Leadership Styles and Labor Market Conditions: An Experiment
Theoretical predictions and hypotheses

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Basic settings regarding monetary payoffs

- A worker hired by a manager works on the manager's project at a fixed wage, w (20 ECU).
- Unobservable, abstract effort $e \in \{0, 1, ..., 10\}$ at cost $c(e)$

Table 1: The effort cost, $c(e) \approx \frac{1}{5.5} e^2$

Effort level	0	1	...	7	8	9	10
Effort cost (ECU)	0	0.2	...	8.9	11.6	14.7	18.2

- e determines the chances of binary outcomes of the project, either success ($\frac{e}{10}$) or failure ($1 - \frac{e}{10}$).
- The manager who hired this worker earns project revenues π_H (40 ECU) from success, or π_L (25 ECU) from failure
- The difference in the project revenues:

$$\Delta\pi := \pi_H - \pi_L$$

Leadership styles

- Each manager makes one contract offer to hire a worker by choosing a leadership style variable. The style could be friendly (F), unfriendly (U), neutral (N), or *both F and U (FU, carrot-and-stick)*:
  - Style F, friendly leadership style, the number of praising messages, $m_F \in \{1, 2, ..., 10\}$, in case of project success
  - Style U, unfriendly leadership style, the number of scolding messages, $m_U \in \{1, 2, ..., 10\}$, in case of project failure
  - Style N, "no leadership style, or neutral leadership style" with $m_F = 0$ and $m_U = 0$
  - Style FU, praises (m_F) in case of project success, and reprimands (m_U) in case of project failure
- The costs of adopting leadership styles:[1]
  - A manager who chooses F (or FU) bears the cost $k_F > 0$ if the project succeeds.
  - A manager who chooses U (or FU) bears the cost $k_U > 0$ if the project fails.
  - Style N with $m_F = 0$ and $m_U = 0$, comes with no extra cost

[1] non-monetary, psychological costs

Monetary payoffs

- A manager's expected monetary payoff (X_M):

$$\frac{e}{10} \cdot \Delta\pi + \pi_L - w$$

- Worker's monetary payoff (X_W):

$$w - c(e)$$

A manager's utility

- With no leadership style (U_M^N):

$$X_M = \frac{e}{10} \cdot \Delta\pi + \pi_L - w$$

- With Style F (U_M^F):

$$\frac{e}{10} \cdot (\Delta\pi - k_F) + \pi_L - w$$

- With Style U (U_M^U):

$$\frac{e}{10} \cdot (\Delta\pi + k_U) + \pi_L - w - k_U$$

- With Style FU (U_M^{FU}):

$$\frac{e}{10} \cdot (\Delta\pi - k_F + k_U) + \pi_L - w - k_U$$

(Assumption: U_M^i for $i \in \{N, F, U, FU\}$ is strictly higher than a manager's reservation utility, i.e., a manager always wants to hire a worker.)

Assumptions on a worker's utility

On top of the monetary payoff (X_W), two additional sources of (dis)utility:

1. The worker cares about the manager's payoff (X_M) and attaches some weight to it.
2. The worker experiences utility or disutility from reading and typing friendly or unfriendly messages.
   - Under N: (dis)utility from reading neutral messages, assumed to be zero
   - Under F (or FU) and project success: utility from reading m_F praising messages: $r \cdot m_F$, with $r > 0$ capturing *the worker's sensitivity to praises*
   - Under U (or FU) and project failure: disutility from reading m_U scolding messages: $s \cdot m_U$, $s > 0$ capturing *the worker's sensitivity to reprimands*

A worker's sensitivity to messages

Baseline responsiveness to m_U and m_F

- The responsiveness, sensitivity, or the degree to which a worker cares about the messages might be asymmetric for praises and reprimands.
- $s >> r$ plausible for some workers ($m_U \in \{1, 2, ..., 10\}$ scolding messages cut deeper than the same number of praising messages m_F make the worker happy)

A hired worker's utility

- With no leadership style (U_W^N):

$$\alpha^N \cdot X_M + (1 - \alpha^N) \cdot X_W$$

- With Style F (U_W^F):

$$\alpha^F \cdot X_M + (1 - \alpha^F) \cdot X_W + r \cdot m_F \cdot \frac{e}{10}$$

