Appendix A Mathematical Proofs

Proposition 1. *If the time constraint is non-binding, then a unique separating equilibrium survives.*

A.1 Proof of Proposition 1

Proof. In a separating PBE, each worker type sends least-cost signals (Riley, 1979) that distinguish themselves from other worker types. This means that the firm can identify each type and, therefore, pay accordingly; $w_{LL} = (1-\beta)\theta_L$, $w_{LH} = (1-\beta)(\theta_L+1)$, $w_{HL} = (1-\beta)\theta_H$, and $w_{HH} = (1-\beta)(\theta_H + 1)$. In equilibrium, each worker's signal strategy $\sigma_\star^{ij}$ obeys the incentive compatibility constraint (ICC) and intuitive refinement criterion (IRC). The ICC provides the lower and the upper bounds within which all PBEs lie, and the IRC identifies the one least-cost optimal solution (binding lower bound). Note that, in a pure signaling game, utility maximization is equivalent to cost minimization. Being the most inferior worker type, LL workers have no incentive to send non-zero signals in either dimension. The equilibrium signals for type LL are $e^\star_{LL} = 0$ and $f^\star_{LL} = 0$. $U^\star_{LL} = (1-\beta)\theta_L$. Next, type LH workers choose signals to distinguish themselves from type LL workers. The ICC is such that type LL workers lack incentive to mimic type LH workers (lower-bound ICC), and the optimal signals should not be too costly such that type LH workers would prefer to be perceived as type LL workers (upper-bound ICC). Note that type LH workers need not be concerned with type HL workers as they never mimic each other (see Corollary 1 for details). The lower-bound ICC is

$$U^\star_{LL} \geq w_{LH} - c^1(e_{LH}, \theta_L) - c^2(f_{LH}, \eta_L).$$

This condition can be rewritten as

$$(1-\beta)\theta_L \geq (1-\beta)(\theta_L + 1) - \frac{e_{LH}}{\theta_L} - \frac{f_{LH}}{\eta_L},$$

which can, in turn, be rearranged as

$$\frac{e_{LH}}{\theta_L} + \frac{f_{LH}}{\eta_L} \geq 1 - \beta. \tag{A.1}$$

Similarly, the upper-bound ICC is

$$w_{LH} - c^1(e_{LH}, \theta_L) - c^2(f_{LH}, \eta_H) \geq w_{LL} - c^1(e_{LL}, \theta_L) - c^2(f_{LL}, \eta_H).$$

This condition can be rewritten as

$$(1-\beta)(\theta_L+1)-\frac{e_{LH}}{\theta_L}-\frac{f_{LH}}{\eta_H}\geq(1-\beta)\theta_L,$$

which can, in turn, be rearranged as

$$1-\beta\geq\frac{e_{LH}}{\theta_L}+\frac{f_{LH}}{\eta_H}. \tag{A.2}$$

To solve for equilibrium signals, type LH workers minimize their signaling cost to satisfy the ICC conditions (A.1) and (A.2):

$$\begin{aligned} \min \quad & \frac{e_{LH}}{\theta_L}+\frac{f_{LH}}{\eta_H} \qquad \text{(A.3)} \\ \text{subject to} \quad & \frac{e_{LH}}{\theta_L}+\frac{f_{LH}}{\eta_L}\geq(1-\beta)\geq\frac{e_{LH}}{\theta_L}+\frac{f_{LH}}{\eta_H}. \end{aligned}$$

Invoking the IRC, the optimal solution lies on the lower-bound ICC (A.1), which can be rearranged as

$$\frac{f_{LH}}{\eta_L}=1-\beta-\frac{e_{LH}}{\theta_L}. \tag{A.1$'$}$$

Substituting (A.1′) in the cost function (A.3) gives

$$(1-\beta)\frac{\eta_L}{\eta_H}-\frac{e_{LH}}{\theta_L}\frac{\eta_L}{\eta_H}+\frac{e_{LH}}{\theta_L},$$

which can, in turn, be rearranged as

$$\underbrace{(1-\beta)\frac{\eta_L}{\eta_H}}_{\text{is a constant}}+\frac{e_{LH}}{\theta_L}\underbrace{(1-\frac{\eta_L}{\eta_H})}_{>0}.$$

This cost function achieves its least-cost objective only when $e^\star_{LH}=0$. Substituting $e^\star_{LH}=0$ in (A.1′) gives $f^\star_{LH}=(1-\beta)\eta_L$. Furthermore, this solution satisfies the upper-bound ICC condition (A.2). The corresponding utility function, $U^\star_{LH}=(1-\beta)(1+\theta_L-\frac{\eta_L}{\eta_H})$. Similarly, the optimal signals for type HL workers are determined when they distinguish themselves from type LL workers. The ICC are such that type LL workers lack incentive to mimic type HL workers (lower-bound ICC), and the optimal signals should not be too costly such that type HL workers would prefer to be perceived as type LL workers (upper-bound ICC). The lower-bound ICC is

$$U^\star_{LL}\geq w_{HL}-c^1(e_{HL},\theta_L)-c^2(f_{HL},\eta_L).$$

This condition can be rewritten as

$$(1-\beta)\theta_L \geq (1-\beta)\theta_H - \frac{e_{HL}}{\theta_L} - \frac{f_{HL}}{\eta_L},$$

which can, in turn, be rearranged as

$$\frac{e_{HL}}{\theta_L} + \frac{f_{HL}}{\eta_L} \geq (1-\beta)(\theta_H - \theta_L). \tag{A.4}$$

The upper-bound ICC condition is

$$w_{HL} - c^1(e_{HL}, \theta_H) - c^2(f_{HL}, \eta_L) \geq w_{LL} - c^1(e^\star_{LL}, \theta_H) - c^2(f^\star_{LL}, \eta_L).$$

This condition can be rewritten as

$$(1-\beta)\theta_H - \frac{e_{HL}}{\theta_H} - \frac{f_{HL}}{\eta_L} \geq (1-\beta)\theta_L,$$

which can, in turn, be rearranged as

$$(1-\beta)(\theta_H - \theta_L) \geq \frac{e_{HL}}{\theta_H} + \frac{f_{HL}}{\eta_L}. \tag{A.5}$$

To solve for equilibrium signals, type HL workers minimize their signaling cost to satisfy the ICC conditions (A.4) and (A.5):

$$\begin{aligned} \min \quad & \frac{e_{HL}}{\theta_H} + \frac{f_{HL}}{\eta_L} \qquad\qquad (A.6)\\ \text{subject to} \quad & \frac{e_{HL}}{\theta_L} + \frac{f_{HL}}{\eta_L} \geq (1-\beta)(\theta_H - \theta_L) \geq \frac{e_{HL}}{\theta_H} + \frac{f_{HL}}{\eta_L}. \end{aligned}$$

Invoking the IRC, the optimal solution lies on the lower-bound ICC (A.4), which can be rearranged as

$$\frac{e_{HL}}{\theta_L} = (1-\beta)(\theta_H - \theta_L) - \frac{f_{HL}}{\eta_L}. \tag{A.4$'$}$$

Substituting (A.4′) in the cost function (A.6) gives

$$(1-\beta)(\theta_H - \theta_L)\frac{\theta_L}{\theta_H} - \frac{f_{HL}}{\eta_L}\frac{\theta_L}{\theta_H} + \frac{f_{HL}}{\eta_L},$$

which can, in turn, be rearranged as

$$\underbrace{(1-\beta)(\theta_H - \theta_L)\frac{\theta_L}{\theta_H}}_{\text{is a constant}} + \frac{f_{HL}}{\eta_L}\underbrace{(1 - \frac{\theta_L}{\theta_H})}_{>0}.$$

This cost function achieves its least-cost objective only when $f^{\star}_{HL} = 0$. Substituting $f^{\star}_{HL} = 0$ in (A.4′) gives $e^{\star}_{HL} = (1-\beta)\theta_L(\theta_H - \theta_L)$. Furthermore, this solution satisfies the upward ICC condition (A.5). The corresponding utility function, $U^{\star}_{HL} = (1-\beta)(\theta_H - \frac{\theta_L}{\theta_H}(\theta_H - \theta_L))$. Lastly, type HH workers must optimize their signals such that they distinguish themselves from both specialized types LH and HL workers. The ICC ensures that both type LH and type HL workers lack incentive to mimic type HH workers (lower-bound ICC conditions). Similarly, type HH workers should not prefer to be perceived either as type LH or type HL workers (upper-bound ICC conditions). The lower-bound ICC in which type LH workers would not mimic type HH workers is

$$U^{\star}_{LH} \geq w_{HH} - c^1(e_{HH}, \theta_L) - c^2(f_{HH}, \eta_H).$$

This condition can be rewritten as

$$(1-\beta)(1 + \theta_L - \frac{\eta_L}{\eta_H}) \geq (1-\beta)(1+\theta_H) - \frac{e_{HH}}{\theta_L} - \frac{f_{HH}}{\eta_H},$$

which can, in turn, be rearranged as

$$\frac{e_{HH}}{\theta_L} + \frac{f_{HH}}{\eta_H} \geq (1-\beta)(\theta_H - \theta_L + \frac{\eta_L}{\eta_H}). \tag{A.7}$$

