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Do Classified Boards Deter Takeovers? Evidence from Merger Waves

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Abstract

We exploit the arrival of industry-wide synergistic merger waves to identify whether classified boards deter takeover bids. In a stylized model, we show that when target classified boards are costly to bidders, their negative effect on takeover likelihood should be more pronounced during merger waves. Using a sample of takeover bids in the United States between 1990 and 2016, we find strong evidence supporting this prediction. The results are robust to accounting for the benefits of classified boards and controlling for other antitakeover provisions. Our findings suggest that classified boards effectively reduce a firm's exposure to the takeover market.

I. Introduction

It is often argued that staggering director election into multiple years ("classified boards") is the most significant potential barrier to takeovers.[1] As such, board classification attracts by far the most attention from shareholder activists, corporate lawyers, proxy advisory firms, and regulators, who are concerned that

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[1]See, for example, Daines and Klausner (2001) and Bebchuk, Coates, and Subramanian (2002). A classified board typically has three classes of directors, which can substantially delay the takeover process when bidders must replace the majority of directors to win.

board classification reduces disciplinary takeover pressure on managers and, ultimately, destroys shareholder value (Manne (1965)). Indeed, shareholder proposals against the classified board provision alone accounted for more than a third of all governance proposals since 1997 (Karpoff, Schonlau, and Wehrly (2022)). Even as the intense shareholder pressure has led some S&P 500 firms to declassify their boards during the last decade, recent evidence that the takeover protection offered by classified boards can be value-enhancing for some firms (e.g., Cremers, Litov, and Sepe (2017)) has brought board classification back at the forefront of corporate governance debates.[2] In addition, classified boards are increasingly popular among IPO firms (Field and Lowry (2022)), suggesting that they will continue to remain an important feature of the corporate governance landscape of public firms.

The debate over the shareholder value implications of classified boards, whether negative or positive, implicitly assumes that they constitute an effective takeover defense. However, existing evidence from the takeover market suggests that classified boards may not have a significant effect on takeover bid incidence, leading Bates, Becher, and Lemmon (2008) to conclude that "overall, the evidence is inconsistent with the conventional wisdom that board classification is an antitakeover device that facilitates managerial entrenchment."[3] Karpoff, Schonlau, and Wehrly (2017) point out that empirical estimates of the effect of antitakeover provisions, such as classified boards, on takeover likelihood might understate their true takeover deterrent power because of an endogeneity concern, as targets with such provisions could also be more valuable to bidders. Using an instrumental variable approach, they show that the two popular indexes of multiple antitakeover provisions, the G-Index and the E-Index, reduce takeover likelihood significantly.[4] Yet, the standalone effect of classified boards remains only modest even in a similar instrumental variable approach (Karpoff et al. (2022)). Therefore, whether board classification constitutes an effective takeover deterrent remains unclear.

In this article, we provide the first direct evidence of a significant negative effect of classified boards on takeover likelihood using a new approach that addresses the potential endogeneity in takeover defenses by exploiting the arrival of industry-wide synergistic merger waves. Our key insight is that such merger waves, which tend to be precipitated by economic and regulatory shocks, bring about sizable industry-wide synergies (e.g., Mitchell and Mulherin (1996), Andrade, Mitchell, and Stafford (2001), and Harford (2005)). These industry synergies generate an arguably exogenous variation in the attractiveness of potential targets in an industry, which helps isolate the takeover deterrence effect of classified boards. Our analysis consists of a set of novel theoretical predictions and empirical tests on whether firms with and without a classified board exhibit

[2]For example, Gallagher and Grundfest (2014) argue that the evidence on benefits of classified boards requires greater involvement of proxy advisors and institutional investors in voting on matters related to classified boards.

[3]Comment and Schwert (1995) find no evidence that poison pills or state-level laws reduce takeover likelihood.

[4]See Gompers, Ishii, and Metrick (2003) for G- and Bebchuk, Cohen, and Ferrell (2009) for E-Index details.

a systematically different likelihood of receiving takeover bids during merger waves.

We first develop a simple stylized model of the takeover market in which managers obtain private benefits of control, which results in mismanagement of the firm. We show that if classified boards are effective at deterring takeover bids, managers will optimally engage in greater mismanagement. In turn, the protected firms become more attractive to potential bidders since greater synergies can be achieved from elimination of the existing mismanagement. These two offsetting forces suggest that the estimated *average* effect of classified boards on takeover likelihood can be insignificant (e.g., Bates et al. (2008)). The basic setup of our model captures the central endogeneity in antitakeover provisions noted in Karpoff et al. (2017): protected firms are run less efficiently, which makes them more attractive to potential bidders.

The key result of our model is that the observed takeover deterrence effect of classified boards should be more pronounced during industry merger waves. The intuition behind this result is as follows: In our model, merger waves are spurred by the arrival of industry-wide positive synergy shocks, which increase the value of targets in that industry to potential bidders. As more potential targets become available during a merger wave, it becomes easier for bidders to avoid the incremental bidding costs associated with a classified board. That is, classified boards become *relatively* more costly to bidders during merger waves. This result forms the novel testable prediction that if classified boards constitute an effective takeover defense, they should deter a greater proportion of potential takeover bids during synergistic merger waves.

Using a sample of publicly traded U.S. firms between 1990 and 2016, we provide strong empirical evidence in support of our theoretical predictions. In the univariate analysis, the probability of receiving a takeover bid during a synergistic merger wave is 11.6% for firms without a classified board but only 5.8% for firms with a classified board ("protected" firms).[5] On the other hand, there is no substantial difference in takeover likelihood between these two groups of firms in normal times.[6] These results hold in a multivariate setting in which we control for other known determinants of takeover likelihood. Supporting our model's central prediction, the estimated coefficient on the main explanatory variable (the interaction term between an indicator for classified boards and for merger wave years) is negative and statistically significant. The point estimate shows that classified boards are associated with a 5.4% reduction in the likelihood of receiving a takeover bid during a synergistic merger wave, which is an economically significant effect relative to the unconditional takeover likelihood of 6.6% in our sample. Further, consistent with our model's comparative statics, the negative relation between classified boards and takeover likelihood is more pronounced when industry merger synergies are greater and when merger waves are less anticipated.

[5]See Section III.B for more details on our measure of synergistic merger waves.

[6]Outside merger waves, 6.8% of firms with a single class of directors become the target of a takeover bid in a given year, compared to 6.1% of firms with multiple classes of directors.

We perform a host of robustness tests using several alternative measures of synergistic merger waves, control variables, regression specifications, and sample restrictions. Our results also hold when we identify industry merger waves using exogenous industry shocks that have been shown to trigger merger waves (e.g., Mitchell and Mulherin (1996), Harford (2005)), rather than realized merger activity. These results show that our finding of a significant takeover deterrence effect of classified boards during industry merger waves is robust to a variety of approaches to capturing industry synergistic merger activity.

We further investigate whether our main results change when we account for two main benefits of classified boards proposed in the literature: increased bargaining power and greater bonding with firm's stakeholders. First, we consider the bargaining effect, by which classified boards can help targets extract higher takeover premiums (Stulz (1988), Schwert (2000)). If classified boards increased targets' bargaining power during merger waves, this could also give rise to an increase in the observed takeover likelihood wedge between firms with and without a classified board. However, we find no evidence that classified boards have an impact on target or bidder takeover premiums during synergistic merger waves. Therefore, the bargaining channel is unlikely to explain the takeover deterrence effect of classified boards during merger waves.

Next, we examine whether our baseline results change when we take into account the "bonding" benefits of classified boards. A growing literature shows that takeover defenses may signal a commitment to remain protected from takeovers, which can increase a firm's standalone value by helping foster long-term investments by important stakeholders (e.g., Johnson, Karpoff, and Yi (2015), (2022), Cremers et al. (2017)). It should be noted that this hypothesis implicitly assumes that the bonding benefits of takeover defenses are not transferable to bidders,[7] which implies that their presence should not affect the firm's likelihood of receiving a takeover bid. Using several proxies for bonding benefits identified in the literature, we find that our main result, that the takeover deterrence effect of classified boards is more pronounced during synergistic merger waves, indeed does not vary with the importance of firms' bonding benefits. Overall, while the bonding benefits of classified boards have been shown to be reflected in firm value, there is no difference in how they affect takeover likelihood in firms with greater bonding benefits.

The remaining potential concern with our main results is the possibility that during synergistic merger waves, acquirers avoid protected targets for reasons unrelated to acquisition costs but correlated with having a classified board. There are no obvious reasons to expect why such reasons should be more prominent in on-wave years (i.e., that they should widen the wedge in takeover likelihood between firms with and without a classified board only on merger waves). Nevertheless, we attempt to address this concern by examining how the likelihood of receiving a takeover bid in classified board firms is impacted by the passage of state-level laws that validate the use of a poison pill for targets incorporated in the state. Existing studies suggest that a classified board is most effective in combination with

[7]Since otherwise stakeholder investment would not depend on whether or not the firm has takeover protection.

poison pills (Klausner (2013), Catan and Kahan (2016)), since they force a bidder to spend two or more years to complete the takeover to obtain the majority of seats on the target's board and rescind the poison pill. Thus, the adoption of a state poison pill law introduces an exogenous enhancement in the takeover deterrence power of classified board firms incorporated in that state. We find that for firms with a classified board, the passage of poison pill laws reduces the likelihood of receiving a takeover bid and that this effect is concentrated during synergistic merger waves. On the other hand, the passage of the laws has no effect on takeover likelihood for firms without a classified board. As the state-level adoption of poison pill laws is arguably exogenous to individual firms, these results support a causal interpretation of our finding that classified boards deter takeover bids significantly during synergistic merger waves.

While our main focus is on the classified board provision, in Section VI we expand our analysis to include a wider set of antitakeover provisions, which can also impede takeover bids. Following the previous literature, we either aggregate these provisions in three alternative indexes (the G-Index and the Delay index from Gompers et al. (2003) and the E-Index from Bebchuk et al. (2009)) or include all provisions individually.[8] We find that the takeover deterrence effect of classified boards is robust to controlling for other governance provisions and their interaction with synergistic merger waves. Further, none of the net indexes and no other antitakeover provision deter takeovers when industries undergo synergistic merger waves. These results provide additional evidence that the classified board provision is one of the most effective tools for target managers to prevent takeover bids.

This article contributes to several strands of the literature. First, our findings complement the recent corporate governance literature studying endogeneity in takeover defenses (e.g., Karpoff et al. (2017), (2022), Karpoff and Wittry (2018)). Our model explicitly allows for endogenous mismanagement and generates unique and novel predictions that exploit the arrival of synergistic merger waves to estimate the takeover deterrence effect of classified boards. Further, our new evidence that classified boards constitute an effective takeover defense provides empirical support for the widespread theoretical and practitioner arguments that board classification is among the strongest antitakeover provisions (e.g., Bebchuk et al. (2002), Klausner (2013)).

Our results also provide an economic intuition for why the previous literature finds a weak average effect of antitakeover provisions on takeover likelihood (e.g., Comment and Schwert (1995), Bates et al. (2008)).[9] We show that the takeover deterrence effect of classified boards varies systematically with industry-wide economic conditions and merger opportunities. Specifically, we find an economically significant takeover deterrence effect of classified boards when industries undergo a synergistic merger wave. However, this effect mostly vanishes after industry merger activity subsides. Our results suggest that future empirical studies

[8]Karpoff et al. (2022) study which of 24 antitakeover provisions in the G-Index are empirically associated with takeover deterrence.

[9]The estimated average effect of classified boards in our sample is 0.4%, which is similar to 0.6% documented in Bates et al. (2008).

of takeover protection mechanisms may consider including industry × year fixed effects to control for heterogeneity in their effectiveness across time-varying industry-wide economic conditions.

Second, this article is related to a long-standing debate on the effects of classified boards on firm value. The conventional agency view predicts a negative value effect of classified boards (e.g., Gompers et al. (2003), Bebchuk and Cohen (2005)), while a recent literature points out that entrenched management can be beneficial for shareholders, especially in young, innovative firms and firms with important stakeholder relationships (e.g., Johnson et al. (2015), (2022), Cremers et al. (2017)).[10] Importantly, both these hypotheses rely on the same fundamental notion that classified boards constitute an effective takeover defense. Our results provide direct evidence of an economically significant takeover deterrence effect of classified boards, supporting the key premise in both these literatures that classified boards have an effect on firm value (either negative or positive). Our results also suggest that, during synergistic merger waves, entrenched managers may resist a greater number of value-enhancing takeover offers, which is in line with Cremers and Ferrell (2014) who find a more negative valuation effect of antitakeover provisions when industry merger activity is high.

