Externalities
Econ 1101

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Announcements

- There is a worksheet on Moodle on positive externalities that will be discussed in recitation this week. (If possible, good to work through this and Reading 4 before recitation)

Midterm results posted next week:

- Scores, answers and answer key will be available on Moodle next week
- Homework scores will be posted as well
- Your TAs have information on your specific exam so questions about scoring, grading problems should be directed toward them
- If you did well, that's great, will count as 22% of your course grade. If you didn't do well and do better on the other exams, Midterm 1 will only count 10%

Platform Debates

- Next week: first platform debate about different carbon policies (externalities)
- You should already be assigned a group, if not contact your TA

Prepare for this debate by:

- Reading 4 on Global Externalities and Cap and Trade
- Reading articles available on Moodle:
  - go to the weblinks for platform debate on week 7 look at some of these sites for ideas about a policy

- Your TA should be talking more about the platform debates in this week's recitation

ECON 1101 Lecture 6.1

1. Positive and negative externalities

2. Modeling externalities

3. Correcting externalities: Taxes

example: negative externality in EconLand

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1. Positive and negative externalities

We have learned so far

Competitive market works:

- with no externalities and regulation (first welfare theorem) the total pie is as big as it can possibly be

- government policies can redistribute the pie but mess up with our ideal:
    - deadweight loss from taxes, subsidies and quotas
    - reduce the total pie, inefficiency cost

- but maybe this is not always true..... Externalities

Intro to Externalities

- Buyers and sellers engage in trade if buyer valuation is higher than supplier cost
    - This is agents asses their own benefits and costs (private) when deciding to engage in an activity

- How does this maps to social cost and benefit?
    - are there extra costs (benefits) of an activity?

- The shower, perfume, listening to music too loudly are activities with **externalities**

Externalities

- The shower, perfume, listening to music too loudly are activities with **externalities**

- **Externalities** arise when a person engages in an activity that influences the welfare of someone else while neither paying nor receiving any compensation for that effect
    - basically the actor (person or firm) does not realize or does not care about the impact of his/her actions on others

- This effects can be either positive or negative

- therefore we can have a negative externality or a positive externality (could be both as well, but let's just consider one or the other in this class)

Positive Externalities

A **positive externality** has a welfare improving impact on society (make others better off)

Some examples:

- Landscaping outside of your house
- Wearing perfume (taking showers)
- Research (others can potentially imitate)
- Studying hard in Econ 1101?
    - Most of benefit is private
    - Maybe a little external social benefit if some of your knowledge spills over to your roommate

Example: positive externality

A homeowner not providing positive externalities to the neighbors by watering the lawn:

- If he were, the block would look better making everyone else better off

Negative Externalities

A **negative externality** has a welfare decreasing impact on society (make others worse off)

Some examples:

- Cigarette smoking
- Noise:
    - from headphones
    - cell phones
    - planes
- driving cars (in term of congestion/ carbon pollution)
    - congestion (Drive on highway. Suppose make 1,000 other drivers go .6 seconds slower, so total external cost is 600 seconds or ten minutes)
    - global warming from carbon

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2. Modeling Externalities

2.1 New terminology (SMB, SMC)

2.2 Plotting Social Marginal Curves
- no externality, positive externaliy and negative externality

2.3 Efficiecy analysis and FWT
- quantity analysis and breacking P3

Modeling Externalities

we want to depict externalities within our current models

- externalities are benefits or costs that are not directly considered (by definition, externalities are costs or benefits that are not paid or compensated for) by private agents (buyers sellers)

- to asses the effect on total surplus of externalities we need to model:
  - social benefit: benefit of all members of the society
  - social cost: cost of all members of the society

- Find a way to combine externality benefit/cost with private benefit/cost.... NEW TERMINOLOGY

2.1 New Terminology

- Recall marginal valuation is the reservation price or valuation of the next buyer to enter the market

    - **Private marginal benefit (PMB)** will take the same meaning: benefit to the next consumer to enter the market, which is just the demand curve **(D)**

    - **Social marginal benefit (SMB)** is the benefit to **society** from the next consumer participating in the market

- SMB is private marginal benefit + any extra benefit on society from that consumer engaging in the market

2.1 New Terminology

Similarly:

- Marginal cost is the cost of the next seller to enter the market

    - **Private marginal cost (PMC)** will take this meaning including only the cost of the suppliers involved in the market, which is just the supply curve **(S)**

    - **Social marginal cost (SMC)** is private marginal cost $+$ any extra cost to society from that seller engaging in the market

2.2 Modeling Externalities

- How should we model externalities? We start with using our model for supply and demand

- Three cases to consider:

  1 no externalities
  2 positive externality
  3 negative externality

- **Show how to plot SMC and SMB** (2.2)
- and what is free market allocation and efficient allocation (2.3):
  - Q(FM) is such that S=D i.e. PMB=PMC
  - Q(eff) is such that SMB=SMC

Case 2: Positive Externality

Positive externality in EconLand - where D people consume perfume

- Suppose perfume has positive externalities: every time you wear perfume D people around you benefit from that

- For every unit produced and used, the extra benefit form good smelling is $4

- Is this a positive or a negative externality?
  -
-

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- Is this a positive or a negative externality?
  - positive consumption externality

- **What is the social marginal befit associated with each consumer?**

Case 2: Positive Externality

What is the social marginal befit associated with each consumer?

This is the social benefit of each unit consumed:

- the benefit of the consumer using it and paying for it: PMB
- plus the benefit this unit gives to others: EB = \$4
    - where EB is external benefit per unit traded

- SMB = PMB+EB

- Here SMB = PMB + 4

Lets plot this....

Table of Benefit

Person	Private Marginal Benefit	Social Marginal Benefit
D1	9	13
D2	8	12
D3	7	11
D4	6	10
D5	5	9
D6	4	8
D7	3	7
D8	2	6
D9	1	5
D10	0	4

Case 3: Negative Externality

Negative externality in EconLand - back to widgets

- Suppose now econ land has problems with pollution:
- for every unit of production in EconLand, factories do environmental and health damage evaluated at \$4

- Is this a positive or a negative externality?
  -
-

Case 3: Negative Externality

Negative externality in EconLand - back to widgets

- Suppose now econ land has problems with pollution:
- for every unit of production in EconLand, factories do environmental and health damage evaluated at $4

- Is this a positive or a negative externality?
- **negative production externality**

Case 3: Negative Externality

Negative externality in EconLand - back to widgets

- Suppose now econ land has problems with pollution:
- for every unit of production in EconLand, factories do environmental and health damage evaluated at $4

- Is this a positive or a negative externality?
- **negative production externality**

- **What is the social marginal cost associated with each producer?**

Case 3: Negative Externality

What is the social marginal cost associated with each producer?

This is the social cost of each unit produced:

- the cost of the S-person producing it and paying for it: PMC (on S)
- plus the cost this unit imposes on others: EC = \$4
    - where EC is external cost per unit traded

- SMC = PMC+EC

- Here SMC = PMC + 4

Lets plot this....

Table of Costs

Person	Private Marginal Cost	Social Marginal Cost
S1	1	5
S2	2	6
S3	3	7
S4	4	8
S5	5	9
S6	6	10
S7	7	11
S8	8	12
S9	9	13
S10	10	14

2.3 Efficiency analysis and FWT

- Three cases to consider (no ext, negative, positive) and how plot

- What is free market allocation and efficient allocation (2.3):
  - Q(FM) is such that S=D i.e. PMB=PMC
  - Q(eff) is such that SMB=SMC

- Discussion about Pareto efficiency:
  - negative externality: over production
  - positive externality: under production

- how do externalities impact general welfare of the society:
  - take negative externality example and do welfare analysis to show DWL

- Next: correcting Externalities

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3. Correcting Externalities: piguvian taxes

Correcting Externalities

- With externalities free market allocation is no longer Pareto efficient allocation
  - we just saw the negative externality example to show there is DWL
  - and recall DWL means the pie is not as big as it can be or not Pareto efficient

- Is there anything we can do to increase welfare on the economy now that we have externality?

- Something we can do to bring us a quantity such that SMC = SMB which give us the social optimal quantity or the Pareto efficient allocation?

Correcting Externalities

- Continue with the negative externality example

- We will see 3 ways of correcting externalities
  - we mean how to achieve Q(eff)

1. Taxes (piguvian),
2. Command and control,
3. Cap and trade (tradable allowances)

Piguvian taxes

Continue with negative externality example ($4)

- We found that with negative externality FWT fails because equilibrium quantity is too high
- What methods do we have to force the quantity down?
  - we can finally make an efficient use of the government
  - a tax can lower the quantity at the efficient level

We will see:

- How big should the tax be?
  - internalize the externality
- What will be the outcome
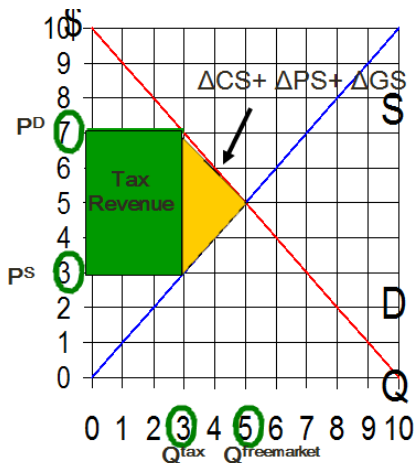- Welfare analysis (ΔTS)