- With Style U (U_W^U):

$$\alpha^U \cdot X_M + (1 - \alpha^U) \cdot X_W - s \cdot m_U \cdot (1 - \frac{e}{10})$$

- With Style FU (U_W^{FU}):

$$\alpha^{FU} \cdot X_M + (1 - \alpha^{FU}) \cdot X_W + r \cdot m_F \cdot \frac{e}{10} - s \cdot m_U \cdot (1 - \frac{e}{10})$$

$\alpha^N, \alpha^F, \alpha^U, \alpha^{FU}$: the relative weight on the manager's monetary payoff under the leadership style N, F, U, and FU, respectively

Reciprocity

$$\alpha(m_F, m_U) := \rho + \theta(m_F, m_U),$$

where

- ρ captures a worker's baseline distributional preferences
- $\theta(m_F, m_U)$ captures reciprocity:
  - No reciprocity for no leadership ($m_F = m_U = 0$): $\theta(0, 0) = 0$
  - Style F triggers positive reciprocity: $\theta(m_F, 0) > 0$, $\frac{\partial \theta(m_F, m_U)}{\partial m_F} > 0$ for $m_F > 0, m_U = 0$
  - Style U triggers negative reciprocity: $\theta(0, m_U) < 0$ and $\frac{\partial \theta(m_F, m_U)}{\partial m_U} < 0$ for $m_F = 0, m_U > 0$
- Thus, $\alpha^U \leq \alpha^N = \rho \leq \alpha^F$
- But $\alpha^{FU} = \rho + \theta(m_U, m_F)$, for $m_F > 0$ and $m_U > 0$, might be equal to / higher or lower than α^N depending on m_F and m_U

Benchmark: no leadership style (N)

$$U_W^N = \alpha^N \cdot \{\frac{e}{10} \cdot \Delta\pi + \pi_L - w\} + (1 - \alpha^N) \cdot \{w - c(e)\}$$

The worker's utility is maximized with e_N^* for $\alpha^N = \rho$:

$$c'(e_N^*) = \frac{\alpha^N}{1 - \alpha^N} \cdot \frac{\Delta\pi}{10}$$

The manager's expected payoff:

$$U_M^{N^*} = \frac{e_N^*}{10} \cdot \Delta\pi + \pi_L - w$$

Friendly vs. no leadership (I/II)

$$U_W^F = \alpha^F \cdot \{\frac{e}{10} \cdot \Delta\pi + \pi_L - w\} + (1 - \alpha^F) \cdot \{w - c(e)\} + r \cdot m_F \cdot \frac{e}{10}$$

The worker's utility is maximized with e_F^* for $\alpha^F = \rho + \theta(m_F, 0)$:

$$c'(e_F^*) = \frac{\alpha^F}{1 - \alpha^F} \cdot \frac{\Delta\pi}{10} + \frac{1}{1 - \alpha^F} \cdot \frac{r \cdot m_F}{10}$$

The manager's utility:

$$U_M^{F^*} = \frac{e_F^*}{10} \cdot (\Delta\pi - k_F) + \pi_L - w$$

The manager is better off with F compared to N if the following holds:

$$U_M^{F^*} - U_M^{N^*} = \Delta\pi \cdot (\frac{e_F^*}{10} - \frac{e_N^*}{10}) - k_F \cdot \frac{e_F^*}{10} > 0. \qquad \text{(F)}$$

(i.e., the expected benefit of increased effort level under Style F compared to the one under N should be bigger than the expected leadership cost)

Friendly vs. no leadership (II/II)

Or, equivalently

$$(\Delta\pi - k_F) \cdot \frac{e_F^*}{10} > \Delta\pi \cdot \frac{e_N^*}{10}.$$

For $\alpha^N = \rho = 0$ (Standard selfish agent), $e_N^* = 0$, and the condition (F) holds if $\Delta\pi - k_F > 0$. For $e_N^* > 0$, I can rewrite (F):

$$\frac{e_F^*}{e_N^*} > \frac{\Delta\pi}{\Delta\pi - k_F}.$$

This condition is likely to hold

- if $\Delta\pi$ (benefit of project success) is big enough compared to the psychological cost of adopting Style F, k_F
- or if $e_F^* >> e_N^*$
  - due to the worker's positive reciprocity ($\alpha^F >> \alpha^N$)
  - or because the worker draws substantial utility from Style F ($r \cdot m_F >> 0$)

