Government Policies (II): Market Failures

Summer 2023
Econ S10-A, Harvard University
Prof. Josh Abel

Textbook chapters 10 and 11

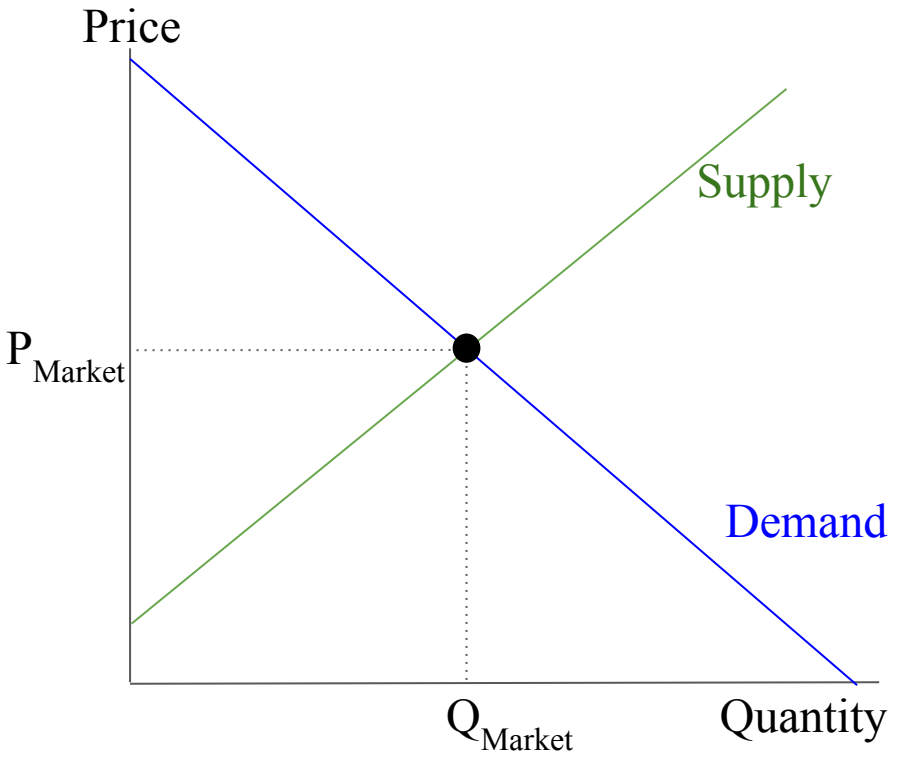
Market Failures

- Last lecture discussed “mechanics” of policy analysis
  - How to model government intervention
  - How price controls and taxes affect price, quantity, and surplus
- Still had view that market is efficient
  - So intervention generally looked bad
- Today we study our first type of “market failure”
  - Externalities: a market transaction affects the well-being of someone not involved
  - This will allow for policy to improve market functioning
- Will study additional market failures throughout the semester
  - Market power (e.g. monopoly)
  - Asymmetric information
  - Consumer irrationality

Externalities

Externalities

- Supply and Demand embody values, costs



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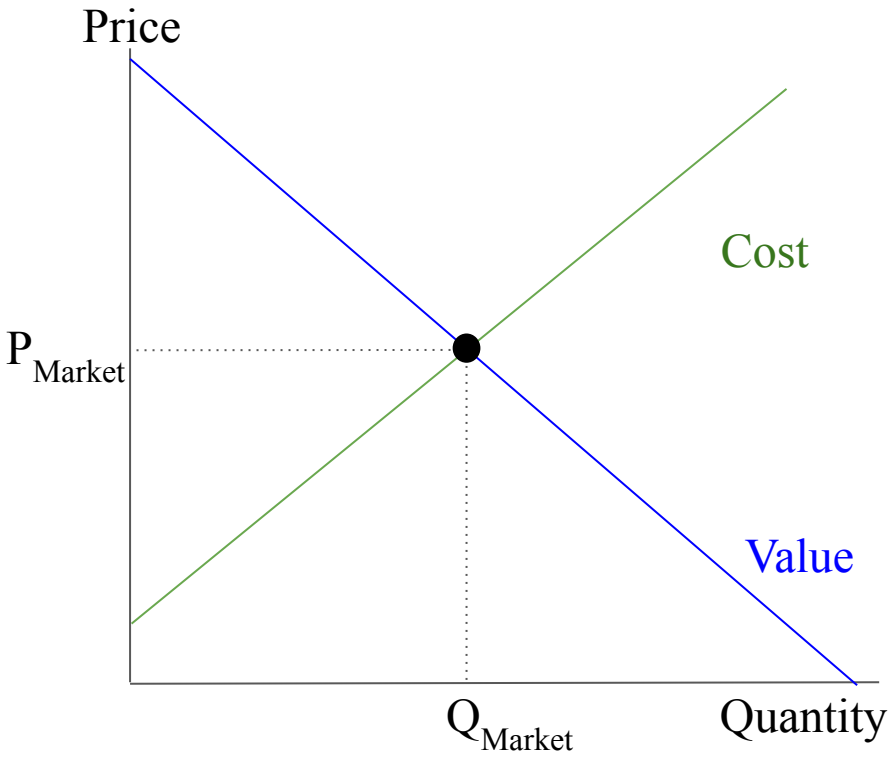
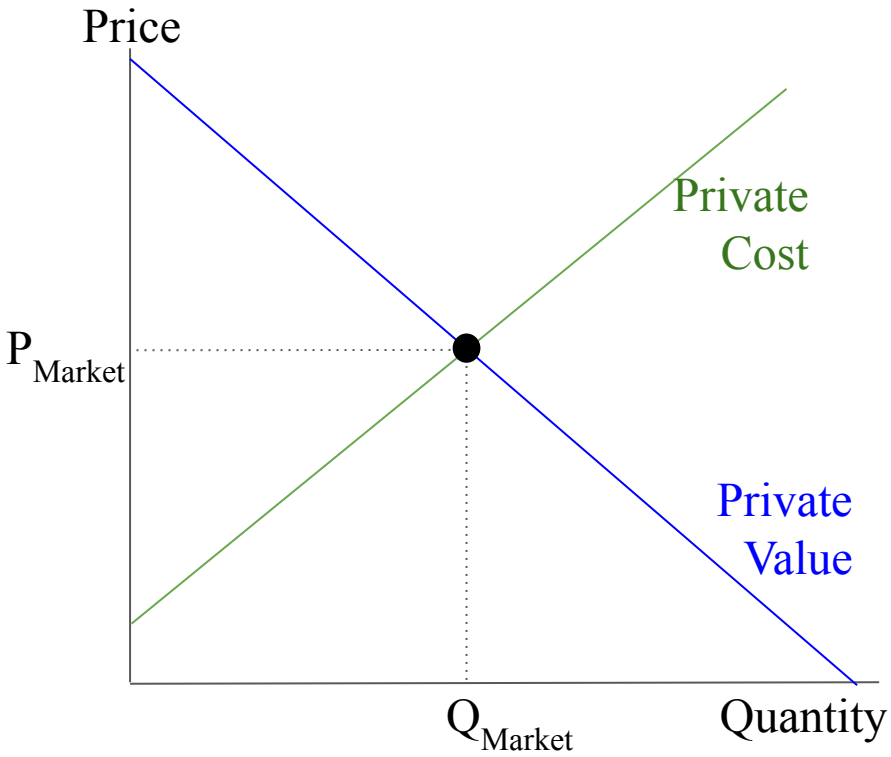


