

# **Positive Self-Image and Incentives in Organizations**

*Luís Santos-Pinto*

*Universidade Nova de Lisboa*

The Economics of the Workplace  
Tinbergen Institute, 15<sup>th</sup> June 2007

## MOTIVATION

- According Myers (1996):

*“On nearly any dimension that is both subjective and socially desirable, most people see themselves as better than average.”*

- The impact of positive self image on incentives in organizations has not been addressed by the literature.

## **WHAT IS POSITIVE SELF IMAGE?**

- Tendency that individuals have for having an overly positive view of their abilities.
- In this paper, positive self image is over estimation of productivity of effort.

## PSYCHOLOGICAL EVIDENCE

- Ninety percent of business managers rate their performance as superior to their average peer (French, 1968).
- Only 1 percent of GE company employees rate their performance as below the median (Meyer, 1975).
- In Australia, only 1 percent of people rate their job performance as below average (Headey and Wearing, 1987).

## **ECONOMIC EVIDENCE**

- The psychological evidence on PSI is based on verbal statements, not on the observation of choices among alternatives.
- Lack of financial incentives may lead to PSI (if there is a slight preference for positive views of the self).
- A few experiments ask individuals to make decisions based on assessment of relative standing and use economic incentives.
- Some experiments suggest that PSI is reduced with economic incentives (e.g., Hoelzl and Rustichini, 2002), while others do not (e.g., Camerer and Lovallo, 1999).

## RESEARCH QUESTIONS

- Is workers' positive self image favorable or unfavorable to the firm?
- Does workers' positive self image change the firm's choice of optimal incentive scheme?
- Does heterogeneity in workers' self images have interesting implications for the composition of the workforce?

## RELATED RESEARCH

- Hvide (2002) defines a positive self image worker as a worker who over estimates his reservation wage and shows that this type of mistaken beliefs is unfavorable to the firm.
- Squintani (2006) considers games where players may hold mistaken beliefs of their abilities and provides foundations for equilibrium concepts in these type of games.
- De la Rosa (2007) studies a situation where multiple principals compete for the services of a single worker. He finds that a risk averse worker may benefit from moderate levels of positive self-image.
- Gervais and Goldstein (2007) show that worker positive self image can reduce incentive problems in teams.

# **WORKERS' MISTAKEN BELIEFS OF THEIR ABILITIES AND THE FIRM'S WELFARE**

- **Question:**
  - Are workers' mistaken beliefs of their abilities favorable or unfavorable to the firm?
- **Strategy:**
  - Use the principal-agent model of moral hazard to compare the firm's welfare with two distinct workers with:
    - the same productivity;
    - the same preferences and reservation utility;
    - different beliefs about productivity.

## SET-UP

- $N$  effort levels:  $a_1 < \dots < a_n < \dots < a_N$ .
- $M$  output levels:  $q_1 < \dots < q_m < \dots < q_M$ .
- Output is a stochastic function of effort,  $p(a_n) = (p_1(a_n), \dots, p_M(a_n))$  where  $p_m(a_n) = \text{Prob}(q_m | a_n)$  and  $p(a_k)$  FOSD  $p(a_l)$  if  $a_k > a_l$ .
- The worker's utility function is  $U(y_m, a_n) = u(y_m) - c(a_n)$ , with  $u$  concave and  $c$  strictly increasing. The reservation utility is  $\underline{U}$ .
- The firm is risk neutral and chooses an incentive scheme and an effort level which maximize expected profits.

## INNOVATION

- A worker exhibits mistaken beliefs of absolute ability if he mistakes the productivity of at least one effort level.
- A worker exhibits positive self image of absolute ability if he:
  - over estimates his productivity at least at one effort level, but never under estimates his productivity at any effort level, that is,  $p^i(a_n)$  FOSD  $p(a_n)$ , for all  $n$ ;
  - perceives a higher effort level to be more productive than a lower effort level, that is, for  $a_k > a_l$  we have  $p^i(a_k)$  FOSD  $p^i(a_l)$ .
- The firm knows about the worker's mistaken beliefs.

## **OBSERVABLE EFFORT**

- **Proposition 1:** If
  - effort is observable
  - the principal is risk neutral
  - the agent is risk averse
  - the principal knows about the agent's beliefsthen the principal is better off with an agent with mistaken beliefs of absolute ability than with an agent with accurate beliefs.