Similarly, type HH workers would not mimic type LH workers (upper-bound ICC) if

$$w_{HH} - c^1(e_{HH}, \theta_H) - c^2(f_{HH}, \eta_H) \geq w_{LH} - c^1(e^{\star}_{LH}, \theta_H) - c^2(f^{\star}_{LH}, \eta_H).$$

This condition can be rewritten as

$$(1-\beta)(1+\theta_H) - \frac{e_{HH}}{\theta_H} - \frac{f_{HH}}{\eta_H} \geq (1-\beta)(1+\theta_L - \frac{\eta_L}{\eta_H}),$$

which can, in turn, be rearranged as

$$(1-\beta)(\theta_H - \theta_L + \frac{\eta_L}{\eta_H}) \geq \frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_H}. \tag{A.8}$$

Type HL workers would not mimic type HH workers (lower-bound ICC) if

$$U^{\star}_{HL} \geq w_{HH} - c^1(e_{HH}, \theta_H) - c^2(f_{HH}, \eta_L).$$

This condition can be rewritten as

$$(1-\beta)(\theta_H - \frac{\theta_L}{\theta_H}(\theta_H - \theta_L)) \geq (1-\beta)(1+\theta_H) - \frac{e_{HH}}{\theta_H} - \frac{f_{HH}}{\eta_L},$$

which can, in turn, be rearranged as

$$\frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_L} \geq (1-\beta)(1+\frac{\theta_L}{\theta_H}(\theta_H - \theta_L)). \tag{A.9}$$

Similarly, type HH workers would not mimic type HL workers (upper-bound ICC) if

$$w_{HH} - c^1(e_{HH}, \theta_H) - c^2(f_{HH}, \eta_H) \geq w_{HL} - c^1(e_{HL}, \theta_H) - c^2(f_{HL}, \eta_H).$$

This condition can be rewritten as

$$(1-\beta)(1+\theta_H) - \frac{e_{HH}}{\theta_H} - \frac{f_{HH}}{\eta_H} \geq (1-\beta)(\theta_H - \frac{\theta_L}{\theta_H}(\theta_H - \theta_L)),$$

which can, in turn, be rearranged as

$$(1-\beta)(1+\frac{\theta_L}{\theta_H}(\theta_H - \theta_L)) \geq \frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_H}. \tag{A.10}$$

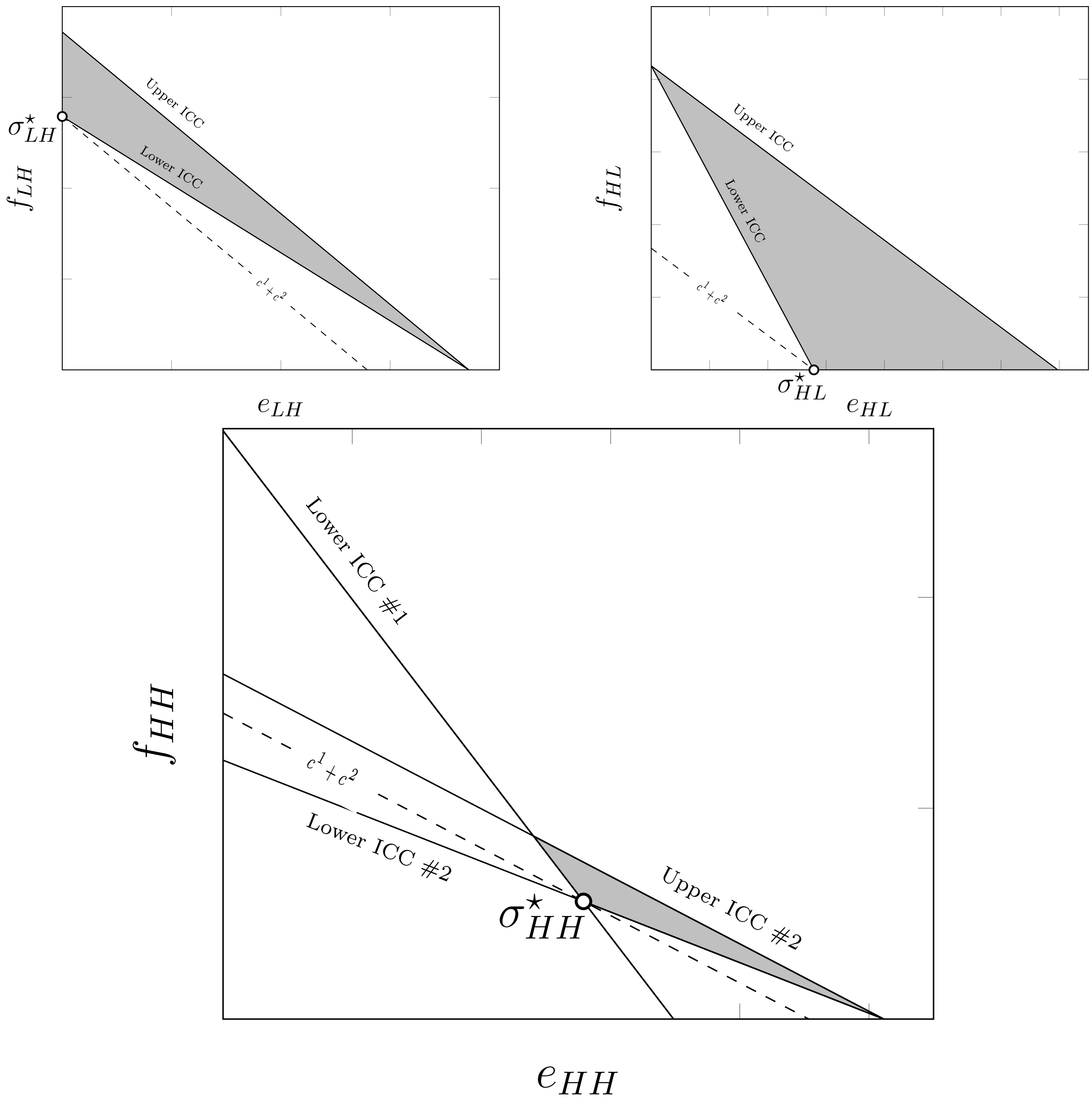
To solve for equilibrium signals, type HH workers minimize their signaling cost to satisfy the ICC conditions (A.7) through (A.10):

$$\begin{aligned} \min \quad & \frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_H} \\ \text{subject to} \quad & \frac{e_{HH}}{\theta_L} + \frac{f_{HH}}{\eta_H} \geq (1-\beta)(\theta_H - \theta_L + \frac{\eta_L}{\eta_H}) \geq \frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_H} \\ & \frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_L} \geq (1-\beta)(1+\frac{\theta_L}{\theta_H}(\theta_H - \theta_L)) \geq \frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_H}. \end{aligned}$$

In this case, the IRC and the fact that the slope of the objective function is not equal to and is bounded within the slopes of the two lower-bound ICC conditions (A.7) and (A.9), the optimal solution is at the intersection of the two lower bounds. The unique equilibrium signals are $e^{\star}_{HH} = (1-\beta)\theta_L(\theta_H - \theta_L)$ and $f^{\star}_{HH} = (1-\beta)\eta_L$. Furthermore, this solution satisfies the upper-bound ICC conditions (A.8) and (A.10). The corresponding utility function, $U^{\star}_{HH} = (1-\beta)(1+\theta_H - \frac{\theta_L}{\theta_H}(\theta_H - \theta_L) - \frac{\eta_L}{\eta_H})$. □

Figure A.1: Equilibrium Diagrams.— Proposition 1

NOTE.– Figure A.1 represents the equilibrium strategy for type LH, HL, and HH workers. The ICC provides the lower and upper bounds within which all PBEs lie (the shaded region), and the IRC identifies the least-cost optimal solution $\sigma^{\star}_{ij}$. Note that the dotted line $c^1 + c^2$ represents the cost function.



