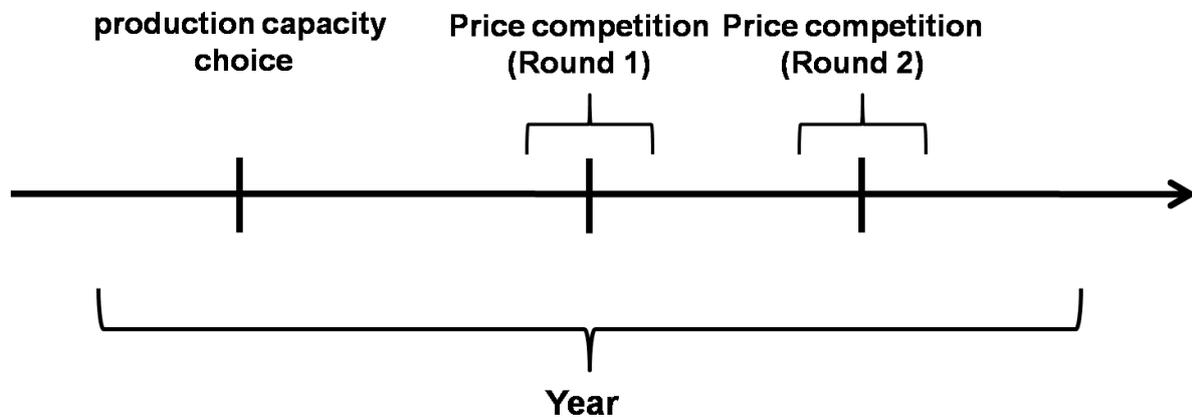


## Competition Game: Price and quantity competition and CO<sub>2</sub> environmental policies (quotas, taxes and emission permits)

You are responsible for managing a firm selling a good whose production emits CO<sub>2</sub>. You will play the same game against the same players on 4 completely separate markets: Actions on one market do not have any direct impact on the other markets. You can see these markets as parallel universes in which demand and production costs are the same, but environmental policies are different (this will be useful to compare outcomes of these policies). Note in particular, that goods produced on one market cannot be sold on other markets.



The timeline is separated into years. At beginning of a year, you have to choose how much to produce. Then, once every firm has decided how much to produce, production takes place and you have to choose the price at which you will sell your goods.

For pedagogic reasons and to allow you to correct potential pricing mistakes, you will play the "sales part" twice (but this does not correspond to any real-world situation). We call rounds these two sales sequences (for each round, the maximum quantity you can sell is equal to the total quantity you selected at the production stage).

Note that goods are perishable: what is not sold at the end of a round is lost.

Finally, your shareholders only leave enough cash in your firm to let you produce a maximum of 1200 goods per round on each market (note that this does not mean that producing 1200 goods is a good idea!). This constraint applies market by market.

Let's first talk about the general structure of the game and we will present the data later. Do not hesitate to play a game alone (one player, one universe) to prepare for the real game.

# The Game Structure

## 1st year

### Production choice

On the first screen, you must select production on each market.

Enter your choice, validate and check your competitors' decisions on the next screen:

## Sales Round

On the next page, you are invited to select your price on each market:

**airECONsim** Year 1 Results Edit Profile \*Player 1 (1) Logout

**Scores**

- \*Player 1 (1) €50,000
- Robot 2 (2) €50,000
- Robot 3 (3) €50,000
- Robot 4 (4) €50,000

**Market**

- Market 1
- Market 2
- Market 3

**Price Choice**

Round 1/2

Market 1

Price: 58

Total: 4708 / Remaining: 4708 goods

Parameters

	*Player 1 (1)	Robot 2 (2)	Robot 3 (3)	Robot 4 (4)
Available Goods	1200 (Technol)	1055 (Technol)	1206 (Technol)	1247 (Technol)
Distribution Unit Cost (variable, not paid yet)	€30	€30	€30	€30
Production Unit Cost (fixed, already paid)	€10	€10	€10	€10
Fixed Costs over the Round (excluding CO <sub>2</sub> )	€20,000	€18,550	€20,060	€20,470
CO <sub>2</sub> Fixed Cost over the Round	€0	€0	€0	€0
CO <sub>2</sub> emissions (tons)	132	116	132.7	137.2
CO <sub>2</sub> emissions by good (tons)	0.11	0.11	0.11	0.11

Enter your prices Check your sales results. Remember that goods are perishable: unsold goods are lost (here, 128 goods for team 1).

