# One-Share-One-Vote and Dual-Class Shares in the Laboratory[1]

**Abstract**: We test the seminal Grossman and Hart (1988) model on the optimality of the "one-share-one-vote" share structure against the dual-class share structure in a laboratory experiment. Our result shows qualitative support to their theoretical prediction asserting that the more efficient contender of control (incumbent or raider) is more likely to win the takeover contest under one-share-one-vote than under dual-class shares. It is interesting to note that contenders generally submit tender-offer prices higher than their maximum willingness to pay predicted by theory in all our treatments. However, the price deviation from the fundamental value is smaller under one-share-one-vote than under dual-class shares. Overall, our results show supportive evidence for better allocation and information efficiency of one-share-one-vote and draw attention to some practical issues when the theory is applied to real market settings.

**Keywords**: One-share-one-vote; Corporate takeover; Dual-class share; Experimental finance; Experimental economics

**JEL Classification:** C92; G32; G34; G38; G41

## 1. Introduction

The design of voting rights of stock shares is at the center of modern corporate governance. The one-share-one-vote (hereby denoted as "OSOV") share structure, based on the principle that the voting power for each share should be one vote, is considered the "bedrock principle of Anglo-Saxon corporate governance" (Wong, 2013). According to a report by corpgov.net (McRitchie, 2019), the OSOV practice is the most prevalent: 89% of IPOs in the United States followed this principle in 2018. Another reason why the OSOV rule is preferred to the dual-class system is that the former protects the interests of the minority shareholders, given the founders of the firm and controlling shareholders generally use the dual-class system to suppress the minority shareholders by widening the separation between cash-flow rights and control rights (Claessens et al., 2002). With the dual-class system, the controlling shareholders can allocate disproportionately large voting rights to themselves vis-à-vis the minority

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shareholders, thus allowing them to hold a majority control over the company. For this reason, the use of the dual-class system has often sparked a debate on whether it should be banned. Some economies like Singapore and Hong Kong, until recently, banned the use of the dual-class system (Govindarajan et al., 2018).

Nevertheless, despite its prevalence and perception as a gold standard in corporate finance, the OSOV xxxxxx seems to face revived challenges from the dual-class system with the emergence of high-tech companies in Silicon Valley. For instance, Facebook offers two types of stocks—Class B, with 10 votes per share, and Class A, with 1 vote per share. CEO Mark Zuckerberg owns 54% of the voting power by holding mainly Class B shares. In response to the call from customers and intense competition, many stock exchanges (e.g., the Hong Kong Stock Exchange) that previously banned the dual-class system also gradually removed or alleviated its restrictions in recent years (Robertson, 2018).

With the renewed interest in whether one should defend the OSOV principle and prohibit the dual-class system, the quest for evidence of the (non-) optimality of the OSOV structure is very valuable. In theory, Grossman and Hart (1988; henceforth, GH) already proved the optimality of the OSOV structure in the corporate takeover context—namely, an efficient incumbent/raider is more likely to win under the OSOV structure than under the dual-class system.

In this paper, we conduct a detailed, step-by-step test of the GH model in the experimental laboratory. While there have been empirical works on this topic based on observational data (Masulis et al., 2009; Nenova, 2003; Smart et al., 2008), using a laboratory provides several advantages. First, many key conclusions in GH depend crucially on the relative size of the private benefit of control, which is not directly observable in any existing empirical data. In a laboratory experiment, the experimenter can set and control the value of private benefit easily. Second, endogeneity and self-selection are prevalent and persistent challenges in empirical works based on observational data, given the choice of OSOV versus dual-class shares is usually not random in real life. The nationwide regulation on share structure may be correlated with other unobservable factors, and in countries where firms can choose between the two structures, the firms that choose OSOV may be different in many ways from those that choose the dual-class system. In this regard, a controlled lab experiment can be a viable alternative. In such an environment, the endogeneity issue can be adequately controlled using a carefully designed experiment, and causal evidence can be established without worrying about possible confounding factors. Third, controlled lab experiments can easily accommodate various policy experiments and rule changes that would be costly to implement in the real world. Thus, lab experiments can serve as a litmus test of a regulatory policy to gauge its effectiveness before deciding whether to implement it.

We find partial support for the theory. Our results suggest that a OSOV share structure is indeed helpful in ensuring the election of efficient management. Interestingly, we find that GH continues to hold even if some of the static market assumptions are relaxed. Our result shows that the bidder submits multiple bids to fend off competing bids and secure control over the firm. Target shareholders refuse to tender their shares induced by the expectations of higher buyout value, and the number of shares received by the bidder is positively correlated with the premium offered, all of which are also reported in the empirical findings. Therefore, our study shows that GH remains robust even as more realistic, decentralized features of the dynamic markets are incorporated. Further, we find that in all cases, the asset bubble tends to be smaller under OSOV than under the dual-class system, an additional argument supporting OSOV in terms of information efficiency of asset prices on top of allocation efficiency of control right.

Our contribution to the literature is mainly three-fold. First, to our knowledge, we are the first to provide experimental evidence on the efficiency of the OSOV share structure versus the dual-class share structure. In comparison, there have been empirical works using observational data (e.g., Deman, 1994, and  Adams and Ferreria, 2008). It is worth noting that most of these works provide a favorable argument for the dual-class structure in that it is a way for founders of growing companies to raise relatively cheap capital through public listing without losing control. While these are important findings, they are not direct tests of the mechanism in the GH model *per se*. Our paper provides clear evidence on the seminal theoretical model from a controlled laboratory environment.

Second, our paper contributes to the broad literature on law and economics, especially law and finance (La Porta et al., 1998). Whether to allow the dual-class system is ultimately a question for legislators and market regulators. The evidence on the optimality or efficacy of a share structure will be beneficial for designing the institutional architecture of corporate governance law.

Third, our paper contributes to the growing literature on experimental finance, especially experimental corporate finance (Bao et al., 2021; Bloomfield & Anderson, 2010; Füllbrunn & Haruvy, 2014; Haruvy et al., 2014; Sunder, 2007) regarding both research methodology and the scope of the topic. Methodologically, while there have been previous experimental studies on corporate takeover (Dai et al., 2013) and the tender offer market (Kale & Noe, 1997), there seems to be a lack of studies on the efficiency versus private benefit concerns of the incumbent and the raider as in the GH model. By incorporating these features, our design allows future studies to examine the related questions in more detail. Topic-wise, we bring the voting right and majority rule design in corporate finance into the experimental literature and set up a potentially useful foundation for future experimental corporate finance studies and wind tunnel tests of institution designs. Besides the above literature, there is also literature on the "takeover game" (Cadsby & Maynes, 1998a, 1998b, 2005), though the primary focus of that type of study is usually the acquirer's risk-taking behavior instead of the governance structure of the firm.

The organization of this paper is as follows. Section 2 describes our experimental design and procedures. Section 3 presents our experimental results. Section 4 provides discussions on our results. Finally, Section 5 concludes this paper.

## 2. Experimental Design and Procedures

Asset market experiments embedded with tender offer options could be complicated for the participants. To reduce the potential source of additional confusion and focus on the impacts of the tender offer, we adopt a constant fundamental values system similar to the work of Noussair et al. (2001).

Twelve subjects trade with each other in one market. They are randomly assigned into one of three roles—incumbent (I), raider (R), or shareholder (S)—at the start of each replication. Economies with OSOV share structures comprise 800 voting shares, while DCS structures comprise 400 voting shares and 400 non-voting shares. All shares provide equal claim to the revenue of the firm, regardless of the voting right. Raiders would gain control over the firm when they own more than 50% of the available voting shares. In other words, for a successful takeover to occur, R has to purchase at least [(0.5×$Total\ voting\ shares\ available$)−$current\ shares\ held$ +1] voting shares (i.e., 400 voting shares under the OSOV share structure and 200 voting shares in the dual-class structure). Incumbents will stay in control when they own more than 50% voting shares or when the raiders fail in doing so. We create a tender offer market with a finite number of shareholders. This allows individual target shareholders to have a significant influence on the tender offer (e.g., the possibility of target shareholders tendering more shares along with the increase in the offer price), something otherwise not observable in markets with infinitesimal shareholders (Bagnoli & Lipman, 1988).

Both incumbents and raiders are also assigned an additional identity: either an efficient or inefficient firm manager. An efficient party's control over the firm is associated with higher fundamental values, while an inefficient party's control is associated with a lower fundamental value of the stock shares. To illustrate the conflict between private benefit and firm value, we normalize the private benefit of an efficient manager to zero. Only an inefficient manager will derive private benefit after successfully securing the firm's control. Inefficient I and inefficient R are granted additional private benefits upon a successful takeover (for inefficient R) or a successful defense against takeover (for inefficient I).

**Table 1**

***Descriptive Summary of the Treatments***

| | Treatment | | | |
|---|---|---|---|---|
| | OSOV-ER | DCS-ER | OSOV-IR | DCS-IR |
| Efficient Party | Raider | Raider | Incumbent | Incumbent |
| Total Voting Shares in the Market | 800 | 400 | 800 | 400 |
| Total Non-Voting Shares in the Market | 0 | 400 | 0 | 4 |
| Initial Voting Shares of Incumbent | 0 | 0 | 0 | 0 |
| Initial Voting Shares of Raider | 0 | 0 | 0 | 0 |
| Initial Voting Shares of One Target Shareholder | 80 | 40 | 80 | 40 |
| Initial Cash of Incumbent | 24,000 | 24,000 | 24,000 | 24,000 |
| Initial Cash of Raider | 24,000 | 24,000 | 24,000 | 24,000 |
| Initial Cash of One Target Shareholder | 1,200 | 1,200 | 1,200 | 1,200 |
| Private Benefit to Winning Incumbent | 6000 | 6000 | 0 | 0 |
| Private Benefit to Winning Raider | 0 | 0 | 6000 | 6000 |
| No of Target Shareholders in the Market | 10 | 10 | 10 | 10 |
| Minimum No. of Acquired Shares to Secure Control | 401 | 201 | 401 | 201 |
| Initial Fundamental Value | 15 | 15 | 15 | 15 |
| Fundamental Value Brought about by Predicted Winner | 25 | 15 | 15 | 5 |
| | Grossman and Hart's Predictions | | | |
| Is Takeover Successful? | Yes | No | No | Yes |
| Predicted Winner | Raider | Incumbent | Incumbent | Raider |

We provide equal initial endowments to both contenders: 24,000 ECU and 0 shares. Each shareholder is entitled to 10% of the total shares and 1,200 ECU. The incumbent and raiders then compete to secure control by submitting an offer price (P) and the number of shares they intend to acquire (Q). Each tender offer lasts for 150 seconds and can be carried over to the next period unless withdrawn. Following the actual real market trading, we implement three conditions that regulate the tender offers submitted by the bidders, as follows:

**Condition 1**: $Q \geq (0.5 * total\ number\ of\ shares) - current\ shares\ held$

**Condition 2**: *P must be greater than the price of the current outstanding tender offer if there is any.*

**Condition 3**: $P \leq Total\ cash\ endowment/(Total\ voting\ shares - current\ shares\ held)$.

Condition 1 means that the minimum quantity specified in the tender offer should be sufficient for the contender to win the corporate control by a simple majority (at least 50% of the shares) if successful.[2] Condition 2 implies that the price offered in a subsequent tender offer must improve the current outstanding tender offer price. Finally, Condition 3 means that the contenders cannot borrow or buy at a margin. So the maximum price they can offer has to be supported by their available cash balance.

