Vicarious Liability for Managerial Myopia

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ABSTRACT

This paper shows that fines on the firm (vicarious liability) can optimally deter misreporting by the firm's manager. In a principal-agent model, shareholders choose whether to award equity compensation to a myopic (short-termist) manager. Equity induces effort and misreporting. The wedge between managerial and shareholders' time horizons provides a measure of agency costs; more-myopic managers tend to misreport more, which increases expected fines. In equilibrium, large decreases in agency costs lead to more equity grants and more misreporting and are consistent with greater shareholder welfare. Social effects are, however, ambiguous given misreporting externalities. Counterintuitively, decreases in agency costs may decrease social welfare if vicarious fines are set too low: shareholders will award equity and induce misreporting even when not justified by the accompanying economic production. The proper level of vicarious fines results in a second-best optimum where shareholders award equity if, and only if, the social gains exceed the cost.

1. INTRODUCTION

There is substantial debate regarding how to optimally deter corporate misreporting. While it is well settled under US law that firms are liable for the fraudulent reporting of their managers (so-called vicarious liability), the past 2 decades have witnessed escalating criticism of the US system. An important line of literature, beginning with Arlen and Carney (1992), contends that, in the presence of agency costs, vicarious liability is inef-

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fective. Managers who falsely inflate firms' results and share price do so to benefit themselves (in the short term, at least) by inflating the value of their incentive compensation and avoiding discipline for poor results; such managers, with their short-term incentives, may not be dissuaded by firm-level punishments that arise after the misreporting is discovered (Coffee 2006). These criticisms of vicarious liability have been influential and have buttressed calls to curtail private securities litigation in some way—and to rely instead on alternatives such as public enforcement, enhanced penalties on managers, or command-and-control regulation. In recent years, corporate defendants, emboldened by substantial academic and political support, have mounted legal challenges to the very existence of private securities class actions, albeit unsuccessfully so far.[1]

The primary contribution of this paper is to show that vicarious liability can provide at least second-best optimal deterrence of misreporting, despite the existence of managerial agency costs. This paper follows the lead of Arlen and Carney (1992) and models agency costs as a manager's relatively short time horizon, which renders him less sensitive to firm-level fines than the shareholder since fines are imposed only later, when the fraud is discovered. The payment of equity compensation, while it induces the manager to exert effort, also tends to cause him to misreport, which boosts the myopic manager's short-term payoffs. Shareholders can eliminate misreporting but at the cost of reducing managerial effort and productivity.

In such a setting, where misreporting carries with it externalities (such as loss of market confidence, illiquidity, capital misallocation, or systemic risk), vicarious penalties can induce at least the second-best optimum. By setting the fine at a simple function of the externality level and share turnover, the regulator can induce shareholders to award equity compensation if, and only if, it is socially efficient to do so. This result contrasts with prior literature, which posits that vicarious liability is ineffective in a setting with agency costs.

Second, a corollary, but counterintuitive, result is that if vicarious fines are not set at the appropriate level, decreases in agency costs may lead to lower levels of social welfare. Alignment of managers' and shareholders' incentives can induce shareholders to award equity compensation where they had not before. This leads to economic production but also increased misreporting, along with its consequent externality. Ab-

1. *Erica P. John Fund v. Halliburton* (573 U.S. [2014]) directly challenged the fraud-on-the-market cause of action, in part on the basis of policy critiques of vicarious liability.

sent a proper level of vicarious fine, shareholders may choose to award too much equity, which causes excess misreporting and lowers social welfare levels. Thus, it would be incorrect to infer that, because managers are abusing shareholders by misreporting, vicarious penalties ought to be lowered. To do so may benefit shareholders but may also result in too much misreporting and lower levels of social welfare.

Third, this paper shows that misreporting is consistent with shareholders' control over executive compensation. This contrasts with the managerial power thesis (see, for example, Bebchuk and Fried 2010), which holds that fraud-inducing compensation is often the result of managerial power over pay. Rather, in the model presented here, large declines in agency costs lead to more equity pay and more misreporting.

A final result is that elimination of misreporting is not an advisable goal in and of itself. Elimination of all misreporting can theoretically be done with vicarious fines but likely at the cost of eliminating useful effort and economic production. Instead, the goal ought to be the internalization of misreporting externalities onto the firm.

The paper proceeds as follows. Section 2 reviews prior literature and expands on the motivation for this paper. Section 3 presents the formal model, styled as a one-shot game among strategic players: shareholders, the manager, and purchasers. Section 4 presents a solution in the form of each player's optimal strategies at each stage of the game. Section 5 discusses the solution and presents the results of the paper. Section 6 concludes. The model's proofs are presented in the Appendix.

2. MOTIVATION AND PRIOR LITERATURE

Vicarious liability for misreporting is one of the defining characteristics of US capital markets. Under federal securities law, individual investors' claims for fraud are readily aggregated into class action lawsuits against the misreporting firm. Such lawsuits, commonly known as fraud-on-the-market class actions, constitute more than 40 percent of federal class action lawsuits filed (Committee on Capital Markets Regulation 2006). Approximately one in 10 public companies will face a class action lawsuit over the course of a 5-year period (Committee on Capital Markets Regulation 2006). While potential penalties for management do exist in the securities class action, it is generally more difficult to obtain recoveries from managers and other individuals or entities involved in the misreporting, for a host of practical and legal reasons (Schwarcz 2015). Pri-

vate securities litigation—against the firm—is the centerpiece of the US federal antifraud regime.

Notwithstanding this, or perhaps because of it, there is substantial skepticism regarding the efficacy of securities class actions, and particularly the remedy of vicarious liability. One important theoretical critique focuses on the role of agency costs in fraud.[2] This line of literature, which began with Arlen and Carney (1992), argues that vicarious liability will not function effectively when managers misreport for personal gain. Arlen and Carney (1992) note that, empirically, managers tend to inflate, rather than deflate, the firm's apparent value and model this misreporting as arising out of a final-period problem. In their view, as well as that of subsequent commentators such as Coffee (2006), managers of poorly performing firms seek to preserve their jobs and increase the value of their stockholdings by misreporting. This supposes a significant divergence in time horizon between managers and shareholders, with managers much more concerned about the short term.