Finally, we contribute directly to the literature on merger waves. Existing studies point to macroeconomic, industry, firm-operating, and financial characteristics as determinants of merger waves (e.g., Mitchell and Mulherin (1996), Andrade et al. (2001), Harford (2005), and Maksimovic, Phillips, and Yang (2013)). Our results add to this literature by showing that the structure of corporate governance in an industry determines which firms in the industry are more likely to be acquired during merger waves. Interestingly, in our sample, the likelihood of receiving a takeover bid for firms with a classified board is mostly flat across on- and off-wave years. This result suggests that the wave pattern in the intensity of merger activity is mainly driven by firms without a classified board.

Previous literature also suggests that merger waves spur the reallocation of industry resources toward more efficient firms (see, e.g., Jovanovic and Rousseau (2002), Harford (2005), Eisfeldt and Rampini (2006), and Maksimovic et al. (2013)).[11] Successful capital reallocation during merger waves requires an efficient market for corporate control where bidders can match with potential targets quickly. The literature has examined how efficiency in the takeover process can be impaired by various frictions in the takeover market, such as financial constraints, uncertainty, or search costs.[12] Our results suggest that corporate governance provisions of target firms can be an additional important friction in the efficient

[10] An early literature studies the value effect of antitakeover provisions using a short-term event study methodology that analyzes the shareholder wealth effects following the announcements of the adoptions or amendments of such provisions (e.g., DeAngelo and Rice (1983)). See Bhagat and Romano (2002) for a survey.

[11] For example, Jensen (1988) argues that substantial reductions in the profitability of oil exploration and development were the catalysts for the 1980s' restructuring in the oil industry. Andrade et al. (2001) suggest that industry shocks, particularly deregulation events were the primary factors in merger activity during the 1990s.

[12] See Eisfeldt and Shi (2018) for a survey of the capital reallocation literature.

reallocation of industry assets during merger waves. Therefore, a growing occurrence of governance interventions, such as shareholder activists' board declassification proposals, can be beneficial when industry capital reallocation through the market for corporate control is desirable.

The remainder of the article is organized as follows: Section II presents a simple stylized model of the takeover market and develops main empirical predictions. Section III describes the data and the construction of our variables. Section IV presents our baseline and comparative statics analysis results. Section V discusses alternative mechanisms for our findings. Section VI discusses the takeover deterrence effect of other antitakeover provisions. Section VII concludes.

II. Motivating Theory

In this section, we develop a stylized model of the market for corporate control to motivate our empirical hypotheses. The model illustrates how the observed takeover deterrence power of mechanisms such as a classified board can be more manifest during synergistic merger waves. Appendix A provides proofs, and the Supplementary Material provides an additional illustration of the results from our model.

A. Baseline Model of Takeover Deterrence

Consider a firm owned by risk-neutral shareholders and operated by a risk-neutral manager. There is an agency problem in the delegated management of the firm, which allows the manager to enjoy private benefits of control $B(m)$ by engaging in mismanagement m. We assume that $B(\cdot)$ is strictly increasing, strictly concave, and twice differentiable, with $B(0) = 0$.

Following Grossman and Hart (1986) and Hart and Moore (1990), shareholders are not able to contract on manager's actions (e.g., project choices) or write profit-sharing agreements and, thus, cannot use a contractual mechanism to induce strict profit maximization.

While shareholders cannot fully preclude the manager's value-destroying actions, such mismanagement is limited by the threat of receiving a takeover bid. Upon takeover, the acquirer realizes both a positive synergy and an additional value gain from eliminating the target's mismanagement. Thus, the value of the target to a potential acquirer is $Z + m$, where Z is the match-specific synergy with a cumulative distribution function $\Phi(Z)$. We assume that Φ is continuous over a positive support, twice-differentiable with a nonconstant density function, and concave.

Bidding entails a cost C to acquirers because of takeover premiums, due diligence, or litigation risk. Takeover deterrence mechanisms, such as a classified board, increase bidding costs because target firms can leverage those mechanisms to bargain for a higher share of the synergy and resist the bid for a longer period. We consider two types of firms: $i = 0$ (declassified board) or 1 (classified board). Accordingly, the cost of bidding for a target without a classified board is C_0, and the classified board increases the cost to $C_1 > C_0$.

Upon the realization of a match-specific synergy Z, the acquirer bids for firm i only if the total benefit from the acquisition exceeds the bidding cost

(i.e., $Z + m_i \geq C_i$, or, equivalently, $Z \geq C_i - m_i$). Thus, given mismanagement m_i, the probability that the manager will avoid receiving a takeover bid is $\Pr(Z \leq C_i - m_i) = \Phi(C_i - m_i)$. Normalizing the manager's utility upon the takeover to 0, the manager's expected utility from operating the firm with mismanagement m_i is $\Phi(C_i - m_i)B(m_i)$. Then the manager's optimal choice of mismanagement m_i is determined by the following first-order condition:

$$\Phi(C_i - m_i)B'(m_i) = \Phi'(C_i - m_i)B(m_i). \tag{1}$$

The left-hand side of equation (1) represents the marginal benefit of mismanagement to the manager consisting of two countervailing effects. First, increasing m_i allows the manager to enjoy higher private benefits $B'(m_i) > 0$. However, such benefits are realized only if she maintains the control of the firm, which happens with probability $\Phi(C_i - m_i)$ that decreases in m_i. The right-hand side of equation (1) shows that m_i decreases the threshold synergy for which a takeover is attractive to the bidder by $\Phi'(C_i - m_i)$, which is costly to the manager as, upon takeover, she would lose her private benefit $B(m_i)$. Intuitively, the manager trades off the higher utility from greater mismanagement against the higher likelihood of receiving a takeover bid as greater mismanagement makes the firm more attractive to potential bidders.

While the first-order condition (1) defines the manager's optimal choice of mismanagement $m_i^* = m^*(C_i)$ only in implicit form, it can be shown that m_i^* satisfies two conditions. First, the manager always engages in some mismanagement (i.e., $m_i^* > 0$). In fact, the first-order condition (1) does not hold at $m_i^* = 0$. This is because, at $m_i^* = 0$, the left-hand side of (1) is strictly positive (since $B' > 0$) while the right-hand side of (1) is 0 (since $\Phi' > 0$ and $B(0) = 0$). Intuitively, the manager will never choose zero mismanagement as she would prefer strictly positive utility with some takeover threat to zero utility with a zero probability of takeover. Second, no manager engages in mismanagement up to the acquisition cost (i.e., $m_i^* < C_i$). In fact, at $m_i^* = C_i$, the right-hand side of (1) is strictly positive while the left-hand side of (1) is 0 (since $\Phi(0) = 0$ and $B' > 0$). In this case, the acquirer always makes a bid because any positive synergy makes an acquisition profitable. Thus, the manager would never engage in mismanagement up to the acquisition cost as that would drive her expected utility to 0. Although reducing mismanagement below C_i decreases the manager's private benefit $B(m_i)$, the manager is compensated by a higher expected utility because of the reduced probability of receiving a takeover bid.

Next, we apply the implicit function theorem to equation (1) to obtain the following results:

Proposition 1. Optimal mismanagement m^* increases with the cost of acquisition C. Therefore, managers of firms with a classified board engage in greater mismanagement than managers of firms without a classified board (i.e., $m_1^* - m_0^* > 0$).

Proposition 1 illustrates the standard agency problem that classified boards can reinforce managerial entrenchment. In our model, firms with a classified board have a lower value because their managers engage in greater mismanagement. This is

consistent with the existing empirical evidence suggesting a generally negative effect of classified boards on firm value (e.g., Bebchuk and Cohen (2005), Core, Guay, and Rusticus (2006)), particularly for large and old firms where agency costs are less likely to be outweighed by other value-enhancing aspects of classified boards (e.g., Johnson et al. (2015), (2022), and Cremers et al. (2017)).

While a classified board allows the manager to engage in greater mismanagement, the next proposition shows that it is not optimal to increase the mismanagement so much as to completely offset the incremental protection against takeovers provided by the classified board. Intuitively, in choosing more mismanagement, the manager trades off the higher private benefit $B(m)$ against the higher chance of receiving a takeover bid. Since $B(m)$ is concave, manager's utility from greater mismanagement increases slower than the probability of being taken over and losing the entire private benefit. Next, we summarize this important property of the incremental optimal mismanagement for firms with a classified board:

Proposition 2. Optimal mismanagement m^* increases less than proportionally with C. Therefore, the incremental optimal mismanagement due to a classified board, $m_1^* - m_0^*$, is smaller than the incremental cost of acquisition, $C_1 - C_0$.

What do these results imply for the effect of classified boards on the likelihood of receiving a takeover bid? Intuitively, classified boards have two offsetting effects. On the one hand, they increase the acquisition cost ($C_1 > C_0$), thereby reducing takeover likelihood. On the other hand, classified boards allow managers to engage in greater mismanagement (Proposition 1), making their firms more attractive to potential acquirers. Proposition 2 shows that, while the optimal mismanagement increases with acquisition costs, it does so less than proportionally. Since acquirers will make a bid only if $Z \geq C_i - m_i^*$, we can establish the following:

Corollary 1. Firms with a classified board are less likely to receive a takeover bid than firms without a classified board since $C_0 - m_0^* < C_1 - m_1^*$.

Corollary 1 shows that classified boards deter takeover bids on average. More importantly, it implies that the *average* takeover deterrence effect of classified boards could be small as shown in Bates et al. (2008). Indeed, the *effective* incremental cost of acquisition imposed by a classified board is $\left(C_1 - m_1^*\right) - \left(C_0 - m_0^*\right)$, which is smaller than $C_1 - C_0$, because the bidder obtains a value gain from eliminating the target's mismanagement upon takeover. By Proposition 1, managers of firms with a classified board optimally engage in greater mismanagement (i.e., $m_1^* - m_0^* > 0$). This makes firms with a classified board more attractive to bidders, which effectively reduces the incremental cost of acquiring these firms. While Proposition 2 implies that this incremental cost is not zero, it could be reduced substantially because of endogenous mismanagement. Hence, our model formalizes how the modest takeover deterrence effect of classified boards could be driven by the endogenous nature of classified boards as discussed in Karpoff et al. (2017).

B. Takeover Deterrence and Merger Waves

In this subsection, we analyze how the takeover deterrence effect of classified boards is affected by the arrival of a positive industry-wide synergy shock $\mu > 0$. This shock increases the takeover synergy uniformly, thereby making targets in the industry more attractive to potential acquirers. More specifically, since an acquisition now brings an additional synergy μ, firms in this industry expect to receive a takeover bid if $Z + \mu \geq C_i - m_i$, or, equivalently, if $Z_i \geq C_i - m_i - \mu$. The synergy shock μ effectively lowers the threshold match-specific synergy Z, at which the manager would expect to receive a bid, from $C_i - m_i^*$ to $C_i - m_i^* - \mu$.

Note that the arrival of a synergy shock μ in a given industry should result in an observable merger wave, since higher expected synergies tend to be associated with higher incidence of takeover bids (see, e.g., Mitchell and Mulherin (1996), Harford (2005)). This observation allows us to empirically test the predictions from our model, as we can observe whether and when industries enter periods of heightened merger activity that we interpret as spurred by the arrival of an industry synergy shock μ.[13] The following corollary provides our key prediction regarding the impact of the positive synergy shock on the takeover deterrence effect of classified boards:

Corollary 2. The takeover deterrence effect of classified boards (i.e., the difference in the likelihood of receiving a bid between firms without and with a classified board) increases with industry synergy shock $\mu > 0$.

Corollary 2 predicts that classified boards should have a more negative effect on takeover likelihood during industry merger waves. Intuitively, the synergy shock reduces all bidding thresholds by μ, making a greater number of targets attractive to potential acquirers. While the incremental bidding cost for classified board firms remains the same at $\left(C_1 - m_1^*\right) - \left(C_0 - m_0^*\right)$, this incremental cost reduces their takeover likelihood disproportionately more at this lower threshold synergy because of the concavity of Φ. In other words, the arrival of the synergy shock μ puts more potential targets with no classified board in play. This makes having a classified board *relatively* more costly to potential bidders, resulting in a more pronounced takeover deterrence effect.[14]

We develop two additional comparative statics predictions from Corollary 2. First, the takeover deterrence effect of classified boards should increase in the

[13]Note that we keep m_i^* constant upon the arrival of μ. This is a plausible assumption as unwinding the effects of mismanagement on firm operations and assets likely takes time, especially if the arrival of the synergy shock was unexpected. In our empirical analysis, we explore the degree to which our results are impacted by whether the merger wave is unanticipated, as described in the discussion of Corollary 2.

