Nonprofit Status and Relational Sanctions: Commitment to Quality through Repeat Interactions and Organizational Choice

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Online Appendix

Proofs

Proof of Lemma 1. To find the optimal punishment period (T_O), we need to solve a recursive program. Let's start with the for-profit organization. Suppose we are in a non-punishment state, where the buyer believes that the seller is choosing e_H. The buyer is willing to pay up to $E(v|e_H)$ and, with the power to make a take-it-or-leave-it offer, the seller will offer $p = E(v|e_H)$. The seller's long-run expected profit from choosing e_H is given by

$$V_{FP}^{+} = p - c_H + (1-\alpha)\delta V_{FP}^{+} + \alpha\delta V_{FP}^{-}$$

The expression V_{FP}^{-} is the seller's long-run profit when the parties are at the beginning of the punishment state. With the punishment length of T_{FP}, we have $V_{FP}^{-} = \delta^{T_{FP}} \cdot V_{FP}^{+}$. When we solve for V_{FP}^{+}, we get

$$V_{FP}^{+} = \frac{E(v|e_H) - c_H}{(1-\delta) + \alpha\delta(1-\delta^{T_{FP}})}$$

If the seller were to deviate and choose low effort, the seller's long-run profit is

$$p - c_L + \alpha\delta V_{FP}^{+} + (1-\alpha)\delta V_{FP}^{-}$$

To induce the seller to choose high effort, we need

$$p - c_H + (1-\alpha)\delta V_{FP}^{+} + \alpha\delta V_{FP}^{-} \geq p - c_L + \alpha\delta V_{FP}^{+} + (1-\alpha)\delta V_{FP}^{-}$$

The weak inequality reduces to

$$\delta(1-\delta^{T_{FP}})V_{FP}^{+} \geq \frac{\Delta c}{1-2\alpha}$$

With the expression for V_{FP}^{+}, the weak inequality becomes

$$\delta(1-\delta^{T_{FP}})\frac{E(v|e_H) - c_H}{(1-\delta) + \alpha\delta(1-\delta^{T_{FP}})} \geq \frac{\Delta c}{1-2\alpha}$$

Note that the left hand side of the expression is strictly increasing with respect to T_{FP}, and as $T_{FP} \to 0$, we get $\delta(1-\delta^{T_{FP}})\frac{E(v|e_H)-c_H}{(1-\delta)+\alpha\delta(1-\delta^{T_{FP}})} \to 0$, violating the incentive condition. Hence, in equilibrium, we need $T_{FP} > 0$.

For a non-profit organization, the basic problem is similar but with the non-distribution constraint. The seller's long-run expected profit from choosing high effort is given by

$$V_{NP}^{+} = \phi(p - c_H) + (1-\alpha)\delta V_{NP}^{+} + \alpha\delta V_{NP}^{-}$$

With the punishment length of T_{NP}, we have $V_{NP}^{-} = \delta^{T_{NP}} \cdot V_{NP}^{+}$. When we solve for V_{NP}^{+}, we get

$$V_{NP}^{+} = \frac{\phi_H \cdot (E(v|e_H) - c_H)}{(1-\delta) + \alpha\delta(1-\delta^{T_{NP}})}$$

If the seller were to deviate and choose low effort, the seller's long-run profit is

$$\phi_L \cdot (E(v|e_H) - c_L) + \alpha\delta V_{NP}^{+} + (1-\alpha)\delta V_{NP}^{-}$$

To induce the seller to choose high effort, we need

$$\begin{aligned}\phi_H \cdot (E(v|e_H) - c_H) + (1-\alpha)\delta V_{NP}^{+} + \alpha\delta V_{NP}^{-} \\ \geq \ \phi_L \cdot (E(v|e_H) - c_L) + \alpha\delta V_{NP}^{+} + (1-\alpha)\delta V_{NP}^{-}\end{aligned}$$

