Optimal Deterrence When Shareholders Desire Fraud

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Abstract: This article presents an economic model of corporate fraud arising from shareholder incentives. First, the model shows that a firm’s current shareholders have a preference for higher reported values. Current shareholders are, in expectation, net sellers of the firm’s shares; a higher reported value of the firm increases current shareholder returns in expectation.

Second, these preferences for inflationary misreporting translate into equilibrium misreporting behavior, which generates inefficiencies due to asymmetric information among secondary market traders. Informed traders undertake inefficient research costs, noise traders demand a discount in order to trade, and selling shareholders face deadweight illiquidity costs.

Third, in general, some ex post penalty for misreporting can eliminate misreporting incentives and result in a unique truth-telling (i.e., separating) equilibrium. This improves social welfare. With joint-welfare maximization among the firm’s initial stakeholders and unlimited liability, it does not matter on whom the penalty is placed.

Finally, the specific mechanism of firm-level (or “vicarious”) fines has desirable qualities from the perspective of administrative feasibility: the optimal fine is a simple function of observable market data. Compensation does not affect this formulation, yet compensation may be desirable in the event of incomplete deterrence because it reduces asymmetric information liquidity costs. The same liability formula applies for alternative targets of liability, such as the manager, and the approximate magnitude of the optimal fine remains the same; however, judgment-proofness and limited liability may militate toward firm-level fines.

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Introduction

What leads firms to misreport, and what should be done about it? The contribution of the instant article is to show that the firm’s current shareholders have incentives to engage in fraud. If these incentives are not properly addressed, they lead to inflationary misreporting. Legal penalties can counter these shareholder incentives, deter fraud, and result in higher social welfare. Private securities litigation, in which defrauded purchasers receive damages equal to their decline in share value, in fact approximates the optimal deterrent penalty.

The proposition that shareholders may gain from fraud is relatively unappreciated by modern legal scholarship. An academic consensus maintains that fraud arises from managerial agency costs: disloyal corporate executives misreport in order to benefit themselves at the expense of the firm and its shareholders. According to this view, shareholders themselves do not desire fraud, and penalties imposed upon the firm or its shareholders do little good. This critique (reviewed in Section I) has been highly influential in attacking the current U.S. system of securities regulation, which relies primarily on private litigation against firms to deter fraud.

In contrast to such received wisdom, this article establishes (in Section II) that the firm’s current shareholders, as a whole, in fact desire higher reports of firm value, whether or not those reports are true. This is because the firm’s current shareholders must be, as a matter of mathematical certainty, net sellers in the future: since they own the entire firm, any shares sold to outside purchasers must come from them as a group. Just as with sellers of other assets, the firm’s owners desire a higher price, even if such higher price is obtained through misrepresentation. This is true in the context of both primary sales (i.e., sales from the firm to purchasers) and secondary sales (i.e., sales from current shareholders to purchasers). Even where the firm is held by heterogeneous shareholders (such as a mix of long-term and short-term shareholders, as well as those who may purchase additional shares), aggregate shareholder preferences are qualitatively similar to the homogeneous shareholder case. Further, if these heterogeneous shareholders can engage in joint welfare maximization, then shareholders’ aggregate interests can be modeled as a single representative shareholder, who also has such inflationary preferences.

Section III then develops a game-theoretic model of secondary trading in the firm’s shares where the price is affected by the firm’s reporting decision, and shows that fraud results in equilibrium. The firm, when managed by a representative shareholder-manager, chooses to misreport when the firm is of low type, since doing

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2 “Fraud,” as used herein, is intended to mean, broadly, any sort of bias in reporting. As Cross & Prentice note, “[i]ssuers may engage in a wide range of opportunistic dishonesty, ranging from blatant lying to more subtle shading of the truth or convenient omission of important but negative information” – not all of which is readily subject to legal anti-fraud penalties. Frank Cross & Robert Prentice, Law and Corporate Finance (Edward Elgar 2007).

3 Absent a penalty, of course. The subsequent argument derives an optimal deterrent penalty.
so increases the price at which the firm’s initial shareholders may sell their shares. Truth-telling is unsustainable, and fraud is the unique equilibrium in pure strategies. If the secondary market is populated by both informed traders (who can undertake research costs to learn the firm’s true value) and noise traders (who can only abstain from trading if they believe they will fail to at least break even), this fraud equilibrium results in inefficient expenditures on research, discounted trading prices, and illiquidity costs. Shareholders’ incentives to misreport, if unchecked, lead to lower social welfare.

Section IV incorporates fines or liability into the model to show – in general – that liability on (any of) the firm’s ex ante stakeholders has the theoretical potential to correct shareholders’ fraud incentives. So long as transfers made to defrauded purchasers are funded by no source external to the firm, an increase in fines lowers the returns of fraud: expected liability rises faster than does the expected gain from a higher trading price. An adequate level of fine makes the returns to fraud negative, which means that fines can deter fraud. Given joint welfare maximization, it does not matter on which of the initial stakeholders this liability falls.

Section V examines the particular liability mechanism of firm-level (or “vicarious”) liability, in which the firm itself is fined for misreporting. Some portion of the fine may be transferred to defrauded purchasers as compensation. The model solution shows that vicarious liability can, indeed, result in optimal deterrence. The optimal fine is remarkably administratively feasible to implement: it is a function entirely of observable market metrics -- the number of shares transacted and the decline in market price. The formula for the optimal fine, as a function of these market metrics, is unaffected by whether or not the fine is used to compensate defrauded purchasers, though there are potential benefits to compensation.

Section VI concludes and discusses some implications of the results. Malign shareholder incentives present a potentially greater problem than managerial incentives due to their relative scale, requiring larger penalties to deter. As it stands, our current system of fraud deterrence – based on private securities litigation – matches up well with the derived optimal.

I. Private securities litigation and its critics

The main deterrence mechanism for corporate fraud in the United States is private securities litigation under Rule 10b-5 of the Securities Exchange Act of 1934. So-called “fraud on the market” class actions constitute more than 50% of federal class actions filed. Such suits are relatively common in the life of a publicly-traded

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4 Research expenditures are inefficient (or “deadweight”) in this model since they produce no informational gain over the case in which the firm reports correctly.
5 The general penalty model sets aside concerns over particular penalty mechanisms, such as the supposed “circularity” problem inherent in private securities litigation.
6 This tracks the current system of private securities litigation, in which the firm is liable for its misstatements.
7 Compensation does affect the prices themselves, which can ameliorate liquidity problems, and it also reduces the incentives to undertake deadweight research costs.
8 See Paulson Committee Report at 71 (Table III.1).
company, with approximately one-in-10 facing a class action lawsuit in a 5-year period.9

The fraud-on-the-market doctrine presumes that investors rely on a (somewhat)10 informationally efficient market price when transacting their securities. If the publicly-available information disclosed by the firm is materially incorrect, the market price will be inaccurate. This may give rise to a colorable claim for damages under the fraud-on-the-market theory, in which it is presumed that the investor relies upon the accuracy of the information on which the stock price is based. When that information is revealed to be incorrect and the stock price moves upon the revelation of the inaccuracy, the stock price movement provides evidence of most of the requisite elements of a fraud claim: if the price movement coincides with the revelation of fraud, causation is satisfied; the materiality of the inaccuracy, based on what reasonable investors care about, is demonstrated through the fact that the market price moved in conjunction with the revelation; and damages are simply (for a purchaser) the price at which the investor purchased less the firm’s stock price after the revelation of the fraud.11 Reliance is presumed under the fraud-on-the-market doctrine, leaving only scienter and actual falsity to be proven by extrinsic evidence.

At the time of its ratification by the Supreme Court in 1988,12 the fraud-on-the-market class action was lauded by academics as an innovative use of financial economic theory in capital markets regulation, and enjoyed “near-universal support.”13 Not long thereafter, however, criticisms emerged that attacked private securities litigation generally, and fraud-on-the-market in particular, along several fronts. Perhaps most damning among these critiques were theoretical14 claims that not only did private securities litigation not work, but that it could never work due to fundamental defects in the mechanism itself. One strand of argument,15 of particular

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10 As Bebchuk & Ferrell (2014) have discussed, it is not necessary to accept market efficiency in order to accept the fraud on the market doctrine. See Allen Ferrell and Lucian Bebchuk, Rethinking Basic, The Business Lawyer (2014).

11 To some extent, these elements may be shown by a price change upon the issuance of the incorrect information, as well, although Dura Pharmaceuticals imposes an economic loss element that requires some ex post price decline. See Spindler, Why Shareholders Want Their CEOs to Lie More after Dura Pharmaceuticals, [ ].