A.2 Proof of Corollary 1

Corollary 1. *Equilibria in which specialized worker types pool together fail the intuitive criterion.*

Proof. Corollary 1 states that the equilibrium in which type LH and type HL workers pool together fails the intuitive criterion. To prove this, let us suppose that such an equilibrium exists. First, type LL workers, being the most inferior worker type, have no incentive to send non-zero signals in either dimension. The equilibrium signals for type LL workers are $e^{\star}_{LL} = 0$ and $f^{\star}_{LL} = 0$. $U^{\star}_{LL} = (1-\beta)\theta_L$. Next, we determine the equilibrium signals of the pooled group (type LH and type HL workers). Let P denote this pooled group. The expected productivity of the pooled group is the sum of the share of expected productivity from both types LH and HL workers, which also depends on k. Note that k denotes the firm's decision to invest in networking activities. In more simple terms, $E(y^{P,k})$ equals the proportion of type LH workers in the pooled group $\times$ the expected productivity from type LH workers plus the proportion of type HL workers in the pooled group $\times$ the expected productivity from type HL workers. In addition, the expected wage of the pooled group is

$$E(w^{P,k}) = (1-\beta)E(y^{P,k}).$$

The ICC dictates that the signals of type LL workers and the pooled group must be distinguishable so as to prevent mutual mimicking. Type LL workers would not mimic the pooled group (lower-bound ICC) if

$$U^{\star}_{LL} \geq E(w^{P,k}) - c^1(e^{P,k}, \theta_L) - c^2(f^{P,k}, \eta_L).$$

This condition can be rewritten as

$$(1-\beta)\theta_L \geq (1-\beta)E(y^{P,k}) - \frac{e^{P,k}}{\theta_L} - \frac{f^{P,k}}{\eta_L}.$$

Rearranging this equation,

$$\frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_L} \geq (1-\beta)(E(y^{P,k}) - \theta_L). \tag{A.11}$$

Similarly, the pooled group would not mimic type LL workers (upper-bound ICC). There are two conditions here:

(i) type LH workers would not mimic type LL workers if,

$$E(w^{P,k}) - c^1(e^{P,k}, \theta_L) - c^2(f^{P,k}, \eta_H) \geq w_{LL} - c^1(e^\star_{LL}, \theta_L) - c^2(f^\star_{LL}, \eta_H), \text{ and}$$

(ii) type HL workers would not mimic type LL workers if,

$$E(w^{P,k}) - c^1(e^{P,k}, \theta_H) - c^2(f^{P,k}, \eta_L) \geq w_{LL} - c^1(e^\star_{LL}, \theta_H) - c^2(f^\star_{LL}, \eta_L).$$

Condition (i) can be rewritten as

$$(1-\beta)E(y^{P,k}) - \frac{e^{P,k}}{\theta_L} - \frac{f^{P,k}}{\eta_H} \geq (1-\beta)\theta_L,$$

which can, in turn, be rearranged as

$$(1-\beta)(E(y^{P,k}) - \theta_L) \geq \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_H}. \tag{A.12}$$

Condition (ii) can be rewritten as

$$(1-\beta)E(y^{P,k}) - \frac{e^{P,k}}{\theta_H} - \frac{f^{P,k}}{\eta_L} \geq (1-\beta)\theta_L,$$

which can, in turn, be rearranged as

$$(1-\beta)(E(y^{P,k}) - \theta_L) \geq \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_L}. \tag{A.13}$$

Since type LH and type HL workers employ a strategy of selecting the same signal levels, each worker type's constrained minimization problem should yield the same result. Therefore, the minimization problem of type LH workers is given as

$$\begin{aligned} \min \quad & \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_H} \\ \text{subject to} \quad & \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_L} \geq (1-\beta)(E(y^{P,k}) - \theta_L) \geq \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_H} \\ & \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_L} \geq (1-\beta)(E(y^{P,k}) - \theta_L) \geq \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_L}. \end{aligned} \tag{A.14}$$

Similarly, the minimization problem for type HL workers is given as

$$\begin{aligned} \min \quad & \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_L} \\ \text{subject to} \quad & \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_L} \geq (1-\beta)(E(y^{P,k}) - \theta_L) \geq \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_H} \\ & \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_L} \geq (1-\beta)(E(y^{P,k}) - \theta_L) \geq \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_L}. \end{aligned} \tag{A.15}$$

Invoking the IRC, the solution lies on the lower bound (A.11), which can be rearranged as

$$\frac{f^{P,k}}{\eta_L} = (1-\beta)(E(y^{P,k}) - \theta_L)) - \frac{e^{P,k}}{\theta_L}. \tag{A.11$'$}$$

Substituting (A.11′) in cost function (A.14) gives

$$(1-\beta)\frac{\eta_L}{\eta_H}(E(y^{P,k}) - \theta_L) - \frac{e^{P,k}}{\theta_L}\frac{\eta_L}{\eta_H} + \frac{e^{P,k}}{\theta_L},$$

which can, in turn, be rearranged as

$$\underbrace{(1-\beta)\frac{\eta_L}{\eta_H}(E(y^{P,k}) - \theta_L)}_{\text{is a constant}} + \frac{e^{P,k}}{\theta_L}\underbrace{(1 - \frac{\eta_L}{\eta_H})}_{>0}.$$

This cost function achieves its least-cost objective only when $e^{P,k} = 0$. Similarly, to determine type HL workers' optimal strategy, substitute (A.11′) in cost function (A.15).

$$(1-\beta)(E(y^{P,k}) - \theta_L) - \frac{e^{P,k}}{\theta_L} + \frac{e^{P,k}}{\theta_H},$$

which can, in turn, be rearranged as

$$\underbrace{(1-\beta)(E(y^{P,k}) - \theta_L)}_{\text{is a constant}} + e^{P,k}\underbrace{(\frac{1}{\theta_H} - \frac{1}{\theta_L})}_{<0}.$$

This expression can be minimized when $e^{P,k} > 0$ and is large, which contradicts type LH workers' optimal strategy. On the other hand, to determine type HL workers' optimal strategy, we rearrange the lower-bound ICC (A.11)

$$\frac{e^{P,k}}{\theta_L} = (1-\beta)(E(y^{P,k}) - \theta_L) - \frac{f^{P,k}}{\eta_L}. \tag{A.11$''$}$$

Substituting (A.11″) in cost function (A.15) gives

$$(1-\beta)\frac{\theta_L}{\theta_H}(E(y^{P,k}) - \theta_L) - \frac{f^{P,k}}{\eta_L}\frac{\theta_L}{\theta_H} + \frac{f^{P,k}}{\eta_L},$$

which can, in turn, be rearranged as

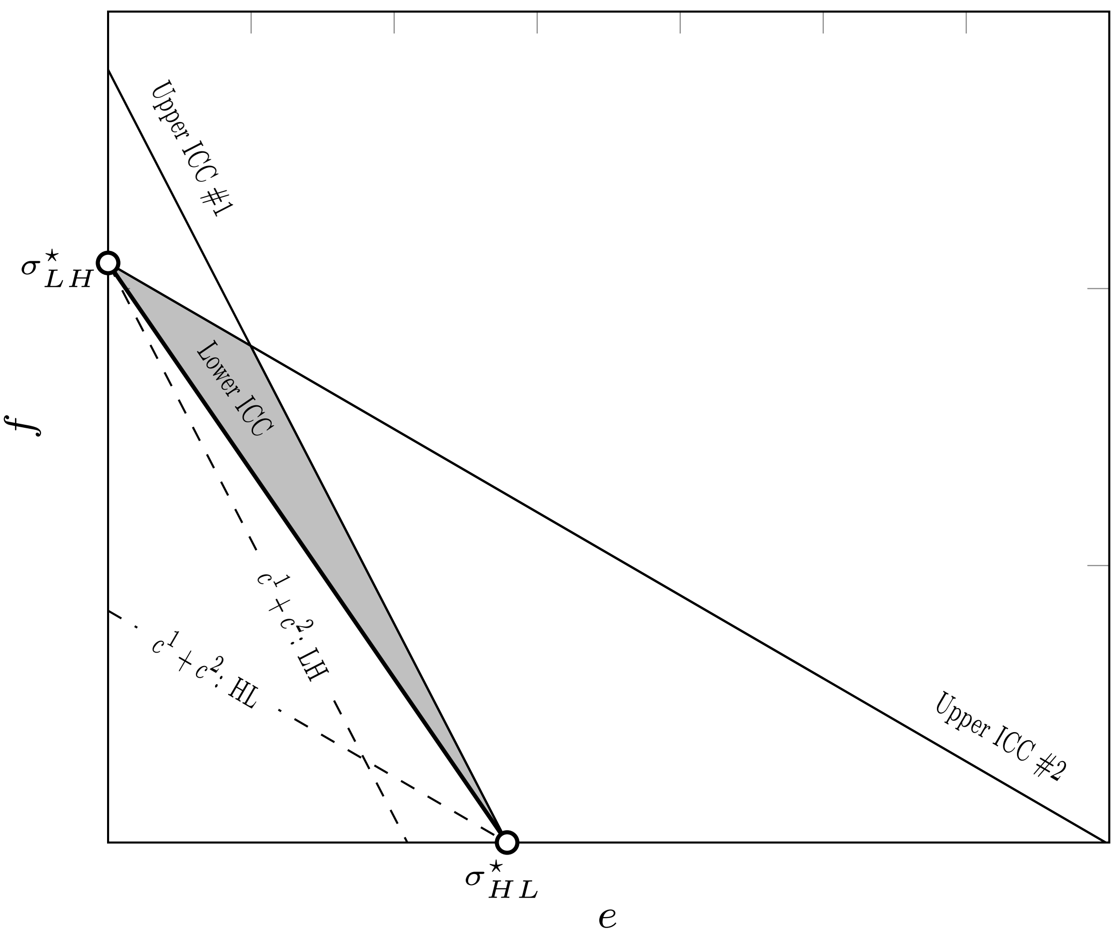
$$\underbrace{(1-\beta)\frac{\theta_L}{\theta_H}(E(y^{P,k})-\theta_L)}_{\text{is a constant}} + \frac{f^{P,k}}{\eta_L}\underbrace{(1-\frac{\theta_L}{\theta_H})}_{>0}.$$