The weak inequality reduces to

$$\delta(1-\delta^{T_{NP}})V_{NP}^{+} \geq \frac{\phi_L \cdot (E(v|e_H) - c_L) - \phi_H \cdot (E(v|e_H) - c_H)}{1-2\alpha}$$

With the expression for V_{NP}^{+}, the weak inequality becomes

$$\delta(1-\delta^{T_{NP}})\frac{E(v|e_H) - c_H}{(1-\delta) + \alpha\delta(1-\delta^{T_{NP}})} \geq \frac{(\phi_L/\phi_H) \cdot (E(v|e_H) - c_L) - (E(v|e_H) - c_H)}{1-2\alpha}$$

When we examine the respective incentive conditions, note first that the left hand sides of the inequalities are identical when $T_{FP} = T_{NP}$. When we compare the right hand sides, we see that

$$\frac{(\phi_L/\phi_H) \cdot (E(v|e_H) - c_L) - (E(v|e_H) - c_H)}{1-2\alpha} \leq \frac{\Delta c}{1-2\alpha}$$

The inequality is strict when $\phi_L < \phi_H$. When $\phi_L < \phi_H$, therefore, non-profit firm will be subject to a weaker incentive requirement, thus requiring $T_{FP} > T_{NP}$. In other words, when there is a decreasing returns to scale in terms of converting cash profit into private benefits (e.g., perquisites) for the entrepreneur, the non-profit executive will have a weaker incentive to deviate from the desired behavior and thus will require a weaker relational sanctions. *QED*

Proof of Proposition 1. For a for-profit firm, the incentive condition was given by

$$\delta(1-\delta^{T_{FP}})\frac{E(v|e_H)-c_H}{(1-\delta)+\alpha\delta(1-\delta^{T_{FP}})} \geq \frac{\Delta c}{1-2\alpha}$$

The incentive condition provides us with the maximum possible α. When $T_{FP}\to\infty$, the inequality becomes: $\frac{\delta}{(1-\delta)+\alpha\delta}(E(v|e_H)-c_H) \geq \frac{\Delta c}{1-2\alpha}$. When we solve for α, we get

$$\alpha \leq \frac{\delta(E(v|e_H)-c_H)-(1-\delta)\Delta c}{\delta(2(E(v|e_H)-c_H)+\Delta c)} \equiv \bar{\alpha}_{FP}$$

Given that the buyer will choose minimum T_{FP} necessary to solve the incentive problem, when we substitute the weak inequality with equality, and solve for $\delta(1-\delta^{T_{FP}})$, we get

$$\delta(1-\delta^{T_{FP}}) = \frac{(1-\delta)\frac{\Delta c}{1-2\alpha}}{(E(v|e_H)-c_H)-\alpha\frac{\Delta c}{1-2\alpha}}$$

When we use this expression to simplify $V_{FP}^{+} = \frac{E(v|e_H)-c_H}{(1-\delta)+\alpha\delta(1-\delta^{T_{FP}})}$, we get

$$V_{FP}^{+} = \frac{1}{1-\delta}\left\{E(v|e_H)-c_H-\frac{\alpha\Delta c}{1-2\alpha}\right\}$$

Note that $\frac{\partial V_{FP}^{+}}{\partial\alpha} < 0$. After some algebra, we also get

$$V_{FP}^{+}(\bar{\alpha}_{FP}) = \frac{2(E(v|e_H)-c_H)+\Delta c}{2-\delta} > 0$$

Hence, with the maximum possible α, the for-profit firm's long-run return is strictly positive. For a non-profit firm, the incentive condition was

$$\delta(1-\delta^{T_{NP}})\frac{E(v|e_H)-c_H}{(1-\delta)+\alpha\delta(1-\delta^{T_{NP}})} \geq \frac{(\phi_L/\phi_H)\cdot(E(v|e_H)-c_L)-(E(v|e_H)-c_H)}{1-2\alpha}$$