12 See Basic, Inc. v. Levinson, 485 U.S. at 231.


14 There is also a significant empirical body of work on whether the U.S. system of securities regulation is effective. These empirical projects, apart from limited instances of natural experiments, have generally lacked any clean identification strategy, and have failed to resolve any of the fundamental welfarist questions pertaining to U.S. securities law. With regard to private securities litigation in particular, it is potentially impossible for observational studies to gauge the effect of deterrence. See Cox and Thomas 2010 (a survey of empirical work on securities litigation which notes that findings on deterrence are scant: “Just how much additional protection is embraced out of fear of the securities class action is at best speculative and indeterminable and, hence, beyond the empiricists’ reach.”).

15 There are two other important theoretical critiques, addressed in separate work. These are the circularity and diversification critiques.

The circularity critique holds that private securities litigation fails as a compensatory mechanism for defrauded purchasers because these purchasers stand on both sides of the
relevance to the instant paper, is the agency theory critique, which views corporate fraud as the product of managerial agency costs.

The modern agency critique holds that fraud on the market “is a product of agency costs between owners and managers.” It centers around the fact that, typically, shareholders do not manage the firm. Instead, they elect directors, who in turn appoint officers to manage the firm on their behalf. Anything that the firm does, such as misreporting, is done in actuality by the firm’s directors, managers, or other employees – not the shareholders. As to why managers would choose to intentionally misreport, agency theorists hypothesize that doing so maximizes the value of the managers’ compensation contracts in some way. According to Coffee (2006), “managers hide bad news because they fear loss of their jobs (either from a dismissal or a hostile takeover), and they overstate favorable developments or inflate earnings in order to maximize the value of their stock options and other equity compensation.”

At the same time (though it does not necessarily follow from the manager’s incentives), the agency view generally holds that the firm’s shareholders do not themselves want the firm to commit fraud. Arlen & Carney (1992) state their position as follows: “corporate agents commit Fraud on the Market... to serve their own interests... We do not believe that shareholders want agents to commit fraud.” Coffee (2006) likens the firm’s shareholders, in the aftermath of fraud, to “the victims of burglary” who are punished “for their failure to take greater precautions.”

In this vein, critics assert that private securities litigation against the firm must fail as a deterrent mechanism. Grundfest (2014), for instance, opines that private securities litigation creates only “wealth transfer[s] among... equally innocent and ignorant investors” and has “nothing to do with optimal deterrence.” An open letter from several prominent securities law professors (Langevoort et al 2007) to the SEC argued that “the current system does a bad job at deterrence because . . . settlements almost never come out of the pockets of the managers who allegedly executed the fraud.”

A prior work by the author describes these two critiques in detail, and demonstrates that they are incorrect. See James C. Spindler, We Have a Consensus on Fraud on the Market – And It’s Wrong, Harvard Business Law Review 2017

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17 Coffee (2006) at 1562.
18 See Arlen & Carney (1992) at 701.
21 Langevoort et al. (2007).
Paulson committee, concluded that “the potential deterrent function of private securities litigation is debatable because virtually all the costs . . . are ultimately borne by the shareholders. Only in [a] rare case . . . do the costs fall on individual [ ]” employees of the corporation.22 This lack of deterrent effect appears to be accepted by a “broad consensus” among current academics.23

There are, of course, a few questions about the agency theory of corporate fraud. Is it true that shareholders themselves get nothing out of misreporting, if that misreporting inflates the apparent value of their shares?24 If not, why would shareholders (or their director designees) award compensation that encourages fraud? Even in the case that shareholders do not desire fraud, would firm-level liability actually lack deterrent effect?25 Such questions have generally gone unasked in the legal academy. In what follows, this paper takes up the first of these questions – whether shareholders can benefit from fraud – and, if so, how legal liability can deter it.

II. Shareholder incentives for fraud

It has been little-appreciated that a firm’s current shareholders should, in the absence of meaningful penalties, desire price inflation of the firm’s shares. Misreporting is typically blamed on disloyal managers and failures of corporate governance – in other words, fraud is the product of agency costs.26

Yet, it is entirely reasonable to suppose that the owner of an asset generally benefits from inflated prices. Consider, by way of analogy, the owner of an antique on which an appraisal is to be performed. The owner may benefit from an apparent increase in value – whether or not based on true information – because he may, at some point, sell the antique, and he will never be the buyer (at least not on net). Of course, it may be that a potential sale falls through and the owner does not sell the object, or perhaps the owner even has no current plans to sell. The point remains that if the owner has some chance of selling in the future, and the appraisal affects the price he will receive, he then has some incentive to seek a higher appraisal value, whether by honest or dishonest means.27

The same principle applies to shareholders of a publicly-traded firm. There may be uncertainty whether any particular shareholder will sell, and when. Yet it must be true that the shareholders, as a group, will be net sellers of the firm: they own all of it, and anyone else’s purchase must come from them. This obtains whether the firm is doing the selling and issuing more shares (known as a primary sale) or the shareholders are selling their shares directly (secondary sales). It obtains even if there exist differences among the shareholders, with some more likely to sell than others

23 Bratton & Wachter [ ].
24 Arlen & Carney (1992) at least anticipate such a question. See Arlen & Carney (1992) at 701.
26 See Arlen & Carney (1992) for an influential early claim along such lines.
27 This puts aside countervailing concerns such as tax and fraud liability, of course.
(though how the differences are worked out may have important implications for what
the firm may do). Ultimately, the shareholders stand in the position of sellers, and
have the incentives that sellers do – namely, to seek a higher price.

This Section II develops that intuition. First, it is shown that homogenous
shareholders – a case that, intuitively, may seem least likely to result in fraud – have
an unequivocal incentive to commit fraud. This incentive exists in both primary and
secondary sales of securities. Heterogeneous shareholders are considered, and it is
demonstrated that price inflation is joint-welfare maximizing; the ability to negotiate
among shareholders implies that everyone can be made better off through price
inflation.

A. Shareholders have a preference for fraud

This section develops a simple economic model of a shareholder-owned firm and
demonstrates the basic result that the firm’s initial shareholders should generally
prefer price-inflating misreporting. In the model, the term “initial shareholders”
means the shareholders who hold the shares at the beginning of the game.

There are four periods of play, \( t = 1, 2, 3, 4 \). The firm has one share
outstanding, an equal fraction of which is owned by a measure 1 of initial
shareholders. All players are risk-neutral, owing to their ability to diversify.

In period 1, a signal (letting \( \eta' \) denote the signal) of the firm’s “type” (denoted as
\( \eta \)) is publicly observed. Type is either high or low quality, and determines the level of
cashflows that the firm will ultimately generate. For concreteness, let high/low type
cashflows be $1/$0 per share, respectively.\(^{28}\) The probability of the firm being of high
type is publicly known, and denoted as \( h, 0 < h < 1 \).

In period 2, trading occurs. It is assumed that each shareholder has an
identical and independent probability of selling her share in period 2, letting \( \pi \) denote
the probability of selling. This assumption of homogeneity is later relaxed, and does
not affect the results.\(^{29}\) The shares are purchased by outside investors, called
purchasers,\(^{30}\) who purchase the shares at price \( p_2 \). The price \( p_2 \) is some function of
the signal of quality; for example, if the signal is believed by the market to be credible,
then \( p_2(\eta' = 1) = 1 \).

In period 3, the firm realizes cashflows corresponding to the type \( \eta \). These
cashflows are publicly observable and verifiable, and they indicate with certainty
whether the period 1 signal was correct. A high type firm generates cashflows of $1,
and a low type firm generates cashflows of $0. Further trading may take place,
generating a market price \( p_3 \).

\(^{28}\) While it is omitted for purposes of simplicity and clarity, one could allow the firm to also
possess an asset or project of observable value \( A \), such that even a low type firm has some
value such that its shares are worth trading.

\(^{29}\) See, infra, Section II.B.

\(^{30}\) Subsequently, in Section III, potential purchasers are decomposed into informed traders and
noise traders. Such a distinction does not affect the instant analysis of shareholder incentives.
In period 4, the firm’s cashflows are distributed to the then-current holders of the firm’s shares pro rata.

We can now demonstrate that the firm’s shareholders always desire a higher report of value, as stated by the following proposition:

**Proposition (1) – Shareholders Desire Fraud:** The set of the firm’s current shareholders (the “initial” shareholders) jointly desire inflationary misreporting.

An informal proof follows.

By assumption, proportion $\pi$ of the initial shareholders will sell their shares in period 2, while proportion $1 - \pi$ will not. This means that every shareholder expects to be a net seller. Those who sell receive the market price based on the signal of quality, $p_2(\eta')$. Those who do not sell will receive the firm’s cashflows, which depend upon the firm’s type but not the signal. Thus, at time 1, each shareholder’s expected payoff ($U_i$) is:

$$(1) \quad U_i = \pi p_2(\eta') + (1 - \pi)E[\eta]$$

The first term on the right hand side is the expected payoff attributable to the likelihood of selling, while the second is the expected payoff attributable to the likelihood of retaining the share.

We can now pose the fundamental question: would the initial shareholders be made better off with a high report of value, even if the firm is of low type? The answer is yes, they would. The reason is that a higher signal of value can raise trading prices in period 2, and never lowers them, while having no effect on the non-selling shareholders.

