>> Experimental Economics

Externalities, Public Goods, and Common Resources

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Outline for Today

- Externalities
- Private vs Social Costs and Benefits
- Characteristics of Goods
- Your Experiment & Lab report 5

The Economics of Pollution

- Pollution is **bad**. Yet most pollution is a side effect of **useful activities**.

- Thus, the optimal quantity of pollution isn't zero.

- Then, how much pollution should a society have? What are the **costs** and **benefits** of **pollution**?

Pollution: An External Cost

- An **external cost** or ***negative externality*** is an **uncompensated** cost that an individual or firm imposes on others.
- In contrast, some activities can give rise to **external benefits** or *positive externalities* that an individual or firm confers on others **without receiving compensation**.
- External costs and benefits are known as ***externalities***.

Private vs. External Costs and Benefits

- Marginal external cost (MEC) = marginal cost accruing to outside parties (*negative externality*)
- Marginal external benefit (MEB) = marginal benefit accruing to outside parties (*positive externality*)
- Marginal private/internal cost (MC) = marginal cost of producers (*supply curve*)
- Marginal private/internal benefit (MB) = marginal willingness to pay (*demand curve*)

Private vs. Social Costs

- For a given quantity of output, the **marginal social cost of a good or activity** is equal to the marginal cost (private) of production plus its marginal external cost.

MSC = MC + **MEC**

Production, Consumption, and Externalities

- When there are external costs, the *marginal social cost* **exceeds** the industry's (private) marginal cost of producing the good.
- Why is that a problem?
- Left to itself, a free-market economy typically produces **too much** of the good because polluters have no incentive to consider the costs they impose on others → Economic inefficiency
- How can we solve this problem?

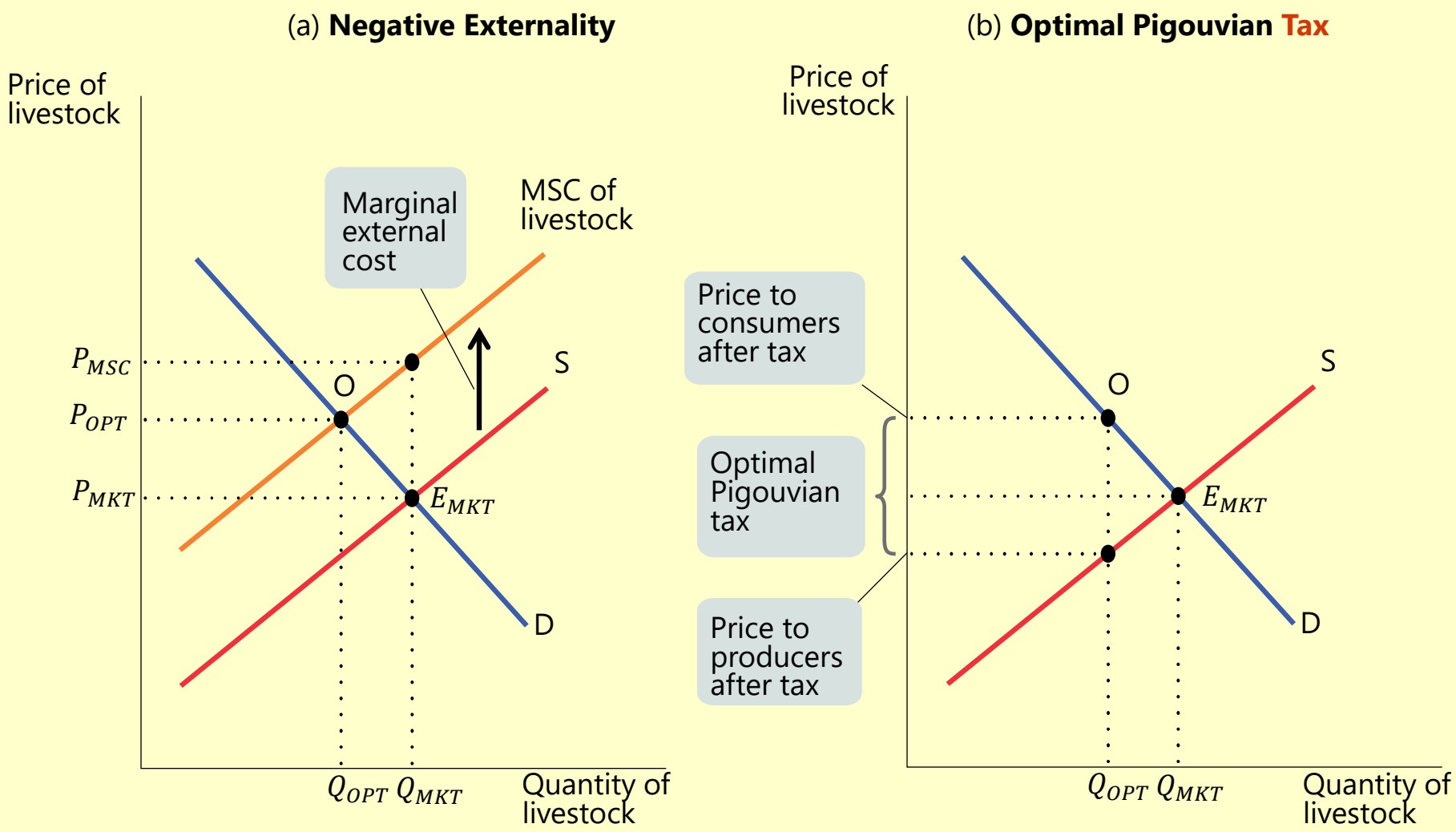
Production, Consumption, and Externalities

- The **socially optimal quantity** can be achieved by an optimal ***Pigouvian* tax**, equal to the marginal external cost – a **fiscal instrument** to deal with **negative** externalities.

- An emissions tax is a form of *Pigouvian tax,* designed to reduce external costs.