When $T_{NP}\to\infty$, the inequality becomes: $\frac{\delta}{(1-\delta)+\alpha\delta}(E(v|e_H)-c_H) \geq \frac{\rho}{1-2\alpha}$ where $\lambda \equiv (\phi_L/\phi_H)\cdot(E(v|e_H)-c_L)-(E(v|e_H)-c_H)$. When we solve for α, we get

$$\alpha \leq \frac{\delta(E(v|e_H)-c_H)-(1-\delta)\lambda}{\delta(2(E(v|e_H)-c_H)+\lambda)} \equiv \bar{\alpha}_{NP}$$

Note that since $\lambda \leq \Delta c$ whenever $\phi_L \leq \phi_H$, when $\phi_L \leq \phi_H$, $\bar{\alpha}_{NP} \geq \bar{\alpha}_{FP}$, with the inequality being strict when $\phi_L < \phi_H$. When we perform similar algebra to derive the non-profit's long-run return, we get

$$V_{NP}^{+} = \frac{\phi_H}{1-\delta}\left\{(E(v|e_H) - c_H) - \alpha\frac{(\phi_L/\phi_H)\cdot(E(v|e_H) - c_L) - (E(v|e_H) - c_H)}{1-2\alpha}\right\}$$

This expression can be rewritten as

$$V_{NP}^{+} = \frac{\phi_H}{1-\delta}\left\{E(v|e_H) - c_H - \frac{\alpha\Delta c}{1-2\alpha}\right\} + \frac{1}{1-\delta}\frac{\alpha}{1-2\alpha}(\phi_H - \phi_L)\{E(v|e_H) - c_L\}$$

Similar to a for-profit, we have $\frac{\partial V_{NP}^{+}}{\partial \alpha} < 0$ and

$$V_{NP}^{+}(\bar{\alpha}_{NP}) = \frac{\phi_H(2(E(v|e_H) - c_H) + \lambda)}{2-\delta} > 0$$

When we compare $V_{NP}^{+}(\bar{\alpha}_{NP})$ with $V_{FP}^{+}(\bar{\alpha}_{FP})$, we see that $V_{FP}^{+}(\bar{\alpha}_{FP}) > V_{NP}^{+}(\bar{\alpha}_{NP})$ whenever $\phi_H < 1$ and/or $\phi_H > \phi_L$. Recall that with the assumption of $\phi_H \geq \phi_L$, $\bar{\alpha}_{NP} \geq \bar{\alpha}_{FP}$. This implies that when $\alpha \in (\bar{\alpha}_{FP}, \bar{\alpha}_{NP}]$, only the non-profit firm will be able to survive in the market.

When we subtract V_{NP}^{+} from V_{FP}^{+}, we get

$$V_{FP}^{+} - V_{NP}^{+} = \frac{1-\phi_H}{1-\delta}\left\{E(v|e_H) - c_H - \frac{\alpha\Delta c}{1-2\alpha}\right\} - \frac{1}{1-\delta}\frac{\alpha}{1-2\alpha}(\phi_H - \phi_L)\{E(v|e_H) - c_L\}$$

First, when we differentiate the expression with respect to α, ϕ_H, or ϕ_L we get

$$\frac{\partial(V_{FP}^{+} - V_{NP}^{+})}{\partial\alpha} = -\frac{1}{(1-2\alpha)^2}\cdot\left(\frac{(1-\phi_H)\Delta c}{1-\delta} + \frac{(\phi_H - \phi_L)(E(v|e_H) - c_L)}{1-\delta}\right) < 0$$