This line of literature has been influential. Subsequent work asserts, for instance, that private litigation lacks deterrent effects, while "threaten[ing] executives with jail" does not (Grundfest 2007, p. A15). Private litigation leads to "wealth transfer[s] among . . . equally innocent and ignorant investors" and has "nothing to do with . . . optimal deterrence" (Grundfest 2014, p. 313). Similarly, "class-based compensatory damages in the securities context are analytically incoherent [because t]he defendant does not internalize the benefits of the [misreporting] activity" (Alexander 1996, p. 1489). The managerial power hypothesis asserts that the agency problem extends to executive compensation: powerful managers may set their own compensation and may choose compensation that they can readily inflate by misreporting (Bebchuk and Fried 2010); in such a case, punishing shareholders for managerial overreaching would lack both efficacy and fairness.

2. There are two other prominent theoretical criticisms of private securities litigation. These are the claims that vicarious liability fails to compensate victims of fraud since shareholders are effectively suing themselves (so-called circularity or pocket-shifting arguments) (Coffee 2006; Committee on Capital Markets Regulation 2006) and that "aggregate risk created by aftermarket fraud [is] diversifiable" and "averages to zero" (Grundfest 2014, pp. 313–14), so that misreporting does not, therefore, harm investors (the diversification critique). Prior work (Spindler 2011, forthcoming) addresses the diversification and circularity critiques and finds them theoretically flawed. There do exist other critiques of private securities litigation, such as those involving conflicts of interest between plaintiffs' lawyers and clients, the expense of litigation, and the meritlessness of litigation. However, such criticisms are largely empirical in nature and/or not specific to fraud on the market.

These criticisms suggest significant and far-reaching reforms of US securities regulation. Proposals include caps on or elimination of the vicarious liability scheme (Langevoort 1996), increased expected penalties for managers (Grundfest 2007), greater reliance on public enforcement via the Securities and Exchange Commission and state and federal prosecutors (Jackson and Roe 2009), allowing shareholders and firms to opt into mandatory arbitration (Committee on Capital Markets Regulation 2006), and substantive regulation of managerial incentives and corporate governance, such as mandating long-term compensation, increasing disclosure, and greater shareholder control (Bebchuk 2006; Bolton, Scheinkman, and Xiong 2006; Bebchuk and Fried 2010; Bhagat and Romano 2009).

The present paper is, in part, a response to these criticisms. First, this paper shows that vicarious liability can efficiently constrain misreporting externalities: shareholders respond to vicarious liability by adjusting the compensation contract accordingly. This result is in line with some prior work that claims that vicarious liability for managerial fraud is appropriate as a form of sanction for poor corporate governance. Mitchell (2009) views shareholders as culpable, to some extent, for creating a permissive atmosphere with regard to managerial malfeasance. Spindler (2011) shows that fraud can arise from shareholders' incentives, modeling a firm in which the manager perfectly represents shareholders' interests and commits fraud to further the interests of the firm's current shareholders (at the expense of future shareholders). In contrast, the present paper shows that, even when shareholders do not desire fraud per se, they may still choose to have it occur because of the joint effort and misreporting problem. In this context, vicarious liability can ensure a second-best outcome.

Second, the results presented here suggest that misreporting is consistent with shareholders' control of the compensation contract, in contrast to the managerial power hypothesis of Bebchuk and Fried (2010). Shareholders will optimally choose to award equity and induce fraud when the resulting economic production is great enough. As it turns out, increased misreporting accompanies large decreases in the agency cost wedge and will also accompany increases in economic productivity, as shareholders choose to award more equity-based compensation. These results are similar to certain others in the finance and accounting literature. Goldman and Slezak (2006) find that resolution of agency conflicts (modeled as increasing personal fines on the manager for malfeasance and im-

proved monitoring technologies) can lead to more fraud and higher levels of shareholder welfare. Similarly, Caskey and Laux (2013) find that a greater ability to manipulate accounting standards leads to a lower optimal level of accounting conservatism. Desai and Dharmapala (2006) find an analogous result with regard to agency costs and corporate tax avoidance.

However, the social welfare effects of lower agency costs are unclear in the presence of misreporting externalities. If there is a large decline in agency costs, shareholders' welfare levels would be higher, rates of misreporting would be higher, and the consequent externalities would also be higher. Social welfare levels could, in fact, decrease. However, with a properly set level of vicarious fines, decreases in agency costs are welfare improving. So, for instance, if Dodd-Frank Act reforms (which include clawbacks, enhanced compensation disclosure, shareholders' say on pay, and mandatory long-term compensation practices) succeed in making managers' time horizons more long term (and therefore more in line with shareholders' horizons), a greater incidence of misreporting and lower social welfare levels may be observed—unless vicarious fines are set at the right level.

Finally, while this paper demonstrates that vicarious liability can result in a second-best optimum (in contrast to legal literature claiming that vicarious sanctions have no deterrent effect), it does not directly address the question of whether a first-best outcome can be had by imposing sanctions directly on the manager. While the optimal balance of managers' and vicarious sanctions is an inquiry left for future work, a line of literature beginning with Kornhauser (1982), Sykes (1984), Easterbrook and Fischel (1985), and Shavell (1987) suggests that agent liability is often of limited efficacy for reasons including risk aversion, judgment-proof status, judicial error, and, not least of all, the competence of the regulator to implement penalties that must take into account complex characteristics of agents, including endogenously determined compensation (which may include indemnification or insurance). So, for instance, in the area of corporate tax evasion, Crocker and Slemrod (2005) propose agent liability as a first-best solution in a context where agents are risk neutral and of unlimited means, while Chen and Chu (2005) find agent liability to result in efficiency losses with risk-averse agents. If a first-best solution of agent liability is not feasible, vicarious liability can ensure a second-best outcome (and, as shareholder-manager contracting approaches completeness, this second best approaches first best).