- more specifically: the **optimal *Pigouvian* tax** is **equal** to the marginal **external** cost of pollution at the socially optimal quantity of pollution.

Negative Externalities and Production



Private vs. Social Benefits

- The **marginal social benefit of a good or activity** is equal to the marginal benefit that accrues to consumers plus its (private) marginal external benefit.

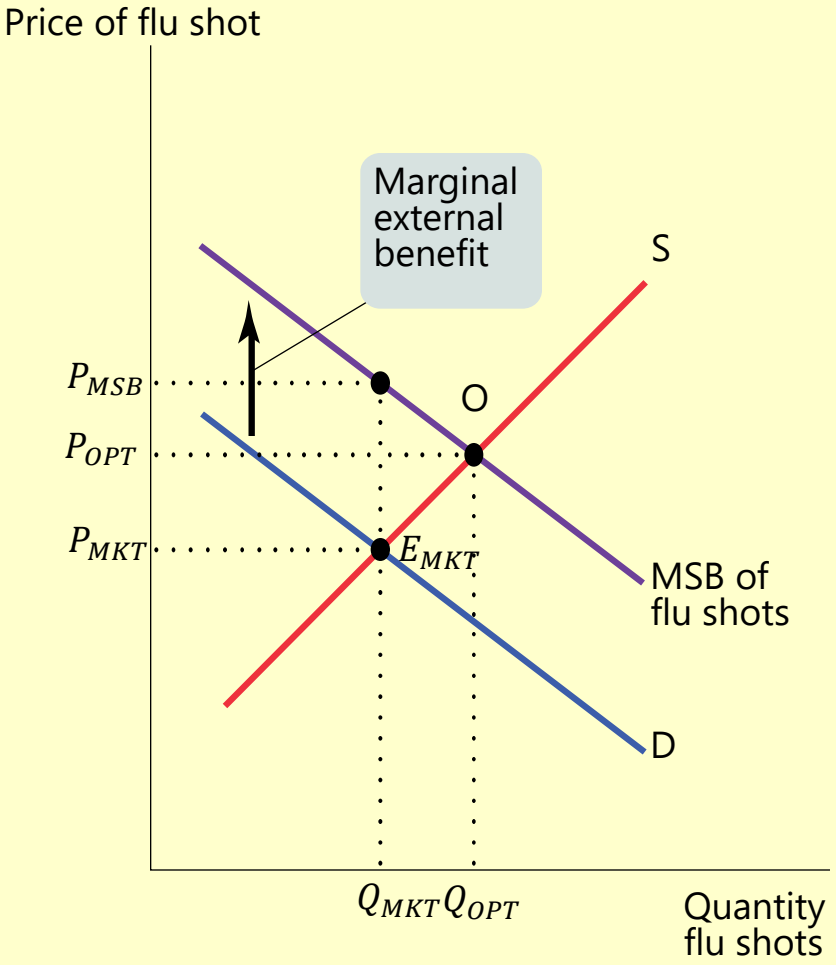
$$\textbf{MSB} = \text{MB} + \textbf{MEB}$$

- How can we achieve a socially optimal quantity?

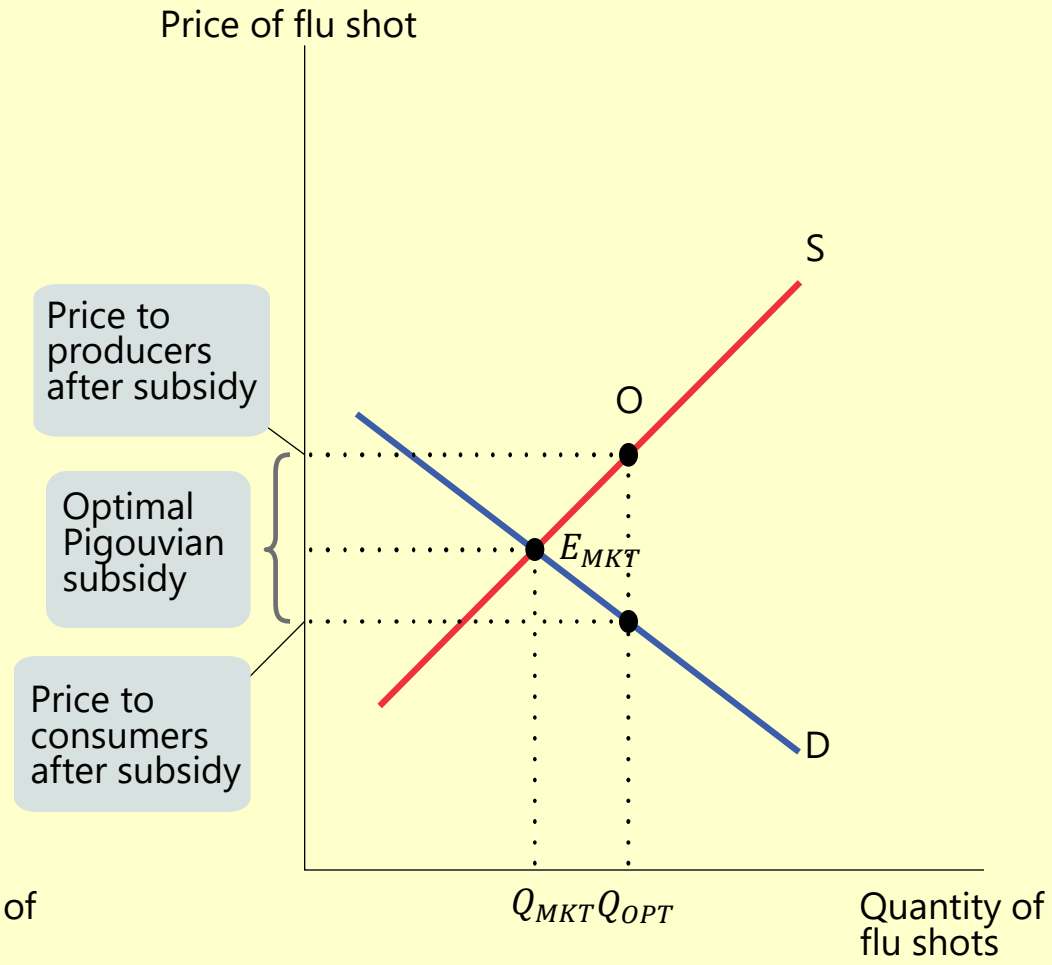
- The **socially optimal quantity** can be achieved by an optimal ***Pigouvian* subsidy**, equal to the marginal external benefit – a **fiscal instrument** to deal with **positive** externalities.

