with Impairment* considers an amortization standard with annual impairment testing of goodwill, whereas the last block of rows (labeled *Amortization*) considers an amortization-only standard. When discussing the results, we refer to the *Amortization with Impairment* regime over 10 years as our main counterfactual because it corresponds to ASC 350-20-35, which permits private firms to amortize goodwill over a period no longer than 10 years and requires the firm to impair assets should they need to. Moving from an impairment regime to this counterfactual regime, we estimate a 4.94 percentage point (i.e., $32.88 - 37.82$) decrease in the deal premium. This decline reflects strategic bidders' valuations declining because they must, at a minimum, amortize the cost equally over 10 years instead of delaying recognition until impairment. Consequently, we find runner-up valuations decline by about 4.6 percentage points (i.e., $1.263 - 1.309$) and a 13% increase in the likelihood of deals failing. Taking the reduction in valuations and the increase in failed auctions together yields counterfactual estimates of a

4.07% reduction in total deal value. To put this decline into perspective, this reduction would amount to approximately \$67 billion in total M&A deal value for 2021 (4.07% × \$1.6tn).

Transitioning to an amortization-with-impairment regime would not only affect deal valuations, but also change who controls productive assets in the economy. Strategic bidders have a comparative advantage over financial bidders because their earnings preferences effectively reduces their acquisition costs. Amortizing goodwill would reduce this advantage and have strategic bidders bid less aggressively. Consequently, financial bidders are approximately 6.9 percentage points, or 23%, more likely to win a takeover auction. As a result, we estimate the value of assets acquired by financial bidders would increase by 17.67%.

7.3 ACCOUNTING'S EFFECT ON TAKEOVER SURPLUS

We next explore how accounting preferences influence the surplus generated by a takeover. Takeover surplus differs from bidder surplus in that it consists only of the gross discounted cash flow generated by the merger. Strategic bidders' preferences for earnings elevate their effective valuations above their cash-based valuations allowing them to bid more aggressively. As a result, takeover surplus can change if a different bidder wins the auction. If all bidders only cared about cash flows, the bidder with the highest cash-based valuation would win.[38] However, with earnings preferences, some strategic bidders will win even though they do not have the highest cash-based valuation.

In figure 5, we report the average takeover surplus, that is, the discounted cash flow expected realized by the merger, v, as a percentage increase above the target's market value. Unsurprisingly, the counterfactual, where all bidders only care about cash flows, has the highest cash-based takeover surplus at 33.2%. The impairment-only regime has a lower takeover surplus than the counterfactual with a 10-year amortization schedule with impairments (i.e., 27.3% vs. 30.4%). The reason why the amortization regime has a larger takeover surplus than the impairment-only regime is that it moderates strategic bidders' bidding advantage and increases the likelihood that the winning bidders will have the highest cash-based valuations.

Taken together, an amortization regime increases private equity ownership and realized cash-based takeover surpluses. However, the welfare implications of these results are not immediately obvious. The increased private equity ownership may heighten the SEC's concern about a shrinking

[38] Having bidders only care about a firm's fundamental value could be interpreted as first-best. However, we hesitate to label it as such because our revealed preferences approach does not allow us to directly analyze the economic frictions that drive strategic bidders' preference for accounting earnings. Consequently, any analysis of economic efficiency may overlook broader factors.