3. THE MODEL

This section presents a formal model of a reporting firm. There are three aspects of delegated agency in this model. First, the manager's effort, which positively impacts the expected value of the firm, is not observable or verifiable. Second, the manager privately observes the firm's value and may choose to misreport that value to the market. Third, to the extent that the manager owns shares of the firm, he may have shorter-term interests with regard to the stock price than do shareholders; this is modeled as a higher likelihood of selling out but could also encompass a more fundamentally short-term outlook. The assumption of managerial myopia is common in the literature on securities fraud: it is presumed that managers are not in it for the long term (for example, Arlen and Carney 1992; Bebchuk and Fried 2010)[3] and may maximize short-term stock price at the expense of long-term stock price and performance.[4]

Shareholders can, to an extent, remedy this conflict of interest via contract. Contracting in this model is incomplete[5] in that shareholders have only one contractual instrument at their disposal: they can award to the manager a number of shares of the company. If the shareholders award no shares, the manager's preference for slacking and truth telling prevails. As shareholders award more stock, the manager will be incentivized to exert effort but also to falsely inflate his report regarding the firm's value. Thus, this model assumes that shareholders have some crude control over effort and misreporting. The fact that equity encourages both effort and misreporting creates trade-offs for the shareholder. Misreporting can be avoided, but this may come at the cost of forsaking effort.

3.1. The Economy

The economy in this model consists of the following actors:

The Firm. The firm can be one of two types: $\eta \in \{H, L\}$. High-type firms have cash flows per share H. Low-type firms have cash flows L, which is normalized to 0. A firm's type is a stochastic function of managerial effort $e \in \{0, 1\}$, with the conditional probability of the firm's type being

3. As noted in Bolton, Scheinkman, and Xiong (2006, p. 579), the financial economics literature also typically assumes that managerial myopia "arises against the wishes of shareholders," because of some form of market imperfection.

4. An omitted extension shows that a risk-averse manager can lead shareholders to choose an endogenously myopic manager.

5. As discussed in Section 5.1, if contracting is complete, vicarious fines result in a first-best outcome.

$\Pr(H|e) = \gamma_e$, where $\Pr(H|e = 1) = \gamma_1$ and $\Pr(H|e = 0) = \gamma_0$, where $1 \geq \gamma_1 \geq \gamma_0 \geq 0$. As a simplification, $\gamma_0 = 0$.[6] Thus, the conditional expected value per share of a firm whose manager exerts effort is $\gamma_1 H$; if the manager does not exert effort, the expected value is 0.

Shareholders. There are N risk-neutral shareholders who each own a share of the firm. To affect the manager's choice of effort and disclosure decisions, the shareholders may choose to award α shares of the firm to the manager. Compensation α is assumed to be publicly observable.[7]

After choosing the manager's compensation contract, each shareholder has an exogenous likelihood π of selling her share after the manager chooses effort and makes a disclosure about the firm's type but before the firm's type and cash flows are definitively revealed. The value π is then the degree of shareholders' short-term interest, which creates some incentive to misreport, while $1 - \pi$ is the shareholder's long-term interest in the firm's performance and stock price. Selling shareholders receive per-share price $p(\eta')$ for their shares. If the firm is found by the regulator to have misreported, the shareholders who have not sold each bear a fine of l per share. Those who did sell simply keep their proceeds. This functions similarly to actual corporate penalties in the US securities antifraud regime.

The expected value of each shareholder's payoff is then

$$\begin{aligned} \mathrm{EU}_s = (1 - \alpha/N) \times (\pi p(\eta') + (1 - \pi)\{\gamma_e[H - l(\eta',\ H)] \\ + (1 - \gamma_e)[L - l(\eta',\ L)]\}) - w/N. \end{aligned}$$

The term w is the flat wage that the manager receives, which may be negative, while α is the amount of stock granted to the manager.

The Manager. The firm is run by a risk-neutral manager. The manager performs two functions: exerting effort and reporting. The manager chooses effort $e \in \{0, 1\}$ at personal cost to himself of $c(0) = 0$, $c(1) = c$. Effort increases the likelihood of the firm achieving high cash flows.

The manager observes the firm's type η and then makes a report η' to

6. This assumption eliminates equilibria in which the manager would misreport in the absence of effort. These equilibria are generally of limited interest. A prior version of the paper, available from the author, allows $\gamma_0 > 0$.

7. The observability assumption simplifies the analysis but loses some generality (secret defection to misreporting-inducing compensation is no longer possible, and multiple-equilibria solutions and shareholder mixing disappear). It does not, however, affect the main results of this paper. A prior version assuming nonobservable compensation is available from the author.

the marketplace. In this report, the manager may choose to tell the truth ($\eta = \eta'$) or lie ($\eta \neq \eta'$).

After making this report, the manager sells an exogenous proportion π_m of his shares and retains proportion $1 - \pi_m$. (Alternatively, π_m could represent other exogenous forms of myopia, such as high discounting, risk aversion, or final-period problems.) To the extent that the manager does not sell his stock, he also bears a fine of l per share for fraud. The proportion π_m is thus the manager's short-term interest, while $1 - \pi_m$ is his long-term interest.

The manager is assumed to have a slight preference for not misreporting the firm's value. This reflects, perhaps, reputational capital of the manager, the possibility of individual sanctions, or simply an ethical or moral preference. In the model, then, absent any performance-based compensation, the manager always reports truthfully.

The expected value of the manager's payoff is then

$$\begin{aligned} \mathrm{EU}_m = {} & \alpha(\pi_m p(\eta') + (1 - \pi_m)\{\gamma_e[H - l(\eta', H)] + (1 - \gamma_e)[L - l(\eta', L)]\}) \\ & + w - c(e). \end{aligned}$$

For the manager to be willing to work, his individual rationality constraint must be satisfied—that is, the manager's expected utility must equal his reservation wage, $\mathrm{EU}_m = \bar{w}$, which always binds.

