

Asset Impairment Regulations

by

Joel S. Demski, Haijin Lin, and David E. M. Sappington

Abstract

We analyze a setting in which entrepreneurs acquire and develop assets before they learn whether they will be forced (by liquidity constraints or intergenerational concerns, for example) to sell their assets. The asset resale market suffers from a "lemons" problem because entrepreneurs who are not compelled to sell their assets may elect to do so opportunistically. In principle, impairment regulation of the type mandated by FAS 144 can help to mitigate the lemons problem. We analyze the optimal design of asset impairment regulation, and examine the extent to which optimal regulatory policy coincides with and differs from the requirements in FAS 144.

1 Introduction

Current FASB regulations require the reporting firm to write down the value of a long lived asset "... if the carrying amount ... is not recoverable from its undiscounted cash flows ..." (FAS 144). In essence, this regulation mandates the certification of asset values that have declined by a sufficiently large amount.

Intuitively, asset impairment regulations of this type help to ensure the smooth operation of financial markets by, for example, precluding the sale or trading of a firm's securities when its reported asset values are substantially below their fair value. In practice, the actual value of some assets can be difficult to ascertain. Consequently, if certification of low-valued assets is not mandated, a firm with impaired assets may be able to impersonate a firm with non-impaired assets.

Such impersonation can affect market prices and thereby disadvantage "distressed" entrepreneurs or investors who are forced (by pressing personal financial considerations or intergenerational concerns, for example) to liquidate their investment in the firm prematurely. That is, absent asset impairment regulation, a classic "lemons problem" (Akerlof, 1970) arises in that the market price for uncertified assets is depressed because opportunistic traders retain highly-valued assets and trade assets with lower value. This lemons problem

may limit incentives for investment in long-lived assets, as entrepreneurs anticipate mispricing and recognize that if they ultimately become distressed, they may be unable to earn a reasonable return on their investment.

While asset impairment regulations can, in principle, lead to more accurate pricing, protect distressed investors, and enhance incentives for investment, the regulations also impose costs on firms that are required to undertake costly certification of asset values and to write down the value of their assets. The optimal design of asset impairment regulations requires a careful balancing of all relevant benefits and costs.

We analyze the optimal design of impairment regulations in a simple, stylized setting where entrepreneurs decide how much to invest in a particular risky asset class before they know whether they will become distressed. Because of typical variation in the return on investments, the ultimate value of an asset, x , cannot be predicted perfectly at the time an investment is undertaken. When an entrepreneur becomes distressed, he is compelled to sell his long-lived asset immediately, regardless of the realized value of the asset. Non-distressed entrepreneurs need not sell their assets. However, a non-distressed entrepreneur who knows his asset is worth less than the prevailing market price for uncertified assets will offer his asset for sale at this price, provided the value of his asset is not so low that he is legally obligated to have the asset value certified.

Recognizing this potential lemons problem and its effect on investment, a regulator specifies in advance a critical asset value (x_c), and mandates that if an asset worth less than this critical level is offered for sale, the true or fair value of the asset must be certified. After the mandated certification is undertaken at cost $k > 0$, entrepreneurs who choose to sell their assets do so. Uncertified assets are sold at a price that reflects the equilibrium expected value of all uncertified assets offered for sale. Certified assets are sold for a price that reflects their true value. A distressed entrepreneur whose asset is worth less than x_c will pay the certification cost and sell his certified assets at a price that reflects the true value of the asset. A non-distressed entrepreneur with such a low-valued asset will choose to retain, rather than sell, the asset in order to avoid the costly certification process. As noted above, a non-distressed entrepreneur with an asset valued between x_c and the prevailing market price for uncertified assets will sell the asset as an uncertified asset at this price.¹

¹For simplicity, the entrepreneur in our model invests in a single risky asset and may be forced to liquidate this investment. This process is meant to be a stylization of selling claims to (net) assets. Mispricing arises when private information compounds this sale possibility, just as it can when privately informed traders exploit their knowledge of a firm's impaired assets. Although our model centers on a single asset entity for simplicity, GAAP stresses a separable group of assets.

