The Existence of Self-Enforcing Implicit Contract
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Kong-Pin Chen

Academia Sinica
This paper studies incentive-provision when very little information can be contracted on.

Specifically, neither effort nor output is contractible.

Effort level can be observed by the employer, but not the court.

The contract can thus only designate how much to pay the worker for their employment relationship, but this payment cannot be contingent on performance (therefore a fixed wage).

Any additional incentive must be provided in non-legal way.
This type of contract is called “implicit contract”.

Since effort is observed by the employer, the firm can promise to pay “bonus” to the worker (in addition to the fixed wage), depending on whether the worker exerts effort.

Since court cannot enforce any performance-based contract, the terms of the contract must be self-enforcing, in the sense that they be equilibrium outcomes.

The employer is long-lived. The need for good reputation helps to enforce the employer to fulfill promise.
An employer lives for an infinite horizon.

Worker $s$ enters in period $s$, and lives for 2 periods.

A worker’s utility depends on his consumption and effort in both periods:

$$U^s_L = U(c^s_s, e^s_s) + \beta U(c^s_{s+1}, e^s_{s+1});$$

where $c^s_t$ is worker $s$’s consumption, and $e^s_t$ his effort level, in period $t$. $\beta$ is discount factor.

Unlike the standard moral hazard literature, effort is observable to both parties.

$e^s \equiv (e^s_s, e^s_{s+1})$, $c^s \equiv (c^s_s, c^s_{s+1})$, $w^s \equiv (w^s_s, w^s_{s+1})$. 
Assumptions:

\[
\lim_{c \to 0} U_c(\cdot) = \infty, \quad \lim_{c \to \infty} U_c(\cdot) = 0, \\
\lim_{e \to 0} U_e(\cdot) = 0, \quad \lim_{e \to \infty} U_e(\cdot) = -\infty.
\]

The employer’s profit from hiring worker \( s \) is

\[
\Pi(w^s, e^s) = \pi(w^s_s, e^s_s) + \beta \pi(w^s_{s+1}, e^s_{s+1}).
\]

Assumptions: \( \lim_{e \to 0} \pi_e(\cdot) = \infty, \lim_{e \to \infty} \pi_e(\cdot) = 0. \)
For each agent $s$, the firm will

$$\max_{w^s, e^s} \Pi(w^s, e^s)$$

s.t. $U_L^s \geq u$, $e_{s+t}^s \geq 0$, and $w_{s+t}^s \geq 0$, $t = 0, 1$.

Let $(\hat{w}^s, \hat{e}^s)$ be the solution.

In the absence of performance-based payment, it is impossible to implement $(\hat{w}^s, \hat{e}^s)$. 
Implicit Contract

- Suppose the contract designates that a worker be paid a contractual wage $\hat{w}$ in the two periods working in the firm.
- Let $R$ be the bonus the firm promises to pay worker $s$ if it observes that the effort level $\hat{e}^s$ is exerted.
- Let $p^H$ be the probability that the worker believes the firm is honest.
- $EU(p^H, w, R)$: Expected utility of a worker jointing the firm and exerts effort $\hat{e}^s$, when his belief is $p^H$.
- $EU(\hat{w})$: The expected utility of worker joining the firm and does nothing.
Assume $p^H$ be such that there exists at least one $\hat{w}$ and $R$ so that $EU(p^H, \hat{w}, R) \geq u$ and $EU(p^H, \hat{w}, R) \geq EU(\hat{w})$.

Consider the following strategy of worker $s$ (Call it strategy $W$): (i) If worker $s - 1$ provides $\hat{e}_s^{s-1}$ and receives (does not receive) $R$, then $s$ provides $\hat{e}_{s+1}^s$ (zero effort). (ii) If worker $s - 1$ does not provide $\hat{e}_s^{s-1}$, then $s$ provide zero effort.

Under this strategy, if a firm cheats worker $i$, all the workers after $i$ only provide effort in the first of their two working periods.
Let

\[ \Pi^H_t = \pi(\hat{w}^t_t, e^t_t) + \beta \pi(\hat{w}^t_{t+1} - R, \hat{e}^t_{t+1}) \]
\[ \Pi^D_t = \pi(\hat{w}^t_t, e^t_t) + \beta \pi(\hat{w}^t_{t+1}, 0). \]

Proposition: The firm’s strategy always to honor promise and the worker’s strategy \( W \) constitute a SPE iff, for all \( s \),

\[ \Pi(\hat{w}^s_{s+1} - R, \hat{e}^s_{s+1}) + \sum_{t=s+1}^{\infty} \beta^{t-(s+1)} \Pi^H_t > \Pi(\hat{w}^s_{s+1}, \hat{e}^s_{s+1}) + \sum_{t=s+1}^{\infty} \beta^{t-(s+1)} \Pi^D_t. \]
Intuition: Once the firm reneges its promises, it lost trust of all incoming workers (who then exert zero effort in 2nd stage). Honoring promise is thus its best response.

The workers are willing to exert effort because they know they will receive bonus: It is the firm’s best interest to do so.

Under the strategy, bonus for the first period effort is enforced by the worker and all later workers. Bonus for second period effort is only enforced by later workers.
Conclusion

- Even if output is unobservable, as long as effort can be jointly observed by both parties, efficient contracting is possible.
- This is done by an implicit contract in which each side retaliates against the other for breaching promise.
- Since workers exert effort first, there is no need for further punishment beyond loss of ex post bonus.
- For the firm, however, it has to be an long-lived entity to suffer future loss of trust, which serves as a threat of the workers as a punishment against renege of contract.
The overlapping setup enables worker $S + 1$ to observe worker $S$’s effort level and whether he’s paid bonus.

However, model is inconsistent, as $P^H$ is not endogenous.