Lecture 12: Teamwork

Compensation in Organizations

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February 5, 2026

Teamwork vs. Relative Performance Pay

- We have studied when and why it can be helpful to pay workers based on their performance relative to others.
- That is, when should wages depend on more than just own output?
- But we always assumed workers produced separately.
  - i.e. $y_1 = e_1 + \epsilon_1$ and $y_2 = e_2 + \epsilon_2$
- But what if workers produce together?
  - i.e. $y = e_1 + e_2$
- We call this teamwork.

Discussion: Friebel, Heinz, Krueger, and Zubanov (2017)

Discussion: Hamilton, Nickerson, and Owan (2003)

Discussion: Coviello, Deserranno, Persico (2022)

Model ("Moral Hazard in Teams," Holmstrom (1982))

- There are N workers, indexed by $i = 1, ..., N$
- Each worker can exert effort e_i at cost $c_i(e_i)$
- We will refer to $e = (e_1, ..., e_N)$ as a list which contains everyone's effort.
- Output is the sum of everyone's effort: $y(e) = e_1 + e_2 + ... + e_N$
- The firm can pay a wage to each worker based only on team output $w_i(y(e))$
- For technical reasons we assume all $c_i(e_i)$ are convex, increasing and differentiable with $c_i(0) = 0$.

Understanding Free Riding

- Consider the case where we use the intuitive wage $w_i(y(e)) = y(e)/N$
- That is everyone splits everything evenly.
- We will see that people free ride.
- This is similar to the struggles of group projects in school.

Definition 1

Free riding is the under supply of effort because the marginal benefits of effort are shared.

Understanding Free Riding: Solution

See the board!

The First-Best Benchmark

- Consider the case where the firm can choose effort levels directly.
- Suppose the firm maximizes total surplus (output minus total effort costs)

See the board!

Is There Any Way to Get First-Best Effort Using Wages?

- Now return to the actual model where the firm can only control effort via wages.
- Wages can only depend on total output.
- We consider several types of wage schemes.
- We ask: can the wage scheme achieve e^*?
- We ignore individual rationality/outside options.

Partnerships

Definition

A partnership is a wage scheme where $w_i(y(e)) \geq 0$ *and:*

$$\sum_{i=1}^{N} w_i(y(e)) = y(e)$$

for every output $y(e)$.

- This is also called budget balanced because everything that is produced is paid out.
- It is called a partnership because we are choosing the share each person gets.
- Assume for this case only that wages are differentiable, so derivatives are well defined.

See the board

Can Partnerships Achieve the First-Best?

Theorem

There does not exist a partnership which achieves the first-best level of effort e^*.

- There is inherent free-riding with teamwork.
- To overcome free-riding we must pay each person the marginal dollar produced
- But because the budget must balance, there is only one marginal dollar!

Can Group Bonuses Achieve the First-Best?

We now relax budget balance.

Definition

A group bonus is a wage scheme where:

$$w_i(y) = \begin{cases} b_i \text{ if } y(e) \geq \bar{y} \\ 0 \text{ else} \end{cases}$$

- This is clearly not budget balanced because if output is below $\bar{y}$ but not 0:

$$\sum_i w_i(y(e)) = 0 < y(e)$$

- If there was an outside option for the workers pay would look like a flat wage plus a bonus if a group target is achieved.

Can Group Bonuses Achieve the First-Best?

See the board

Can Group Bonuses Achieve the First-Best?

Theorem

A group bonus with $\sum_i b_i = y(e^*)$, $b_i > c_i(e_i^*)$ and $\bar{y} = y(e^*)$ achieves the first-best level of effort.

Money Burning

- We showed that organizations which give out everything in wages cannot achieve the first-best.
- We showed that there are organizations that do not balance the budget that can!
- Specifically group bonuses require us to commit to burn money.
- That is, some of the output must be destroyed or given to someone else.
- Discussion: if the firm is owned by the workers is money burning credible?

Money Burning

- We showed that organizations which give out everything in wages cannot achieve the first-best.
- We showed that there are organizations that do not balance the budget that can!
- Specifically group bonuses require us to commit to burn money.
- That is, some of the output must be destroyed or given to someone else.
- Discussion: if the firm is owned by the workers is money burning credible?
- No: once output is produced we will want to pay it out.

Discussion: separation of ownership and control