[14]It should be noted that our model derives testable predictions exclusively on the observed *difference* in takeover likelihood between firms with and without a classified board. While this wedge should unambiguously increase with industry synergy μ, our model does not predict the *level* of takeover likelihood of each of the two types of firms. In fact, the level of takeover likelihood will depend on several model parameters, including the shape of synergy distribution function Φ, managerial utility function B, the bidding costs for firms with and without a classified board C_1 and C_0, and the size of industry synergy μ. By contrast, the key insight of our model – that the takeover deterrence effect increases with industry synergy – only characterizes the *relative* increase in takeover bid frequency for firms without a classified board, which does not depend on specific model parameters.

strength of the synergy shock μ as it results in a greater decrease in the synergy threshold. Second, this effect should be greater when the synergy shock μ is less anticipated. To see this, suppose that the manager fully anticipates the arrival of μ. Then she could adjust her mismanagement (i.e., reduce m_i) in anticipation of the merger wave so as to offset the impact of μ on the threshold synergy, which she anticipates to receive a takeover bid. If so, we would see no relationship between the synergy shock and the takeover deterrence effect of classified boards. When the industry synergy shock is less anticipated, the manager is less able to adjust her mismanagement, leading to a more pronounced increase in the takeover deterrence effect during industry merger waves.

The results in this section constitute the basis for our empirical predictions: i) on average, classified boards modestly reduce takeover likelihood, ii) the takeover deterrence effect of classified boards is greater during synergistic merger waves, iii) the effect is increasing in the level of industry-wide merger synergy, and iv) the effect is stronger for less anticipated merger waves. The remainder of this article provides empirical evidence supporting these predictions.

III. Data and Variables

A. Sources of Data

Our sample includes U.S. public firms covered by the Investor Responsibility Research Center (IRRC) / Institutional Shareholder Services (ISS) between 1990 and 2016. The IRRC data include a set of 24 governance provisions in the S&P 1500 and other major U.S. firms about every 2 years from 1990 until 2006.[15] Following the extant literature, we assign the most recent IRRC data for years not covered by IRRC. After 2006, ISS acquired IRRC and continued reporting a similar set of governance provisions every year.[16] This IRRC/ISS data is matched to Compustat/CRSP financial information using historical CUSIP numbers. We exclude financial and utility firms (SIC codes between 6000 and 6999 and between 4900 and 4999) since M&A activity is mostly regulated in these industries during our sample period. Our baseline data set consists of 28,084 firm-year observations for 2,810 unique firms between 1990 and 2016. Appendix B describes the sources and definition of all variables.

The information on both successful and unsuccessful takeover bids is retrieved from the Securities Data Corporation's (SDC) mergers and acquisitions database. Our sample bids include the form of deals classified as "mergers," "acquisitions," and "acquisitions of majority interest." Following Bates et al. (2008), we filter out multibid auctions and follow-on bids by including only the initial bid for a given target, which is defined as the bid without any preceding bids within 365 calendar days before the announcement. We drop "spin-off" deals from the sample where the acquirers are the firm's shareholders. We also exclude deals in which the bidder holds more than 50% of the shares of the target before the bid announcement

[15]The IRRC volumes are published in the following years: 1990, 1993, 1995, 1998, 2000, 2002, 2004, and 2006.

[16]While ISS has apparently changed the method of collecting data on certain provisions (Karpoff et al. (2017)), the information on classified boards remains consistent across the IRRC and ISS data.

(Kadyrzhanova and Rhodes-Kropf (2011)). Our sample of firms is associated with 1,953 takeover bids between 1990 and 2016.

B. Synergistic Merger Waves

To identify synergistic merger waves, we first define a synergistic takeover deal as one with positive bidder and target announcement-period combined wealth effect (CWE), following Bradley, Desai, and Kim (1988). CWE is calculated as the value-weighted sum of cumulative abnormal returns (CAR) to the bidder and the target for a window of $(-5, +2)$ trading days around the bid announcement. Synergistic merger waves are defined as industry-year observations in which the number of synergistic merger deals is 1-standard-deviation above the industry time-series median (see Harford (2005) for a similar definition of industry merger waves).[17] To define industries, we use the 48 industry classification of Fama and French (1997), which we construct using historical SIC codes from Compustat.[18] The synergistic merger waves identified in our sample coincide largely with the waves reported in Harford (2005).[19]

Our theoretical model predicts that the takeover deterrence effect of classified boards should be stronger during relatively unanticipated merger waves. In our baseline specification, we require that waves involve a surprise bid in at least half of the subsectors (at 3-digit SIC codes) within an industry. Following the approach in Song and Walkling (2000), a surprise takeover bid is the first bid after a period of at least 9 months with no acquisition activity in the subsector.[20] We use several alternative specifications of merger waves that vary with the degree of anticipation, including waves with no surprises, to test the predictions of our model that the takeover deterrence effect of classified boards increases in the size and surprise of the synergy shock μ.

C. Summary Statistics

Table 1 presents summary statistics of firm and merger deal characteristics in our sample. On average, 53.5% of our sample firms have a classified board. The proportion of firms with a classified board was relatively stable at around 50%–60% every year until 2006, and began to decline in the last 10 years of the sample period. The decline in the share of firms with a classified board reflects a wave of board

[17]When identifying synergistic merger waves, we use all the deal announcements reported in the SDC, including the deals involving firms outside the IRRC/ISS data.

[18]Our results are also robust to a finer industry classification at 3-digit SIC codes.

[19]For example, the top five industry merger waves with the highest number of synergistic deals in our sample are in the second half of the 1990s and include the following industries: i) business services, ii) semiconductors, iii) telecommunication, iv) healthcare, and v) retail. Harford (2005) classifies all of these five episodes as merger waves driven by major economic motives to merge, such as the Telecom Act of 1996 and the consolidation and industry growth in the hardware and software industries from the late 1990s. Figure IA2 in the Supplementary Material plots the share of industries that are undergoing a synergistic merger in each year of our sample.

[20]The 9-month gap corresponds to the 95th percentile of the sample distribution of the period between two subsequent bids in a subsector.

TABLE 1

Summary Statistics

Table 1 summarizes the characteristics of the sample firms, merger deals, and synergistic waves. Our baseline data set consists of 28,084 firm-year observations with 2,810 unique firms included in the IRRC/ISS data between 1990 and 2016. TARGET is a dummy variable indicating whether a firm receives a takeover bid. CB is a dummy variable indicating whether a firm's board employs multiple classes of directors. WAVE is a dummy variable for industry-year observations in which the number of announced deals with positive bidder and target combined wealth effect (CWE) is 1-standard-deviation above the industry time-series median. CWE is the value-weighted bidder and target cumulative abnormal return (CAR) measured over an event window of $(-5, +2)$ days surrounding bid announcements using the market model in which parameters are estimated over a window of $(-241, -41)$ days. Waves are required to involve a surprise bid in at least half of the subsectors within an industry, where a surprise bid is the first takeover bid after a period of at least 9 months with no acquisition activity in the subsector. Industries are defined using Fama and French (1997) 48 industry classifications. See Appendix B for the complete list of variable definitions. All ratio variables are winsorized at the 1%/99% level.

	Mean	Median	Std. Dev.
Main Variables			
TARGET	0.066	0	0.249
CB	0.535	1	0.499
WAVE	0.058	0	0.233
Firm Controls			
SIZE	7.475	7.327	1.500
MARKET_TO_BOOK	1.921	1.549	1.172
SALES_GROWTH	0.085	0.066	0.207
LEVERAGE	0.228	0.214	0.184
ROA	0.139	0.137	0.094
R&D	0.034	0.003	0.057
CAPEX	0.061	0.043	0.059
STOCK_RETURN	0.035	−0.016	0.468
HHI	0.070	0.055	0.063
Deal Characteristics			
TARGET_CAR	0.114	0.061	0.192
BIDDER_CAR	0.004	−0.001	0.102
CWE	0.024	0.016	0.076
STOCK_OFFER	0.181	0	0.385
TENDER_OFFER	0.080	0	0.272
COMPLETED_DEAL	0.700	1	0.458

declassification that occurred among S&P 1500 firms since 2006 in response to pressure from activist shareholders and proxy advisory firms (Cohen and Wang (2013)). However, as shown in Field and Lowry (2022), at the same time, classified boards have been increasingly popular for initial public offering (IPO) firms. For example, Lyft, one of the biggest IPOs in 2019, adopted three classes of directors with staggered 3-year terms.

The share of firm years on a surprise synergistic merger wave in our sample is 5.8%. Other firm characteristics are similar to those in the extant corporate governance literature using the IRRC/ISS data (e.g., Gompers et al. (2003) and Karpoff et al. (2017)).[21] Deal characteristics are also comparable with those in the previous studies on the market for corporate control (e.g., Mikkelson and Partch (1989), Schwert (2000), and Bates et al. (2008)). In particular, firms that receive a takeover bid are 6.6% of the firm-year observations. Deals using stock payment comprise 18.1% of our sample deals. Further, the incidence of tender offers is 8.0%, and about 70% of the deals are completed eventually.[22]

[21] All ratio variables are winsorized at the 1% level. Our results remain unaffected when we use no winsorization.

[22] Our results are robust to excluding incomplete deals from the sample (i.e., estimating the likelihood of being acquired rather than just receiving a takeover bid). These results are reported in Tables IA1 and IA2 in the Supplementary Material.

IV. Do Classified Boards Deter Bidders During Merger Waves?

In this section, we present our baseline empirical analysis that examines whether the takeover deterrence effect of classified boards is stronger when an industry is undergoing a synergistic merger wave. We also test the predictions of our model with respect to the magnitude and surprise of the positive industry synergy shock μ. Finally, we check the robustness of our baseline results to alternative regression specifications and variable definitions.

Throughout our empirical tests, we use a matched sample approach to control for the difference in characteristics of firms with and without a classified board (e.g., Cremers et al. (2017)). Our model implies that firms protected by a classified board underperform because of greater managerial mismanagement. Further, acquirers make takeover bids based on the tradeoff between the characteristics of a particular target (e.g., underperformance) and the costs associated with acquiring that target. To better isolate the effect of classified boards on the acquisition costs, therefore, we match firms with a classified board to firms that have similar pre-bid characteristics but do not have a classified board. Specifically, we control for differences in pre-bid performance of firms with and without a classified board by performing propensity score matching (Rosenbaum and Rubin (1983)) on the following firm characteristics: industry, firm size, market-to-book ratio, sales growth, leverage, return on assets (ROA), and investment in fixed assets (CAPEX) and R&D. We match each classified board firm to a firm without a classified board but similar to the classified board firm in these dimensions.[23]

A. Univariate Comparison of Takeover Likelihood

Table 2 reports the bid frequency and deal characteristics in on-wave (column 1) and off-wave industry-year observations (column 2) and the difference in their means (column 3). On average, the likelihood of receiving a takeover bid is higher on-wave than off-wave years (7.44% vs. 6.33%), but the difference is not statistically significant. Consistent with our prediction, however, we find that the difference is substantial and statistically significant for firms without a classified board (11.60% vs. 6.79%). On the other hand, the bid frequency for firms with a classified board remains at around 6% in both on- and off-wave years, with the difference statistically insignificant. To sum up, the takeover likelihood of firms without a classified board is about twice as large as that of firms with a classified board in on-wave years, while the bid frequency for these two groups of firms is similar in off-wave years.

Turning to deal characteristics, we do not find significant differences between on- and off-wave years except for target premiums (TARGET_CAR), combined wealth effects (CWE), and tender offer frequency. Higher target premiums during synergistic merger waves suggest that targets share some of the surplus from synergistic deals. Therefore, an effective classified board that impedes takeovers

[23]Our baseline findings are robust to using the full sample without propensity score matching.