Shareholders' assets will be frozen until the tender offer is completed (i.e., successfully executed, expired, or withdrawn by the bidders). Shares would then be returned to the respective shareholders when the tender offer was unsuccessful. The round would end either with a successful takeover by the raider or the incumbent or when the incumbent manages to defend his/her position at the end of the round (i.e., after the 12th period).

The Class A shares are entitled to 100% voting rights and 50% dividend rights ($sA$), while Class B shares are entitled to 0% voting rights and 50% dividend rights ($sB$) in the DSC structure. There is only one class of shares under OSOV, granting the owner 100% voting rights and 100% dividend rights.

The parameters used in our experiments are inspired by paradigms 4.1.2 of GH. Assuming that $\alpha$ is the required voting right to win the contest; $y_R$ ($y_I$) is the total firm value under a raider's (incumbent's) management; $z_R$ ($z_I$) is the private benefits for Raider (Incumbent); $s_A$ and $s_B$ are the dividend entitlement (for Class A and Class B shares, respectively; and $v_A$ and $v_B$ are the voting rights for Class A and Class B shares, respectively. The dividend entitlement refers to the rights that the class confers for the total dividend stream. Then, we have the following two significant cases, which can be summarized as:[3]

**Case 1**: **Efficient Raider (Paradigm 4.2.2. of GH)**

"Given $y^I < y^R$, R wins control if and only if $z^I < L_I$, where $L_I = s_A(y^R - y^I)$ if $v_B < (1 - \alpha)$, and $L_I = \min(s_A, s_B)(y^R - y^I)$ if $v_B \geq (1 - \alpha)$. If $z^I \leq L_I$, R makes the offer, and the

[2] We assume that when the winning contender obtains 50% of the shares, the contender will be able to exercise control over the company. This is a reasonable assumption given that the remaining 50% is held by several shareholders; to be able to fight, they must agree to form a coalition, something that is unlikely to happen given that shareholders act independently and make tender decisions without knowing what tender decisions are made by other shareholders.

[3] There are four cases in GH in total. However, in GH's scenario 4.1.1 (4.2.1), the incumbent (raider) is expected to win the contests all the time, and the raider (incumbent) is expected not to contest at all regardless of the voting structure. In this paper, we focus on the more interesting cases of 4.1.2 and 4.2.2, where the security voting structures influence the outcome of the control contest (both the winner's identity and the firm's value).

market value of the firm is $y^R$. If $z^I > L_I$, R does not make an offer, and the market value of the firm is $y^I$."

**Case 2**: **Inefficient Raider (Paradigm 4.1.2. of GH)**

"Given $y^R < y^I$, R will win control if and only if $z^R > L$, where $L = s_A(y^I - y^R)$ if $v_A > alpha$ and $L = (y^I - y^R)$ if $v_A \leq alpha$. In the event $z^R > L$, R will offer (just above) $s_A y^I$ for the class A shares if $v_A > alpha$ (and the Class B shares will be worth $s_B y^R$); while, if $v_A \leq \alpha$, R will offer (just above) $s_A y^I$ for the A shares and (just above) $s_B y^I$ for the B shares. Given $z^R > L$ (i.e., R does take control), the market value of the firm will therefore be $V = s_A y^I + s_B y^R$ if $v_A > \alpha$, and $y^I$ if $v_A \leq \alpha$. We can rewrite this as $V = y^R + L$. On the other hand, if $z^R \leq L$ (i.e., the incumbent retains control), the market value of the firm will be $y^I$."

In the first case, a takeover by the raider is efficient ($y_R > y_I$) and the raider receives insignificant private benefit ($z_R$). If the incumbent's private benefit is less than the loss incurred upon acquiring the shares (i.e., $z_I \leq L$), then $R$ can offer (just above) $s_A y_R$ and $s_B y_R$ to purchase Class A and Class B shares, respectively. In other words,

**Case 1**: $R$ wins $\Leftrightarrow z_I \leq L$, where $L = s_A(y_R - y_I)$

All shareholders will tender to the raider, driving the market value of the firm to $y_R$. Intuitively, the incumbent can only counter with a winning bid to protect the firm if his or her private benefits are substantial enough to overcome the potential increase in firm value. Otherwise, the raider could always offer a higher price to purchase all voting rights.[4]

We can apply a similar principle when we look at the second case. Corporate takeover is inefficient ($y_R < y_I$), and the incumbent receives insignificant private benefits ($\boldsymbol{z_I}$). If the raider's $z_R > L$, $R$ can offer (just above) $s_A y_I$ for the Class A shares. All shareholders will tender to the raider, and the firm's value becomes $s_A y_R + s_B y_R$. In other words,

**Case 2**: $R$ wins $\Leftrightarrow z_R > L$, where $L = s_A(y_I - y_R)$

Therefore, the raider must receive enough private benefits to cover the potential loss in firm value if he or she acquires the firm. Otherwise, the incumbent can always compete with a higher price, and the status quo is maintained.

[4] In our experiment, the private benefit takes the form of monetary value that is given whenever the party obtains control. So, the contenders are assumed to be able to pledge the private benefit as additional cash to finance the takeover. In real life, the private benefit may not necessarily take the form of monetary benefit; it could also be in the form of on-the-job perks and the intangible benefits from being able to exert control over the company.

Overall, the intuition behind the advantage of OSOV over DCS can be explained in the following way. Because the incumbent and the raider participate in the price competition, the winner is usually the one who is able to offer a higher price premium *per share*. For the efficient contender without private benefit, the price premium comes from the efficiency gain. The efficiency gain per share only depends on the total number of shares, but not the voting structure. However, for the contender who is inefficient but with a private benefit, the maximum price premium per share he or she can offer equals the private benefit divided by the *number of voting shares*. Therefore, DCS will favor the inefficient contender because the number of voting shares will be smaller than the total number of shares under DCS, while it is always equal to the total number of shares under OSOV.

We set the initial fundamental value (FV) of shares to be 15 ECU. Upon a successful takeover, an efficient raider would be able to improve the firm performance and therefore increase FV from 15 ECU to 25 ECU (i.e., an increase by 10). An inefficient raider would worsen the firm performance and decrease the FV from 15 ECU to 5 ECU (i.e., a decrease by 10). The firm's value is subsequently determined as follows: $y_R = 25 \text{ ECU} \times 800 \text{ shares} = 20{,}000 \text{ ECU}$ if the party is efficient and $y_R = 5 \text{ ECU} \times 800 \text{ shares} = 4{,}000 \text{ ECU}$ if the party is inefficient, respectively. The FV of a share under the control of the incumbent, on the other hand, remains unchanged at 15 ECU, such that the firm's value, $y_I = 15 \text{ ECU} \times 800 \text{ shares} = 12{,}000 \text{ ECU}$. Applying the above parameters, we set a total of four treatments, which differ in terms of the share structure implemented in the firm, the efficiency level of the contenders, and the private benefits ($z_x, x = I, R$) conferred upon the party.

GH demonstrated the cases where shareholders never benefit when an inferior rival wins control, given that the market value does not rise above its status quo value (and in some cases, it falls). To accentuate the difference between superior and inferior takeovers, we make the case that raiders in efficient raider (ER) treatments increase the FV to 25, while raiders in inefficient raider (IR) treatments reduce the FV to 5.

<u>Treatment OSOV-ER: Efficient Raider (R), Inefficient Incumbent (I), and OSOV Share Structure:</u>

$R$ will win as his or her profit from the efficiency gain will be $profit_R = 800 \text{ shares} \times (25 - 15) \text{ ECU} = 8000 \text{ ECU} > z_I = 6000 \text{ ECU}$. $R$ will offer 25 ECU to buy all the voting shares available and break even. He or she cannot offer more as his or her private benefit is insignificant, and he or she cannot offer less as the shareholders expect him or her to win. Thus, if *R* offers less than the FV, shareholders will prefer to hold on to the shares. On the other hand, *I* is only willing to pay $\frac{(800*15)+6000}{800} = 22.5$ ECU per share. Since this price is lower than 25 ECU, *I* will not be able to beat *R* in the takeover contest. The winner would be *R*.

<u>Treatment DCS-ER: Efficient Raider (R), Inefficient Incumbent (I) and DCS Structure:</u>

The incumbent *I* will win as the profit for the raider is only $profit_R = 400 \text{ shares} \times (25 - 15) \text{ ECU} = 4000 \text{ ECU} < z_I = 6000 \text{ ECU}$. *R* is only willing to offer 25 ECU to buy all the voting shares available in the market. On the other hand, *I* is willing to offer $\frac{(400*15)+6000}{400} = 30$ ECU per share, higher than the maximum willingness to pay by *R*. So the winner would be *I*.

<u>Treatment OSOV-IR: Inefficient Raider (R), Efficient Incumbent (I), and OSOV Share Structure:</u>

*R* will not win as the profit for the efficient incumbent $profit_I = 800 \text{ shares} \times (15 - 5) \text{ ECU} = 8000 \text{ ECU} > z_R = 6000 \text{ ECU}$. *R* is willing to offer a maximum of $\frac{(800*5)+6000}{800} = 12.5$ ECU to buy all the voting shares available and break even. On the other hand, *I* is willing to offer (800∗15)/800 = 15 ECU per share, higher than the maximum willingness to pay by *R*. So the winner would be *I*.

<u>Treatment DCS-IR Inefficient Raider(R), Efficient Incumbent (I), and DCS Structure:</u>

The inefficient raider *R* will win not as his or her profit $profit_I = 400 \text{ shares} \times (15 - 5) \text{ ECU} = 4000 \text{ ECU} < z_R = 6000 \text{ ECU}$. *R* is willing to offer $\frac{(400*5)+6000}{400} = 20$ ECU to buy all the voting shares available in the market. On the other hand, *I* is only willing to offer (400∗15)/400 = 15 ECU per share, lower than the maximum willingness to pay by *R*. So the winner would be *R*.

Note that the FV values are the same in Treatment OSOV-ER and DCS-ER(OSOV-IR and DCS-IR). The efficient raider will win under OSOV-ER but not OSOV-IR. An efficient incumbent will win under OSOV-IR but not in DCS-IR. The OSOV share structure increases (reduces) the likelihood of a successful takeover when $y_I < y_R$ ($y_R < y_I$). As such, an efficient R is more likely to win under the OSOV share structure than a DCS structure, while an inefficient R is more likely to win under a DCS structure than an OSOV share structure, as summarized by the following hypotheses:

**Hypothesis 1:**

*One-share-one-vote ensures that the efficient raiders will always succeed, and the inefficient raiders will never be successful in taking over the company. Likewise, an efficient incumbent will retain control, while an inefficient incumbent will never be successful in defending the company. As such, the one-share-one-vote structure maximizes the company value.*

One related corollary finding is that the raider will not attempt to enter the contest in markets where the Incumbent is expected to win (treatments DCS-ER and OSOV-IR). This is because the identity of the expected winner is public knowledge, and any tender offers made by the raider will not be successful. The Incumbent will be able to offer more attractive prices to the target shareholders. Likewise, the target shareholders will promptly respond to the Incumbent's tender offer (should it be launched), for they will lose their welfares if they fail to do so. As such, the raider will not attempt tender offer submission, and the market is expected to be uncontested.