Positive Externalities and Consumption

(a) **Positive Externality**



(b) **Optimal Pigouvian Subsidy**



Characteristics of Goods

- Goods can be classified according to
  - whether they are ***excludable***
  - whether they are ***rival in consumption***

- A good is **excludable** if the supplier of that good can prevent people who don't pay from consumption.

- A good is **rival in consumption** if it can't be consumed by more than one person at the same time.

Characteristics of Goods

	Rival in consumption	Non-rival in consumption
Excludable	***Private goods*** • Laptop • Private toilet fixtures	***Artificially scarce goods*** • Pay-per-view sport events • Computer software
Non-excludable	***Common resources*** • Clean water • Bio-diversity (fishing in the ocean)	***Public goods*** • Group project • Public sanitation • National defense

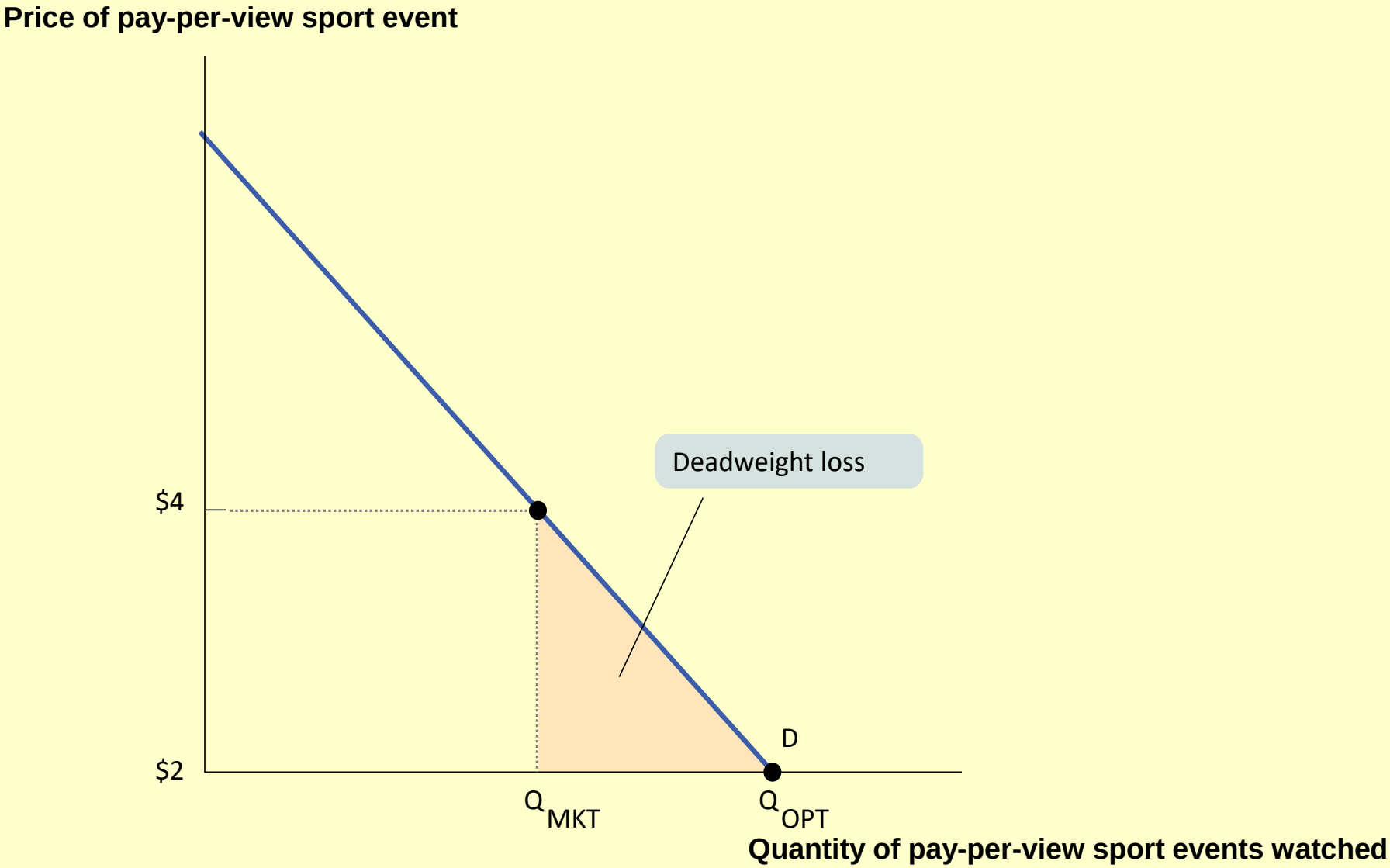
Artificially Scarce Goods

- An ***artificially scarce good*** is *non-rival in consumption* → the marginal cost of allowing one more person to consume the good is zero.

- However, because it's also *excludable*, sellers charge a price, leading to *inefficiently low consumption*.

- The problems of artificially scarce goods are similar to those posed by monopolies.