Purchasers. Purchasers observe the manager's signal and then pay a price $p(\eta')$ such that, in expectation, they will break even as a result of competition and individual rationality. Purchasers are strategic in the sense that they take into account the equilibrium actions of the other players. The purchaser's individual rationality (IR) constraint is then that their expected utility equals 0:

$$\mathrm{IR}_p\colon \mathrm{EU}_p = \sum_{\eta \in \{H, L\}} \Pr(\eta|\eta')\eta - p(\eta') = 0.$$

The Regulator. The regulator sets the fine l and imposes it against the firm's shareholders if the regulator determines that there has been misreporting, $0 \leq l \leq \bar{l}$, where $\bar{l}$ is the maximum assessable fine due to limited liability. For simplicity, it is assumed that the regulator ensures that purchasers are left unharmed by the fines (that is, the regulator fines only the nonselling shareholders). This assumption keeps l from affecting the purchaser's IR constraint but does not affect the overall analysis. I as-

sume that there is perfect enforcement of misreporting: $l(H', L) = l > 0$, while $l(H', H) = l(L', H) = l(L', L) = 0$.[8]

3.2. A Chronological Summary

The following puts the game together in chronological order:

1. A fine per share for misreporting, $l \in [0, \bar{l}]$, is determined by the regulator and observed by all. Shareholders choose the number of shares α to award to the manager, which is observable.
2. The manager chooses unobservable effort $e \in \{0, 1\}$ and incurs the personal cost of that effort, $c(0) = 0$, $c(1) = c$.
3. The firm's type η is realized as a probabilistic function of effort; the manager observes this realization of type, $\eta \in \{H, L\}$. The manager makes a disclosure η' to the marketplace of the firm's type: $\eta' \in \{H, L\}$. The manager may choose to tell the truth about the firm's type ($\eta' = \eta$) or lie ($\eta' \neq \eta$).
4. Trading occurs. Proportion π of shareholders sell their shares, and the manager sells proportion π_m of his shares. Purchasers break even in expectation.
5. The regulator assesses a fine of l per share against each of the firm's nonselling shareholders (including the manager, if applicable) if misreporting occurred.

An equilibrium consists of a price given the manager's disclosure; the manager's choice of disclosure given firm type, effort, and share grant α; the manager's choice of effort given α; and the shareholder's choice of α.

4. SOLVING FOR EQUILIBRIUM

I solve for the shareholders' and manager's choices by backward induction.

4.1. The Purchaser's Pricing Decision

The purchaser's IR constraint determines the price $p(\eta')$ for which shareholders and the manager can sell their shares. Given the manager's signal,

8. The absence of a penalty for underreporting does not affect the analysis because, given the assumption of perfect enforcement, underreporting of value will never occur. Underreporting could occur when the regulator makes errors in observing firm type η, but I do not consider that here.

the price is the conditional expected value of the share—that is, the purchasers break even in conditional expectation.

If purchasers anticipate a separating equilibrium, $p(H) = H$, $p(L) = 0$. In a pure-strategy pooling equilibrium, $p(H) = \gamma_e H \equiv p_e$, $p(L) = 0$. Note that purchasers also infer the effort level exerted in equilibrium. It is assumed that purchasers interpret a disclosure of L to be informative, and hence $p(L) = 0$ (otherwise, a pooling equilibrium is problematic since low-type managers would prefer to disclose L to avoid the fine l for disclosing high). In a mixed-strategy equilibrium, utilizing Bayes's law, purchasers set the price as $p(H) = \gamma_e H/\gamma_e + x(1 - \gamma_e) \equiv p_{x,e}$, and $p(L) = 0$, where x is the likelihood of misreporting.

4.2. The Manager's Disclosure Decision

At the time that the manager decides which signal to send to the market, he knows the type of the firm ($\eta \in \{H, L\}$) as well as his share of the firm's ownership α and his prior choice of effort level. If $\alpha = 0$, the manager has no pecuniary incentive one way or the other, and his slight preference for telling the truth leads him to report truthfully. If the fine l is low enough relative to the manager's short-term interest π_m, and the equity grant α is high enough, the manager will prefer misreporting in the low state ($\eta = L$). As the fine gets higher, and depending on the equity compensation level, the manager will misreport less: the manager goes from pure misreporting to sometimes misreporting and finally to never misreporting. These results can be restated more formally in the following proposition:

Proposition 1. Depending on the level of fine l, the manager's behavior is to always report truthfully in the no-effort equilibrium and in the effort-exerting equilibrium to report as follows:

i) *Low Fines.* For $l \in [0, \pi_m/(1 - \pi_m)\gamma_1 H)$, the manager reports truthfully if $\alpha = 0$, and for $\alpha > 0$ he always misreports in the low state.

ii) *Medium Fines.* For $l \in [\pi_m/(1 - \pi_m)\gamma_1 H, \pi_m/(1 - \pi_m)H)$, the manager reports truthfully if $\alpha = 0$, and for $\alpha > 0$ he mixes disclosure in the low state, with the rate of misreporting given by $x = \gamma_1/(1 - \gamma_1)[\pi_m H - (1 - \pi_m)l/(1 - \pi_m)l]$.

iii) *High Fines.* For $l \geq \pi_m/(1 - \pi_m)H$, the manager always reports truthfully.

Proof. See the Appendix.

4.3. The Manager's Choice of Effort

The manager chooses effort after the fine l and compensation level α are set but before he has observed the firm's type and before he makes a disclosure to the marketplace. However, the manager can backward induce both his own disclosure decision and the market's equilibrium response to it in the subsequent stages of the game.

Proposition 2. The manager exerts effort $e = 1$ if, and only if, $\alpha = \bar{\alpha}$. Otherwise, he chooses $e = 0$. The term $\bar{\alpha} \equiv c/\gamma_1(1 - p_m)(H + l)$ if the manager will pool or mix his reporting behavior given low firm type and $\bar{\alpha} \equiv c/\gamma_1 H$ where the manager will separate.

Proof. See the Appendix.

4.4. The Shareholder's Choice of Compensation

In this section, the final step of the backward-induction problem is reached: the shareholder's choice of compensation for the manager. In choosing compensation, shareholders will consider the joint effect of compensation on effort and fraud.

