A Simple Mechanism for Improving Insurance Regulation

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Abstract

Many actions of insurance companies are subject to a simple regulatory approval or disapproval. Typically, the company asking for approval does not have to pay a fee in order to have the regulator consider their proposal. Furthermore, if the proposal is accepted, the insurance company would not be entitled to any rebate of this fee if one were charged. This paper shows that neither of these features is optimal. If insurance companies have private information about the effects of their proposal, then the regulator can harness some of this private information if it requires a (possible substantial) fee for consideration of the proposal and promises to refund all or more than all of the fee back to the insurance company if the proposal is approved. In fact, if there is no limit on the size of the filing fee, then the regulator can induce the company to almost never file a proposal that reduces social welfare and therefore can almost always approve any proposal that is filed. If there is a limit on the size of the fee, then the use of refundable filing fees increases social welfare but does not achieve the first best.

1 Introduction

Insurance companies frequently must obtain regulatory approval for many actions they undertake. For example, insurance rates and policy forms are subject to regulatory approval in nearly all states; if an insurer wants to change its rates or introduce a new product, it usually needs regulatory approval; insurance companies investment strategies also can be subject to regulatory scrutiny if the regulators view them as not "sensible"; and, of course, mergers between insurance companies must be approved before they can be completed (Klein 1995). In most cases, the regulator does not charge the company a fee to submit its proposal for consideration. In the rare cases in which this does occur, the fee is typically not substantial. Furthermore, the insurance company is never entitled to any rebate on a filing fee (if one exists at all) if the regulator approves the proposal. This paper shows that none of these features of insurance regulation is generally optimal.

In any of the situations in which an insurance company is submitting a proposal for regulatory approval, the company will likely have better information about the regulation's consequences than will the regulator herself. If an insurance company asks for a rate increase or decrease, the desirability of this change will depend on the demand for the insurance product, the financial condition of the insurance company, and the degree of competition with other insurance companies. These are all facts the company itself is likely to have superior information about than the regulator. Similarly, since the company has done research on the likely effects of a new product it might offer, a merger,or its investment strategy, it will usually have superior information about the consequences of these actions than will the regulator.

Unfortunately, because the insurance company and the regulator often have at least somewhat opposing interests, the regulator cannot simply rely on the insurance company to truthfully report its information or to only submit a proposal in states of the world in which it knows the regulator would want to approve that proposal.[1] Instead, the regulator must typically rely on its own, less accurate, signals about the state of the world to determine whether or not to approve the company's proposal. In this paper, I show that despite a conflict of interest between the insurance company and the regulator, it is possible to use filing fees (fees for submitting a proposal) or refundable filing fees (filing fees for which some fraction, possibly exceeding one, of the fee is refunded is the

[1] In some cases, the regulator can rely on the market to discipline the insurance company. But, the existence of regulation in the first place suggests that the market itself will not guarantee efficient outcomes. This could be due to lack of competition, asymmetric information, or solvency concerns. Furthermore, one can think of the market response as one of the part of the information the company knows better than the regulator.

regulator approves the proposal) to partially or completely harness the private information of the insurance company about the state of the world to improve the regulator's decision-making.[2]

In special cases, the use of (possibly negative) filing fees alone can achieve the first best–the proposal is submitted and approved if and only if it increases social welfare. In other cases, the use of refundable filing fees can improve the regulator's decision-making even if it cannot achieve the first best. If, however, there are no constraints on the size of the filing fee or the degree of refundability, even in these cases one can get arbitrarily close to the first best.[3] Whether filing fees alone can achieve the first best depends on the degree of payoff alignment between the insurance company and the regulator. If insurance company's payoff from the proposal in all states in which the proposal increases social welfare is greater than its payoff from the proposal in all states in which the proposal decreases social welfare, a filing fee (or subsidy) can guarantee that the insurance company's payoff is positive if and only if the proposal increases social welfare. In this (easy) case, all the regulator need do is charge the appropriate filing fee (or subsidy) and then approve any proposal the insurance company submits.

If the payoff alignment between the insurance company and the regulator is worse, so that the insurance company's payoff in some states that decrease social welfare is greater than its payoff in some states that increase social welfare, then filing fees alone cannot induce the company to submit the proposal if and only if it increases social welfare. In these cases, the regulator must make at least some use of her imperfect signals of the state of the world. That said, by making the filing fee refundable upon approval, the regulator can increase the difference in the company's payoff between approval and disapproval. The larger is this difference, the more the company only wants to submit its proposal in states in which approval is most likely. As long as the regulator's signals are of any value, this will be in states in which the proposal increases social welfare. As a result, the use of refundable filing fees can reduce the probability that the insurance company submits the proposal in states in which doing so reduces social welfare. Of course, in equilibrium the probability the company submits the proposal in welfare-reducing states can never be zero or

[2]If the insurance company is a repeat player with the regulator, it may be able to develop a reputation for only submitting reasonable proposals. To the extent this reputational mechanism works, it would serve much the same purpose as the refundable filing fees in this paper. In both cases, the company has something to lose, either its filing fees or its reputation, if the regulator rejects the proposal. That said, reputation is only valuable to the extent that you can exploit it. Thus, reputation, by itself, will not work as well as refundable filing fees, though it may provide a useful supplement. Furthermore, given that many insurance companies may not submit proposals that frequently, insurance company management may change, and regulators may change, reputation will not always provide strong incentives.

[3]As will become clear, this result is related to Mirrlees (1999) result that in some situations the solution to the standard moral hazard problem can be arbitrarily close to the first best outcome.

else the regulator would want to approve any proposal submitted, in which case the company would submit any proposal that has a positive private payoff regardless of the social payoff. That said, if there are no constraints on the size of the filing fee (no limited liability) or the size of the refund, one can make the probability the insurance company will submit the proposal arbitrarily close to zero in welfare-reducing states while still inducing it to submit the proposal with probability one in welfare-increasing states. If there are limits on the filing fee or the amount of refundability, then the regulator cannot achieve the first best, but she still can reduce the probability that the company files welfare-reducing proposals and, thus, improve regulatory outcomes.

This paper is related to the literature on regulation with asymmetric information (see Laffont and Tirole 1993). That literature, however, is typically concerned with direct, ongoing, regulation, rather than the simple approval or disapproval regulation with which I am concerned here. More closely related are a series of papers on the regulation of mergers (mergers are typically either subject to binary (approval or disapproval) outcome). In fact, the model in this paper could be applied to merger regulation outside of the insurance context. Besanko and Spulber (1993) model the decision to merge by firms with private knowledge of the efficiency consequences of the merger. In their model, however, the government regulator has no independent signal of the state (the efficiency consequences of the merger). Rather, they model of how commitment to a pro-consumer welfare standard can influence the merger filing decision in a way that increases social welfare. Cassiman (2000) has a related model of regulatory approval or disapproval of research joint ventures in which the firms have private information about the degree of research spillovers. In that model, as well, the regulator has no independent signal of the degree of spillovers. Rather, both firms report independently, which enables the regulator to harness some of the firm's private information. Langerlof and Heidhues (2005) also model mergers with private information to analyze whether regulators should consider efficiencies. Once again, this paper does not consider the possibility that the regulator may have an independent signal of efficiencies. Rather, it is concerned with the relative costs and benefits of inducing the merging parties to produce verifiable evidence of the efficiencies from the merger.