An Artificially Scarce Good



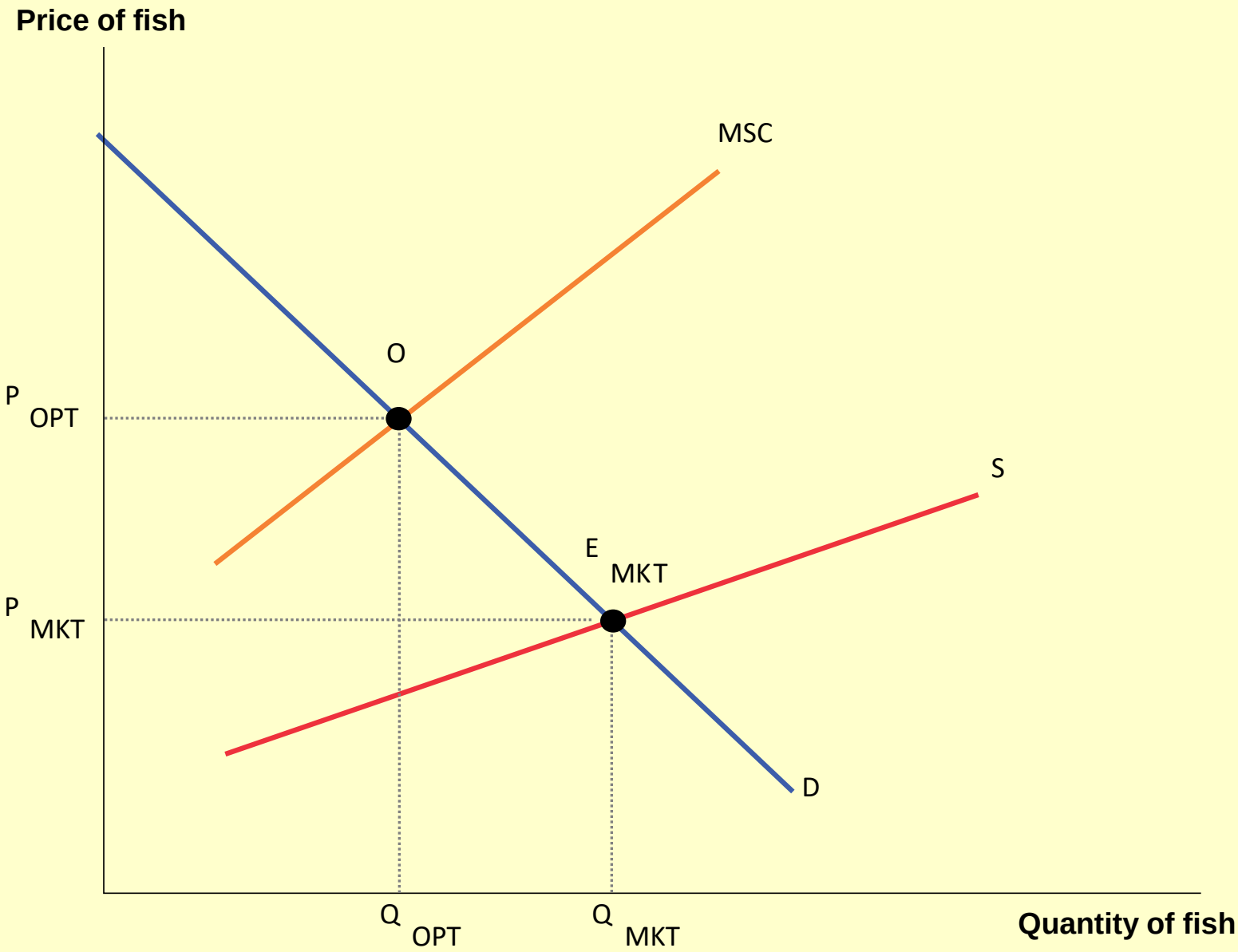
Common Resources and Overuse

- A **common resource** is non-excludable but rival in consumption: "*you can't stop me from consumption, and more consumption by me means less for you*."

- Because of negative externalities, the *marginal social cost* of my use is higher than my individual *marginal cost.* Yet, my individual marginal cost is lower than my individual benefit.

- Thus, if left to the free market → ***overuse -*** *inefficiently high production*

A Common Resource



The Efficient Use and Maintenance of a Common Resource

- To ensure efficient use of a common resource, society must force individual users of the resource considering the costs they impose on other users.

- Like negative externalities, a common resource can be efficiently managed by:
  - a **tax** or a **regulation** imposed on the use of the common resource.
  - making it **excludable** and assigning **property rights** to it.
  - creating a system of tradable **licenses** for the right to use the common resource.

Public Goods

- Goods that are ***non-excludable*** suffer from the ***free-rider problem***: individuals have no incentive to pay for their own consumption and instead will take a "free ride" on anyone who does pay.

- When goods are ***non-rival in consumption***, the efficient price for consumption is zero.

- Since private costs are higher than private benefits to produce one unit, the forces of self-interest lead to *inefficiently low production*.

Why Markets Can Supply Only Private Goods Efficiently

- Because private goods are **excludable**, producers can charge for them and so have an incentive to produce them.
- Because they are also **rival in consumption**, it is efficient for consumers to pay a positive price—a price equal to the marginal cost of production.
- If one or both of these **characteristics** are **lacking**, a market economy will **not** lead to **efficient** production and consumption of the good.