On the other hand, the raider is expected to make one tender offer submission in markets where the raider is expected to win (OSOV-ER and DCS-IR). Regardless of whether or not the incumbent challenges the raider's tender offer, the target shareholders will be supportive of the raider's tender offer, given that the raider is able to offer higher prices than the incumbent and that the target shareholders stand to lose their welfares if they do not choose to do so. For this reason, there should be at least one tender offer in OSOV-ER and DCS-IR (if the incumbent chooses not to defend the management).

GH expects the market prices of the assets to follow the values brought about by the expected winners. This means that the asset prices will be based on the higher of the two possible fundamental values in our experiment when efficient management will be elected (i.e., a price of 25 ECUs in OSOV-ER and 15 ECUs in OSOV-IR). On the other hand, asset prices will reflect the lower of the two possible fundamental values when inefficient management is expected to win (i.e., a price of 15 ECUs in DCS-ER). The only exception is market DCS-IR, where the expected winner (the inefficient management) will be forced to match the value associated with the efficient loser. This is because, unlike market DCS-ER (where the iIncumbent is not required to defend his or her predicted victory), the predicted winner in DCS-IR (i.e., the raider) is expected to create at least one tender offer and is likely to meet resistance from the losing (but more efficient) incumbent, forcing the former to utilize his or her private benefit to offer higher prices than the value he or she will bring about.

**Hypothesis 2a:**

*Market prices of the assets are expected to reflect the actual value realized by the predicted winners, except for the markets where the inefficient raider is expected to win. In the latter case, the raider will be induced to utilize his or her private benefit to offer prices that match the value potentially brought about by the losing incumbent.*

If Hypothesis 2a is confirmed, the contenders bid following the theoretical prediction by GH. If it is rejected, we will test Hypothesis 2b.

**Hypothesis 2b:**

*The market price will deviate less from the fundamental value in OSOV treatments than in dual-class treatments.*

If Hypothesis 2b is confirmed, it shows OSOV markets have a higher level of information efficiency.

## 3. Experimental Results

A total of 288 subjects from Nanyang Technological University were recruited, of whom 50% were male. An average of 4.4 out of the total 10 risky options were chosen, suggesting that students are generally risk-averse. We also assessed the subjects' cognitive abilities using the CRT test by Frederick (2005) and subjects' backward reasoning ability using sequential-move games developed by Dixit and Nalebuff (2008) after the experiment.

**Table 2**

***Descriptive Summary of the Sessions***

| Treatment | Session | New Session | No of Traders | No of Round | Gender (1 all male, 0 all female) | Risk Aversion (average no of risky choices) | Avg CRT Score (out of 3) | Ratio of Winning Game21 | Earnings (SGD) |
|---|---|---|---|---|---|---|---|---|---|
| *OSOV-ER* | 13 | 1 | 12 | 6 | 0.7 | 4.5 | 1.3 | 0.7 | 20.6 |
| *OSOV-ER* | 14 | 2 | 12 | 5 | 0.6 | 4.8 | 1.1 | 0.9 | 21.0 |
| *OSOV-ER* | 15 | 3 | 12 | 4 | 0.3 | 4.3 | 1.6 | 1.0 | 20.7 |
| *OSOV-ER* | 16 | 4 | 12 | 3 | 0.7 | 2.9 | 1.6 | 1.0 | 17.4 |
| *OSOV-ER* | 17 | 5 | 12 | 3 | 0.3 | 4.8 | 2.0 | 0.8 | 20.8 |
| *OSOV-ER* | 18 | 6 | 12 | 5 | 0.4 | 3.9 | 1.8 | 0.9 | 20.2 |
| *DCS-ER* | 19 | 7 | 12 | 6 | 0.5 | 4.3 | 2.0 | 0.7 | 21.6 |
| *DCS-ER* | 20 | 8 | 12 | 4 | 0.3 | 4.8 | 1.7 | 0.8 | 25.6 |
| *DCS-ER* | 21 | 9 | 12 | 3 | 0.4 | 4.9 | 1.3 | 0.9 | 17.3 |
| *DCS-ER* | 22 | 10 | 12 | 3 | 0.3 | 4.4 | 2.0 | 0.8 | 24.3 |
| *DCS-ER* | 23 | 11 | 12 | 5 | 0.3 | 4.3 | 1.9 | 0.8 | 22.4 |
| *DCS-ER* | 24 | 12 | 12 | 5 | 0.8 | 4.0 | 2.5 | 0.8 | 18.7 |
| *OSOV-IR* | 25 | 13 | 12 | 6 | 0.4 | 4.9 | 2.0 | 0.8 | 22.4 |
| *OSOV-IR* | 26 | 14 | 12 | 3 | 0.5 | 3.5 | 1.9 | 0.9 | 21.0 |
| *OSOV-IR* | 27 | 15 | 12 | 6 | 0.5 | 4.3 | 2.0 | 0.6 | 18.7 |
| *OSOV-IR* | 28 | 16 | 12 | 2 | 0.3 | 3.7 | 1.9 | 0.9 | 19.7 |
| *OSOV-IR* | 29 | 17 | 12 | 5 | 0.6 | 4.8 | 2.1 | 0.8 | 21.0 |
| *OSOV-IR* | 30 | 18 | 12 | 3 | 0.3 | 4.4 | 1.8 | 0.8 | 20.7 |
| *DCS-IR* | 31 | 19 | 12 | 3 | 0.7 | 6.0 | 1.8 | 0.9 | 20.1 |
| *DCS-IR* | 32 | 20 | 12 | 3 | 0.8 | 4.5 | 1.7 | 0.9 | 21.3 |
| *DCS-IR* | 33 | 21 | 12 | 3 | 0.4 | 4.9 | 1.6 | 0.9 | 20.7 |
| *DCS-IR* | 34 | 22 | 12 | 6 | 0.6 | 4.0 | 2.7 | 0.8 | 22.5 |
| *DCS-IR* | 35 | 23 | 12 | 3 | 0.8 | 3.6 | 1.7 | 0.8 | 20.3 |
| *DCS-IR* | 36 | 24 | 12 | 3 | 0.7 | 4.1 | 1.9 | 0.9 | 19.5 |
| Total (Average) | | | 288 | 98 | 0.5 | 4.4 | 1.8 | 0.8 | 20.8 |

Table 2 provides the descriptive statistics of the subjects' demographic profiles. The number of replications varied across sessions as contenders could utilize up to 12 periods in one round to win the contest. We informed all subjects that a new replication would commence when there was still sufficient time within the duration of 2 hours. Thus, the number of replications would be smaller if the average duration of each replication were longer. In total, we there were 98 replications across all four treatments. Subjects received, on average, a payoff of 20 Singapore Dollars.

### 3.1.Tender Offer Success Rate

We observed a mixture of successful and unsuccessful takeovers in both scenarios when the takeover was expected to be take place and when it was not, as demonstrated in Table 3. At the onset, the average number of times that the raider won did not appear to indicate a significant difference between OSOV and DCS markets in markets with efficient takeover. The success rate under OSOV, however, was lower than that of DCS when the takeover was inefficient.

**Table 3**

***Number of Successful and Unsuccessful Takeovers in Each Treatment***

This table presents the number of replications with successful and unsuccessful takeovers in each of the four treatments. Information on whether or not a takeover is expected to be successful by GH is provided at the last column.

| | Takeover Statistics | | | |
|---|---|---|---|---|
| | Successful Takeovers | Unsuccessful Takeovers | Total Number of Replications | Is Takeover Expected to be Successful? |
| *OSOV-ER* | 15 | 11 | 26 | Yes |
| *DCS-ER* | 15 | 11 | 26 | No |
| *OSOV-IR* | 11 | 14 | 25 | No |
| *DCS-IR* | 13 | 8 | 21 | Yes |

We subsequently ran a regression analysis to control for the demographic profiles of the individual contenders, as presented in Table 4. Here, the dependent variable (which denotes 1 if a takeover was successful and 0 if the incumbent retained control over the firm) was estimated against the OSOV structure dummy (which denotes 1 if the OSOV structure was implemented and 0 ifthe DSC structure was implemented), among other demographic profile variables—conditional on whether or not the takeover was efficient. OSOV increases (reduces) the likelihood of successful takeover when it increases (decreases) the firm's value, as signified by the statistically positive (negative) coefficient of the OSOV structure dummy in the probit regression involving Treatments OSOV-ER and DCS-ER (OSOV-IR and DCS-IR) in Model 1 (2). The average marginal effects are displayed in Model 3 (4): the likelihood of an efficient (inefficient) takeover to succeed increased by 35% (decreased by 56%) under OSOV, as compared to the dual-class share structure. We can see that the OSOV structure is more effective than the dual-class share structure in ensuring the selection of an efficient management under a corporate control contest, supporting GH's prediction. Our results show support for the qualitative prediction by GHart: use of the OSOV system indeed appears to facilitate efficient takeovers and discourage inefficient takeovers.

**Table 4**

***Regression Analysis of the Factors Influencing the Success Rate of Takeovers***

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Successful takeover (1 if the winner is raider, 0 if the winner is incumbent) | | | |
| | Efficient Takeover (i.e., OSOV-ER & DCS-ER) | | Inefficient Takeover (i.e., OSOV-IR & DCS-IR) | |
| VARIABLES | PROBIT | Marginal Effects | PROBIT | Marginal Effects |
| One-Share-One-Vote Dummy | 0.944** | 0.348** | -1.824** | -0.561** |
| ( 1 if OSOV, 0 DCS) | (0.397) | (0.141) | (0.848) | (0.239) |
| Round | 0.161 | 0.0595 | 0.415*** | 0.127*** |
| | (0.104) | (0.0363) | (0.110) | (0.0283) |
| Avg. CRT | 0.690 | 0.254 | -0.532 | -0.164 |
| | (0.896) | (0.327) | (0.837) | (0.260) |
| Avg. No of Risky Choices | 0.0536 | 0.0198 | -1.131*** | -0.347*** |
| | (0.338) | (0.124) | (0.381) | (0.103) |
| Avg. Win in Backward Induction | -1.007 | -0.371 | -0.914 | -0.281 |
| | (1.701) | (0.630) | (1.430) | (0.440) |
| Avg. No of Students who Major in Econ/Bus/Accountancy | 2.515* | 0.927* | -6.418*** | -1.972*** |
| | (1.498) | (0.537) | (2.315) | (0.665) |
| Avg. No of Financial / Economics Modules Taken | -0.303 | -0.112 | 3.426** | 1.053** |
| | (0.943) | (0.346) | (1.558) | (0.442) |
| Avg. Composition of Nationalities | -0.141 | -0.0518 | -5.199** | -1.598** |
| ( 0 if all non-Singaporeans, 1 if all Singaporeans) | (0.473) | (0.174) | (2.317) | (0.717) |
| Constant | -1.924 | | 9.182*** | |
| | (3.973) | | (2.698) | |
| Observations | 52 | 52 | 46 | 46 |
| No of Clusters (at Session level) | 12 | | 12 | |

This table presents the results of PROBIT regression analysis, with the dependent variable being 1 if a takeover is successful, and 0 if a takeover is unsuccessful. Standard errors (clustered at the session level) are in parentheses. All the regressions include demographic variables as additional regressors. * indicates significance at the 10% level, ** indicates significance at the 5% level, and *** indicates significance at the 1% level.