The next section outlines the structure of the model. Section 3 discusses the cases in which filing fees alone can achieve the first best. Section 4 discusses the cases in which the regulator must use refundable filing fees in conjunction with its signals of the state. Section 4.1 analyzes a case in which the regulator only needs to use one of its two signals. Section 4.2 analyzes a case in which the regulator uses both signals. Section 5 concludes.

2 Model

An insurance company submits a proposal to a social welfare-maximizing regulator for approval. This could be an application for a rate increase or decrease, for a change in its policy forms, to enter a new line of business, to merge with another insurance company or for any other action requiring regulatory approval. This proposal has two separate effects on social welfare measured by $B \in \{B_h, B_l\}$ and $K \in \{K_h, K_l\}$; $B_h > B_l$ and $K_h > K_l$. The prior probability that $B = B_h$ is p_B, and the prior probability that $K = K_h$ is p_K. These states are uncorrelated. These effects are shared between the insurance company and the rest of society (typically the consumers) as follows. The insurance company's payoff from getting the proposal approved is $\beta B + \kappa K$. Thus, consumer's benefit from the proposal is $(1 - \beta)B + (1 - \kappa)K$. I assume that dimension B is such that the insurance company's interests are necessarily somewhat aligned with society's, so that $\beta > 0$. I allow for $\beta > 1$. I assume, without loss of generality, that $\beta > \kappa$. It is possible that the insurance company's interests in dimension K are directly opposed to society's; that is, I allow for the possibility that $\kappa < 0$. I assume that β and κ are common knowledge, but that the actual values of B and K are private information of the insurance company. The regulator does, however, observe signals b and k of B and K, respectively. I assume the cumulative distribution function for b and k given B and K are given by $F_h(b), F_l(b), G_h(k), G_l(k)$ for high and low values of B and K, respectively with support $[\underline{b}, \overline{b}]$ and $[\underline{k}, \overline{k}]$. $f_h(b), f_l(b), g_h(k), g_l(k)$ are the associated density functions. I assume that both f_j and g_j satisfy the monotone likelihood ratio property (MLRP): $\frac{f_h'(b)}{f_h(b)} > \frac{f_l'(b)}{f_l(b)}$ and $\frac{g_h'(k)}{g_h(k)} > \frac{g_l'(k)}{g_l(k)}$.

The insurance company must pay a fee, f, to submit the proposal to the regulator. If this fee is constrained, then the maximum filing fee is denoted as $\bar{f}$. If the regulator approves the proposal, then a fraction, γ, of the fee is rebated to the company. I allow the filing fee to be positive or negative and the rebate fraction to be greater or less than one. To make the problem interesting, I will assume that $B_h + K_h > 0$ and $B_l + K_l < 0$, so that there is at least one state in which the regulator wants to approve the proposal and at least one state in which she wants to reject it. Similarly, I will assume that the insurance company's interests are partially but not completely aligned with the regulator's so that there exists a state ij such that $\beta B_i + \kappa K_j > 0$ and $B_i + K_j > 0$ and another state $i'j'$ such that either $\beta B_{i'} + \kappa K_{j'} > 0$ and $B_{i'} + K_{j'} < 0$ (the insurance company may be tempted to submit a welfare-reducing proposal) or $\beta B_{i'} + \kappa K_{j'} < 0$ and $B_{i'} + K_{j'} > 0$ (the insurance company may not submit a welfare-increasing proposal) or both. One can then divide the analysis into cases in which a filing fee alone achieves the first best (section 3) and cases in which a filing fee enables the regulator to use her signals of the state more efficiently to approach the first best (section 4).

In section 4, I restrict attention to two cases. First, I consider the case in which only $B_h+K_h > 0$. In this case, it turns out that if $\bar{f}$ is not too small, that the regulator only needs to use her signal k of K since the insurance company only submits the proposal when $B = B_h$. Second, I consider the case in which $B_h + K_l > 0$ and $B_l + K_h, B_l + K_l < 0$. In this case the regulator needs to use both signals b and k. After examining both cases, it will become clear that the remaining cases that I do not consider are also ones in which the regulator makes use of both signals and that the analysis in these cases is very similar to what I present in section 4.2. In the interest of avoiding redundancy, these cases are omitted.

3 Filing fee alone achieves the first best

In some cases, the introduction of a filing fee alone may be sufficient to achieve first best regulation. The first proposition describes the conditions that are necessary for this to be the case. Notice that in some cases this filing fee may be negative.

Proposition 1 *If $\beta B_i+\kappa K_j > \beta B_{i'}+\kappa K_{j'}$ for any two states ij and $i'j'$ such that $B_i+K_j > 0$ and $B_{i'} + K_{j'} < 0$ and $\bar{f} \geq Max_{i'j'st\ B_{i'}+K_{j'}<0}\beta B_{i'} + \kappa K_{j'}$ then there exists a feasible $f \in [f_1, f_2]$ such that if the insurance company must pay f to submit its proposal to the regulator, then in the unique perfect Bayesian equilibrium insurance company submits its proposal in state ij if and only if $B_i + K_j > 0$ and the regulator approves this proposal with probability one.*

Proof. Let $f_1 = Max_{i'j'st\ B_{i'}+K_{j'}<0}\beta B_{i'} + \kappa K_{j'}$ and $f_2 = Min_{ij\ st\ B_i+K_j>0}\beta B_i + \kappa K_j$. The assumption that $\beta B_i+\kappa K_j > \beta B_{i'}+\kappa K_{j'}$ *for any two states* ij *and* $i'j'$ *such that* $B_i+K_j > 0$ *and* $B_{i'} + K_{j'} < 0$ guarantees that $f_2 > f_1$. If the regulator will always approve any proposal, then for $f \leq f_2$, the insurance company will submit its proposal whenever $B_i+K_j > 0$. If $f \geq f_1$ then even if its proposal will be approved with probability one, the insurance company will not submit its proposal if $B_i+K_j < 0$. Such an f is feasible so long as $\bar{f} \geq f_1$. Given that the insurance company follows this submission strategy, it is optimal for the regulator to approve any submission since only welfare increasing submissions are submitted. It is easy to see that no other strategies can be an equilibrium since insurance company will never want to file a welfare-reducing submission, so the regulator will always approve any submissions filed. Q.E.D.

Proposition 1 shows that under a certain conditions there are a range of cases in which introducing a filing fee alone can achieve the first best. These cases occur when, although the regulator and the company may have different preference intensity, the states that increase social welfare all generate a higher gross payoff to the insurance company than do the states that reduce social welfare. In these cases, a filing fee which exceeds the company's payoff from the welfare-reducing state with the highest payoff for the company but is less than the company's payoff from the welfare-increasing state with the lowest payoff for the company can induce the company to only file in states that increase social welfare. With those incentives, the regulator can approve the proposal whenever the company submits it. Notice that if the problem is that the insurance company may submit welfare-reducing proposals, this filing fee will be positive. If, on the other hand, the problem is that the insurance company might not submit welfare-increasing proposals, then this filing fee will be negative.