Proposition 3.

i) *Low Fines* (*Pooling*). Equity compensation of $\alpha = \bar{\alpha}$ is an equilibrium if and only if $l(1 - \gamma_1)(1 - \pi) + c \leq \gamma_1 H$. Otherwise, $\alpha = 0$ is the equilibrium.

ii) *Medium Fines* (*Mixed Pooling*). Equity compensation of $\alpha = \bar{\alpha}$ is an equilibrium if and only if $l(1 - \gamma_1)(1 - \pi)x + c \leq \gamma_1 H$. Otherwise, $\alpha = 0$ is the equilibrium.

iii) *High Fines* (*Separation*). Equity compensation of $\alpha = \bar{\alpha}$ is an equilibrium if and only if $c \leq \gamma_1 H$. Otherwise, $\alpha = 0$ is the equilibrium.

Proof. See the Appendix.

Intuitively, the shareholder is forced, in some contexts, to choose between effort and misreporting and no effort and no misreporting. In such cases, the shareholder weights the productivity gain from equity compensation against the expected fine that the shareholder faces. The expected fine takes into account the probability of failure, the probability of misreporting given failure, and the probability of not selling out given failure and misreporting.

5. DISCUSSION

General insights of the model are the following:

First, firm-level fines can result in second-best deterrence of corporate misreporting in the presence of agency costs and misreporting externalities.

Second, corporate misreporting is consistent with shareholders' control over compensation decisions. In fact, large decreases in agency costs lead to increases in misreporting. In the presence of misreporting externalities, decreases in agency costs may not be socially beneficial unless fines are set at their optimal level.

Third, elimination of misreporting is not, in itself, an advisable goal. Nor is, necessarily, minimization of agency costs. Rather, regulators should attempt to internalize misreporting externalities onto the firm. This provides shareholders the optimal incentives to allow misreporting only when it is socially efficient to do so. I discuss these insights below.

5.1. Optimal Deterrence

Supposing that misreporting results in some externality whose cost to society is E, can vicarious liability deter inefficient misreporting?[9] The answer is yes: by imposing a fine on the firm $l = f(E)$, the regulator can assure that misreporting occurs only when it is second-best efficient.

Consider the shareholders' compensation choices in the instances in which awarding compensation would lead to at least some misreporting, that is, pooling or mixing. The condition for the shareholders to award $\alpha = 0$ (and hence to induce the manager to separate) is $l(1 - \gamma_1)(1 - \pi)y > \gamma_1 H - c$, where $y = 1$ in the pooling equilibrium and $y = x$ in the mixing equilibrium.

The condition for efficiency is that the net value added from effort exceeds the expected externality from misreporting: $\gamma_1 H - c \geq (1 - \gamma_1)yE$. Combining the equity and efficiency conditions yields $(1 - \gamma_1)yE = l(1 - \gamma_1)(1 - \pi)y$, which can be rearranged to provide the following proposition:

Proposition 4. The socially second-best efficient outcome can be achieved by imposing vicarious liability for misreporting in the amount of $l = E/(1 - \pi)$.

9. External costs are commonly thought to include precaution or search costs related to the firm (for example, researching the firm's true value), increased risk that may be borne by others, and increased uncertainty about the value of other firms, leading to capital misallocation.

Hence, setting the fine at this level will ensure that the shareholder chooses no effort and separation when the risk of misreporting is inefficient and chooses effort and misreporting only when the total social benefits outweigh the costs. This fine is administratively feasible. The term π is the degree of turnover during the active period of the misreporting and prior to its revelation; class action fraud-on-the-market lawsuits already use such a measure to proxy for damages. This outcome is second best, since the first-best outcome requires that economic production always occurs while misreporting never occurs.[10]

Thus, not only can firm-level fines optimally deter misreporting, but setting the appropriate level of fine is administratively feasible given knowledge of the externality E (which is, admittedly, not necessarily easy to determine because of the diffuse nature of misreporting externalities). So long as the fine is set at this optimal level, misreporting is, in a sense, a positive outcome, as it means that shareholders are choosing to engage in socially efficient production.

While this paper assumes the intractability of agency costs, it should be noted that vicarious liability continues to function well when agency costs can be eliminated or even when complete contracts are feasible. In the absence of agency costs, the manager and shareholders have the same degree of myopia, $\pi_m = \pi$, which is merely a particular case of the more general result already demonstrated: vicarious liability continues to second-best deter misreporting.[11]

If contracting is complete, vicarious liability can result in the first-best optimum. In the context of the current model, a complete contract would allow the shareholder to effectively choose the manager's level of myopia π_m by, say, awarding sufficiently long-term compensation. If this choice is observable, it is apparent that shareholders would choose the case with

10. While this measure of optimal fine is derived from the specific parameters of this model, more generally, the functional form of $f(E)$ depends on the particular mechanism of punishment. In reality, the optimal fine may be easier to implement, as it may be unnecessary to incorporate a measure of share turnover. As discussed in Spindler (2011), allowing purchasers to recover their losses in the form of price drops internalizes on shareholders the purchasers' losses, even when the firm suffers exogenous litigation costs. This suggests that, under the fraud-on-the-market regime that currently exists, imposing a penalty of $l = E$ on the firm, in addition to plaintiffs' recovery, would satisfy the efficiency condition.

11. Misreporting of a no-agency-cost firm is examined at length in Spindler (2011), which models a firm in which managers perfectly represent the interests of current shareholders.

no myopia, $\pi_m = 0$, for any level of fine greater than 0.[12] This is so because, in rational expectations equilibrium, misreporting does not garner a positive payoff to shareholders, observability removes the incentive to defect,[13] and vicarious liability renders misreporting unprofitable.

5.2. Lower Agency Costs and More Misreporting

In this model, fraud-inducing compensation is consistent with shareholders' control over compensation. As it turns out, when agency costs (here, in the form of managerial myopia) are very high, shareholders will tend to avoid awarding such compensation. Conversely, when the interests of shareholders and managers are more closely aligned, shareholders will award more performance-based compensation. More performance-based compensation can lead to more misreporting. This contrasts with the managerial power view of Bebchuk and Fried (2004, 2010), in which misreporting induced by compensation implies that managers have taken control of the compensation process.