## OBSERVABLE EFFORT

- When effort is observable the firm's implementation problem is given by:

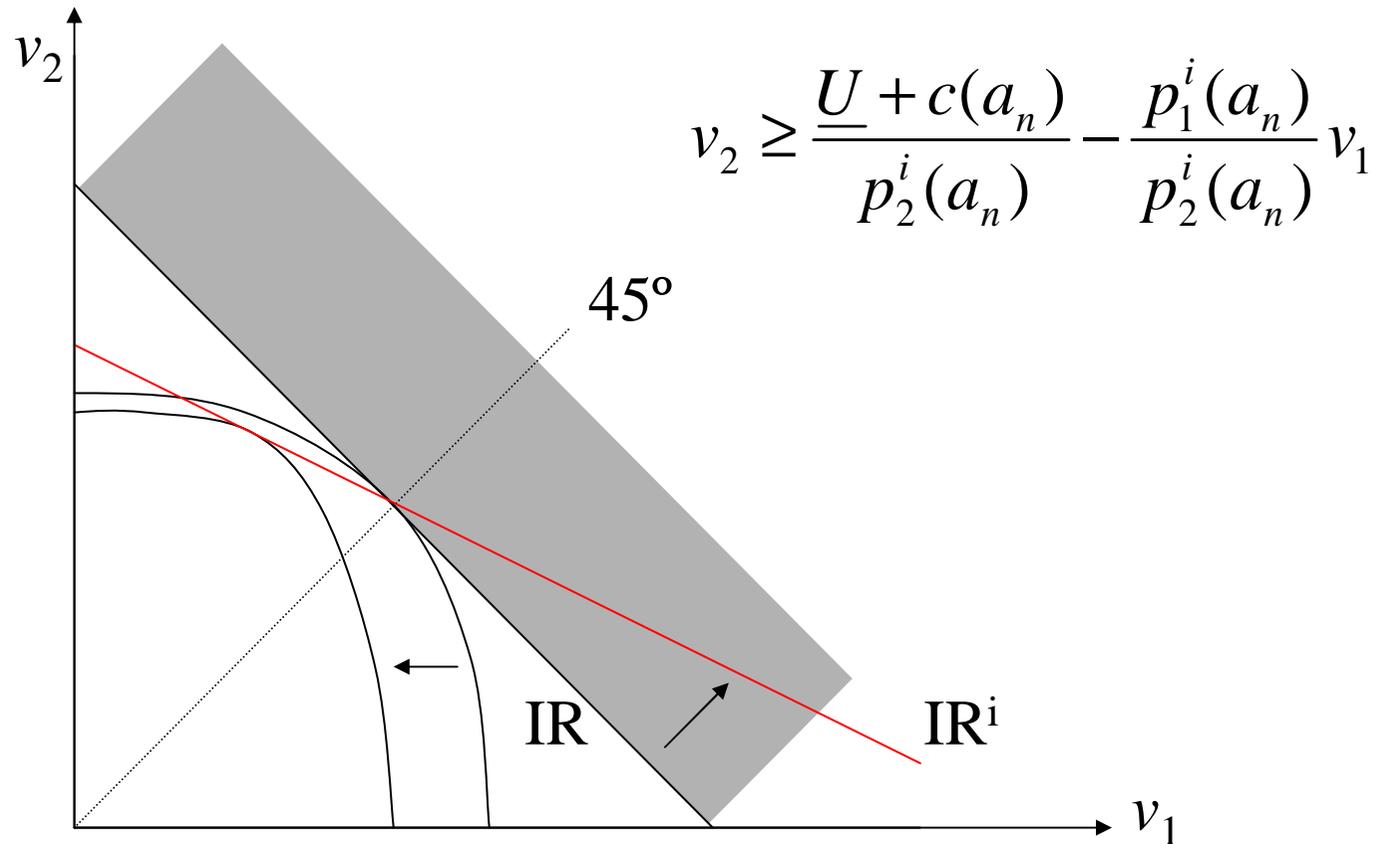
$$\begin{aligned} \min_{\{v_m\}} & \sum_{m=1}^M p_m(a_n) h(v_m) \\ \text{s.t.} & \sum_{m=1}^M p_m^i(a_n) v_m - c(a_n) \geq \underline{U} \quad (\text{IR}^i) \end{aligned}$$

## **OBSERVABLE EFFORT**

- When effort is observable, the agent's mistaken beliefs only intervene in the agent's willingness to accept the contract offered by the principal.
- Because the agent believes that his effort will result in a different level of output than it actually will:
  - the optimal contract should not fully insure the agent,
  - it is cheaper for the principal to implement the intended action, than in the standard model.

