



# Takeovers, shareholder litigation, and the free-riding problem

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## ARTICLE INFO

### Article history:

Received 26 September 2020

Accepted 9 October 2020

Available online 5 November 2020

### JEL classification:

G34

G38

K22

K41

### Keywords:

Squeeze-out

Appraisals

Entire fairness

Judicial review

Takeover bids

## ABSTRACT

When shareholders of a target firm expect a value improving takeover to be successful, they are individually better off not tendering their shares to the buyer and the takeover potentially fails. Squeeze-out procedures can overcome this free-riding dilemma by allowing a buyer to enforce a payout of minority shareholders and seize complete control of the target firm. However, it is often argued that shareholder litigation restores the free-riding dilemma. Applying a sequential takeover game, we examine the two standard legal remedies of shareholders, the 'action of avoidance' and the judicial 'price fairness review' and demonstrate that it is not shareholder litigation that brings back the free-riding dilemma, but rather the strategic gambling of buyers for lower prices and flaws in the design and application of squeeze-out laws. We also analyze a favorable change in jurisdiction of the German Federal Court and provide implications for legal policy.

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## 1. Introduction

It is commonly accepted that takeovers of firms play a crucial role in the economy. Given effective competition, successful takeovers accelerate the restructuring and rightsizing of formerly weak and cost inefficient firms. Through the acquisition, buyers are able to realize synergies in production and economies of scope and scale. Furthermore, takeovers often lead to the replacement of the previous management, and this ideally favors change and a quicker adjustment to the market situation (see, among others, Yarrow, 1985; Scherer, 1988; Holmström and Nalebuff, 1992).

Many large firms in the various industries of today's economies can be regarded as widely held corporations<sup>1</sup> (see, e.g., Porta et al., 1998; Faccio and Lang, 2002, and Rubin, 2007), and a successful takeover often requires that a public bid from a corporate buyer is accepted by the firm's shareholders.<sup>2</sup> It is well known that this

takeover bid mechanism is prone to a free-riding dilemma among shareholders: "any profit a raider can make from the price appreciation of shares he purchases represents a profit shareholders could have made if they had not tendered their shares to the raider" (Grossman and Hart, 1980, p. 43). As efficiency enhancing takeovers eventually lead to a higher firm value and thus higher share prices, holding out and keeping the shares will enable minority shareholders to freeride on the buyer's effort and participate in these takeover gains. Thus, shareholders will reject a public bid from the buyer when they expect the takeover to be successful and value improving. As a consequence, such free-riding behavior potentially impedes the takeover as the buyer may not collect enough shares to assume control of the target.

In order to facilitate takeovers, so-called squeeze-out procedures have become increasingly relevant for corporate buyers in many jurisdictions (e.g., United States Delaware law, European Directive 2004/25/EC, German § 327a-327f AktG). In principle, a squeeze-out<sup>3</sup> entitles a buyer who has collected the majority of a

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<sup>1</sup> In many European countries, the ownership of public companies is rather concentrated. Faccio and Lang (2002) point out that, nonetheless, roughly 37 percent of their sample of more than 5,000 corporations in 13 Western European countries can be regarded as widely held.

<sup>2</sup> In the United States, tender offers to the target's shareholders were typically employed in hostile takeovers. Following a 2013 change in United States Delaware

law, tender offers are now employed in friendly takeovers, too (see, e.g., Boone et al., 2018).

<sup>3</sup> In European legislation the term 'squeeze-out' corresponds to what is frequently called a 'freeze-out' in the United States (see, e.g., Krebs, 2012, p. 941, and Subramanian, 2005, p. 5). We use these terms interchangeably, with the meaning set out in this paper.

company's shares and who meets a required minimum fraction of ownership (the 'squeeze-out threshold') to forcibly pay out all the minority shareholders and assume full ownership of the company.<sup>4</sup> As a consequence, in a tender offer for control, shareholders can no longer expect to participate in the anticipated appreciation of the share price by rejecting the bid. Squeeze-out procedures thus basically eliminate the free-riding problem (see Yarrow, 1985).

However, such squeeze-outs also enable the buyer to seize the complete gains of the takeover and force shareholders out of their investments. Most countries thus enacted specific shareholder protection laws. Standard legal remedies for shareholders include the '*action of avoidance*', which contests the legitimacy of the squeeze-out itself, and '*price fairness*'-procedures where the payout price is reviewed by the court. In the end, a court ruling can hinder or delay the squeeze-out and change the distribution of takeover gains between the buyer and the shareholders. Several scholars claim that such shareholder litigation effectively restores the free-riding problem and thus frustrates the underlying incentive mechanism of squeeze-out procedures (see, e.g., Mueller and Panunzi, 2004 and Burkart and Lee, 2018).

In this paper we focus on tender offers that are followed by a squeeze-out (i.e., 'two-step' tender offers), and examine the effects of costly shareholder litigation on the success of such takeovers. We show that shareholder protection rights and litigation induce a redistribution of takeover gains, as intended by legislators in the United States and Europe, and do not impede efficient takeovers or sizeable rents for the acquirer per se. In the following, we stylize the takeover bid mechanism as a sequential game between a corporate buyer and atomistic shareholders. In this theoretical setting, all takeovers are value improving and individual shareholders may either accept the offered price by the buyer and tender their shares, or reject it. If sufficient shares are collected in the tender phase, the buyer may announce squeeze-out procedures and, in exchange for a compensation payment, force all remaining shareholders out of the target. Shareholders may, however, move to court and seek a review of the fairness of the compensation payment by the judge. A buyer thus has to form rational expectations about the later value of litigation to shareholders, i.e. about their reservation price. In order to accomplish the takeover and eliminate any free-riding incentive, he then makes a profit-maximizing tender offer that equals this reservation price.

We find that, despite the risk of shareholder litigation, a buyer is basically able to make a tender offer at a price below the expected post-takeover share value and achieve a successful takeover. The judicial '*price fairness review*', however, compels buyers to offer higher prices to incentivize tendering and thus avoid the free-riding problem. Low costs of shareholder litigation, brief court procedures and a low discount rate work in favor of litigating shareholders. As a consequence, the required payments to eliminate free-riding increase, and it becomes costlier for the buyer to achieve a certain takeover. Our analysis shows that the free-riding dilemma in the takeover bid mechanism only re-emerges when buyers try to reduce takeover costs by using lower-than-optimal bids, when dual legal thresholds for corporate control and squeeze-outs are in place, and when the judicial price review focuses on share price fluctuations after the buyer made his public bid.

More broadly, we demonstrate that it is not shareholder litigation that restores the observed free-riding dilemma, but the strategic gambling of buyers for lower prices and flaws in the design of squeeze-out laws and judicial review. This finding applies to the two standard legal remedies of shareholders, the '*action of avoid-*

*ance*' and the judicial '*price fairness review*'.<sup>5</sup> Previous research by Mueller and Panunzi (2004) and Burkart and Lee (2018) does not consider shareholders' litigation cost and shareholders' time preferences. They also do not take into account that, in practice, most court proceedings are ended by settlement. Our results corroborate the detrimental effect of separate legal thresholds for corporate control and squeeze-outs shown by Gomes (2012) and Dalkir et al. (2018).

The paper is organized as follows: chapter 2 provides an overview of the related literature and chapter 3 introduces the institutional background. Chapter 4 describes the stylized takeover game and derives first theoretic results. We then apply our model to a major change in the German jurisdiction on squeeze-outs in chapter 5. Chapter 6 concludes.

## 2. Related Literature

Following the seminal work by Grossman and Hart (1980) on the fundamental free-rider problem in takeovers, the literature in this field has discussed various solutions and aspects of the dilemma (e.g., Shleifer and Vishny, 1986; Bagnoli and Lipmann, 1988; Bebchuk, 1989; Hirshleifer and Titman, 1990; Kyle and Vila, 1991; Holmström and Nalebuff, 1992; Burkart et al., 1998; Cornelli and Li, 2002, and Amihud et al., 2003).