From the first inequality, we see that, as $\alpha \to 0$, $V_{FP}^{+} - V_{NP}^{+} \to \frac{1-\phi_H}{1-\delta}\{E(v|e_H) - c_H\} > 0$ and as $\alpha \to 1/2$, $\frac{\alpha}{1-2\alpha} \to \infty$, so that $V_{FP}^{+} - V_{NP}^{+} \to -\infty$. Hence, there exists a unique $\bar{\alpha} \in (0, \bar{\alpha}_{FP}]$ such that the entrepreneur strictly prefers a non-profit when $\alpha \geq \bar{\alpha}$ and a for-profit, otherwise. In terms of the exact location of $\bar{\alpha}$, we can compare $V_{FP}^{+}(\bar{\alpha}_{FP})$ with $V_{NP}^{+}(\bar{\alpha}_{FP})$. With some algebra, we have

$$\begin{aligned}
&V_{NP}^{+}(\bar{\alpha}_{FP}) - V_{FP}^{+}(\bar{\alpha}_{FP}) \\
&\quad = \frac{\phi_H}{1-\delta}\left\{(E(v|e_H) - c_H) - \bar{\alpha}_{FP}\frac{\lambda}{1-2\bar{\alpha}_{FP}}\right\} - \frac{1}{1-\delta}\left\{E(v|e_H) - c_H - \frac{\bar{\alpha}_{FP}\Delta c}{1-2\bar{\alpha}_{FP}}\right\} \\
&\quad = \frac{\phi_H\{(1-\delta)\Delta c - \bar{\alpha}_{FP}\delta(\Delta c - \lambda)\}}{(1-\delta)\delta(1-2\bar{\alpha}_{FP})} - \frac{(1-\delta)\Delta c}{(1-\delta)\delta(1-2\bar{\alpha}_{FP})} \\
&\quad = \frac{\bar{\alpha}_{FP}\delta(\phi_H - \phi_L)}{(1-\delta)\delta(1-2\bar{\alpha}_{FP})}(E(v|e_H) - c_L) - \frac{(1-\phi_H)(1-\delta)\Delta c}{(1-\delta)\delta(1-2\bar{\alpha}_{FP})}
\end{aligned}$$

where we used the equality $\Delta c - \lambda = \frac{\phi_H - \phi_L}{\phi_H}(E(v|e_H) - c_L)$. As $\phi_H \to 1$ but $\phi_H - \phi_L > 0$, $V_{NP}^{+}(\bar{\alpha}_{FP}) - V_{FP}^{+}(\bar{\alpha}_{FP}) > 0$ and vice versa. Since $V_{FP}^{+} - V_{NP}^{+} = \frac{1-\phi_H}{1-\delta}\{E(v|e_H) - c_H\} \geq 0$ when $\alpha = 0$, when $V_{NP}^{+}(\bar{\alpha}_{FP}) - V_{FP}^{+}(\bar{\alpha}_{FP}) > 0$, we get $\bar{\alpha} < \bar{\alpha}_{FP}$. If $V_{NP}^{+}(\bar{\alpha}_{FP}) - V_{FP}^{+}(\bar{\alpha}_{FP}) < 0$, we get $\bar{\alpha} = \bar{\alpha}_{FP}$.

Next, when we differentiate $V_{FP}^{+} - V_{NP}^{+}$ with respect to ϕ_H or ϕ_L we get:

$$\frac{\partial(V_{FP}^{+} - V_{NP}^{+})}{\partial \phi_H} = -\frac{1}{1-\delta}\left\{E(v|e_H) - c_H - \frac{\alpha \Delta c}{1-2\alpha}\right\} - \frac{1}{1-\delta}\frac{\alpha}{1-2\alpha}\{E(v|e_H) - c_L\} < 0$$

$$\frac{\partial(V_{FP}^{+} - V_{NP}^{+})}{\partial \phi_L} = \frac{1}{1-\delta}\frac{\alpha}{1-2\alpha}\{E(v|e_H) - c_L\} > 0$$