# OBSERVABLE EFFORT

- Example:** Two output levels, risk averse worker who over estimates the productivity of  $a_n$ , and the firm prefers  $a_n$ .



Note that  $v_1 = u(y_1)$  and  $v_2 = u(y_2)$ .

## UNOBSERVABLE EFFORT

- If the worker is risk averse and the firm does not prefer to implement the lowest effort level there is an incentive problem.
- Need to distinguish between two effects of mistaken beliefs on the firm's implementation problem:
  - participation effect: the impact of mistaken beliefs on the participation constraint for fixed wages;
  - incentive effect: the impact of mistaken beliefs on the set of incentive compatibility constraints for fixed wages.

## UNOBSERVABLE EFFORT

- **Example:** Two effort levels ( $a_1 < a_2$ ), two output levels ( $q_1 < q_2$ ), and the firm prefers to implement  $a_2$ .
- When effort is unobservable the firm's implementation problem is given by:

$$\min_{v_1, v_2} p_2(a_2)h(v_2) + [1 - p_2(a_2)]h(v_1)$$

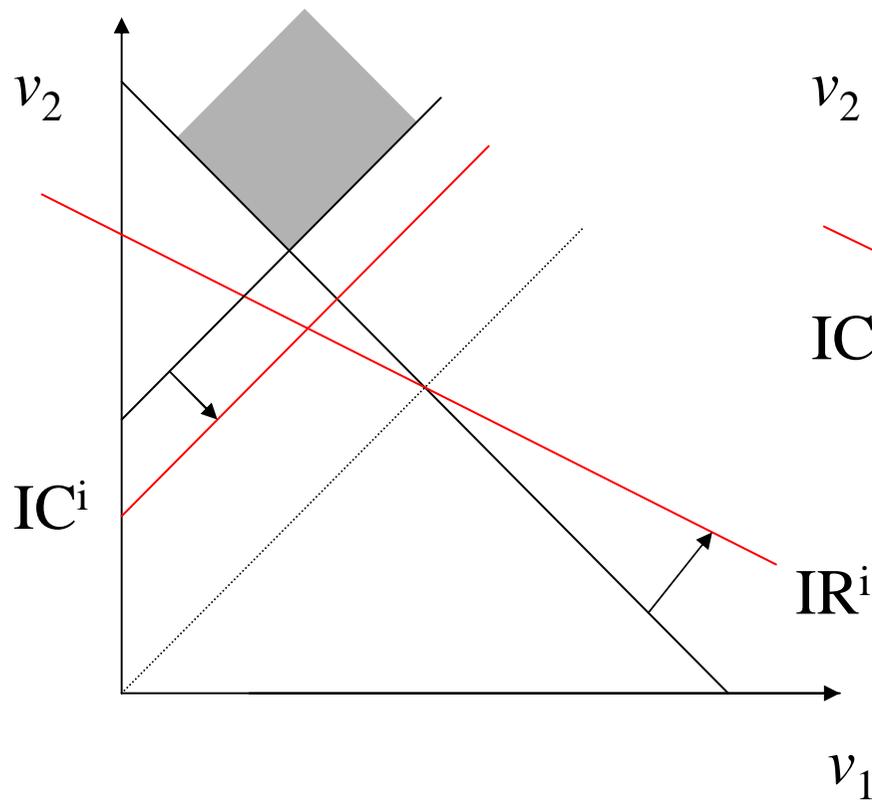
$$\text{s.t. } p_2^i(a_2)v_2 + [1 - p_2^i(a_2)]v_1 - c(a_2) \geq \underline{U} \quad (\text{IR}^i)$$

$$[p_2^i(a_2) - p_2^i(a_1)](v_2 - v_1) \geq c(a_2) - c(a_1) \quad (\text{IC}^i)$$