This cost function achieves its least-cost objective only when $f^{P,k} = 0$. Therefore, equilibrium in which types LH and HL workers play the same signal strategy does not exist. □

Remark 1. *Pooling of specialized types LH and HL workers is feasible* only *when all worker types pool together as one unit.*

Figure A.2: Equilibrium Diagrams.— Corollary 1

NOTE.– Figure A.2 shows that types LH and HL workers do not play the same equilibrium strategies. The ICC provides the lower and upper bounds within which all PBEs lie (the shaded region). Note that the dotted lines $c^1 + c^2 : LH$ and $c^1 + c^2 : HL$ represent the cost functions. The IRC identifies two different least-cost solutions $\sigma^\star_{LH}$ and $\sigma^\star_{HL}$.



Proposition 2. *If the time constraint is binding and*

(a) if $\eta_L > \theta_H$ (or $\theta_L > \eta_H$), then a different separating equilibrium survives, and

(b) if $\theta_L \leq \eta_H$ and $\eta_L \leq \theta_H$, then an equilibrium in which only the two superior worker types pool together survives.

(b.1) If $\frac{\theta_H}{\theta_L} \geq \frac{\eta_H}{\eta_L}$, then an equilibrium in which types HL and HH pool together survives.

(b.2) If $\frac{\eta_H}{\eta_L} \geq \frac{\theta_H}{\theta_L}$, then an equilibrium in which types LH and HH pool together survives.

A.3 Proof of Proposition 2(a)

Proof. The proof of separating equilibrium under time constraint is given as follows. First, since workers of types LL, LH, and HL are not time constrained (as in Proposition 1), their equilibrium signals remain the same. Next, we determine the equilibrium signals of type HH workers under a binding time constraint, represented as (e^c_{HH}, f^c_{HH}). In other words, $e^\star_{HH} + f^\star_{HH} > T$, where (i) $(e^\star_{HH}, f^\star_{HH})$ are the equilibrium signals of type HH workers under no time constraints; (ii) T equals $e^\star_{HH} + f^\star_{HH} - (1-\beta)\Delta$; and (iii) Δ is the magnitude of the time constraint. Thus, $T = (1-\beta)(\theta_L(\theta_H - \theta_L) + \eta_L - \Delta)$. The lower- and upper-bound ICC conditions for type HH workers is the same as in Proposition 1. In addition to these constraints, the least-cost signaling problem of type HH workers requires the time constraint to hold. The minimization problem of type HH workers can be written as

$$\begin{aligned}
\min \quad & \frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_H} \\
\text{subject to} \quad & \frac{e_{HH}}{\theta_L} + \frac{f_{HH}}{\eta_H} \geq (1-\beta)(\theta_H - \theta_L + \frac{\eta_L}{\eta_H}) \geq \frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_H} \\
& \frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_L} \geq (1-\beta)(1 + \frac{\theta_L}{\theta_H}(\theta_H - \theta_L)) \geq \frac{e_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_H} \\
& e_{HH} + f_{HH} \leq T.
\end{aligned}$$

Invoking the IRC, the solution lies on the combined lower bounds (A.7) and (A.9). Owing to the presence of the time constraint, only one of the two lower bounds can hold with equality. Hence, two solutions survive based on which lower-bound ICC is binding. When $\eta_L > \theta_H$, lower bound ICC (A.9) is binding. Likewise, when $\theta_L > \eta_H$, lower bound ICC (A.7) is binding. The more interesting case is demonstrated when $\eta_L > \theta_H$. The time constraint equation is rearranged and substituted in (A.9),

$$\frac{T - f_{HH}}{\theta_H} + \frac{f_{HH}}{\eta_L} = (1 - \beta)(1 + \frac{\theta_L}{\theta_H}(\theta_H - \theta_L)). \tag{A.16}$$

Solving for f_{HH} from this equation (A.16) and substituting for T gives

$$f^c_{HH} = (1 - \beta)\eta_L(1 - \frac{\Delta}{\eta_L - \theta_H}). \tag{A.16$'$}$$

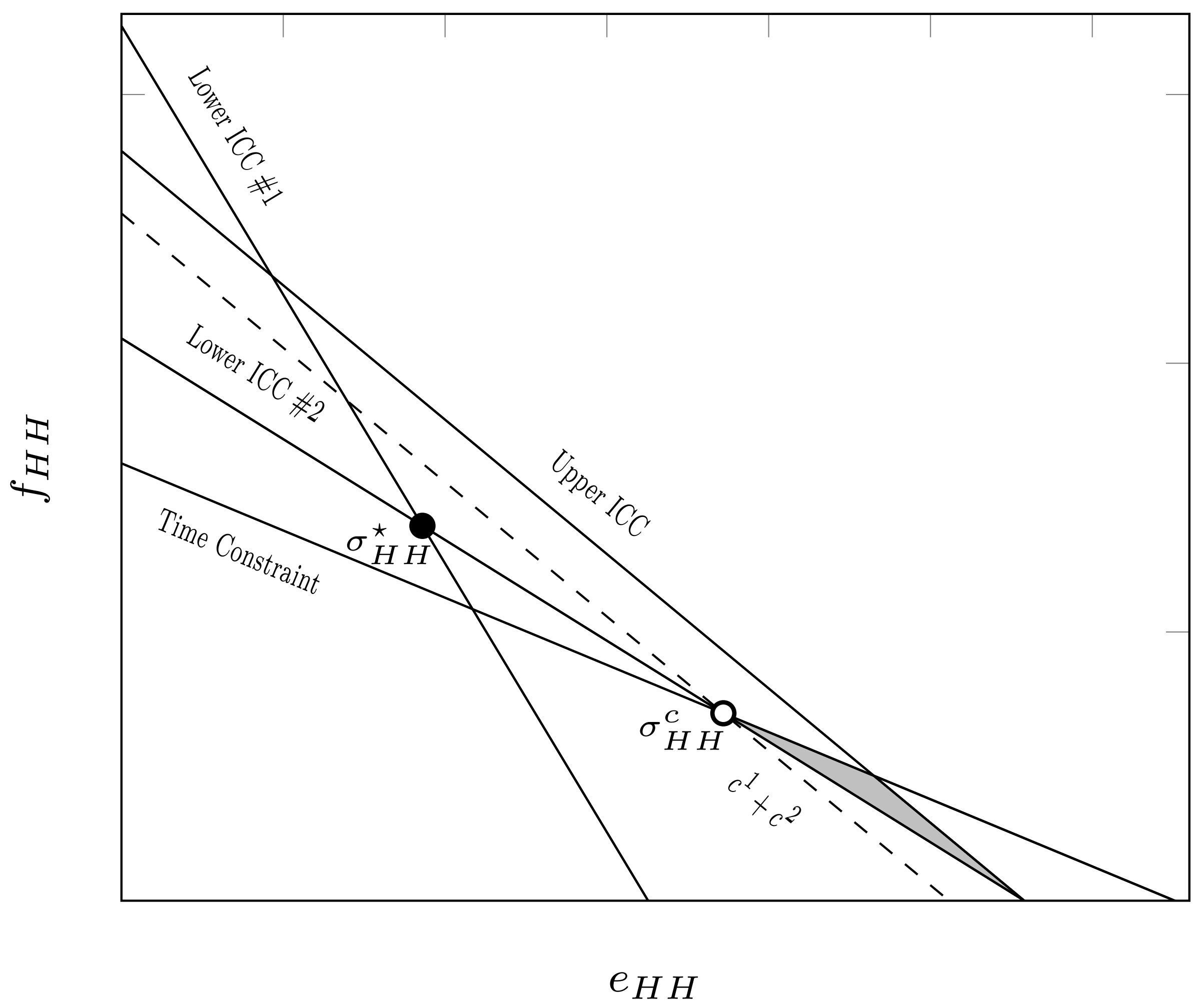
By substituting the value of f^c_{HH} into the time constraint,

$$e^c_{HH} = (1 - \beta)(\theta_L(\theta_H - \theta_L) + \Delta(\frac{\theta_H}{\eta_L - \theta_H})).$$