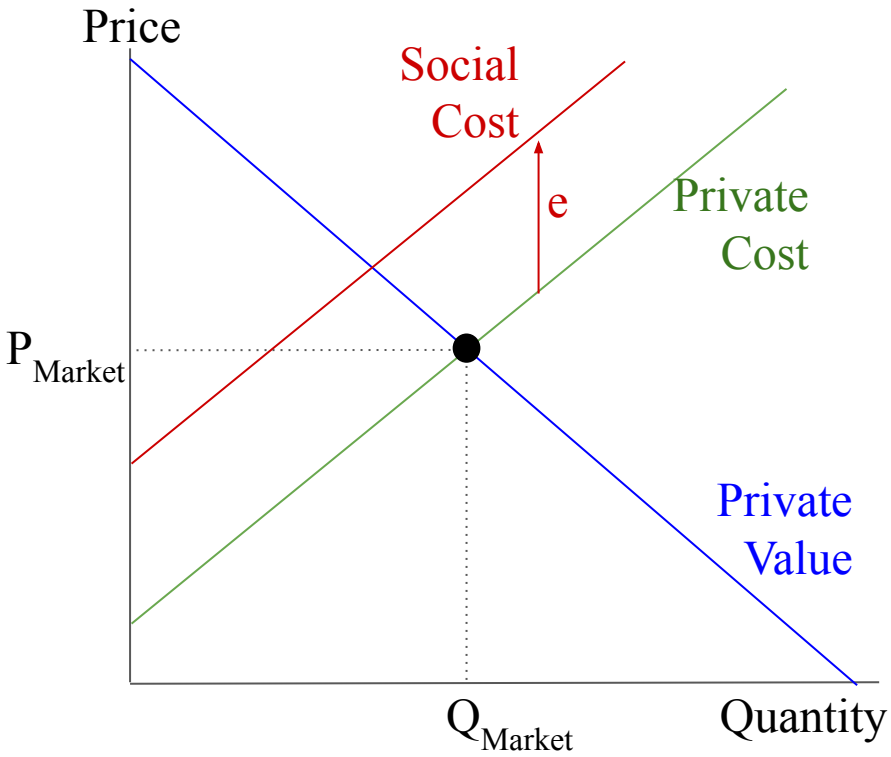
Externalities

- Supply and Demand embody values, costs
  - But they are ***private*** values and costs



Externalities

- Supply and Demand embody values, costs
  - But they are ***private*** values and costs
- Gas has additional pollution costs to society
  - A negative externality
- How does the externality affect P and Q?



Externalities

- Supply and Demand embody values, costs
  - But they are ***private*** values and costs
- Gas has additional pollution costs to society
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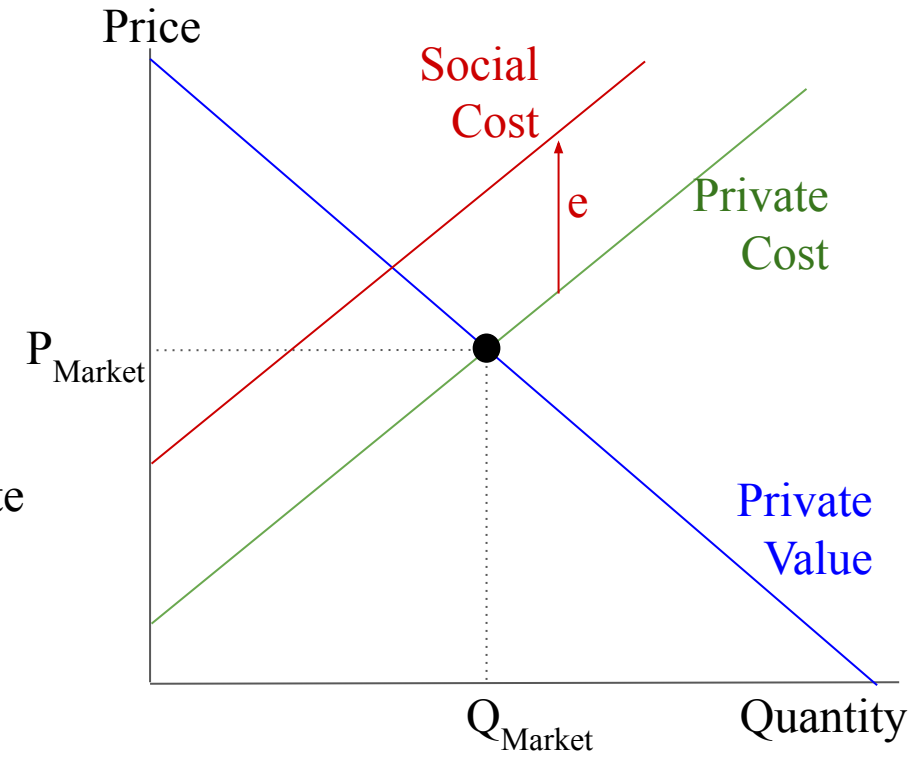
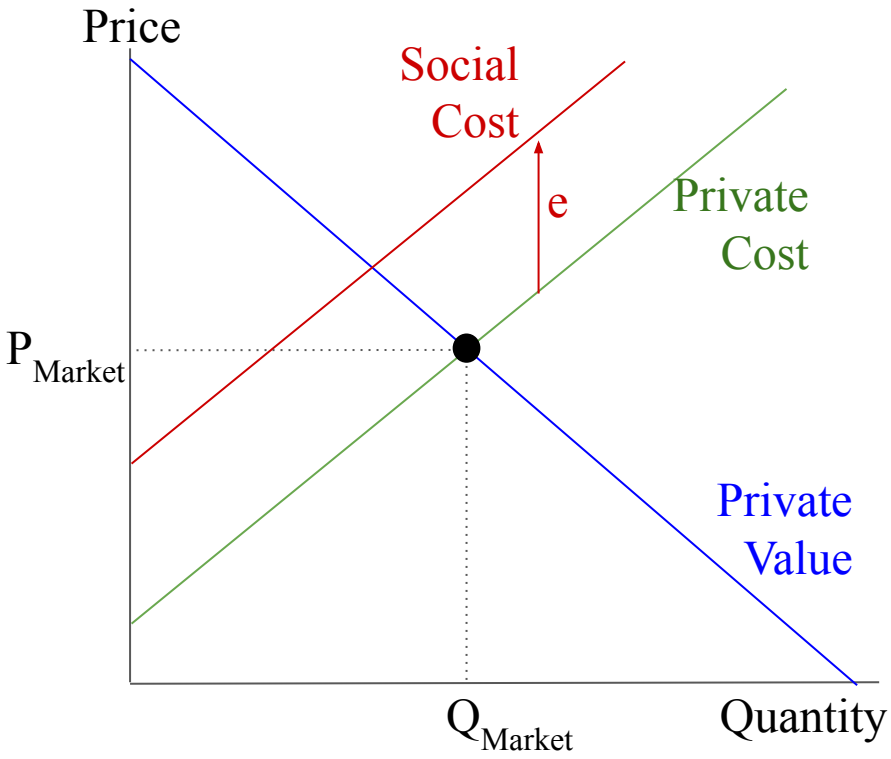
- How does the externality affect P and Q?
  - It doesn't – that's the whole point!
  - Market outcome is determined by private actors based on private incentives



Externalities and Efficiency

- What is the efficient level of Q here?