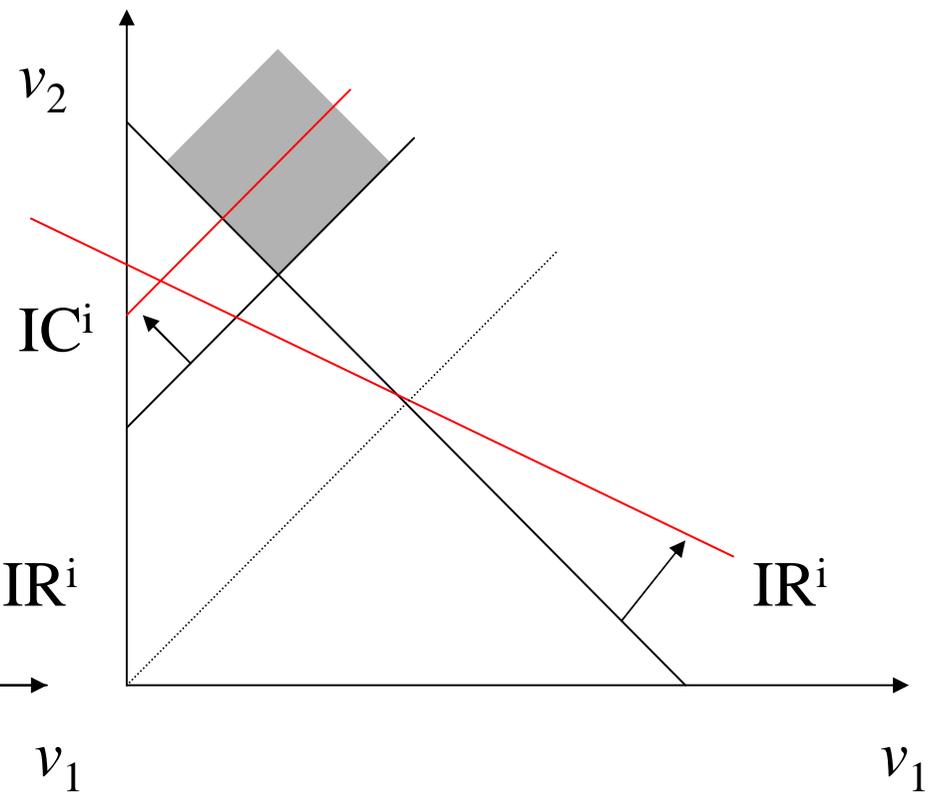
# UNOBSERVABLE EFFORT

- **Example:** PSI worker

favorable part. effect  
favorable inc. effect



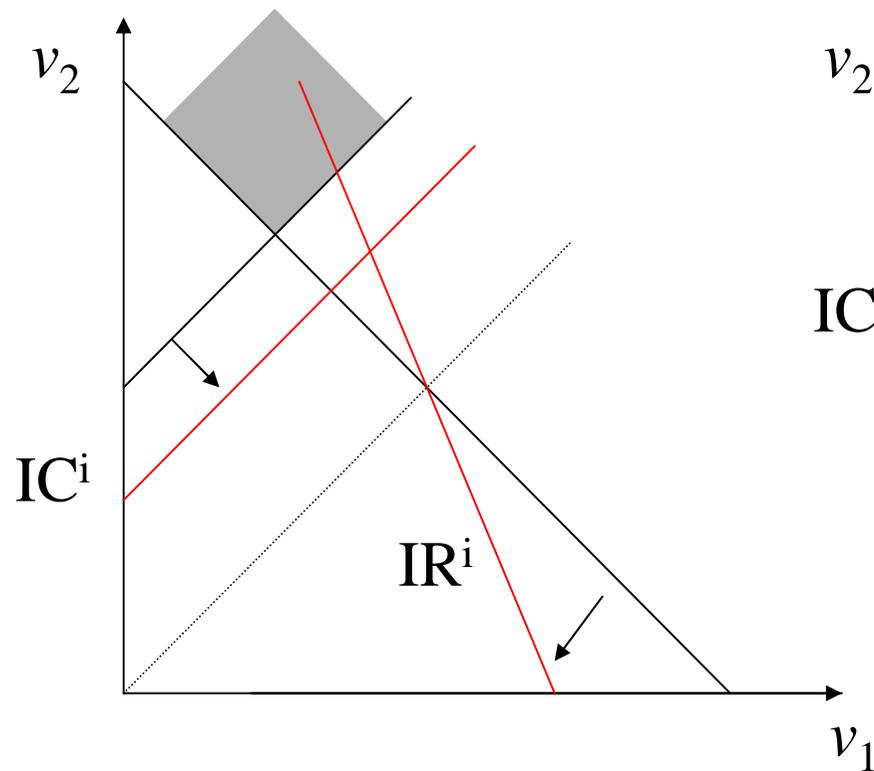
favorable part. effect  
unfavorable inc. effect