Note that $f^c_{HH} < f^\star_{HH}$ and $e^c_{HH} > e^\star_{HH}$, when $\eta_L > \theta_H$. More precisely, type HH workers underinvest in f and overinvest in e when time is constrained. Finally, (A.16′) also gives the maximum bound of the time constraint, Δ. Since f^c_{HH} and Δ are inversely related, $\Delta = \Delta_{max}$ when $f^c_{HH} = 0$. Hence, $\Delta_{max} = \eta_L - \theta_H$. Furthermore, the solution (e^c_{HH}, f^c_{HH}) satisfies the lower-bound ICC (A.7), and the two upper-bound ICC conditions (A.8) and (A.10). □

Figure A.3: Equilibrium Diagrams.— Proposition 2 (a)

NOTE.– Figure A.3 shows type HH workers' optimal strategy under binding time constraints and when $\eta_L > \theta_H$. The ICC provides the lower, upper, and time-constraint bounds within which all PBEs lie (the shaded region), and the IRC identifies the least-cost optimal solution σ^c_{HH}. Note that $\sigma^\star_{HH}$ was an unattainable optimal strategy owing to the presence of time constraints. The dotted line $c^1 + c^2$ represents the cost function.



A.4 Proof of Proposition 2(b.1)

Proof. This is the proof of the PBE in which types HL and HH workers pool together and send the same signals $(e^{P,k}, f^{P,k})$. First, since the ICC here and in separating equilibrium (see Proposition 1) for types LL and LH workers remains the same, their equilibrium signals also remain the same. Next, we determine the equilibrium signals of the pooled group (type HL and type HH workers). Let P denote this pooled group. The expected productivity of the pooled group is the sum of the share of the expected productivity from both types HL and HH workers, which also depends on k. Note that k denotes the firm's decision to invest in networking activities. In more simple terms, $E(y^{P,k})$ equals the proportion of type HL workers in the pooled group × the expected productivity from type HL workers plus the proportion of type HH workers in the pooled group × the expected productivity from type HH workers. If $k = 1$ (the firm invests), then $E(y^{P,k})$ is

$$\frac{q(1-s)}{q(1-s)+qs} \times \theta_H + \frac{qs}{q(1-s)+qs} \times (\theta_H + 1) = \theta_H + s,$$

or if $k = 0$ (the firm does not invest), then $E(y^{P,k})$ is

$$\frac{q(1-s)}{q(1-s)+qs} \times \theta_H + \frac{qs}{q(1-s)+qs} \times (\theta_H) = \theta_H.$$

Thus, the expected productivity and expected wage of the pooled group can be represented as

$$E(y^{P,k}) = \theta_H + k.s,$$

and

$$E(w^{P,k}) = (1-\beta)E(y^{P,k}).$$

Now, the pooled group workers must ensure that they distinguish themselves from both types LL and LH workers. The lower-bound ICC conditions would ensure that both types LL and LH workers would lack incentive to mimic the pooled group. Similarly, the upper-bound ICC conditions would ensure that the pooled group would not prefer to be perceived as either type LL or type LH workers. The lower-bound ICC in which type LL workers would not mimic the pooled group is

$$U^{\star}_{LL} \geq E(w^{P,k}) - c^1(e^{P,k}, \theta_L) - c^2(f^{P,k}, \eta_L).$$

This condition can be rewritten as

$$(1-\beta)\theta_L \geq (1-\beta)E(y^{P,k}) - \frac{e^{P,k}}{\theta_L} - \frac{f^{P,k}}{\eta_L},$$

which can, in turn, be rearranged as

$$\frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_L} \geq (1-\beta)(E(y^{P,k}) - \theta_L). \tag{A.17}$$

Similarly, the pooled group would not mimic type LL workers (upper-bound ICC conditions). If type HL workers would not mimic type LL workers, this automatically implies that type HH workers would also lack incentive to mimic type LL workers. Hence, the upper-bound ICC is

$$E(w^{P,k}) - c^1(e^{P,k},\theta_H) - c^2(f^{P,k},\eta_L) \geq w_{LL} - c^1(e^{\star}_{LL},\theta_H) - c^2(f^{\star}_{LL},\eta_L).$$

This condition can be rewritten as,

$$(1-\beta)E(y^{P,k}) - \frac{e^{P,k}}{\theta_H} - \frac{f^{P,k}}{\eta_L} \geq (1-\beta)\theta_L,$$

which can, in turn, be rearranged as

$$(1-\beta)(E(y^{P,k}) - \theta_L) \geq \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_L}. \tag{A.18}$$

Type LH workers would not mimic the pooled group (lower-bound ICC) if

$$U^{\star}_{LH} \geq E(w^{P,k}) - c^1(e^{P,k},\theta_L) - c^2(f^{P,k},\eta_H).$$

This condition can be rewritten as

$$(1-\beta)(1+\theta_L - \frac{\eta_L}{\eta_H}) \geq (1-\beta)E(y^{P,k}) - \frac{e^{P,k}}{\theta_L} - \frac{f^{P,k}}{\eta_H},$$

which can, in turn, be rearranged as

$$\frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_H} \geq (1-\beta)(E(y^{P,k}) - \theta_L - 1 + \frac{\eta_L}{\eta_H}). \tag{A.19}$$

Similarly, the pooled group would not mimic type LH workers (upper-bound ICC conditions). Because types LH and HL workers never pool with each other (see Corollary 1 for details), the upper-bound ICC condition is that type HH workers would not mimic type LH workers. That is,

$$E(w^{P,k}) - c^1(e^{P,k},\theta_H) - c^2(f^{P,k},\eta_H) \geq w_{LH} - c^1(e^{\star}_{LH},\theta_H) - c^2(f^{\star}_{LH},\eta_H).$$

This condition can be rewritten as,

$$(1-\beta)E(y^{P,k}) - \frac{e^{P,k}}{\theta_H} - \frac{f^{P,k}}{\eta_H} \geq (1-\beta)(1+\theta_L - \frac{\eta_L}{\eta_H}),$$

which can, in turn, be rearranged as

$$(1-\beta)(E(y^{P,k}) - \theta_L - 1 + \frac{\eta_L}{\eta_H}) \geq \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_H}. \tag{A.20}$$

Since types HL and HH workers employ a strategy of selecting the same signals, each worker type's constrained minimization problem should yield the same result. Therefore, the minimization problem for type HL workers is

$$\begin{aligned} \min \quad & \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_L} \qquad\qquad (A.21)\\ \text{subject to} \quad & \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_L} \geq (1-\beta)(E(y^{P,k}) - \theta_L) \geq \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_L} \\ & \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_H} \geq (1-\beta)(E(y^{P,k}) - \theta_L - 1 + \frac{\eta_L}{\eta_H}) \geq \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_H}, \end{aligned}$$

and the minimization problem for type HH workers is given as

$$\begin{aligned} \min \quad & \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_H} \qquad\qquad (A.22)\\ \text{subject to} \quad & \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_L} \geq (1-\beta)(E(y^{P,k}) - \theta_L) \geq \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_L} \\ & \frac{e^{P,k}}{\theta_L} + \frac{f^{P,k}}{\eta_H} \geq (1-\beta)(E(y^{P,k}) - \theta_L - 1 + \frac{\eta_L}{\eta_H}) \geq \frac{e^{P,k}}{\theta_H} + \frac{f^{P,k}}{\eta_H}. \end{aligned}$$