**airECONsim** Year 1 Results Edit Profile \*Player 1 (1) Logout

**Scores**

- \*Player 1 (1) €105,520
- Robot 4 (4) €93,633
- Robot 3 (3) €84,071
- Robot 2 (2) €81,985

[Back To Previous Decision](#)

**Market**

- Market 1
- Market 2
- Market 3

**Round 1/2**

Market 1

Total: 4716 / Unsold: 128 goods

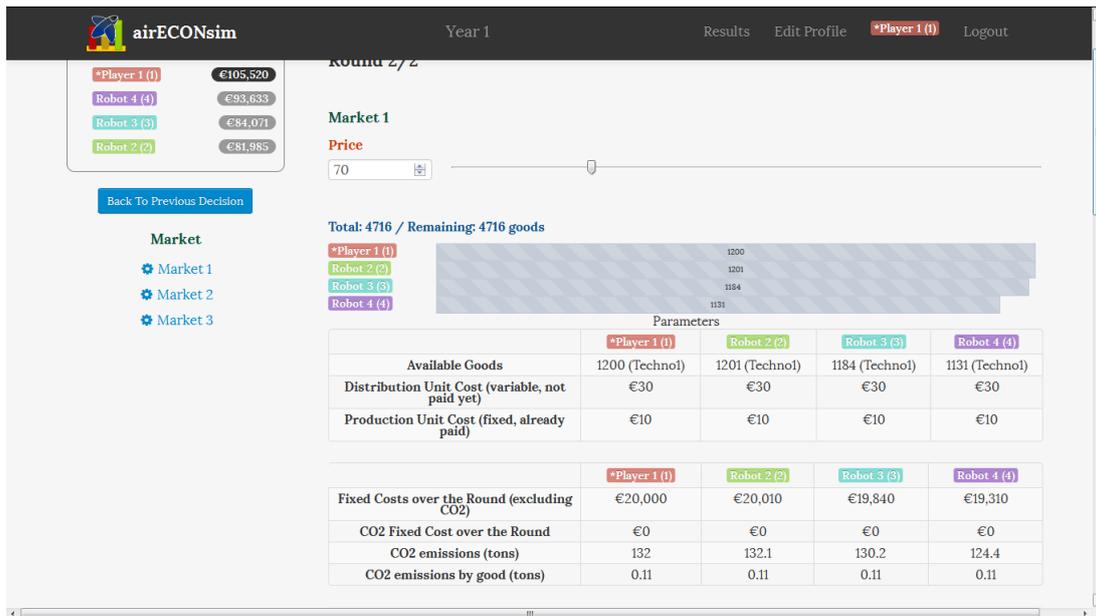
Results

	*Player 1 (1)	Robot 2 (2)	Robot 3 (3)	Robot 4 (4)
Price	€70	€55	€60	€60
Sales	1072 / 1200	1201 / 1201	1184 / 1184	1131 / 1131
Sales at "halftime"	411	710	583	569
Total Production	1200 (Technol)	1201 (Technol)	1184 (Technol)	1131 (Technol)
Revenue since beginning of Round (excluding CO <sub>2</sub> and exceptional)	€75,040	€66,055	€71,040	€67,860
Fixed Costs over the Round (excluding CO <sub>2</sub> and exceptional)	€20,000	€20,010	€19,840	€19,310
CO <sub>2</sub> Fixed Costs over the Round	€0	€0	€0	€0
Variable Costs over the Round	€32,160	€36,030	€35,520	€33,930
CO <sub>2</sub> emissions (tons)	132	132.1	130.2	124.4
Profits over the Round (excluding CO <sub>2</sub> , slots and exceptional)	€22,880	€10,015	€15,680	€14,620