4 Filing fee alone does not achieve the first best

If the payoff to the insurance company might be higher in a state in which the proposal reduces social welfare than in a state in which the proposal increases social welfare, then the introduction of a filing fee alone will not guarantee the first best. The reason is that the regulator cannot approve any proposal with probability one or else the company will either not submit a welfare-increasing proposal because of the high filing fee or will submit a welfare-reducing proposal because the regulator will approve it. As a result, the regulator must, at least in part, base her decision on the signals she receives about the state. How she uses these signals depends on in which states the company might file even if the proposal reduces social welfare or might fail to file even if the proposal increases social welfare. The next subsection considers cases in which the regulator need only consider one signal, k, in order to achieve the second best option. The following subsection considers optimal filing fees and regulation when the regulator uses both signals.

4.1 $B_h + K_l < 0$ and $B_l + K_h < 0$

If the proposal only increases social welfare in state hh, then the optimal regulatory strategy (in cases in which the filing fee alone is not sufficient to achieve the first best) only uses the regulator's signal, k, of K. In this case, notice that it must be that $\kappa < 0$ or else the condition of Proposition 1 is satisfied. Given this, first consider the case in which $\beta B_h + \kappa K_l > 0$ but $\beta B_l + \kappa K_l < 0$. The regulatory problem is simply deterring filing in state hl. In this situation, however, the company only wants to file if $B = B_h$, so the regulator need not consider her signal b of B. Moreover, because of MLRP, the regulator will follow a cut-off strategy of approving the proposal if and only if $k \geq k^*$ for some k^*. Given this, in state hh the company submits the proposal if and only if $(1 - G_h(k^*))(\beta B_h + \kappa K_h + \gamma f) - f \geq 0$ where f is the filing fee and γ is the share of the filing fee that is rebated to the company if its proposal is approved. In state hl the company submits the proposal if and only if $(1 - G_l(k^*))(\beta B_h + \kappa K_l + \gamma f) - f \geq 0$. Because the regulator chooses her ex post optimal strategy, it is not possible for the company to only submit a proposal in hh. If that could happen, then the regulator would approve any proposal with probability one (set $k^* = \underline{k}$), in which case the company would submit a proposal in hl.

Thus, the best equilibrium for social welfare must involve the company submitting a proposal in hh with probability one and playing a mixed submission strategy in hl (submitting with probability s_{hl}). This is only possible if $(1 - G_h(k^*))(\beta B_h + \kappa K_h + \gamma f) - f \geq 0$ when $(1 - G_l(k^*))(\beta B_h + \kappa K_l + \gamma f) - f = 0$. This is equivalent to

$$(K_h - K_l)\kappa(1 - G_h(k^*))(1 - G_l(k^*)) + f(G_l(k^*) - G_h(k^*)) \geq 0 \tag{1}$$

The first term is negative since $\kappa < 0$, while the second term is positive since G_h stochastically dominates G_l (by MLRP). The left-hand side is increasing in $G_l(k^*)$ and decreasing in $G_h(k^*)$ (the probability the proposal is rejected in state hl and hh respectively) and increasing in f (the size of the filing fee)–γ (the share of the filing fee that is refundable) is chosen to satisfy $(1 - G_l(k^*))(\beta B_h + \kappa K_l + \gamma f) - f = 0$. If the signal is sufficiently accurate, it is easy to see that this can be positive (it is positive if $G_l(k^*) = 1$ since $\beta B_h + \kappa K_h > 0$). Condition (1) is easier to satisfy for larger f and will always hold if f can be made large enough. Furthermore, as the following lemma shows, under a reasonable hazard rate condition, the higher the cutoff signal for approval, the easier it is to induce the firm to file in hh with probability one whenever it plays a mixed submission strategy in hl.

Lemma 1 *Assume* $\frac{g_l(k)}{1-G_l(k)} > \frac{g_h(k)}{1-G_h(k)}$. *If, for* $k^* = \hat{k}$, *the* f *that makes the company indifferent between submitting the proposal in state hl also induces the company to strictly prefers to submit the proposal in state hh, then for any* $k^* > \hat{k}$, *the* f *that makes the company indifferent between submitting the proposal in state hl will also induce the company to strictly prefers to submit the proposal in state hh.*

Proof. If the company is indifferent between submitting and not in hl, then it must be that $(1 - G_l(k^*))(\beta B_h + \kappa K_l + \gamma f) = f$. For the company to strictly prefer submitting the proposal in hh, it must be that $(1 - G_h(k^*))(\beta B_h + \kappa K_h + \gamma f) > f$. Thus, it suffices to show that $(1 - G_h(k^*))(\beta B_h + \kappa K_h + \gamma f)/(1 - G_l(k^*))(\beta B_h + \kappa K_l + \gamma f)$ is strictly increasing in k^*. Taking the derivative of this with respect to k^* yields

$$\frac{(\beta B_h + \kappa K_h + \gamma f)\{(1 - G_h(k^*))g_l(k^*) - (1 - G_l(k^*))g_h(k^*)\}}{(1 - G_l(k^*))^2(\beta B_h + \kappa K_l + \gamma f)} \tag{2}$$

This is positive since $\frac{g_l(k)}{1-G_l(k)} > \frac{g_h(k)}{1-G_h(k)}$. Q.E.D.

From here on, assume the regulator's signals are sufficiently accurate that there is a cutoff value k^* so that the expected payoff from submitting the proposal is larger in state hh than in state hl. This is formalized in the following assumption.

Assumption 1 *For any $f > 0$, there exists a $k^* < \overline{k}$ such that $(K_h - K_l)\kappa(1 - G_h(k^*))(1 - G_l(k^*)) + f(G_l(k^*) - G_h(k^*)) = 0$.*

Assumption 1 implies that no matter how small the filing fee, there is a minimum cutoff $k^* = \hat{k}$ so that the company submits the proposal with probability one in state hh and with some probability strictly between zero and one if state hl if and only if $k^* \geq \hat{k}$. Of course, if the filing fee is sufficiently small, by Lemma 1, this cutoff may have to be arbitrarily close to $\overline{k}$. If the regulator does indeed choose $k^* \geq \hat{k}$, then let s_{hl} be the probability that the company submits the proposal in state hl. To ensure that this is in fact between zero and one, it must be that $(1-G_l(k^*))(\beta B_h+\kappa K_l+\gamma f) = f$ or $\gamma^*(f) = \frac{f-(1-G_l(k^*))(\beta B_h+\kappa K_l)}{f(1-G_l(k^*))}$.