Our work relates to a strand of research on the effect of squeeze-out rules and shareholder litigation. Several authors have shown that, in principle, squeeze-out procedures offer a simple solution to the free-rider problem: If minority shareholders can be forced out of the firm at the price of the tender offer, free-riding (by non-tendering) is unattractive (e.g., Yarrow, 1985; Burkart and Panunzi, 2003, and Amihud et al., 2003).<sup>6</sup> Some authors claim that shareholder protection laws and litigation, however, frustrate this effect or even intensify the problem (see, e.g. Mueller and Panunzi, 2004 and Burkart and Lee, 2018). Mueller and Panunzi (2004) argue that shareholders will hold out in the tender offer, if there is the smallest chance that they will receive the (higher) post-takeover share value in an ensuing court ruling on the terms of the squeeze-out. Burkart and Lee (2018) generalize these results and point out that the incentive for shareholders to hold out is intensified, if the value improvement of the target firm grows with the buyer's ultimate stake in it.

One branch of research examines how separate legal thresholds for corporate control and squeeze-outs affect takeover success (see, e.g., Burkart and Panunzi, 2003; Gomes, 2012, and Dalkir et al., 2018). Gomes (2012) studies takeovers in a dynamic environment, allowing for offer revisions and trading in target shares during the takeover. His analysis shows that, when a bid is conditioned upon the buyer reaching the squeeze-out threshold, arbitrageurs can accumulate shareholdings that are large enough to jeopardize the success of the takeover and compel the buyer into pre-emptively offering a higher price. He also reasons that higher squeeze-out thresholds require higher offer prices, as less shares are required to veto the transaction, thus raising the bargaining power of arbitrageurs. Dalkir et al. (2018) find similar results in a setting where individual shareholders believe that their tendering decision might impact the success of the takeover. They find that in widely held firms separate legal thresholds will fully restore the free-riding

<sup>5</sup> If an '*action of avoidance*' is filed, a shareholder contests the legitimacy of the squeeze-out as a whole, which may even lead to a nullification of that measure. '*Price fairness review*' puts the offered price under scrutiny.

<sup>6</sup> In their conclusion, Grossman and Hart (1980) already note that a second step merger or liquidation of the target firm is a common 'exclusionary device' (a mechanism that excludes minority shareholders from a part of the takeover gain, thus resolving the free-riding dilemma) in practice.

<sup>4</sup> The legal boundaries for a squeeze-out are outlined in Chapter 3.

problem, as shareholders who believe that the takeover will be successful but that the squeeze-out threshold may not be achieved are better off not tendering their shares, unless they are offered (at least) the post-takeover value of shares.

### 3. Institutional Background

In order to understand how squeeze-outs and shareholder litigation affect the success of takeovers, we examine some of the general legal conditions that apply to these procedures. We concentrate on the institutional frameworks in the United States (Delaware law<sup>7</sup>) and the European Union, with some additional detail on the provisions in Germany as one example for the setting in a large member state of the European Union.<sup>8</sup> In 'one-step' mergers<sup>9</sup> the free-riding problem does not arise because the merger is binding for all shareholders (Burkart and Lee, 2018, p. 19). We therefore limit the discussion to takeovers that are broadly structured as 'two-step' tender offers for control followed by a squeeze-out of minority shareholders.<sup>10</sup>

In the United States, a buyer who has collected a simple voting majority in a target company (i.e., often less than fifty percent of share capital) can frequently squeeze-out the minority shareholders and assume complete control of the target (e.g., Dalkir et al., 2018; Gomes, 2012, and Krebs, 2012). Under European regulation such a buyer is required to meet a separate, more demanding threshold of ownership (often at ninety percent of share capital, or higher) before he can initiate a squeeze-out of minority shareholders (see, e.g. European Directive 2004/25/EC, § 327a–327f AktG<sup>11</sup>, § 39a–39c WpÜG<sup>12</sup>, and § 62 UmwG<sup>13</sup>).

What are the legal boundaries for the price that the buyer offers to minority shareholders in a squeeze-out? Although not expressly required, legislation provides strong incentives for buyers to offer the same price in the tender offer and the squeeze-out. In the United States, squeeze-outs that meet this condition are subjected to lower standards of judicial review (Subramanian, 2005, p. 22) and can avoid the need for shareholder approval.<sup>14</sup> In Europe, the *equal treatment* principle of the Takeover Directive is understood to entail that the squeeze-out price may not be lower than the price offered in a preceding bid (Kaisanlahti, 2007). Under certain conditions,<sup>15</sup> the tender offer price is specifically presumed to be fair for the

purposes of a squeeze-out and thus unlikely to be subjected to extensive judicial review (Venturuzzo, 2010, p. 893).

There is also no general legal requirement for the squeeze-out price to meet or exceed the market price of the target firm's shares before the squeeze-out or before an earlier bid for control. However, in the United States, 'price fairness' procedures ensure that minority shareholders receive at least the pre-bid market price in a squeeze-out (Amihud et al., 2003, pp. 22–23). In Europe, corresponding regulations vary across national jurisdictions. In the United Kingdom, for example, the squeeze-out price may be lower than the pre-bid market price (Kaisanlahti, 2007, p. 503). In Germany, the Federal Court of Justice (BGH) holds that the average share price during a reference period of three months before the announcement date of the squeeze-out sets the lower boundary for the compensation pursuant to § 327a–327f AktG (see BGH II ZB 18/09 [2010]).<sup>16</sup>

In both the United States and Europe almost all squeeze-outs are subject to shareholder litigation and are eventually settled in court (see, e.g., Cain and Solomon, 2014, or Krishnan et al., 2012 for the United States, and Aders et al., 2016; Croci et al., 2017, or Gehling et al., 2007 for Europe). Standard legal remedies for shareholders include the right to appeal the squeeze-out, i.e. enforce a verification of its legitimacy ('*action of avoidance*'), and the right to apply for a judicial review on the fairness of the payout price ('*price fairness*'). The applicable conditions of shareholder litigation regarding, for example, eligibility, scope of compensation, fee allocation, and delay of completion vary considerably across jurisdictions (see, e.g., Kaisanlahti, 2007; Krebs, 2012; Restrepo and Subramanian, 2015 or Venturuzzo, 2010 for some detail). Typically, '*actions of avoidance*' will delay the payment of the compensation while court proceedings are ongoing, whereas '*price fairness*' procedures will not (see, e.g., Krebs, 2012, and Croci et al., 2017).

Empirical results suggest that litigated takeovers in the United States have a 7.8 percent lower probability of success and, if successful, generate around 30 percent higher takeover premiums than corresponding non-litigated takeovers (Krishnan et al., 2012, p. 5). Litigation of squeeze-outs in Germany has been found to substantially raise the payout to minority shareholders: Croci et al. (2017, p. 112) show that the payout is increased by an average 26.3 percent following such litigation, whereas the increase is significantly larger in '*price fairness*' procedures (34.9 percent) than in '*actions of avoidance*' (11.3 percent). At the same time, '*price fairness*' procedures are more frequent than '*actions of avoidance*', whereas both remedies are often applied simultaneously (around 54, 9, and 37 percent of litigated squeeze-outs, respectively; Krishnan et al., 2012, p. 102).

### 4. Takeover model with squeeze-out Litigation

Building on the insights of Grossman and Hart (1980) and Bebchuk (1989),<sup>17</sup> we apply a sequential takeover game to analyze the potential conflict between the incentive mechanism of squeeze-outs in public takeover bids and shareholder litigation.