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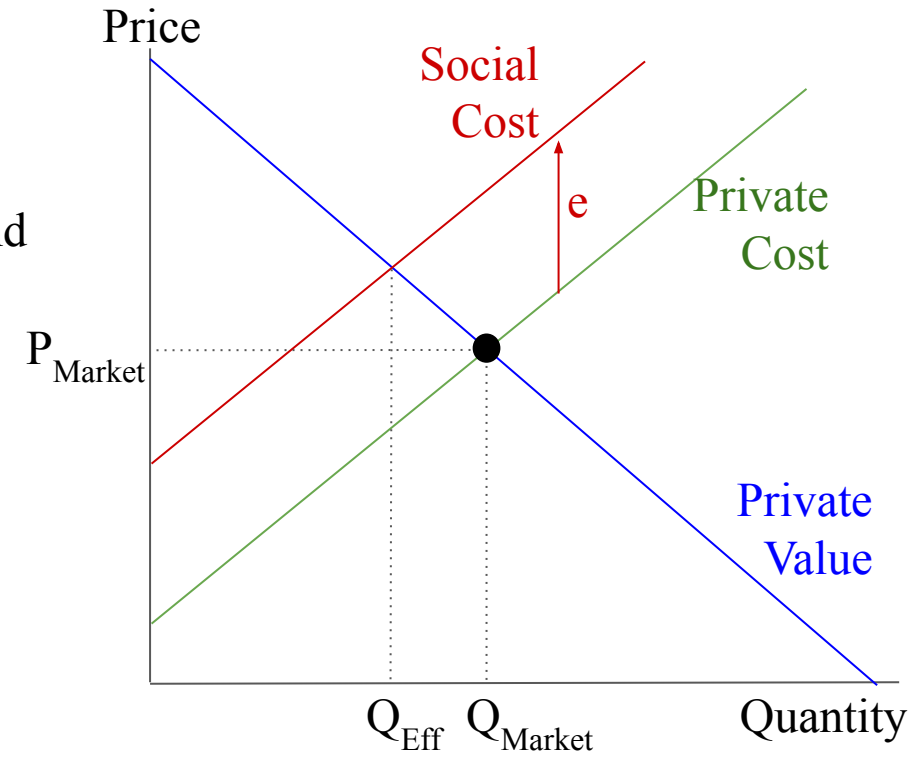
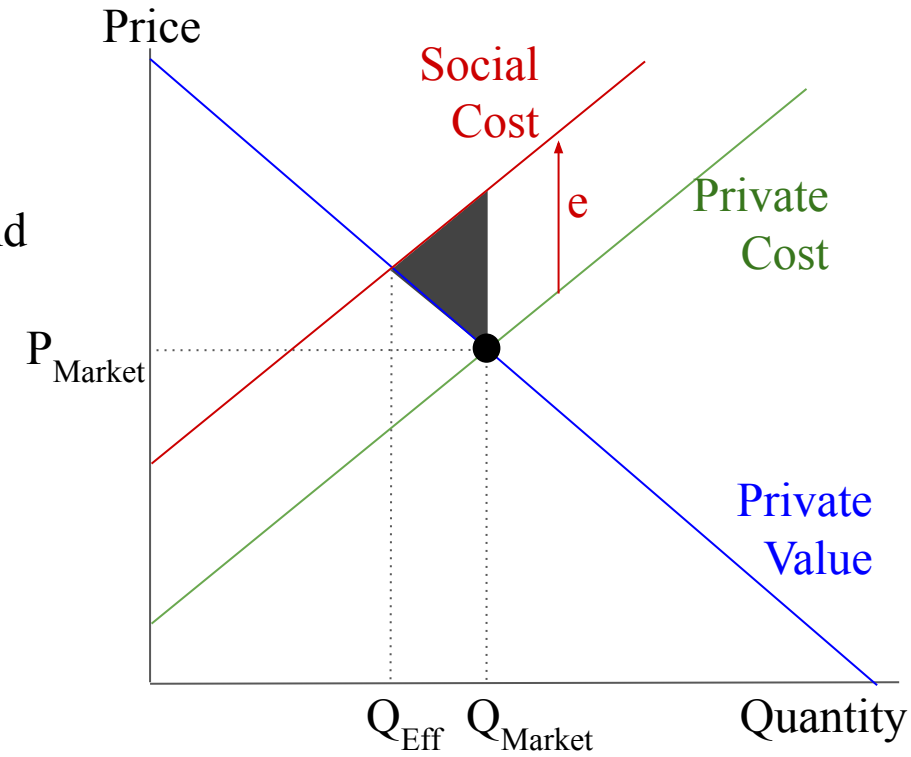
  - Market ignores part of the social cost and therefore overproduces



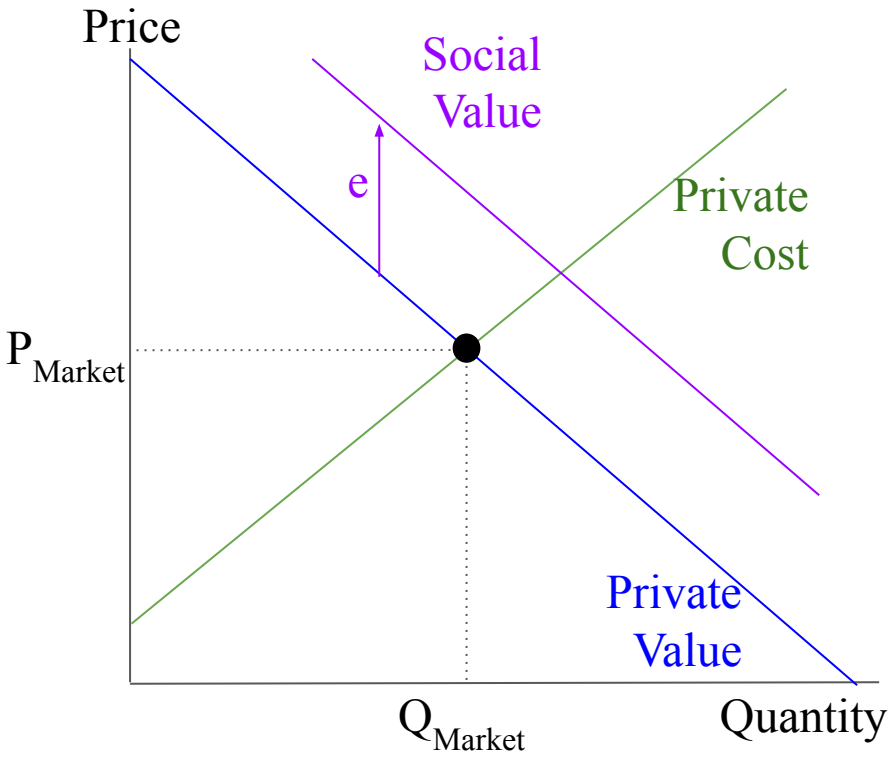
Externalities and Efficiency

- What is the efficient level of Q here?
- It is below the market quantity
  - Market ignores part of the social cost and therefore overproduces
- Creates DWL
  - Units with private value just above cost
  - Small surplus is outweighed by external social costs



Positive Externalities

- Some activities ***benefit*** other people
  - Exterior home maintenance



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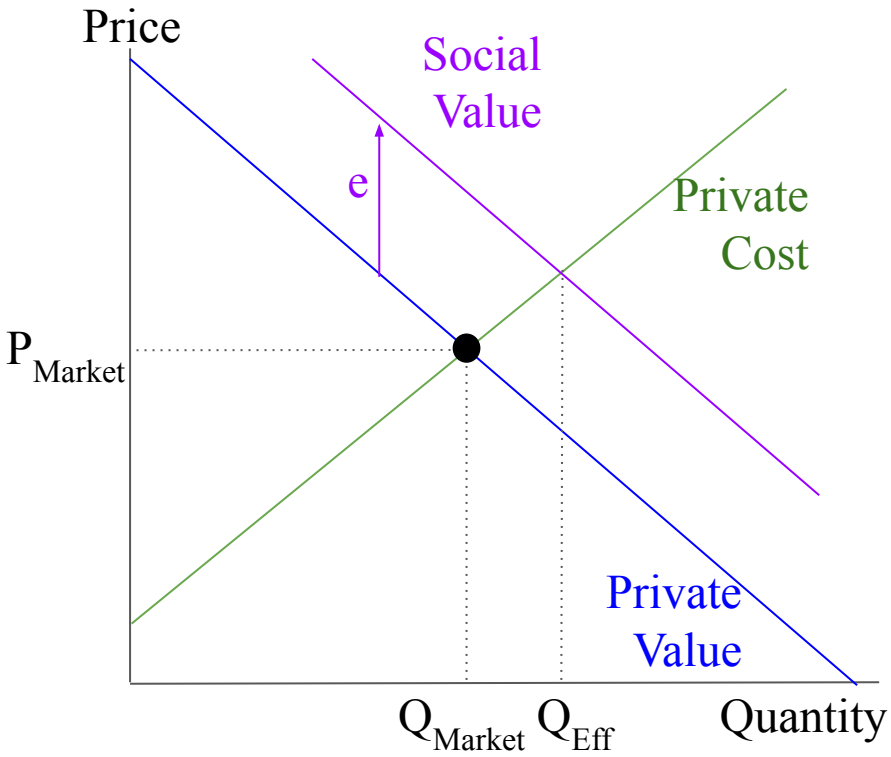
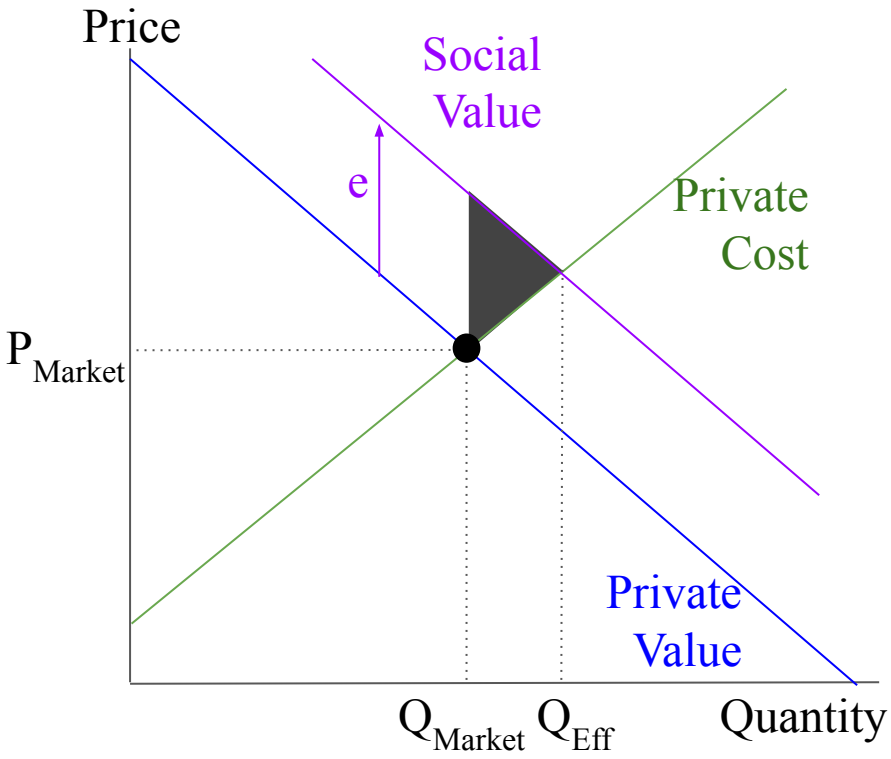
  - People don't incorporate the benefits to their neighbors from mowing the lawn