Lab report 5: Treatment 1

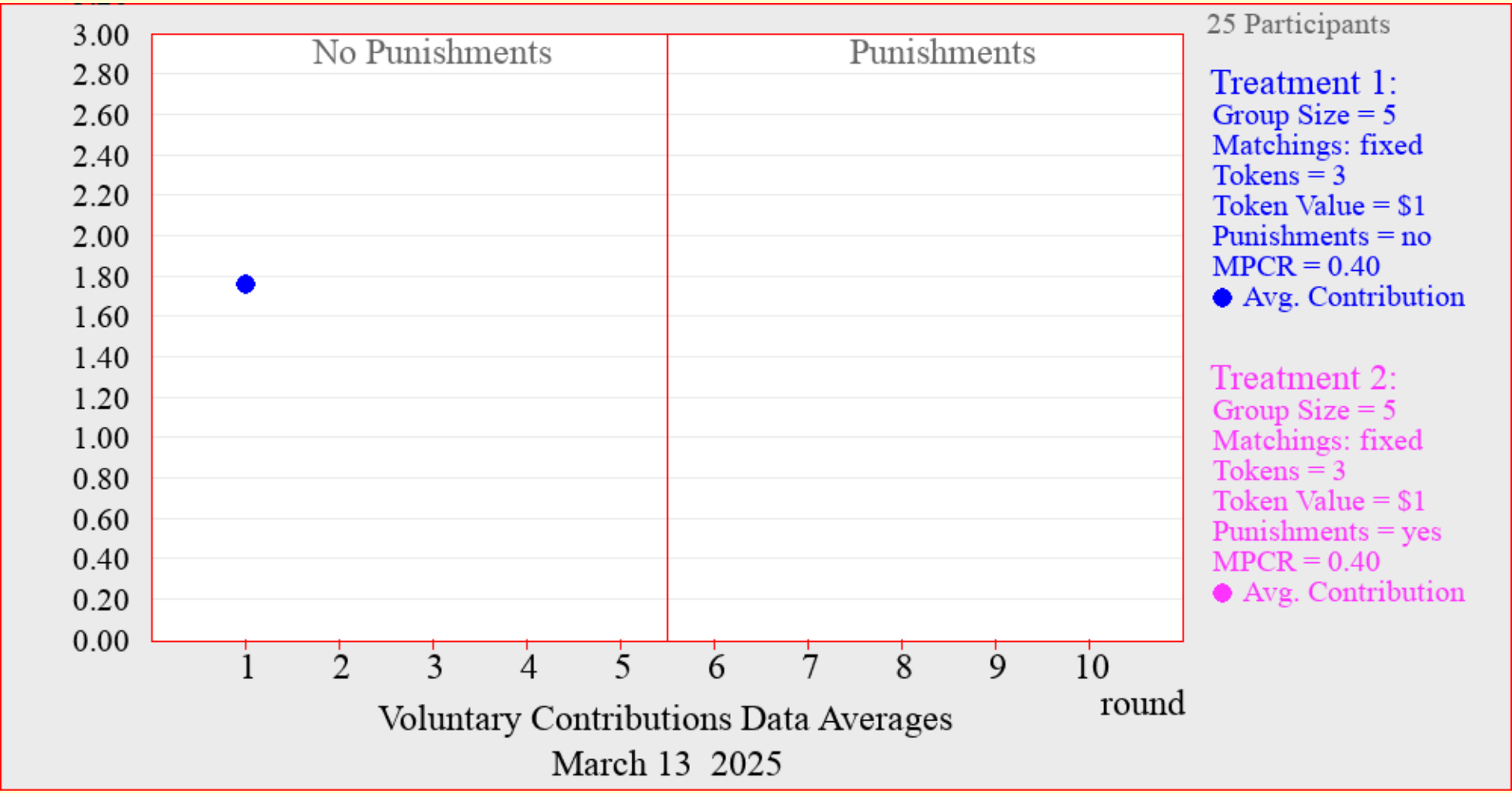
- Voluntary contribution to a public good

- What is the Nash equilibrium?
  - **Backward induction** → *zero* contribution in last round
  - Zero contribution in second last round
  - …
  - Zero contribution in first round

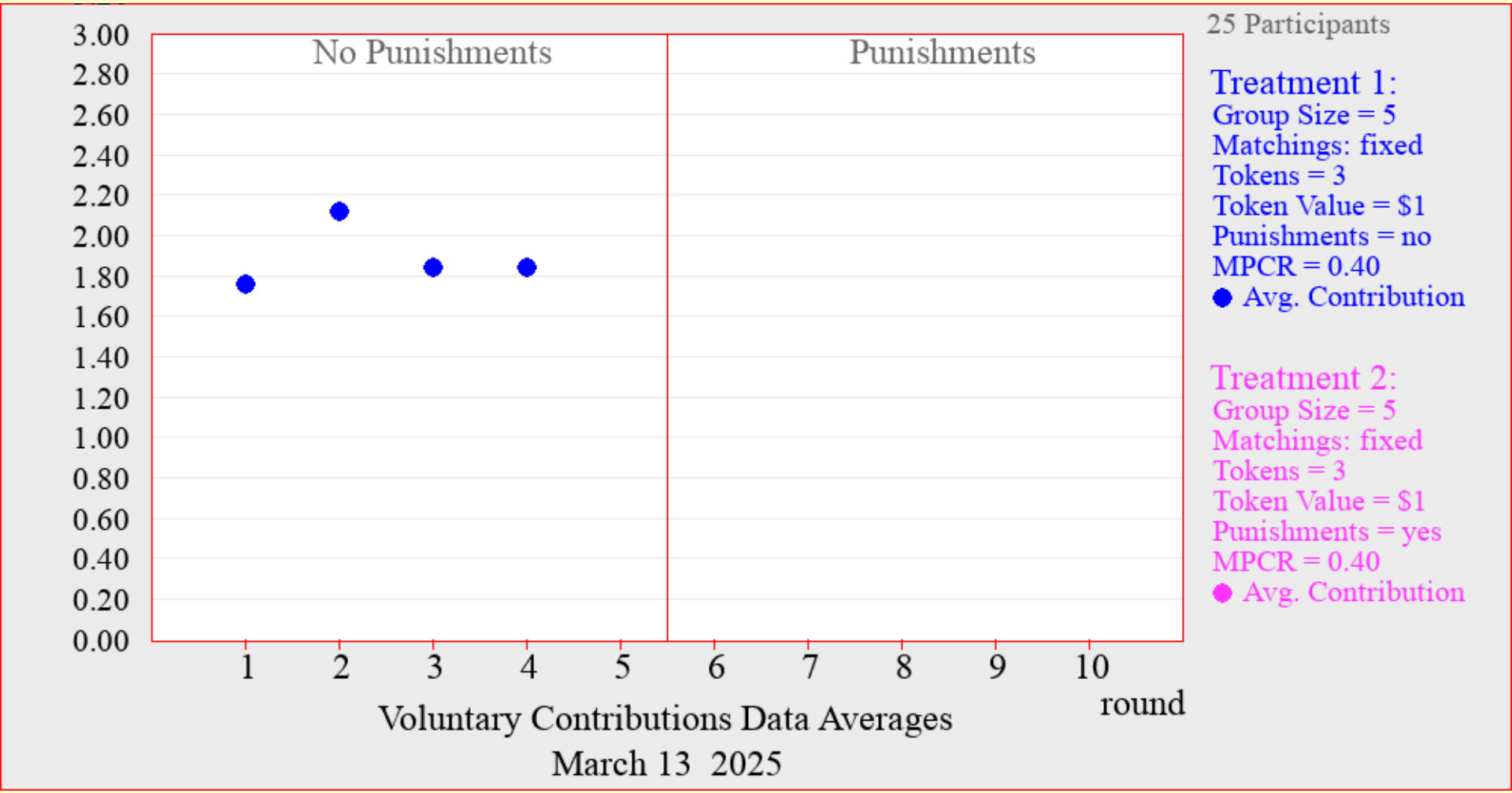
- Is this optimal?