TABLE 2

Univariate Comparison of Takeover Likelihood and Deal Characteristics

Table 2 compares the takeover likelihood and deal characteristics across on- and off-wave industry-year observations. Takeover likelihood is the average annual incidence of takeover bids in the relevant sample. Column 1 is based on the subsample of bids during years when an industry is in a synergistic merger wave. Column 2 corresponds to all other years. Column 3 shows the difference between on- and off-wave characteristics with statistical significance calculated from 2-sided *t*-tests. Industries are defined using Fama and French's (1997) 48 industry classifications. See Appendix B for the complete list of variable definitions. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	On-Wave (%)	Off-Wave (%)	Difference: 1–2 (%)
Likelihood of Receiving a Takeover Bid	1	2	3
All Firms	7.44	6.33	1.11
Firms with a classified board: A	5.75	6.10	−0.35
Firms without a classified board: B	11.60	6.79	4.81***
Difference: A–B	−5.84***	−0.68*	
Deal Characteristics			
TARGET_CAR	17.01	10.98	6.02***
BIDDER_CAR	1.74	0.24	1.51
CWE	5.69	2.12	3.57***
STOCK_OFFER	21.49	17.90	3.59
TENDER_OFFER	14.05	7.64	6.41**
COMPLETED_DEAL	63.64	70.47	−6.83

during synergistic merger waves may induce a loss of value-increasing opportunities for target shareholders. The higher CWE for deals on waves confirms that our proxy for a synergistic merger wave is properly constructed. Further, tender offers appear to be more prevalent during merger waves, suggesting that acquirers indeed view industry synergy opportunities as temporary and are eager to realize them in a timely manner.[24]

B. Baseline Regression Results

Our baseline regression models follow Bates et al. (2008) and, in addition, allow the takeover deterrence effect of classified boards to vary with the incidence of synergistic merger waves:

$$\text{TARGET}_{ikt} = a_t + d_k + b_1\text{CB}_{ikt-1} \times \text{WAVE}_{kt} + b_2\text{CB}_{ikt-1} + b_3\text{WAVE}_{kt} + b_4 X_{ikt-1} + \varepsilon_{ikt}, \quad (2)$$

where i denotes firm, k denotes industry, t denotes year, TARGET is a dummy variable that equals one if the firm receives a takeover bid. CB is a dummy variable that equals one if the firm has a classified board provision. WAVE is a dummy variable that equals one if the industry is undergoing a synergistic merger wave. X is a set of control variables based on the existing literature (e.g., Schwert (2000), Bebchuk and Cohen (2005), Bates et al. (2008), and Kadyrzhanova and Rhodes-Kropf (2011)), including firm size and its square, market-to-book ratio, sales growth, leverage, ROA, market-adjusted stock return, and industry concentration. Our regression models include year (a_t) and industry (d_k) fixed effects to control for time variation in merger activity as well as time-invariant unobserved heterogeneity

[24]Betton, Eckbo, and Thorburn (2008) document that tender offers tend to be quicker than merger negotiations. Therefore, our results are consistent with the interpretation that bidders prefer tender offers to expedite deals during synergistic merger waves.

across industries. Finally, we calculate the statistical significance of coefficients using robust standard errors clustered at the industry level to allow for potential serial correlation of merger activity within an industry.

We estimate equation (2) using either probit or linear probability models. To ease the interpretation of our findings, for probit models, we report the marginal effects of the explanatory variables calculated at their mean, rather than their raw estimated coefficients. Further, the reported marginal effects of the interaction term between CB and WAVE in the probit model are computed following the method of Ai and Norton (2003).

Table 3 presents the results from our baseline analysis. First, column 1 of Table 3 shows the probit estimates for the takeover deterrence effect of classified boards without distinguishing on- and off-wave years, as in Bates et al. (2008) and

TABLE 3

Baseline Analysis of the Likelihood of Receiving a Takeover Bid

Table 3 presents the results from our baseline analysis of the impact of classified boards on takeover likelihood during synergistic merger waves. The dependent variable is TARGET, which is a dummy variable indicating whether a firm receives a takeover bid. Columns 1 and 2 report the marginal effects estimated from a probit regression model. Marginal effects of the interaction term between CB and WAVE are computed as in Ai and Norton (2003). Columns 3 and 4 report the coefficients estimated from a linear probability model. CB is a dummy variable indicating whether a firm's board employs multiple classes of directors. WAVE is a dummy variable for industry-year observations in which the number of synergistic deals is 1-standard-deviation above the industry time-series median, with an additional requirement that at least half of the subsectors within an industry should receive a surprise bid. Industries are defined using Fama and French's (1997) 48 industry classifications. All control variables are measured at the beginning of the year. See Appendix B for the complete list of variable definitions. Standard errors are clustered at the industry level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Probit		LPM	
	1	2	3	4
CB × WAVE		−0.061***		−0.054***
		(−2.68)		(−2.69)
CB	−0.004	−0.001	−0.005	−0.001
	(−1.24)	(−0.34)	(−0.94)	(−0.30)
WAVE		0.056***		0.066***
		(5.16)		(3.27)
SIZE	−0.028***	−0.028***	−0.057**	−0.057**
	(−3.31)	(−3.35)	(−2.35)	(−2.35)
SIZE_SQUARED	0.003***	0.003***	0.005***	0.005***
	(4.90)	(4.94)	(2.69)	(2.69)
MARKET_TO_BOOK	−0.012***	−0.012***	−0.012***	−0.012***
	(−4.82)	(−4.73)	(−3.86)	(−3.78)
SALES_GROWTH	−0.019**	−0.018**	−0.023	−0.022
	(−2.11)	(−2.05)	(−1.60)	(−1.55)
LEVERAGE	0.030***	0.031***	0.030*	0.030*
	(2.74)	(2.85)	(1.94)	(1.95)
ROA	−0.014	−0.014	0.005	0.004
	(−0.57)	(−0.60)	(0.15)	(0.13)
R&D	0.086**	0.086**	0.077	0.078
	(2.11)	(2.12)	(0.98)	(0.98)
CAPEX	0.003	0.007	0.014	0.015
	(0.08)	(0.19)	(0.23)	(0.25)
STOCK_RETURN	−0.009*	−0.009*	−0.005*	−0.005
	(−1.84)	(−1.80)	(−1.72)	(−1.65)
HHI	0.132***	0.157***	0.121**	0.143***
	(2.62)	(3.12)	(2.43)	(2.84)
Industry and year dummies	Yes	Yes	Yes	Yes
No. of obs.	21,766	21,766	21,766	21,766
Adj. (or pseudo) R^2	0.065	0.067	0.059	0.060

other previous empirical studies. The estimates suggest that, in a given year, firms with a classified board are about 0.4% less likely to receive a bid relative to firms with a single class of directors, but the coefficient is not statistically significant at conventional levels. This result is consistent with the findings of Bates et al. (2008). Column 3 shows that the estimates from a linear probability model are similar in magnitude and statistical significance.[25] Considering that the unconditional likelihood of receiving a bid for firms in our sample is about 6.6%, these results confirm the existing finding in the literature that the *average* deterrence effect of classified boards is small.

Column 2 of Table 3 shows the main finding of our study. The interaction term between CB and WAVE is negative and statistically significant. The estimated marginal effect indicates that firms with a classified board are 6.1% less likely to receive a takeover bid during an industry synergistic merger wave than firms without a classified board. The magnitude of this effect is economically significant at about 90% of the unconditional takeover likelihood (about 6.6%). By contrast, the coefficient on CB without interaction, which captures the takeover deterrence effect of classified boards outside merger waves, is not different from zero economically and statistically. Column 4 shows that the estimates from a linear probability model are similar to those from the probit model, in terms of both statistical and economic significance. Therefore, our findings are not driven by the specific selection of an empirical model. As our baseline specification includes a number of fixed effects (year and industry), we use the linear probability model in the remainder of the article since its results are more likely to be robust to the inclusion of fixed effects.[26]

Our baseline results from the linear probability model (column 4) suggest that firms with a classified board are 5.4% less likely to receive a takeover bid during a synergistic merger wave compared with similar firms without a classified board. These results are consistent with our theoretical prediction that classified boards have a significant takeover deterrence effect in years of peak synergistic merger activity in the industry. To provide an additional angle on the economic significance of these results, we calculate the implied probabilities of receiving a takeover bid for firms with and without a classified board during the $(-2, +2)$ year window surrounding the onset of a synergistic merger wave.[27] These probabilities, calculated for each year of the event window, are plotted in Figure 1. Before the onset of a merger wave, there is no clear difference in takeover likelihood between firms with and without a classified board. With the arrival of the wave, however, the difference in takeover likelihood between the two groups (i.e., the takeover deterrence effect of classified boards) reaches about 6% in the first year of the wave, which is close to the sample average takeover likelihood of 6.6%. It decreases in the subsequent

[25]The estimated coefficients associated with other firm and industry characteristics are generally consistent with the previous literature. For example, smaller or underperforming (low stock returns or market-to-book ratio) firms are more likely to become takeover targets (Morck, Shleifer, and Vishny (1988), Comment and Schwert (1995)).

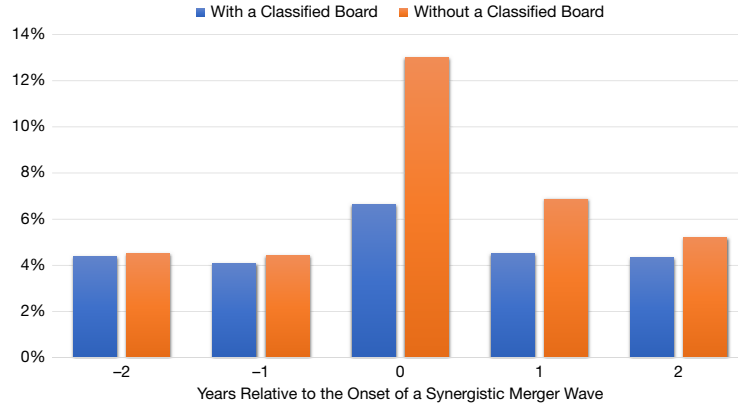
[26]Chamberlain (1980) shows that nonlinear regression models such as probit suffer from an incidental parameter problem when fixed effects are included in the model.

[27]Firm-year observations outside this event window are excluded from this illustration.

FIGURE 1

Takeover Likelihood Surrounding the Onset of Synergistic Merger Waves

Figure 1 shows the changes in the implied takeover likelihood during a 5-year (−2, +2) window surrounding the onset of a synergistic merger wave. Takeover likelihood is estimated from a probit model reported in column 2 of Table 3 with all control variables evaluated at their means. The implied takeover likelihoods for firms with and without a classified board are represented in blue and orange bars, respectively. Year 0 on the horizontal axis indicates the onset of the wave. See Appendix B for details on the definition of synergistic merger waves.



years as merger activity subsides and remains elevated for 2 years after the onset of the wave.

Two features of Figure 1 are noteworthy. First, at the onset of a merger wave, the implied likelihood that firms without a classified board receive a takeover bid is over 12%, which is twice as large as the likelihood that a firm with a classified board becomes a takeover target in the same year (around 6%). Second, only the takeover odds of firms with a single class of directors display significant time variation. In fact, they roughly triple in on-the-wave years compared with off-the-wave years (around 4%). By contrast, the takeover odds of firms with a classified board are relatively flat across the two subsamples at around 4% to 6%. These observations confirm that the classified board provision represents an economically significant impediment to takeover bids during times when industries undergo synergistic merger waves.

C. Comparative Statics

In Section II, we show that the takeover deterrence effect of classified boards increases in the strength of the positive synergy shock μ (Corollary 2). This comparative static leads to two empirical predictions. First, the takeover deterrence effect of classified boards should be more pronounced in merger waves with higher average synergy. Second, since μ is unanticipated, the effect should be stronger for less anticipated merger waves.

Table 4 presents the results. To ease the interpretation of our findings, column 1 reports our baseline estimates from column 4 of Table 3. Recall that, in our baseline measure, merger waves are defined as industry-year observations in which the number of synergistic deals is 1-standard-deviation above the industry time-series

TABLE 4

Comparative Statics

Table 4 examines the comparative statics with respect to the strength and surprise components of synergistic merger waves. We estimate linear probability models of takeover likelihood. The dependent variable is TARGET, which is a dummy variable indicating whether a firm receives a takeover bid. CB is a dummy variable indicating whether a firm's board employs multiple classes of directors. Column 1 reports our baseline results from column 4 of Table 3. In our baseline specification, WAVE is defined as industry-year observations in which the number of synergistic deals is 1-standard-deviation above the industry time-series median, with an additional requirement that at least half of the subsectors within an industry should receive a surprise bid. In column 2, waves are defined as industry-year observations in which the number of nonsynergistic deals is 1-standard-deviation above the industry time-series median. In columns 3 and 4, synergistic waves are defined as industry-year observations in which the number of synergistic deals is above the industry time-series median (column 3) or two standard deviations above the industry time-series median (column 4). Column 5 drops the requirement that waves should consist of surprise bids. In columns 6 and 7, waves are required to have a smaller (33% in column 6) or a larger (66% in column 7) share of subsectors with surprise bids. Industries are defined using Fama and French's (1997) 48 industry classifications. All control variables are measured at the beginning of the year. See Appendix B for the complete list of variable definitions. Standard errors are clustered at the industry level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