From the first inequality, since $\frac{\partial(V_{FP}^{+} - V_{NP}^{+})}{\partial \phi_H} < 0 \ \forall \alpha$, as ϕ_H increases, $\bar{\alpha}$ must (at least weakly) decrease. Hence, the entrepreneur is more likely to choose a non-profit form. Also, from the expression for $V_{NP}^{+}(\bar{\alpha}_{FP}) - V_{FP}^{+}(\bar{\alpha}_{FP})$, we see that an increase in ϕ_H makes it more likely to have $V_{NP}^{+}(\bar{\alpha}_{FP}) - V_{FP}^{+}(\bar{\alpha}_{FP}) > 0$ so that $\bar{\alpha} < \bar{\alpha}_{FP}$. In the extreme, from the expression for $V_{FP}^{+} - V_{NP}^{+}$, when $\phi_H \to 1$, the first expression disappears and only the second expression remains, producing $V_{FP}^{+} - V_{NP}^{+} < 0 \ \forall \alpha$ and $\bar{\alpha} = 0$: non-profit strictly dominates for-profit. Finally, from the second inequality, we see that as ϕ_L rises, $\bar{\alpha}$ must increase, thereby making the entrepreneur more likely to choose a for-profit form. Also, from $V_{NP}^{+}(\bar{\alpha}_{FP}) - V_{FP}^{+}(\bar{\alpha}_{FP})$, an increase in ϕ_L makes it less likely to have $V_{NP}^{+}(\bar{\alpha}_{FP}) - V_{FP}^{+}(\bar{\alpha}_{FP}) > 0$, thereby pushing $\bar{\alpha}$ towards $\bar{\alpha}_{FP}$. *QED*

Proof of Corollary 1. When a for-profit firm is subject to a tax rate of $1 - \beta(\pi) \in [0,1]$, the for-profit's long-run return can now be written as

$$V_{FP}^{+}(\beta) = \frac{1}{1-\delta}\left\{\beta_H \cdot (E(v|e_H) - c_H) - \alpha \frac{\beta_L \cdot (E(v|e_H) - c_L) - \beta_H \cdot (E(v|e_H) - c_H)}{1-2\alpha}\right\}$$

where scalars (β_H, β_L) are defined by $\beta_H \cdot (E(v|e_H) - c_H) \equiv \beta(E(v|e_H) - c_H)$ and $\beta_L \cdot (E(v|e_H) - c_L) \equiv \beta(E(v|e_H) - c_L)$.

When we subtract V_{NP}^{+} from $V_{FP}^{+}(\beta)$, we get

$$V_{FP}^{+}(\beta) - V_{NP}^{+} = (\beta_H - \phi_H)\left\{E(v|e_H) - c_H - \frac{\alpha \Delta c}{1-2\alpha}\right\} + \frac{1}{1-\delta}\frac{\alpha}{1-2\alpha}[(\beta_H - \beta_L) - (\phi_H - \phi_L)]\{E(v|e_H) - c_L\}$$

Hence, the entrepreneur is more likely to form a for-profit organization as $\beta_H - \phi_H$ gets larger or as $[(\beta_H - \beta_L) - (\phi_H - \phi_L)]$ gets larger.

As a special case, suppose $\beta_L \leq \phi_L$ and $\beta_H \geq \phi_H$, so that $\beta_H - \phi_H \geq 0$ and $[(\beta_H - \beta_L) - (\phi_H - \phi_L)] \geq 0$. The difference in valuations becomes:

$$V_{FP}^{+}(\beta) - V_{NP}^{+} = (\beta_H - \phi_H)\left\{E(v|e_H) - c_H - \frac{\alpha \Delta c}{1-2\alpha}\right\} + \frac{1}{1-\delta}\frac{\alpha}{1-2\alpha}[(\beta_H - \beta_L) - (\phi_H - \phi_L)]\{E(v|e_H) - c_L\} \geq 0$$

In this case, the progressive tax structure functions as a stronger deterrent against deviation. Hence, with a for-profit firm, not only will the entrepreneur be entitled to receive a larger per-period distribution in equilibrium ($\beta_H \geq \phi_H$) but she will also face shorter relational sanctions. The entrepreneur will (at least weakly) prefer a for-profit form and the shorter relational sanctions also improve welfare.