The regulator, then, chooses k^* to maximize social welfare. This amounts to choosing k^* so that the expected social welfare of a proposal in which the regulator receives a signal of k^* is zero. The expected social welfare of a proposal with a signal k, given that the firm submits the proposal with probability one in hh and with probability s_{hl} in hl (and with probability zero in all other states) is given by:

$$\frac{p_K g_h(k)}{p_K g_h(k) + (1 - p_K)s_{hl}g_l(k)}(B_h + K_h) + \frac{(1 - p_K)s_{hl}g_l(k)}{p_K g_h(k) + (1 - p_K)s_{hl}g_l(k)}(B_h + K_l) \tag{3}$$

k^* is the value of k for which this expression is zero. Totally differentiating this with respect to s_{hl} at $k = k^*$ gives $\frac{dk^*}{ds_{hl}} = \frac{g_h(k)g_l(k)}{s_{hl}(g_l(k)g_h'(k)+g_l'(k)g_h(k))} > 0$. This expression is positive due to the MLRP assumption. This is not surprising since the less likely the company is to file in state hl the lower the signal for which the regulator can approve the proposal and still expect social welfare not to decline. Thus, the equilibrium values of k^* and s^*_{hl} must satisfy the following conditions if the insurance company is going to submit the proposal in state hh with probability one and in state hl with probability less than one:

$$\begin{aligned} p_K g_h(k^*)(B_h + K_h) + (1 - p_K)s^*_{hl} g_l(k^*)(B_h + K_l) = 0 \\ (1 - G_l(k^*))(\beta B_h + \kappa K_l + \gamma f) = f \end{aligned} \tag{4}$$

The second equation determines k^* for any given f and γ and the first equation determines s^*_{hl} given k^*. Higher filing fees then create an equilibrium with a lower cutoff value, k^*, for approval of the proposal and thus (because of the first equilibrium condition) a lower probability of filing in state hl, s^*_{hl}. Since total welfare is given by $p_K(1-G_h(k^*))(B_h+K_h)+(1-p_K)s_{hl}(1-G_l(k^*))(B_h+K_l)$, and the regulator chooses k^* to maximize total welfare, lower levels of s_{hl} can only increase welfare (since $B_h + K_l < 0$). Thus, the best equilibrium for total welfare must be the one with the lowest feasible values for k^* and s^*_{hl}, and thus with the highest values for f. The feasibility constraint is that $k^* \geq \hat{k}$ or else the company will not submit the proposal in state hh. $\hat{k}$, of course, is the k^* for which the left hand side of (1) is zero. Of course, if $\bar{f}$ is sufficiently low, it may not be possible to satisfy (4). Inspection of (1) shows that this is easier to satisfy for higher levels of f. With a low f, it might be that the k^* necessary to satisfy the second equation in (4) would make the first equation positive even if $s^*_{hl} = 1$. The mixed filing strategy equilibrium in state hl, then is only possible if there exists a $\tilde{k} \in [\underline{k}, \overline{k}]$ such that:

$$\begin{aligned} p_K g_h(\tilde{k})(B_h + K_h) + (1 - p_K) g_l(\tilde{k})(B_h + K_l) \leq 0 \\ (1 - G_l(\tilde{k}))(\beta B_h + \kappa K_l + \gamma \bar{f}) = \bar{f} \end{aligned} \tag{5}$$

If this is not the case, then the only possible equilibrium is one in which the insurance company submits the proposal with probability one in both hh and hl.

Lemma 2 *If $\beta B_h + \kappa K_l > 0$ and $\beta B_l + \kappa K_l < 0$ and $\kappa < 0$ and there exists a $\tilde{k} \in [\underline{k}, \overline{k}]$ such that (5) holds, then it is socially optimal to make the filing fee as large as possible, $f = \bar{f}$. The socially optimal level of refundability is given by $\gamma^*(\bar{f}.) = \frac{\bar{f}. - (1-G_l(\hat{k}^*))(\beta B_h + \kappa K_l)}{\bar{f}.(1-G_l(\hat{k}^*))}$ where $\hat{k}^*$ is the value of k^* that satisfies $(K_h - K_l)\kappa(1 - G_h(\hat{k}^*))(1 - G_l(\hat{k}^*)) + \bar{f}.(G_l(\hat{k}^*) - G_h(\hat{k}^*)) = 0$. If there is no constraint on γ and f, then one can get arbitrarily close to the first best by* *letting* $k^* \to \underline{k}$ *and* $\gamma^* \to 1/(1-G_l(k^*))$ *and* $f = \frac{(1-G_l(k^*))(\beta B_h + \kappa K_l)}{1-\gamma^*(1-G_l(k^*))}$.

Proof. Given that the company will file with probability one in state hh and with some probability strictly between zero and one in state hl, I have already shown it is socially optimal to reduce the probability of filing in state hl as low as possible and to increase the probability of approval given filing as high as possible. How far one can do this is limited by the constraint that the company's net expected payoff from filing is at least as great in state hh as in state hl. This constraint is easier to satisfy for larger f. Thus, if f is constrained to not exceed $\bar{f}$, the socially optimum occurs at $f = \bar{f}$ and the lowest value of k^* consistent with this constraint, which is $\hat{k}^*$. $\gamma = \gamma^*(\bar{f}.) = \frac{\bar{f}.-(1-G_l(\hat{k}^*))(\beta B_h + \kappa K_l)}{\bar{f}.(1-G_l(\hat{k}^*))}$ guarantees that the company is indifferent between filing and not in state hl. If there is no constraint on γ or f, then by increasing γ arbitrarily close to $1/(1-G_l(k^*))$ one can satisfy (1) for k^* arbitrarily close to $\underline{k}$ and then (4) implies that s^*_{hl} is arbitrarily close to zero and $f = \frac{(1-G_l(k^*))(\beta B_h + \kappa K_l)}{1-\gamma^*(1-G_l(k^*))}$. Because the probability of the proposal being approved approaches one in state hl and approaches zero in hl (since the probability of filing approaches zero in this state), this approaches the first best. Q.E.D.

Lemma 2 says that because higher filing fees reduce the probability of the company submitting the proposal in the state in which the proposal reduces welfare, state hl, it is optimal to make the filing as large as possible. This makes the regulator's job easier by enabling her to rely more on the strong signal sent by filing that the state is one in which the proposal increases welfare rather than on her noisy signal of the state. This strategy, however, is limited by the need to ensure that the company still has the incentive to file in the good state, hh. Thus, the social optimum increases the filing fee and reduces the signal cutoff for approval as far as possible until the company becomes indifferent to submitting the proposal in either state. The filing fee can be increased more and the cutoff for approval reduced more the more refundable the filing fee is (up to $1/(1-G_l(k^*))$) upon acceptance of the proposal. It is optimal to make the filing fee as large as possible. If there is no limit on γ and f, then by creating a large subsidy for filing if it is approved and making the filing fee large enough, one can approach the first best by ensuring that the insurance company almost never submits the proposal in state hl and still wants to submit the proposal in state hh and by ensuring that the regulator then almost always approves the proposal. The company still has a larger payoff from submitting the proposal in state hh than hl since the probability of approval in hh is slightly higher and the payoff from approval is tremendous due to the large subsidy for approval. This result is reminiscent of Mirrlees (1999).