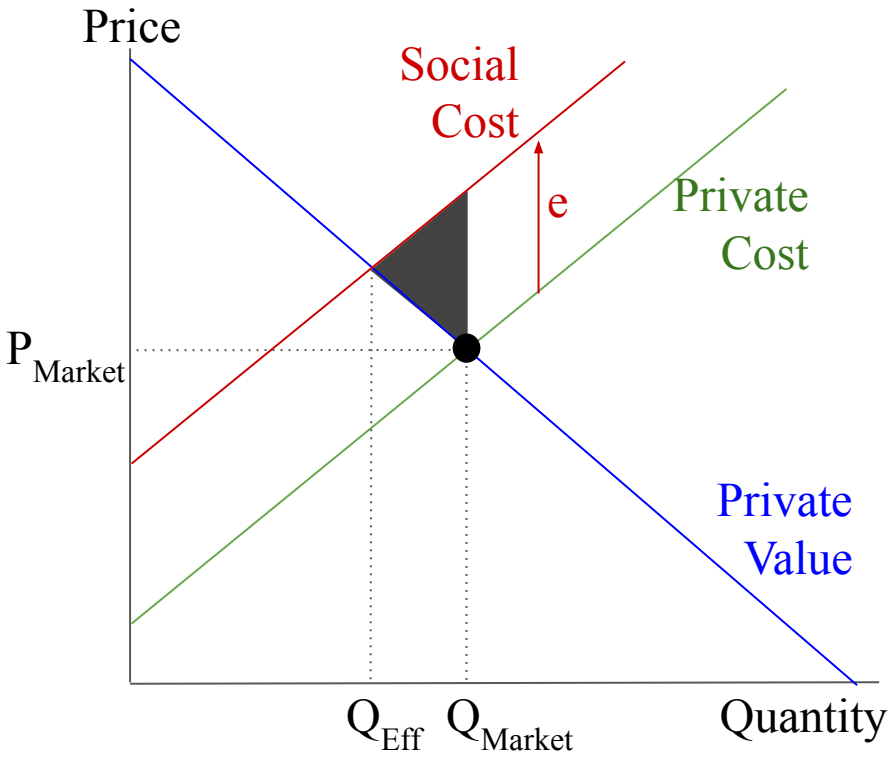
Positive Externalities

- Some activities ***benefit*** other people
  - Exterior home maintenance
- Market under-provides the activity
  - People don't incorporate the benefits to their neighbors from mowing the lawn
- Again, DWL
  - Some mowing with social value above cost is not done
  - Mower bears all cost, only gets some of the benefit



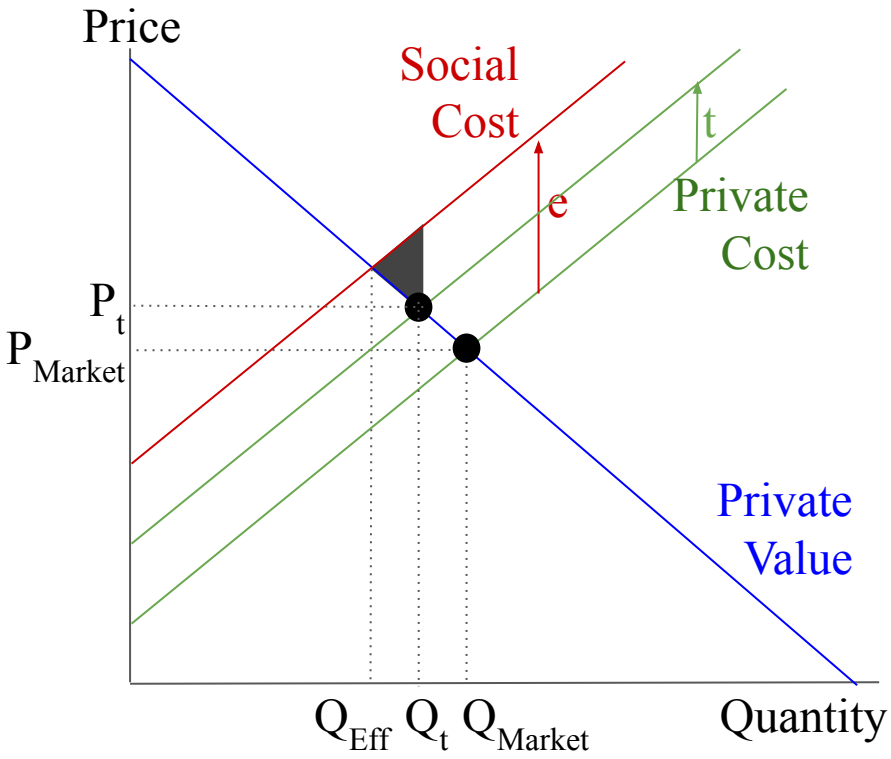
Pigouvian Tax

- Market is over-producing



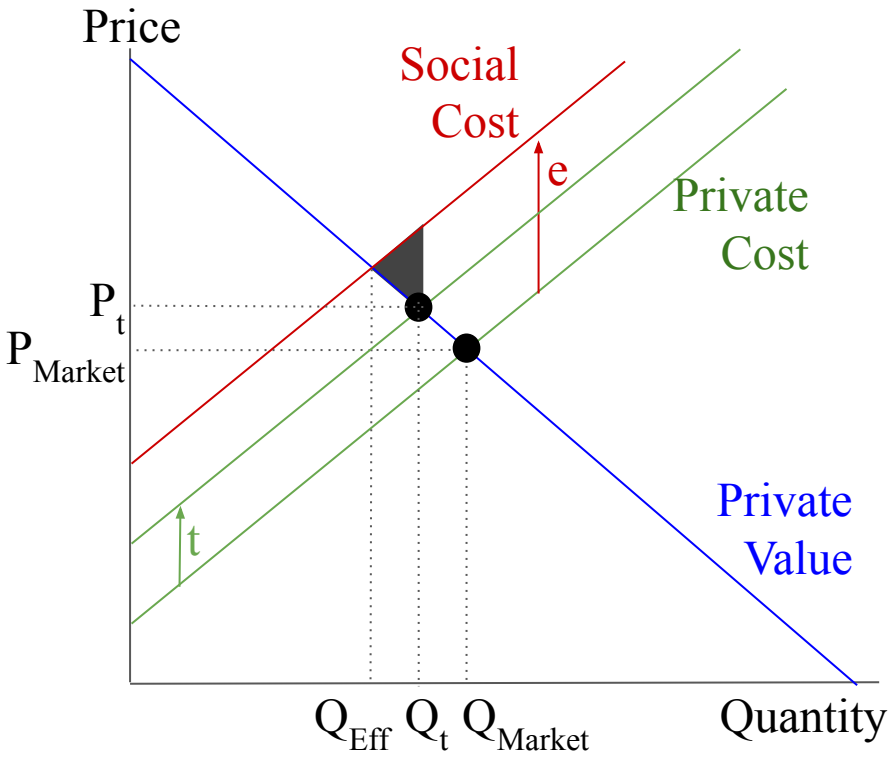
Pigouvian Tax

- Market is over-producing
- A tax will decrease quantity
  - And DWL!
- Raised the private cost, so it's closer to the social cost
  - Gets agents to act more in line with society's interests
  - Price comes closer to reflecting true cost
  - Known as <u>Pigouvian Tax</u>