Our analysis provides three main conclusions. First, although the lemons problem harms distressed entrepreneurs, it benefits non-distressed entrepreneurs. On balance, the gains and losses are offsetting for the risk-neutral entrepreneur if no certification takes place. Therefore, in the absence of any certification requirement, the expected return from an investment is precisely the expected value of the investment. Consequently, the impairment policy that maximizes aggregate expected surplus imposes no certification requirement. This policy induces the surplus-maximizing (first-best) level of investment. Second, a non-trivial certification requirement like the one reflected in FAS 144 is optimal when certification costs are sufficiently small and the welfare of distressed investors is valued more highly than the welfare of non-distressed investors. Such a certification policy induces investment in excess of the first-best level as entrepreneurs attempt to reduce expected certification costs by securing assets with values above the certification threshold. Third, the opportunity to voluntarily certify high asset values can reduce aggregate expected surplus. When the cost of voluntary certification is sufficiently low, a distressed investor with a high asset value will find it profitable to certify his asset. The associated certification cost, coupled with the corresponding reduction in the equilibrium price of uncertified assets, serves to reduce the aggregate expected surplus of entrepreneurs. Mandatory certification does not reduce the surplus reduction introduced by the possibility of voluntary certification.²

The analysis proceeds as follows. Section 2 reviews the key elements of our formal analysis. Section 3 analyzes benchmark settings. Section 4 characterizes the asset impairment regulation that maximizes total expected surplus when it is prohibitively costly for asset owners to voluntarily certify the worth of high-value assets. Section 5 describes the corresponding policy that maximizes a weighted average of the expected welfare of distressed and non-distressed entrepreneurs. Section 6 explores the changes that arise when voluntary certification of asset values is not prohibitively costly. Section 7 concludes and suggests directions for future research. The proofs of all formal conclusions are presented in the Appendix.

2 The Basic Model

We consider settings in which risk-neutral entrepreneurs decide how much to invest in a risky asset. Following Dye (2002), investment I yields expected (gross) payoff $\hat{x}(I) = \frac{\beta}{\alpha} I^\alpha$, where α and β are strictly positive parameters. α is less than unity, reflecting diminishing

²We also find that when a non-trivial asset impairment regulation is imposed, the expected return to investment is always higher when the certification mandate is imposed only on asset sellers than when it is imposed on all asset owners.

expected payoffs to investment. The actual payoff to investment (x) is stochastic, and is modeled via $x = \hat{x}(I) + \varepsilon$, where ε is a random variable with a uniform distribution on the interval $[-f, f]$. f is a strictly positive constant. This simple formulation allows the level of investment to affect the expected financial payoff from investment, but not the variance of this payoff. The entrepreneur's activity here can be viewed as investment in and development of an asset in a particular class of assets.

After spending I to purchase and develop an asset, each entrepreneur learns privately the realized value of his asset. At the same time, each entrepreneur discovers privately whether exogenous financial considerations compel him to sell his asset. Each entrepreneur becomes so distressed with probability $\pi \in (0, 1)$. An entrepreneur is non-distressed (and so is not compelled to sell his asset) with probability $1 - \pi$.

An entrepreneur's investment decision may be affected by the prevailing asset impairment regulation. The regulation specifies a critical asset value, x_c , and requires all entrepreneurs whose assets are worth x_c or less to have the value of their asset certified before the asset is offered for sale. For simplicity, such certification is assumed to always reveal accurately the true value of the asset. The cost of certification is a known, fixed constant, $k > 0$, for all values of x_c . Entrepreneurs always comply with the stipulated asset impairment policy.³ Initially, voluntary certification of high-value assets is presumed to be prohibitively costly.⁴ This simplifying assumption is relaxed in section 6.