We find support for Hypothesis 1:

**Observation 1:** *A mixture of successful and unsuccessful takeovers is found in all four treatments, regardless of whether the raider is expected to lose or win. The OSOV system, nevertheless, is associated with a higher likelihood of the efficient management being selected as the winner of the corporate control contest, in support of GH's prediction of OSOV's superiority.*

### 3.2.Total Bid Submissions and Share Valuations

GH argues that the large capital loss borne by the predicted loser is the primary factor that deters him or her from submitting a bid in the contest. For this reason, raiders will make null tender offer in treatments where the incumbent is predicted to retain his or her tenure. When a takeover is expected to be successful, on the other hand, incumbents will not resist the winning raider. All in all, we would anticipate no contest (i.e., zero bid submission) in treatments DCS-ER and OSOV-IR and a single uncontested bid submission (i.e., one single bid submitted by the incumbent and raider, respectively) in treatments OSOV-ER and DCS-IR. Moving from the supply to the demand side, GH also anticipates the target shareholders to preserve the no-contest (single uncontested bid) nature of the DSC-ER and OSOV-IR (OSOV-ER and DCS-IR) treatments. In markets with a single uncontested bid, target shareholders will simultaneously tender their shares to the expected winners because they will receive higher payoffs than if they choose not to sell their assets. In a way, the GH model for OSOV appears to be a takeover model that generates "no takeover contest" predictions, like Milgrom and Stockey's (year) "no trade theorem" for efficient asset markets.

**Table 5**

***Tender Offer Submission Frequency***

This table presents the average frequency of tender offer submission by both raider and incumbent in one round. We tested the difference between the submission of raider and incumbent using the Mann-Whitney pairwise comparison test and report the outcomes in the table. Information on GH's prediction on the contest outcome is also included.

| | Frequency of Tender Offer Submission in 1 Round | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Raider | | Incumbent | | Mann-Whitney (H0:Raider=Incumbent) | | | |
| Treatment | mean | s.d. | mean | s.d. | p-value | n | Successful takeover predicted? | Is contest predicted? |
| *OSOV-ER* | 3.96 | 2.63 | 4.46 | 2.80 | 0.4643 | 52 | Yes | No |
| *DCS-ER* | 5.85 | 3.79 | 6.04 | 4.12 | 0.9266 | 52 | No | No |
| *OSOV-IR* | 4.40 | 3.03 | 3.12 | 2.33 | 0.1198 | 50 | No | No |
| *DCS-IR* | 7.19 | 3.84 | 5.71 | 3.77 | 0.2346 | 42 | Yes | No |

Our experimental data, nevertheless, demonstrate that both contenders appear to be overly active in submitting bids in the tender offer competition, regardless of their type and likelihood to win in theory. The average number of tender offer submissions ranges from 3.96

to 7.19 times, suggesting numerous instances of submission revisions (Table 5). There appear to be no significant differences across all treatments. Of particular interest are treatments DCS-ER and OSOV-IR, where the incumbent managers are expected to retain their reigns. The theory predicts that a raider is not likely to make an offer given that the incumbent can offer more attractive prices to the shareholders. The incumbent, knowing that the raider is not likely to enter, will not make any tender offers either. Our data, however, show that incumbents signal their resistance even as they are expected to win in all 51 replications recorded. The dominant form of control seizing also comes through active purchasing of the company shares, 79% of the time in OSOV-IR and 55% DCS-ER. Even in the few instances where incumbents retain control through passive defense or non-acquisition strategy, the homegrown managers still impose offers against the raiders. Some of these offers expired without enough subscriptions, whilee others were withdrawn by the incumbents prior to their maturity. This was perhaps done in order to force the raiders to raise their bid premium levels, and thus exhausting their ability to win over the incumbents. Indeed, Ruback (1988) also considered targeted repurchase as an important form of takeover defense. There has been a large empirical literature on how managerial resistance or takeover defense influence firm value (e.g., Cain et al., 2017; Field & Karpoff, 2002; Humphery-Jenner, 2014; Jennings & Mazzeo, 1993; Souther, 2016), though the result is mixed on whether high resistance leads to a higher or lower takeover premium and post takeover firm value.

**Table 6**

***Tender Price Dynamics***

This table presents the difference between the initial (last) tender offer prices submitted by the winners and the individual's maximum willingness to purchase. We tested if the difference is statistically distinct from zero, using the Wilcoxon signed-rank test, and report the outcomes in the table.

| | (First Tender Quote - Max Willingness to Buy) | | | | (Last Tender Quote - Max Willingness to Buy) | | | |
|---|---|---|---|---|---|---|---|---|
| Treatment | mean | s.d. | n | Signed-rank p-value (H0:Diff=0) | mean | s.d. | n | Signed-rank p-value (H0:Diff=0) |
| *OSOV-ER* | -1.43 | 6.21 | 26 | 0.3872 | 4.70 | 2.02 | 26 | < 0.0001 |
| *DCS-ER* | -4.16 | 6.15 | 26 | 0.0040 | 10.62 | 10.97 | 26 | 0.0002 |
| *OSOV-IR* | 7.18 | 6.25 | 25 | < 0.0001 | 9.96 | 6.34 | 25 | < 0.0001 |
| *DCS-IR* | 1.39 | 7.40 | 21 | 0.8893 | 12.89 | 10.08 | 21 | 0.0001 |

Many winners start bidding at the price which exceeds their rival's capacity. This is evidenced by the close correspondence between winners' tender quotes and the maximum willingness to pay predicted by GH. Consequently, the realized positive premiums exceeded the maximum willingness to pay across all four treatments, as indicated by the positive markups above the threshold in all last, winning quotes (Table 6). We were able to retain this inference even as we included incumbents who defended their positions without any successful purchase of shares. We inferred that the realized market value departs in a positive direction away from what was anticipated by GH. This result is consistent with the empirical findings that the bid premium is positively associated with the tender offer success rate (St-Pierre et al., 1996; Stulz, 1988). While target shareholders may not generally tender their shares right away after a tender offer is made, perhaps in anticipation of higher prices offered in the subsequent tender offer revision, the OSOV system ensures that contenders are able to secure their control faster. In other words, there is a shorter waiting time for a tender offer to be successfully completed under a OSOV system as compared to a dual-class share system.

In summary, the overall winner statistic affirms the GH prediction, and this is achieved against the backdrop of multiple tender offer revisions and the resulting price hike.

**Observation 2:** *Corporate control contests are characterized by multiple offer submissions and a positive price deviation from the expected market value, deviating from the theoretical prediction that only the contender who is predicted to win will launch a tender offer while the other simply takes no actions.*

### 3.3. Bidder's Excess Expenditure and Target Shareholders' Welfare

Bidders in OSOV treatments appear to acquire assets more aggressively. We find that the excess purchase under the OSOV system is statistically larger than those under the DCS system. In particular, winners in OSOV-ER and OSOV-IR purchase 33.11% and 41.6% more shares than required (i.e., 133 and 167 units above the minimum 401 shares required), significantly higher than the average 20.5% and 22.8% seen in DCS-ER and DCS-IR treatments (i.e., 41 and 46 units above the required 201 shares), at 5% and 1% significance level, respectively. A similar pattern is exhibited when we look at the actual expenditures of the bidding parties, with successful bidders spending more in OSOV than DCS (Table 7).

**Table 7**

***Excess Expenditure***

This table presents the OLS regression with the percentage of excess shares purchased by the contest winners as the dependent variable. Standard errors (clustered at the session level) are in parentheses. All the regressions include demographic variables as additional regressors. * indicates significance at the 10% level, ** indicates significance at the 5% level, and *** indicates significance at the 1% level.

| VARIABLES | (1) (Executed Price*Executed Shares - Max. Willingness to Buy*Min. Shares Required to Win) | (2) |
|---|---|---|
| One-Share-One-Vote Treatment | 3,282*** | 2,893*** |
| | (1,048) | (951.3) |
| Is Private Benefit given to winning Incumbent or raider? (1 if Incumbent, 0 if raider) | -1,682 | -2,250** |
| | (1,085) | (1,037) |
| Round | 231.5 | 309.3* |
| | (233.7) | (154.6) |
| CRT | | -1,136*** |
| | | (235.9) |
| No of Risky Choices | | 216.4 |
| | | (256.5) |
| Win in Backward Induction | | -588.7 |
| | | (942.7) |
| Major in Econ/Bus/Accountancy | | 1,289 |
| | | (859.5) |
| No of Financial / Economics Modules Taken | | -772.7* |
| | | (392.9) |
| Local Students (0 if all non-Singaporeans, 1 if all-Singaporeans) | | 561.9 |
| | | (855.7) |
| Constant | 4,103*** | 5,996*** |
| | (1,008) | (1,911) |
| Observations | 83 | 83 |
| R-squared | 0.248 | 0.399 |
| No of Clusters | 24 | 24 |

At the onset, it might appear that all contest winners suffer, to a certain extent, from the winner's curse. When we look at the bid volume proposed by the contenders, however, we find no discernible difference between the excess bid volume submitted by contenders in different asset structures. That is, they generally exceed the minimum amount required to secure control by 10.2% to 17.30%, on top of the excessive quotes imposed as shown earlier. In terms of bidders' intention to over-acquire the overall market share of the company stock (than necessary), we do not therefore find evidence that the OSOV system exacerbates the winner's curse.

**Table 8**

***Shareholders' Reactions to Bid Price Adjustment***

This table presents the OLS regression with the ratio of the change in the total shares received by the winner over the change in bid price as the dependent variable. Standard errors (clustered at the session level) are in parentheses. All the regressions include demographic variables as additional regressors. * indicates significance at the 10% level, ** indicates significance at the 5% level, and *** indicates significance at the 1% level.

| | (1) | (2) |
|---|---|---|
| | Change in Total Shares tendered / Change in Price | |
| VARIABLES | Efficient Takeover (i.e., OSOV-ER & DCS-ER) | Inefficient Takeover (i.e., OSOV-IR & DCS-IR) |
| One-Share-One-Vote Dummy | 55.00** | 68.50** |
| | (23.17) | (29.29) |
| Round | 11.37* | 14.50 |
| | (5.264) | (12.42) |
| CRT | -11.48 | -20.55 |
| | (18.72) | (19.99) |
| No of Risky Choices | 14.92 | 0.0174 |
| | (11.12) | (10.10) |
| Win in Backward Induction | -11.39 | 89.79* |
| | (29.57) | (43.47) |
| Major in Econ/Bus/Accountancy | 15.67 | -3.982 |
| | (21.74) | (26.67) |
| No of Financial / Economics Modules Taken | -11.88 | 27.25 |
| | (18.26) | (20.90) |
| Local Students | 30.59 | 3.770 |
| (0 if all non-Singaporeans, 1 if all-Singaporeans) | (27.25) | (26.04) |
| Constant | -55.40 | -67.06 |
| | (54.05) | (105.9) |
| Observations | 115 | 147 |
| R-Squared | 0.115 | 0.030 |
| No of Clusters | 12 | 12 |

What then could have possibly induced larger excess expenditures borne by winners in OSOV than in DCS structures? We find a plausible explanation from the supply side perspective. Using the ratio of the change in the total shares received by the winner over the change in tender quote as a measure of shareholders' responsiveness, we find that the target shareholders are more willing to sell their shares to the winners of OSOV markets than DCS markets, as evidenced by the statistically positive OSOV coefficients in Table 8. In other words, given the same amount of bid quote revisions, contenders under the OSOV structure receive larger proportions of the total market shares than do their DCS counterparts.