As another special case, when $\beta''(\pi) = 0$ so that $\beta_H = \beta_L = \overline{\beta}$, for-profit's long-run return simplifies to

$$V_{FP}^{+}(\overline{\beta}) = \frac{\overline{\beta}}{(1-\delta)}\left\{E(v|e_H) - c_H - \frac{\alpha \Delta c}{1-2\alpha}\right\}$$

Note that, compared to the case with no profit tax, the magnitudes of the relational sanctions and the attendant deadweight loss are the same. The profit-difference between two organizational forms becomes

$$V_{FP}^{+}(\overline{\beta}) - V_{NP}^{+} = (\overline{\beta} - \phi_H)\left\{E(v|e_H) - c_H - \frac{\alpha \Delta c}{1-2\alpha}\right\} - \frac{1}{1-\delta}\frac{\alpha}{1-2\alpha}(\phi_H - \phi_L)\{E(v|e_H) - c_L\}$$

Compared to the case of no profit tax ($\overline{\beta} = 1$), the entrepreneur is more likely to choose a non-profit form ($\bar{\alpha}$ shifts to the left). This, in turn, decreases social welfare since even though the profit tax does not create a deadweight loss, the entrepreneur suffers a personal reduction in return. When $\overline{\beta} < \phi_H$, the entrepreneur will strictly prefer a non-profit organization, regardless of α. *QED*

Proof of Corollary 2. When the seller bears the cost of γc_i, for the non-profit organization, the incentive condition becomes

$$\delta(1-\delta^{T_{NP}})\frac{E(v|e_H) - \gamma c_H}{(1-\delta) + \alpha\delta(1-\delta^{T_{NP}})} \geq \frac{(\phi_L(\gamma)/\phi_H(\gamma)) \cdot (E(v|e_H) - \gamma c_L) - (E(v|e_H) - \gamma c_H)}{1-2\alpha}$$

where we have introduced new expressions: $\phi(E(v|e_H) - \gamma c_H) \equiv \phi_H(\gamma) \cdot (E(v|e_H) - \gamma c_H)$ and $\phi(E(v|e_H) - \gamma c_L) \equiv \phi_L(\gamma) \cdot (E(v|e_H) - \gamma c_L)$. Note that since both $E(v|e_H) - \gamma c_L$ and

$E(v|e_H) - \gamma c_H$ are increasing and $\gamma \Delta c$ is decreasing as γ gets smaller, $\phi_L(\gamma)/\phi_H(\gamma)$ decreases as γ decreases. The right hand side of the inequality can be re-written as

$$\frac{(\phi_L(\gamma)/\phi_H(\gamma)) \cdot (E(v|e_H) - c_L) - (E(v|e_H) - c_H) + (1-\gamma) \cdot ((\phi_L(\gamma)/\phi_H(\gamma))c_L - c_H)}{1-2\alpha}$$

When $\phi_L(\gamma) \le \phi_H(\gamma)$, $(1-\gamma) \cdot ((\phi_L(\gamma)/\phi_H(\gamma))c_L - c_H)$ strictly negative. Hence, both the left and right hand sides decrease as γ decreases, leading to a strictly smaller T_{NP}. Non-profit's long-run profit becomes

$$\begin{aligned} V_{NP}^{+}(\gamma) = \frac{1}{1-\delta}\Bigg\{&\phi_H(\gamma) \cdot (E(v|e_H) - \gamma c_H) \\ &- \alpha \frac{\phi_L(\gamma) \cdot (E(v|e_H) - \gamma c_L) - \phi_H(\gamma) \cdot (E(v|e_H) - \gamma c_H)}{1-2\alpha}\Bigg\} \\ = &\frac{\phi_H(\gamma)}{1-\delta}\left\{E(v|e_H) - \gamma c_H - \frac{\alpha\gamma\Delta c}{1-2\alpha}\right\} + \frac{1}{1-\delta}\frac{\alpha}{1-2\alpha}(\phi_H(\gamma) \\ &- \phi_L(\gamma))\{E(v|e_H) - \gamma c_L\} \end{aligned}$$

As γ decreases, $V_{NP}^{+}(\gamma)$ strictly increases. Hence, when production subsidy is provided only to non-profit organizations, entrepreneur becomes more likely to form a non-profit organization ($\bar{\alpha}$ shifts to the left).