Assume first that the signal is viewed credibly by the market. In such a case, a signal of low type ($\eta' = 0$) results in a low price ($p_2 = 0$), whereas a high signal ($\eta' = 1$) results in a high price ($p_2 = 1$). There is no other effect of the signal on the initial shareholders’ expected payoffs; thus, where the signal is credible, shareholders prefer a high report, even if the firm is of low quality.

Alternatively, suppose that the high quality signal is viewed as non-credible. Assume also that a low signal is taken as perfectly revealing of low type, so that $p_2(0) = 0$. In such a case, a low signal would result in a low price ($p_2 = 0$). In contrast, a high signal results carries no informational value, and does not affect the market’s forecast of the firm’s value ($p_2 = E[\eta]$). As before, the signal does not affect the payoffs in the event that the shareholder does not sell; hence, the inflated signal payoff is strictly higher.

Thus, the initial shareholders do better from the higher reports in each case, whether or not those higher reports are true. What drives this result is that the firm’s

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31 If this were not the case, then shareholders could simply be, at a first cut, indifferent to the choice of signal. It is a common convention to define off-the-equilibrium path behavior in signaling models.
initial shareholders are net sellers in expectation – which must, as a matter of mathematics, be true.

This is a fundamental incentive of shareholders. The model is (as yet) agnostic as to how the reports of quality originate, but the point is that these incentives should persist in general, whatever the reporting mechanism. So, one could imagine that the reports issue forth from the heavens, in which case shareholders might pray for higher reports. Or, more likely, the reports may come from a manager; in such a case, shareholders would certainly hope, and may indeed encourage, the manager to inflate her reporting. The reporting mechanism is taken up in Part III, below.

Before getting to that, Part II.B (immediately below) relaxes the assumption of homogeneous seller shareholders and shows that these inflationary incentives generalize.

B. Generalizing shareholder preferences
The result that the firm’s current shareholders prefer inflationary misreporting can be extended to additional important cases. These incentives persist even where shareholders are heterogeneous with regard to their time horizon: only some may sell in the future, while others may in fact buy. Joint welfare maximization leads to the same result as in the homogeneous shareholder case. Additionally, secondary trading (i.e., trading among shareholders) presents no fundamental difference from primary sales of securities (sales by the issuer).

1. Heterogenous initial shareholders
In the real world, investors are not homogeneous, and may hold substantially different time horizons. There exist both long-term investors (those who buy and hold with a relatively low expectation of selling in the near future) and short-term investors who move fluidly in and out of securities positions. Some investors may even expect to add to their long positions over time.

In such a world, in order to predict the firm will do, one must know which set of shareholders, if any, exerts control over the firm. However, if shareholders have the ability to agree among themselves on a course of action – that is, they can act collectively to maximize their own joint welfare – then there is, in fact, a clear result as to their collective preferences, and a corresponding prediction as to the firm behavior they prefer. Heterogeneous shareholders jointly prefer fraud, and we may expect firms to behave accordingly.

Consider the case where there are three shareholders: a short-term holder, who expects to sell; a long-term holder who will never sell; and a buyer-shareholder who expects to be a net purchaser in the future. Their payoff functions are, respectively

\[ U_S = \pi p_2(\eta) + (1 - \pi)E[\eta] \]
\[ U_H = E[\eta] \]
\[ U_B = E[\eta] + \gamma(E[\eta] - p_2(\eta)) \]

The variable \( \gamma \) in the buyer-shareholder’s payoff function is the likelihood that the buyer-shareholder will purchase an additional share in the future. So long as
outside purchasers are expected to purchase some shares of the firm, it must be the case that $\gamma < \pi$. Summing up these utilities, we obtain the joint welfare function of the firm’s initial shareholders:

$$\sum U_i = (\pi - \gamma)p_2(\eta) + (3 + \gamma - \pi)E[\eta]$$

Inspecting the first term on the right hand side of equation (4), it is apparent that the shareholders’ joint welfare is a positive function of the period 2 trading price ($p_2(\eta)$), which is itself a positive function of the signal of quality. A high signal results in higher joint welfare. This joint welfare result implies that, if shareholders have the ability to bargain among themselves and so reach a joint-welfare maximizing form of corporate governance, they will do so in a way that encourages price-inflating fraud.

Thus, in the presence of joint welfare maximization among the initial shareholders, the game is essentially unchanged from the homogeneous shareholder case. One could, in fact, rewrite equation (4) as

$$\sum U_i/3 = \pi_z p_2(\eta) + (1 - \pi_z)E[\eta]$$

where $\pi_z = (\pi - \gamma)/3$. That is, the aggregate joint welfare function of heterogeneous shareholders is of the exactly the same form as in the homogeneous shareholders case. The game is the same whether the initial shareholders are homogeneous or heterogeneous, and a game with heterogeneous shareholders may be rewritten as a game with a single representative shareholder.

Notably, the fraud incentive result is highly general: the current set of shareholders always jointly desires fraud. This suggests a clear problem: so long as the firm’s corporate governance allows the current set of shareholders to maximize their joint self-interest (which is a plausible definition of functional corporate governance), then these incentives may lead to fraud. This intuition is taken up in Section III, which shows that, indeed, fraud is the predictable equilibrium behavior.

2. Primary sales

As it turns out, initial shareholder incentives are unchanged whether it is shareholders or the firm itself that is selling shares. Where the firm sells shares, the proceeds that it receives from the purchasers redound to the benefit of the initial shareholders: those proceeds can either be distributed or used to fund additional projects (whose proceeds will ultimately be distributed). The initial shareholders do better where the proceeds are higher and/or the fraction of the firm sold is lower.

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32 This intuition leads to the question of whether we should favor one group of shareholders over another, such as long-term shareholders. To some extent, such favoritism is reflected in recent attempts at reform, such as Dodd-Frank, which privilege long-term performance-based compensation for corporate executives. However, as Fried (2015), has shown, favoring long-term shareholders can lead to inefficient outcome, where long-term shareholders destroy value in order to expropriate short-term shareholders. See Jesse Fried, *The Uneasy Case for Favoring Long-Term Shareholders*, Yale Law Journal (2015). Indeed, one could demonstrate a general result that favoring, and granting control, to one shareholder constituency leads to inefficiencies where that group can expropriate the others in a costly fashion. Such inefficiencies disappear (by construction) when shareholders can contract to a joint welfare maximizing outcome – but this leaves the fraud incentive result, as above.
More formally, consider a similar model to the above. In period 1, there is a signal of the firm’s quality. In period 2, the firm sells a variable fraction $f$ of the firm to a set of purchasers in return for a fixed payment of $K$. In period 3, cashflows are realized, and in period 4 the firm distributes cashflows pro-rata to all of its owners.

In period 4, the initial shareholder will receive the $1 - f$ share of the firm’s cashflows $\eta$ and other assets (cash of $K$). The initial shareholders’ payoffs are then:

$$U_I = (1-f)(E[\eta] + K)$$

For the purchasers to break-even in expectation, the price that they pay must satisfy the condition that the implicit price of the firm equals the expected value conditional on the report: $K/f = E[\eta|\eta']$. Substituting $K = f \cdot E[\eta|\eta']$ into the payoff function, we obtain:

$$U_I = (1-f)(E[\eta] + f \cdot E[\eta|\eta'])$$

If a low report is taken as revealing of low quality, and a high report is either taken as true or disregarded, then it must be that the firm’s implicit price is greater for a high report than for a low one ($E[\eta|1'] > E[\eta|0']$). Repeating the same analysis as in the secondary sale case above, one can again conclude that the initial shareholders prefer the high signal under either separation or pooling. Thus, fraudulent inflation of the signal is, overall, desirable from the initial shareholders’ perspective given either the separating or pooling equilibrium. What holds true in the secondary sale case holds true in the primary sale case as well. Indeed, one can note that equation (3) is a positive linear combination of the firm’s expected cashflows ($E[\eta]$) and the price of the firm as a function of the report ($E[\eta|\eta']$) – which is the same form as in the secondary sale case, in equation (1).

III. A model of equilibrium fraud behavior

The preceding discussion has focused solely on shareholder incentives. It has not considered whether shareholders’ preference for fraud translates into actual misreporting outcomes, or under what conditions such outcomes may occur. This requires some consideration of the governance structure within the firm, as well as the strategic behavior of actors within the firm and the marketplace. This section shows that in a signaling game where the firm is managed by a representative-shareholder, the equilibrium result is fraud.