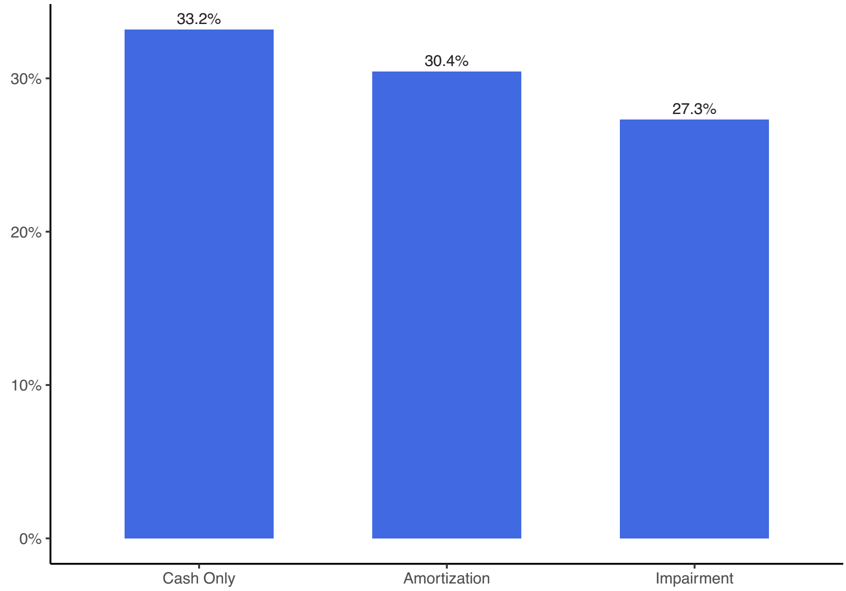

FIG. 5.—Takeover surplus. This figure shows the merger surplus under alternative accounting regimes. Each bar represents the merger surplus, that is, the percent difference between the fundamental value, v, of the winning bidder and the current market value of the target. The bar labeled *Cash Only* is the merger surplus when all bidders only care about cash flows. The bar labeled *Amortization* is the merger surplus when goodwill must be amortized over 10 years and tested annually for impairment. The bar labeled *Impairment* is the merger surplus using the current impairment-only accounting regime.

public investing universe.[39] Conversely, the increased takeover surplus may indicate that capital allocation in the economy would improve.

To further examine whether capital allocation might improve under different accounting regimes, in untabulated analysis, we investigate how shareholders react to the influence of earnings preferences in merger decisions. We proxy for managers' earnings preferences using CEO bonus compensation because bonuses are a strong indicator of earnings in compensation contracts (Shalev, Zhang, and Zhang [2013]), suggesting earnings matter for these bidders.[40]

In this analysis, we do not find that merger announcement returns are lower for mergers that create more goodwill when a manager is likely to have earnings preferences. This lack of reaction is consistent with shareholders not perceiving the earnings preferences as value-reducing. However, we also find that the subsequent market reactions to goodwill

[39] See, for instance, https://www.sec.gov/news/speech/lee-sec-speaks-2021-10-12.

[40] In a regression explaining the takeover price, the interaction between bonuses and goodwill is positive and significant, suggesting that CEOs with bonus pay are willing to pay more if they can create more goodwill, which is consistent with having a stronger earnings preference.

impairments are larger when the manager is more likely to care about earnings, which is consistent with investors eventually ascertaining that a manager's focus on earnings can lead to suboptimal outcomes. Taken together, our results suggest that earnings preferences allow strategic bidders to pay more, but we are unable to determine whether the increased willingness to pay corresponds to overpayment. We consequently leave this for future research.

7.4 INDUSTRY-SPECIFIC OUTCOMES

The counterfactual analyses presented so far have been based on average target characteristics and goodwill allocations, overlooking the substantial heterogeneity observed across different industries, as shown in tables 1 and 2. To address this limitation, we conduct separate counterfactual simulations for each of the 12 Fama-French industries, accounting for their specific characteristics. In these industry-specific counterfactuals, we simulate auctions by applying the average target characteristics, number of bidders, distribution of bidder type, impairment rate, and goodwill allocation corresponding to each industry.

Table 8 summarizes the results for four industries: Business Equipment, Oil and Gas, Consumer Nondurables, and Manufacturing.[41] We report Business Equipment (panel A) and Oil and Gas (panel B) because Business Equipment has the highest average goodwill allocation, whereas Oil and Gas has the lowest. Generally, the impact of transitioning to a 10-year amortization policy is positively correlated with the amount of goodwill allocation in each industry. For instance, in the Business Equipment industry, where 50.1% of the purchase price is allocated to goodwill, the decrease in aggregate deal values under the amortization-with-impairments policy is more pronounced, with a reduction of 7.2%. By contrast, in the Oil and Gas industry, where only 23.7% of the purchase price is allocated to goodwill, the decrease in aggregate deal values is smaller, at 6.5%.

We report counterfactuals for Consumer Nondurables (panel C) and Manufacturing (panel D) because they have the highest (79%) and lowest (34%) proportion of financial bidders, respectively. The presence of financial bidders can mitigate the effects of goodwill accounting on deal volume because their pseudo-valuations are unaffected by accounting. Comparing panels C and D, we observe that switching to a 10-year amortization schedule with impairment has a smaller effect on aggregate deal volume for consumer nondurables (2.34%) than for manufacturing targets (5.93%). These findings suggest the proportion of bidders affected by accounting influences accounting's effect on mergers.