Interestingly, the overall price deviation in the OSOV market is still smaller than that in the DCS market. Purchasing prices hover 142% (111%) above the rational expectation market value in DCS-ER (DCS-IR), well beyond the 17% (66%) markups reported in OSOV-ER (OSOV-IR). The difference between the two structures is significant especially when the takeover is efficient, as demonstrated by both Table 9 and Table 10. When we translate this into the standard measure of relative absolute deviation introduced by Stockl et al. (2010), the RAD in DCS treatments is also much larger than in OSOV treatments.

**Table 9**

***Relative Absolute Deviation of Tender Prices from Predicted Value***

This table presents the deviation of tender price from the predicted market value, measured by the RAD index introduced by Stockl et al. (2010). We also test if the RAD measures are statistically distinct from zero, using the Wilcoxon signed-rank test, and report the outcomes in the table.

| | RAD (with respect to GH's predicted Market Value) | | | | | |
|---|---|---|---|---|---|---|
| Treatment | mean | s.d. | min | max | n | Signed-rank p-value (H0:0) |
| *OSOV-ER* | 0.17 | 0.06 | 0.00 | 0.20 | 21 | < 0.0001 |
| *DCS-ER* | 1.42 | 0.76 | 0.53 | 3.00 | 21 | 0.0001 |
| *OSOV-IR* | 0.66 | 0.36 | 0.10 | 1.00 | 22 | < 0.0001 |
| *DCS-IR* | 1.11 | 0.66 | 0.37 | 3.00 | 19 | 0.0001 |
| Kruskal-Wallis $\chi^2$ | 49.532 | | | | | |
| *p*-value | 0.0001 | | | | | |
| Mann-Whitney | *p*-value | n | | | | |
| *H0: OSOV = DCS* | < 0.0001 | 83 | | | | |
| *H0: OSOV-ER = DCS-ER* | < 0.0001 | 43 | | | | |
| *H0: OSOV-IR = DCS-IR* | 0.1389 | 40 | | | | |

**Table 10**

***Estimation of RAD***

This table presents the OLS regression with the absolute deviation of tender price from the predicted market value as the dependent variable. Standard errors (clustered at the session level) are in parentheses. All the regressions include demographic variables as additional regressors. * indicates significance at the 10% level, ** indicates significance at the 5% level, and *** indicates significance at the 1% level.

| | (1) | (2) | (3) |
|---|---|---|---|
| | When compared with GH's Market Value | | |
| | RAD | | |
| VARIABLES | Pooled | Efficient Takeover (i.e., OSOV-ER & DCS-ER) | Inefficient Takeover (i.e., OSOV-IR & DCS-IR) |
| One-Share-One-Vote Dummy | -0.946*** | -1.478*** | -0.544 |
| ( 1 if OSOV, 0 DCS) | (0.183) | (0.246) | (0.306) |
| Raider-Is-Efficient Dummy | -0.150 | | |
| ( 1 if Raider improves, 0 if Incumbent improves) | (0.175) | | |
| Round | 0.0507 | 0.0429 | 0.0407 |
| | (0.0364) | (0.0535) | (0.0395) |
| Avg. CRT | -0.109* | -0.170 | -0.0981 |
| | (0.0617) | (0.107) | (0.0740) |
| Avg. No of Risky Choices | -0.0324 | -0.0695 | -0.00263 |
| | (0.0326) | (0.0611) | (0.0385) |
| Avg. Win in Backward Induction | 0.0597 | 0.260 | -0.0754 |
| | (0.130) | (0.166) | (0.242) |
| Avg. No of Students who Major in Econ/Bus/Accountancy | 0.205 | -0.256 | 0.201 |
| | (0.172) | (0.396) | (0.211) |
| Avg. No of Financial / Economics Modules Taken | -0.0761 | -0.0107 | -0.0786 |
| | (0.0526) | (0.122) | (0.0774) |
| Avg. Composition of Nationalities | 0.0325 | 0.0294 | 0.0256 |
| ( 0 if all non-Singaporeans, 1 if all Singaporeans) | (0.119) | (0.164) | (0.213) |
| Constant | 1.517*** | 1.897*** | 1.301*** |
| | (0.269) | (0.499) | (0.335) |
| Observations | 83 | 42 | 41 |
| R-squared | 0.439 | 0.681 | 0.230 |
| Cluster (Session) | 24 | 12 | 12 |

The above findings indicate that changes in the number of shares received by the winners dominate over the increase in prices. Note that GH implicitly assumes that the incumbent and raider can always get the exact number of shares they want to purchase, and an additional subscription is going to be pro-rated, but in practice, most stock markets do not allow this type of proration in takeover tender offers. In our experiment, we choose the setting closer to the one in the real market—namely, asset transactions are not pro-rated. Contenders in our experiments are required to purchase all assets tendered by the shareholders, even if it exceeds the actual volume registered. To this end, our result shows that GH theoretical prediction is robust even if the underlying assumption of proration of shares upon a transaction is removed.

This finding highlights the need to place more attention on the change in the shareholders' behaviors, especially as the issue of excess expenditures is not solely due to the winner's curse. Shareholders are more likely to tender their shares to the efficient management in OSOV treatments than the inefficient management in DCS treatments, possibly because of an implicit intention to use their voting shares to support "the good guy." Thanks to this larger extent of acquisition, target shareholders also enjoy a higher payoff under the OSOV structure than the DCS structure, increased by almost 28% when GH prediction is satisfied (p-value = 0.0001, 1 replication = 1 observation). At the same time, the successful bidders in OSOV enjoy a greater concentration of market power than do their counterparts in DCS. One such support is found by the greater flexibility shareholders demonstrate (in the form of the number of shares committed) in response to the changes in the price offered by the contenders in OSOV, as indicated in Table 10. The overall deviation from the predicted market value is expected to affect the equity prices as they allow controlling shareholders to extract the private benefits of the winners.

**Observation 3:** *Winners generally purchase more assets than the minimum required number to win the contest; successful bidders in OSOV enjoy greater market power than do their counterparts in DCS. This is plausibly due to shareholders' greater inclination to tender more voting shares than dual-class shares to the contest winners.*

**Observation 4:** *Though the contender's bid prices are not exactly the same as the theoretical prediction by GH, the price deviation from fundamental values is still much smaller in OSOV treatments than in DCS treatments, indicating higher information efficiency of the market price in OSOV treatments.*

### 3.4.Tendering Probabilities of Target Shareholders

In this section, we present several notable tendering behaviors of the target shareholders. Specifically, we examine the dynamic process in which the price evolves from the initial bid over different rounds of revision. As mentioned earlier, the final purchasing prices are generally higher than the initial bid quote imposed by the bidders. Along with the several rounds of bid revisions, there are also corresponding changes in the tendering responses of the target shareholders. We first compare the completion rate of the bid created by the contest winners in each round (i.e., the percentage of the shares received by the bidder). Our data show that the further away the revision is from the final executed bid, the lower the completion rate is. The null hypothesis that the Kendall Tau-B correlations are zero is rejected across all four treatments ($p$-value < 0.01), suggesting statistically significant growth in the number of shares tendered as bidders revise their offers.

**Figure 1**

***Shareholders' Tendering Decisions***

This figure presents the distribution of the target shareholders' responses to the successful bids of the contest winners. The vertical axis is the percentage of the shareholders, while the horizontal axis is the percentage of shares in the possession of the target shareholders eventually tendered to the contest winners.