In this case, the IRC and the fact that the slope of the objective function is not equal to and not bounded within the slopes of the two lower-bound ICC conditions, (A.17) and (A.19), means that the optimal solution would satisfy one of the two lower bounds with equality. Here, the lower bound (A.17) holds with equality, which can, in turn, be rearranged as

$$\frac{e^{P,k}}{\theta_L} = (1-\beta)(E(y^{P,k}) - \theta_L) - \frac{f^{P,k}}{\eta_L}. \tag{A.17$'$}$$

Substituting (A.17′) in cost function (A.21) gives

$$(1-\beta)\frac{\theta_L}{\theta_H}(E(y^{P,k}) - \theta_L) - \frac{f^{P,k}}{\eta_L}\frac{\theta_L}{\theta_H} + \frac{f^{P,k}}{\eta_L},$$

which can, in turn, be rearranged as

$$\underbrace{(1-\beta)\frac{\theta_L}{\theta_H}(E(y^{P,k})-\theta_L)}_{\text{is a constant}}+\frac{f^{P,k}}{\eta_L}\underbrace{(1-\frac{\theta_L}{\theta_H})}_{>0}.$$

This cost function achieves its least-cost objective when $f^{P,k}=0$. Similarly, substituting (A.17′) in cost function (A.22) gives

$$(1-\beta)\frac{\theta_L}{\theta_H}(E(y^{P,k})-\theta_L)-\frac{f^{P,k}}{\eta_L}\frac{\theta_L}{\theta_H}+\frac{f^{P,k}}{\eta_H},$$

which can, in turn, be rearranged as

$$\underbrace{(1-\beta)\frac{\theta_L}{\theta_H}(E(y^{P,k})-\theta_L)}_{\text{is a constant}}+\frac{f^{P,k}}{\eta_L}(\frac{\eta_L}{\eta_H}-\frac{\theta_L}{\theta_H}).$$

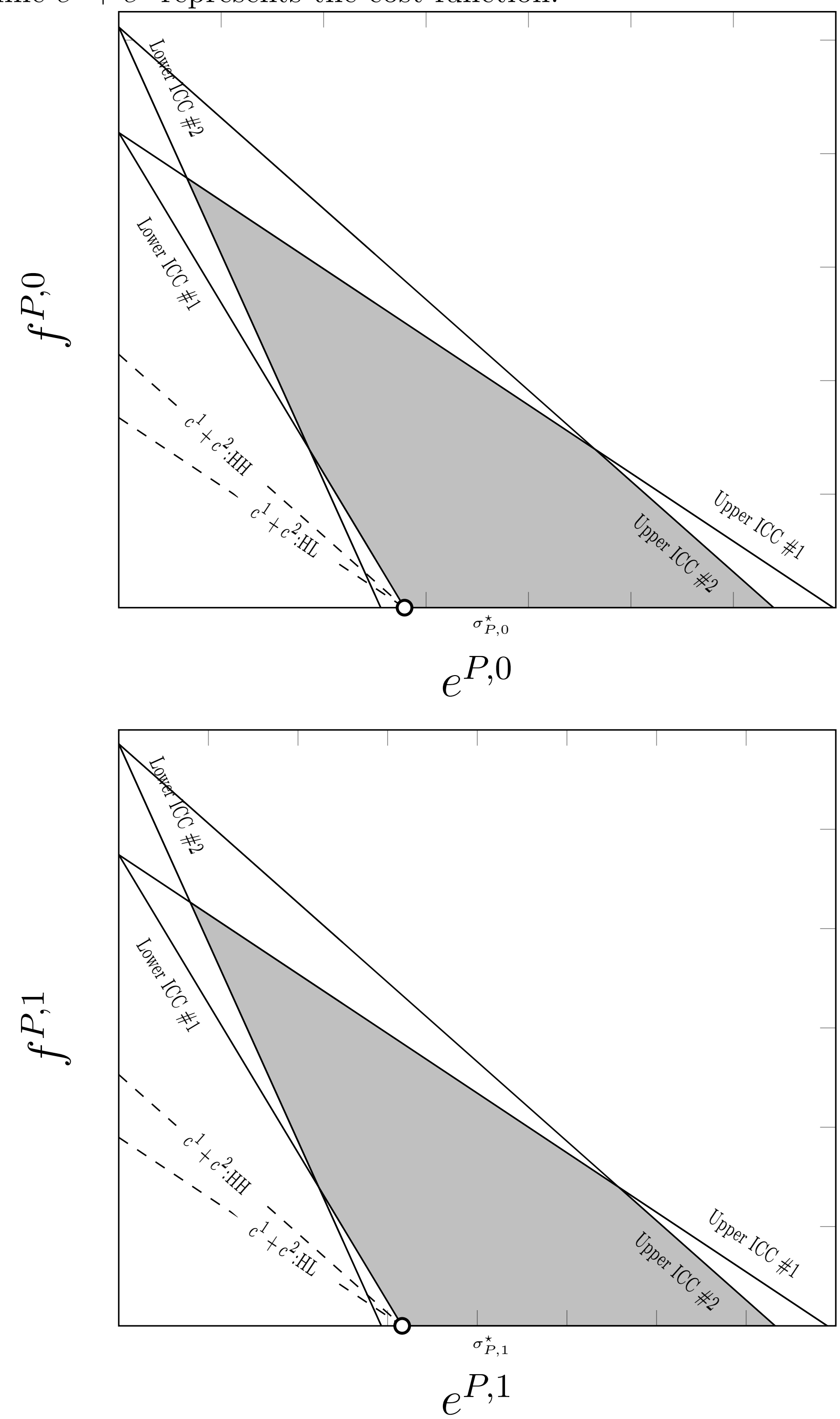
Thus, $f^{P,k}=0$ is the solution for the abovementioned cost minimization problem only when $(\frac{\eta_L}{\eta_H}-\frac{\theta_L}{\theta_H})\geq 0$, or $\frac{\theta_H}{\theta_L}\geq\frac{\eta_H}{\eta_L}$. Note that both types HL and HH workers yield the same signal strategy $f^{P,k}=0$ when optimized for cost. Substituting $f^{P,k}=0$ in (A.17′) and solving for $e^{P,k}$ gives

$$e^{P,k}=(1-\beta)\theta_L(E(y^{P,k})-\theta_L).$$

Thus, the solution $(e^{P,k},f^{P,k})$ satisfies the lower-bound ICC (A.19), and the two upper-bound ICC conditions (A.18) and (A.20). The equilibrium signals when a firm invests (when $k=1$) are $e^{P^\star,1}=(1-\beta)\theta_L(\theta_H-\theta_L+s)$ and $f^{P^\star,1}=0$. The corresponding utility function $U^{P^\star,1}$ is $(1-\beta)((\theta_H+s)(1-\frac{\theta_L}{\theta_H})+\frac{\theta_L^2}{\theta_H})$. The equilibrium signals when a firm refrains from investing (when $k=0$) are $e^{P^\star,0}=(1-\beta)\theta_L(\theta_H-\theta_L)$ and $f^{P^\star,0}=0$. The corresponding utility function $U^{P^\star,0}$ is $(1-\beta)(\theta_H(1-\frac{\theta_L}{\theta_H})+\frac{\theta_L^2}{\theta_H})$. □

Figure A.4: Equilibrium Diagrams.— Proposition 2 (b.1)

NOTE.– Figure A.4 shows the equilibrium strategy when type HL and HH workers pool together. Note that $\frac{\theta_H}{\theta_L} \geq \frac{\eta_H}{\eta_L}$. The ICC provides the lower and upper bounds within which all PBEs lie (the shaded region), and the IRC identifies the least-cost optimal solution $\sigma^{\star}_{P,k}$. The dotted line $c^1 + c^2$ represents the cost function.