		Synergy			Surprise		
	Baseline	None	Low	High	None	Low	High
	1	2	3	4	5	6	7
CB × WAVE	−0.054***	−0.022	−0.025	−0.069**	−0.015	−0.028*	−0.055*
	(−2.69)	(−1.60)	(−1.66)	(−2.20)	(−1.30)	(−1.82)	(−1.95)
CB	−0.001	−0.003	−0.002	−0.003	−0.001	−0.001	−0.003
	(−0.30)	(−0.51)	(−0.32)	(−0.60)	(−0.30)	(−0.30)	(−0.68)
WAVE	0.066***	0.022*	0.041**	0.068**	0.031**	0.036**	0.062**
	(3.27)	(1.93)	(2.67)	(2.09)	(2.64)	(2.06)	(2.33)
SIZE	−0.057**	−0.057**	−0.056**	−0.057**	−0.056**	−0.056**	−0.056**
	(−2.35)	(−2.35)	(−2.35)	(−2.35)	(−2.32)	(−2.34)	(−2.34)
SIZE_SQUARED	0.005***	0.005***	0.005***	0.005***	0.005**	0.005***	0.005**
	(2.69)	(2.70)	(2.69)	(2.70)	(2.67)	(2.69)	(2.68)
MARKET_TO_BOOK	−0.012***	−0.012***	−0.012***	−0.012***	−0.012***	−0.012***	−0.012***
	(−3.78)	(−3.88)	(−3.80)	(−3.85)	(−3.86)	(−3.80)	(−3.85)
SALES_GROWTH	−0.022	−0.022	−0.022	−0.022	−0.022	−0.022	−0.022
	(−1.55)	(−1.58)	(−1.57)	(−1.59)	(−1.60)	(−1.57)	(−1.60)
LEVERAGE	0.030*	0.030*	0.030*	0.030*	0.030*	0.030*	0.030*
	(1.95)	(1.95)	(1.96)	(1.95)	(1.91)	(1.93)	(1.93)
ROA	0.004	0.005	0.005	0.005	0.006	0.005	0.005
	(0.13)	(0.15)	(0.15)	(0.17)	(0.19)	(0.17)	(0.17)
R&D	0.078	0.078	0.077	0.078	0.072	0.076	0.079
	(0.98)	(0.98)	(0.97)	(0.98)	(0.91)	(0.95)	(0.99)
CAPEX	0.015	0.014	0.016	0.015	0.012	0.014	0.014
	(0.25)	(0.23)	(0.27)	(0.26)	(0.20)	(0.24)	(0.23)
STOCK_RETURN	−0.005	−0.005*	−0.006*	−0.005	−0.005*	−0.006*	−0.005*
	(−1.65)	(−1.70)	(−1.71)	(−1.66)	(−1.73)	(−1.73)	(−1.71)
HHI	0.143***	0.125**	0.124**	0.126**	0.126**	0.131**	0.133**
	(2.84)	(2.51)	(2.64)	(2.50)	(2.55)	(2.50)	(2.66)
Industry and year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	21,766	21,766	21,766	21,766	21,766	21,766	21,766
Adj. R^2	0.060	0.059	0.060	0.060	0.060	0.060	0.059

median, with the additional requirement that at least half of the subsectors within an industry receive a surprise bid.

Columns 2–4 show how our baseline results vary with the intensity of synergistic merger activity. In column 2, we define merger waves similarly to the baseline measure but using only nonsynergistic deals (i.e., those with negative CWE). In columns 3 and 4, we define low- and high-synergistic merger waves using a lower (above the median) or a higher (two standard deviations above the median) cutoff for the number of synergistic deals. Consistent with the predictions of our theoretical model, we find that the magnitude of the estimated coefficients increases

monotonically from nonsynergistic waves (−0.022) to high-synergistic waves (−0.069). Further, the statistical significance of coefficients in nonsynergistic (column 2) and low-synergistic (column 3) waves is slightly below the 10% level (t-stats around −1.6). The result that the takeover deterrence effect of classified boards is weaker in nonsynergistic waves is consistent with the theory and empirical evidence in Shleifer and Vishny (2003) and Rhodes-Kropf, Robinson, and Viswanathan (2005) that nonsynergistic waves are likely to be driven by stock overvaluation where target managers might have an incentive to sell the firm to an overvalued bidder.

Next, columns 5–7 present the results from varying the degree to which merger waves are unanticipated. In column 5, we drop the requirement that waves should consist of surprise bids and define waves as all periods of high-synergistic activity, regardless of the degree to which they are anticipated. In columns 6 and 7, the waves are constructed using a smaller (33% in column 6) or a larger (66% in column 7) share of subsectors with surprise bids than in the baseline measure. We find that the negative relation between classified boards and takeover likelihood is monotonically increasing in the degree of surprise.

Overall, these results are consistent with the comparative statics predictions of our theoretical model and further corroborate that classified boards become a strong takeover defense mechanism during times when industries experience an unanticipated arrival of synergistic merger opportunities.[28]

D. Robustness of the Baseline Results

Table 5 summarizes the results of a broad set of tests showing the robustness of our baseline findings to alternative variable definitions and regression specifications. For brevity, the table reports only the coefficients of interest on CB, WAVE, and CB × WAVE. All regression models include the same set of control variables as in Table 3 (see Table IA3 in the Supplementary Material for the coefficients associated with all controls). For ease of comparison, row 11 reports the linear probability model estimates from our baseline analysis (column 4 of Table 3).

In row 1, we define merger waves as industry-year observations with high levels of merger activity involving all deals (i.e., both synergistic and nonsynergistic deals, not just synergistic deals as in the baseline measure). The estimated coefficient on the interaction term between CB and WAVE remains negative and statistically significant and is considerably higher than the result with only nonsynergistic waves (column 2 of Table 4). This result shows that the strong takeover deterrence effect of classified boards during merger waves is mostly observed in those with positive synergies, which is consistent with the main prediction of our theoretical model.

In our baseline analysis, we use a matched sample approach to control for the difference in characteristics of firms with and without a classified board. Row 2 shows that our main finding holds for the full sample without propensity score

[28]Tables IA1 and IA2 in the Supplementary Material show that our baseline and comparative statics results still hold when we use the likelihood of being acquired conditional on receiving a bid (i.e., the likelihood of deal completion), rather than the likelihood of receiving a takeover bid, as the dependent variable.

TABLE 5

Robustness Tests of the Likelihood of Receiving a Takeover Bid

Table 5 presents the robustness of our baseline findings in Table 3. We estimate linear probability models of takeover likelihood. The dependent variable is TARGET which is a dummy variable indicating whether a firm receives a takeover bid. In row 1, waves are defined as industry-year observations in which the number of all deals (i.e., both synergistic and nonsynergistic deals, is 1-standard-deviation above the industry time-series median). Row 2 reports the results from the sample without propensity-score matching. Row 3 reports the estimated coefficients from a regression model that includes an interaction term between the classified board provision and industry concentration. Row 4 reports the estimated coefficients from a regression model that includes the interaction of all controls with the merger wave indicator. In row 5, standard errors are two-way clustered by industry and year. In row 6, we include industry × year fixed effects in the regression model. In row 7, waves are defined at the SIC 3-digit level rather than Fama–French 48 industries. In row 8, we exclude firms with dual-class shares from the sample. Row 9 reports the results from a regression model in which the dependent variable equals one if a firm makes (rather than receives) a takeover bid in a given year. Finally, in row 10 we replace WAVE with an indicator variable for major deregulation events identified in Harford (2005). To ease comparison, row 11 shows the results from our baseline analysis (Table 3). All regression models include firm-level control variables as well as industry and year-fixed effects as in Table 3. All control variables are measured at the beginning of the year. The estimates of the controls are omitted for brevity (see Table IA3 in the Supplementary Material for the full set of estimates). See Appendix B for the complete list of variable definitions. Standard errors are clustered at the industry level except in row 5. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Robustness	CB × WAVE	CB	WAVE
1	All (synergistic and nonsynergistic) waves	−0.048***	−0.002	0.051***
		(−3.17)	(−0.34)	(3.34)
2	Sample without propensity-score matching	−0.036**	0.000	0.047***
		(−2.44)	(0.07)	(3.29)
3	Interact CB with HHI	−0.054***	−0.005	0.067***
		(−2.70)	(−0.72)	(3.28)
4	Interact all variables with WAVE	−0.052***	−0.002	−0.097
		(−2.70)	(−0.31)	(−0.41)
5	Two-way clustered standard error	−0.054**	−0.001	0.066***
		(−2.41)	(−0.33)	(2.93)
6	Industry × year fixed effects	−0.053**	−0.002	
		(−2.65)	(−0.37)	
7	Waves defined at SIC 3-digit industry	−0.053*	−0.002	0.083***
		(−1.90)	(−0.62)	(3.12)
8	Firms without dual class shares	−0.065***	−0.002	0.077***
		(−2.92)	(−0.42)	(3.57)
9	Bidding likelihood	0.005	−0.004	0.002
		(0.33)	(−0.63)	(0.15)
10	DEREG replacing WAVE	−0.165***	−0.001	0.212***
		(−3.79)	(−0.39)	(4.37)
11	Baseline results (Table 3)	−0.054***	−0.001	0.066***
		(−2.69)	(−0.30)	(3.27)

matching. The coefficient on the interaction term between CB and WAVE remains significant, both economically and statistically.[29]

In row 3, we include an interaction term between CB and industry concentration to control for a possible correlation between industry concentration and merger activity. Further, in row 4, all control variables are interacted with WAVE, allowing for the effect of these variables on takeover likelihood to vary with industry merger activity. In row 5, standard errors are clustered two-way by industry and year to allow for an arbitrary correlation in error terms both within- and across-industry. Our baseline results remain unchanged in all these alternative specifications.

[29]Note that without matching, the control sample consists of all firms without a classified board, rather than those with a similar pre-bid performance to the classified board firms. In our framework, on average, firms without a classified board are subject to less mismanagement, which reduces the potential merger benefit to bidders. Thus, in the full sample, the takeover likelihood difference between firms with and without a classified board is likely to be understated due to the offsetting influence of superior performance on takeover likelihood of firms without a classified board.

Row 6 reports results from a regression model that includes industry × year fixed effects. In this specification, we cannot identify the standalone effect of WAVE but can still estimate the interaction effect between CB and WAVE since not all firms within the same industry have a classified board. The estimated coefficients are very similar to our baseline estimates. Therefore, our findings are not driven by an omitted time-varying industry characteristic that could induce a spurious correlation between takeover likelihood and classified boards.

In row 7, we define synergistic merger waves at the 3-digit SIC industry classification level, instead of Fama–French 48 industries. Specifically, we define synergistic merger waves as the 3-digit SIC industry-year observations with the number of synergistic deals 1-standard-deviation above the industry time-series median. Similar to our baseline measure, the waves are further restricted to those that take place after a surprise bid, defined as the first takeover bid after at least a 9-month period with no acquisition activity in that 3-digit SIC industry. The results from this test are similar to those from our baseline specification.

Previous literature argues that dual-class shares can provide strong takeover bid protection, especially for young firms (see, e.g., Daines and Klausner (2001), Bebchuk et al. (2002), and Field and Lowry (2022)). To the extent firms are protected by dual-class status, their takeover likelihood may be unaffected by whether or not they have other takeover defenses, which can reduce the precision of our estimates of the takeover deterrent effect of classified boards. To address this concern, we next estimate our regression models for firms without dual-class shares. The estimated coefficients in row 8 show that our results become slightly stronger both economically and statistically. This result suggests that the takeover deterrence effect of classified boards during merger waves is more pronounced for firms without dual-class shares.

In row 9, we examine the possibility that, during merger waves, classified board firms are more likely to become acquirers rather than targets. We use the baseline specification (equation (2)) changing the dependent variable to an indicator that takes a value of one if the firm makes a takeover bid. The results show that classified boards are not significantly associated with a greater likelihood of making a takeover bid during synergistic merger waves.

Our baseline analysis defines synergistic merger waves using realized merger activity. In the last robustness test, we explore an alternative approach that does not rely on ex post realized activity, but instead focuses on industry shocks, specifically deregulation events, that have been shown to trigger subsequent waves of merger activity in the industry (Mitchell and Mulherin (1996), Harford (2005)). This approach provides a less accurate measure of synergistic takeover opportunities in an industry than our baseline measure, which is based on the intensity of observed synergistic takeover activity. Still, it provides a useful robustness check of our baseline results since it does not depend on a proxy for merger synergies.

We construct a dummy variable DEREG that takes the value of one in years when an industry faces a major deregulation event identified by Harford (2005). In row 10, we replace WAVE with the lagged value of DEREG.[30] The coefficient on

[30]We lag this variable to allow for a delay between the onset of a deregulation event and a realized merger wave.

the interaction term between CB and DEREG shows that classified boards significantly reduce takeover bid likelihood in the period following these shocks. Moreover, point estimate on the interaction term is close to the estimate on the standalone DEREG variable, indicating that classified board firms' takeover likelihood is largely insensitive to industry shocks. These results bolster our baseline finding that classified boards constitute a sizable takeover deterrent during periods of heightened merger activity.

V. Alternative Mechanisms

Our baseline results in Section IV show that the difference in takeover likelihood between firms with and without a classified board is significantly more pronounced during synergistic merger waves. This result is robust to several different specifications, measures of merger waves, and sample restrictions. In this section, we discuss several alternative mechanisms that may be driving our main results.