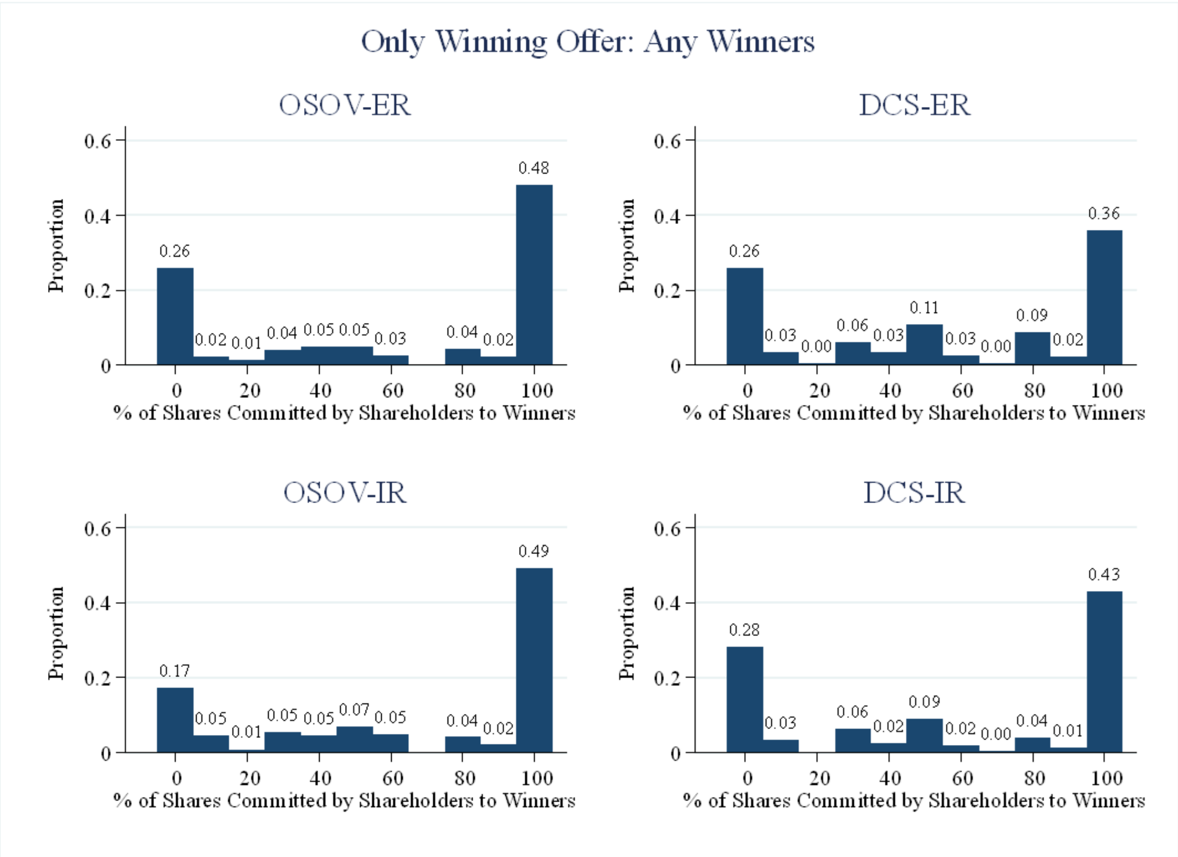

**Table 11**

***Probit Estimation of Shareholders' Tendering Decisions***

This table presents the probit estimation with the proportion of target shareholders who tender all or none of their shares as the dependent variables. Standard errors (clustered at the session level) are in parentheses. All the regressions include demographic variables as additional regressors. * indicates significance at the 10% level, ** indicates significance at the 5% level, and *** indicates significance at the 1% level.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Likelihood of Target Shareholder Committing to the Winner: | | | |
| | ALL Her Shares | | NONE of Her Shares | |
| VARIABLES | PROBIT | Marginal Effects | PROBIT | Marginal Effects |
| One-Share-One-Vote Dummy | 0.255** | 0.0931** | -0.198*** | -0.0600*** |
| | (0.111) | (0.0405) | (0.0723) | (0.0222) |
| Is the Winner a Raider? | 0.130* | 0.0477* | -0.0862 | -0.0262 |
| (1 if raider, 0 if incumbent) | (0.0761) | (0.0282) | (0.0654) | (0.0199) |
| Round | 0.0563** | 0.0206** | 0.0610** | 0.0185** |
| | (0.0254) | (0.00928) | (0.0307) | (0.00919) |
| CRT | 0.250*** | 0.0913*** | -0.0962** | -0.0292** |
| | (0.0511) | (0.0173) | (0.0478) | (0.0144) |
| No of Risky Choices | 0.102*** | 0.0374*** | -0.0413 | -0.0125 |
| | (0.0225) | (0.00807) | (0.0293) | (0.00883) |
| Win in Backward Induction | 0.170 | 0.0623 | 0.0667 | 0.0203 |
| | (0.109) | (0.0391) | (0.102) | (0.0309) |
| Major in Econ/Bus/Accountancy | -0.297** | -0.109** | 0.0733 | 0.0223 |
| | (0.135) | (0.0495) | (0.152) | (0.0461) |
| No of Financial / Economics Modules Taken | 0.130*** | 0.0474*** | -0.0552 | -0.0168 |
| | (0.0468) | (0.0170) | (0.0795) | (0.0241) |
| Local Students | -0.0704 | -0.0258 | 0.0834 | 0.0253 |
| (0 if all non-Singaporeans, 1 if all-Singaporeans) | (0.101) | (0.0368) | (0.102) | (0.0310) |
| Constant | -1.545*** | | -0.466* | |
| | (0.247) | | (0.247) | |
| Observations | 913 | 913 | 913 | 913 |
| No. of Clusters (at Session level) | 24 | | 24 | |

Second, a significant amount of shareholder heterogeneity is recorded in the target shareholders' tendering decisions. About 17% to 26% of the target shareholders do not surrender any of their shares at all to the winners at their successful bids. Only about 36% to 48% of the shareholders sell all their possessions, while the remaining population partially tender their shares (Figure 1).

Table 11 presents the estimations of the proportion of two types of target shareholders: (i) those who tender all their shares to the winners and (ii) those who do not surrender any of their shares. The coefficients of the OSOV dummy are statistically significantly positive in the first estimation and statistically significantly negative in the second one. In other words, OSOV proves to be superior in increasing the number of fully committed target shareholders and reducing the number of non-committed ones.

Shareholders' greater reception of offers made in the OSOV structure can also be seen by the fall in the proportion of shareholders who chose to divide their votes for both contesting candidates. This is understandable given the their receptions of the offer results in the election of an efficient management, unlike the DCS structure. The promotion of an inefficient winner means greater reluctant engagement from the shareholders' side. At the same time, it induces the efficient party to present a greater threat against the inefficient party, even though the inefficient party is able to offer a higher price and is poised to win. If this is the case, then shareholders' preference over efficiency (i.e., higher fundamental value) might explain the observed differences between the OSOV and DCS structures.

**Observation 5:** *We observe strong positive correlations between the number of revisions and the bid completion rate. While target shareholders display heterogeneity in their tendering activities, OSOV increases the likelihood of agents to tender all their shares and diminishes the tendency not to tender their shares at all.*

## 4. Discussion

Our paper affirms GH's (1988) prediction that OSOV is superior to DCS in promoting the election of efficient management and protection of shareholders' interest. This outcome is recorded against the backdrop of few other observations not included in the static theory but empirically found in the dynamic market settings. For instance, GH assumes that under rational expectations and a common knowledge of the productivity of the winners, shareholders will only tender their shares to the predicted winners. Because of this, treatments with anticipated takeover successes (failures) should be characterized by only one offer made by the raiders (no contest). Our paper, however, finds that bidders impose contesting bids even when they are expected to lose and manage to secure some controls away from the predicted winners in the process. This is consistent with the multiple bids recorded in actual practice. Franks and Harris

(1989), for instance, showed that multiple bids are even observed within uncontested takeover environments (more than 9% of the uncontested bids).

Second, GH's assumptions that target shareholders do not view themselves as nonpivotal in the success of the takeover means that they possess full bargaining power that subsequently enables them to extract the takeover gains completely (Muller, 2004; Dalkir et al., 2019). Unlike the static setting (where target shareholders stand to lose by not selling the shares), target shareholders in a dynamic market can refuse to tender their assets when they expect future share value to be higher than what is being offered (even as the post-takeover true asset value is public knowledge) renders the takeover to be unprofitable. We document that majority of the tender offer outcomes benefit the target shareholders more than the bidder.

Third, our result also supports the empirical observations that the expected number of shares received is an increasing function of the premium offered by the contenders and that the contenders cannot ascertain the actual number of shares they receive (Stulz, 1988; Walkling, 1985). Corollary to this is our documented evidence of bids that have failed but later succeed after the increase in their quotes, as well as the rampant instances of oversubscribed bids (Bradley et al., 1983). This is not to say that the bidders will always be the losers in the long run. As stressed by Jensen and Meckling (1976), managers may be able to yield positive returns, especially if the firm value increases monotonically with the growth in the managerial asset ownership.

One particularly interesting finding is that shareholders under OSOV gain more than their counterparts in DCS. By the same argument, the expected winner under OSOV suffers greater loss than their counterparts in DCS. There is, however, a trade-off, for this means that OSOV confers a greater concentration of shareholdings (and thus voting rights) to the managers. If a similar pattern is also observed in real markets, extra attention may need to be paid to the protection of acquirers against losses due to excessive overbidding.

The above-mentioned features of decentralized markets allow few instances of non-predicted winners securing control over the firms. Despite the mixed nature of the contest winners, the overall pattern is still supportive of the very idea propounded by GH. As such, we show that GH continues to hold even as several assumptions related to the nature of a static market are relaxed.

## 5. Conclusion

We test the GH (1988) theory on the optimality of the OSOV share structure in a laboratory setting. Various features of the empirical dynamic market settings are documented in our data. These include our records of bidders submitting more than one bid to secure control over the firm, target shareholders refusing to tender their shares induced by the expectations of higher buyout value, and the positive correlation between the number of shares received by the bidder and the premium offered. We show that not all markets ended up with predicted winners being successful. Nevertheless, the overall pattern is still supportive of GH's conjecture. In other words, GH continues to hold even when the assumptions of a static market and proration are relaxed.

Our result may have the following policy implications. First, though the DCS structure may have several benefits in terms of motivating and keeping the talented entrepreneurs in high tech companies, our results suggest caution needs to be taken in permitting its wide adoption. DCS may cause inefficiency in takeovers and the replacement of talents in the dynamic setting.

Second, our result shows that the winners' curse may happen where both the incumbent and the raider bid too high in the takeover contest. While shareholders benefit from it, managers/contenders may suffer. This result may suggest the possible desirability for regulators to give some alert to the contenders when the bidding price is much higher than the initial share price.

In our experiments, bidders purchase all shares rendered even as target shareholders tend to oversubscribe (more so in the OSOV than DCS). Comment and Jareell (1987), for instance, suggested that bidders should be allowed to set out the maximum number of shares to be accepted in order to minimize the loss of the winners. Future studies could therefore look into the possibility of introducing variations such as two-tier offers, partial offers, or proration mechanisms and see how they affect the GH predictions. To reduce unintended complexities to our experiment, we do not provide open-market operations as an alternative for bidders to acquire shares from the target shareholders. Another extension of our study can therefore consider looking into how the presence of this open market also affects the theory.

## References


Adams, R., & Ferreira, D. (2008). One share-one vote: The empirical evidence. *Review of Finance*, *12*(1), 51–91.

Bagnoli, M., &Lipman, B. L. (1988). Successful takeovers without exclusion. *The Review of Financial Studies*, *1*(1), 89–110.

Bao, T., Halim, E., Noussair, C. N., &Riyanto, Y. E. (2021). Managerial Incentives and Stock Price Dynamics: an Experimental Approach. *Experimental Economics*, *24*(2), 617–648.

Bloomfield, R., & Anderson, A. G. (2010). Experimental finance. In *Behavioral Finance* (pp. 113–130), John Wiley & Sons, Inc..

Bradley, M., Desai, A., & Kim, E. H. (1983). The rationale behind interfirm tender offers: Information or synergy? *Journal of Financial Economics*, *11*(1–4), 183–206.

Cadsby, C. B., & Maynes, E. (1998a). Corporate takeovers in the laboratory when shareholders own more than one share. *The Journal of Business*, *71*(4), 537–572.

Cadsby, C. B., &Maynes, E. (1998b). Laboratory experiments in corporate and investment finance: A survey. *Managerial and Decision Economics*, *19*(4–5), 277–298.

Cadsby, C. B., & Maynes, E. (2005). Gender, risk aversion, and the drawing power of equilibrium in an experimental corporate takeover game. *Journal of Economic Behavior and Organization*, *56*(1), 39–59.

Cain, M. D., McKeon, S. B., & Solomon, S. D. (2017). Do takeover laws matter? Evidence from five decades of hostile takeovers. *Journal of Financial Economics*, *124*(3), 464–485.

Claessens, S., Djankov, S., Fan, J. P. H., & Lang, H. H. P. (2002). Disentangling the incentive and entrenchment effects of large shareholdings. *The Journal of Finance*, *57–6*, 2741–2771.

Comment, R., & Jarrell, G. A. (1987). Two-tier and negotiated tender offers: The imprisonment of the free-riding shareholder. *Journal of Financial Economics*, *19*(2), 283–310.

Dai, Y., Gryglewicza, S., Smit, H. T. J., & De Maeseneire, W. (2013). Similar bidders in takeover contests. *Games and Economic Behavior*, *82*, 544–561.

Dalkır, E., Dalkır, M., & Levit, D. (2019). Freeze-out mergers. *The Review of Financial Studies*, *32*(8), 3266–3297.

Deman, S. (1994). The theory of corporate takeover bids: A subgame perfect approach. *Managerial and Decision Economics*, *15*(4), 383–397.

Dixit, A. K., & Nalebuff, B. (2008). *The art of strategy: A game theorist's guide to success in business & life*. WW Norton & Company.