A.5 Proof of Proposition 2(b.2)

Proof. This is the proof of the PBE in which types LH and HH workers pool together and send the same signals $(e^{P,1}, f^{P,1})$. First, since the ICC here and in separating equilibrium (see Proposition 1) for type LL and HL workers remains the same, their equilibrium signals also remain the same. Next, the equilibrium signals of the pooled group (type LH and type HH workers) are determined. Let P denote this pooled group. The expected productivity of the pooled group is the sum of the share of expected productivity from type LH and type HH workers. Without ambiguity, firms invest in the workers' socializing activity ($k = 1$) since the pooled group comprises high sociability types only. Clearly, condition (3) is met. In more simple terms, $E(y^{P,1})$ equals the proportion of type LH workers in the pooled group $\times$ the expected productivity from type LH workers plus the proportion of type HH workers in the pooled group $\times$ the expected productivity from type HH workers.

$$\frac{(1-q)s}{(1-q)s+qs} \times (\theta_L + 1) + \frac{qs}{(1-q)s+qs} \times (\theta_H + 1).$$

Thus, the expected productivity and expected wage of the pooled group can be represented as

$$E(y^{P,1}) = \theta_L + q(\theta_H - \theta_L) + 1,$$

and

$$E(w^{P,1}) = (1-\beta)E(y^{P,1}).$$

Now, the pooled group workers must ensure that they distinguish themselves from both types LL and HL workers. The lower-bound ICC conditions would ensure that both types LL and HL workers would lack incentive to mimic the pooled group. Similarly, the upper-bound ICC conditions would ensure that the pooled group would not prefer to be perceived as either type LL or type HL workers. The lower-bound ICC in which type LL workers would not mimic the pooled group is

$$U^{\star}_{LL} \geq E(w^{P,1}) - c^1(e^{P,1}, \theta_L) - c^2(f^{P,1}, \eta_L).$$

This condition can be rewritten as

$$(1-\beta)\theta_L \geq (1-\beta)E(y^{P,1}) - \frac{e^{P,1}}{\theta_L} - \frac{f^{P,1}}{\eta_L},$$

which can, in turn, be rearranged as

$$\frac{e^{P,1}}{\theta_L} + \frac{f^{P,1}}{\eta_L} \geq (1-\beta)(E(y^{P,1}) - \theta_L). \tag{A.23}$$

Similarly, the pooled group would not mimic type LL workers (upper-bound ICC conditions). If type LH workers would not mimic type LL workers, this automatically implies that type HH workers also lack incentive to mimic type LL workers. Hence, the upper-bound ICC is

$$E(w^{P,1}) - c^1(e^{P,1}, \theta_L) - c^2(f^{P,1}, \eta_H) \geq w_{LL} - c^1(e^{\star}_{LL}, \theta_L) - c^2(f^{\star}_{LL}, \eta_H).$$

This condition can be rewritten as

$$(1-\beta)E(y^{P,1}) - \frac{e^{P,1}}{\theta_L} - \frac{f^{P,1}}{\eta_H} \geq (1-\beta)\theta_L,$$

which can, in turn, be rearranged as

$$(1-\beta)(E(y^{P,1}) - \theta_L) \geq \frac{e^{P,1}}{\theta_L} + \frac{f^{P,1}}{\eta_H}. \tag{A.24}$$

Type HL workers would not mimic the pooled group (lower-bound ICC) if

$$U^{\star}_{HL} \geq E(w^{P,1}) - c^1(e^{P,1}, \theta_H) - c^2(f^{P,1}, \eta_L).$$

This condition can be rewritten as

$$(1-\beta)(\theta_H - \frac{\theta_L}{\theta_H}(\theta_H - \theta_L)) \geq (1-\beta)E(y^{P,1}) - \frac{e^{P,1}}{\theta_H} - \frac{f^{P,1}}{\eta_L},$$

which can, in turn, be rearranged as

$$\frac{e^{P,1}}{\theta_H} + \frac{f^{P,1}}{\eta_L} \geq (1-\beta)(E(y^{P,1}) - \theta_H + \frac{\theta_L}{\theta_H}(\theta_H - \theta_L)). \tag{A.25}$$

Similarly, the pooled group would not mimic type HL workers (upper-bound ICC conditions). Because types LH and HL workers never pool with each other (see Corollary 1 for details), the upper-bound ICC condition is that type HH workers would not mimic type HL workers. That is,

$$E(w^{P,1}) - c^1(e^{P,1}, \theta_H) - c^2(f^{P,1}, \eta_H) \geq w_{HL} - c^1(e^{\star}_{HL}, \theta_H) - c^2(f^{\star}_{HL}, \eta_H).$$

This condition can be rewritten as

$$(1-\beta)E(y^{P,1}) - \frac{e^{P,1}}{\theta_H} - \frac{f^{P,1}}{\eta_H} \geq (1-\beta)(\theta_H - \frac{\theta_L}{\theta_H}(\theta_H - \theta_L)),$$

which can, in turn, be rearranged as

$$(1-\beta)(E(y^{P,1})-\theta_H+\frac{\theta_L}{\theta_H}(\theta_H-\theta_L))\geq\frac{e^{P,1}}{\theta_H}+\frac{f^{P,1}}{\eta_H}. \tag{A.26}$$

Since types LH and HH workers employ a strategy of selecting the same signals, each worker type's constrained minimization problem should yield the same result. Therefore, the minimization problem for type LH workers is

$$\begin{aligned}\min\ &\frac{e^{P,1}}{\theta_L}+\frac{f^{P,1}}{\eta_H} &\text{(A.27)}\\ \text{subject to}\ &\frac{e^{P,1}}{\theta_L}+\frac{f^{P,1}}{\eta_L}\geq(1-\beta)(E(y^{P,1})-\theta_L)\geq\frac{e^{P,1}}{\theta_L}+\frac{f^{P,1}}{\eta_H}\\ &\frac{e^{P,1}}{\theta_H}+\frac{f^{P,1}}{\eta_L}\geq(1-\beta)(E(y^{P,1})-\theta_H+\frac{\theta_L}{\theta_H}(\theta_H-\theta_L))\geq\frac{e^{P,1}}{\theta_H}+\frac{f^{P,1}}{\eta_H},\end{aligned}$$

and the minimization problem for type HH workers is given as

$$\begin{aligned}\min\ &\frac{e^{P,1}}{\theta_H}+\frac{f^{P,1}}{\eta_H} &\text{(A.28)}\\ &\frac{e^{P,1}}{\theta_L}+\frac{f^{P,1}}{\eta_L}\geq(1-\beta)(E(y^{P,1})-\theta_L)\geq\frac{e^{P,1}}{\theta_L}+\frac{f^{P,1}}{\eta_H}\\ &\frac{e^{P,1}}{\theta_H}+\frac{f^{P,1}}{\eta_L}\geq(1-\beta)(E(y^{P,1})-\theta_H+\frac{\theta_L}{\theta_H}(\theta_H-\theta_L))\geq\frac{e^{P,1}}{\theta_H}+\frac{f^{P,1}}{\eta_H}.\end{aligned}$$

In this case, the IRC and the fact that the slope of the objective function is not equal to and not bounded within the slopes of the two lower-bound ICC conditions, (A.23) and (A.25), the optimal solution would satisfy one of the two lower bounds with equality. Here, the lower bound (A.23) holds with equality, which can, in turn, be rearranged as

$$\frac{f^{P,1}}{\eta_L}=(1-\beta)(E(y^{P,1})-\theta_L)-\frac{e^{P,1}}{\theta_L}. \tag{A.23$'$}$$

Substituting (A.23′) in cost function (A.27) gives

$$(1-\beta)\frac{\eta_L}{\eta_H}(E(y^{P,1})-\theta_L)-\frac{e^{P,1}}{\theta_L}\frac{\eta_L}{\eta_H}+\frac{e^{P,1}}{\theta_L},$$

which can, in turn, be rearranged as

$$\underbrace{(1-\beta)\frac{\eta_L}{\eta_H}(E(y^{P,1})-\theta_L)}_{\text{is a constant}}+\frac{e^{P,1}}{\theta_L}\underbrace{(1-\frac{\eta_L}{\eta_H})}_{>0}.$$

This cost function achieves its least-cost objective when $e^{P,1} = 0$. Similarly, substituting (A.23′) in cost function (A.28) gives

$$(1-\beta)\frac{\eta_L}{\eta_H}(E(y^{P,1})-\theta_L)-\frac{e^{P,1}}{\theta_L}\frac{\eta_L}{\eta_H}+\frac{e^{P,1}}{\theta_H},$$

which can, in turn, be rearranged as

$$\underbrace{(1-\beta)\frac{\eta_L}{\eta_H}(E(y^{P,1})-\theta_L)}_{\text{is a constant}}+\frac{e^{P,1}}{\theta_L}(\frac{\theta_L}{\theta_H}-\frac{\eta_L}{\eta_H}).$$