A. Bargaining Benefits of Classified Boards

A long-standing literature argues that classified boards improve targets' bargaining position vis-à-vis acquirers, enabling targets to extract higher takeover premiums (Stulz (1988)) while lowering bidder synergy gains (Schwert (2000), Bates et al. (2008)). In our stylized model, the incremental bidding cost associated with classified boards does not vary with industry synergy shock μ. If, however, classified boards increased targets' bargaining power during merger waves, this would provide an alternative explanation for our finding of an increased takeover likelihood wedge between firms with and without a classified board on merger waves.

To investigate the possibility that the bargaining effect could be driving our baseline result, we estimate the effect of target classified boards on changes in announcement-period shareholder wealth in on- and off-wave years. Specifically, in Table 6, we report the results from OLS regressions, where the dependent variable is the cumulative abnormal return (CAR) to target (TARGET_CAR), bidder (BIDDER_CAR), or both (CWE) for trading days $(-5, +2)$ relative to the date of the takeover bid announcement. CARs are estimated using the same methodology discussed in Section III.B. The regression models include the same set of controls as in Table 3 including year and industry fixed effects. In addition, we control for whether the deal is associated with stock payment (STOCK_OFFER), whether it takes the form of a tender offer (TENDER_OFFER), and whether it is completed eventually (COMPLETED_DEAL). We cluster standard errors at the industry level as in our previous results.

The coefficient of interest in Table 6 is the interaction term between CB and WAVE that captures the incremental effect of classified boards on announcement returns during synergistic merger waves. We first consider target takeover premiums (TARGET_CAR). Column 1 of Table 6 shows that the estimated coefficient on the interaction term is neither economically nor statistically significant. Column 2 of Table 6 reports the results on bidder synergy gains (BIDDER_CAR). First, the coefficient on the standalone term of CB is negative and statistically significant,

TABLE 6

Bargaining Benefits of Classified Boards

Table 6 reports the results from an event study of merger announcement returns. The dependent variable is the target cumulative abnormal return (TARGET_CAR) in column 1, the bidder cumulative abnormal return (BIDDER_CAR) in column 2, and the combined bidder and target wealth effect (CWE) in column 3. CWE is the value-weighted average of TARGET_CAR and BIDDER_CAR measured over an event window of (−5, +2) days surrounding bid announcements using the market model in which parameters are estimated over a window of (−241, −41) days. CB is a dummy variable indicating whether a firm's board employs multiple classes of directors. WAVE is a dummy variable for industry-year observations in which the number of synergistic deals is 1-standard-deviation above the industry time-series median, with an additional requirement that at least half of the subsectors within an industry should receive a surprise bid. All control variables are measured at the end of the year right before the deal announcement date. See Appendix B for the complete list of variable definitions. Standard errors are clustered at the industry level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	TARGET_CAR	BIDDER_CAR	CWE
	1	2	3
CB × WAVE	−0.025	−0.001	0.005
	(−0.69)	(−0.04)	(0.24)
CB	0.001	−0.011*	−0.010
	(0.09)	(−1.83)	(−1.56)
WAVE	0.078**	0.019	0.025**
	(2.27)	(1.15)	(2.02)
SIZE	−0.053***	−0.005	0.017*
	(−3.39)	(−0.28)	(1.78)
SIZE_SQUARED	0.002*	0.000	−0.001**
	(1.85)	(0.39)	(−2.43)
MARKET_TO_BOOK	−0.026***	−0.011*	−0.009**
	(−5.20)	(−1.93)	(−2.34)
SALES_GROWTH	0.045**	−0.023*	−0.010
	(2.59)	(−1.81)	(−0.98)
LEVERAGE	−0.005	0.021	0.025
	(−0.21)	(1.32)	(1.61)
ROA	0.185**	0.078*	0.101***
	(2.23)	(1.91)	(3.71)
R&D	0.118	0.141**	0.077
	(1.14)	(2.65)	(1.31)
CAPEX	0.074	−0.014	−0.053
	(0.80)	(−0.16)	(−1.43)
STOCK_RETURN	−0.019	0.004	−0.003
	(−1.48)	(0.49)	(−0.45)
HHI	0.116	0.150	0.045
	(0.97)	(1.09)	(0.58)
STOCK_OFFER	0.043***	−0.030***	−0.004
	(3.26)	(−4.42)	(−0.81)
TENDER_OFFER	0.178***	−0.011	0.010
	(9.79)	(−1.09)	(0.98)
COMPLETED_DEAL	0.020**	0.030***	0.004
	(2.10)	(4.73)	(0.85)
Industry and year FE	Yes	Yes	Yes
No. of obs.	1,953	966	966
Adj. R^2	0.248	0.077	0.073

consistent with the previously documented negative effect of target classified boards on bidder premiums (e.g., Bates et al. (2008)). However, the interaction term CB × WAVE remains close to zero and insignificant. We also find no incremental effect of classified boards on the target and bidder combined wealth effect in column 3 of Table 6. These results suggest that investors do not anticipate deals that involve targets with classified boards to be significantly worse for bidders during industry merger waves.

Overall, we find no evidence that the effect of classified boards on target and bidder takeover premiums becomes more pronounced during synergistic merger

waves. Therefore, we conclude that the bargaining effect of classified boards is unlikely to explain our main finding of the takeover deterrence effect of classified boards during merger waves.

B. Bonding Benefits of Classified Boards

A growing literature shows that takeover defenses may also offer a bonding benefit wherein greater protection from takeovers fosters long-term investments by important stakeholders, which enhances firm value. Such bonding benefits have been shown to be present in firms for which stakeholder relationships are more likely to be important, such as young firms, R&D-intensive firms, and firms with material customers or strategic partners (e.g., Johnson et al. (2015), (2022), and Cremers et al. (2017)). In this subsection, we examine whether classified boards impact takeover likelihood differently in firms with greater bonding benefits.

It should be noted that, from the vantage point of our model, the bonding benefits of classified boards should not matter for our results on the effect of classified boards on takeover likelihood. To see this, note that takeover likelihood depends on the value of the target to the *bidder* upon acquisition. Yet, any bonding benefits derived from takeover defenses are not transferable to bidders. This is indeed an implicit assumption in the literature on the bonding hypothesis of takeover defenses; otherwise, stakeholders would expect no disruption in their business ties with the firm whether or not it is taken over, and therefore, relationship-specific investments would not depend on the firm's takeover defenses. Hence, the presence of bonding benefits should not change bidders' payoff from acquisitions, thereby leaving our model's predictions on the takeover deterrence effect of classified boards and how it varies with industry merger waves unaffected.

We can still examine empirically whether bonding benefits influence the relationship between classified boards and takeover likelihood during synergistic merger waves. To do so, we reestimate the baseline specification (equation (2)) allowing for an additional interaction term with a proxy for bonding benefits from the previous literature (e.g., Johnson et al. (2015), (2022), and Cremers et al. (2017)). We use four such proxies: significant customers, R&D intensity, strategic partnership, and firm age since going public. For each proxy, we construct a dummy variable BONDING that takes a value of one in firm years in which i) the firm has at least one customer that accounts for a 10% or higher portion of sales, ii) the firm's R&D intensity belongs to the top tercile of the sample distribution, iii) the firm participates in a strategic alliance (including joint venture), and iv) the firm went public five or fewer years ago.[31]

Table 7 reports the results. The coefficient of interest is the triple-interaction term between CB, WAVE, and BONDING. This coefficient captures whether firms with greater bonding benefits exhibit a systematically different pattern in the takeover deterrence effect of classified boards during synergistic merger waves. In all specifications, the coefficient on CB $\times$ WAVE $\times$ BONDING is insignificant and inconsistent in sign and magnitude. On the other hand, the interaction term

[31] Johnson et al. (2022) find the strongest positive effect of takeover defenses on valuation of firms in the first 2 years relative to their IPO. However, the IRRC/ISS sample contains very few young firms, and there is not enough variation in our data to isolate the effect of synergistic merger waves on them.

TABLE 7

Bonding Benefits of Classified Boards

Table 7 examines whether the takeover deterrence effect of classified boards during merger waves varies with the importance of firms' bonding benefits from takeover defenses. We estimate an expanded model of equation (2) where we allow for an additional interaction of classified board and wave indicators with a dummy variable BONDING that captures the importance of firms' bonding benefits using four proxies. Specifically, BONDING takes a value of 1 if i) the firm has at least one customer that accounts for a 10% or higher portion of sales, ii) the firm's R&D intensity belongs to the top tercile of our sample, iii) the firm participates in a strategic alliance (including joint venture), or iv) the firm went public five or fewer years ago. Industries are defined using Fama and French's (1997) 48 industry classifications. All control variables are measured at the beginning of the year. See Appendix B for the complete list of variable definitions. Standard errors are clustered at the industry level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Large Customer	High R&D	Strategic Alliance	Young Firm
	1	2	3	4
CB × WAVE × BONDING	0.039	−0.025	−0.036	−0.004
	(0.92)	(−0.42)	(−1.21)	(−0.06)
CB × WAVE	−0.065**	−0.050**	−0.043**	−0.052**
	(−2.63)	(−2.28)	(−2.50)	(−2.60)
CB × BONDING	−0.003	0.003	0.005	0.018
	(−0.37)	(0.31)	(0.80)	(1.44)
WAVE × BONDING	−0.045	0.004	0.033	−0.042
	(−1.32)	(0.06)	(1.06)	(−0.73)
CB	−0.000	−0.002	−0.003	−0.003
	(−0.07)	(−0.55)	(−0.59)	(−0.65)
WAVE	0.079***	0.066***	0.056***	0.068***
	(3.17)	(2.88)	(3.29)	(3.29)
BONDING	−0.001	0.007	0.008	0.004
	(−0.20)	(0.70)	(1.35)	(0.30)
SIZE	−0.056**	−0.056**	−0.057**	−0.056**
	(−2.33)	(−2.33)	(−2.33)	(−2.34)
SIZE_SQUARED	0.005**	0.005**	0.005**	0.005***
	(2.68)	(2.67)	(2.60)	(2.69)
MARKET_TO_BOOK	−0.012***	−0.012***	−0.012***	−0.012***
	(−3.78)	(−3.78)	(−3.85)	(−3.79)
SALES_GROWTH	−0.022	−0.022	−0.022	−0.023
	(−1.52)	(−1.52)	(−1.53)	(−1.59)
LEVERAGE	0.030*	0.031*	0.032**	0.030*
	(1.95)	(1.94)	(2.10)	(1.95)
ROA	0.003	0.002	0.006	0.009
	(0.11)	(0.07)	(0.21)	(0.29)
R&D	0.081	0.038	0.065	0.077
	(1.00)	(0.52)	(0.81)	(0.97)
CAPEX	0.017	0.017	0.014	0.013
	(0.28)	(0.27)	(0.24)	(0.22)
STOCK_RETURN	−0.005	−0.005	−0.005	−0.005
	(−1.64)	(−1.62)	(−1.60)	(−1.59)
HHI	0.142***	0.145***	0.142***	0.145***
	(2.81)	(2.85)	(2.83)	(2.86)
Industry and year FE	Yes	Yes	Yes	Yes
No. of obs.	21,766	21,766	21,766	21,766
Adj. R^2	0.060	0.060	0.060	0.061

between CB and WAVE remains consistently negative and significant, with similar point estimates to the baseline results in Table 2.[32] These results show that bonding benefits of classified boards do not offset or magnify the takeover deterrence effect of classified boards during synergistic merger waves.

[32]The results remain similar with alternative variable cutoffs or interacting our bonding indicators with control variables and fixed effects. See Table IA4 in the Supplementary Material for these additional results.

To summarize, while the bonding benefits of classified boards can be reflected in firm *value*, there is no pronounced difference in how classified boards affect *takeover likelihood* in firms with greater bonding benefits. These results are consistent with our prediction that bonding benefits do not enter bidders' valuation of the target. Indeed, the debate on whether classified boards result in agency costs or bonding benefits is about the effect of takeover defenses on the firm's value as a standalone entity. At the root of these valuation effects, whether negative or positive, is the ability of classified boards to successfully protect the firm from takeover bids. By showing that classified boards have a strong takeover deterrence power, our results support the basic premise in both literatures.

C. Evidence from Staggered Adoption of State Poison Pill Laws

The remaining potential concern with our main results is the possibility that, during synergistic merger waves, acquirers avoid protected targets for reasons unrelated to acquisition costs but correlated with having a classified board. Our propensity score matching approach alleviates the omitted variable concern, though only to the extent that the differences between firms with and without a classified board are observable. In addition, any omitted variable concern is already mitigated by our empirical design since any alternative mechanism would have to work only during synergistic merger waves (i.e., it would need to affect the takeover likelihood wedge between firms with and without a classified board differently in on- and off-wave years). Nevertheless, to further rule out the omitted variable concern due to unobservables, in this subsection, we design a difference-in-differences test that exploits the staggered adoption of state-level poison pill laws.