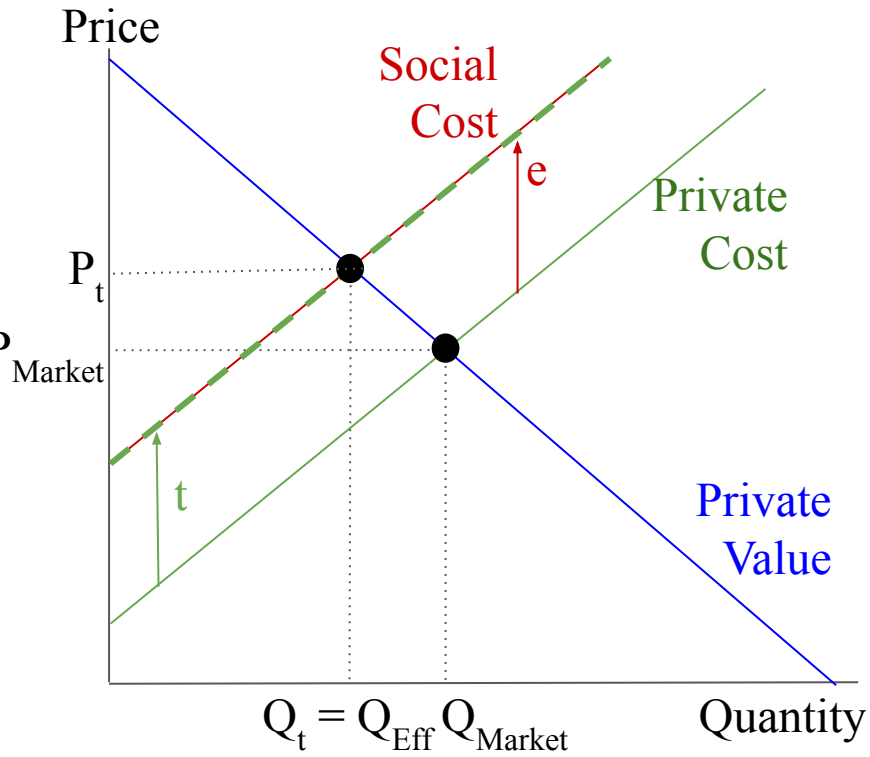
Optimal Pigouvian Tax

- How can we choose t to achieve efficiency?



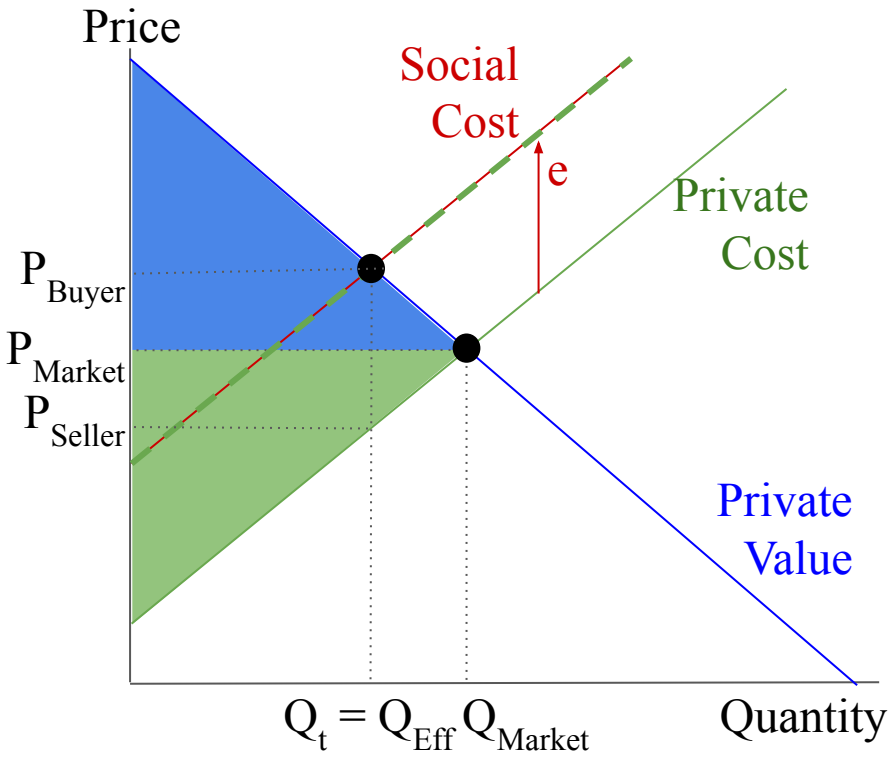
Optimal Pigouvian Tax

- How can we choose t to achieve efficiency?
  - t = e
- Make private agents feel the full cost of their activity
- The market will no longer produce the harmful units with cost above value



Optimal Pigouvian Tax (2)

- Reduces Producer and Consumer Surplus



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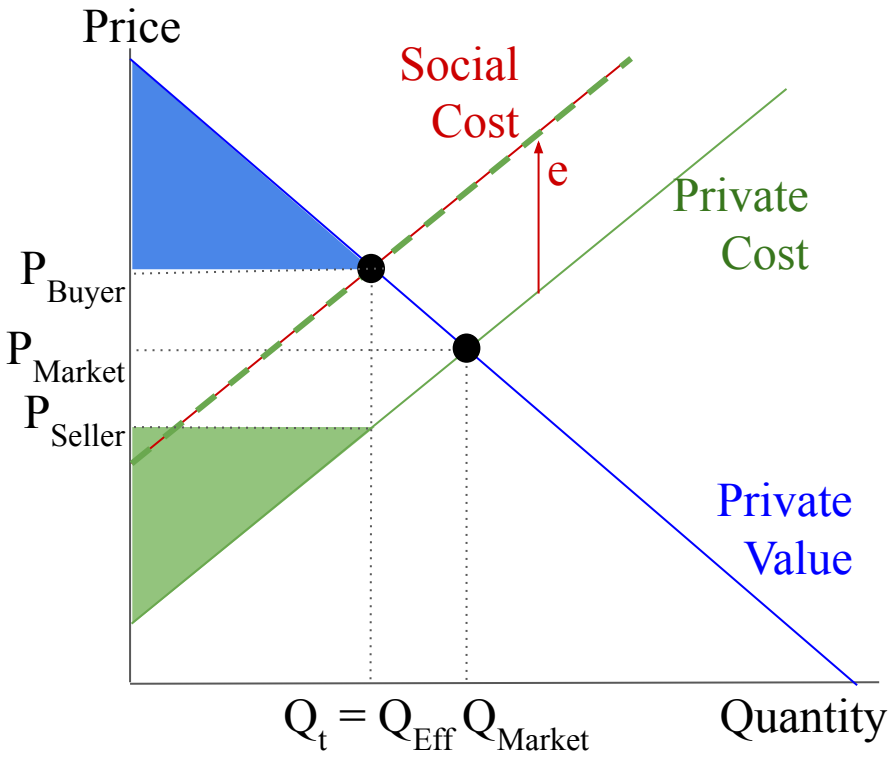