Buyers are unable to distinguish among uncertified assets. Therefore, all uncertified assets sell at a single market-clearing price, P . In equilibrium, this price is the expected value of all uncertified assets offered for sale. All distressed entrepreneurs offer their assets for sale, and those with realized asset values above x_c sell their uncertified assets at price P . Consequently, given investment level I and critical certification value $x_c \in [\underline{x}(I), \bar{x}(I)]$, the probability an uncertified asset is offered for sale, given it is owned by a distressed entrepreneur, is

$$\int_{x_c}^{\bar{x}(I)} g(x) dx = \frac{\bar{x}(I) - x_c}{2f}, \quad (1)$$

³Sufficiently large penalties for non-compliance, coupled with limited random testing of non-certified assets that are offered for sale, will induce such behavior.

⁴In practice, it is often more difficult to provide conclusive evidence that an asset has a particularly high value than it is to prove the asset has a particularly low value. High value often stems from such ethereal considerations as goodwill, while low value results from such readily observed, concrete considerations as physical damage.

where: (1) $\underline{x}(I) = \hat{x}(I) - f$ is the smallest possible realization of payoff x when investment I is undertaken; (2) $\bar{x}(I) = \hat{x}(I) + f$ is the corresponding largest possible realization of x ; and (3) $g(x) = \frac{1}{2f}$ for all $x \in [\underline{x}(I), \bar{x}(I)]$ is the unconditional density function for x , which reflects the uniform distribution of ε .

Non-distressed entrepreneurs with realized asset values below x_c or above P will retain, rather than sell, their assets. The sale of an asset with value $x \leq x_c$ requires certification, and so provides net payoff $x - k$ to the entrepreneur. By retaining such a low-value asset, the non-distressed entrepreneur enjoys the higher payoff, x . Similarly, the non-distressed entrepreneur secures value x by retaining an asset with value $x > P$, whereas he would realize the lower payoff P if he sold the uncertified asset. Consequently, when $x_c \in [\underline{x}(I), \bar{x}(I)]$, the probability an uncertified asset is offered for sale, given it is owned by a non-distressed entrepreneur, is:

$$\int_{x_c}^P g(x) dx = \frac{P - x_c}{2f}. \quad (2)$$

Equations (1) and (2) imply the probability an uncertified asset is traded at price P , given investment I , is:

$$q \equiv \pi \left[\frac{\bar{x}(I) - x_c}{2f} \right] + [1 - \pi] \left[\frac{P - x_c}{2f} \right]. \quad (3)$$

From equations (1) - (3), the expected value of an uncertified asset traded at price P , following investment I is:

$$v_a \equiv \frac{\pi [\bar{x}(I) - x_c]}{2fq} \left[\frac{x_c + \bar{x}(I)}{2} \right] + \frac{[1 - \pi][P - x_c]}{2fq} \left[\frac{x_c + P}{2} \right]. \quad (4)$$

Equating v_a and P provides:

Lemma 1. *When $x_c \in [\underline{x}(I), \bar{x}(I)]$, the equilibrium price of an uncertified asset, given investment I , is:*

$$P = x_c + \frac{\sqrt{\pi} [\bar{x}(I) - x_c]}{1 + \sqrt{\pi}}. \quad (5)$$

In summary, the timing in the model is as follows. First, the regulator specifies the asset impairment regulation (x_c). Second, entrepreneurs choose investment levels simultaneously and independently. Third, each entrepreneur observes privately the payoff from his investment. At the same time, each entrepreneur learns privately whether he is distressed (and so must sell his asset) or non-distressed (and so can retain his asset, if he chooses to do so). Fourth, entrepreneurs with realized asset values below x_c who choose to sell their asset have

their asset value certified at personal cost k . Fifth, entrepreneurs with realized asset values above x_c who choose to sell their (uncertified) assets offer these assets for sale. Finally, all uncertified assets offered for sale are sold at a price equal to the expected value of these uncertified assets. Certified assets also are sold at their known value at this time.