The intuition behind our experiment is as follows: Poison pills typically provide target stockholders (other than the bidder) with a right to purchase additional target stock at a large discount, thereby making it prohibitively expensive for any bidder to obtain a control stake in the target. If a target has a poison pill, the only way a bidder can obtain control is by getting the majority of the target's directors to approve the takeover and rescind the poison pill. Corporate lawyers and academics argue that poison pills significantly enhance the takeover deterrent power of classified boards, because staggered director terms imply that it can take two or more years for a bidder to obtain the majority of the seats on the target's board if current management is unwilling to accept the bid (Klausner (2013), Catan and Kahan (2016)).

While firms can adopt a poison pill without shareholders' approval (known as having a "shadow" pill), there is a long history of litigating the validity of poison pills (Catan and Kahan (2016)). In response, several states have enacted laws that validate the use of poison pills, thereby greatly reducing the litigation risk for the management of firms incorporated in those states. Therefore, we expect the takeover deterrent power of classified boards to increase after the passage of state poison pill laws. Our empirical approach then is to estimate whether state poison pill laws reduce takeover likelihood in firms with a classified board and whether this effect is concentrated in merger waves. As the state-level adoption of poison pill laws is arguably exogenous to individual firms, this approach allows us to identify the effect of an exogenous increase in the strength of classified boards' takeover

deterrence effect, while holding constant other determinants of the firm's classified board status.

Using the staggered passage of poison pill laws by 14 states during our sample period, we estimate the following model:

$$\text{TARGET}_{ikst} = a_t + d_k + d_s + b_1 \text{PP}_{st-1} \times \text{WAVE}_{kt} + b_2 \text{PP}_{st-1} + b_3 \text{WAVE}_{kt} + b_4 X_{ikst-1} + \varepsilon_{ikst}, \tag{3}$$

where i denotes firm, k denotes industry, s denotes state of incorporation, and t denotes year. PP is a dummy variable that takes a value of one if a poison pill law has been enacted in state s by year t.[33] Specifically, PP takes a value of 0 for states with no poison pill laws during the entire sample period, a value of one for states that have adopted poison pill laws before the start of our sample period (i.e., before 1990), and switches from 0 to 1 when a state adopts a poison pill law at some point during our sample period. In addition to year and industry-fixed effects, we include state-fixed effects (d_s) to control for unobserved heterogeneity across states. We cluster standard errors at the industry level as in our baseline analysis.

To hold constant unobservable determinants of the firm's board classification, we estimate the model in equation (3) separately in two subsamples of firms with or without a classified board. Within each subsample, we define the treatment group as firms incorporated in states that have passed a poison pill law (i.e., PP equals one) and the control group as firms incorporated in states that have yet to pass a poison pill law. The model in equation (3) is essentially a difference-in-difference-in-differences (DDD) specification. As in the standard difference-in-differences approach, we take the change in takeover likelihood before and after the passage of the poison pill laws separately for firms in the treatment and control groups (first difference), and then take the difference across the two groups (second difference). This second difference, reflected in the coefficient b_2 on PP, captures the effect of an exogenous decline in takeover likelihood due to the adoption of a poison pill law. To further allow for the effect of poison pill laws to vary with the strength of synergistic merger activity in the industry (third difference), we introduce the interaction term PP $\times$ WAVE and predict that this effect is concentrated in synergistic merger waves (i.e., $b_1 < 0$). Importantly, we expect that this effect is observed only in the sample of firms with a classified board.

The results are presented in Table 8. First, columns 1–4 show the results for firms with a classified board. Column 1 shows a negative relation between PP and takeover likelihood, though the estimated coefficient is not statistically significant. More importantly, column 2 shows that the estimated coefficient on the interaction term PP $\times$ WAVE is negative and significant, while the standalone coefficient on PP is insignificant. This result shows that the takeover deterrence effect of poison pill laws presents only during synergistic merger waves. The point estimate on the interaction term PP $\times$ WAVE indicates that the passage of poison pill laws reduces the likelihood of receiving a takeover bid on waves by 2.1%, which is about 40% of our baseline estimate of 5.4% for the takeover deterrence effect of classified boards.

[33] We obtain the list of states and enactment dates of poison pill laws from Karpoff and Wittry (2018).

TABLE 8

Evidence from Staggered Adoption of State Poison Pill Laws

Table 8 examines the impact of classified boards on takeover likelihood during synergistic merger waves with a difference-in-difference-in-differences (DDD) model using staggered adoption of state poison pill laws. The sample is restricted to firms with a classified board in columns 1–4, and to firms without a classified board in columns 5–8. We estimate linear probability models in which the dependent variable equals one if a firm receives a takeover bid. PP is a dummy variable indicating whether a state has adopted a poison pill law by the time of observation. WAVE is a dummy variable for industry-year observations in which the number of synergistic deals is 1-standard-deviation above the industry time-series median, with an additional requirement that at least half of the subsectors within an industry should receive a surprise bid. Columns 3, 4, 7, and 8 drop firms identified as lobbying state legislatures for poison pill statutes or reincorporated at any point during our sample period. Enactment dates of poison pill laws and the list of lobbying firms are from Karpoff and Wittry (2018). Industries are defined using Fama and French's (1997) 48 industry classifications. All control variables are measured at the beginning of the year. See Appendix B for the complete list of variable definitions. Standard errors are clustered at the industry level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	With Classified Board				Without Classified Board			
	1	2	3	4	5	6	7	8
PP × WAVE		−0.021**		−0.022**		−0.004		0.003
		(−2.17)		(−2.09)		(−0.23)		(0.13)
PP	−0.015	−0.014	−0.000	0.001	0.013	0.014	0.005	0.005
	(−1.07)	(−0.96)	(−0.02)	(0.12)	(0.69)	(0.76)	(0.24)	(0.25)
WAVE		0.000		−0.000		0.008		0.005
		(0.06)		(−0.00)		(0.65)		(0.35)
SIZE	−0.050***	−0.050***	−0.062***	−0.062***	−0.090**	−0.090**	−0.103***	−0.103***
	(−2.90)	(−2.90)	(−3.30)	(−3.31)	(−2.62)	(−2.62)	(−3.00)	(−3.00)
SIZE_SQUARED	0.005***	0.005***	0.005***	0.005***	0.007***	0.007***	0.008***	0.008***
	(3.70)	(3.69)	(3.96)	(3.96)	(2.90)	(2.90)	(3.28)	(3.28)
MARKET_TO_BOOK	−0.007***	−0.007***	−0.007***	−0.007***	−0.004	−0.004	−0.003	−0.003
	(−3.11)	(−3.12)	(−2.83)	(−2.84)	(−1.14)	(−1.13)	(−1.01)	(−1.00)
SALES_GROWTH	−0.013	−0.013	−0.010	−0.011	−0.038**	−0.038**	−0.034*	−0.034*
	(−1.18)	(−1.20)	(−0.83)	(−0.85)	(−2.52)	(−2.50)	(−1.97)	(−1.96)
LEVERAGE	0.030**	0.030**	0.027*	0.027*	0.037	0.037	0.043	0.043
	(2.02)	(2.02)	(1.72)	(1.73)	(1.45)	(1.44)	(1.62)	(1.62)
ROA	0.019	0.019	0.025	0.025	−0.021	−0.022	−0.016	−0.017
	(0.63)	(0.63)	(0.83)	(0.84)	(−0.73)	(−0.74)	(−0.47)	(−0.48)
R&D	0.078	0.078	0.048	0.048	−0.010	−0.010	−0.001	−0.001
	(1.63)	(1.64)	(1.12)	(1.13)	(−0.16)	(−0.16)	(−0.02)	(−0.02)
CAPEX	−0.002	−0.002	−0.009	−0.009	0.040	0.040	0.026	0.026
	(−0.05)	(−0.05)	(−0.20)	(−0.19)	(0.61)	(0.61)	(0.39)	(0.40)
STOCK_RETURN	−0.000	−0.000	−0.001	−0.001	−0.004	−0.004	−0.006	−0.006
	(−0.01)	(−0.00)	(−0.44)	(−0.44)	(−0.62)	(−0.63)	(−0.99)	(−0.99)
HHI	0.135**	0.134**	0.134*	0.131*	0.061	0.062	0.049	0.051
	(2.09)	(2.10)	(1.85)	(1.83)	(0.72)	(0.73)	(0.52)	(0.53)
Industry and year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Excl. lobby. firms	No	No	Yes	Yes	No	No	Yes	Yes
Excl. reinc. firms	No	No	Yes	Yes	No	No	Yes	Yes
No. of obs.	12,939	12,939	11,843	11,843	6,546	6,546	5,890	5,890
Adj. R^2	0.083	0.083	0.078	0.078	0.096	0.096	0.086	0.086

Columns 3 and 4 show that our findings are robust to excluding firms that either are actively engaged in lobbying (identified by Karpoff and Wittry (2018)) or changed their state of incorporation during our sample period.[34] These results show that the passage of state-level poison pill laws has a strong takeover deterrence effect for

[34]While adoption of state poison pill laws is likely exogenous for many firms (Romano (1987)), Karpoff and Wittry (2018) show that the enactment of these laws was motivated by political lobbying by some firms incorporated in the state. The exogeneity assumption is then violated for these firms. Moreover, firms may choose to reincorporate into states that have already passed a poison pill law; however, this is unlikely since historically reincorporation happened mostly into Delaware or firms' headquarters state (Karpoff and Wittry (2018)).

firms with a classified board, and that this effect is concentrated on synergistic merger waves.

In columns 5–8, we repeat our DDD analysis in a group of firms without a classified board. Columns 5 and 6 show that the adoption of state-level poison pill laws does not increase the takeover likelihood for treated firms relative to control firms in both on- and off-wave years. Columns 7 and 8 show that these results remain the same after excluding the lobbying and reincorporating firms. These results are consistent with our prediction that shadow pills are likely to be effective only for firms with a classified board.

In sum, the results in Table 8 show that poison pill laws strengthen the effect of classified boards on takeover likelihood during synergistic merger waves. Since the passage of state poison pill laws is plausibly exogenous to individual firms, this finding supports a causal interpretation that classified boards deter takeover attempts significantly during industry merger waves.

VI. Takeover Deterrence Effect of Other Governance Provisions

Our main analysis focuses on the classified board provision, which is widely recognized as the most significant barrier to change-in-control bids (see, e.g., Daines and Klausner (2001), Bebchuk and Cohen (2005)). However, the predictions of our model apply more generally to any other provision that can impede a potential takeover attempt. In this section, we broaden our analysis to include a wider set of antitakeover provisions that has been studied in the previous literature. The information on these provisions comes from the IRRC data that contain 24 governance provisions studied by Gompers et al. (2003). In the following analysis, our sample period ends in 2006 when IRRC published the last comprehensive data on all 24 provisions.[35]

Table 9 presents the results from expanding the baseline specification (equation (2)) to include controls for a broad set of governance provisions and their interaction with the industry merger wave indicator WAVE. As in the previous literature, we aggregate these other provisions in an index because they tend to be highly collinear (NET_INDEX). Specifically, we control for the "net" (of the classified board provision) version of two prominent governance indexes in the literature, the G-Index (Gompers et al. (2003)) and the E-Index (Bebchuk et al. (2009)). We also control for the net "Delay" index from Gompers et al. (2003), which includes blank check preferred stock, limited ability to call a special meeting, and limitations on action by written consent provisions that have been shown to slow the bidding process (Kadyrzhanova and Rhodes-Kropf (2011)). Columns 1–3 show that the interaction term between CB and WAVE remains negative and

[35] After 2006, the original IRRC data are succeeded by ISS, which reports data on some antitakeover provisions (including the classified board provision) but not all 24 provisions used in Gompers et al. (2003). Further, there is inconsistency in how the data are collected by IRRC and ISS, which makes the post-2006 data on many provisions not comparable with the original IRRC data. However, this inconsistency is not present in the classified board provision. See Karpoff et al. (2017) for details.