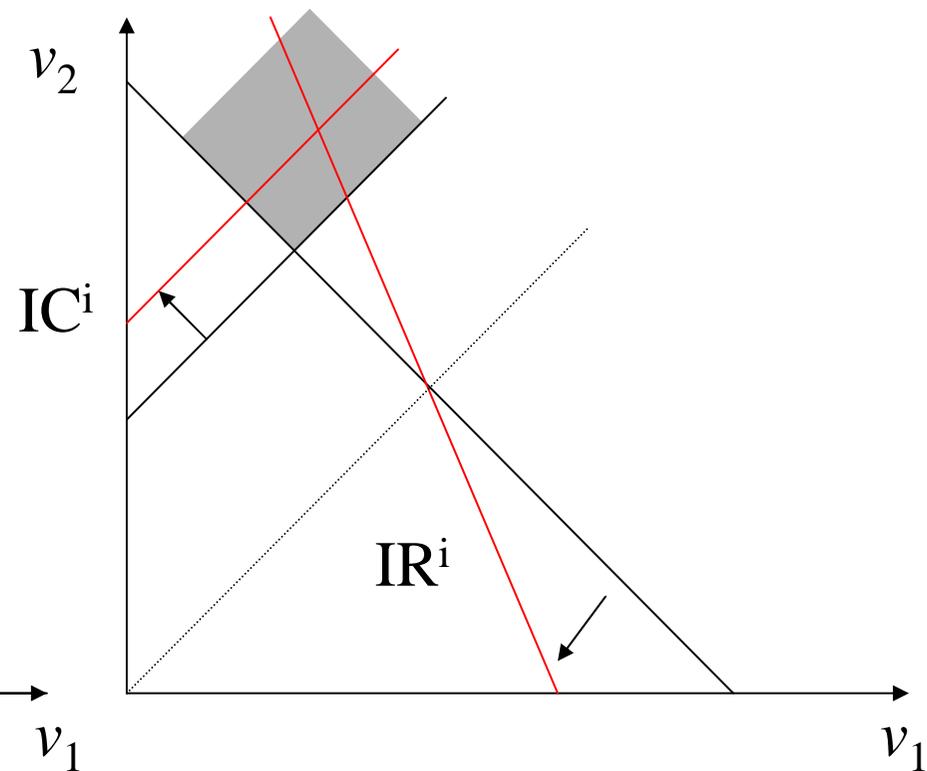
# UNOBSERVABLE EFFORT

- **Example:** NSI worker

unfavorable part. effect  
favorable inc. effect



unfavorable part. effect  
unfavorable inc. effect



## UNOBSERVABLE EFFORT

- **Lemma 1:** If effort is unobservable and the optimal wage-incentive scheme that implements effort level  $a_n$  with an accurate worker,  $\{y_m^*\}$ , is nondecreasing in output, then:
  - a PSI agent values  $\{y_m^*\}$  *more* than an accurate agent;
  - a NSI agent values  $\{y_m^*\}$  *less* than an accurate agent.
- **Proof:** If  $\{y_m^*\}$  is nondecreasing in output, then the definitions of PSI and NSI imply the result.

## UNOBSERVABLE EFFORT

- **Proposition 2:** If
  - effort is unobservable
  - the principal is risk neutral
  - the agent is risk averse
  - MRLC and CDFC hold
  - self-image and effort are complements
  - the principal knows about the agent's beliefs,then the cost to the principal of implementing an arbitrary action is lower (higher) with a positive (negative) self-image agent than with an agent with accurate beliefs.

## **UNOBSERVABLE EFFORT**

- If MRLC and CDFC hold then the wage incentive scheme is increasing with output.
- This implies that positive self-image has a favorable impact on the participation constraint.
- If self-image and effort are complements, then positive self-image makes higher effort relatively more attractive.
- This slackens the downward incentive constraints which is sufficient for an overall favourable (unfavourable) impact on incentive constraints given MRLC and CDFC.