➢ No, but very likely that players play NE

Lab report 5: Treatment 1



Lab report 5: Treatment 1



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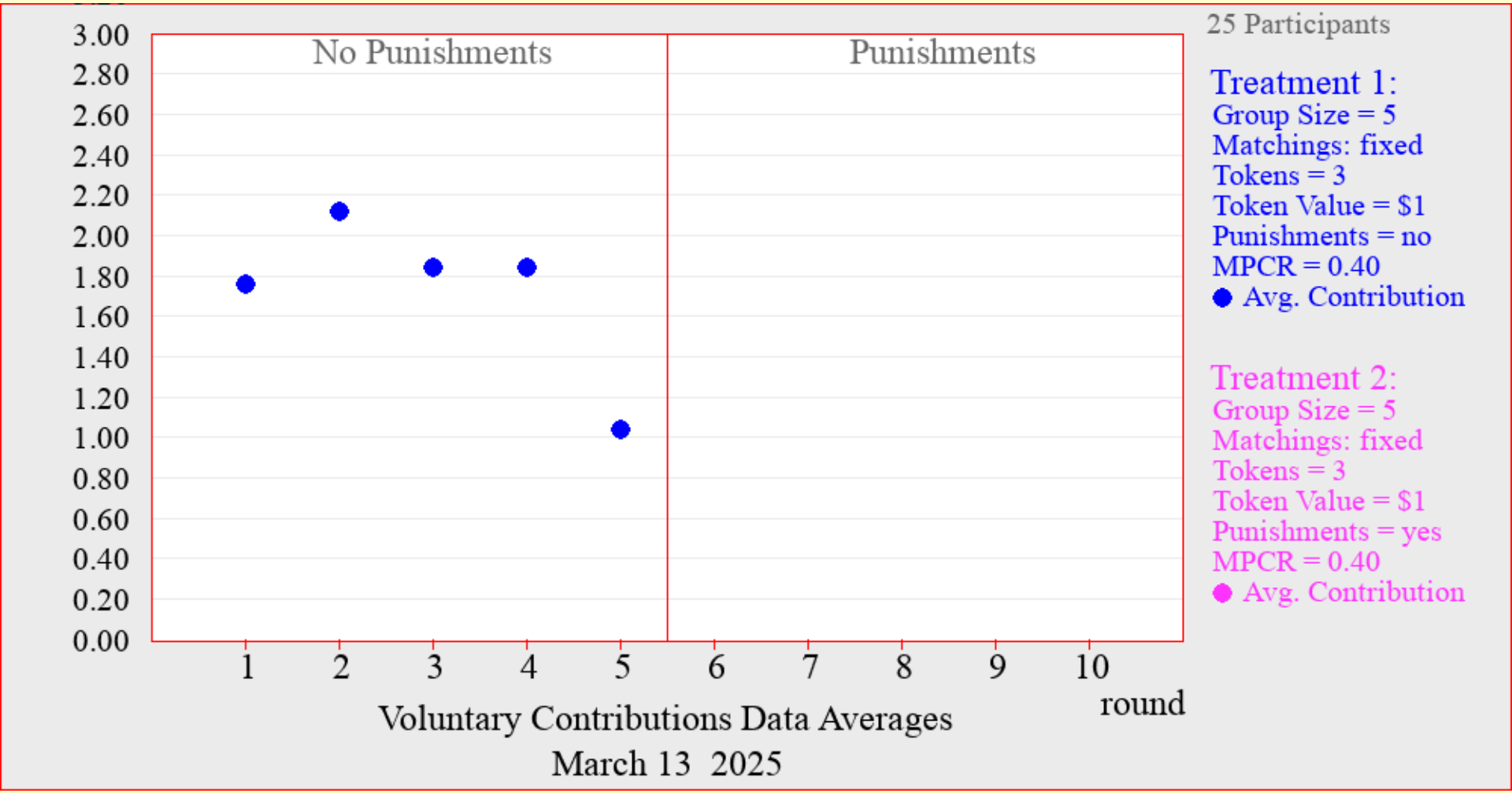