[41] Due to space limitations, results for other industries are omitted but are available upon request.

TABLE 8
Counterfactuals for Select Industries

Panel A: Business Equipment

	Valuation Effects				Distributional Effects	
	Premium	Runner-up Valuation	% Failed	ΔM&A Dealvalue	Probability PE Winner	ΔPE Assets
Impairment	44.82%	1.377	1.88%	—	17.34%	—
Amortization						
10 Years w/I	35.05%	1.282	2.36%	−7.21%	27.89%	49.25%
10 Years	38.10%	1.312	2.16%	−4.91%	23.62%	29.53%

Panel B: Oil and Gas

	Valuation Effects				Distributional Effects	
	Premium	Runner-up Valuation	% Failed	ΔM&A Dealvalue	Probability PE Winner	ΔPE Assets
Impairment	40.21%	1.333	4.21%	—	23.75%	—
Amortization						
10 Years w/I	32.25%	1.257	5.05%	−6.50%	33.69%	32.63%
10 Years	34.61%	1.280	4.76%	−4.55%	29.92%	20.25%

Panel C: Consumer Nondurables

	Valuation Effects				Distributional Effects	
	Premium	Runner-up Valuation	% Failed	ΔM&A Dealvalue	Probability PE Winner	ΔPE Assets
Impairment	30.38%	1.235	7.81%	—	54.17%	—
Amortization						
10 Years w/I	27.89%	1.210	8.21%	−2.34%	60.82%	9.65%
10 Years	28.67%	1.218	8.02%	−1.54%	58.40%	6.15%

Panel D: Manufacturing

	Valuation Effects				Distributional Effects	
	Premium	Runner-up Valuation	% Failed	ΔM&A Dealvalue	Probability PE Winner	ΔPE Assets
Impairment	50.00%	1.427	0.17%	—	9.49%	—
Amortization						
10 Years w/I	41.20%	1.345	0.24%	−5.93%	14.11%	39.86%
10 Years	45.62%	1.386	0.21%	−2.96%	11.50%	17.59%

This table shows how the counterfactual results vary by select Fama-French-12 industries. It compares the current impairment regime with regimes that require a 10-year amortization period with and without annual impairment testing (w/I). Panel A, B, C, and D summarize the results for Business Equipment, Oil and Gas, Consumer Nondurables, and Manufacturing targets. *Premium* is the average premium of the takeover price over the market value of the target based on an ascending auction with random jump bids. *Runner-Up Valuation* is the average valuation of the bidder with the second-highest valuation. *% Failed* is the probability of a takeover failing; i.e., no bidder has a valuation above the market value of the target. Δ*Dealvalue* is the percentage difference in aggregate deal value under an alternative accounting regime and the current impairment regime. This calculation takes into account both the change in average deal value and the probability of deals failing. *Probability PE Winner* is the percentage of auctions with a financial bidder winning. Δ*PE Assets* is the percentage difference of total assets acquired by financial acquirers under an alternative accounting regime compared with the impairment-only regime.