# **MISTAKEN BELIEFS OF RELATIVE ABILITY AND THE FIRM'S CHOICE OF OPTIMAL INCENTIVE SCHEME**

- **Question:**

- Do workers' mistaken beliefs of their relative abilities change the firm's choice of optimal incentive scheme?

- **Strategy:**

- If workers have mistaken beliefs of their peers' abilities the principal may gain by making each worker's compensation depend on the output of his peers.
- Rule out alternative explanations for interdependent contracts.
- Rule out mistaken beliefs of absolute ability.

# **TIMING OF A PRINCIPAL MULTIPLE-AGENT MODEL OF MORAL HAZARD**

- Mookherjee (1984):
  1. The firm offers a contract to each worker;
  2. Each worker accepts or rejects;
  3. Workers choose simultaneously their effort level (effort choices are unobservable to the firm);
  4. The output of each worker (a stochastic function of effort) is publicly observed;
  5. Workers are paid on the basis of the output realizations.

## SET-UP

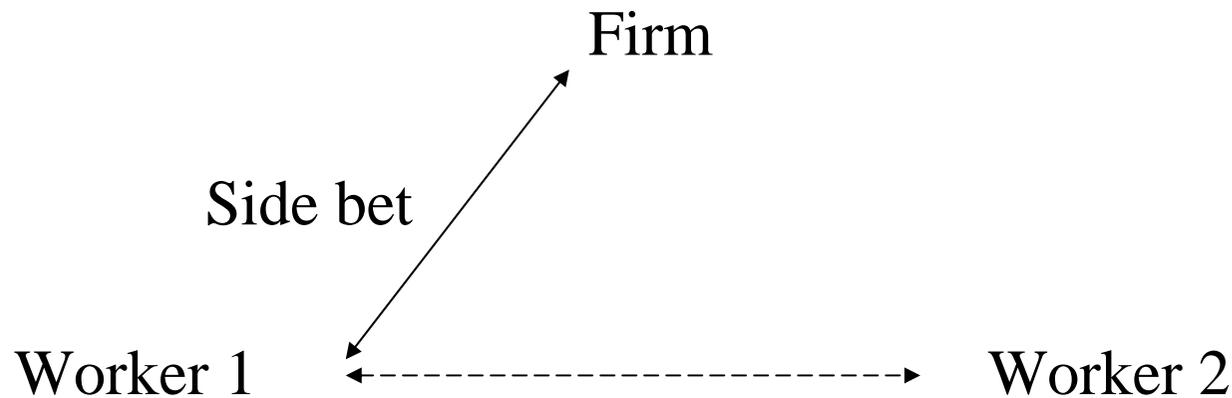
- Two workers case,  $i = 1, 2$ .
- $N$  effort levels:  $a_1^i < \dots < a_n^i < \dots < a_N^i$ ,  $i = 1, 2$ .
- $M$  output levels:  $q_1 < \dots < q_m < \dots < q_M$ .
- Output is a stochastic function of effort. Assuming that worker's production functions are separable in effort and that there is no common uncertainty we have that

$$p_{ml}(a^1, a^2) = p_m(a^1) p_l(a^2)$$

- Worker  $i$ 's utility function is  $U^i(y_m, a_n) = u^i(y_m) - c^i(a_n)$ , with  $u^i$  concave and  $c^i$  strictly increasing. The reservation utility is  $\underline{U}^i$ .
- The firm is risk neutral and chooses a pair of incentive schemes and an effort pair which maximize expected profits.

# INNOVATION

- Workers have accurate beliefs of their own productivity but can have mistaken beliefs of their opponent's productivity.
- Let worker  $i$ 's beliefs about the productivity of worker  $j$ 's effort level  $a^j$  be given by  $p^i(a^j) = (p_1^i(a^j), \dots, p_m^i(a^j), \dots, p_M^i(a^j))$ , where  $p_m^i(a^j) = \text{Prob}^i(q_m | a^j)$ .
- Equilibrium assumptions:
  - The firm knows about the workers' beliefs of relative ability.
  - Each worker thinks that his opponent's beliefs of relative ability are mistaken, while he thinks that his own beliefs of relative ability are correct.



Has accurate beliefs about his own productivity but underestimates 2's productivity.