<sup>7</sup> We limit the judicial analyses in the United States to Delaware law under which most U.S. companies are incorporated (Amihud et al., 2003, p. 22).

<sup>8</sup> See, e.g., Krebs, 2012 or Venturuzzo, 2010 for a detailed comparison of European and U.S. legislation on squeeze-outs.

<sup>9</sup> In a U.S. statutory merger, the merger and the squeeze-out are consummated in one step (see, e.g., Venturuzzo, 2010).

<sup>10</sup> This restriction does not limit our analysis to 'hostile' takeovers. Many 'friendly' takeovers in Europe and in the United States are structured as tender offers (see, e.g., Martynova and Renneboog, 2006, p. 13, for Europe, and Offenberg and Pirinsky, 2015, and Boone et al., 2018, for the United States).

<sup>11</sup> German Stock Corporation Act.

<sup>12</sup> German Securities Acquisition and Takeover Act. The Takeover Act squeeze-out is rarely employed in practice, possibly because of untested court procedures when the buyer fails to obtain the additional ninety percent majority of minorities condition (Krebs, 2012, p. 971), or possibly because buyers seldom attain the required ninety-five percent threshold in the preceding tender offer (Allen and Overy, 2017, p. 21).

<sup>13</sup> German Transformation Act.

<sup>14</sup> § 251h Delaware General Corporation Law (DGCL) allows a buyer to effect a squeeze-out merger without shareholders' approval if he holds a majority of the listed target's share capital following a friendly tender offer for all of the target's share capital and the merger consideration is the same as the tender offer consideration.

<sup>15</sup> In cases of a voluntary tender offer, the consideration offered in the tender offer is presumed to be fair where, through acceptance of the bid, the buyer has acquired shares representing no less than ninety percent of the voting capital comprised in the bid. In cases of a mandatory tender offer, the consideration offered in the tender offer is unconditionally presumed to be fair (see Art. 15, Directive 2004/25/EC).

<sup>16</sup> This reflects a favorable change from earlier jurisdiction in Germany. We examine the effects of this change in chapter 5.

<sup>17</sup> Grossman and Hart (1980) identified the free-riding problem in the takeover bid mechanism and proposed that successful tender offers have to be higher than the post-takeover stock value. Bebchuk (1989) extended this analysis to takeover bids below the post-takeover stock value, which succeed with positive probability and this probability is contingent on the spread between the expected share price and the tender offer.

#### 4.1. Assumptions

Consider a game of complete information with a unique Buyer  $B$  and  $N$  atomistic Shareholders  $S_i$  of a target firm with  $i = 1, \dots, N$ , where  $N$  is large. The target firm has an ex-ante value of  $V_0$ , which means a per share value of  $V_0/N = v_0$ . The target is subject to a potential takeover, and a successful buyer may cut its operating costs by reorganizing production procedures or changing the firm's current management. Thus, the firm value increases to  $V_1$  (i.e., a value  $v_1$  per share) if the takeover is successful. We assume  $V_1 > V_0$ , which implies that the takeover is socially desirable. All players are assumed to be risk neutral.<sup>18</sup>

In order to take over the target firm, the Buyer can make a public tender offer to shareholders with the tender price  $p_T$  per share. All tender offers in this game are unconditional. The administration of this tendering process produces constant transaction costs  $C_B$  for the Buyer. Shareholders tender  $X$  shares to the Buyer, and the takeover is successful if  $X \geq \bar{k}N$ . Let  $0 < \bar{k} < 1$  specify the fraction of shares required for obtaining corporate control (e.g., fifty percent). If all shares are tendered,  $X = N$ , the Buyer obtains complete control of the target. We denote the private value of complete control as  $V_2$  with  $V_2 \geq V_1$  (or  $v_2 \geq v_1$  per share, respectively). This captures the fact that complete control usually reduces the transaction costs of operating the target firm<sup>19</sup>, and thus increases the firm value.<sup>20</sup>

After a successful takeover, corporate buyers are entitled to use squeeze-out procedures to buy out remaining shareholders in order to assume complete control of the firm. Initially, we assume that the Buyer may squeeze-out minority shareholders whenever the takeover is successful, that is, whenever at least  $\bar{k}N$  shares are tendered.<sup>21</sup> Then, minority shareholders must turn in the remaining shares, and receive a compensation  $p_S$  per share from the Buyer. Squeeze-out procedures create additional, constant transaction costs  $C_S$  for the Buyer.

Courts enforce shareholder protection laws. We assume that minority shareholders may legally challenge the fairness of the cash compensation and move to court (which we designate 'price fairness procedures' in the following).<sup>22</sup> In this case, court procedures last  $T$  periods, and shareholders discount future payments with the interest rate  $r$ . Eventually, the court decides in favor of the Buyer with probability  $\lambda \in [0, 1]$ . We assume the allocation of legal fees under the American rule, i.e. each party bears the same litigation costs  $L$ .<sup>23</sup> In order to evade court proceedings, the Buyer can make a take-it-or-leave-it settlement offer to litigating shareholders.

The noncooperative takeover game consists of four stages as displayed in Fig. 1: The bid by the Buyer (Stage 1), the tendering pro-

cess (Stage 2), the squeeze-out decision (Stage 3) and shareholder litigation (Stage 4).

The game begins with the Buyer who decides at stage 1 whether to make an offer to shareholders in order to take over the target firm. If a bid is made, shareholders may either accept the offered price and tender their shares or holdout and potentially benefit from higher share prices if the takeover is successful. The game ends if the Buyer fails to collect enough shares to assume corporate control. If sufficient shares are tendered at stage 2, the takeover is successful and the Buyer may decide if he wants to squeeze-out the minority shareholders at stage 3. In case of a squeeze-out, the Buyer pays a compensation to the minority shareholders for collecting the remaining shares. Minority shareholders may accept this payout price, or move to court for price fairness procedures at stage 4. The court then decides the case in favor of the Buyer with the exogenous probability  $\lambda$ .

#### 4.2. From court to takeover bids

In this sequential takeover game with complete information, the Buyer makes a profit-maximizing bid to take over the target. In the following, we describe the reasoning of the Buyer and shareholders throughout the game. The optimal bid is then determined via backward induction.<sup>24</sup> Thus, our analysis begins at stage 4.

At stage 4, the shareholder  $S_i$  considers the squeeze-out price  $p_S$  of the Buyer. A rational shareholder will legally challenge the 'fairness' of the offer and litigate only if the expected gains from court procedures  $\pi_S^{4L}$  are positive,  $\pi_S^{4L} > 0$ .<sup>25</sup> Note that such price fairness procedures generally do neither contest the squeeze-out itself nor stall the transfer of the offered squeeze-out price  $p_S$  to shareholder  $S_i$ . When entering litigation, only the fairness of the payout price is put under judicial scrutiny, which may lead to an additional payment to shareholders if the court regards the initial offer as too low. The shareholder pays the litigation costs  $L$  upfront. The shareholder's payoff from litigation  $\pi_S^{4L}$  can be defined as

$$\pi_S^{4L} = \frac{(1 - \lambda)(\eta v_1 - p_S)}{(1 + r)^T} - L \quad (1)$$

We stylize price fairness procedures as follows: if the court believes the shareholder to have a righteous claim, it will discard the squeeze-out price of the Buyer and enforce the 'fair' compensation,  $\eta v_1$ . A potential court bias is common knowledge and captured by  $\eta$ . We assume that courts will generally attempt to determine the true post-takeover value  $v_1$ , and market participants expect an unbiased court ( $\eta = 1$ ) to enforce a price that equals the true share value.<sup>26</sup> A pro-shareholder court ( $\eta > 1$ ), however, is biased in its interpretation of 'fairness' and will enforce higher compensations. A pro-buyer court ( $\eta < 1$ ) will be expected to stipulate lower payments. The shareholders win fairness procedures with probability  $1 - \lambda$ , and receive the present value of the difference between the court-determined 'fair' price and the offered price.