TABLE 9

Controlling for the Influence of Other Governance Provisions and Indexes

Table 9 repeats our baseline analysis (Table 3) with additional controls that summarize firms' governance provisions other than classified boards. In columns 1–3, we control for the "net" version (excluding the classified board provision) of the G-Index (Gompers et al. (2003)), the E-Index (Bebchuk, Cohen, and Ferrell (2009)), the "Delay" provisions (Gompers et al. (2003)), and their interaction terms with WAVE. In column 4, we reestimate our baseline specification with including all 24 provisions in the G-Index as well as their interaction terms with WAVE in a single regression model. CB is a dummy variable indicating whether a firm's board employs multiple classes of directors. WAVE is a dummy variable for industry-year observations in which the number of synergistic deals is 1 standard deviation above the industry time-series median, with an additional requirement that at least half of the subsectors within an industry should receive a surprise bid. The sample period ends in 2006 when IRRC published the last comprehensive data on all 24 provisions. All regression models include firm-level control variables as well as industry and year-fixed effects as in Table 3. Industries are defined using Fama and French's (1997) 48 industry classifications. All control variables are measured at the beginning of the year. The estimates of the controls are omitted for brevity. The coefficients associated with all other provisions in the G-Index (column 4) are reported in Table IA5 in the Supplementary Material). See Appendix B for the complete list of variable definitions. Standard errors are clustered at the industry level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Excluding Classified Board			Individually
	G-Index	E-Index	Delay	All 24 Provisions
Controlled Governance Indexes or Provisions	1	2	3	4
CB × WAVE	−0.042**	−0.040**	−0.036**	−0.043***
	(−2.33)	(−2.54)	(−2.17)	(−2.88)
CB	−0.001	−0.000	−0.001	−0.003
	(−0.15)	(−0.01)	(−0.21)	(−0.42)
WAVE	0.041	0.051**	0.058***	0.026
	(1.52)	(2.28)	(3.04)	(0.40)
NET_INDEX	0.001	0.001	0.004	
	(1.01)	(0.68)	(1.29)	
NET_INDEX × WAVE	0.001	−0.000	−0.007	
	(0.43)	(−0.03)	(−0.78)	
Other provisions × WAVE	No	No	No	Yes
Controls	Yes	Yes	Yes	Yes
Industry and year FE	Yes	Yes	Yes	Yes
No. of obs.	14,330	14,330	14,330	14,330
Adj. R^2	0.075	0.075	0.075	0.076

statistically significant after controlling for all three versions of the NET_INDEX and its interaction with WAVE. We also find no evidence that these net indexes represent a strong takeover defense mechanism in either on- or off-wave years.

Next, we estimate a specification where we include all provisions in the G-Index and their interaction with WAVE individually, rather than aggregating them in a net index. Column 4 of Table 9 shows that the negative effect of classified boards on takeover likelihood during merger waves remains significant, both statistically and economically. In addition, no other governance provision appears to have a strong takeover deterrence effect during synergistic industry merger waves (these estimates are reported in Table IA5 in the Supplementary Material).[36] Overall, these results provide evidence consistent with the extant literature (e.g., Bebchuk et al. (2002), Bebchuk and Cohen (2005), and Klausner (2013)) that

[36]To further explore the takeover deterrence effect of individual provisions in the G-Index, we also estimate the baseline linear probability model (Table 3) for each provision separately. Table IA6 in the Supplementary Material summarizes the results. Row 1 shows that the effect of the classified board provision in the sample period up to 2006 is significant and similar to that reported in column 4 of Table 3. Other than the dual class provision ("Unequal Voting"), which is widely recognized to provide strong takeover bid protection, especially for young firms (e.g., Field and Lowry (2022)), all other provisions show either a statistically weak or no takeover deterrence effect during synergistic merger waves.

argues that board classification is the key provision that protects managers from potential takeover attempts.

VII. Conclusion

A growing literature in corporate governance points out that estimates of the effect of antitakeover provisions on takeover likelihood are subject to the endogeneity concern that targets with such provisions could also be more valuable to bidders (e.g., Karpoff et al. (2017)). In this article, we exploit the arrival of industry-wide synergistic merger waves as an arguably exogenous variation in the attractiveness of potential targets in a particular industry to identify the takeover deterrence effect of classified boards. Our analysis consists of a set of novel theoretical predictions and empirical tests on whether firms with and without a classified board exhibit a systematically different likelihood of receiving takeover bids during merger waves.

In a model of the takeover market with endogenously determined managerial mismanagement, we show that managers protected by classified boards optimally engage in greater mismanagement, which in turn attracts more synergy-seeking bidders. This result explains the weak relationship between classified boards and observed takeover likelihood documented in the previous literature (e.g., Bates et al. (2008), Karpoff et al. (2022)). The key prediction of our model is that the takeover deterrence effect of classified boards should be much stronger during synergistic merger waves. This is because a greater availability of synergistic targets during such waves increases the relative bidding cost for targets with a classified board.

We find strong empirical evidence consistent with this prediction using a sample of U.S. public firms between 1990 and 2016. During synergistic merger waves, firms without a classified board are twice as likely to receive a takeover bid as firms with a classified board. However, there is no substantial difference in the takeover likelihood between these two groups outside merger waves. Our main results are robust to several different regression specifications, measures of merger waves, sample restrictions, and to controlling for other antitakeover provisions. Further, consistent with our model's predictions, the negative relation between classified boards and takeover likelihood increases monotonically in the intensity of synergies and the degree of surprise in the wave.

We explore several alternative explanations of our main results. First, we find no incremental effect of merger waves on takeover announcement returns for classified board targets, which rules out an alternative explanation related to the bargaining effect of classified boards. We also show that the bonding benefits of classified boards do not offset or magnify the takeover deterrence effect of classified boards during synergistic merger waves. To address any remaining empirical concerns, we exploit the state-level adoption of poison pill laws, which enhance the takeover deterrence power of classified boards, to establish that our findings are not driven by an omitted variable correlated with firms' board structures.

Overall, this article offers a new theoretical framework and empirical evidence that show that classified boards have a significant takeover deterrence effect, which is particularly pronounced during times when industry conditions are ripe

for value-creating merger opportunities. Our results indicate that board classification can hamper industry capital reallocation through the market for corporate control. Our finding of greater effectiveness of classified boards during merger waves suggests that future empirical studies of takeover protection mechanisms may consider including industry × year fixed effects to control for heterogeneity in their effectiveness across industry economic conditions.

Appendix A. Proofs

This appendix provides proofs of the propositions in Section II. The manager's optimal choice of mismanagement m should maximize her objective function $G(m) = \Phi(C-m)B(m)$. The first-order condition $\Phi(C-m)B'(m) = \Phi'(C-m)B(m)$ is necessary and sufficient since $G(m)$ is concave by concavity of $\Phi(\cdot)$ and $B(\cdot)$.

A.1. Proof of Propositions 1 and 2

The first-order condition defines the manager's optimal choice of mismanagement $m^*(C)$ only in an implicit form. By implicit function theorem,

$$\frac{\partial m^*}{\partial C} = \frac{-\Phi''(C-m)B(m) + \Phi'(C-m)B'(m)}{-\Phi''(C-m)B(m) + 2\Phi'(C-m)B'(m) - \Phi(C-m)B''(m)} \in (0,1)$$

since

- $\partial m^*/\partial C > 0$ due to the concavity of $\Phi(\cdot)$ and $B(\cdot)$. For any m, a higher C leads to a higher synergy threshold for an acquirer to make a bid. This enables the manager to engage in greater mismanagement without incurring a higher probability of receiving a takeover bid.
- $\partial m^*/\partial C < 1$ due to the concavity of $B(\cdot)$. That is, m^* increases less than proportionally with C. □

A.2. Proof of Corollary 1

Define the deterrence effect of classified boards as the difference in the probability of receiving a takeover bid between firms without and with and without a classified board. Proposition 2 implies that

$$\frac{\partial}{\partial C}\Phi(C-m^*) = \Phi'(C-m^*)\left(1 - \frac{\partial m^*}{\partial C}\right) > 0,$$

because $\partial m^*/\partial C < 1$. In other words, the expected likelihood of continuation without receiving a takeover bid, $\Phi(C-m^*)$, is increasing in C. Thus, classified boards have a deterrence effect since they reduce the expected likelihood of receiving a takeover bid: $\Phi\left(C_1 - m_1^*\right) > \Phi\left(C_0 - m_0^*\right)$. Intuitively, classified boards increase the bidding cost C. This increases the optimal mismanagement m^* (Proposition 1), which makes the target more attractive to potential acquirers. However, m^* increases less than proportionally with C (Proposition 2; i.e., $C_1 - m_1^* > C_0 - m_0^*$). Thus, the overall impact of classified boards is to reduce the takeover likelihood.

A.3. Proof of Corollary 2

Now consider the arrival of a positive synergy shock $\mu > 0$ that increases potential merger synergies. Assuming that the shock could not be anticipated by the target firm's manager and that the manager cannot fix her mismanagement instantaneously, the manager now faces greater likelihood of receiving a takeover bid with probability $1 - \Phi(C_i - m_i^* - \mu)$. The concavity of $\Phi(\cdot)$ implies that the takeover deterrence effect of classified boards increases with the synergy shock μ:

$$\frac{\partial}{\partial \mu}\left[\Phi(C_1 - m_1^* - \mu) - \Phi(C_0 - m_0^* - \mu)\right] = -\Phi'(C_1 - m_1^* - \mu) + \Phi'(C_0 - m_0^* - \mu) > 0,$$

because $C_1 - m_1^* > C_0 - m_0^*$. Thus, for any $\mu > 0$, the difference in the likelihood of receiving a takeover bid between firms with and without a classified board increases in μ. □

Appendix B. Variable Definitions

Governance Provisions and Indices (IRRC/ISS)

CB: a dummy variable indicating whether a firm's board employs multiple classes of directors.

NET_INDEX: the net (of the classified board provision) version of governance indexes. We use three indexes: i) G-Index, which is the index of 24 governance provisions developed by Gompers et al. (2003); ii) E-Index, which is the index of 6 governance provisions developed by Bebchuk et al. (2009), including classified board, golden parachutes, limits to amend bylaws, limits to amend charters, poison pill, and supermajority; and iii) "Delay" provisions classified by Gompers et al. (2003), including blank check preferred, classified board, limits to call special meeting, and limits on action by written consent. We follow Karpoff et al. (2022) to compute these governance indexes.

Merger Outcomes and Waves (SDC and CRSP)

TARGET: a dummy variable indicating whether a firm receives a takeover bid.

TARGET_CAR (BIDDER_CAR): the cumulative abnormal return on the stock of the target (bidder) for trading days $(-5, +2)$ relative to the takeover bid date. We calculate abnormal returns using the market model with parameters estimated from CRSP daily returns within the $(-241, -41)$ window.

WAVE: industry-year observations are considered to be on a synergistic merger wave if the number of announced deals with positive bidder and target combined wealth effect (CWE) in that year is 1-standard-deviation above the industry time-series median, where CWE is the value-weighted average of target and bidder CARs. In addition, waves are required to involve a surprise bid in at least half of the subsectors within an industry, where a surprise bid is defined as the first takeover bid after a period of at least 9 months with no acquisition activity in the subsector (defined at the SIC 3-digit level) in an industry. Industries are defined using Fama and French's (1997) 48 industry classifications.

Firm Characteristics (Compustat, CRSP, and SDC)

SIZE: log of book value of assets (AT), deflated to 2009 dollars.

SIZE_SQUARED: square of SIZE.

MARKET_TO_BOOK: the ratio of market value of assets, defined as book value of assets plus market value of common equity (PRCC_F × CSHO) less the sum of book value of common equity (CEQ) and balance sheet deferred taxes (TXDB), to book value of assets (AT).

SALES_GROWTH: the change in sales (SALE) from year $t-1$ to t, scaled by sales in year $t-1$.

LEVERAGE: the ratio of book value of debt (DLC + DLTT) to book value of assets (AT).

ROA: the ratio of operating income before depreciation (OIBDP) to book value of assets (AT).

R&D: the ratio of R&D expenditures (XRD) to book value of assets (AT). It is set to 0 if XRD is missing.

CAPEX: the ratio of capital expenditures (CAPX) to book value of assets (AT).

STOCK_RETURN: fiscal-year stock return net of the CRSP value-weighted market portfolio return.

HHI: the sum of the squares of sales-based market shares for all firms in the industry.

DEREG: a dummy variable that takes a value of one if an industry year is undergoing a deregulation event. The list of deregulation events is from Harford (2005).

BONDING: a dummy variable BONDING that takes a value of one in firm years in which either i) the firm has at least one customer that accounts for a 10% or higher portion of sales, ii) the firm's R&D intensity belongs to the top tercile of the sample distribution, iii) the firm participates in a strategic alliance (including joint venture), or iv) the firm went public five or fewer years ago. We extract customer sales information from the Compustat historical customer segment database, alliance information from the SDC strategic alliance and joint venture database, and IPO date information from J. R. Ritter that covers firms going public since 1975 (this data set is available at https://site.warrington.ufl.edu/ritter/files/founding-dates.pdf.) For the rest of our sample firms not included in this data set, we use the year of the first trading day from CRSP as an IPO year.

Deal characteristics (SDC)

STOCK_OFFER: a dummy variable that takes a value of 1 if the method of payment includes bidder equity, 0 otherwise.

TENDER_OFFER: a dummy variable that takes a value of 1 if the bid is in the form of a tender offer, 0 otherwise.

COMPLETED_DEAL: a dummy variable that takes a value of 1 if the takeover was successfully completed, 0 otherwise.

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S0022109023000170.

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