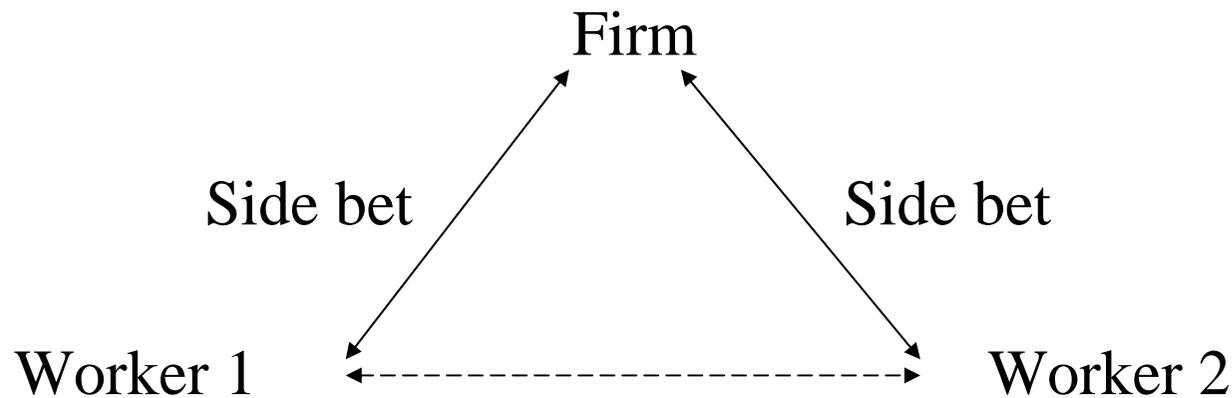
Knows that 2 thinks that 1's productivity is equal to 2's actual productivity.

Thinks (incorrectly) that his beliefs are correct but that 2's beliefs are mistaken.

Has accurate beliefs about her own productivity and accurate beliefs about 1's productivity.

Knows that 1 thinks that 2's productivity is smaller than 1's actual productivity.

Thinks (correctly) that her beliefs are correct but that 1's beliefs are mistaken.



Has accurate beliefs about his own productivity but underestimates 2's productivity.

Knows that 2 thinks that 1's productivity is smaller than 2's actual productivity.

Thinks (incorrectly) that his beliefs are correct but that 2's beliefs are mistaken.

Has accurate beliefs about her own productivity but underestimates 1's productivity.

Knows that 1 thinks that 2's productivity is smaller than 1's actual productivity.

Thinks (incorrectly) that her beliefs are correct but that 1's beliefs are mistaken.

## CHOICE OF OPTIMAL INCENTIVE SCHEME

- **Proposition 3:** If

- production functions are separable in effort choices;
  - there is no common uncertainty;
  - workers are weakly risk averse;
  - at least one worker has accurate beliefs of his own ability but mistaken beliefs of his opponent's ability;
  - each worker thinks that his opponent's beliefs of relative ability are mistaken, while he thinks that his own beliefs of relative ability are correct;
  - the firm is risk neutral and knows about the workers' beliefs;
- then the cost of implementing an arbitrary effort pair is lower under an interdependent incentive scheme than under an individualistic one.

## CHOICE OF OPTIMAL INCENTIVE SCHEME

- If a worker has a positive self image of relative ability the firm should:
  - increase compensation in output pairs where the worker's opponent has a low output;
  - reduce compensation in output pairs where the worker's opponent has a high output.
- If a worker has a negative self image the opposite procedure should be taken.

## CONCLUSION

- The paper introduces a new approach to studying the impact of workers' mistaken ability beliefs on incentives in organizations.
- The paper provides answers to three research questions:
  - Q1: *“Is workers' positive self image favorable or unfavorable to the firm?”*
  - A: Workers' mistaken ability beliefs are always favorable to the firm when effort is observable. If effort is not observable then mistaken beliefs can be either favorable or unfavorable to the firm.

## CONCLUSION

- Q2: *“Does workers’ positive self image change the firm’s choice of optimal incentive scheme?”*
- A: Yes. Workers’ mistaken beliefs of their peers’ abilities make interdependent contracts more attractive to firms than individualistic contracts.
- Q3: *“Does heterogeneity in workers’ self images have interesting implications for the composition of the workforce?”*
- A: Yes. The paper provides conditions--(i) the wage incentive scheme is nondecreasing with output and (ii) self image and effort are complements--under which the firm is better off by having a positive self image worker rather than an accurate or a negative self image worker.