3 Benchmark Settings

Before characterizing optimal asset impairment regulation in the present setting, briefly consider three benchmark settings: the first-best setting, the no-certification setting, and the full-certification setting.

In the first-best setting, each entrepreneur's realized asset value is observed publicly and costlessly. Because there is no asymmetric information about asset values (and therefore no lemons problem) in this setting, risk-neutral entrepreneurs will undertake the surplus-maximizing level of investment, I^{FB} , where:

$$I^{FB} \equiv \arg \max_I \{ \hat{x}(I) - I \} \Leftrightarrow \hat{x}'(I^{FB}) = 1. \quad (6)$$

Furthermore, each entrepreneur in the first-best setting will secure an *ex ante* expected net payoff of $V^{FB} = \hat{x}(I^{FB}) - I^{FB}$.⁵

Now consider the no-certification (NC) setting in which the regulator imposes no certification requirement at all, and no asset is ever certified. Employing logic analogous to the logic employed to prove Lemma 1, it is readily verified that when no certification requirement is imposed and so no asset values are certified, the equilibrium price of uncertified assets will be:

$$P^{NC} = \underline{x}(I) + \frac{2f\sqrt{\pi}}{1 + \sqrt{\pi}} = \hat{x}(I) - \frac{f[1 - \sqrt{\pi}]}{[1 + \sqrt{\pi}]}. \quad (7)$$

Equation (7) reveals an equilibrium price of uncertified assets below the expected value of all assets in the population ($\hat{x}(I)$). The price reduction $\left(\left[\frac{1 - \sqrt{\pi}}{1 + \sqrt{\pi}} \right] f \right)$, which reflects the noted lemons problem, is more pronounced the greater is the potential variation in asset payoffs (f) and the greater is the likelihood ($1 - \pi$) of non-distressed entrepreneurs in the population. The reduced price arises from the common knowledge that non-distressed entrepreneurs will systematically offer low-value ($x \in (\underline{x}(I), P]$) assets for sale and withhold high-value

⁵Expectations here pertain to the time period before entrepreneurs observe the realized value of their assets and before they learn whether they are distressed or not distressed.

($x \in (P, \bar{x}(I))$) assets from the market, thereby diluting the average value of uncertified assets offered for sale.⁶

Given the equilibrium price for uncertified assets, P^{NC} , an entrepreneur's expected net payoff in the NC setting is:

$$V^{NC} \equiv \max_I \left\{ \pi P^{NC} + [1 - \pi] \left[\int_{\underline{x}(I)}^{P^{NC}} P^{NC} g(x) dx + \int_{P^{NC}}^{\bar{x}(I)} x g(x) dx \right] - I \right\} . \quad (8)$$

Finally, consider the full-certification (FC) setting in which the regulator requires the certification (at cost k) of all assets offered for sale. Non-distressed entrepreneurs never sell their assets in the FC setting because the certification cost reduces the net payoff from an asset sale below the value of the asset (which the entrepreneur can secure by retaining, rather than selling, the asset). Because distressed entrepreneurs must sell their assets, each incurs cost k , and sells his (certified) asset at a price equal to the realized value of the asset. Therefore, an entrepreneur's expected net payoff in the FC setting is:

$$V^{FC} \equiv \max_I \left\{ \pi [\hat{x}(I) - k] + [1 - \pi] \hat{x}(I) - I \right\} . \quad (9)$$

It is apparent from equation (9) that entrepreneurs will undertake the first-best level of investment (so $I^{FC} = I^{FB}$) in the FC setting, and their expected net payoff will be:

$$V^{FC} = \hat{x}(I^{FB}) - I^{FB} - \pi k. \quad (10)$$

4 Surplus-Maximizing Asset Impairment Regulation

In principle, impairment regulation could induce: (1) full certification, which arises when distressed entrepreneurs always certify the value of their assets in equilibrium; (2) selective certification, which arises when, in equilibrium, distressed entrepreneurs certify the value of their assets for some (lower) realized values, but not for other (higher) realized values; or (3) no certification, which occurs when no entrepreneur ever certifies the value of his asset,