Field, L. C., & Karpoff, J. M. (2002). Takeover defenses of IPO firms. *The Journal of Finance*, *57*(5), 1857–1889.

Füllbrunn, S., & Haruvy, E. (2014). The dividend puzzle: A laboratory investigation. InS. M. Collins, R. M. Isaac, & D. A. Norton (eds.), *Experiments in financial economics*, volume 16, (pp. 87–110), Emerald Publishing Ltd.

Franks, J. R., & Harris, R. S. (1989). Shareholder wealth effects of corporate takeovers: The UK experience 1955–1985. *Journal of Financial Economics*, *23*(2): 225–249.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, *19*(4): 25–42.

Govidarajan, V., Rajgopal, S., Srivastave, A., % Enache, L. (2018, December 3). Should dual-class shares be banned? *Harvard Business Review*. https://hbr.org/2018/12/should-dual-class-shares-be-banned

Grossman, S. J., & Hart, O. D. (1988). One share-one vote and the market for corporate control. *Journal of Financial Economics, 20*(1/2), 175–202.

Haruvy, E., Noussair, C. N., & Powell, O. (2014). The impact of asset repurchases and issues in an experimental market. *Review of Finance*, *18*(2), 681–713.

Humphery-Jenner, M. (2014). Takeover defenses, innovation, and value creation: Evidence from acquisition decisions. *Strategic Management Journal*, *35*(5), 668–690.

Jennings, R. H., & Mazzeo, M. A. (1993). Competing bids, target management resistance, and the structure of takeover bids. *The Review of Financial Studies*, *6*(4), 883–909. https://doi.org/10.1093/rfs/6.4.883

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305–360.

Kale, J. R., & Thomas H. Noe (1997). Unconditional and conditional takeover offers: Experimental evidence. *The Review of Financial Studies*, *10*(3), 735–766.

La Porta, R., Lopez-de-Silanes, F., Andrei Shleifer, A., & Vishny, R. W. (1998). Law and finance. *Journal of Political Economy*, *106*(6), 1113–1155.

Masulis, R. W., Wang, C., &Xie, F. (2009). Agency problems at dual-class companies. *The Journal of Finance*, *64*(4), 1697–1727.

McRitchie, J. (2019). One-share-one-vote? Dual class debated. https://www.corpgov.net/2019/05/one-share-one-vote-dual-class-debated/

Muller, H. M., & Panunzi, F. (2004). Tender offers and leverage. *The Quarterly Journal of Economics*, *119*(4), 1217–1248.

Milgrom, P., & Stokey, N. (1982). Information, trade and common knowledge. *Journal of Economic Theory*, *26*(1), 17–27.

Nenova, T. (2003). The value of corporate voting rights and control: A cross-country analysis. *Journal of Financial Economics*, *68*, 325–351.

Noussair, C., Robin, S., & Ruffieux, B. (2001). Price bubbles in laboratory asset markets with constant fundamental values. *Experimental Economics*, *4*, 87–105.

Robertson, B. (2018). Hong Kong adds dual-class shares, paving way for tech titans. https://www.bloomberg.com/news/articles/2018-04-24/hong-kong-approves-dual-class-shares-paving-way-for-tech-titans

Ruback, R. S. (1988). An overview of takeover defenses. In A. J. Auerback (ed.), *Mergers and acquisitions* (pp. ###–###). University of Chicago Press.

Scharfstein, D. (1988). The disciplinary role of takeovers. *The Review of Economic Studies*, *55*(2), 185–199.

Souther, M. E. (2016). The effects of takeover defenses: Evidence from closed-end funds. *Journal of Financial Economics*, *119*(2), 420–440.

Smart, S. B., Thirumalai, R. S., &Zutter, C. J. (2008). What's in a vote? The short-and long-run impact of dual-class equity on IPO firm values. *Journal of Accounting and Economics*, *45*(1), 94–115.

St-Pierre, J., Gagnon, J.-M., & Saint-Pierre, J. (1996). Concentration of voting rights and board resistance to takeover bids. *Journal of Corporate Finance*, *3*(1), 45–73.

Stöckl, T., Huber, J., & Kirchler, M. (2010). Bubble measures in experimental asset markets. *Experimental Economics*, *13*(3), 284–298.

Stulz, R. M. (1988). Managerial control of voting rights. *Journal of Financial Economics*, *20*, 25–54.

Sunder, S. (2007). What have we learned from experimental finance? In *Developments on Experimental Economics* (pp. 91–100). Springer.

Walkling, R. A. (1985). Predicting tender offer success: A logistic analysis. *Journal of Financial and Quantitative Analysis*, *20*(4), 461–478.

Wong, S. C. Y. (2013). Rethinking "one-share-one-vote." *Harvard Business Review*. https://hbr.org/2013/01/rethinking-one-share-one-vote

# Appendix

## A.1 Experimental Instructions of OSOV-ER

### General Information

You are now taking part in an interactive study on decision-making. **Please pay attention to the information provided here and make your decisions carefully. If at any time you have questions to ask, please raise your hand and we will attend to you in private.**

Please note that unauthorised communication is prohibited. Failure to adhere to this rule would force us to stop the experiment and you may be held liable for the cost incurred in this simulation. You have the right to withdraw from the study at any point in time, and if you decide to do so your payments earned during this study will be forfeited.

You will earn a **show-up fee of S$2**. Besides that, you will be able to earn a considerable amount of money during the study. The amount depends partly on the decisions you and others make and partly on chance.

At the end of this session, this money will be paid to you in private and in cash. It will be contained in an envelope (indicated with your unique user ID) together with a claim card acknowledging that you have been given the correct payment amount.

### General Instructions

Each of you will be given a unique user ID. Please remember your ID as it is your only identity in our database. Your ID will also be used for payment collection. Your **anonymity will be preserved for the study.** You will never be aware of the personal identities of other participants during or after the study. All information collected will be kept **strictly confidential** for the sole purpose of this study.

There are **5 stages** in this experiment. **Stage 1 comprises an asset trading game. Stage 2, 3, and 4 contain decision-making problems. Stage 5 consists of a post-experiment questionnaire.**

### STAGE 1 – Trading Game (Practice & Real)

In this experiment, you are going to participate in a computerized market where units of a fictitious asset (i.e., “shares” of a “stock”) are traded.

The currency used in this market is called experimental currency unit (ECU). At the end of this stage, the ECU that you have accumulated will be converted to Singapore dollars for your payment.

## Duration of the Experiment

To ensure your understanding of the experiment, you will first answer a quiz regarding the setup. All questions must be answered correctly before you can proceed. After that, the Practice Trading Game will commence, consisting of 2 periods, each lasting for 100 seconds.

The Real Trading Game will follow the Practice Trading Game. For the Real Trading Game, each round consists of 12 trading periods, and each period lasts for 100 seconds. After each period, a summary page will show up for 10 seconds. Each round will terminate at either the end of the 12th trading period or when a takeover is successful, whichever is earlier. After this, a new round will begin. There is a maximum of 6 rounds within 2 hours.

## The Tender Offer Setup

You will be placed in an experimental market with **12** participants. The firm issues **800** voting shares. Voting shares are shares that empower the shareholders to vote on major corporate issues, including voting for or against any corporate takeover. The shares have the same **initial** fundamental value of **15 ECU**. However, at the end of the round, depending on who is controlling the firm, the final share value either remains at **15 ECU**, or increases to **25 ECU**.

Each participant may play one of the following roles: **shareholder, incumbent or raider**.

**Individual shareholders do not have access to the control of the firm**. Their payoff purely depends on the profit they earn from selling (“tendering”) their shares to the incumbent or raider when either or both of them launch a tender offer.

The **incumbent** is the manager who is currently in control of the firm, and the **raider** is an outside bidder who tries to take over the control of the firm. If the raider manages to accumulate more than 50% of the voting shares (at least 401 shares) of the firm, he or she wins the takeover game and receives the control of the firm. If the raider does not manage to accumulate more than 50% of the voting shares at the end of the 12th period in each round, he or she loses the takeover game and the incumbent remains in control. Note that when a takeover successfully happens, the trading round will end, and a new trading round will begin.

**For all three types of market participants, if they keep the shares until the end, they will receive a final share value of 15 ECU if the incumbent is still in control of the firm, or 25 ECU per share if the raider takes over the firm.** On top of these, the **incumbent** earns a private benefit of **6000 ECU** if he or she wins the takeover game and 0 if he or she loses. Thus, only the incumbent, but **not** the raider and the individual shareholders, will have access to the private benefits of controlling the firm.

*Illustration*

| | **Incumbent retains control of firm** | **Raider wins & take control of firm** |
|---|---|---|
| **Final Share Value** | 15 ECU | 25 ECU |
| **Private Benefit to Incumbent/Raider (Winner)** | 6000 ECU | 0 ECU |

The role will determine the initial amount of the endowment (cash and/or shares) in hand. No asset units or cash can be carried over to the next trading round. At the start of a new trading round, your role will be reshuffled, and your endowments will be replenished with new asset units and cash in hand.

**The Trading Mechanism**

The incumbent and the raider can only buy or sell your shares through tendering an offer. The respective **investor's ID and stock ownership percentage will be displayed publicly if he or she owns more than or equal to 5% of the total voting shares. Otherwise, the ID and the stock ownership percentage will not be revealed.**

Only the incumbent and the raider can tender an offer to shareholders to purchase the shareholders' voting shares privately. As shareholders can receive a higher payoff by tendering their shares to an incumbent or raider who offers a higher price, it is important to read this part of the instructions carefully as well if you are a shareholder.

*Submitting a tender offer*

For a raider, making a tender offer is the only way in which he or she can gain control over the firm. Offering a high price usually leads to a higher chance of winning but also a lower potential profit of the takeover.

For an incumbent facing a takeover threat, you can defend your position by launching a tender offer. If an incumbent purchases a large fraction of voting shares from the market, it will lead to a very low chance for the raider to accumulate more than 50% shares to win the control.

The rule of the tender offer is exactly the same for both raider and incumbent. A tender offer can be launched at any point, each lasting for 150 seconds, so it can be carried over to the next period. When the raider (incumbent) launches a new tender offer, any pending buy or ask offer submitted in the open market by the raider (incumbent) will be withdrawn automatically.

A raider (incumbent) can launch a tender offer by specifying an offer price (P) and the quantity of shares he or she wants to acquire (Q). There are **three conditions to be satisfied when submitting P and Q**:

1. Q ≥ 401 – Existing number of voting shares
2. P ≤ Cash endowment / (800 – existing number of voting shares)
3. P ≥ Price of another existing tender offer (if any)

The intuition of the above three conditions are:

1. The number of shares that the raider (incumbent) aims to buy should be at least enough for him or her to reach 401 shares in order to gain control of the firm.
2. There is a cash constraint for tender offer. The raider (incumbent) has to have enough cash to buy all the outstanding shares in the market. In other words, he or she cannot submit a price that is too high for him or her to buy all the outstanding shares with his or her limited cash endowment.
3. If there is an existing tender offer in the market, the price in order to launch another tender offer must be an improvement from the previous bid.

If the conditions above are not satisfied, you will be prompted with a pop-up and will have to re-enter P and Q values that satisfy both conditions.