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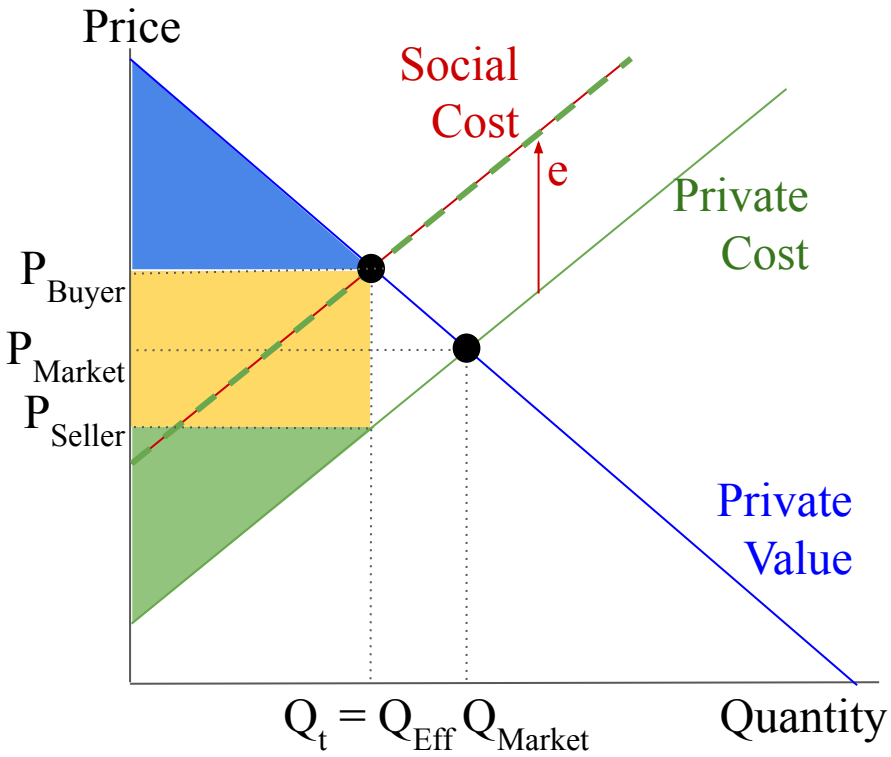
- Reduces Producer and Consumer Surplus
- Raises tax revenue



Optimal Pigouvian Tax (2)

- Reduces Producer and Consumer Surplus
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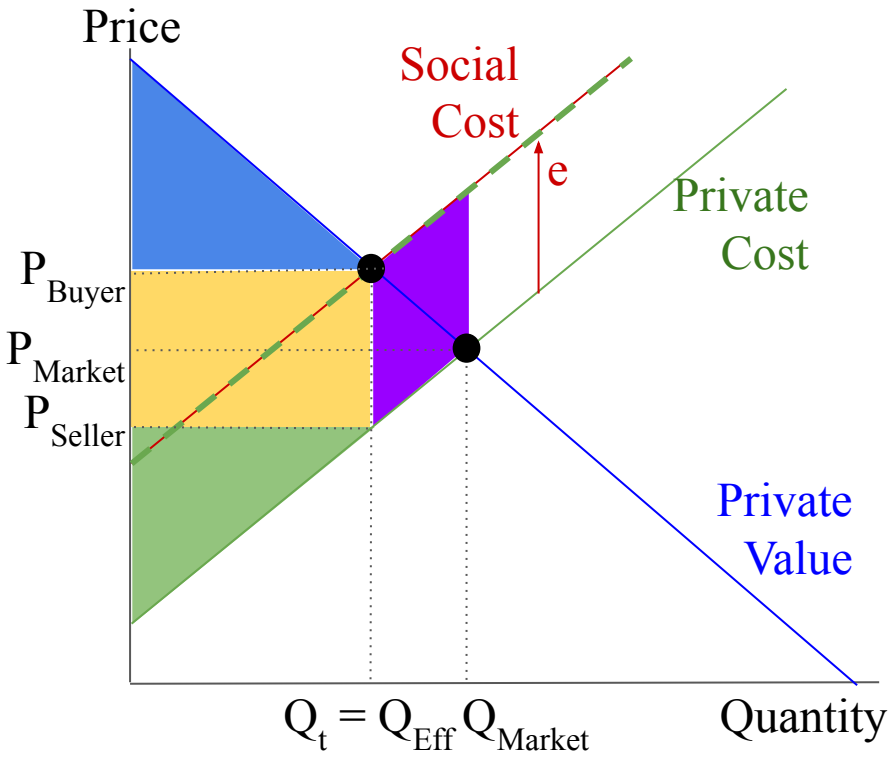
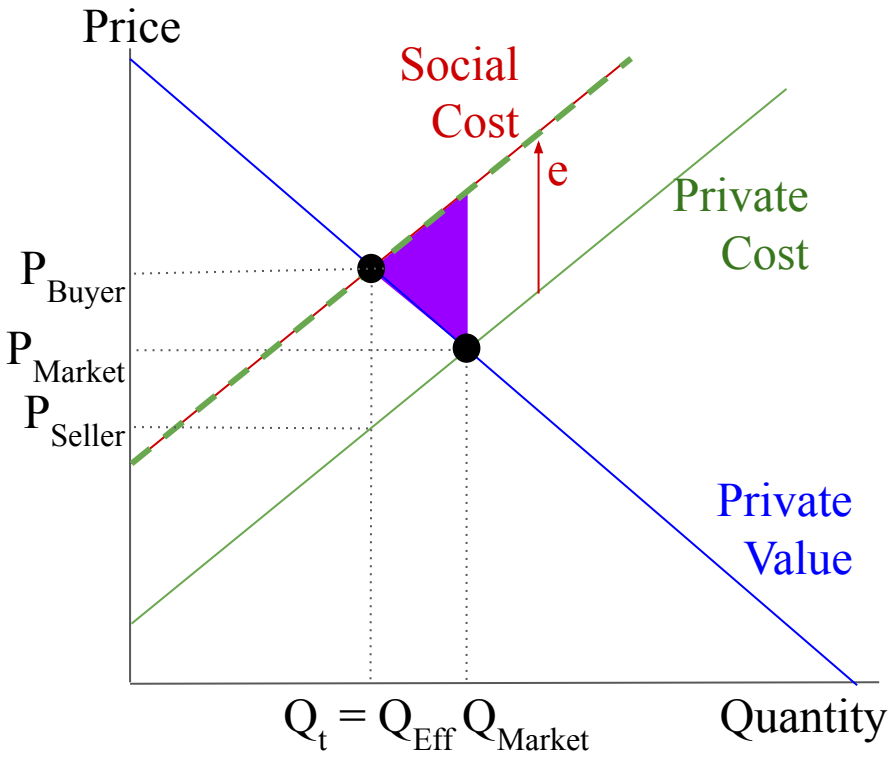
- Reduces external cost



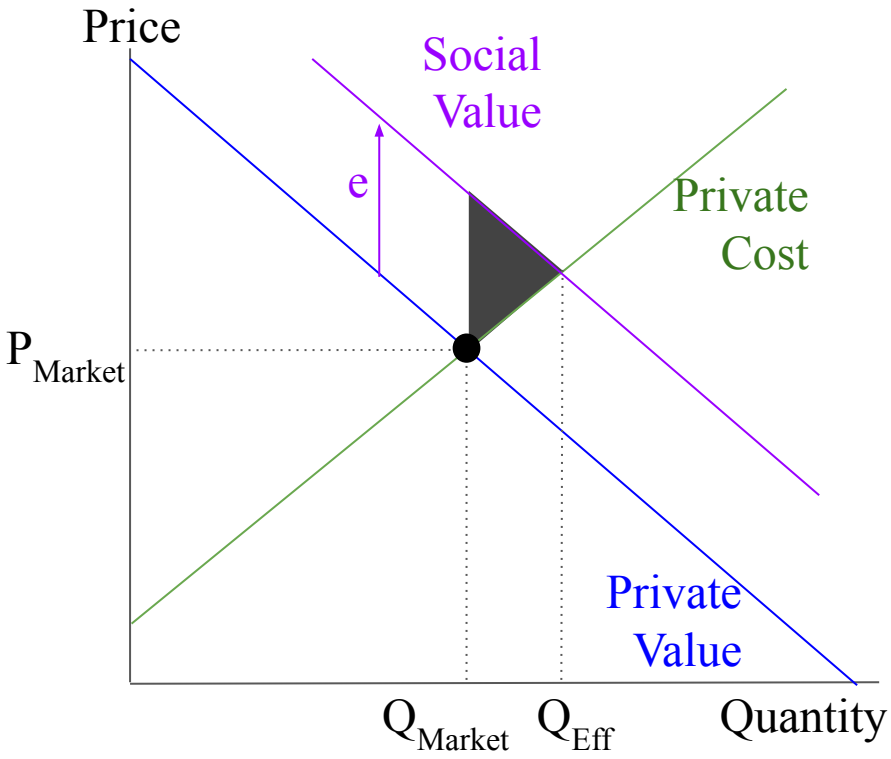
Optimal Pigouvian Tax (2)