⁶Equations (5) and (7) reflect risk-neutral, competitive pricing. In particular, market pricing in our model reflects self-fulfilling expectations and thus is never in error, given the available information. Consequently, gains and losses in the model arise from rational responses to information asymmetries, not to any fundamental mis-pricing of underlying pooled assets.

in equilibrium. To determine which of these three outcomes is optimal, initially suppose the regulator seeks to maximize expected surplus, which is an investor's expected net payoff from investment.

The greatest expected surplus the regulator could possibly achieve is $V^{FB} = \hat{x}(I^{FB}) - I^{FB}$, the expected surplus achieved in the first-best setting where there is no lemons problem. Proposition 1 reveals the surplus-maximizing regulator can secure this level of expected surplus by setting x_c below $\underline{x}(I^{FB})$, and thereby inducing no certification.

Proposition 1. *Surplus-maximizing regulation induces no certification by setting x_c below $\underline{x}(I^{FB})$. Surplus-maximizing regulation thereby induces the first-best investment level (I^{FB}), the first-best level of expected surplus ($V^{FB} = \hat{x}(I^{FB}) - I^{FB}$), and an equilibrium price for uncertified assets $P^{NC} = \hat{x}(I^{FB}) - \frac{f[1-\sqrt{\pi}]}{[1+\sqrt{\pi}]}$.⁷*

As noted above, when asset values are never certified, the lemons problem causes the equilibrium price of uncertified assets to fall below the expected value of all assets in the population. This price reduction imposes a loss on distressed entrepreneurs. However, non-distressed entrepreneurs gain from their ability to sell uncertified assets selectively at a price in excess of underlying value. These gains and losses are offsetting in equilibrium and so, at the time investment takes place, the expected return from investment is precisely the expected value of the investment. Consequently, risk-neutral entrepreneurs undertake the first-best investment level and achieve the same equilibrium expected net payoff as in the first-best setting.

5 Welfare-Maximizing Asset Impairment Regulation

Proposition 1 implies certification requirements like those in FAS 144 do not maximize expected surplus in the present setting. Aggregate expected surplus is highest when no certification requirement is imposed. However, certification requirements like those in FAS 144 can increase expected welfare when the returns to distressed entrepreneurs are valued more highly than the returns to non-distressed entrepreneurs.

To demonstrate this conclusion formally, suppose social welfare increases dollar for dollar with the net payoff of distressed entrepreneurs, but increases by only $w \in (0, 1)$ dollars as

⁷Full certification would also be optimal if certification were costless (so $k = 0$), since the lemons problem would then be eliminated without incurring any certification costs.

the net payoff of non-distressed entrepreneurs increases by one dollar. When the payoffs of non-distressed entrepreneurs are discounted in this manner, the gains they secure by selling their uncertified assets at a price above actual value confer a reduced social benefit. In this sense, the lemons problem imposes greater social losses. To limit these losses, the optimal asset impairment regulation in this setting (which we call welfare-maximizing asset impairment regulation) imposes a non-trivial certification requirement ($x_c > \underline{x}(I^{FB})$) on asset sellers when the cost of certification is sufficiently small. The certification requirement induces investment in excess of the first-best level, as investors attempt to reduce expected certification costs by securing assets with values above the certification threshold. The induced investment distortion and the equilibrium certification costs both reduce aggregate surplus. However, they also serve to increase the equilibrium price for uncertified assets and reduce the prevailing lemons problem. The result can be an increase in the welfare of distressed investors that outweighs the corresponding decline in the welfare of non-distressed investors, as Proposition 2 reports.