At stage 3, the Buyer decides whether to squeeze-out minority shareholders and, in that case, what price should be offered as compensation.

Concerning the offered price: the Buyer knows that shareholders have no incentive to litigate when the squeeze-out price  $p_S$  equals the expected net value of litigation to shareholders, i.e. their

<sup>18</sup> The general outcome of the game does not change, if shareholders are assumed to be risk-averse. In that case, shareholders will prefer an even lower, but certain payout price offered by the buyer to the risky outcome of litigation. In other words, shareholder risk-aversion relaxes the lower threshold for the optimal price offer.

<sup>19</sup> Transaction costs in this regard also include effort costs due to legal conflict with minority shareholders.

<sup>20</sup> It is commonly assumed that (some) higher concentration in control of a corporation can lead to a higher firm value, e.g., Shleifer and Vishny, 1986; Bolton and Von Thadden (1998). In this takeover model, we do not consider countervailing effects, such as reduced market capitalization and lower liquidity.

<sup>21</sup> This is a simplifying assumption. In many jurisdictions, it is sufficient to own fifty-one percent of the shares to assume control of the target, while a squeeze-out cannot be launched by the controlling shareholder with less than, e.g., ninety percent of the shares. As this likely affects the tendering decision of remaining shareholders, we analyze this broader case in the Annex A2.

<sup>22</sup> We use this broader term of 'price fairness' to identify the general implications of judicial price review in our game. Croci et al. (2017) show empirically that contesting the fairness of the offered price often pays out for minority shareholders. The second group of legal remedies is the legal challenge of the squeeze-out itself ('action of avoidance') which we leave to section 4.4.

<sup>23</sup> We do not focus on fee-shifting in this paper. For the German case, § 15 SpruchG specifies the allocation of court fees for fairness procedures.

<sup>24</sup> Finite games of complete information are solved via backward induction, see Fudenberg and Tirole (1999), p. 72.

<sup>25</sup> We treat the less frequent 'action of avoidance', where the shareholder contests the legitimacy of the squeeze-out, in section 4.4.

<sup>26</sup> This is not always the case. For example, in appraisal proceedings under Delaware law, the court determines the fair value "exclusive of any element of value arising from the accomplishment or expectation of the merger" (§ 262h DGCL), i.e. a value that represents the pre-bid price  $v_0$ .



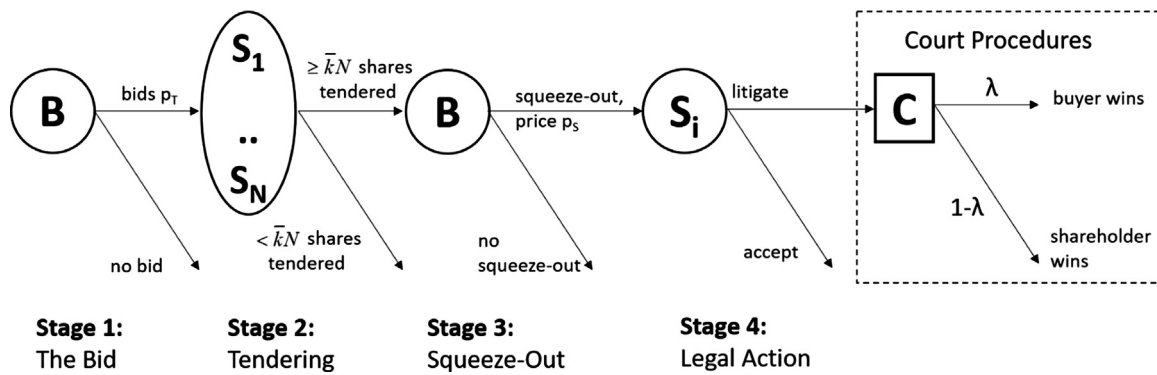


Fig. 1. Extensive form of the takeover game.

reservation price. In other words, the expected gains from litigation for shareholders then fall to  $\pi_S^{AL} = 0$ , and it does not pay off to contest the squeeze-out offer. Using (1), we thus find the minimum squeeze-out price to avoid litigation with

$$p_S \geq \eta v_1 - \frac{(1+r)^T L}{1-\lambda} = p_{MIN} \quad (2)$$

<sup>27</sup> Trivially, the squeeze-out price increases in the courts' evaluation of a 'fair' stock price. It is also straightforward that litigation costs  $L$ , <sup>28</sup> expected case disposition time  $T$ , time preference of shareholders  $r$ , a pro-buyer bias ( $\eta < 1$ ) of the court, and the probability of a success for the Buyer in court  $\lambda$  reduce the required minimum offer. Inequality (2) also shows that corporate Buyers can obtain a minimum offer below the post-takeover share value,  $p_S < v_1$ , if the litigation costs for shareholders are sufficiently high.<sup>29</sup>

Concerning the decision to launch the squeeze-out: The Buyer will choose a squeeze-out, if the value gained from complete control exceeds the additional buy-out costs of the Buyer, now holding  $X \geq kN$  shares after the tender offer. As shareholders will anticipate that only profitable squeeze-outs are executed by the Buyer, the squeeze-out can only serve as a credible threat to shareholders and thereby eliminate the free-riding problem (at stage 2), if and only if it is indeed in the interest of the Buyer at stage 3 to push for the squeeze-out once he learns that the takeover was successful. Thus, a credible squeeze-out<sup>30</sup> requires the condition  $V_2 - v_1 X \geq (N - X)p_S + C_S$  to be fulfilled. Solved for  $p_S$ , the paid squeeze-out price that is profitable for the buyer cannot exceed  $p_{MAX}$  with

$$p_S \leq v_2 + \frac{(v_2 - v_1)X - C_S}{N - X} = p_{MAX} \quad (3)$$

Clearly, the upper threshold  $p_{MAX}$  decreases if procedural takeover costs  $C_S$  are high or if there is little or no added value of complete control ( $v_2 \approx v_1$ ). Only if  $p_{MAX} < p_{MIN}$ , however, does it become too costly to buy out the remaining shareholders. Otherwise, the Buyer sets a credible and profit-maximizing squeeze-out price  $p_S$  with  $p_S = p_{MIN} \leq p_{MAX}$  and litigation is avoided with certainty.

At stage 2, shareholders accept or reject the tender price offer  $p_T$ . In the following, we only focus on tender prices in the range  $v_0 < p_T < v_1$ . It is easy to see that lower tender prices will never succeed, and higher tender prices will typically lead to a successful but very costly takeover.<sup>31</sup> We call it a *free-rider-problem* in the tradition of GROSSMAN and HART (1980)<sup>32</sup>, if each individual shareholder is better off holding out when takeover success is expected with certainty. In our model, the decision to tender is a (weakly) dominant strategy for shareholders if and only if the tender price is never below the expected squeeze-out price,  $p_T \geq E(p_S)$ ,<sup>33</sup> and squeeze-outs are credible: if shareholders expect a successful takeover, holding out and rejecting the offer does not lead to an expected payment higher than  $p_T$ . If shareholders expect the takeover to fail, accepting the tender offer is always better than holding out and being stuck with  $v_0$ . Thus, squeeze-out procedures in our game allow a (weak) subgame-perfect Nash-equilibrium in pure strategies where all shareholders tender, and the takeover occurs with certainty.<sup>34</sup>

The free-rider-problem is restored, however, if the tender price is below the expected outcome of a squeeze-out,  $p_T < E(p_S)$ . Then, shareholders who expect a successful takeover are better off rejecting the offer and waiting for the squeeze-out payment (and possible court appraisal). In this case, there is no Nash-equilibrium in pure strategies. Equilibria in mixed strategies exist and takeovers still occur with positive probability (see corollary 2).