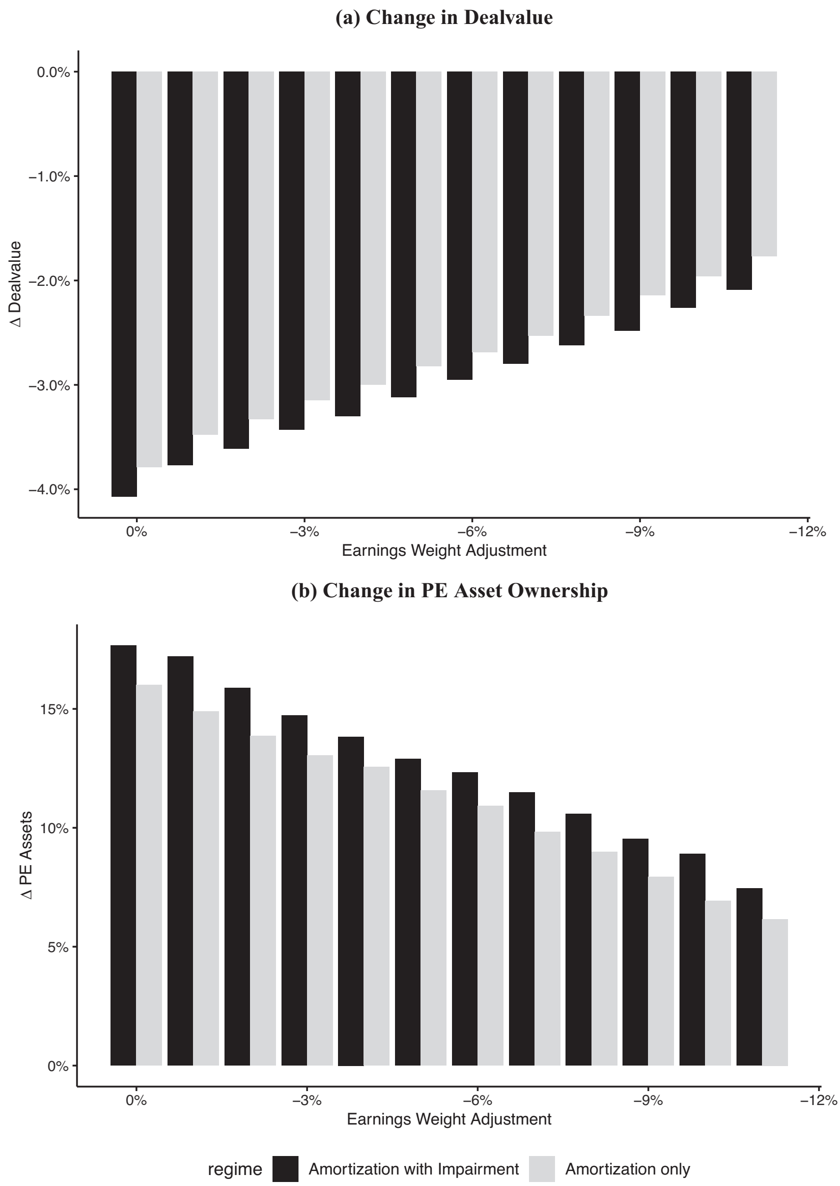

Fig. 6.—Counterfactual sensitivity to changes in earnings weight. This figure shows the outcome of our counterfactual analyses if the weight on earnings decreased by a certain percentage; 0% represents the baseline counterfactual reported in table 7. Panel a presents the percent change of the aggregate deal value. Panel b presents the percent change of the assets held by financial bidders.

7.5 SENSITIVITY ANALYSIS

Our counterfactual analyses assume that bidders' preferences remain unchanged under alternative accounting regimes. However, changing the accounting treatment of goodwill may also reduce the informativeness of earnings, because amortization is deterministic, whereas impairments reflect a decline in the acquisition's value. As a result, this change may also reduce strategic bidders' preferences for earnings.

In the online appendix, we describe how we combine the model of Kanodia, Sapra, and Venugopalan [2004] with estimates from Liang [2020] and our own simulations to determine that the maximum possible reduction on the weight on earnings to be around 10%. We examine how this reduction would affect our counterfactual estimates. Figure 6 shows the sensitivity of our main counterfactual results assuming a 10-year amortization regime relative to an impairment-only regime. In this sensitivity analysis, we assume a reduction in the weight on earnings up to 10%. Panel A shows the expected change in deal value for the 10-year amortization regimes ranges from −4.07% in the main counterfactual to −2.3% if the earnings weight was reduced by 10%. Similarly, panel B shows that the increase in assets under financial bidder control would go from 17.7% to around 10%. Collectively, this figure suggests that a decline in earnings preference following a switch to amortization could reduce our counterfactual estimates by, at most, half.

8. *Conclusion*

This paper examines the impact of the accounting treatment of goodwill on the market for corporate control. To disentangle the accounting effects from the competitive effects that bidders face, we develop and estimate a structural model of bidding in takeover auctions. The model assumes the bidders' valuations of the target are a function of the target's characteristics. We assume strategic bidders can be sensitive to goodwill accounting, maximizing a combination of earnings and cash flows, whereas financial bidders only maximize cash flows. Although we estimate strategic bidders care about earnings, which is a function of accounting standards, they are far more interested in cash flows.