Using taxes to correct externality

- To force the quantity to Q=3 we can use a tax of \$4, the outcome of this policy will be: $Q = 3, \quad P^D = 7, \quad P^S = 3$

Recall tax analysis in Econland when we didn't say anything about externalities
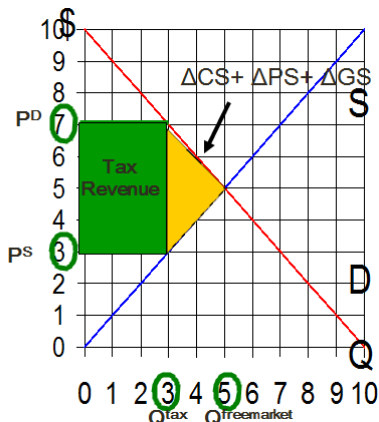
$4 tax without externality

	Free Market	$4 tax	Change
Q	5	3	-2
P^D	5	7	+2
P^S	5	3	-2
CS	12.5	4.5	-8
PS	12.5	4.5	-8
GS	0	12	+12
CS+PS+GS	25	21	-4

$4 tax with externality

Now recognize the existence of a negative externality: Production of 1 widget imposes an external marginal cost of $4 on others

- None of the above changes
- The cost is external to the decision makers so doesn't affect what the do and what they get.
- But the socially optimally quantity changes! Is now lower than the freemarket level. First Welfare Theorem doesn't hold

Let's think of "mother nature" as another party involved here who is suffering the damage from the externality. Let's add another row to take her into account.

$4 tax with externality

	Free Market	$4 tax	Change
Q	5	3	-2
P^D	5	7	+2
P^S	5	3	-2
CS	12.5	4.5	-8
PS	12.5	4.5	-8
GS	0	12	+12
CS+PS+GS	25	21	-4
Externality	-20	-12	+8
Total Surplus Including Externality	5	9	+4

$4 tax with externality

Picture: From above

ΔCS+ ΔPS+ ΔGS

Tax Revenue
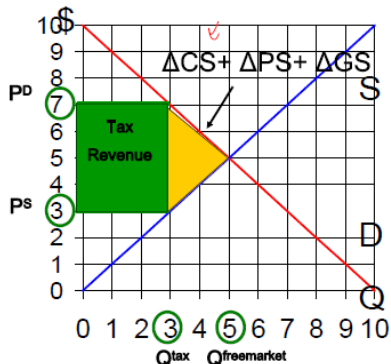
This picture leaves out the externality. Let's put it in.

Effect of $4 tax

SMC
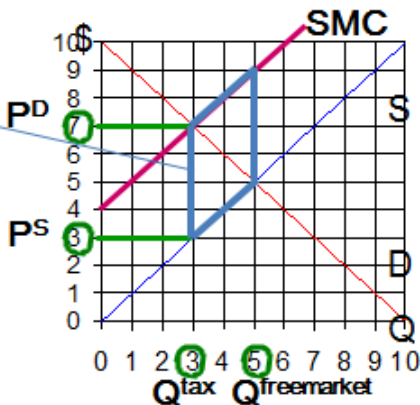
ΔTS including Externality

ΔExternality (positive)
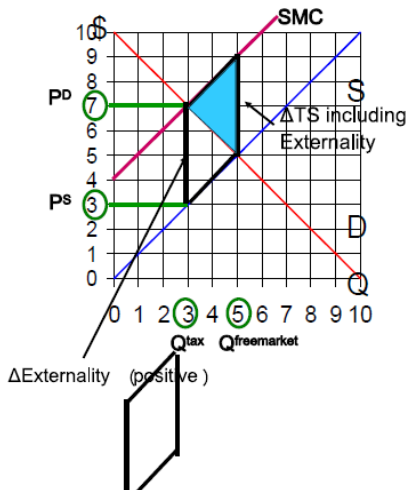
$4 tax with externality

This parallelogram is the change in externality that was caused by the tax (the tax caused there to be two less units in Econland)

Remember this triangle is just surplus loss we get from taxing. This used to be the DWL, but we don't call it that anymore.

We are left with this. This area is a gain in surplus compared to not taxing, when there is a negative externality.

Notes

- For this lecture: we worked mainly in the whiteboard
- Slides are not self contained for this particular class
- To see more slides about this topic look at moodle lec 6(i) and first part of 6(ii)