At stage 1, the Buyer decides whether to take over the target firm. If he decides to make a bid, he chooses the tender price that maximizes his expected payoff  $\pi_B$ . This payoff is defined by the value of complete control  $V_2$  less total takeover costs, which are the sum of the expenses for buying shares and transaction costs for bidding and squeeze-out procedures. The Buyer will bid for the target if the following condition holds for his payoff at stage 1,  $\pi_B^1$ , with

$$\pi_B^1 = V_2 - Xp_T - (N - X)p_S - C_S - C_B > 0 \quad (4)$$

Given (4) holds, any price scheme with  $p_T = E(p_S)$  achieves the takeover. Lower tender offers restore the free-rider-problem and create the risk of failure, and higher tender offers only increase

<sup>27</sup> Lower offers ( $p_S < p_{MIN}$ ) fail to rule out costly shareholder litigation, even though the squeeze-out itself may be credible. We will show later that if shareholders can expect to increase profits from holding out (and litigating), then the free-riding problem reoccurs, and takeovers may not be successful at stage 2.

<sup>28</sup> The British fee-shifting rule ('the winner takes all') would increase the effective settlement payment by  $L$ .

<sup>29</sup> If the shareholder is risk-averse, an even lower offer  $p_S$  is sufficient as the shareholder prefers the certain payment to the uncertain gains from litigation.

<sup>30</sup> Credibility may not be an issue under a legal regime which requires a corporate buyer to announce any intended squeeze-out offer during the tender phase, and then the buyer is bound by law to this offer. However, this does not change the economic reasoning here, as a squeeze-out will only be considered if the buyer expects it to be profitable, thus  $p_S \leq E(p_{MAX})$  holds.

<sup>31</sup> Note that costless 'price fairness' procedures in pro-shareholder courts may increase the reservation price of shareholders above the post-takeover value.

<sup>32</sup> Burkart and Lee (2018) describe this behavior of shareholders as 'ex-ante'-free-riding in contrast to 'ex-post'-free-riding where shareholders do not actively take part in the governance of the firm.

<sup>33</sup> Gomes (2012) demonstrates that 'coercive' offers, i.e. offers where the squeeze-out price is below the tender offer price, are ineffectual because arbitrage traders can accumulate enough shares to prevent the buyer from reaching the squeeze-out threshold.

<sup>34</sup> Without squeeze-outs, only equilibria in mixed strategies exist, and takeover success is not certain.

takeover costs. While we assume that Buyer and shareholders form rational expectations, one might consider the impact of diverging party beliefs: if the Buyer or potential minority shareholders are more pessimistic about the prospect of winning in court than a rational decision-maker would be, then c.p. the optimal tender offer will be accepted and the takeover still succeeds. If at least one of the parties is overly optimistic about the outcome of trial, then c.p. some tender offers will be rejected, there will be litigation and takeovers fail with positive probability.

#### 4.3. The optimal bid

We summarize:

**Corollary 1.** (i) Any tender offer that fulfils  $p_T = p_S = p_{MIN} \leq p_{MAX}$  ensures a complete takeover with certainty. (ii) This tender price is the profit-maximizing offer from the Buyer to achieve the takeover with certainty.

In order to achieve a certain takeover of the target, the buyer chooses the price scheme  $p_T = p_S = p_{MIN}$ . Using (2) and (4), a takeover will be profitable if  $V_2 - \left( \eta v_1 - \frac{(1+r)^T L}{1-\lambda} \right) N - C_S - C_B > 0$ . We find that socially desirable takeovers will thus be executed under squeeze-out litigation if  $V_2 + \frac{(1+r)^T N}{1-\lambda} L > \eta \cdot V_1 + C_S + C_B$  holds. Though this is not a necessary condition, it is straightforward that efficient takeovers are more likely to occur even under shareholder litigation if the private value of complete control over the target is high for the Buyer. In addition, sizeable costs of litigation, lengthy court procedures or lower transaction costs are disadvantageous for shareholders and allow the favorable takeover. Low litigation fees for shareholders and pro-shareholder courts, however, may turn some efficient takeovers not profitable for the buyer, and potentially produce an inefficiency.<sup>35</sup> Without an added value of complete control ( $v_2 = v_1$ ), complete takeovers under low court fees will then be undesirable for the Buyer.

Buyers may increase their profits in a takeover if they are willing to accept potential failure in the tendering phase. For this, buyers choose a tender offer that is below the reservation price of shareholders, which reduces the buyer's expenses. However, this lower price is insufficient to eliminate the free-riding dilemma, and thus the takeover may fail with some probability. We call this the *gambling offer*. In this case, buyers tolerate the free-riding problem of shareholders in order to reduce takeover costs, and gamble that a lower bid,  $p_T < p_S$ , will still be successful. For an equilibrium in mixed strategies, all shareholders must be indifferent between tendering and holding out. We concentrate on the focal solution where all shareholders tender with probability  $t$  with  $0 < t < 1$ , and takeovers occur with probability  $P(t)$ . Thus,  $t$  must satisfy  $(1 - P(t))(p_T - v_0) - P(t)(p_S - p_T) = 0$ . Solved for  $P(t)$ , takeovers occur with probability  $P(t) = \frac{p_T - v_0}{p_S - v_0}$ , and  $0 < P(t) < 1$  holds for  $p_T < p_S$ . Any reduction of the tender offer  $p_T$  below the squeeze-out price  $p_S$  will thereby also reduce the probability of success. We thus have the following corollary:

**Corollary 2.** For any tender offer  $p_T < p_S = p_{MIN} \leq p_{MAX}$ , takeovers occur with a probability less than one.

So far, our results demonstrate that squeeze-out litigation (i.e. price fairness procedures) primarily induces some redistribution of social gains to shareholders, as intended by shareholder protection laws. From this perspective, the risk of litigation induces higher (tender) offers to avoid free-riding shareholders. This restricts the

occurrence of some efficient takeovers, and thus potentially produces an allocative inefficiency. However, we find that squeeze-out litigation does not restore the free-riding problem per se (in contrast to Mueller and Panunzi, 2004, p. 25; Burkart and Lee, 2018, p. 20): Buyers may choose bids below the post-takeover value and successfully make tendering the (weakly) dominant strategy of shareholders. In other words, we demonstrate that the underlying incentive compatibility mechanism of squeeze-out procedures is not destroyed by litigation, and allows for certain success. The common observation that some takeovers actually fail can be well explained, however, as maximizing buyers are tempted to tolerate some free-riding in order to further increase profits. Given that the redistribution of takeover gains is not desirable to buyers, we would c.p. expect more gambling offers and a higher risk of failure when shareholder protection rights are expanded by legislators.

From an efficiency perspective, a more serious constraint to takeovers than litigation ("the legal risk") is the application of different thresholds for majority control and initiating squeeze-out procedures: if, for example, a raider may assume effective control of a corporation when he collects more than fifty percent of the shares, but squeeze-out laws require a ninety percent majority, the free-rider-problem manifests again.

**Corollary 3.** For two distinct legal thresholds for the ratio of acquired shares,  $k_1$  (for takeovers) and  $k_2$  (for squeeze-outs), with  $k_2 > k_1$ , any tender offer  $p_T < v_1$  implies (i) that takeovers fail with a positive probability and (ii) that the risk of failure increases in the gap between  $k_1$  and  $k_2$ .

