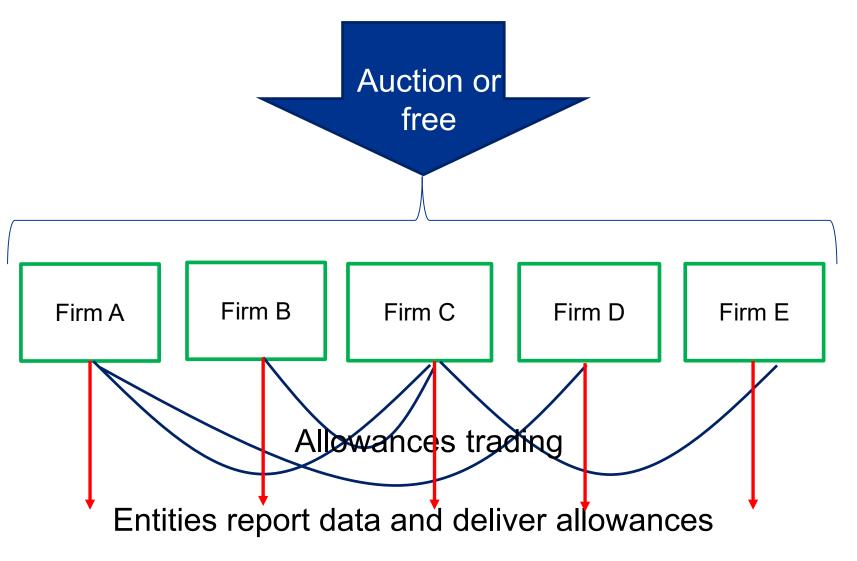# Emissions Trading Game

Introduction

- Emissions trading is a market mechanism used to control the amount of pollution being emitted-with flexibility for firms.

- Emissions trading schemes are in action worldwide, the largest is the European Union ETS.

- New Zealand's ETS currently includes foresters, industrial emitters, fuels, and energy generators.

Emissions limits= number of allowances

Auction or free

Firm A   Firm B   Firm C   Firm D   Firm E

Allowances trading

Entities report data and deliver allowances

Government verifies and enforces

Emissions trading game

- This game was developed to give people an understanding of the basic concepts behind emissions trading.

- It demonstrates a simplistic textbook trading system where the economy consists of one electricity Retailer and one cement producer.

- It demonstrates how the ETS works when the point of obligation is at the firm level.

Assumptions

Your firms are the only sources of pollution in the economy.

 Your goal is to maximize profit by choosing how much to produce, while complying with regulations.

…or maximize environmental benefits with the same profits.

Format

In each scenario, you will need to decide on a production level that will maximize your profit given the regulatory state.

Three possible regulatory states:

- No GHG emissions regulation
- GHG emissions limits
- GHG emissions trading

Negotiate to have more ambitious goals

- More ambitious GHG limits with trading

Game Setup Basics

Please form small groups of two or three people.

Electricity Retailer please pair up with a cement producer.

Please keep the handout information within your own group - don't show the sheet to the other group.

The Production Schedule

Your handout has a production schedule similar to this one.

This is an example, whose numbers are different from your schedule.

Coal fired electricity supplied	0	1	2	3	4	5	6	7
Profit from all electricity supplied	-$10	$0	$9	$12	$20	$22	$24	$23
Emissions	0	1	2	3	4	5	6	7

The Production Schedule

If you reduce production from 3 to 2, your profit reduces $12-$9=$3, and your firm's pollution reduces by one.

If you increase production from 3 to 4, your profit increases $20-$12=$8, and your firm's pollution increases by one.

Coal fired electricity supplied	0	1	2	3	4	5	6	7
Profit from all electricity supplied	-$10	$0	$9	$12	$20	$22	$24	$23
Emissions	0	1	2	3	4	5	6	7

Round 1

Production with and without regulation

Round 1 No GHG regulation

Decide on your production level under no regulation.

Do not share your emission and production levels yet

Under no regulation	Electricity supplied/ Cement produced	Profit	Emissions

Round 1: No regulations

Firm	Profit	Production	Emissions
Electricity Retailer	$17	8 units	11 units
Cement producer	$37	8 units	7 units
Total	$54	--	18 units

Round 1: with regulations

Decide on your production level with regulations in place to reduce GHG emissions. Each firm may emit 6 emissions units.

Trading is not allowed.

Uder no regulation	Electricity supplied/ Cement Produced	Profit	Emissions

Round 1: with regulations

Firm	Profit	Production	Emissions
Electricity Retailer	$16	3 units	6 units
Cement Producer	$24	7 units	6 units
Total	$40	--	12 units

Round 2
Emissions Trading

Example trade

If this firm were producing 3 units a year and allocated 3 allowances, she would make $5 more profit from production by buying an extra allowance. She would be better off if the allowance cost less than $5.

In what circumstances would the allowance seller also be better off?

Cement Produced	0	1	2	3	4	5	6	7
Profit from cement production	-$12	-$1	$8	$14	$19	$24	$28	$26
Emissions	0	1	2	3	4	5	6	7

Round 2

Trading system introduced.

Decide on your production level given Firms are allocated 6 allowances each.

Please start negotiating with your pair firm.

– Work out how much you are willing to pay to buy allowances and how much you would need to be paid to sell allowances

Be sure to compare your profit before and after the trade before finalizing the trade.

Under ETS	Electricity supplied/ Cement Produced	Profit	Emissions

Discussion

Who managed to undertake a trade?

Who was the buyer/seller?

How many allowances did you trade?

How much did you increase your profit by?

Round 2: Emissions Trading

The optimal trade occurs when electricity Retailers sell 2 allowances to Cement Producer.

*Exact profit depends on the Price of allowances.

Firm	profit	Producción	Emissions
Electricity Retailer	$16*	5 units	8 units
Cement Producer	$30*	5 units	4 units
Total	$46	--	12 units

Comparison

Case	Total Profit	Emissions from Electricity Retailer	Emissions from Cement Producer	Total Emissions
No regulation	$54	7 units	11 units	18 units
Under regulation	$40	6 units	6 units	12 units
ETS	$46	4 units	8 units	12 units

Round 3

Be more ambitious with ETS

Round 3

You have an initial limit of 6 allowances per firm and no trade.

Cooperate with your pair firm to have a more ambitious emissions reduction in Exchange for an ETS. The government accepts the offer only with more environmental ambition,

How do you allocate the production level so no firm loses relative to the initial state of 6 allowances?

Start negotiating with your pair firm,

Offer to the Government	Allowances assigned to Electricity retailer	Allowances assigned to Cement producer	Profit	Emissions

Round 3: More ambition

Trading is not only more effective at reducing costs, it can allow more ambitious environmental goals.

*Exact profit depends on price of allowances.

Firm	Profit	Allowance	Emissions
Cement Producer	$16*	5 units	8 units
Electricity Retailer	$24*	5 units	2 units
Total	$40	10 units	10 units

Comparison

Case	Total Profit	Emissions Electricity Retailer	Emissions Cement Producer	Total Emissions
No regulation	$54	7 units	11 units	18 units
With regulation	$40	6 units	6 units	12 units
ETS	$46	4 units	8 units	12 units
More ambitious ETS	$40	2 units	8 units	10 units

Lessons

1. Trading itself does not affect environmental outcomes.

2. Limiting emissions can improve environmental outcomes but reduce profitability.

3. Trading can reduce the costs of meeting a target.

4. Trading allows more ambition for emissions reduction.