Up until now, I have assumed that the company will only consider filing proposals in state hh

(when doing so increases welfare) or in state hl (when doing so decreases welfare), but will not file in any of the other cases that reduce welfare. If either $\beta B_l + \kappa K_l > 0$ and $\beta B_l + \kappa K_h < 0$ or $\beta B_l + \kappa K_h > 0$, then the regulator's problem is potentially more complicated because the company might have want to submit the proposal for either value of B. Thus, she may need to consider her signal b of B. That said, notice that if the regulator follows the same strategy as outlined in Lemma 2, then the company will never file in state ll. To see this, notice that since $\beta > 0$, $\beta B_h + \kappa K_l > \beta B_l + \kappa K_l$. Since the strategy in Lemma 2 makes the company indifferent between submitting the proposal in hl and not, the payoff from submitting the proposal in ll must be negative. Thus, even if $\beta B_l + \kappa K_l > 0$ or $\beta B_l + \kappa K_h > 0$, the probability of the company submitting a proposal in states ll or lh are zero if the filing fee and approval cutoff for k^* are those given in Lemma 2. Thus, I have proved the following proposition.

Proposition 2 *If $\kappa < 0$, there exists a $\tilde{k} \in [\underline{k}, \overline{k}]$ such that (5) holds and Assumption 1 holds, then the socially optimal filing fee is given by $\bar{f}$, the socially optimal level of refundability is given by $\gamma^*(\bar{f}.) = \frac{\bar{f}.-(1-G_l(\hat{k}^*))(\beta B_h+\kappa K_l)}{\bar{f}.(1-G_l(\hat{k}^*))}$ where $\hat{k}^*$ is the value of k^* that satisfies $(K_h - K_l)\kappa(1 - G_h(\hat{k}^*))(1 - G_l(\hat{k}^*)) + \bar{f}.(G_l(\hat{k}^*) - G_h(\hat{k}^*)) = 0$. If there are no constraints on γ* and *f, then one can get arbitrarily close to the first best by letting $k^* \to \underline{k}$ and $\gamma^* \to 1/(1-G_l(k^*))$ and $f = \frac{(1-G_l(k^*))(\beta B_h+\kappa K_l)}{1-\gamma^*(1-G_l(k^*))}$. The insurance company submits the proposal with probability one in state hl, with probability s^*_{hl} in state hl, and with probability zero in states ll and lh. The regulator approves the proposal if and only if $k \geq \hat{k}^*$ and does not base her decision on b, her signal of B. s^*_{hl} and $\hat{k}^*$ are given by $(K_h - K_l)\kappa(1 - G_h(\hat{k}^*))(1 - G_l(\hat{k}^*)) + \bar{f}.(G_l(\hat{k}^*) - G_h(\hat{k}^*)) = 0$ and $p_K g_h(\hat{k}^*)(B_h + K_h) + (1 - p_K)s^*_{hl} g_l(\hat{k}^*)(B_h + K_l) = 0$.*

Proposition 2 says than whenever the regulator only wants to approve the proposal in state hh and $\kappa < 0$, that it need only consider its signal of K, the parameter in which it has opposing interests from the company. In so doing, it can reduce the probability of the company submitting a proposal that reduces social welfare by making the filing fee large and refundable upon approval. If this refund can exceed the actual fee, then the regulator can, by making the filing fee sufficiently large and the refund sufficiently great, induce the company to almost never file in a state which reduces social welfare and therefore almost always approve the proposal (rejecting only when the signal of K is close to its worst possible level). This allows it to almost completely harness the private information of the company and thus approach the complete information outcome despite the fact that the regulator and the company have opposite preferences concerning K.

If $\beta B_l + \kappa K_l > 0$ or $\beta B_l + \kappa K_h > 0$ and (5) does not hold, then while it is not be possible to induce a mixed filing strategy in state hl, the regulator now wants to deter filing in states ll or lh. Since both $\beta B_l + \kappa K_l$ and $\beta B_l + \kappa K_h$ are less than $\beta B_h + \kappa K_l$, it is possible that $\bar{f}$ would be large enough to satisfy the analogue of (5) for those states. If so, then it would be possible to completely deter filing in those states (by following a strategy similar to what is discussed in the next subsection) since doing so would not make the regulator want to approve any submission (since the company still submits in hl). If $\bar{f}$ is not large enough even for this, then the company would submit the proposal in any state in which it had a positive payoff.

4.2 $B_h + K_l > 0$ and $B_l + K_h < 0$ and $B_l + K_l < 0$

If the proposal only increases social welfare in states hh and hl, then the filing fee will not achieve the first best if and only if $\beta B_l + \kappa K_l > \beta B_h + \kappa K_h$ (if $\kappa > 0$, a filing fee alone will always achieve the first best since $\beta > \kappa$). The regulatory problem is to induce filing in state hh while minimizing filing in state ll (because $\kappa \leq 0$, if the company files in hh it will also file in hl). Because there will be filing for both values of B and K, the regulator will use both signals. Nonetheless, because of MLRP, the regulator will follow a cut-off strategy of approving the proposal if and only if $b \geq b^*(k)$ for some decreasing function $b^*(k)$ for any k. Alternatively, one can write the regulator's strategy as approving the proposal if and only if $k \geq k^*(b)$ for some function decreasing function $k^*(b)$. Given this, in state hh the company submits the proposal if and only if $(\beta B_h + \kappa K_h + \gamma f) \int_{\underline{k}}^{\overline{k}} g_h(k)(1 - F_h(b^*(k))dk - f \geq 0$ where f is the filing fee and γ is the share of the filing fee that is rebated to the company if its proposal is approved. In state ll the company submits the proposal if and only if $(\beta B_l + \kappa K_l + \gamma f) \int_{\underline{k}}^{\overline{k}} g_l(k)(1 - F_l(b^*(k))dk - f \geq 0$. Because the regulator chooses her ex post optimal strategy, it is not possible for the company to never submit a proposal in ll. If that could happen, then the regulator would approve any proposal with probability one (set $b^*(k) = \underline{b}$), in which case the company would submit a proposal in ll.

Thus, the best equilibrium for social welfare must involve the company submitting a proposal in hh and hl with probability one and playing a mixed submission strategy in ll (submitting with probability s_{ll}). This is only possible if $(\beta B_h + \kappa K_h + \gamma f) \int_{\underline{k}}^{\overline{k}} g_h(k)(1 - F_h(b^*(k))dk - f \geq 0$ when $(\beta B_l + \kappa K_l + \gamma f) \int_{\underline{k}}^{\overline{k}} g_l(k)(1 - F_l(b^*(k))dk - f = 0$. This is equivalent to

$$f(\frac{q_{hh}}{q_{ll}} - 1) - q_{hh}\{(\beta B_l + \kappa K_l) - (\beta B_h + \kappa K_h)\} \geq 0 \tag{6}$$

In this expression, q_{ij} is the probability of the regulator approves a proposal submitted in state ij. So, $q_{hh} = \int_{\underline{k}}^{\overline{k}} g_h(k)(1 - F_h(b^*(k))dk$ and $q_{ll} = \int_{\underline{k}}^{\overline{k}} g_l(k)(1 - F_l(b^*(k))dk$. Clearly, condition (6) is easier to satisfy the larger is f and the smaller is the difference between $\beta B_l + \kappa K_l$ and $\beta B_h + \kappa K_h$. Furthermore, as the following lemma shows, under a reasonable hazard rate condition, the higher the cutoff for either signal b or k for approval given the value of the other signal, the easier it is to induce the firm to file in hh with probability one whenever it plays a mixed submissions strategy in ll.