Proposition 2. *When k is sufficiently small,⁸ the welfare-maximizing asset impairment regulation (for $0 < w < 1$) induces selective certification via imposing a non-trivial certification requirement ($x_c > \underline{x}(I^{FB})$). The certification requirement induces investment above the first-best level.*

6 Asset Impairment Regulation with Voluntary Certification

The analysis to this point has presumed certification takes place only when it is mandated by regulatory fiat. Implicitly, the cost of certifying the asset has been assumed to be k if certification takes place within the mandated region, and to be prohibitive otherwise.⁹ This assumption is intended to capture most simply the intuitive idea that it is easier to certify the value of a distressed asset than it is to certify the value of an asset that is phenomenally successful.¹⁰ We now illustrate how alternative assumptions can introduce new qualitative

⁸The critical value of k is $\frac{2f[1-\pi][1-w][\pi-\sqrt{T}]}{\pi[1+\sqrt{\pi}]}$, where $T \equiv \frac{\pi[1+\sqrt{\pi}]c}{f[1-w][1-\sqrt{\pi}]}$ and C is the product of $[\pi + w(1 - \pi)]$ and $\left\{ \frac{1-\alpha}{\alpha} - \left[\frac{2f-\alpha[2f+\pi k]}{\alpha[2f+\pi k]} \right] \left[\frac{\pi k+2f}{2f} \right]^{\frac{1}{1-\alpha}} \right\} \beta^{\frac{1}{1-\alpha}}$.

⁹The "lower tail investigation" feature of this regulation is reminiscent of the performance investigation literature (e.g., Townsend, 1979; Baiman and Demski, 1980; Lambert, 1985; and Dye, 1986).

¹⁰FAS 144 and the predecessor FAS 121 reflect claims that the costs of certifying the fair value of a well-performing asset outweigh the corresponding benefits. For example, paragraph 141 of FAS 121 states "... Comment letters and ... testimony ... clearly indicated that a requirement to specifically test each asset or group of assets for impairment each period would not be cost-effective."

conclusions. To do so most simply, consider the design of surplus-maximizing impairment regulation when an asset can always be certified at cost k , regardless of its value.

In particular, suppose an entrepreneur can voluntarily certify the value of his asset ($x > x_c$) at personal cost k , if he chooses to do so. Also suppose an entrepreneur that chooses to sell an asset with actual value below x_c must certify the value of the asset (again, at personal cost k). A distressed entrepreneur, who must sell his asset, will undertake the mandated certification if his asset value is less than x_c in this setting. The distressed entrepreneur also will undertake voluntary certification if the value of his asset (x) exceeds the equilibrium price for non-certified assets (P) by more than the cost of certification (i.e., if $x \geq P + k$). Such voluntary certification is profitable because it allows the entrepreneur to increase the revenue from the sale of his relatively valuable asset by more than the cost of certification.

In contrast, a non-distressed entrepreneur will never undertake certification in this setting. Certification delivers payoff net of certification cost $x - k$ to an entrepreneur whose asset has value x (because certified assets can only be sold at their true value). Retention of the asset secures the higher payoff x . The non-distressed entrepreneur will continue to opportunistically sell his uncertified asset whenever its value is between x_c and the prevailing price for uncertified assets.

Proposition 3 considers the impact of voluntary certification when no mandatory certification is imposed. The proposition reveals the opportunity to voluntarily certify asset values can be detrimental for investors. When the cost of voluntary certification is sufficiently low, an investor will find it profitable to certify his asset whenever the value of the asset is sufficiently high. By removing the high-value assets from the pool of uncertified assets, such voluntary certification reduces the expected value, and thus the equilibrium price, of an uncertified asset. The combination of certification costs for high-value assets and a lower price for uncertified assets causes aggregate expected surplus to decline. Thus, investors would be better off if they could credibly promise to never avail themselves of the opportunity to voluntarily certify a high asset value. Absent this commitment power, investors are harmed by the ability to certify an asset value voluntarily.