## 2<sup>nd</sup> sales round

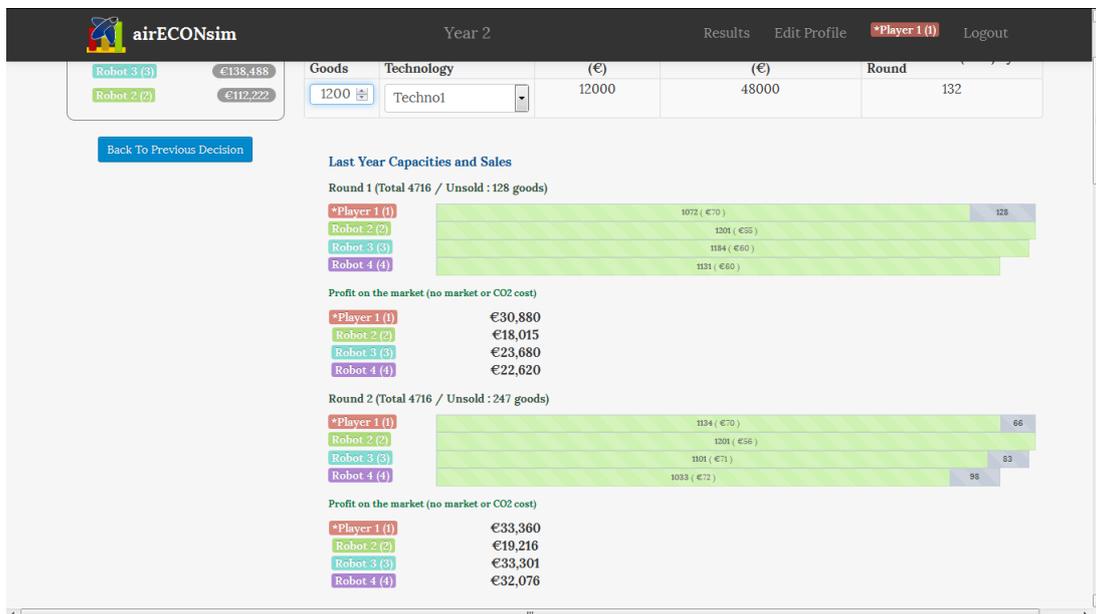
We start a new round and play the sales phase once more (understand that we are only doing once more exactly what we did in the previous round. This is not supposed to represent any "real-world" phenomenon, it is just intended to allow you to correct potential mistakes) → once again, you have as many goods to sell on markets as you had in the beginning of the 1<sup>st</sup> round.

Note that you can find all the past results, by clicking on "results" in the topbar.



## 2<sup>nd</sup> year of the game

For each market, you have information displayed, reminding you about previous year's productions, prices, sales and profits (green bars).



The game is repeated and lasts 3 years.

## Game Data:

### Demand

If you and each of your competitor all set the same price on a market, each firm will sell, on average, about:

Price	40	45	50	55	60	65	70	75	80	85	90
Sales/firm	762	727	694	663	633	603	575	548	522	496	471

Demand is proportional to the number of firms in the game (and is the same as in the other competition games on economics-games.com. Be careful, the game has common features with other games you can find on our other site, lud.io, but demand is quite different).

As you will see, products are slightly differentiated and customers have different brand preferences... (There is also some random in the customer's characteristics): The cheapest firm will usually not get the whole demand.

Consequently, because of price differentiation, demand estimates displayed above can only be used to get information about orders of magnitude.

### Costs

A firm must pay €15 for each good produced, and then €4 for each good sold. Each good produced « emits » 0.5 tons of CO<sub>2</sub> (CO<sub>2</sub> emissions are hence completely determined by choices at the production phase).

Unit production cost, c <sub>1</sub>	Unit distribution cost, c <sub>2</sub>	CO <sub>2</sub> emissions (tons) per good produced
€15	€4	0.5

### Environmental policies

Finally, note that environmental policies differ on each market.

- Market 1 is a benchmark market, there is no environmental policy.
- On market 2, there is a CO<sub>2</sub> environmental tax equal to €40 for each ton of emitted CO<sub>2</sub>
- On market 3, there are (non-tradable) quotas. A firm cannot emit more than 300 tons of CO<sub>2</sub> by round (or 600 tons by year)
- Market 4 is regulated with CO<sub>2</sub> emissions permits. Each year, each firm receives 600 permits for free (that is, 300 permits for each round). With a permit, a firm can emit one ton of CO<sub>2</sub> at no cost. If a firm emits more CO<sub>2</sub> than it has permits, it must buy permits at a price of €40 for each exceeding ton of CO<sub>2</sub>. If it emits less CO<sub>2</sub> than it has permits, it will be able to sell unused permits at a price of €40 each.

Note that for a €40 unit tax for each ton of CO<sub>2</sub>, producing 1000 goods costs  $€(15+0.5*40)*1000$ , i.e. €35000. If firms all decide to produce 1000 goods, they will find themselves in the same situation as in one of the markets of the first competition game of economics-games.com (Impact of fixed costs and capacity constraints on price and profits, with differentiated goods).