In this two-threshold scenario, shareholders have an incentive to holdout if they believe that enough shares are tendered for the takeover to be successful but not enough for the squeeze-out, in line with prior results of Dalkir et al. (2018). As a consequence, there exists no equilibrium in pure strategies for any takeover offer that is below the post-takeover firm value, and efficient takeovers always occur with a probability smaller than one.<sup>36</sup> In other words, while the introduction of squeeze-out procedures helps to overcome the free-riding problem in takeovers, the use of two different thresholds at least partly restores it. The more restrictive the legislator is on the requirements for a squeeze-out, i.e. the more unlikely it is that the result of the tendering process meets these criteria, the lower is the desirable incentive effect of squeeze-outs on tendering shareholders in the mixed strategy equilibrium.

#### 4.4. The action of avoidance

While we put the focus on the more widespread 'price fairness'-litigation by shareholders, our approach also holds for 'action of avoidance'-procedures, i.e. shareholders contest the legitimacy of the squeeze-out and seek its nullification. Overall, such 'action of avoidance'-procedures rarely lead to a revocation of the squeeze-out (see, e.g., Aders et al., 2016; Croci et al., 2017), but induce similar settlement bargaining between the Buyer and litigating shareholders. As a major procedural difference, a shareholder who contests the squeeze-out itself is not entitled to the compensation payment while court proceedings are still ongoing. At stage 4, the litigating shareholder then expects the payoff  $\pi_S^{4L} = \frac{\lambda p_S + (1-\lambda)v_1}{(1+r)^T} - L$ . If the Buyer prevails in court, the offer  $p_S$  is enforced, otherwise the litigating shareholder keeps his share with its post-takeover value  $v_1$ . Applying backward induction, we again derive the minimum offer, which then gives  $p_{MIN} = \frac{(1-\lambda)v_1 - (1+r)^T L}{(1+r)^T - \lambda}$ . All others equal, this

<sup>35</sup> The buyer may still become the majority shareholder of the target, and thereby increase its efficiency. However, without squeeze-outs, the free-riding-problem unfolds and takeovers occur with a probability lower than one.

<sup>36</sup> Such restrictive squeeze-out laws are still preferable to laws which generally prohibit squeeze-outs. The case of separate thresholds for assuming control and initiating a squeeze-out is analyzed in the Annex A2.

payment is clearly lower than the minimum offer (2) under 'price fairness' procedures. Thus, the 'action of avoidance' can be considered less restrictive for Buyers. Supporting this theoretical insight, Croci et al. (2017) provide empirical evidence that the 'action of avoidance' leads to significantly lower gains for shareholders than 'price fairness procedures'.

## 5. Application: judicial fairness review in Germany

In the following, we will use our takeover model to illustrate the economic reasoning behind a major turn in German jurisdiction on the judicial review of shareholder compensation.

### 5.1. German jurisdiction on shareholder compensation

In case of litigation, courts have to determine the fair compensation of shareholders without knowing the true firm value. Until 1999, German courts deemed it inappropriate to consider stock prices as a proxy for the fair market value of the firm. This view changed fundamentally in 1999 when the German Constitutional Court (see BVerfG 1 BvR 1613/94 [1999]) assessed this judicial practice to violate the constitutionally protected property rights of shareholders. Since then, appellate courts developed different approaches to use stock prices as proxy for fair compensation, ranging from the specific share price at the day of the general shareholder's assembly (see OLG Düsseldorf ZIP 2000, 1525 [2000]) to the average share price over a period of about 8 months (see OLG Stuttgart 4W 15/98 [2000]). In 2001, the Federal Supreme Court eventually established two major principles, these were the close connection of the reference price by courts to the actual execution of squeeze-out procedures, typically taking the day of the general assembly's decision on the squeeze-out as reference date, and the calculation of the average share price over the preceding three-month period (see BGH II ZB 15/00 [2001]). This approach was meant to guarantee the connection to the actual transfer of ownership, but limit the effect of stock price volatility on the determined compensation.

In July 2010, the Federal Supreme Court changed its jurisdiction and ruled the three-month reference period to end already at the day of the announcement of squeeze-out procedures (see BGH II ZB 18/09 [2010]).

### 5.2. Stock prices as judicial proxy

Let the target be a listed firm. We apply the well-established *efficient market hypothesis* (see Samuelson, 1965; Fama, 1970; Rubinstein, 2001; Malkiel, 2005, and Yen and Lee, 2008) to describe the development of the target's share price at the stock market. Before the takeover at stage 1, the share price  $z$  equals the ex-ante firm value,  $z^1 = v_0$ . At stage 4, the share price equals the post-takeover value  $z^{4,TO} = v_1$  if the takeover was successful, and  $z^F = v_0$  in case of a failure. In between, we stylize the share price as a random variable with  $Z$  if the market believes in the success of the takeover, and specify  $z = v_0$  otherwise. For simplicity, assume that there are only three realizations of the share price  $Z$ : it can be higher, lower or equal to the true post takeover value.<sup>37</sup> We specify that  $Z = v_1$  occurs with probability  $(1 - \rho)$ . The higher stock price  $\bar{z}$ , with  $\bar{z} = v_1 + d$ , and the lower stock price  $\underline{z}$ , with  $\underline{z} = v_1 - d$ , are equidistant from  $v_1$  and are realized with symmetric probability  $\frac{\rho}{2}$ . Thus,  $d$  can be interpreted as the average deviation from the expectancy

value, and  $E(Z) = v_1$  applies. We assume that all this is known to the informed parties of the takeover, the Buyer and the target's shareholders. Only the court, as the external enforcement agency, does not know the true firm value, but observes the stock market price.

### 5.3. Shifting the reference period prior to the squeeze-out announcement

At first, imagine the reference period includes a certain amount of time after the public squeeze-out announcement, i.e. the time period between the public offer and the general assembly's decision. Then, the court will observe the realization of the share value after the squeeze-out price is set by the Buyer at stage 3.<sup>38</sup> Given the success of the takeover and the squeeze-out, the decision to litigate by minority shareholders is then also based on the observed realization of the stock price  $Z$ . For example, when the high stock price  $\bar{z}$  is realized, then minority shareholders can expect to extract from court procedures  $E(\pi_S^{4L}|\bar{z}) = p_S - L + \frac{(1-\lambda)(\eta(v_1+d)-p_S)}{(1+r)^T}$ . In order to evade costly litigation and legal uncertainty, the Buyer should clearly offer  $p_S \geq \pi_S^{4L}$  as before.

As the Buyer has to set the squeeze-out price before the realization of  $Z$  is observed, he is unable to rule out shareholder litigation without increasing the payout price  $p_S$ . More specifically, the previously minimum payout offer (2) will prove insufficient whenever  $Z = \bar{z}$  is observed and lead to costly shareholder litigation with probability  $\frac{\rho}{2}$ . Any higher payout price increases takeover costs due to the increased payment. Any lower payout price increases takeover costs due to increased litigation. Furthermore, any payment that falls short of the high stock price,  $p_S < \eta\bar{z} - \frac{(1+r)^T L}{1-\lambda}$ , effectively restores the free-riding dilemma. Then, holding out and waiting for the realization of  $Z$  is preferable to tendering for shareholders if the takeover is deemed certain.

Consequently, a judicial routine that refers to the development of the stock price after the squeeze-out announcement of the Buyer incentivizes shareholders to wait for the realization of the stock price.<sup>39</sup> Such procedures increase c.p. the risk of a failed takeover or require higher payout offers from the Buyer. Marginal takeovers are potentially discouraged under this judicial regime. Note that the inefficiency is caused only by the information disadvantage of the first-mover, the Buyer, about the enforced stock price by courts.

Our findings suggest that the change in jurisdiction of the German Federal Court in 2010 corrected this inefficiency. In the words of the court, "the value, based on the three-month period before the general assembly, is neither known nor predictable at that time. It cannot be used to determine the payment offer for compensation [...]" (BGH II ZB 18/09, p.13 [2010]). The legal reasoning of the German Federal Court acknowledged the informational disadvantage of the first-moving buyer under the previous judicial practice, and thus changed its jurisdiction. By shifting the reference period prior to the squeeze-out announcement, both decision-makers, the Buyer and shareholders, have symmetric information about the potential reference price of the court when it comes to squeeze-out procedures.