Proposition 3. *Suppose entrepreneurs can voluntarily certify the value of their asset at cost $k < \frac{2f}{1+\sqrt{\pi}}$, but no mandatory certification is imposed. Then entrepreneurs will voluntarily certify asset values $x \geq \underline{x}(I^{FB}) + k[1 + \sqrt{\pi}]$, undertake the first-best level of investment (I^{FB}), and achieve expected surplus $\hat{x}(I^{FB}) - I^{FB} - \frac{\pi k}{2f}[2f - k(1 + \sqrt{\pi})] < V^{FB}$.*

Conceivably, mandatory certification of low-value assets as in FAS 144 could increase expected surplus in this setting with voluntary certification. Mandatory certification would both raise the equilibrium price of uncertified assets and reduce the incidence of (costly) voluntarily certification. However, mandatory certification only reduces equilibrium voluntary certification costs by introducing corresponding mandatory certification costs. Furthermore, although any diminution of the lemons problem can benefit distressed entrepreneurs, it can harm non-distressed entrepreneurs. On balance, mandatory certification affects neither the entrepreneur's investment level nor his expected net payoff in this setting.

Proposition 4. *Suppose entrepreneurs can voluntarily certify their asset at cost $k < \frac{2f}{1+\sqrt{\pi}}$. Then mandatory certification that induces selective certification affects neither the entrepreneur's investment level (I^{FB}) nor his expected net surplus.*

The "irrelevance" of mandatory certification suggested by Proposition 4 should be interpreted with caution because the conclusion reflects the simplifying assumptions of constant certification costs and a uniform distribution for the random component of payoffs (ε). The more robust conclusion is that the design of asset impairment regulation can become more complex and more subtle when voluntary certification is not prohibitively costly.

7 Conclusions

The foregoing analysis provides a mixed assessment of impairment requirements of the sort reflected in FAS 144. The analysis conforms that mandatory certification of asset values can mitigate lemons problems in asset resale markets, and thereby enhance social welfare. Further, selective certification can be preferable to full certification, and it can be optimal to require the certification of particularly low asset values. These are distinguishing features of FAS 144.

Our analysis does not provide unqualified support for every detail of FAS 144, however. Most importantly, we found that mandatory certification can reduce expected surplus, even when certification costs are small. Although mandatory certification reduces the lemons problem by raising the equilibrium price of uncertified assets, the associated gains for distressed entrepreneurs are more than offset by corresponding losses for non-distressed entrepreneurs. Therefore, mandatory certification is only welfare-enhancing in the simple setting considered here if the welfare of distressed entrepreneurs is valued more highly than the welfare of non-distressed entrepreneurs. Our analysis also emphasized the limited impact that mandatory certification can have on equilibrium investment and welfare when voluntary

certification is possible.

Our analysis also supports the imposition of asset certification requirements only on asset sellers, rather than on all asset owners (as in FAS 144). When these requirements are imposed on all asset owners, non-distressed entrepreneurs are forced to incur certification costs. In our model, where the requirements are imposed only on asset sellers, non-distressed entrepreneurs with particularly low asset values avoid certification costs without aggravating the lemons problem. The non-distressed entrepreneurs recognize they can only sell their low-value assets if they have their asset values certified, and so rationally choose to retain, rather than sell, their low-valued assets. In practice, small, closely-held firms often argue for regulatory relief. Such relief may be consistent with the identified optimality of limiting certification to instances where trades occur.¹¹

It remains to determine whether our conclusions persist in more general analyses of asset markets. Future research should consider more general certification cost structures and alternative forms of uncertainty, for example, as well as risk aversion. Alternative (imperfect) certification technologies and the possibility of evading certification mandates merit formal investigation, as do models that explore the interactions among distinct but related regulations. Interactions between the option to sell assets and managerial incentives also warrant consideration in richer models (along the lines of Arya and Glover (2003), for example).

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¹¹If unit certification costs decline with the scale of certification, some certification of the value of non-traded assets might be optimal.

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8 Appendix