To show that decreases in agency costs may lead to more misreporting, consider what happens as agency costs decline in the following three cases:

Case 1. Suppose that the representative shareholder is willing to award equity compensation at $\pi_m = 1$. Agency costs in such a case are relatively small compared with the benefits of managerial effort. If the shareholder awards the equity when the manager always misreports, it is also the case that the shareholder will continue to award equity for any lower π_m, since the incidence of misreporting must be weakly lower.

Case 2. On the other hand, suppose that the shareholder does not award equity at $\pi_m = 1$ (agency costs are relatively large). There must exist some lower level of myopia at which the shareholder will choose to award equity. As π_m declines, the manager goes from pure pooling behavior to mixing behavior, and the rate of mixing x declines as π_m declines. Even-

12. As shown in an omitted appendix and by other work such as Bizjak, Brickley, and Coles (1993), Acharya, John, and Sundaram (2000), Brisley (2006), Bhattacharyya and Cohn (2010), Laux (2012), Peng and Roell (2013), Chaigneau (2015), and Spindler (2012, 2016), the existence of other factors can lead shareholders to rationally choose a nonzero level of managerial myopia via the compensation contract.

13. If the contract is not observable, then shareholders' incentives to defect must also be countered. Such an analysis would proceed largely the same as in Spindler (2011), in which there is no multitasking problem between reporting and effort. Vicarious liability is still a first-best deterrent.

tually, as π_m declines, there is some rate of mixing x and expected liability $(1 - \gamma_1)x(1 - \pi_1)l$ that the shareholder finds worth incurring to obtain the benefits of production $\lambda_1 H - c$. Thus, the incidence of misreporting will jump from 0 to $(1 - \gamma_1)x$ when agency costs become sufficiently small. As π_m continues to decline, so do x and the incidence of misreporting.

Case 3. As agency costs decrease owing to shareholders' time horizon becoming more short term (that is, π increases), the awarding of equity and misreporting must both weakly increase. This can be summed up in the following proposition:

Proposition 5. Where agency costs are large, in the sense that shareholders do not award equity compensation because of the manager's divergent interest, a decrease in agency costs weakly increases the incidence of misreporting. Where agency costs are small, decreases in agency costs can either increase or decrease the incidence of misreporting.

This result runs counter to the common notion that corporate misreporting is the product of agency costs and that reducing agency costs will reduce the incidence of misreporting. Reducing agency costs leads to increased levels of shareholder welfare, but this may in fact involve more misreporting.

Note that while decreasing agency costs benefits shareholders, it does not necessarily improve social welfare if fines are not set optimally. If fines are too low and E is relatively large, large decreases in agency costs decrease social welfare levels: shareholders choose to award equity compensation, which results in misreporting, even though it is socially inefficient to do so. Hence, reforms designed to increase shareholders' control over management or otherwise reduce agency costs may have negative effects if misreporting externalities are not properly internalized on the firm. Similarly, it would be incorrect, though perhaps intuitive, to conclude that the apparent abuse of shareholders by misreporting managers justifies lowering or eliminating vicarious penalties; to do so may benefit shareholders but may also lead to more misreporting and lower levels of social welfare.

5.3. Eliminating Misreporting May Eliminate Effort and Production

Fraud and effort are positively correlated, and, in fact, incentive compensation leads to both effort and misreporting. Further, misreporting may

be more likely to occur when the gains from effort are higher. Misreporting is, in a sense, symptomatic of high economic production. Because of this relationship, and contrary to some prior legal literature that views the elimination of misreporting as costless, attempts to eliminate misreporting can eliminate effort.

From an inspection of the manager's disclosure conditions in Section 4.2, one can see that a greater fine l is required to induce separating behavior as γ_1 and/or H increases. The rate at which the manager lies in a mixing equilibrium x is also increasing in both γ_1 and H. Overall, an increase in γ_1 and/or H weakly increases the rate of managerial misreporting given a low-type firm.

With regard to the shareholders' behavior, consider the conditions for awarding the fraud-and-effort-inducing compensation package $\bar{\alpha}$ in Section 4.4. This is written $l(1 - \gamma_1)(1 - \pi)y + c < \gamma_1 H$, where $y = 1$ in the case in which the manager always pools, $y = x$ in the mixing case, and $y = 0$ in the separating case. From inspection, in the separating and pooling cases, the left-hand side of the expression declines in the return to effort, while the right-hand side increases, which means that the condition altogether grows more slack as γ_1 increases. In the mixing case, after substituting for x, the condition also grows more slack in γ_1, since the expression may be rewritten $l(1 - \pi)\gamma_1[\pi_m H - (1 - \pi_m)l/(1 - \pi_m)l] + c < \gamma_1 H$. Overall, then, as the returns to effort increase, the shareholder weakly awards more equity compensation. This leads naturally to the following proposition:

Proposition 6. The likelihood of misreporting, conditional on low firm type, is weakly higher as either γ_1 and/or H (productivity) increases. The change in the unconditional likelihood of misreporting depends on whether the level of managerial myopia is relatively high or low.

The second part of the proposition notes that the effect of productivity on misreporting is ambiguous and depends on the manager's myopia (π_m). For instance, if the manager is in a pure pooling equilibrium, an increase in γ_1 does not affect his propensity to misreport given low firm type (he always does so), but it does decrease the likelihood of low firm type. Thus, the unconditional likelihood of misreporting decreases. On the other hand, if the manager is currently in a mixing or separating equilibrium, increases in γ_1 and/or H do weakly increase the unconditional likelihood of misreporting. In the mixing equilibrium, for instance, the unconditional rate of misreporting is the rate of failure $(1 - \gamma_1)$ multi-

plied by the rate of mixing as $x = [\gamma_1/(1 - \gamma_1)]\{[\pi_m H - (1 - \pi_m)l]/(1 - \pi_m)l\}$, which is increasing in γ_1 and H.