Unfriendly vs. no leadership

$$U_W^U = \alpha^U \cdot \{\frac{e}{10} \cdot \Delta\pi + \pi_L - w\} + (1 - \alpha^U) \cdot \{w - c(e)\} - s \cdot m_U \cdot (1 - \frac{e}{10})$$

The worker's utility is maximized with e_U^* for $\alpha^U = \rho + \theta(m_U)$:

$$c'(e_U^*) = \frac{\alpha^U}{1 - \alpha^U} \cdot \frac{\Delta\pi}{10} + \frac{1}{1 - \alpha^U} \cdot \frac{s \cdot m_U}{10}$$

The manager's expected payoff:

$$U_M^{U^*} = \frac{e_U^*}{10} \cdot (\Delta\pi + k_U) + \pi_L - w - k_U$$

The manager is better off with U compared to N, if the following holds:

$$U_M^{U^*} - U_M^{N^*} = \Delta\pi \cdot (\frac{e_U^*}{10} - \frac{e_N^*}{10}) - k_U \cdot (1 - \frac{e_U^*}{10}) > 0. \qquad \text{(U)}$$

(the benefit of increased effort level under Style U should be bigger than the cost in expectation)

Friendly vs. unfriendly leadership

When the manager can choose between friendly and unfriendly leadership, the following condition (F') should hold for F to be beneficial for the manager compared to U.

$$U_M^{F^*} - U_M^{U^*} = \Delta\pi \cdot (\frac{e_F^*}{10} - \frac{e_U^*}{10}) - k_F \cdot \frac{e_F^*}{10} + k_U \cdot (1 - \frac{e_U^*}{10}) > 0 \qquad \text{(F')}$$

(The expected benefit of increased effort level should be higher than the expected leadership cost increments)

The condition is easier to hold,

- the higher the increase in the effort level ($e_F^* >> e_U^*$)
- the higher the value of effort increment ($\Delta\pi$) compared to the cost of Style F (k_F)
- the higher the psychological cost of scolding a worker for a project failure (k_U)

Style FU; friendly AND unfriendly leadership

The hired worker will be praised if the project succeeds and scolded if it fails, at the respective cost for the manager, k_F and k_U.

$$U_W^{FU} = \alpha^{FU} \cdot \{\frac{e}{10} \cdot \Delta\pi + \pi_L - w\}$$
$$+ (1 - \alpha^{FU}) \cdot \{w - c(e)\} + r \cdot m_F \cdot \frac{e}{10} - s \cdot m_U \cdot (1 - \frac{e}{10})$$

The worker's utility is maximized with e_{FU}^* for $\alpha^{FU} = \rho + \theta(m_F, m_U), m_F > 0, m_U > 0$:

$$c'(e_{FU}^*) = \frac{\alpha^{FU}}{1 - \alpha^{FU}} \cdot \frac{\Delta\pi}{10} + \frac{1}{1 - \alpha^{FU}} \cdot \frac{r \cdot m_F + s \cdot m_U}{10}$$

The manager's expected payoff:

$$U_M^{FU^*} = \frac{e_{FU}^*}{10} \cdot (\Delta\pi - k_F + k_U) + \pi_L - w - k_U$$

Style FU vs. other leadership styles

The manager chooses FU over N, if

$$U_M^{FU^*} - U_M^{N^*} = \Delta\pi \cdot (\frac{e_{FU}^*}{10} - \frac{e_N^*}{10}) - k_F \cdot \frac{e_{FU}^*}{10} - k_U \cdot (1 - \frac{e_{FU}^*}{10}) > 0.$$

The manager chooses FU over F, if

$$U_M^{FU^*} - U_M^{F^*} = \Delta\pi \cdot (\frac{e_{FU}^*}{10} - \frac{e_F^*}{10}) - k_F \cdot (\frac{e_{FU}^*}{10} - \frac{e_F^*}{10}) - k_U \cdot (1 - \frac{e_{FU}^*}{10}) > 0.$$

The manager chooses FU over U, if

$$U_M^{FU^*} - U_M^{U^*} = \Delta\pi \cdot (\frac{e_{FU}^*}{10} - \frac{e_U^*}{10}) - k_F \cdot \frac{e_{FU}^*}{10} + k_U \cdot (\frac{e_{FU}^*}{10} - \frac{e_U^*}{10}) > 0.$$

When the psychological costs of adopting Style FU, k_F and k_U, are negligible compared to $\Delta\pi$ (15 ECU), the critical determinant of adopting the leadership style over the other is the difference in effort levels.