Our counterfactual analyses suggest strategic bidders' preference for earnings substantially boosts average deal premia and deal volume. This preference implies changing the accounting for goodwill would influence merger activity. We estimate that moving from an impairment-only regime to an amortization regime for goodwill—as recently proposed by standard setters—would decrease the target valuations of public acquirers, because amortization expenses reduce future earnings. Our results suggest these changes would reduce the bid premia and deal volume while shifting more assets to private equity acquirers. As a result, these findings provide insights into the economic consequences of accounting in the M&A market. We believe these conclusions may interest standard setters as they continue to debate whether to modify the accounting for acquisitions.

APPENDIX A: LIKELIHOOD CONTRIBUTIONS

All bids and valuations are scaled by the market value of target j. $\Phi(\cdot)$ is the cdf of a standard normal distribution.

Winning Bid. From assumption (1), it follows that the likelihood of that bid equals

$$\begin{aligned} L^z(b_{1,j}; x, \beta_z, \sigma_z|w) &= P\left(b_{1,j} \leq \frac{v_{1,j}}{A^a_{1,j}}\right) \\ &= P\big(A_{1,j} b_{1,j} \leq v_{1,j}\big) \\ &= P\big(A_{1,j} b_{1,j} \leq \exp(X_j\beta_z)\exp(\epsilon_{1,j})\big) \\ &= P\big(\log(A_{1,j}) + \log(b_{1,j}) \leq X_j\beta_z + \epsilon_{1,j}\big) \\ &= P\big(\log(A_{1,j}) + \log(b_{1,j}) - X_j\beta_z \leq \epsilon_{1,j}\big) \\ &= 1 - P\big(\epsilon_{1,j} \leq \log(A_{1,j}) + \log(b_{1,j}) - X_j\beta_z\big) \\ &= 1 - \Phi\left(\frac{\log(b_{1,j}) - X_j\beta_z + \log(A^a_{1,j}(w))}{\sigma_z}\right). \end{aligned}$$

Formal Losing Bid. From assumptions (1) and (2), it follows that the likelihood of that bid equals

$$\begin{aligned} L^z(b_{1,j}; x, \beta_z, \sigma_z|w) &= P\left(b_{i,j} \leq \frac{v_{i,j}}{A^a_{i,j}} \leq b_{1,j}\right) \\ &= \Phi\left(\frac{\log(b_{1,j}) - X_j\beta_z + \log(A^a_{i,j}(w))}{\sigma_z}\right) \\ &\quad -\Phi\left(\frac{\log(b_{i,j}) - X_j\beta_z + \log(A^a_{i,j}(w))}{\sigma_z}\right). \end{aligned}$$

Informal Losing Bid. From assumptions (1), (2), and (3), it follows that the likelihood of that bid equals

$$\begin{aligned} &L^z(b_{1,j}; x, \beta_z, \sigma_z|w) = P\left(1 \leq \frac{v_{i,j}}{A^a_{i,j}} \leq b_{1,j}\right) \\ &= \Phi\left(\frac{\log(b_{1,j}) - X_j\beta_z + \log(A^a_{i,j}(w))}{\sigma_z}\right) - \Phi\left(\frac{\log(1) - X_j\beta_z + \log(A^a_{i,j}(w))}{\sigma_z}\right) \\ &= \Phi\left(\frac{\log(b_{1,j}) - X_j\beta_z + \log(A^a_{i,j}(w))}{\sigma_z}\right) - \Phi\left(\frac{-X_j\beta_z + \log(A^a_{i,j}(w))}{\sigma_z}\right). \end{aligned}$$

No Observed Bid. The likelihood of observing a bidder not submitting equals

$$L^z(b_{1,j}; x, \beta_z, \sigma_z | w) = P\left(\frac{v_{i,j}}{A^a_{i,j}} \leq b_{1,j}\right) = \Phi\left(\frac{\log(b_{1,j}) - X_j\beta_z + \log(A^a_{i,j}(w))}{\sigma_z}\right).$$

Statement that Valuation Is Below Market Value. From assumption (2), it follows that the likelihood of observing a bidder leaving the auction with this reason equals

$$\begin{aligned} L^z(b_{1,j}; x, \beta_z, \sigma_z | w) &= P\left(\frac{v_{i,j}}{A^a_{i,j}} \leq 1\right) \\ &= \Phi\left(\frac{\log(1) - X_j\beta_z + \log(A^a_{i,j}(w))}{\sigma_z}\right) \\ &= \Phi\left(\frac{-X_j\beta_z + \log(A^a_{i,j}(w))}{\sigma_z}\right). \end{aligned}$$

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