Lab report 5: Treatment 2

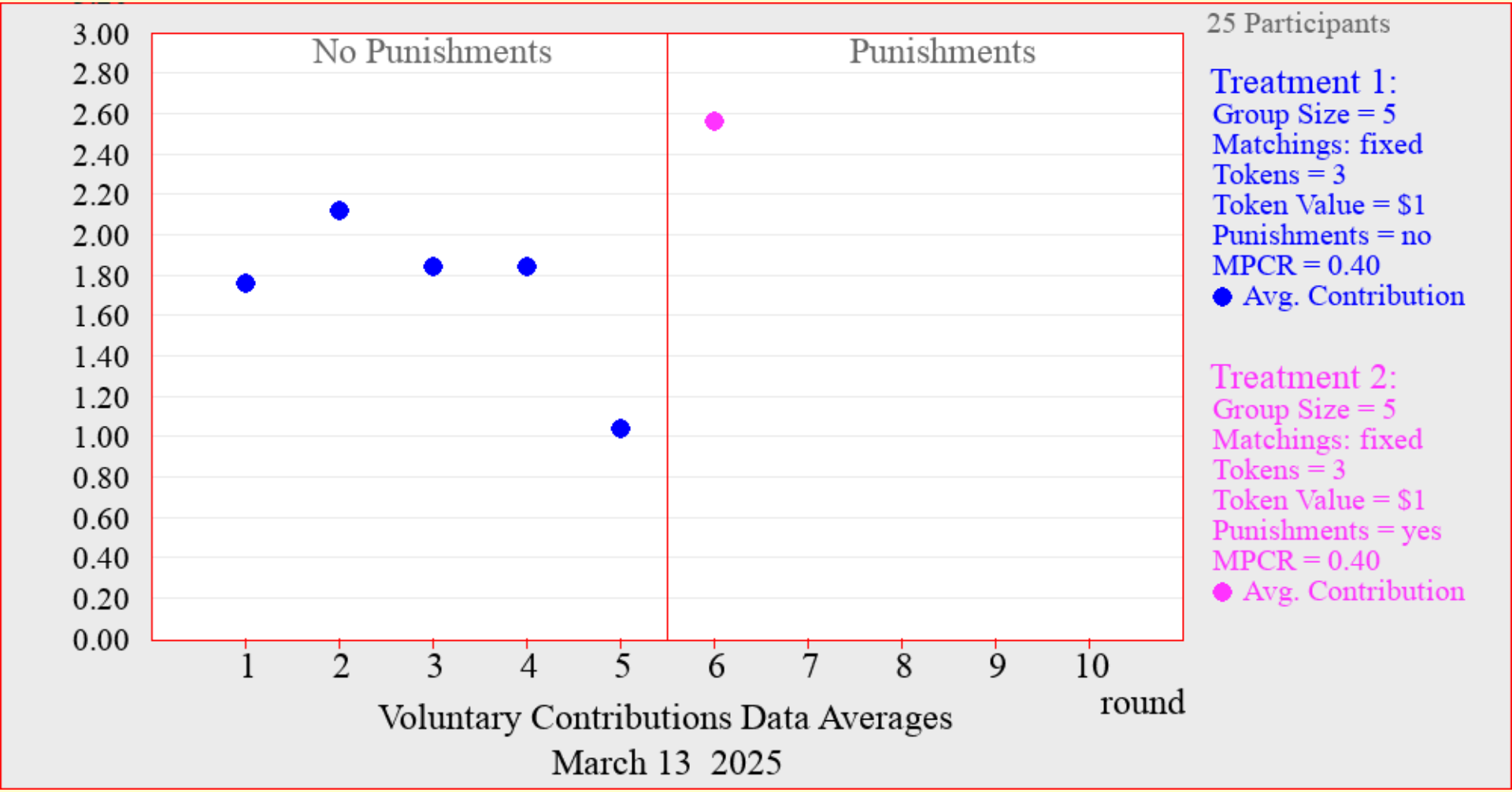
- Now, societies can punish free-riders

- What is the Nash equilibrium?
  - **Backward induction** → *zero* contribution in last round
  - …
  - Zero contribution in first round

- Is this optimal?

➢ No, and we see that players play NE **less**

Lab report 5: Treatment 2



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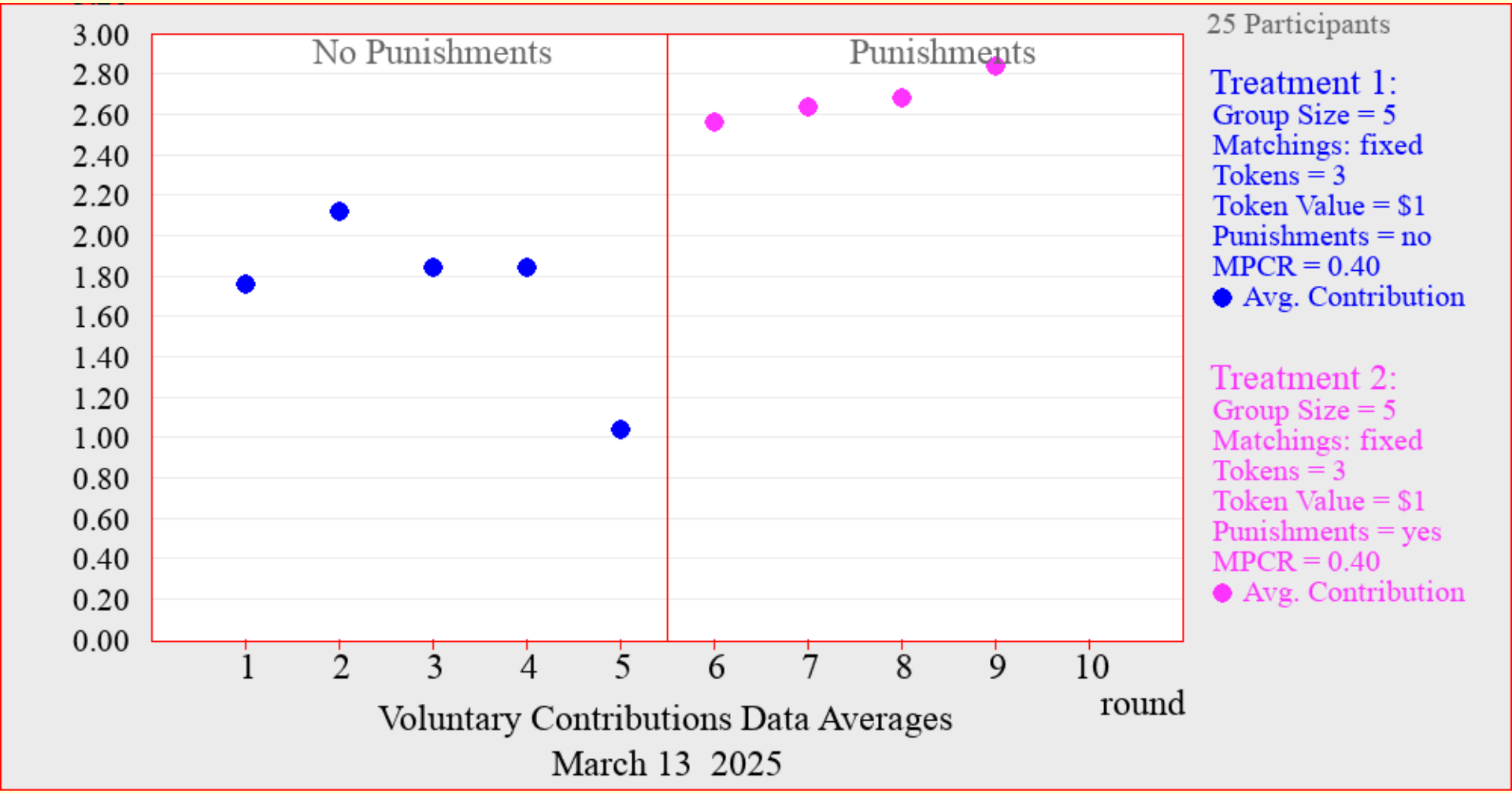