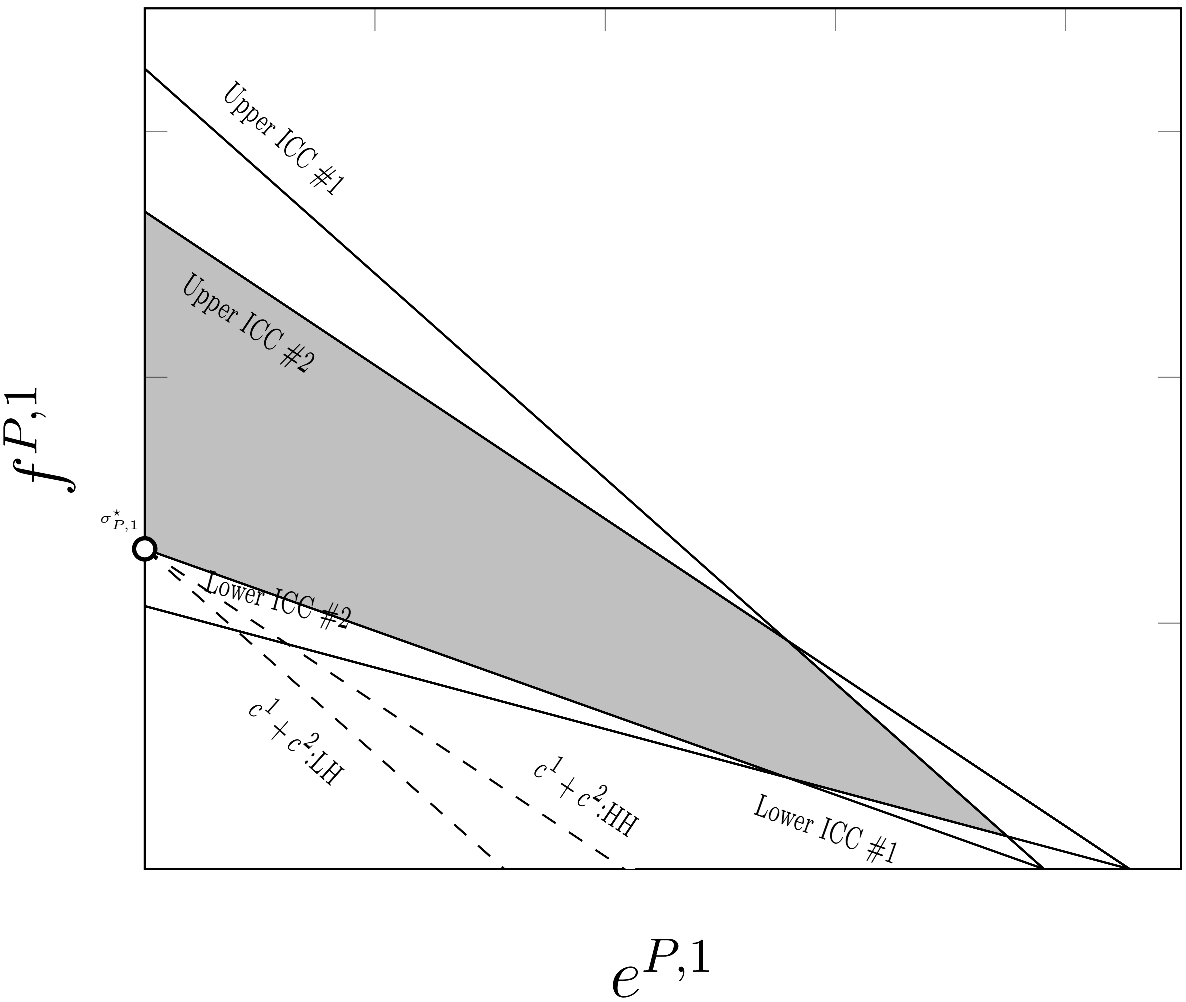
Thus, $e^{P,1} = 0$ is the solution for the abovementioned cost-minimization problem only when $(\frac{\theta_L}{\theta_H} - \frac{\eta_L}{\eta_H}) \geq 0$, or $\frac{\theta_H}{\theta_L} \leq \frac{\eta_H}{\eta_L}$. Note that both types LH and HH workers yield the same signal strategy $e^{P,1} = 0$ when optimized for cost. Substituting $e^{P,1} = 0$ in (A.23′) and solving for $f^{P,1}$ gives

$$f^{P,1} = (1-\beta)\eta_L(E(y^{P,1})-\theta_L).$$

Furthermore, the solution $(e^{P,1}, f^{P,1})$ satisfies the lower-bound ICC (A.25), and the two upper-bound ICC conditions (A.24) and (A.26). The equilibrium signals for the pooled group are $e^{P^\star,1} = 0$ and $f^{P^\star,1} = (1-\beta)\eta_L(E(y^{P,1}) - \theta_L) = (1-\beta)\eta_L(q(\theta_H - \theta_L) + 1)$, which requires $\frac{\theta_H}{\theta_L} \leq \frac{\eta_H}{\eta_L}$ as a necessary condition. The corresponding utility function, $U^{P^\star,1} = (1-\beta)(q(\theta_H - \theta_L)(1 - \frac{\eta_L}{\eta_H}) + \theta_L + (1 - \frac{\eta_L}{\eta_H}))$. □

Figure A.5: Equilibrium Diagrams.— Proposition 2 (b.2)

NOTE.– Figure A.5 shows the equilibrium strategy when type LH and HH workers pool together. Note that $\frac{\theta_H}{\theta_L} \leq \frac{\eta_H}{\eta_L}$. The ICC provides the lower and upper bounds within which all PBEs lie (the shaded region), and the IRC identifies the least-cost optimal solution $\sigma^{\star}_{P,1}$. The dotted line $c^1 + c^2$ represents the cost function.



Appendix B O*Net Analysis

B.1 Data Description

The United States Department of Labor, Occupational Information Network (O*NET) compiles several descriptors of occupations and workers and organizes them into categories such as skills, knowledge, work context, and work activities. Of these, this study considers three "work activities" proxies and three "work context" proxies for sociability: (i) Communicating with people outside the organization; (ii) Establishing and maintaining interpersonal relationships; (iii) Obtaining information; (iv) Contact with others; (v) Duration of work week; and (vi) Structured versus unstructured work. The inclusion of (i), (ii), and (iv) as sociability measures is straightforward. Characteristic (iii) directly measures knowledge transfer from social assets. Since socializing happens after routine working hours, occupations that require sociability typically have longer duration of work week [characteristic (v)]. Occupations requiring sociability are typically flexible, requiring a greater degree of inter-temporal task substitution, and do not include general operational frameworks [characteristic (vi)].

"Contact with others" and "Structured versus unstructured work" are measured on a scale of 1 to 5, with higher scores reflecting a greater degree of contact and work freedom, in that order. "Duration of work week" is measured on a scale of 1 to 3, where 1 = "Less than 40 hours," 2 = "40 hours," and 3 = "More than 40 hours." All other measures are rated on a scale of 1 to 5, with "Not important" measured as 1 and "Extremely important' measured as 5. All ratings are standardized between 0 and 100. A characteristic is considered "very important" if its standardized rating is 80 or higher. "Sociability index" is an equally weighted measure of all six measures. A high sociability index denotes an equally weighted score of 80 or higher.

This study starts with the 1,089 occupations listed in the 2012–22 O*Net/SOC/OOH Crosswalk file. Except for two occupations, "Farm labor contractors" and "Hunters and Trappers," all others have non-missing employment data obtained from the Bureau of Labor Statistics. Now, two primary questions are answered. (1) How many occupations rate sociability as a "very important" job feature? (2) How many employees work in such occupations?

B.2 Results

Table B1 shows the results of the O*Net analysis. The proportion of occupations that rate sociability "highly" has a mean value of 18.0 percent. In addition, 16.3 percent of the overall workforce participates in these occupations.

Table B1: Proportion of jobs that rate sociability highly

	Occupations ($N = 1087$)	Workforce ($N = 145.35M$)
Work Activities:		
Communicating with people outside organizations	8.5 %	6.4 %
Establishing & maintaining interpersonal relationships	14.3 %	13.2 %
Obtaining information	46.8 %	40.2 %
Work context:		
Contact with others	57.6 %	71.3 %
Duration of typical work week	23.4 %	19.0 %
Structured versus unstructured work	33.6 %	32.4 %
Sociability index	18.0 %	16.3 %

Data Sources.–

- Occupational characteristics are from O*NET.
- 2012 employment data are from the Bureau of Labor Statistics (BLS)

Note.– Table B1 shows the importance of sociability as a job feature. The market universe comprises occupations covered in O*Net, for which employment data were available from the BLS. The final sample contains 1,087 occupations and 145.35 million employees. The six sociability measures are detailed in Appendix B.1. The sociability index is the equally weighted index of the six sociability measures. The table shows the percentage of jobs that rate sociability highly and the percentage of workers in such jobs for each measure.