There are two opposing effects on welfare. Although a strictly smaller T_{NP} decreases the deadweight loss from relational sanctions, the deadweight loss from private benefit conversion (measured by $(1 - \phi_H(\gamma)) \cdot (E(v|e_H) - \gamma c_H)$) increases because the entrepreneur realizes a larger per-period profit in equilibrium. If the latter effect is larger, this will decrease welfare. Furthermore, there also is the effect on organizational choice. Since the entrepreneur becomes more likely to choose non-profit, when non-profit creates a larger deadweight loss, conversion from for-profit to non-profit will further decrease welfare. *QED*

Proof of Corollary 3. With $p(\theta) = \theta \cdot E(v|e_H) + (1-\theta) \cdot c_H$, respective incentive conditions are

$$\delta(1-\delta^{T_{FP}})\frac{p(\theta) - c_H}{(1-\delta) + \alpha\delta(1-\delta^{T_{FP}})} \ge \frac{\Delta c}{1-2\alpha}$$

and

$$\delta(1-\delta^{T_{NP}})\frac{p(\theta) - c_H}{(1-\delta) + \alpha\delta(1-\delta^{T_{NP}})} \ge \frac{\lambda(\theta)}{1-2\alpha}$$

where we have introduced new expressions: $\phi(p(\theta) - c_H) \equiv \phi_H(\theta) \cdot (p(\theta) - c_H)$, $\phi(p(\theta) - c_L) \equiv \phi_L(\theta) \cdot (p(\theta) - c_L)$, and $\lambda(\theta) \equiv (\phi_L(\theta)/\phi_H(\theta)) \cdot (p(\theta) - c_L) - (p(\theta) - c_H)$. By assumption, θ and ϕ_i are inversely related: $\frac{\partial \phi_i(\theta)}{\partial \theta} < 0$. From the incentive conditions, the maximum α necessary can be found as:

$$\alpha \leq \frac{\delta(p(\theta) - c_H) - (1-\delta)\Delta c}{\delta(2(p(\theta) - c_H) + \Delta c)} \equiv \bar{\alpha}_{FP}(\theta)$$

and

$$\alpha \leq \frac{\delta(p(\theta) - c_H) - (1-\delta)\lambda(\theta)}{\delta\big(2(p(\theta) - c_H) + \rho(\theta)\big)} \equiv \bar{\alpha}_{NP}(\theta)$$

These thresholds are equivalent to those from Proposition 1, except for the fact that they now depend on θ. Note that when $\phi_H(\theta) > \phi_L(\theta)$, we have $\lambda(\theta) < \Delta c$ and $\bar{\alpha}_{FP}(\theta) < \bar{\alpha}_{FP}(\theta)$. Furthermore, as θ decreases, both $\bar{\alpha}_{FP}(\theta)$ and $\bar{\alpha}_{NP}(\theta)$ decrease.

In order to have $\bar{\alpha}_{FP}(\theta) \geq 0$, we need $\delta(p(\theta) - c_H) - (1-\delta)\Delta c \geq 0$. With the expression $p(\theta) = \theta \cdot E(v|e_H) + (1-\theta) \cdot c_H$, this is equivalent to

$$\theta \geq \frac{(1-\delta)\Delta c}{\delta(E(v|e_h) - c_H)} \equiv \underline{\theta}_{FP}$$

The comparable lower bound for the non-profit organization is $\underline{\theta}_{NP} \equiv \frac{(1-\delta)\lambda(\theta)}{\delta(E(v|e_h) - c_H)} < \underline{\theta}_{FP}$. Therefore, if $\theta \in [\underline{\theta}_{NP}, \underline{\theta}_{FP})$, only the non-profit organizations can operate in the market. In terms of the price, $p(\underline{\theta}_{FP}) = \frac{(1-\delta)\Delta c}{\delta(E(v|e_h) - c_H)}(E(v|e_h) - c_H) + c_H = c_H + \frac{(1-\delta)}{\delta}\Delta c$. Hence, when $p \in [c_H + \frac{(1-\delta)}{\delta}\lambda(\theta), c_H + \frac{(1-\delta)}{\delta}\Delta c)$, only the non-profit firms will operate in the market.