This relationship among effort, productivity, and misreporting has important regulatory implications. Consider the perspective of an outsider who studies misreporting firms; suppose that she can observe compensation but cannot observe effort. The outsider would see that all firms that misreport utilize equity compensation ($\alpha = \bar{\alpha}$) and that all firms that misreport have ex post valuations that are low ($\eta = L$). The outsider may posit that high compensation causes fraud (which is true) and that high compensation and fraud cause low ex post performance (which is false). The outsider may then conclude that one could increase overall welfare by enacting policies that reduce or eliminate the incidence of fraud, for instance, by prohibiting compensation packages $\bar{\alpha}$. However, that has the unintended consequence of eliminating effort and reducing overall firm value by a factor of $\gamma_1 H$. Such a policy is likely to be an overall detriment.

This same point is true if the outsider wishes to arbitrarily raise corporate fines l. Intuitively, if agency costs are high, increases in fines beyond the optimal level will be relatively ineffective in deterring the manager's fraud decision but may deter shareholders from awarding the efficient compensation package $\bar{\alpha}$.

One question that may arise is whether it is desirable or feasible to set fines at infinity, which would have the theoretical effect of deterring even highly myopic managers from misreporting (a first-best outcome). The answer is likely no for several reasons. Very high levels of myopia ($\pi_m \to 1$) require extremely high levels of fines to deter misreporting. The judgment-proof nature of managers and firms (along with limited liability of shareholders) places a practical limit on expected fines ($\bar{l}$ in the model). Type 2 error (failure to convict instances of fraud) requires larger nominal fines. Type 1 error (false fraud convictions) means that equity compensation will be deterred even if no or little fraud occurs. Similarly, infinite fines do not work well in a trembling-hand scenario in which misreporting may occur occasionally despite actors' desires. So while very large vicarious fines could theoretically result in a first-best outcome, they are likely infeasible or welfare reducing in many realistic contexts.

6. CONCLUSION

This paper shows that fines on the firm (that is, vicarious liability) can second-best efficiently deter misreporting. Shareholders choose the manager's level of equity compensation and hence choose the frequency with which misreporting will occur. Penalties imposed on the firm, and hence imposed on shareholders, can induce shareholders to choose misreporting outcomes only when it is socially efficient to do so. This is contrary to a large and growing legal and public policy literature that suggests that vicarious fines are inappropriate and ineffective when misreporting is the product of agency costs, and in particular the product of myopic managers' desire to boost their compensation.

In addition, it has been shown that misreporting outcomes that are ex post harmful to shareholders are, in fact, consistent with shareholders' control over managerial compensation. Even wholly nonmyopic shareholders choose some degree of misreporting as a collateral cost of production. Further, shareholder turnover creates some degree of shareholder myopia.

While recent reforms and literature have attempted to reduce agency costs and provide shareholders with more control over management, this paper demonstrates that such moves may be socially welfare decreasing if vicarious fines are not set optimally. Large decreases in agency costs lead to more misreporting; if fines are not set at their optimal level, such increases in misreporting may be socially inefficient.

Conversely, reforms aimed at single-mindedly reducing misreporting may decrease levels of social welfare. An increase in fines beyond their optimal level may deter misreporting but may do so at the cost of socially efficient effort and production.

APPENDIX: PROOFS

A1. Proof of Proposition 1: The Manager's Disclosure Behavior

In all cases, with the assumption that $\gamma_0 = 0$, there is no incentive to misreport when effort is not exerted in equilibrium, as such a report would not fool the market. All the analysis that follows in this proof assumes that effort is exerted in equilibrium.

A1.1. Separating Equilibrium. For a separating equilibrium to result, it must be the case that the manager of a low-type firm must prefer to disclose truthfully:[14]

$$\alpha[\pi_m L + (1 - \pi_m)L] \geq \alpha[\pi_m H + (1 - \pi)(L - l)].$$

In the case in which $\alpha = 0$ (the shareholders grant the manager no shares of stock), the manager always prefers to tell the truth by assumption. If $\alpha > 0$, rearranging yields a lower bound for l:

$$\text{Separation: } l \geq \frac{\pi_m}{1 - \pi_m} H. \tag{A1}$$

A1.2. Pooling Equilibrium. For pooling to take place, it must be that managers of low-type firms prefer to disclose high rather than to tell the truth and receive a payoff of 0:

$$\alpha[\pi_m \gamma_1 H - (1 - \pi_m)l] > 0.$$

In the case in which $\alpha = 0$, the manager's personal preference for truth makes truthful disclosure a dominant strategy, and no pooling equilibrium will exist. Rearranging the above, I then obtain the following condition:

$$\text{Pooling: } l < \frac{\pi_m}{1 - \pi_m} \gamma_1 H, \quad \alpha > 0. \tag{A2}$$

A1.3. Mixed-Strategy Equilibrium. For $l \in \{[\pi_m/(1 - \pi_m)]\gamma_1 H, [\pi_m/(1 - \pi_m)]H\}$ and $\alpha > 0$, there exists no pure-strategy equilibrium. In such a case, managers will pursue a mixed strategy in which they lie with probability x in the low state and tell the truth with probability $1 - x$. For managers to be willing to mix, managers of low-type firms must be indifferent between disclosing high (which entails receiving the mixed-strategy price p_x and bearing the risk of liability l) and disclosing low (and receiving 0). Formally,

$$\alpha[\pi_m p_x - (1 - \pi_m)l] = 0 \Leftrightarrow p_x = \frac{1 - \pi_m}{\pi_m} l. \tag{A3}$$

The purchaser's pricing in the mixed-strategy case gives the condition that, to break even, the price must be $p_x = \gamma_1 H[\gamma_1 + x(1 - \gamma_1)]^{-1}$. Combing these yields a solution for the rate x at which the manager will lie in his mixing strategy:

$$x = \frac{\gamma_1}{1 - \gamma_1} \frac{\pi_m H - (1 - \pi_m)l}{(1 - \pi_m)l}. \tag{A4}$$