Effort levels under different leadership styles (I/II)

$$c'(e_N^*) = \frac{\alpha^N}{1-\alpha^N} \cdot \frac{\Delta\pi}{10}$$

$$c'(e_F^*) = \frac{\alpha^F}{1-\alpha^F} \cdot \frac{\Delta\pi}{10} + \frac{1}{1-\alpha^F} \cdot \frac{r \cdot m_F}{10}$$

$$c'(e_U^*) = \frac{\alpha^U}{1-\alpha^U} \cdot \frac{\Delta\pi}{10} + \frac{1}{1-\alpha^U} \cdot \frac{s \cdot m_U}{10}$$

$$c'(e_{FU}^*) = \frac{\alpha^{FU}}{1-\alpha^{FU}} \cdot \frac{\Delta\pi}{10} + \frac{1}{1-\alpha^{FU}} \cdot \frac{r \cdot m_F + s \cdot m_U}{10}$$

- The motivational effect of a leadership style comes from $r \cdot m_F$ or $s \cdot m_U$
- The positive or negative reciprocity (α) might add to or cancel out the motivating effect.

Effort levels under different leadership styles (II/II)

- Style F boosts the effort level up through the increase in the worker's weight on the manager's payoff ($\alpha^N \leq \alpha^F$) in addition to the motivating effect ($r \cdot m_F$).
- Style U aggravates the worker ($\alpha^U \leq \alpha^N \leq \alpha^F$). $e_U^* \leq e_F^*$ is likely for similar sensitivity for praises and reprimands ($r \approx s$)
- If α^U is not too lower than α^F and s is strictly higher than r, $e_U^* \geq e_F^*$ is also possible.
- Choosing FU over U is likely to be beneficial since it might mitigate the negative reciprocity effect of adopting U (if $\alpha^U \leq \alpha^{FU}$) on top of the double motivating effect $r \cdot m_F + s \cdot m_U$.
- FU's advantage over F is less clear. $\alpha^F \geq \alpha^{FU}$ is likely.

ELD market

- Each manager wants to win the single worker in the market.
  - The reservation utility of the worker is $max\{0ECU,$ Utility from being hired by the other manager$\}$.
  - Participation constraint of the worker is likely to be restrictive.
  - But, managers do not set the wage, but instead set the leadership style to ensure the worker's participation.
  - The psychological cost of praising the single worker for a project success is likely to be negligible compared to the benefit ($\Delta\pi$).

Hypotheses

Managers will choose a friendly leadership style to win the worker.
Competition between the managers drives m_F up to 10.

ELS market

- It is very likely that a hired worker earns rent.
  - The reservation utility of a worker is 0 ECU.
  - Assume that w is high enough to cover all disutility from work and reading messages.
- Each manager can choose a leadership style not worrying about the worker's participation constraint.
- Instead, they consider the conditions (F), (U), (F') when they choose their leadership style, given their expectations on the hired worker's effort level under each style.

Hypotheses

- For the choice set {N, F}:
  Style F, if $\Delta\pi \cdot (\frac{E[e_F^*]}{10} - \frac{E[e_N^*]}{10}) - k_F \cdot \frac{E[e_F^*]}{10} > 0$ (F)
- For {N, U}:
  Style U, if $\Delta\pi \cdot (\frac{E[e_U^*]}{10} - \frac{E[e_N^*]}{10}) - k_U \cdot (1 - \frac{E[e_U^*]}{10}) > 0$ (U)
- For {N, F, U}:
  Given that condition (F) and (U) hold,
  Style F, if $\Delta\pi \cdot (\frac{E[e_F^*]}{10} - \frac{E[e_U^*]}{10}) - k_F \cdot \frac{E[e_F^*]}{10} + k_U \cdot (1 - \frac{E[e_U^*]}{10}) > 0$,
  Style U otherwise