One necessary assumption of this model is that the shareholders and/or the firm do not credibly commit not to undertake fraud. After all, behind the veil of ignorance, shareholders may well be better off in a world in which fraud does not

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33 It is almost a tautology to say that if one credibly commits not to undertake an act, then the resulting equilibrium does not comprise that act. In the signaling model developed below, the shareholder-representative manager (who does not have the ability to publicly and credibly pre-commit) cannot choose the equilibrium, but can only choose a best response within the equilibrium that is sustained by the actions of all the players. While the shareholders (as well as the other game participants) may be jointly better off in a hypothetical non-fraud equilibrium, the point of collective action models, such as the Prisoners’ Dilemma, is that such a desirable outcome may not be sustainable as an equilibrium.
occur. Is it plausible to assume that shareholders or their manager-designees are unable to, or in any event do not, provide such a commitment?³⁴ To address this question, Section III.A. presents a thumbnail sketch of modern corporate governance, and discusses two characteristics that make the lack of such commitment at least plausible, or even likely. First, shareholders and their director-designees retain significant discretion to punish or reward management ex post. Second, the law itself maintains some bias in favor of current shareholders that arguably makes maximization of current shareholder payoffs the norm.

Section III.B then presents a model of a firm managed by a representative-shareholder (the “representative-shareholder manager” or, simply, the “manager”). Section III.C solves the model, and shows that fraud is the unique equilibrium outcome in pure strategies.

A. Current shareholders and corporate governance

Suppose that a corporation is run by a robot. Further, suppose that the shareholders can program that robot for every possible eventuality, and then make public the code. In such a world, it would be possible to perfectly commit the firm, ex ante, to act in any desired fashion in any possible eventuality. This would, of course, include actions such as engaging in, or abstaining from, inflationary misreporting. The market could have total confidence that a firm would never misreport, even were it ex post optimal for the firm, provided that the manager-robot’s code proscribed such action.

As yet, unfortunately, this is not the state of corporate governance. Business firms are run by humans, whose algorithmic code is not observable. In particular, in the paradigmatic large corporation held by dispersed shareholders, shareholders govern the firm by electing or replacing directors, which they do at set intervals of one or more years. The directors, in turn, appoint the firm’s top executives, and determine compensation for the executives and themselves. This compensation typically includes equity-based compensation, with a mix of both long and short-term incentives. The compensation plans may be detailed and set certain fixed targets (such as achieving a specified level of stock price for equity incentives to vest), but virtually always contains some degree of discretion on the part of the board to adjust compensation and to fire, replace, or promote.³⁵ The shareholders themselves retain discretion over renewing or replacing incumbent directors.

The incentives of the firm’s directors and executives also include fiduciary duties, under which they are obligated to act in the firm’s best interests. While Delaware case law (as in Gheewalla) treats the firm as the beneficiary of the management’s fiduciary duties, much of the time this is regarded interchangeably with benefitting the firm’s shareholders: excepting insolvency, they are the residual

³⁴ Some prior work finds that even where such a commitment is possible, shareholders would not make it due to a joint production problem (e.g., stock compensation encourages both productive effort and fraud, such that even shareholders who do not desire fraud would still tolerate it in order to achieve higher production). See Goldman & Slezak (2005); James C. Spindler, Vicarious Liability for Managerial Myopia, Journal of Legal Studies, 2017.

³⁵ For instance, Apple’s executive compensation disclosures show a mix of long and short term compensation, as well as significant discretion afforded to the board of directors to award bonuses and to renew or renegotiate compensation.
claimants of the firm, and hence, according to law and economics orthodoxy, have the
proper incentives to maximize value. It is generally allowable, for instance, for a firm’s
manager to undertake risk-increasing activities, even at some loss of overall enterprise
value, since the enhanced risk generally redounds to the benefit of the firm’s equity
holders; creditors who are expropriated by such an action are typically limited to their
contractual rights. In the context of a sale of the firm, the firm’s management has the
responsibility to seek the highest price, notwithstanding the fact that such comes at the
expense of purchasers-cum-future-shareholders. If management believes that
bidder A, who offers a higher purchase price, has a worse long term plan than bidder
B, who offers a lower purchase price, prominent caselaw (such as Revlon) indicates
that management is obligated to go with bidder A. Recent reports of activist investors
suggest an enhanced focus on short-term results, and this is generally seen as legally
unobjectionable. In contrast, the converse – entrenching management so that they are
immune to such shareholder pressures – receives more scrutiny. That said,
distinctions in the law itself between long-term and short-term interests are muddied,
and one can point to other cases and contexts in which management is allowed to
ignore short term stock price in favor of long term plans or, more recently, in a belief
that short term prices are incorrect (e.g., Airgas).

What modeling assumptions can be drawn from this sketch of corporate
governance? First, the ability to pre-commit to a particular governance strategy is
limited. Executives are not pre-programmed robots, and executive compensation
contracts (themselves not very transparent) are not complete algorithms; directors and
shareholders retain discretion to reward and punish. In addition, executives and
directors alike have at least similar incentives to those of the shareholders by virtue of
their performance-based compensation: they themselves are effectively shareholders,
and while they are doubtless different from run-of-the-mill shareholders, there is no
particular reason to believe that they could not or would not engage in the sort of joint
welfare maximization exercise among heterogeneous shareholders discussed above.
Finally, the common law’s imposition of fiduciary duties arguably imposes a bias
toward the firm’s current shareholders as well.36 For these reasons, the manager of a
firm may have incentives that are roughly in line with those of the aggregate body of
shareholders, as described in equation (2) above, and also be subject to joint welfare
maximization in aggregate with those shareholders. Such is the assumption that will
follow in the model below.

B. A model of a representative shareholder-managed firm

The model builds on that presented in Part II.A above, with the addition of a
reporting mechanism and a marketplace of potential purchasers. The firm is managed
by a representative shareholder-manager, who is assumed to perfectly represent the
shareholders-in-aggregate. In period 1, the manager privately observes the firm’s type
(η), which, as before, may be high or low. The manager then makes a report of the
firm’s type (η'). The manager chooses the report to maximize his own well-being,
which, as a representative shareholder, maximizes the well-being of the shareholders
in aggregate.

36 Corporate fiduciary law does impose a duty not to engage in illegal acts, such that the agent
who violates the law may be liable to the corporation for any damages imposed. This applies to
fraud – but such liability of the agent is premised on the condition that the firm itself suffers
damages, as it would under a system of anti-fraud liability.
In period 2, trading occurs. Measure \( \pi \) of the initial shareholders experience an exogenous liquidity event, such that they face cost \( C_i \) if they fail to fully\textsuperscript{37} liquidate their shares. There are two purchasers,\textsuperscript{38} a noise trader and an informed trader, each of whom can purchase up to measure \( \pi \) of stock. Because there is potentially more demand than supply, there will be rationing if both purchasers elect to purchase; in particular, bids are randomly filled until either the bids or the allotment are exhausted. The price is assumed to be set automatically as the highest price at which the market will clear, subject to the selling shareholders’ willingness to sell and the purchasers’ willingness to purchase.

Both purchasers are rational and can observe the manager’s report, but they do not observe the firm’s type. The informed trader can privately expend cost \( C_r \) to perform research on the firm’s value; this effort represents research into the firm’s actual value. If the informed trader researches, he observes the firm’s type (\( \eta \)). The informed trader can then choose to bid at the market price or abstain from purchasing. The noise trader receives no information apart from the manager’s signal, and simply chooses either to bid at the market price or to abstain from trading, based on his break-even constraint.

In period 3, cashflows are realized and there is no longer any asymmetric information about the firm. More trading may take place, at market price \( p_3 \).

In period 4, the firm’s cashflows are distributed pro-rata to the firm’s then-current shareholders (i.e., to those initial shareholders who did not sell and the purchasers who purchased). Cashflows are equal to \( \eta \), which may be either 1 or 0.

C. The model solution: fraud in equilibrium

In this section, the model is solved by backward induction, showing that the subgame-perfect equilibrium outcome is that the firm engages in fraud and that purchasers undertake deadweight precaution costs. The solution to the model is summed up by Proposition (2):

*Proposition (2) – Fraud in equilibrium.* Absent some antifraud penalty, the unique equilibrium reporting behavior is to always report high type, whether or not it is true.

The proof of Proposition (2) comprises the rest of this Section III.C. Intuitively, however, the equilibrium outcome of fraud occurs because the ex post payoffs to the initial shareholders are always higher when the manager lies about low firm type. The worst that can happen is that the report of high type is viewed as uninformative (there is, by assumption, no liability for fraud), and thus the market prices the firm at its

\textsuperscript{37} The requirement of full liquidation to avoid liquidity costs eliminates the possibility that markets would partially clear by a non-discounted sale to only informed investors. Such an outcome does not affect the model dynamic that the risk of fraud leads to liquidity costs, but it does complicate the analysis.

\textsuperscript{38} The assumption of only one informed trader prevents the more complicated dynamic where informed traders are competing against each other, but does not affect the overall results: there would still be wasteful precaution costs undertaken in equilibrium, and an illiquidity discount to ensure that the market clears.
unconditional expected value (minus a discount to protect the uninformed traders); it is as though there was no report in the first place. The best that can happen is that the market believes the high report, and pays a high price, which unambiguously benefits the initial shareholders. In contrast, a report of low type is taken as credible, and results in a low price; from the perspective of maximizing initial shareholder payoffs, this is undesirable.

