

we have,

$$\begin{aligned}
& \frac{d^2 \Pi_0(e^{**}(\gamma), e^{**}(\gamma); 0) - \Pi_0(e^*(\rho, \gamma), e^*(\rho, \gamma); x_h^*(\rho))}{d\gamma d\rho} \\
&= 4 \frac{\partial e^*(\rho, \gamma)}{\partial \rho} [(p_\ell R - L) - x_h^*(\rho)c] + 2 [1 - 2(\gamma + e^*(\rho, \gamma))] \frac{\partial x_h^*(\rho)}{\partial \rho} c \\
&= \begin{cases} 2 [1 - 2(\gamma + e^*(\rho, \gamma))] \left(-\frac{2[(p_\ell R - L) - x_h^*(\rho)c]}{2[(p_\ell R - L) - x_h^*(\rho)c] + k''(e^*(\rho, \gamma))} + 1 \right) \frac{\partial x_h^*(\rho)}{\partial \rho} c < 0, & \text{if } \rho \in (\underline{\rho}, \bar{\rho}), \\ 0, & \text{if } \rho \geq \bar{\rho}. \end{cases} \tag{42}
\end{aligned}$$

where the inequality follows from the fact that $\frac{\partial e^*(\rho, \gamma)}{\partial \rho} < 0$ for $\rho \in (\underline{\rho}, \bar{\rho})$ by (33). This then implies that that we have $\frac{d\Pi_0(e^{**}(\gamma), e^{**}(\gamma); 0) - \Pi_0(e^*(\rho, \gamma), e^*(\rho, \gamma); x_h^*(\rho))}{d\gamma} < 0$ for all $\rho > \underline{\rho}$.

Overall, we thus have that the welfare difference $W(e^{**}(\gamma); 0) - W(e^*(\rho, \gamma); x_h^*)$ is strictly decreasing in γ for all $\rho > \underline{\rho}$ and $\gamma > \underline{\gamma}$, because $\Pi_0(e^{**}(\gamma), e^{**}(\gamma); 0) - \Pi_0(e^*(\rho, \gamma), e^*(\rho, \gamma); x_h^*(\rho))$ is decreasing in γ and $C(e^{**}(\rho)) - C(e^*(\rho, \gamma))$ is increasing in γ as shown above. Since we have that $W(e^{**}(\gamma); 0) - W(e^*(\rho, \gamma); x_h^*)$ is strictly positive at $\gamma = \underline{\gamma}$, it follows that there exists $\tilde{\gamma}(\rho) > \underline{\gamma}$, such that $W(e^{**}(\gamma); 0) - W(e^*(\rho, \gamma); x_h^*) \geq 0$ if and only if $\gamma \leq \tilde{\gamma}(\rho)$. \square

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