Lemma 3 *Assume* $\frac{f_l(b^*(k)))g_l(k)}{\int_{\underline{k}}^{\overline{k}}(1-F_l(b^*(k)))g_l(k)dk} > \frac{f_h(b^*(k)))g_h(k)}{\int_{\underline{k}}^{\overline{k}}(1-F_h(b^*(k)))g_h(k)dk}$ and $\frac{g_l(k^*(b)))f_l(b)}{\int_{\underline{b}}^{\overline{b}}(1-G_l(k^*(b)))f_l(k)dk} > \frac{g_h(k^*(b)))f_h(b)}{\int_{\underline{b}}^{\overline{b}}(1-G_h(k^*(b)))f_h(k)dk}$. *If, for $k^*(b) = \hat{k}(b)$ or $b^*(k) = \hat{b}(k)$, the f that makes the company indifferent between submitting the proposal in state ll also induces the company to strictly prefer to submit the proposal in state hh, then for any $k^*(b) > \hat{k}(b)$ or $b^*(k) > \hat{b}(k)$, the f that makes the company indifferent between submitting the proposal in state ll will also induce the company to strictly prefer to submit the proposal in state hh.*

Proof. If the company is indifferent between submitting and not in ll, then it must be that $(\beta B_l + \kappa K_l + \gamma f) \int_{\underline{k}}^{\overline{k}} g_l(k)(1 - F_l(b^*(k))dk = f$. For the company to strictly prefer submitting the proposal in hh, it must be that $(\beta B_h + \kappa K_h + \gamma f) \int_{\underline{k}}^{\overline{k}} g_h(k)(1 - F_h(b^*(k))dk > f$. Thus, it suffices to show that $\frac{(\beta B_h+\kappa K_h+\gamma f) \int_{\underline{k}}^{\overline{k}} g_h(k)(1-F_h(b^*(k;\lambda))dk}{(\beta B_l+\kappa K_l+\gamma f) \int_{\underline{k}}^{\overline{k}} g_l(k)(1-F_l(b^*(k;\lambda))dk}$ is strictly increasing in λ, where λ is a parameter that measures level of the b cutoff for any given k. That is, $\frac{\partial b^*(k;\lambda)}{\partial \lambda} \geq 0 \ \forall k \in [\underline{k}, \overline{k}]$ and $\exists k \in [\underline{k}, \overline{k}]$ such that $\frac{\partial b^*(k;\lambda)}{\partial \lambda} > 0$. Taking the derivative of $\frac{(\beta B_h+\kappa K_h+\gamma f) \int_{\underline{k}}^{\overline{k}} g_h(k)(1-F_h(b^*(k;\lambda))dk}{(\beta B_l+\kappa K_l+\gamma f) \int_{\underline{k}}^{\overline{k}} g_l(k)(1-F_l(b^*(k;\lambda))dk}$ with respect to λ yields

$$\frac{(\beta B_h + \kappa K_h + \gamma f)\{q_{hh} \int_{\underline{k}}^{\overline{k}} g_l(k) f_l(b^*(k;\lambda)) \frac{\partial b^*(k;\lambda)}{\partial \lambda} dk - q_{ll} \int_{\underline{k}}^{\overline{k}} g_h(k) f_h(b^*(k;\lambda)) \frac{\partial b^*(k;\lambda)}{\partial \lambda} dk\}}{q_{ll}^2(\beta B_l + \kappa K_l + \gamma f)} \tag{7}$$

This is positive since $\frac{f_l(b^*(k)))g_l(k)}{\int_{\underline{k}}^{\overline{k}}(1-F_l(b^*(k)))g_l(k)dk} > \frac{f_h(b^*(k)))g_h(k)}{\int_{\underline{k}}^{\overline{k}}(1-F_h(b^*(k)))g_h(k)dk}$. This proves the lemma with respect to $b^*(k)$. A similar argument shows that $\frac{(\beta B_h+\kappa K_h+\gamma f) \int_{\underline{b}}^{\overline{b}} f_h(b)(1-G_h(k^*(b;\phi))dk}{(\beta B_l+\kappa K_l+\gamma f) \int_{\underline{b}}^{\overline{b}} f_l(b)(1-G_l(k^*(b;\phi))dk}$ is increasing in ϕ if $\frac{g_l(k^*(b)))f_l(b)}{\int_{\underline{b}}^{\overline{b}}(1-G_l(k^*(b)))f_l(k)dk} > \frac{g_h(k^*(b)))f_h(b)}{\int_{\underline{b}}^{\overline{b}}(1-G_h(k^*(b)))f_h(k)dk}$ which proves the lemma with respect to $k^*(b)$. Q.E.D.

From here on, assume the regulator's signals are sufficiently accurate that there is a cutoff value

k^* so that the expected payoff from submitting the proposal is larger in state hh than in state hl. This is formalized in the following assumption.

Assumption 2 *For any* $f > 0$, *there exists a* $k^*(b)$ with $k^*(b) < \overline{k}$ for some $b < \bar{b}$ *such that* $f(\frac{\int_{\underline{b}}^{\bar{b}} f_h(b)(1-G_h(k^*(b))dk}{\int_{\underline{b}}^{\bar{b}} f_l(b)(1-G_l(k^*(b))dk} - 1) - \int_{\underline{b}}^{\bar{b}} f_h(b)(1 - G_h(k^*(b))dk\{(\beta B_l + \kappa K_l) - (\beta B_h + \kappa K_h)\} = 0.$

Assumption 2 implies that for any positive f, there is a minimum cutoff function $k^*(b) = \hat{k}(b)$ (and similarly, that there is a minimum cutoff function $b^*(k) = \hat{b}(k)$) such that the company submits the proposal with probability one in state hh and with some probability strictly between zero and one if state ll if and only if $k^*(b) \geq \hat{k}(b)$ (or $b^*(k) \geq \hat{b}(k)$). If the regulator does indeed choose $k^*(b) \geq \hat{k}(b)$ (or $b^*(k) \geq \hat{b}(k)$), then let s_{ll} be the probability that the company submits the proposal in state ll. To ensure that this is in fact between zero and one, it must be that $(\beta B_l + \kappa K_l + \gamma f) \int_{\underline{b}}^{\bar{b}} f_l(b)(1 - G_l(k^*(b))dk = f$ or $\gamma^*(f) = \frac{f - q_{ll}(\beta B_l + \kappa K_l)}{f q_{ll}}$. If $\beta B_l + \kappa K_l > 0$, it is easy to see that $\gamma^*(f)$ is decreasing in q_{ll} which means it is increasing in the approval cutoff function $b^*(k)$ or $k^*(b)$. That is, the more likely the proposal is to be approved, the smaller the amount of refundability can be and still have the insurance company want to submit the proposal.

