

# Lecture 12: Teamwork

## Compensation in Organizations

Jacob Kohlhepp

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## 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: Friebe, Heinz, Krueger, and  
Zubakov (2017)

## Model (“Moral Hazard in Teams,” Holmstrom (1982))

- ▶ There are  $N$  workers, indexed by  $i = 1, \dots, N$
- ▶ Each worker can exert effort  $e_i$  at cost  $c_i(e_i)$
- ▶ We will refer to  $e = (e_1, \dots, e_N)$  as a list which contains everyone's effort.
- ▶ Output is the sum of everyone's effort:  $y(e) = e_1 + e_2 + \dots + e_N$
- ▶ 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)

## The First-Best Benchmark: Solution

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.

Can Partnerships Achieve the First-Best?

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?

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- ▶ 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.

## Worker Co-Op vs. Corporations vs. Partnerships

Discussion: separation of ownership and control