14. A manager of a high-type firm always prefers to disclose truthfully, since there is no type 1 error in the model.

A2. Proof of Proposition 2: The Manager's Choice of Effort

A2.1. Effort with High Fines: Separation. If the fine l is high enough that the manager will choose to disclose truthfully regardless of the firm's type and regardless of the optimal effort level, I ask simply whether the manager would be better off incurring the cost of effort and enjoying a higher probability that his equity share is valuable, as opposed to slacking. Formally, the condition for the exertion of effort is

$$\alpha\{\gamma_1[\pi_m H + (1-\pi_m)H] + (1-\gamma_1)[\pi_m L + (1-\pi_m)L]\} - c$$
$$\geq \alpha\{\gamma_0[\pi_m H + (1-\pi_m)H] + (1-\gamma_0)[\pi_m L + (1-\pi_m)L]\}.$$

Solving this for α specifies the minimum equity share for which the manager will exert effort in the separating case:

$$\bar{\alpha}_s = \frac{c}{\gamma_1 H}.$$

A2.2. Effort with Low Fines: Pooling. Where the fine l is low ($l \leq [\pi_m/(1-\pi_m)]\gamma_1 H$), pooling is always the optimal strategy in the equilibrium in which effort is exerted. The manager will exert effort $e = 1$ if the following is true:

$$\gamma_1\alpha[\pi_m p_e + (1-\pi_m)H] + (1-\gamma_1)\{\alpha[\pi_m p_e - (1-\pi_m)l]\} - c$$
$$\geq \gamma_0\alpha[\pi_m p_e + (1-\pi_m)H] + (1-\gamma_0)\{\alpha[\pi_m p_e - (1-\pi_m)l]\}.$$

This may be rewritten

$$\gamma_1\alpha(1-\pi_m)(H+l) \geq c.$$

The left-hand side is the manager's expected increased share payoff from exerting effort: γ_1 is the change in likelihood that the firm's project will be successful as a result of the manager's effort, α is the manager's share of the firm, $1-\pi_m$ is the likelihood that the manager will retain his shares and receive the firm's cash flows and any liability, and finally $H + l$ is the marginal pecuniary benefit to a shareholder of the project's success (H is the cash flow received, while l is the liability avoided). On the right-hand side, c is the cost of the manager's effort.

When rearranged, this condition specifies the level of share ownership α necessary for the manager to exert effort in the pooling case (denoted $\bar{\alpha}_p$):

$$\bar{\alpha}_p \equiv \frac{c}{\gamma_1(1-\pi_m)(H+l)}.$$

A2.3. Effort with Medium Fines: Mixing. The following equation defines the condition for the manager to exert effort in the zone of medium fines, with the left-hand side giving equilibrium behavior of $e = 1$ and the right-hand side giving the payoff for a defection to $e = 0$:

$$\gamma_1\alpha[\pi_m p_x + (1-\pi_m)H] + (1-\gamma_1)x\alpha[\pi_m p_x - (1-\pi_m)l] - c$$
$$\geq \gamma_0\alpha[\pi_m p_x + (1-\pi_m)H] + (1-\gamma_0)x\alpha[\pi_m p_x - (1-\pi_m)l].$$

From the manager's mixing condition, equation (A3), $\alpha(\pi_m p_x - (1-\pi_m)l) = 0$, and the above then reduce to

$$\gamma_1\alpha(1-\pi_m)(H+l) \geq c,$$

which is the same as in the pooling case. The level of equity compensation necessary to induce effort is therefore the same as well:

$$\bar{\alpha}_x = \bar{\alpha}_p = \frac{c}{\gamma_1(1-\pi_m)(H+l)}.$$

A3. Proof of Proposition 3: The Shareholders' Compensation Decision

A3.1. Choice of Compensation with Low Fines. If fines are low, the manager will tell the truth if $\alpha = 0$ (note that the firm type and disclosure are always low given the assumption $\gamma_0 = 0$) and will always lie in the low state if $\alpha = \bar{\alpha}$. In choosing between the two options, the manager will choose $\alpha = \bar{\alpha}$ if and only if

$$\gamma_1[\pi p_1 + (1-\pi)H] + (1-\gamma_1)[\pi p_1 - (1-\pi)l] \geq 0.$$

This may be reduced and rewritten

$$\gamma_1 H \geq (1-\gamma_1)(1-\pi)l + c.$$

Intuitively, this means that the shareholder awards the equity compensation only when the expected gain from effort (the left-hand side) exceeds the expected cost of the fine (the right-hand side).

A3.2. Choice of Compensation with Medium Fines. With medium fines, managers will play a mixing strategy: given that the firm is of low type, a manager receiving compensation of $\bar{\alpha}$ will falsely disclose high value with probability x, which results in price p_x. If compensation is given by $\alpha = 0$, the manager always tells the truth.

For $\bar{\alpha}$ to be an equilibrium with medium fines, it must be the case that

$$\gamma_1[\pi p_x + (1-\pi)H] + (1-\gamma_1)x[\pi p_x - (1-\pi)l] - c \geq 0. \tag{A5}$$

This may be rewritten

$$\gamma_1(1-\pi)H + [\gamma_1 + (1-\gamma_1)x]\pi p_x \geq (1-\gamma_1)x(1-\pi)l + c.$$

Substituting for p_x yields the following condition:

$$\gamma_1 H \geq (1-\gamma_1)x(1-\pi)l + c.$$

Again, the shareholder awards the equity compensation if and only if the ex-

pected productivity gains exceed the expected fine. Since x increases in π_m, shareholders are more likely to award equity compensation as agency costs decrease (that is, as π_m decreases or π increases).

A3.3. Choice of Compensation with High Fines. If the fine is high enough such that $l \geq [\pi_m/(1 - \pi_m)]H$, the manager always prefers to tell the truth when the firm is of low type, and the expected fine is always 0. Hence, the shareholder will always award equity compensation of $\alpha = \bar{\alpha}$ so long as $\gamma_1 H \geq c$.

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