1. The purchasers’ and sellers’ trading decisions

In period 2, the purchasers have to decide whether to purchase the offered shares. In addition, the informed potential purchaser (synonymously, “informed trader”) has to decide whether to invest in research, which, while costing $C_r$, allows the informed purchaser to observe the firm’s type.

The purchasers’ participation (i.e., break-even) constraints require that either the informed trader or the noise trader is willing to purchase the entire allotment of shares. If the informed trader does not elect to research the firm’s type, then the informed trader is effectively identical to the noise trader, with his expected payoff given by the following:

$$U_n = \frac{1}{2} E[\eta | \eta'] - \frac{1}{2} p_2(\eta') \geq 0$$

If the informed trader performs research, she will purchase the share only when the firm’s type is high ($\eta = 1$). In such a case, the allotment $\pi$ of shares is purchased by either the informed or noise trader, with each taking half the shares in expectation. If the firm’s type is low ($\eta = 0$), the informed trader who researches will abstain from purchasing, and the entire allotment goes to the uninformed trader. The informed trader will research in equilibrium if the expected payoff from doing so is greater than the expected payoff from trading as a noise trader. Formally:

$$U_r = \frac{1}{2} Pr(1 | 1') (1 - p_2(1')) + \frac{1}{2} Pr(0 | 1') (0) - C_r > U_n$$

Because the noise trader expects to be rationed in expectation if the firm is of high quality, and to purchase the whole allotment where the firm is of low quality, the noise trader’s payoff in an equilibrium where the informed trader researches is lower. Specifically, letting $U_{nr}$ denote the expected payoff to the noise trader where the informed trader is expected to research, we have:

$$U_{nr} = \frac{1}{2} Pr(1 | 1') (1 - p_2(1)) + Pr(0 | 1') (0 - p_2(1))$$

In order for the market to clear, the noise trader must be willing to enter a bid for the entire allotment of shares being sold. Setting equation (7) to be greater than or equal to zero provides the requisite pricing discount for markets to clear:

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39 Following Kevin Rock’s (1986) model of winner’s curse in securities offerings, bids are randomly filled until either the bids or the allotment are exhausted. This means that the uninformed trader’s bid is in expectation only half filled (given the parameters of this model) when the shares are underpriced, and completely filled when the shares are overpriced.

40 This dynamic is essentially that of Rock’s “winner’s curse” model of illiquidity in public offerings.

41 To make the notation less cumbersome, I will henceforth write $Pr(\eta = 1 | \eta' = 1)$ as $Pr(1 | 1')$, and etc.
A final market clearing condition is that the initial shareholders with liquidity events are willing to sell at the discounted market price. This requires that the illiquidity cost be greater than or equal to the illiquidity discount:

\[ C_i \geq E[\eta] - p_2(1) \]

Thus, equations (8) and (9) determine the price (if any) at which the shares will be transacted in period 2 when informed traders are expected to perform research in equilibrium.

A couple preliminary observations and assumptions are in order. First, unless equation (6) holds – meaning that the informed investor is willing to undertake research – there is no cost (in this model, at least) arising from a misreporting equilibrium. If equation (6) is not satisfied, undertaking research (a deadweight cost) is not cost-effective for informed traders, and there is then no information asymmetry among market participants. Conversely, if equation (6) is satisfied, then either one of two things happen: the initial shareholders offer the shares at a discount and the informed traders undertake dead-weight research costs, or else the initial shareholders are unwilling to offer the shares at the requisite discount and instead endure illiquidity costs. In the analysis that follows, it is assumed that equations (6) and (9) are both satisfied, such that research is a credible threat and initial shareholders will be willing to put the shares up for sale at the market-clearing discount determined by equation (8).

2. The manager’s reporting decision

In period 1, the manager learns the firm’s type. The manager then makes a report of the firm’s type to the market. In order to solve for the manager’s optimal response, one must consider the manager’s choice under each possible state of the world (high versus low type), and depending upon whether the manager’s signal is taken as credible or non-credible (i.e., whether the equilibrium is one of separation or pooling).

High type firms

Consider the manager’s disclosure decision if the firm’s type is high (\( \eta = 1 \)). In an equilibrium where the market believes the manager’s report, it is straightforward that the representative-shareholder’s payoffs are maximized with a report of high quality (\( \eta' = 1 \)). This enables the selling shareholders to receive a high price. If the manager were to disclose low type, selling shareholders would receive the low price of \( p_2 = 0 \). Thus, the payoffs to the selling shareholders are strictly lower with a low report. The payoffs to the non-selling shareholders are unaffected by the manager’s disclosure.

In an equilibrium where the market does not believe the manager’s report, the manager’s report of high type will not be believed even if it is true. Thus, the report of
high type will result in the discounted price of equation (8).\textsuperscript{42} In contrast, were the manager to report low type, the selling shareholders would receive the low price of $p_2 = 0$. As before, the payoffs to the selling shareholders are strictly lower with a low report, and the non-selling shareholders’ payoffs are not affected by the manager’s report.\textsuperscript{43}

\textit{Low type firms}

A similar analysis obtains in the case where the manager learns that the firm’s type is low. The payoffs to the non-selling shareholders are unaffected by the disclosure, while the selling shareholders’ payoffs are strictly higher with a high report.\textsuperscript{44}

Formally, pooling is an equilibrium strategy for the manager who learns that the firm is of low quality if:

\begin{equation}
\pi p_2(1') + (1 - \eta)E[\eta] > \pi p_2(0') + (1 - \eta)E[\eta]
\end{equation}

Since the non-selling shareholder payoffs in equation (10) cancel out, as they are unaffected by the reporting decision, the pooling equilibrium condition is simply:

\begin{equation}
p_2(1') > p_2(0')
\end{equation}

\textsuperscript{42} This assumes, as above, that equations (6) and (9) are satisfied – i.e., that search is an equilibrium behavior, and that initial shareholders are still willing to sell at the discounted price. If equation (6) does not hold, then there is no liquidity discount. If equation (6) holds but equation (9) does not, then if the manager reports high, the selling shareholders will not sell, they will bear liquidity cost $C$, and then will enjoy the firm’s high cashflows of 1. They are better off in this case than if the manager were to disclose low, which would lead the shareholders to sell for 0. Hence the separating (truth-telling) equilibrium still obtains.

\textsuperscript{43} One could imagine that the well-intentioned manager might attempt to keep the initial shareholders from selling out at this price, which is too low given his private knowledge, but such actions are not part of this game. This could potentially describe other situations where the manager prevents a sale of the company at a short-term price that the manager believes is too low. In the merger and takeover context, for instance, management may have a veto over such sales, whether through the requirement that management adopt a plan of merger, or via various takeover defenses such as the poison pill. In the instant case of secondary market trading, the selling decision rests with the initial shareholders, and the model does not allow the manager to communicate his private knowledge to the firm’s initial shareholders.

\textsuperscript{44} As before, this assumes that equations (6) and (9) are satisfied. If equation (6) holds (there will be search and hence a liquidity discount) but equation (9) does not (selling shareholders are unwilling to bear the liquidity discount), then the analysis is somewhat different though a similar ultimate result obtains. In this case, the manager’s high report leads selling shareholders not to sell; selling shareholders endure liquidity cost $C$ and then receive the firm’s cashflows of zero. The selling shareholder would be made better off if the manager reported low quality; this would save them the liquidity costs. Hence, pure pooling (lying) is not an equilibrium outcome. Neither is pure separation (truth-telling), since there is no liquidity discount in a separating equilibrium, such that the selling shareholders would be made strictly better off by defection to pooling. Instead, there will obtain a mixed equilibrium in which the manager lies with probability < 1, such that the liquidity discount is small enough to allow the selling shareholders to sell. While the incidence of fraud is lower, fraud still occurs with strictly positive probability.
This is always true, given the assumption that a low report is taken as credible. Hence, a strategy of pure pooling behavior is an equilibrium.

One can also show formally that separation (truth-telling) is not an equilibrium behavior given the manager’s knowledge that the firm is of low quality. The condition for separation to be maintained is:

\[(12) \quad \pi p_2(0') + (1 - \pi)E[\eta] > \pi p_2(1') + (1 - \pi)E[\eta]\]

This reduces to:

\[(13) \quad p_2(0') > p_2(1')\]

This condition is never satisfied, and pooling is the unique pure strategy equilibrium. The share will be transacted at a liquidity discount. Noise traders will break even in expectation, while information traders will enjoy positive expected information rents. Social welfare is reduced by the amount of the research cost, \(C\).

\section*{IV. Liability can eliminate fraud incentives}

The prior section demonstrated that, absent anti-fraud liability, the unique pure strategy equilibrium is one in which the manager always misrepresents firm type when the firm type is low. Such a result is undesirable because it creates deadweight costs from illiquidity: research costs of informed traders and/or illiquidity costs of initial shareholders when markets fail to clear. This is, more or less, a form of the Prisoners’ Dilemma, in which the inability to commit not to defect leads to an inefficient outcome.