- Reduces Producer and Consumer Surplus
- Raises tax revenue
- Reduces external cost
- Overall net benefit



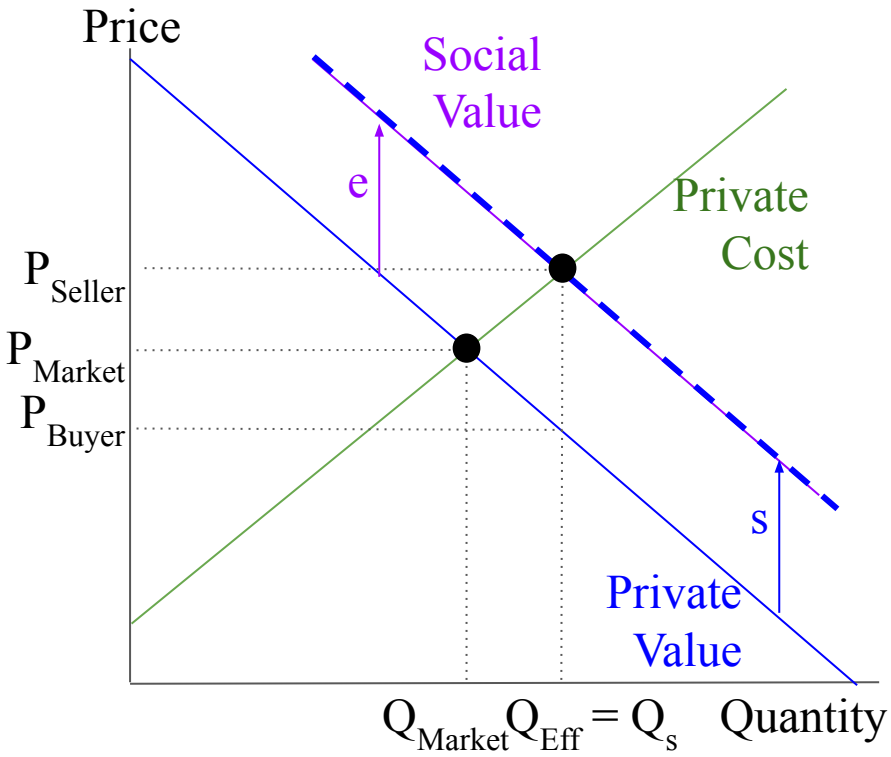
Positive Externalities (2)

- How can government help?



Positive Externalities (2)

- How can government help?
  - Set subsidy s = e
  - Aligns private value with social value and gets market to produce extra



Internalizing the Externality

- Pigouvian taxation works by getting agents to “internalize the externality”
  - They still only care about private benefits/costs!
  - But the tax aligns those with the social benefits/costs
  - Pursuit of private interests maximizes social well-being
    - The Invisible Hand needs some help sometimes

Public Goods

Public Goods

- Consider national defense, the protection of society from foreign adversaries
- Protecting me doesn't detract from the military's ability to protect you (non-rival)
- The military can't protect me without simultaneously protecting you (non-excludable)
- National defense is an example of a Public Good (non-rival and non-excludable)
- In some sense, it's a good with an externality on steroids
    - If I protect the country, I only get a small portion of the benefit – most goes to others
- Based on our theory of externalities, will the private market be efficient on national defense?

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- Based on our theory of externalities, will the private market be efficient on national defense?
    - No: there is a positive externality, so it will be under-provided
- Public Goods are instances where externalities are so extreme that economists recommend that the government just provide the good directly, rather than try to nudge the market

Optimal Public Good Provision

- A Public Good should be provided if and only if the ***sum*** of WTPs exceeds the cost
- Consider putting a street lamp that costs $100 on a dead-end street with 2 neighbors
  - Neighbor A values it at $60
  - Neighbor B values it at $80
    - This street lamp should be built, because the value ($60+$80) exceeds cost ($100)
- Consider a new missile defense system that costs $10 trillion
  - Each of the country's 400 million residents values its protection at $1,000
  - It should not be built, because its value ($400 billion) is below its cost ($10 trillion)

Eliciting Values

- Optimal Public Good provision on the previous slide seemed easy
- But the problem is that it's **very** difficult to know how much these things are valued
- You can't just ask!
- Consider the following approach:
  - "Tell me how much you value the good…
  - "...I will then add up the values given by all people…
  - "...If the total value exceeds the cost, we'll provide the Public Good…
  - "...And everyone will pay an equal share of the cost."

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- People who value it above the average cost will have incentive to overstate their value (∞)
- People who value it below the average cost will have incentive to understate their value ($-\infty$)

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  - Free Rider Problem: I want to use it but I don't want to pay for it.
- Inability to charge a price for use unravels all the great things we've learned about markets
- All of this makes Public Goods provision very difficult, with a measure of guesswork

The Coase Theorem

An Externality

- Suppose I like to use my fireplace.
  - I value nights by the fire at $60, and it costs me $10 to light and tend the fire.
- Your house is down-wind from me. When I light a fire, your property fills with smoke.
  - The smoke causes you $100 of frustration.
  - We fight a lot because of it.
  - The fire affects you, but you had no say in the decision to light it.
    - Externality
- The fire will happen, because my private benefit ($60) exceeds my private cost ($10)
- The fire is inefficient, because the social benefit ($60) is less than the social cost ($10+$100)

Private Solutions

- The market failed.
- But before devising an intrusive government policy, let's consider a private solution.
- Suppose you have the right to a smokeless property
  - If I light a fire, you can sue me for $100
  - Now the private cost ($10+$100) exceeds the private benefit ($60)
  - No fire: efficient
- Giving you property rights solved the problem.
- What if I had the rights instead? I have the right to light a fire, and you have to deal with it.

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- Giving you property rights solved the problem.
- What if I had the rights instead? I have the right to light a fire, and you have to deal with it.
  - You can pay me $51 to not light the fire
  - Now the private (opportunity) cost ($10+$51) exceeds the private benefit ($60)
  - No fire: efficient

The Coase Theorem

- The externality only caused the market to fail because property rights were unclear
- Once the property right is defined, the efficient outcome can occur
- Remarkably, the efficient outcome occurs regardless of who gets the rights!
  - Known as the “Coase Theorem”
- Privately, we care who gets the property rights…
  - If I get them, you have to pay me $51
  - If you get them, you don’t
- …but from a social efficiency perspective, it is irrelevant
- Government only needs to define property rights and have a legal system to enforce them
- Better approach than just banning fires (or not)
  - Have to choose the right option!
  - Easier to just assign property rights and let the private parties sort it out

The Limits of Property Rights

- Suppose a power plant pollutes a local river
  - This saves them $100 compared to proper disposal of waste
  - It causes $1 of harm to each of the town's 200 residents
- Further suppose the property right is given to the power plant

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- Further suppose the property right is given to the power plant
- Coase Theorem predicts that residents should pay off power plant to keep river clean
- But no individual resident has a strong incentive to organize this
  - High Transaction Costs of organizing may prevent gains from trade
  - Property rights may fail to generate an efficient outcome

Climate Change

- All sorts of activities we all engage in contribute to climate change
- When I drove into school, I emitted greenhouse gases, to all of our detriment
- But this occurs in a complicated, difficult-to-measure way
  - Hard to say exactly what the property rights are that we need to define
- Also unclear who needs to negotiate with who to get all of this sorted out.
  - Very expensive and cumbersome process
  - High Transaction Costs!
- For some externalities, private solutions are unlikely to work
- Government interventions can be much more effective