Finally, when $\phi(\pi)$ is strictly concave, both $\phi_L(\theta)/\phi_H(\theta)$ and $\lambda(\theta)$ increase as θ rises. Conversely, as θ decreases, both $\underline{\theta}_{NP}$ and $c_H + \frac{(1-\delta)}{\delta}\lambda(\theta)$ decrease, thereby increasing the region in which only the non-profit will survive and operate. *QED*

Proof of Corollary 4. First, from the proofs of Proposition 1, we know that when $\bar{\alpha}_{FP} < \alpha \leq \bar{\alpha}_{NP}$, for-profit organizations make a strictly negative long-run profit and, hence, $O_i = NP \; \forall i$. Note, however, the total mass of firms operating in the market will be strictly less than one: $N_{NP} < 1$ and $N_{FP} = 0$. Second, we also know that when $\alpha \leq \overline{\alpha}$, for-profit organizations make a strictly larger long-run return than non-profit organizations. Therefore, hence, $O_i = FP \; \forall i$.

Third, suppose $\overline{\alpha} < \bar{\alpha}_{FP}$ and $\overline{\alpha} < \alpha \leq \bar{\alpha}_{FP}$. In this region, while both types of organizations make a (at least weakly) positive long-run return, non-profit organizations perform better than for-profit organizations: $0 \leq V_{FP}^{+}(\alpha) < V_{NP}^{+}(\alpha)$. Suppose we initially start with $N_{FP} = 1$ and $N_{NP} = 0$ and consider a marginal increase in N_{NP}. As $\phi(\pi|N_{NP}) \to 1$, $V_{NP}^{+}(\alpha)$ will decrease. From the scalar representation of

$$V_{NP}^{+}(\alpha|N_{NP}) = \frac{1}{1-\delta}\Big\{\phi_H(N_{NP})\cdot(E(v|e_H)-c_H) - \frac{\alpha}{1-2\alpha}\cdot(\phi_L(N_{NP})\cdot(E(v|e_H)-c_L) - \phi_H(N_{NP})\cdot(E(v|e_H)-c_H))\Big\},$$

an increase in N_{NP} implies that $\phi_H(N_{NP})\cdot(E(v|e_H)-c_H) \to (E(v|e_H)-c_H)$ and $(\phi_L(N_{NP})\cdot(E(v|e_H)-c_L) - \phi_H(N_{NP})\cdot(E(v|e_H)-c_H)) \to \Delta c$. The first effect increases, while the second effect decreases, $V_{NP}^{+}(\alpha|N_{NP})$. Note that the second effect is multiplied by $\frac{\alpha}{1-2\alpha}$, which can be substantially large when α is close to $1/2$.

Hence, there are two possible convergence scenarios. First, when $\frac{\alpha}{1-2\alpha}$ is sufficiently large, we'll have some $\widehat{N}_{NP} < 1$ where $V_{NP}^{+}(\alpha|\widehat{N}_{NP}) = V_{FP}^{+}(\alpha)$ and $\phi(\pi|\widehat{N}_{NP}) < 1$. In such a case, we'll have the co-existence of both for-profit and non-profit firms. Second, we can have $V_{NP}^{+}(\alpha|N_{NP}) \to V_{FP}^{+}(\alpha)$ as $N_{NP} \to 1$ while $V_{NP}^{+}(\alpha|N_{NP}) \geq V_{FP}^{+}(\alpha)\ \forall N_{NP}$. In that case, the market will eventually be dominated by non-profit firms but they operate (and the market treats them) just like for-profit firms. *QED*