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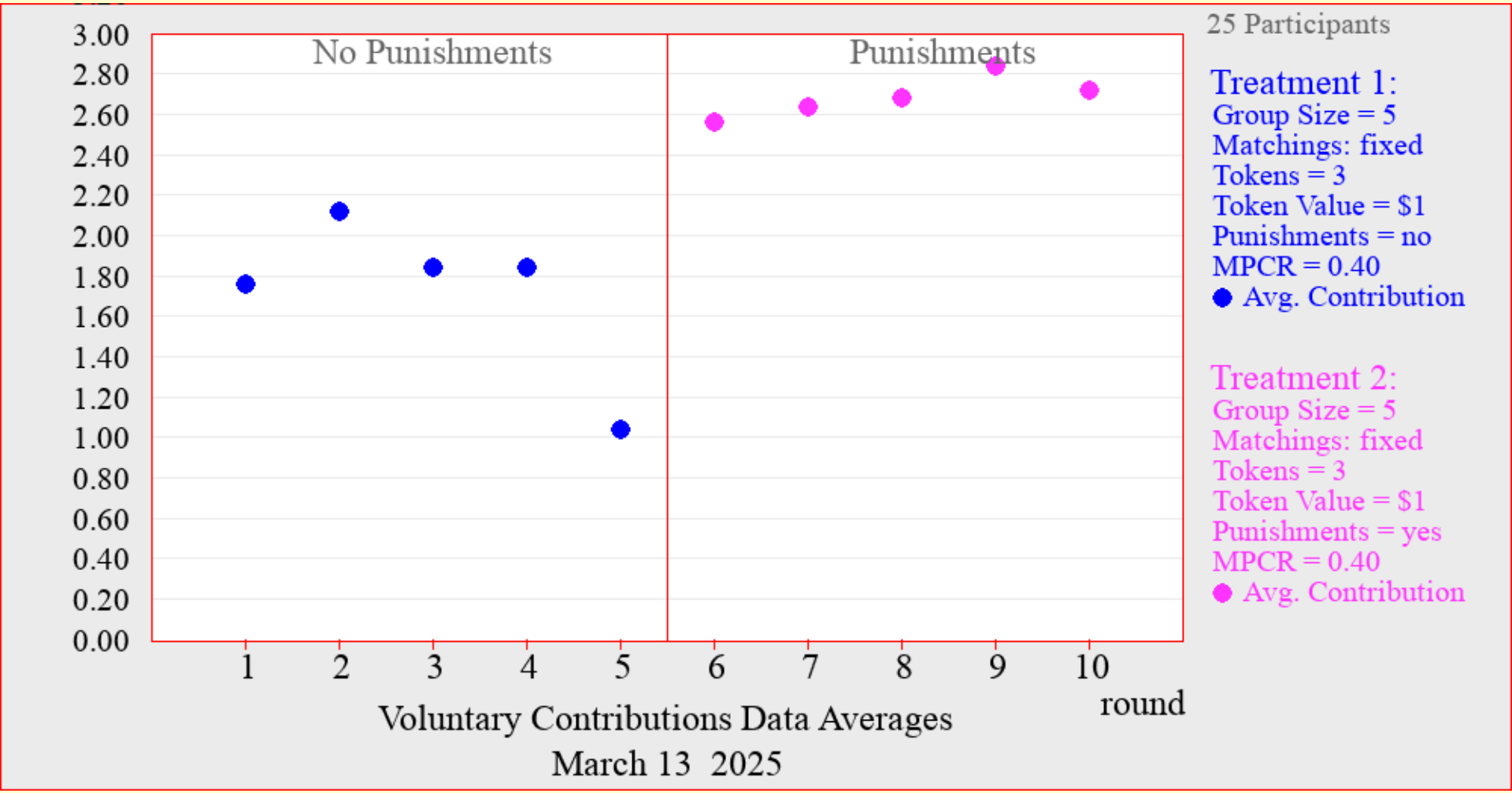

Lab report 5

Rounds	Number of subjects that contributed zero	Percentage of subjects that contributed zero	Number of subjects that contributed 3	Percentage of subjects that contributed 3
1	5	20	8	32
2	3	12	15	60
3	9	36	15	60
4	9	36	14	56
5	15	60	7	28
6	1	4	17	68
7	2	8	20	80
8	2	8	22	88
9	1	4	23	92
10	1	4	21	84