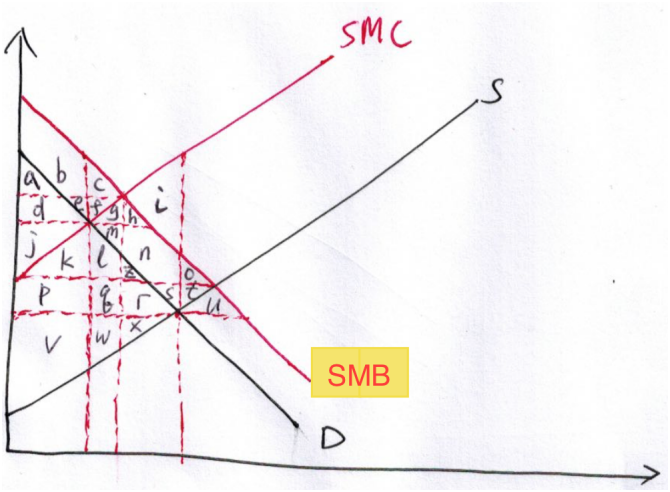
Homework 8 (36 Points)

Problem 1 (8 Points)

The following graph illustrates the market for a good that generates both positive and negative externalities[1]. Note: the government has not imposed any tax or subsidy on the market. Hence the market is at its free-market equilibrium.



SMB: social marginal benefit; SMC: social marginal cost

Find out the following:

1. Consumer surplus + Producer surplus
2. External benefit
3. External cost
4. Deadweight loss

[1]For example, self-driving cars can both reduce road accidents and generate pollution and congestion.

Problem 2 (8 Points)

In a village, each person has the following willingness to pay for beer:

1^{st} bottle	\$5
2^{nd}	4
3^{rd}	3
4^{th}	2
5^{th}	1
Further bottles	0

1. The cost of producing beer is \$1.50, and the competitive suppliers sell it at this price. (The supply curve is horizontal.) How many bottles will each villager consume? What is each person's consumer surplus? (2 Points)

2. Suppose producing beer creates pollution. Each bottle has an external cost of \$1. Taking this additional cost into account, what is total surplus per person? (total surplus per person = total surplus/number of people) (2 Points)

3. The mayor of the village imposes a \$1 tax on beer. What is consumption per person now? Calculate each person's consumer surplus and total surplus per person. Based on your calculations, would you support the mayor's policy? (4 Points)

Problem 3 (10 points)

Services like Uber are called **two-sided markets**: the riders are on one side and the drivers are on the other side. Two-sided markets have an important feature: the more users there are on the other side, the happier users on this side are. For example, if you are a potential rider that uses Uber, then the more Uber drivers there are, the happier you are because it means you can get a ride more easily, everything else being equal. In other words, when a driver joins Uber, she will make you happier. Similarly, by using the Uber app as a potential rider, you are making Uber drivers happier. This has been called **indirect network externality**.

1. Explain in what sense is indirect network externality an externality, and in what sense it may not be a true externality. (2 Points)

2. What other services that you know are two-sided platforms? List at least three. (2 Points)

3. Suppose the demand function for the two sides of the market is

$$\begin{aligned} Q_A &= 1 - 0.3p_A + 0.5Q_B \\ Q_B &= 1 - 0.6p_B + 0.5Q_A \end{aligned} \tag{1}$$

   , i.e., demand on side A (Q_A) depends on the the amount of users on side B (Q_B) and vice versa. Suppose the platform company's profit function is

$$\pi = p_A Q_A + p_B Q_B$$

   Calculate the optimal price (p_A^*, p_B^*) this platform company should charge each side of the market. (2 Points)

4. Compare with the no indirect network externality case:

$$\begin{aligned} Q_A &= 1 - 0.3p_A \\ Q_B &= 1 - 0.6p_B \end{aligned}$$

   Do the optimal prices increase or decrease for side A and B when there is indirect network externality? Can you explain why? (4 Points)

Problem 4 (10 points)

Read the articles

- Djankov, S. 2021. "How do companies avoid paying international taxes? And will countries agree on new rules to reform the system?" PIIE.
- Bunn, D. 2021. "A Global Minimum Tax and Cross-Border Investment: Risks & Solutions" Tax Foundation[2].

1. Summarize the OECD two-pillar plan to reform international taxation rules. (2 Points)
2. According to Djankov (2021), what are some of the limitations of the OECD plan? (4 Points)
3. According to Bunn (2021), what could be some of the negative consequences of the OECD plan and how to mitigate them? (4 Points)

[2]In particular, read the sections after "A Simple Example of Taxes on Global Companies and Investment Decisions."

Problem 5 (bonus: 5 points)

The "Double Irish Dutch Sandwich" was a tax strategy used by Google, Apple, Facebook and many other corporations to shift profits by sending royalty payments for intellectual property to jurisdictions with no corporate income taxes. Can you describe how it worked?