## 6. Conclusion

An efficient legal system should encourage value-improving takeovers of firms. Against this background, we apply a sequential

<sup>38</sup> This broadly reflects the earlier German jurisdiction of a reference period of three months before the day of the shareholder resolution that approves the squeeze-out (see above).

<sup>39</sup> Note that we derive this finding under the assumption of efficient financial markets. The incentive to holdout may be even higher if shareholders engage in strategic trading to further increase the stock price.

<sup>37</sup> One could also assume the stock price to be normally distributed around the mean value  $v_1$ . Even though the results are qualitatively similar, this complicates the analysis. Thus, we apply the described simplification.



takeover game with a corporate buyer and atomistic shareholders of a target firm to analyze the potential conflict between the incentive mechanism of squeeze-outs in public takeover bids and shareholder litigation.

We show that in theory, despite the risk of litigation, the buyer is able to achieve the complete takeover of the target and acquire some part of the takeover gains. For this, a rational buyer has to anticipate the expected value of litigation to minority shareholders from the beginning, and then make a tender offer that is below the post-takeover stock value but equal to the reservation price of shareholders. While a judicial price fairness review clearly increases this price offer above the pre-takeover stock value, thus making the takeover costlier to the buyer, it does not restore the free-riding problem: an equilibrium in pure strategies exists where the buyer offers the expected outcome of litigation to shareholders, and all shareholders tender. In other words, the risk of shareholder litigation requires a higher (minimum) offer from the buyer to incentivize tendering and thus avoid the free-riding problem. Lengthy court procedures and a high time preference of shareholders work in favor of the buyer and lower this minimum offer, while pro-shareholder courts imply a higher price offer and thus higher takeover costs. This implication generally holds for the two standard legal remedies of shareholders, the 'action of avoidance' and 'price fairness' review, though the former shows a lower impact on the buyer's minimum offer.

Even though shareholder litigation does not contradict the incentive compatibility mechanism of squeeze-outs, several considerations may explain the common observation of litigation and takeover failure.

First, the existence of relevant litigation costs to shareholders enables buyers to limit the costly increase in takeover premiums in order to incentivize tendering. Given the potential costs of litigation and the risk of losing in court, shareholders will be willing to accept some reduction in the offered payout price. Particularly in pro-shareholder courts, buyers can only succeed at paying below post-takeover stock prices when litigation costs are sizeable. Any mechanism that reduces litigation costs for shareholders, such as class action procedures, thus implies a higher tender offer from the buyer to keep shareholders from free-riding. As a consequence, some buyers might find it preferable to tolerate this free-riding behavior, accept a positive risk of failure, and keep the tender offer low. In this regard, rational buyers gamble as they trade the increased risk of failure against the lower takeover costs in the tendering phase.

Second, the existence of two different legal thresholds for corporate control and the feasibility of squeeze-out procedures effectively restores the free-riding dilemma. Whereas a similar result by Gomes (2012) relies on the assumption of increased bargaining power of arbitrageurs, we show in a model with atomistic, hence powerless shareholders that the free-riding problem is caused simply by the mere existence of two different legal thresholds. In this case, shareholders may speculate that the takeover succeeds without meeting the higher threshold of the squeeze-out which would make holding out the dominant strategy. Consequently, the more rigid the threshold for squeeze-outs is, the stronger the free-riding problem resurfaces. As the use of two distinct thresholds is particularly widespread in European takeover laws, this creates a major inefficiency in squeeze-out procedures. Lawmakers should consider applying a one-threshold approach. The recently increased use of tender offers with subsequent squeeze-outs after the removal of such a second, supermajority threshold for takeovers under US Delaware law clearly supports this finding.

Third, an additional limitation lies in the judicial evaluation of the firm value. Such an evaluation often uses stock prices as a reference for the fair value, but significant fluctuations during takeovers

create uncertainty to buyers. Exemplified by the change in jurisdiction of the German Federal Court, it appears reasonable that courts apply a reference period of the firm's stock price that ends prior to the announcement of the squeeze-out decision. Otherwise, the buyer has an informational disadvantage when defining the payout price and this would cause either higher takeover costs or a higher probability of failure.

## Appendix A.

### Proof of Corollary 1

- (i) A takeover with certainty requires that there is no free-riding problem. First, a price  $p \leq p_{MAX}$  ensures that the squeeze-out is credible. Second, the price  $p = p_{MN}$  is the lowest price that rules out litigation. Any lower price will incentivize shareholders to holdout and legally challenge the 'fairness' of the payment, which puts the takeover at risk. Third, any price  $p_T$  that fulfills  $p_T \geq E(P_S)$  makes tendering at least as preferable for shareholders as holding out.
- (ii) Consider an alternative price scheme  $[p_T = p_s + \Delta p; p_s \leq p_{MAX}]$  with  $\Delta p > 0$ . Again, this price set achieves a certain takeover. However, incentive compatibility only requires the condition  $p_T \geq P_S$  to be binding. Thus, takeover costs are higher by  $\Delta pX$ . For any  $\Delta p < 0$ , tendering is no more a dominant shareholder strategy and takeovers fail with positive probability.

### Proof of Corollary 3

Assume two legal thresholds,  $k_1$  and  $k_2$ : the threshold  $k_1$  defines the ratio of shares required for obtaining majority control of a firm. Threshold  $k_2$  defines the required ratio of shares for starting squeeze-out procedures, with  $k_2 > k_1$ . For simplicity, the Buyer makes the offer  $p_T = P_S$ . There is no equilibrium in pure strategies: Given that a shareholder expects  $k_2 > k > k_1$ , that is, the takeover is successful but a squeeze-out is not possible, it is best not to tender. For expectations of  $k < k_1$ , tender is preferable as the takeover is expected to fail. For  $k > k_2$ , the decision to tender is irrelevant for shareholder payoffs. For an equilibrium in mixed strategies, shareholders must be indifferent between tendering and holding out. We concentrate on the focal solution and assume that all shareholders tender with probability  $t$ . Let  $F(x, y, z)$  be the Binomial distribution function with  $x$  trials, probability of success  $y$ , and no more of  $z$  trials to be successful, then the probability of a successful takeover is determined by  $P_1(t) = 1 - F(N, t, k_1N - 1) =$

$$\sum_{j=k_1N}^N \frac{N!}{j!(N-j)!} t^j (1-t)^{N-j}. \text{ Trivially } P_2(t) = 1 - F(N, t, k_2N - 1) < P_1(t)$$

holds, which implies that a takeover is strictly more likely than a takeover with a subsequent squeeze-out. Shareholders are indifferent if the gains of tendering equal the loss of tendering,  $(1 - P_1(t))(p_t - v_0) - (P_1(t) - P_2(t))(v_1 - p_T) = 0$ . Solving for the probability of a takeover, we find  $P_1(t) = \frac{p_T - v_0 + P_2(t)(v_1 - p_T)}{v_1 - v_0} < 1$ . We know that  $P_1(t)$  and  $P_2(t)$  increase monotonically in the interval (0,1). This implies that the existence of squeeze-out procedures increases the probability of a takeover for any  $P_2 > 0$ . However, the higher c.p. the legal threshold for squeeze-out procedures,  $k_2$ , the lower  $P_2$  and the lower the positive impact on the probability of successful takeovers. Note that this result equals the solution of BEBCHUCK (1989, p. 175) for the case  $P_2 = 0$ . If  $k_1 = k_2$ , then  $P_1 = P_2$ . Thus, tendering is the dominant strategy and takeovers are always successful,  $P(t) = 1$ . Also, for the case  $p_T = v_1$ , no free-riding problem exists and takeovers occur with certainty.