The regulator, then, chooses the cutoff function $k^*(b)$ (or $b^*(k)$) to maximize social welfare. This amounts to choosing $k^*(b)$ so that the expected social welfare of a proposal in which the regulator receives a signal of $k^*(b)$ is zero. The expected social welfare of a proposal with a signal k and b given that the firm files with probability one in hh and hl and with probability s_{ll} in ll (and with probability zero lh) is given by:

$$\frac{p_B p_K f_h(b) g_h(k)(B_h + K_h) + p_B(1-p_K) f_h(b) g_l(k)(B_h + K_l)(1-p_B)(1-p_K) s_{ll} f_l(b) g_l(k)(B_l + K_l)}{p_B p_K f_h(b) g_h(k) + p_B(1-p_K) f_h(b) g_l(k) + (1-p_B)(1-p_K) s_{ll} f_l(b) g_l(k)} \tag{8}$$

Totally differentiating this with respect to s_{ll} holding k constant and setting $b = b^*(k)$ gives $\frac{db^*(k)}{ds_{ll}} = \frac{f_h(b^*(k)) f_l(b^*(k))}{s_{ll}(f_l(b^*(k)) f_h'(b^*(k)) + f_l'(b^*(k)) f_h(b^*(k)))} > 0$. This expression is positive due to the MLRP assumption. Similarly, one can show that MLRP implies that $\frac{dk^*(b)}{ds_{ll}} > 0$. This is not surprising since the less likely the company is to file in state ll the lower the signal for which the regulator can approve the proposal and still expect social welfare not to decline. Thus, the equilibrium values of $b^*(k)$ and s^*_{ll} must satisfy the following conditions:

$$\frac{p_B p_K f_h(b^*(k))g_h(k)(B_h{+}K_h) + p_B(1-p_K)f_h(b^*(k))g_l(k)(B_h{+}K_l)(1-p_B)(1-p_K)s_{ll}f_l(b^*(k))g_l(k)(B_l{+}K_l)}{p_B p_K f_h(b^*(k))g_h(k) + p_B(1-p_K)f_h(b^*(k))g_l(k) + (1-p_B)(1-p_K)s_{ll}f_l(b^*(k))g_l(k)} = 0 \tag{9}$$

$$(\beta B_l + \kappa K_l + \gamma f)\int_{\underline{k}}^{\overline{k}} g_l(k)(1-F_l(b^*(k))dk = f$$

The second equation determines $b^*(k)$ for any given f and γ and the first equation determines s^*_{ll} given $b^*(k)$. Higher filing fees then create an equilibrium with a lower cutoff value, $b^*(k)$, for approval of the proposal and thus (because of the first equilibrium condition) a lower probability of filing in state ll, s^*_{ll}. Once again, notice that this mixed strategy equilibrium is only possible if there exists a cutoff function $\tilde{b}(k)$ such that:

$$\frac{p_B p_K f_h(\tilde{b}(k))g_h(k)(B_h{+}K_h) + p_B(1-p_K)f_h(\tilde{b}(k))g_l(k)(B_h{+}K_l)(1-p_B)(1-p_K)s_{ll}f_l(\tilde{b}(k))g_l(k)(B_l{+}K_l)}{p_B p_K f_h(b^*(k))g_h(k) + p_B(1-p_K)f_h(b^*(k))g_l(k) + (1-p_B)(1-p_K)s_{ll}f_l(b^*(k))g_l(k)} \leq 0 \tag{10}$$

$$(\beta B_l + \kappa K_l + \gamma \bar{f})\int_{\underline{k}}^{\overline{k}} g_l(k)(1-F_l(\tilde{b}(k))dk = \bar{f}$$

If this does not hold, then the insurance company will submit the proposal with probability one in state ll, since it knows that its probability of approval is high enough to make this decision profitable. If (10) can be satisfied, then, since expected total welfare is given by

$$p_B p_K \int_{\underline{k}}^{\overline{k}} g_h(k)(1-F_h(b^*(k))dk(B_h+K_h) + p_B(1-p_K)\int_{\underline{k}}^{\overline{k}} g_l(k)(1-F_h(b^*(k))dk(B_h+K_l) \tag{11}$$

$$+(1-p_B)(1-p_K)s_{ll}\int_{\underline{k}}^{\overline{k}} g_l(k)(1-F_l(b^*(k))dk(B_l+K_l)$$

and $b^*(k)$ is chosen to maximize expected total welfare, lower levels of s_{ll} can only increase welfare (since $B_l + K_l < 0$). Thus, the best equilibrium for total welfare must be the one with the lowest feasible values for $b^*(k)$ and s^*_{ll}, and thus with the highest values for f. The feasibility constraint is that $b^*(k) \geq \hat{b}(k)$ or else the company will not submit the proposal in state hh. $\hat{b}(k)$, of course, is the $b^*(k)$ for which the left hand side of (6) is zero. Inspection of (6) shows that this is easier to satisfy for higher levels of f.

Proposition 3 *Assume there exists a cutoff function $\tilde{b}(k)$ such that (10) is satisfied. If $\beta B_l +$*

$\kappa K_l > \beta B_h + \kappa K_h$, then the socially optimal filing fee is given by $\bar{f}$, the socially optimal level of refundability is given by $\gamma^*(\bar{f}.) = \frac{\bar{f} - \hat{q}_{ll}(\beta B_l + \kappa K_l)}{\bar{f}\hat{q}_{ll}}$ where $\hat{q}_{ll} = \int_{\underline{k}}^{\bar{k}} g_l(k)(1 - F_l(\hat{b}^*(k))dk$ and $\hat{b}^*(k)$ is the function of $b^*(k)$ that satisfies (6) at equality with $f = \bar{f}$. If there is no constraint on γ and f, then one can get arbitrarily close to the first best by letting $b^*(k) \rightarrow \underline{b}$ and $\gamma^* \rightarrow 1/\int_{\underline{k}}^{\bar{k}}(1 - F_l(\hat{b}^*(k)))g_l(k)dk$ and $f = \frac{\int_{\underline{k}}^{\bar{k}}(1-F_l(\hat{b}^*(k)))g_l(k)dk(\beta B_l + \kappa K_l)}{1-\gamma^* \int_{\underline{k}}^{\bar{k}}(1-F_l(\hat{b}^*(k)))g_l(k)dk}$. The insurance company submits the proposal with probability one in states hh and hl, with probability s^*_{ll} in state ll, and with probability zero in state lh. The regulator that receives signals b and k approves the proposal if and only if $b \geq \hat{b}^*(k)$. s^*_{ll} and $\hat{b}^*(k)$ are given implicitly by $\frac{(\beta B_h + \kappa K_h)\hat{q}_{hh}(1-\gamma^*(\bar{f}.)\hat{q}_{ll}) - (\beta B_l + \kappa K_l)\hat{q}_{ll}(1-\gamma^*(\bar{f}.)\hat{q}_{hh})}{1-\gamma^*(\bar{f}.)\hat{q}_{ll}} = 0$ and $p_B p_K f_h(\hat{b}^*(k))g_h(k)(B_h + K_h) + p_B(1 - p_K)f_h(\hat{b}^*(k))g_l(k)(B_h + K_l)(1 - p_B)(1 - p_K)s_{ll} f_l(\hat{b}^*(k))g_l(k)(B_l + K_l) = 0.$