This section considers a particular means of resolving the problem: ex post liability for fraud. There are several potential targets of such liability: the manager, the firm itself, the selling shareholders, or the non-selling shareholders. Any such liability could theoretically work: indeed, provided that there exists the ability to maximize joint welfare among the various shareholders and the manager, there is no \textit{a priori} reason to believe it matters where the liability is assessed. Accordingly, the discussion in this section makes no assumptions about where the liability lies; rather, it is assumed that joint welfare maximization implies that the firm’s initial shareholders, in aggregate, bear the expected cost of any such liability. Further, in order to keep things as general as possible, the model below makes no limiting assumptions about how the liability is used once assessed: it could be used to compensate purchasers, it could be burned by the government, or anything in between.

Building on the model so far, suppose that at time \(t = 4\) liability of \(l\) is assessed against the firm’s initial shareholders if misreporting has occurred. Some fraction \(\theta\), \(0 \leq \theta \leq 1\), of that liability may be transferred to purchasers of the firm’s shares.

The solution of the model is summed up by the following proposition:
**Proposition (3) – The Existence of a Deterrent Fine.** There exists a level of fine \( l \) for misreporting that, when placed on the firm’s initial shareholders, is sufficient to make separation the unique equilibrium in pure strategies.

The formal proof is given in the Appendix. Intuitively, however, the proof requires showing that the liability inflicted on shareholders exceeds the positive effect that the liability might have on the aggregate stock purchase price. Where the liability is not used to compensate purchasers, the effect on stock price is zero, and this is trivial to show. The closest case is where the full measure of liability is transferred to purchasers: in such an instance, the increase in price would reflect the transfer \( l \) weighted by the probability of the transfer occurring, which must be less than 1 since fraud does not occur if the firm’s type is actually high. However, the firm’s manager, when making the choice of whether to misreport, knows if the firm is of low type; if it is, the liability occurs with certainty. Therefore, the expected negative impact of the fine is \( l \), while the positive effect on price is something less than \( l \). For a sufficiently high level of liability, the firm’s initial shareholders are better off not committing fraud, and therefore the manager will report truthfully.

**V. Optimal vicarious liability and compensation**

This section considers a particular fraud liability mechanism: firm-level liability (also known as “vicarious liability”). Firm-level fines are notable, in part, because they are the prevalent current mechanism of anti-fraud liability in the U.S. securities law regime; they are also relatively easy to implement, since the firm is readily identified and may be less subject to judgment-proofness problems. However, as many commentators have noted, firm-level fines have the peculiar quality, in the fraud context, of forcing defrauded purchasers to fund some portion of the liability.

This section solves for the optimal level of fine to place on the firm in order to deter misreporting. The solution is a simple function of the number of shares transacted and readily observable market prices. This section also considers the effect of compensation of defrauded purchasers. Compensation does not affect the formula for the optimal fine as a function of market prices (though it does affect what those prices are). Overall, firm level fines appear to function well as a deterrent, and the current system of private securities litigation tracks the optimal penalty.

The model proceeds as before, except with a particular liability mechanism placed on the firm ex post and a compensating transfer made to defrauded purchasers. After the realization of the firm’s cashflows and revelation of whether fraud was committed, liability of \( l \) is assessed against the firm in period 4. Because this liability is assessed against the firm after sales have been made, defrauded purchasers bear a portion of the liability. Mitigating this, we allow some fraction \( \theta \) of liability to be used to fund per-share transfers of \( t \) to the plaintiff class.

As it turns out, this model indicates that ex post liability on the firm promotes optimal deterrence:

**Proposition (4) – Optimal Vicarious Liability.** In a firm run by a representative shareholder-manager, optimal deterrence can be achieved through an ex post fine placed on the firm. The optimal fine is a function of observable market
metrics, in particular the number of shares sold multiplied by the decline in stock price upon the revelation of the fraud: \( l = \pi(p_2 - p_3) \).

The proof is provided in the Appendix, while an intuitive version of the proof is presented here which gets across the main points. The manager’s reporting decision takes into account the overall welfare of the initial shareholders, fraction \( \pi \) of whom sell out and receive the market price \( p_2 \), and fraction \( 1 - \pi \) of whom do not sell and incur liability if the report is inflated. If the manager observes a low signal of value, she must decide whether the increase in the selling shareholders receive in terms of market price \( (p_2(1) - p_2(0)) \) is greater than the liability that the non-selling shareholders endure when the fraud is discovered \( (l) \). This provides a formulation for the optimal liability level in terms of period 2 price inflation. While the hypothetical, uninflated period 2 price of the firm is not observable \( (p_2(0)) \), the period 3 price is a function of the uninflated period 2 price and the impending liability \( (p_2(0) - l = p_3) \). This allows the liability to be expressed in terms of observable market metrics, as in the proposition.

Even though the selling shareholders escape liability, the non-selling shareholders do not, and the manager’s desire to maximize the aggregate welfare of the initial shareholders requires her to balance the gains of the sellers against the losses of the non-sellers. The fact that purchasers bear a fraction of the liability does not frustrate the deterrent effect of the fine: all that matters is that some of the fine is borne by the initial shareholders. So long as this is the case, a sufficiently high level of fine will deter misreporting.

One attractive aspect of this form of liability is that the optimal penalty is easy to determine and implement. All that a court must do is count the number of shares transacted, and then multiply this by the drop in price upon the revelation of the fraud. The resulting dollar amount is assessed against the firm, without regard to who its current owners are. This measure is sufficient to internalize upon the firm the gains from fraud.

**A. To compensate or not to compensate**

Compensation has no effect on the optimal deterrent formula. From full compensation to zero compensation, the formula, in terms of market prices, remains the same. Deterrence is thus separable from compensation. Even if it were true that private securities litigation fails to compensate, with the proceeds entirely instead siphoned off by class action lawyers, it would not undermine the deterrence function or affect the way in which it is optimally implemented.

That said, compensation has some salutary effects in terms of both administrative efficiency and liquidity.

First, compensation makes administration of the antifraud rule arguably easier, since it removes the requirement that the court determine the number of shares sold. Because the aggregate transfer must equal the aggregate liability \( (\pi t = l) \), the optimal liability (given in Proposition [4]) may be rewritten in terms of the transfer to each plaintiff share:

\[
(33) \quad t = p_2(1) - p_3(0)
\]
Thus, with full compensation, all the court needs to do is to award each defrauded purchaser \( t \) per share. In contrast, with no compensation, there are no plaintiff claims, and the court or regulator would have to look to measures of share turnover in order to properly calculate liability.\(^{45}\)

Second, compensation can improve the liquidity of the market in the event that there is less than full deterrence. Suppose that deterrence of fraud is incomplete; perhaps there is accidental misreporting that occurs, or that fraud sometimes goes unpunished (i.e., type 2 error). In such a case, purchasers still face price uncertainty, which gives rise to incentives to invest in research on the part of informed traders. This, in turn, creates the risk of expropriation of the noise traders, which implies that there will either be a discount below actuarially fair value, or else a risk of markets failing to clear. Either way, resources are wasted on research and/or illiquidity costs are incurred.

Compensation can remedy such problems. Because they will receive some transfer \( t \) in the event of a fraudulent report, noise traders will bid at a higher price in period 2. Or, in other words, they require a lower discount in order to be induced to trade. This is apparent from the fact that the second period trading price \( p_2 \) is positive in the level of compensating transfer \( \theta \), as shown in equation (23.1).\(^{46}\) The increase in price may be beneficial through one of two channels. The first channel is that a price increase may induce informed traders to refrain from research, since the gains from research decline as the purchase price increases. This is apparent from a comparison of the informed payoffs (in which the informed traders opportunistically abstain from purchase when the firm is of low type, but expend research costs), versus the payoff when everyone is uniformly uninformed.

\[
U_r = \frac{1}{2} Pr(1|1')(1 - p_2(1')) + \frac{1}{2} Pr(0|1') * 0 - C_r + U_n = 0
\]

As \( p_2(1') \) rises, eventually the informed trader does better refraining from research, and instead acting as a noise trader.

The second channel through which a higher price improves outcomes is through the effect on the selling shareholders’ liquidity costs. The selling shareholder will hold the share, and incur illiquidity costs of \( C_l \) where the discount is greater than the liquidity costs: formally, from equation (9), if the following is true: \( E[\eta] - p_2(1') > C_l \). These illiquidity costs are deadweight losses. Increasing the trading price can push the selling shareholder past the threshold at which she prefers to sell her share.

**B. Does it matter who bears ex post liability?**

Given concerns over the bad behavior of corporate executives, it is reasonable to inquire whether it is feasible or preferable to impose fines on executives instead. As it turns out, fines on the manager are both theoretically coherent and administratively feasible: neither the basic formulation of the optimal fine, nor ease with which it is administered, are substantially altered. This itself, however, leads to a substantial

\(^{45}\) Share turnover is an imperfect metric if shares are sold and repurchased during the effective period of the fraud by the same shareholder.