## Declaration of Competing Interest

The authors report no declarations of interest.

## References

- Aders, Christian, Kaltenbrunner, Hannes, Schwetzler, Bernhard, 2016. *Die Kosten des "Private Taking in Deutschland"*: Eine empirische Untersuchung. *Corporate Finance*, 9, pp. 295–306.
- Allen, Overy, Accessed March 12, 2019 2017. *A Guide to Public Takeovers in Germany*. [www.allenoverly.com](http://www.allenoverly.com).
- Amihud, Yakov, Kahan, Marcel, Sundaram, Rangarajan K., NYU Working Paper No. FIN-02-009 2003. The Foundations of Freezeout Laws in Takeovers. <https://ssrn.com/abstract=1294176>.
- Bagnoli, Mark, Lipman, Barton L., 1988. Successful takeovers without exclusion. *Rev. Finance Stud.* 1 (1), 89–110.
- Bebchuk, Lucian A., 1989. Takeover bids below the expected value of minority shares. *J. Finance Quant. Anal.* 24, 171–184.
- Bolton, Patrick, Von Thadden, Ernst-Ludwig, 1998. Blocks, liquidity, and corporate control. *J. Finance* 53, 1–25.
- Boone, Audra, Broughman, Brian, Macias, Antonio J., 2018. Shareholder approval thresholds in acquisitions: evidence from tender offers. *J. Corp. Finance* 53, 225–245 (C).
- Burkart, Mike, Lee, Samuel, 2018. *Activism and Takeovers*. European Corporate Governance Institute, Brussels, Working Paper No. 543/2018.
- Burkart, Mike, Panunzi, Fausto, 2003. Mandatory Bids, Squeeze-Out, Sell-Out and the Dynamics of the Tender Offer Process. European Corporate Governance Institute, Brussels, Working Paper No. 10/2003.
- Burkart, Mike, Gromb, Denis, Panunzi, Fausto, 1998. Why higher takeover premia protect minority shareholders. *J. Polit. Econ.* 106 (1), 172–204.
- Cain, Matthew D., Solomon, Steven D., Ohio State Public Law Working Paper No. 236 2014. *Takeover Litigation in 2013*.
- Cornelli, Francesca, Li, David D., 2002. Risk arbitrage in takeovers. *Rev. Finance Stud.* 15 (3), 837–868.
- Croci, Ettore, Nowak, Eric, Ehrhardt, Olaf, 2017. The corporate governance endgame – minority squeeze-out regulation and post-deal litigation in Germany. *Manage. Finance* 43, 95–123.
- Dalkir, Elif, Dalkir, Mehmet S., Levit, Doron, 2018. Freeze-out mergers. *Rev. Finance Stud.* (Forthcoming) <https://ssrn.com/abstract=3188109>.
- Faccio, Mara, Lang, Larry H.P., 2002. The ultimate ownership of Western European corporations. *J. Finance Econ.* 65 (3), 365–395.
- Fama, Eugene F., 1970. Efficient capital markets: a review of theory and empirical work. *J. Finance* 25, 383–417.
- Fudenberg, Drew, Tirole, Jean, 1999. *Game Theory*. MIT Press, Cambridge.
- Gehling, Christian, Heldt, Cordula, Royé, Claudia, Accessed March 18, 2019 2007. Squeeze-out – Recht und Praxis. *Studien des Deutschen Aktieninstituts* 39. [www.dai.de/files/dai-usercontent/dokumente/studien/2007-10-01%20Squeeze%20Out.pdf](http://www.dai.de/files/dai-usercontent/dokumente/studien/2007-10-01%20Squeeze%20Out.pdf).
- Gomes, Armando, 2012. Takeovers, Freezeouts, and Risk Arbitrage, Working Paper on 02/25/2019 <http://apps.olin.wustl.edu/faculty/gomes/takeovers.pdf>.
- Grossman, Sanford, Hart, Oliver, 1980. Takeover bids, the free-rider problem, and the theory of the corporation. *Bell. J. Econ.* 11, 42–64.
- Hirshleifer, David, Titman, Sheridan, 1990. Share tendering strategies and the success of hostile takeover bids. *J. Polit. Econ.* 2 (98), 295–324.
- Holmström, Bengt, Nalebuff, Barry, 1992. To the raider goes the surplus? A reexamination of the free-rider problem. *J. Econ. Manag. Strategy* 1, 37–62.
- Kaisanlahti, Timo, 2007. When is a tender price fair in a squeeze-out? *Eur. Bus. Organ. Law Rev.* 8 (4), 497–519.
- Krebs, Christian A., 2012. Freeze-out transactions in Germany and the U.S.: a comparative analysis. *German Law J.* 13 (8), 941–978.
- Krishnan, C.N.V., Masulis, Ronald W., Thomas, Randal S., Thompson, Robert B., 2012. Shareholder litigation in mergers and acquisitions. *J. Corp. Finance* 18, 1248–1268.
- Kyle, Albert S., Vila, Jean-Luc, 1991. Noise trading and takeovers. *Rand. J. Econ.* 22 (1), 54–71.
- Malkiel, Burton G., 2005. Reflections on the efficient market hypothesis: 30 years later. *Finance Rev.* 40 (1), 1–9.
- Martynova, Marina, Renneboog, Luc, ECGI - Finance Working Paper No. 114/2006; CentER Discussion Paper Series No. 2006-06 2006. Mergers and Acquisitions in Europe. <https://ssrn.com/abstract=880379>.
- Mueller, Holger M., Panunzi, Fausto, 2004. Tender offers and leverage. *Q. J. Econ.* 119 (4), 1217–1248.
- Offenberg, David, Pirinsky, Christo A., 2015. How do acquirers choose between mergers and tender offers? *J. Finance Econ.* 116 (2), 331–348.
- Porta, Rafael La, Lopez De Silanes, Florencio, Shleifer, Andrei, Vishny, Robert W., 1998. Law and finance. *J. Polit. Econ.* 106 (6), 1113–1155.
- Restrepo, Fernan, Subramanian, Guhan, 5 Harvard Business Library Review 205. Accessed March 18, 2019 2015. The Effect of Delaware Doctrine on Freezeout Structure and Outcomes: Evidence on the Unified Approach. <http://nrs.harvard.edu/urn-3:HUL.InstRepos:17742178>.
- Rubin, Amir, 2007. Ownership level, ownership concentration and liquidity. *J. Financ. Mark.* 10, 219–248.
- Rubinstein, Mark, 2001. Rational markets: yes or no? The affirmative case. *Finance Anal. J.* 57 (3), 15–29.
- Samuelson, Paul A., 1965. Proof that properly anticipated prices fluctuate randomly. *Ind. Manage. Rev.* 6, 41–49.
- Scherer, Frederic, 1988. Corporate takeovers: the efficiency arguments. *J. Econ. Perspect.* 2, 69–82.
- Shleifer, Andrei, Vishny, Robert W., 1986. Large shareholders and corporate control. *J. Polit. Econ.* 94 (3), 461–488.
- Subramanian, Guhan, 2005. Fixing freezeouts. *Yale Law J.* 115 (1), 2–70.
- Ventoruzzo, Marco, 2010. Freeze-outs: transcontinental analysis and reform proposals. *Virginia J. Int. Law* 50 (4), 841–917.
- Yarrow, George K., 1985. Shareholder protection, compulsory acquisition and the efficiency of the takeover process. *J. Ind. Econ.* 34 (1), 3–16.
- Yen, Gili, Lee, Cheng-Few, 2008. Efficient market hypothesis (EMH): past, present and future. *Rev. Pacific Basin Finance Mark. Policies* 11 (2), 305–329.