Proof. Given that the company will file with probability one in state hh and with some probability strictly between zero and one in state ll, I have already shown it is socially optimal to reduce the probability of filing in state ll as low as possible and to increase the probability of approval given filing as high as possible. How far one can do this is limited by the constraint that the company's net expected payoff from filing is at least as great in state hh as in state ll. This constraint is easier to satisfy for larger f. Thus, if f is constrained to $\bar{f}$, the socially optimum occurs at $f = \bar{f}$,$\gamma^*(\bar{f}.) = \frac{\bar{f} - \hat{q}_{ll}(\beta B_l + \kappa K_l)}{\bar{f}\hat{q}_{ll}}$ and the lowest value of $b^*(k)$ consistent with this constraint, which is $\hat{b}^*(k)$. If there is no constraint on γ or f, then by increasing γ arbitrarily close to $1/\hat{q}_{ll} = 1/\int_{\underline{k}}^{\bar{k}}(1 - F_l(\hat{b}^*(k)))g_l(k)dk$ (from below if $\beta B_l + \kappa K_l > 0$ and from above if $\beta B_l + \kappa K_l < 0$) one can satisfy (6) for $b^*(k)$ arbitrarily close to $\underline{b}$ and then (9) implies that s^*_{ll} is arbitrarily close to zero and $f = \frac{\int_{\underline{k}}^{\bar{k}}(1-F_l(\hat{b}^*(k)))g_l(k)dk(\beta B_l + \kappa K_l)}{1-\gamma^* \int_{\underline{k}}^{\bar{k}}(1-F_l(\hat{b}^*(k)))g_l(k)dk}$. Because the probability of the proposal being approved approaches one in states hl and hh and approaches zero in ll (since the probability of filing approaches zero in this state), this approaches the first best. Q.E.D.

Proposition 3 says that because higher filing fees that get rebated back to the company if the regulator approves the proposal reduce the probability of the company submitting the proposal in the state in which the proposal reduces welfare, state ll, it is optimal to make the filing as large as possible and the rebate as large as possible. Once again, this allows the regulator to use the private information of the company to the maximum extent possible by inducing it to only file in states that increase welfare. For this to work, however, it must be that the company's payoff from filing in states that increase welfare exceeds its payoff in states that decrease welfare. This can occur for large enough filing fees and rebates since this makes even small increases in the probability of approval critical to the company's payoff. This result is completely analogous to the result in Proposition 2 except that in this case, the regulator uses both signals, b and k, since both provide information about the state since the company submits the proposal for either value of B and K with positive probability.

If (10) does not hold, then the insurance company will always submit a proposal in states $hh, hl.ll$ or, if $\beta B_l + \kappa K_l < 0$, only in state hl. The latter would be possible without any filing fee. In either case, the use of a small filing fee would not help the regulator harness the insurance company's private information.

5 Conclusion

This paper presents a simple, easily implementable, mechanism for harnessing the private information of a regulated insurance company that submits any proposal to a regulator for approval. Even if the regulator's signals of the company's private information are not very accurate, if the filing fee can be made large enough, the use of a refundable filing fee can induce the company to submit its proposal in every state in which that proposal increases welfare and almost never submit the proposal in a state that decreases welfare. If the filing fee is subject to some exogenous maximum, say because of the limited liability of the company or because of solvency concerns, then the use of a refundable filing fee can still reduce the probability that the company files a proposal that reduces social welfare. By reducing the expected payoff from filing a proposal that the regulator is more likely to reject relative to the payoff of a proposal that the regulator is more likely to accepted, refundable filing fees can reduce the incentive to submit a proposal that reduces welfare without reducing the incentive to submit a proposal that increases welfare. In so doing, the regulator then can be more lenient it its approval standards since it knows the company is less likely to submit the proposal in the first place if it reduces social welfare. This means that socially beneficial proposals are more likely to be approved and socially harmful proposals are less likely to be approved.

Of course, the results in this paper depend on the regulator maximizing social welfare. To the extent the regulator has other goals, it isn't necessarily the case that refundable filing fees would work as well. That said, if we are to have regulation at all, it should be the case that the regulator's goals are at least positively correlated with social welfare maximization (even if not perfectly). Otherwise, we are better off abolishing regulation entirely. Thus, if regulation itself can improve social welfare, then a proposal that improves a regulator's ability to achieve her objectives should improve social welfare even more. So, as long as the regulator's goals are reasonably well aligned with welfare-maximization this proposal should help.

This assumes, however, that this proposal does not worsen the alignment of the regulator's goals with that of social welfare-maximization. This could occur if the regulator's utility function included a concern for her budget. Then, if the regulatory agency could keep the filing fees it obtained, or even if it could more persuasively argue for a bigger budget if it was bringing in more revenue, then refundable filing fees would distort its incentives. In particular, it might set filing fees either too high (to obtain more revenue per proposal filed) or too low (if the socially optimal fee was so high that it deterred a large number of proposals from being filed). Even worse, it would have an incentive to deny proposals that are likely to be welfare-increasing to avoid having to refund the filing fee to the insurance company. This worst form of this problem, however, could easily be avoided by ensuring that the filing fees themselves do not remain with the regulatory agency and that the agency' funding is not explicitly correlated with the revenue it brings in (or gives out) due to these refundable filing fees. There still could be a problem if the agency's budget was informally correlated with its revenue, maybe because this was seen as a sign of successful operation. Thus, it would be critical in adopting this proposal to make it clear that neither regulatory performance nor the size of the agency's budget should be based on the amount of the filing fees the agency brings in. Insurance company interests groups would be a natural watchdog for this potential problem.[4]

While this paper was written in the context of insurance regulation, this simple mechanism could be applicable in other contexts. Anytime a regulator must make an up or down decision on a proposal submitted by a firm with private information, refundable filing fees could improve the regulator's decision-making ability. One other leading example of such a situation would be merger regulation (for insurance companies or otherwise). In such a context, the regulator and the merging parties would place positive value on any efficiencies generated by the merger, but the merging parties would also place positive value on any market power the merger created while the regulator would place negative value on this market power. Since the merging parties know their firms and their industry better than the regulator does, they would likely have private information about both of these facts. Thus, the use of refundable filing fees for merger regulation could

[4]The experience of the Federal Trade Commission (FTC) and the Department of Justice (DOJ) merger review suggests that filing fees can be structured so as not to bias the regulator's decision. Merging parties pay (non-refundable) filing fees when they file for merger review with these agencies. Neither agency is entitled to keep these fees. No one has ever suggested that either the FTC nor the DOJ are setting too lenient standards for merger review to induce more companies to file mergers so that the federal government can receive more filing fees.

greatly improve the ability of competition authorities to approve welfare-increasing mergers and reject welfare-decreasing ones.

6 References

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