Once a tender offer is launched, the tender offer is successful when the raider or incumbent reaches an ownership of just above 50% of the outstanding voting shares within the duration the tender offer is open. Otherwise, it is considered to be unsuccessful, and the tendered shares will be returned to sellers. You could also withdraw your tender offer before it expires, and the tendered shares will be returned immediately.

*Shareholder's involvement in tender offer*

If you are assigned the role of a shareholder, you can sell (tender) your voting shares to any outstanding tender offer by raider or incumbent. The shares that are submitted to a tender offer are frozen and are not available to be traded until after the tender offer expires or is withdrawn. If the tender offer is successful, you will be paid according to the price specified in the offer. If a tender offer is withdrawn or unsuccessful within the time limit, the shares that you tendered will be returned to you.

**Earning for STAGE 1**

After all trading rounds have ended, the computer will randomly select a round and convert your final wealth for that round to Singapore dollars at the following rate:

| Role allocated in the chosen round | Conversion Rate |
|---|---|
| Shareholder | 170 ECU = S$1 |
| Incumbent/Raider | 1250 ECU = S$1 |

* Conversion rate differs due to the different endowment at the start of each round.

Final Wealth for Stage 1 = No. of Shares in Hand x 15 ECU (or 25 ECU if Raider successfully takeover) + Cash in Hand + Private Benefit (for Incumbent or Raider)

The converted amount will be your earnings for Stage 1.

If you have any question that was not fully answered by the instructions, please raise your hand and ask before proceeding.

## STAGE 2 - Decision Problem

In this stage, you will be asked to make a series of choices. Your earnings will depend on the probability and choices made by you. The decision problems are not designed to test you. What we want to know is what choices you would make in them. The only right answer is what you would choose.

For each line on the table on the screen, please select whether you prefer Option A or Option B. If you choose Option A in that line, you will receive S$1; If you choose Option B, you will receive either S$3 or S$0 depending on the corresponding probability.

There are a total of 10 lines in the table. However, only 1 line will be randomly selected by the computer and be used for your payment. As it is randomly generated after submitting your answers, you should pay attention to the choices you make for every line.

If you have any questions, please raise your hand and we will attend to you in private.

## STAGE 3 - Cognitive Reflection Test (CRT)

You are required to answer three questions within 2 minutes for this stage. Each question answered correctly will provide you with $0.50.

## STAGE 4 – Backward Induction

In this stage, you will be tasked with a computer player. The “counter” will start at 0. The computer player will begin first by adding “1” or “2” to the counter. After the computer player has made a choice, you can observe its choice and add either “1” or “2” to the counter. After your choice, it is again the turn of the computer player. The computer player can, again, add “1” or “2” to the counter. The stage will continue with you and the computer player taking turns. The stage will end once the counter reaches 21, and the winner is the player who selects the last choice that makes the counter reach 21. If the participant wins in this round, you will be provided with $1.

## STAGE 5 – Post-Experiment Questionnaire

In this stage, you are required to answer a post-experiment questionnaire. When you are done, we will prepare your earnings and ask you to sign a receipt, and the experiment will be over. Thank you again for your participation!

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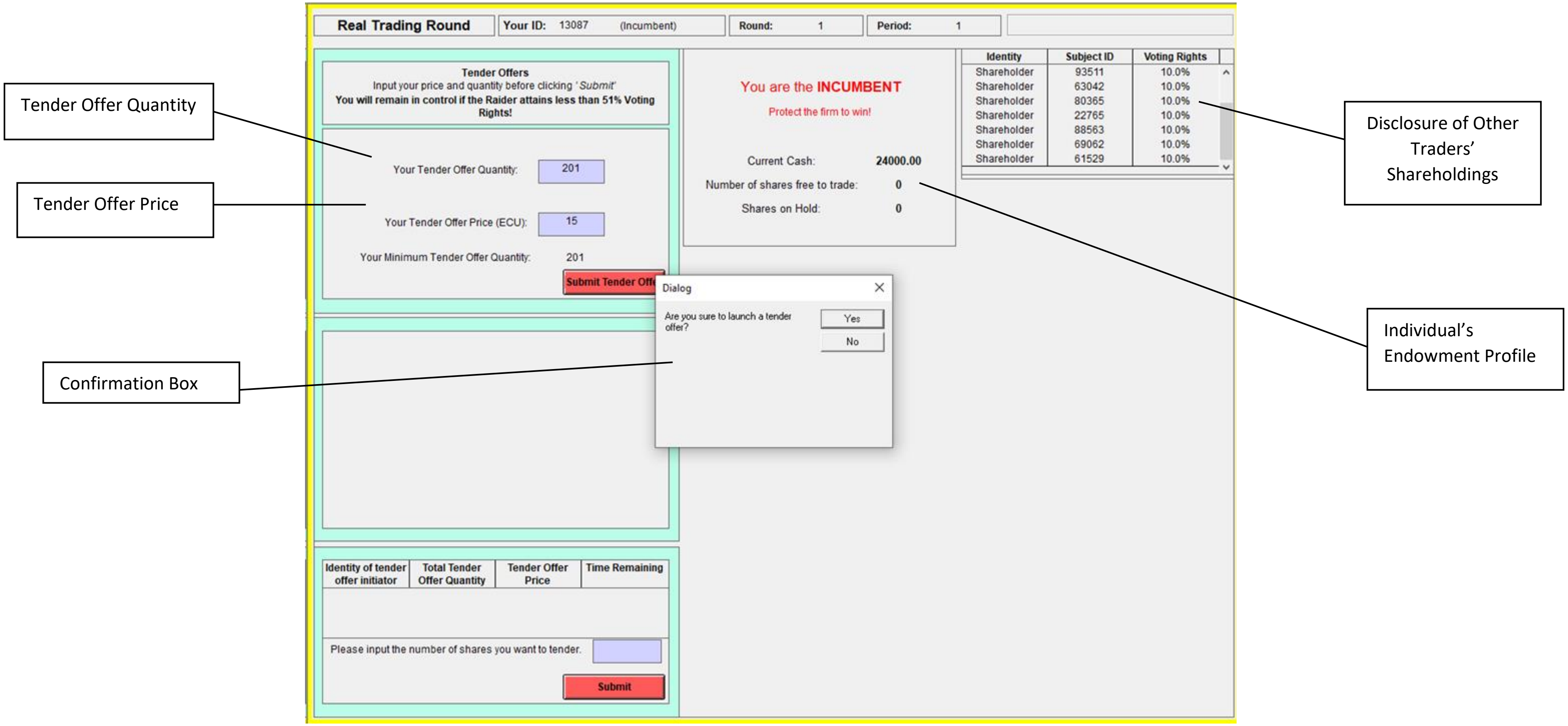
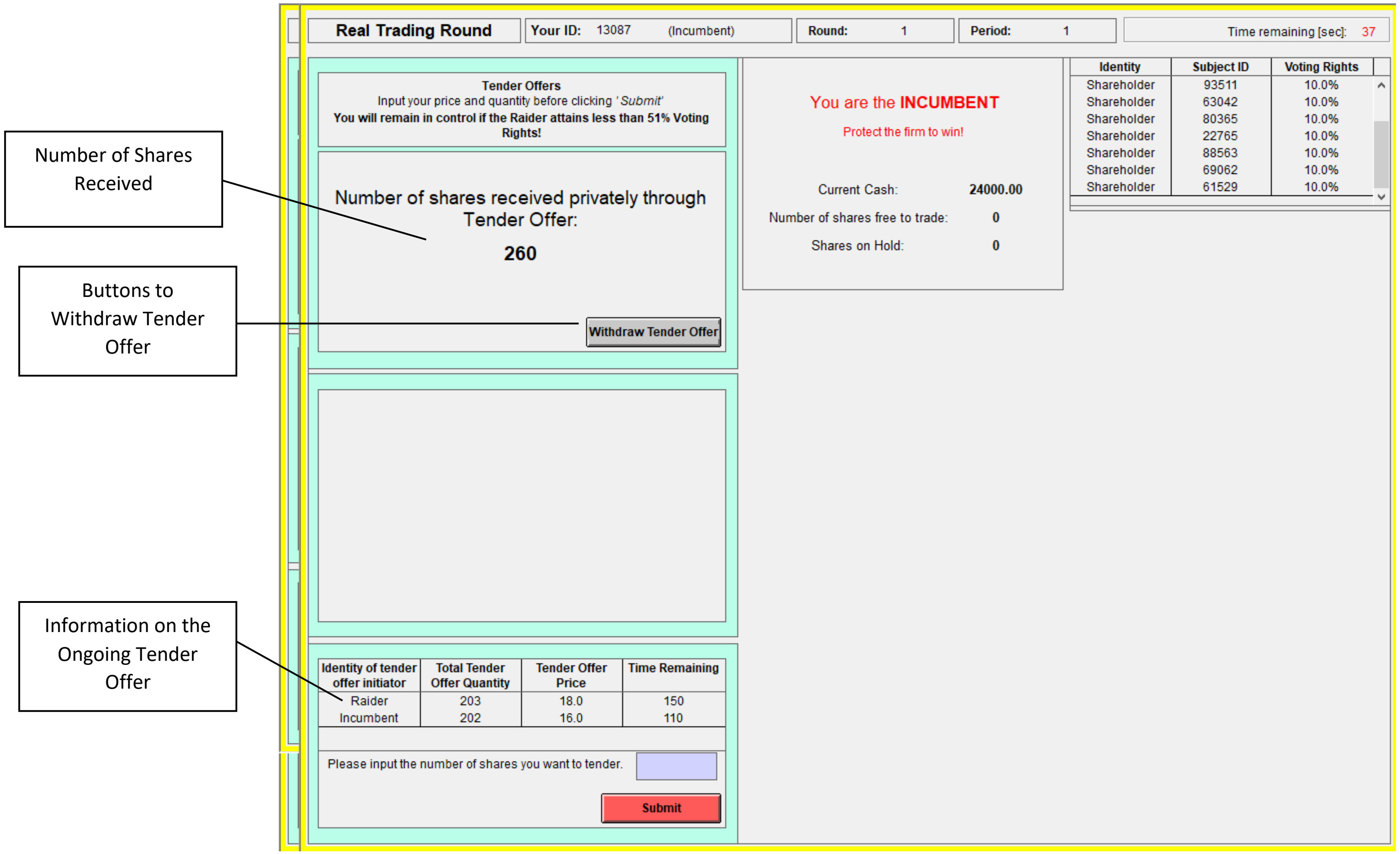
**If you have any questions that have not been fully answered by the instructions, please raise your hand and ask for assistance before proceeding.**

## A.2 Example of Stage 1 Screen

**Tender Offer Stage of Incumbent or Raider (before tender offer is launched).** We provide equal initial endowments to both contenders: 24,000 ECU and 0 shares. Each shareholder is entitled to 10% of the total shares and 1,200 ECU. The incumbent and raiders then compete to secure control by submitting an offer price (P) and the number of shares they intended to acquire (Q). Each tender offer lasts for 150 seconds and can be carried over to the next period unless withdrawn.



**Tender Offer Stage of Incumbent or Raider (after tender offer is launched).**



**Tender Offer Stage of Shareholders.**