\(^{46}\) See Appendix.
practical problem: because the requisite magnitude of the manager-based fine is approximately the same as the magnitude of the firm-level fine, the manager is likely to be judgment-proof.

The analysis that follows assumes that liability is placed upon the manager, but it could equally as well apply to liability placed on other parties, such as insurers, auditors, or a particular shareholder, with whom the firm has the ability to engage in ex ante joint welfare maximization regarding reporting.

Supposing that the manager faced a potential fine for committing fraud – an act that, as shown above, is generally beneficial to the shareholders, absent liability – it would stand to reason that the firm and the manager would engage in joint-welfare maximizing contracting. The simplest form of doing so is that the firm would agree to indemnify the manager for the liability, if and when it is incurred. This results in exactly the same game as described above: the firm is the one that actually pays the fine, since it holds the manager harmless, and everything proceeds as before.

Things are more complicated once we consider attempts by rulemakers to prevent the firm from bearing such a fine: for instance, the SEC limits the ability of firms to indemnify executives, and fiduciary law does not generally allow the disclaimer of agent liability for matters such as committing fraud. If ex post indemnification is prohibited, then the firm and manager may shift to ex ante compensation, in which the manager receives an up-front payment of $w$ in return for promising to manage the firm in the initial shareholders’ best interests. The basic contour of such compensation $w$ is that it makes the manager as well off, in expectation, as she would be absent the liability burden. Assuming risk-neutrality of the manager, this implies $w = \Pr(l) l$. Aggregating the welfare of the firm’s shareholders and the manager, the wage $w$ cancels out, yielding the following objective function:

\[
\text{Max}_{\eta'} \ pi_2(\eta', l, t, \theta) + (1 - \pi)E[\eta] - l \theta l
\]

The variable $I_l$ is an indicator variable equal to 1 if the manager falsely misreports high type. The form of equation (35) is different from the objective function (23.2) in the vicarious liability analysis: where the firm directly bears liability, $\pi$ shareholders escape liability, which is borne instead by the defrauded purchasers. Rearranging (35) yields the optimal liability condition, which is

\[
l = \pi(p_2(1') - p_2(0'))
\]

Because $p_2(0')$ – the price of the firm at time 2 had the manager disclosed correctly – is not directly observable, we must instead rely on the time 3 price, $p_3$, which is. The firm does not bear the liability, hence the realization of liability does not affect time 3 price; hence $p_3(0) = p_2(0)$. The optimal liability is thus expressed in terms of market prices and trading volume as:

\[
l = \pi(p_2(1') - p_3(0))
\]

47 This assumption is certainly not true, but it simplifies the analysis.

48 See Appendix.
Under a scheme of complete ($\theta = 1$) compensation, the appropriate per-share transfer is:

\[(38) \quad t = p_3(1') - p_3(0)\]

There are a few notable aspects to this solution. First, it is the same, in terms of market prices, as the solution for firm-level liability (the price levels, however, are different). It is as easy to implement as firm-level liability, and presumably sits well within the competence of courts to administer. Though the model here contemplates a fine situated upon the manager, such a scheme of liability works when targeting any actor who engages in ex ante joint welfare maximization with the firm and its shareholders.

However, other practical problems do affect the choice of target. For one, the fact that the magnitude of the optimal fine on the manager is roughly the same as the optimal fine on the firm raises problems of judgment-proofness. As with firm-level fines, the level of fine must internalize the gains to the firm from misreporting; the manager, however, is unlikely to have resources to pay a fine that is premised on firm-wide gains. That is, where it may be that millions of shares are changing hands at significantly inflated prices, a fine based on such a measure will often be beyond the manager’s solvency. Where judgment-proofness truncates the fine, deterrence and compensation are no longer possible.

All that said, to the extent that reformers desire to place the burden of antifraud liability on actors other than the firm itself, the model here demonstrates that the optimal penalty, in terms of market metrics, does not change. This suggests that whatever shape future reforms take, the penalties imposed will have to follow the same basic formula to maintain deterrence.

VI. Conclusion

This article has shown that a firm’s shareholders, as a general proposition, have incentives to favor price-inflating misreporting. If such incentives are not countered through some offsetting penalty such as liability, then the expected equilibrium behavior is for firms to engage in fraud. An optimal penalty mechanism is derived, and the optimal fine is a simple, administratively-feasible formula based on readily observable market metrics. Further, the optimal penalty level tracks the measure of damages in real-world private securities litigation, which suggests that private securities litigation may be approximately optimal from a deterrence perspective.

Compensation does not affect the deterrence function, though compensation does have an impact on actual market prices and the strategic decision-making of market participants. Compensation lowers the risk of expropriation that noise traders face, raising prices. This lowers the returns to informed trading and the incentives of informed traders to undertake deadweight research costs. It also lessens the likelihood that markets fail to clear and thereby lowers illiquidity costs.

From a theoretical perspective, it does not matter on which of the firm’s initial stakeholders (including the manager) the liability is placed ex post, so long as the initial stakeholders have the ability to engage in joint welfare-maximizing behavior.
The converse of this, however, is that, regardless of who bears the liability, the requisite deterrent penalty is always of the same approximate magnitude. Because this magnitude is large (it must take into account the firm-wide gains to shareholders from price inflation), there are practical reasons, such as judgment-proofness, to believe that imposing such large penalties on individual managers is impractical or infeasible.

There are several practical implications of these results. The chief among them is that corporate fraud may be a more pernicious problem than the prevailing agency theory suggests. In the agency theory of corporate fraud, managers misreport in order to benefit themselves; thus, relatively small adjustments to the compensation contract, such as those administered through regulatory penalties, are required in order to counteract fraud incentives. In contrast, under the theory presented in the instant article, fraud derives from shareholder incentives, and the potential gains from fraud are on the order of the firm’s market capitalization. Penalties must be large, and this may limit the effectiveness of certain punishment mechanisms, such as individual liability for corporate executives.

Second, there are potentially negative effects of corporate governance reforms that empower shareholders. To the extent that agency costs exist (for example, suppose corporate managers simply do not care about shareholders, and rather prefer a comfortable and predictable corporate existence), resolution of those agency costs may result in more fraud and/or lower social welfare. A shareholder-run capital market, without proper deterrence mechanisms, would be neither fraud-free nor welfare-maximizing. More work is needed to integrate the roles of firm corporate governance and firm reporting. To the extent there are limits on the ability to contract between shareholders and managers, what are those limits, and what do those imperfect but second-best optimal contracts portend for reporting incentives? Economic models can help answer such questions, though unfortunately the securities law literature tends to eschew formal economic analysis.

Finally, the theory presented here tends to support the status quo system of private securities litigation. In particular, status quo penalties appear to be approximately correct for purposes of fraud deterrence. The principle of compensation, in which plaintiff purchasers recover the liability as a transfer, also has ameliorative, welfare-improving effects in the event of less than complete deterrence. Calls to restrict or abandon our current system of private securities litigation may be premature.

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VII. Appendix – Proofs

A. Proof of Proposition (3) – The Existence of a Deterrent Fine

The proof consists of showing that liability will eliminate a pooling equilibrium and sustain a separating equilibrium.

1. Pooling

Suppose the representative shareholder-manager observes that the firm is of low quality and that the manager knows that a pooling equilibrium exists (i.e., her report of high quality will be disregarded). Equation (10) above indicated that the representative shareholder-manager will falsely report if the net payoff from doing so (on the left hand side) exceeds the payoff from reporting truthfully (the right hand side):

\[ \pi_p (1') + (1 - \eta)E[\eta] > \pi_p (0') + (1 - \eta)E[\eta] \]

Suppose further that if fraud occurs, the firm (or any subset of its initial shareholders) is fined amount \( l \) in period 3. Writing the per-share and total fine as \( l \) (recalling that there is measure 1 of shares outstanding) and assuming that the fine is assessed only when the manager falsely reports high type, the manager’s fraudulent reporting condition becomes the following:

\[ \pi_p (1', l) + (1 - \eta)E[\eta] - E[l] > \pi_p (0') + (1 - \eta)E[\eta] \]

Equation (14) shows that the fine enters into the manager’s calculus in two ways. First, the fine is borne by the firm’s initial shareholders in aggregate (the third term on the left hand side). Second, the expectation of a fine affects the period 2 price that will be paid by the traders where the manager reports high type (in the low type report). This effect is not known without putting more structure on the fine: if the fine is simply absorbed by the government or otherwise wasted, the effect on price is presumably at best zero or even negative;\(^50\) on the other hand, if the fine is used to recompense defrauded purchasers, then the effect on price may be positive.

If an increase in the fine always decreases the left-hand side relative to the right-hand side of equation (14), and such decrease does not go to zero, then it must be the case that there exists some sufficiently high level of \( l \) such that equation (14) is not satisfied (i.e., in which the manager will no longer engage in a pure pooling strategy). Taking the derivative of equation (14) with respect to the level of fine \( l \), the left-hand side is \( \pi_p (1')/dl - 1 \), while the derivative of the right-hand side is zero. Thus, if the left-hand side derivative is less than zero, and does not go to zero in the limit, then a fine eliminates the pure pooling equilibrium. Rearranging marginal utility to the representative shareholder for an increase in fines:

\(^50\) This would be the case if the fine were placed on the firm after the fraud were discovered, and no part of the fine used to compensated purchasers.
So long as equation (15) is always sufficiently negative, then it must be the case that a sufficiently high fine will eliminate pooling as an equilibrium outcome. Does this condition hold? Yes, it does, so long as the total compensation paid to the defrauded purchasers is less than or equal to the total liability assessed against the firm. The purchasers receive a transfer of $t$ per share; the aggregate transfer is therefore $\pi t$. Additionally, to fund the transfer, $1 - \pi$ non-selling shareholders bear a fine of $l$. If the entire aggregate fine is used to fund the aggregate transfer to the purchasers, this implies the following equivalence:

\begin{equation}
\pi t = l
\end{equation}

Denote the likelihood of the purchaser receiving the transfer $\Pr(l)$. In such a case, her expected payoff from the fine/transfer mechanism is $\Pr(l)t$. Substituting in from (16), we can rewrite this net payoff from the fine/transfer ($\Delta U_{nt}(l)$) as:

\begin{equation}
\Delta U_{nt}(l) = \Pr(l)l/\pi
\end{equation}

Equation (17) represents the component of price $p_2$ that derives from the level of fine. Taking the derivative with respect to $l$ then yields:

\begin{equation}
dp_2/dl = \Pr(l)/\pi
\end{equation}

Plugging this into equation (15) shows that the condition for sufficiency of vicarious fine requires:

\begin{equation}
dU_i/dl = \pi dp_2/dl - 1
\end{equation}

Thus, from (19), the initial shareholders’ marginal expected utility of the fine is strictly negative and linear in the level of fine. This means that a sufficiently high fine on the firm can eliminate the pooling equilibrium.

**2. Separation**

A similar argument demonstrates that a vicarious fine of sufficiently high magnitude can maintain separation. Returning to the separation condition under the existence of a fine (a modified version of equation (12)), for the manager to be willing to tell the truth about low quality, the expected payoff from truth-telling (the left-hand side) must be greater than a defection out of equilibrium to lying (the right-hand side):

\begin{equation}
\pi p_2(0') + (1 - \pi)E[\eta] > \pi p_2(1',l) + (1 - \pi)(E[\eta] - l)
\end{equation}

The imposition of the fine has no effect on the truth-telling payoff (the fine is never assessed given a low report), but it is assessed for a high report, and it may increase the price paid in period 2 given a high report. The marginal return to the initial shareholders from an increasing fine where the manager falsely reports high is given by:

\begin{equation}
dU_i/dl = \pi dp_2/dl - 1
\end{equation}
While equation (21) is identical to equation (15) in the pooling case, the effect of the fine upon price is different because the defection represents out-of-equilibrium behavior – i.e., the purchasers are not expecting it. Therefore, the marginal effect upon price is zero, and the initial shareholders’ marginal return to the fine is simply \( \frac{dU_i}{dl} = -1 \). This is linear and strictly negative, which implies that a sufficiently high fine can maintain the separating equilibrium. ■

**B. Proof of Proposition (4) – Optimal Vicarious Liability**

The proof proceeds by backward induction. First, the decisions of the market purchasers are considered, and the market-clearing price is derived. Then the manager’s decision under separating and pooling equilibria are solved.

1. **The market pricing decision**

The aggregate transfer is \( \pi t \) (since \( \pi \) shares will be transacted, with a transfer of \( t \) per share), which implies the following equivalence:

\[
\pi t = \theta l
\]

In a separating equilibrium, the fine is never assessed, the transfer is never paid, and therefore the price is not affected. The period 2 price thus takes the manager’s disclosure as credible: \( p_2(1) = 1 \). In a pooling equilibrium, the manager always lies if the firm is of low type, the fine is assessed with probability \( Pr(0 \mid 1') = 1 - h \), and the effect on price is determined by the noise trader’s break-even constraint:

\[
U_{nt} = \frac{1}{2} Pr(1 \mid 1')(1 - p_2(1)) + Pr(0 \mid 1')(t - l - p_2(1)) = 0
\]

(Note that it must be that \( t - l - p_2(1) \leq 0 \). If it were not, the noise trader would do better than break even, and the informed trader would never research and instead employ the noise trader strategy of always bidding on the offered shares.)

The price determined by equation (23) will thus be a function of the transfer and liability scheme in place. Rearranging and substituting for \( t \) provides the following statement of the period 2 market price:

\[
p_2(1') = \frac{Pr(1 \mid 1') + 2Pr(0 \mid 1')(\theta - \pi)l}{Pr(1 \mid 1') + 2Pr(0 \mid 1')}
\]

With this pricing behavior in mind, the representative shareholder-manager’s problem is to choose the report \( \eta' \) in order to maximize aggregate shareholder payoffs:

\[
\text{Max}_{\eta'} \pi p_2(\eta) + (1 - \pi)(E[\eta] - I_l * l)
\]

The term \( I_l \) is an indicator variable equal to 1 if the manager falsely reports that the firm is of high type.
2. The Manager’s choice under separation

When the manager decides whether to defect from a separating equilibrium, there is no effect of the transfer/liability mechanism on period 2 price since the market is expecting only truth-telling, and does not value the existence of an insurance policy for fraud. The period 2 prices are thus \( p_2(0'), l, t) = p_2(0), p_2(1', l, t) = p_2(1). \) From equation (23.2), the manager’s condition for refraining from defection is then:

\[
\pi p_2(0) + (1 - \pi)E[\eta = 0] \geq \pi p_2(1) + (1 - \pi)(E[\eta = 0] - \ell)
\]

Rearranging terms, we find the expression for the requisite fine in terms of market prices:

\[
l \geq (p_2(1) - p_2(0)) \pi / (1 - \pi)
\]

This is therefore the requisite level of liability required to maintain a separating equilibrium. Is the fine administratively feasible? It presents some difficulties since, while \( p_2(1) \) is observable from the trading market, \( p_2(0) \) (the correct price of the firm, had the manager not defected) is not. However, the observable, post-revelation-of fraud-trading price in period 3 (\( p_3 \)) is a function of both the period 2 correct value and the expected liability to be levied upon the firm. Specifically,

\[
p_3(0) = p_2(0) - l
\]

Substituting equation (26) into (25) and rearranging yields the following expression for the requisite liability.

\[
l \geq \pi(p_2(1) - p_3(0))
\]

These market prices are readily observable. A court or regulator must still determine the net number of shares sold by the initial shareholders during the effective period of the fraud (\( \pi \)).

3. The manager’s choice under pooling

Under a pooling equilibrium, the market discounts the manager’s high report. In addition, the shares will trade at a discount relative to unconditional expected value in order to induce noise traders to bear the risk of expropriation by the informed traders (as described above in equations (5) through (8)). Under an antifraud liability regime with a fine of \( l \), transfer of \( t \), and aggregate transfer of \( \pi t = \theta l \), we can write the manager’s problem of whether to defect from the pooling equilibrium as:

\[
\pi p_2(1', l, t, \theta) + (1 - \pi)(E[\eta] - \ell) \leq \pi p_2(0') + (1 - \pi)E[\eta]
\]

If the inequality is satisfied, the manager would choose to report truthfully.

The manager’s decision is subject to the purchasers’ pricing constraint. In the case that informed traders undertake research, pricing constraint is:
(30) \[ U_n = \frac{1}{2} Pr(1 \mid 1')(1 - p_2(1')) + Pr(0 \mid 1')(t - l - p_2(1')) = 0 \]

Rearranging equation (29), the requisite liability level to allow pooling (in terms of market prices) is the same as under separation:

(31) \[ l \geq (p_2(1', l, t, \theta) - p_2(0')) \times \pi / (1 - \pi) \]

As in the separation case, the unobservable correct price, had the manager told the truth (\( p_2(0') \)) may be rewritten in terms of the market price after the fraud is revealed (\( p_3 \)):

(32) \[ l \geq \pi(p_2(1', l, t, \theta) - p_3(0,l)) \]

Equation (32) presents the requisite liability for eliminating pooling as an equilibrium. Notably, the requisite liability \( l \) is the same, in terms of market prices, as in the separating case. (Note, however, that the prices themselves will generally be different in the separating in the pooling cases.) While the \( p_2 \) and \( p_3 \) terms are themselves functions of the level of liability and transfer, it is directly observable in the form of the market price. This result is independent of the fraction \( \theta \) of the fine \( l \) that is used to fund transfers \( t \) to defrauded purchasers – that is, the requisite liability for fraud deterrence is given by the same simple formula involving observable market prices, without regard to the level of compensation paid to purchasers. ■