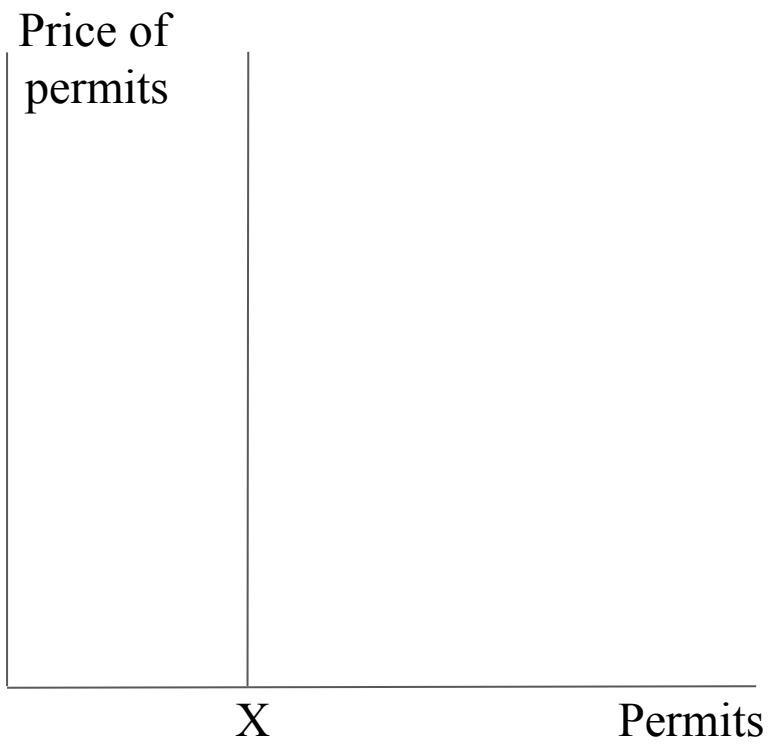
Externality Application: Cap-and-Trade

Targeting Quantity

- In some scenarios with externalities, you may have a sense of what quantity you want
  - E.g. Greenhouse gas emissions
- But it can be very hard to know what level to set the Pigouvian tax at to achieve it
  - After all, we don’t actually see Supply and Demand curves in the real world
- An alternative is known as “Cap-and-Trade”

Auction for Emissions Permits

- Suppose we think X emissions of CO_2 is acceptable (i.e. will "cap" emissions at X)
- Government auctions off X permits
  - Each permit allows you to omit 1 unit of CO_2



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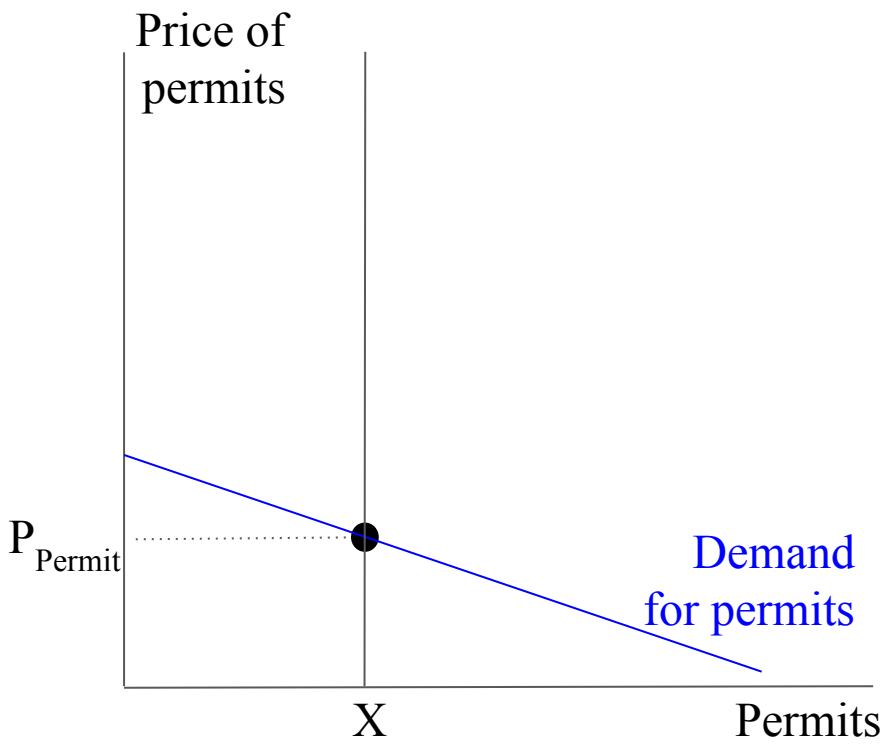

Auction for Emissions Permits

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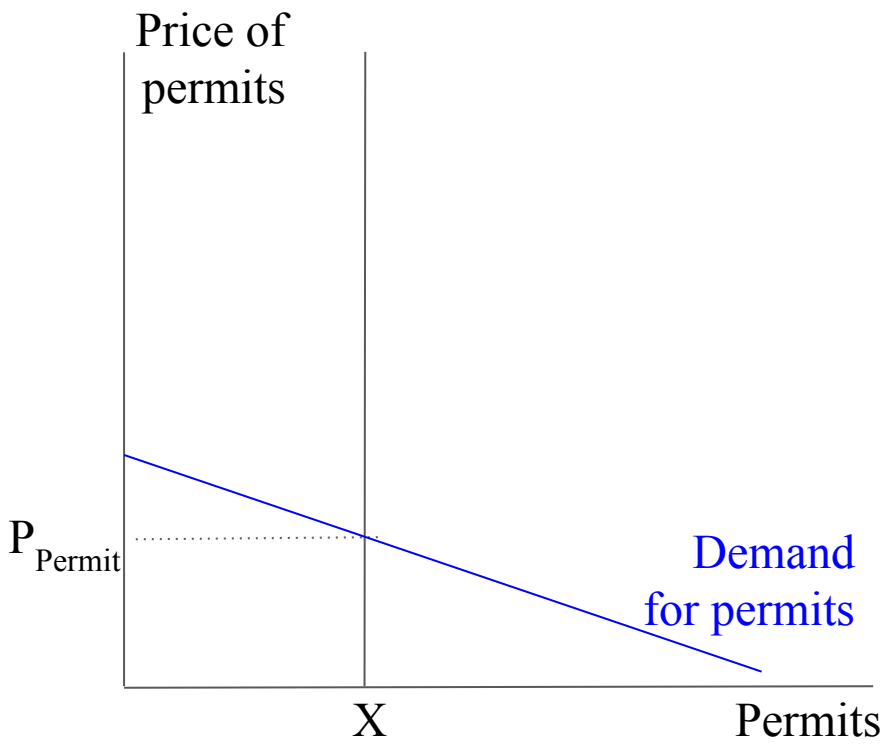
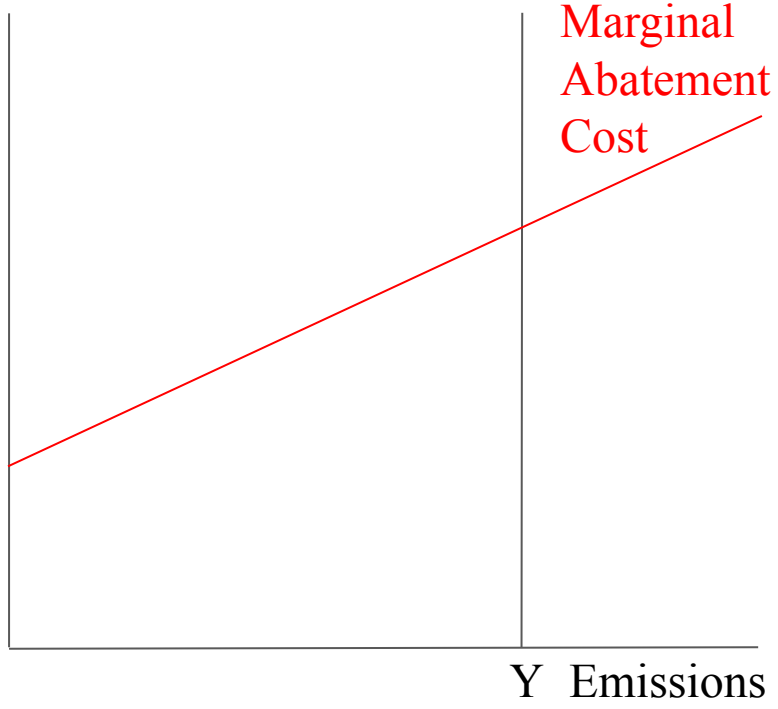
- Demand for permits will determine the price
- But where does Demand come from?



Abatement Costs

- Consider a firm that plans to emit Y units of CO_2
- It can install carbon-capture technology to avoid emitting, but it is costly



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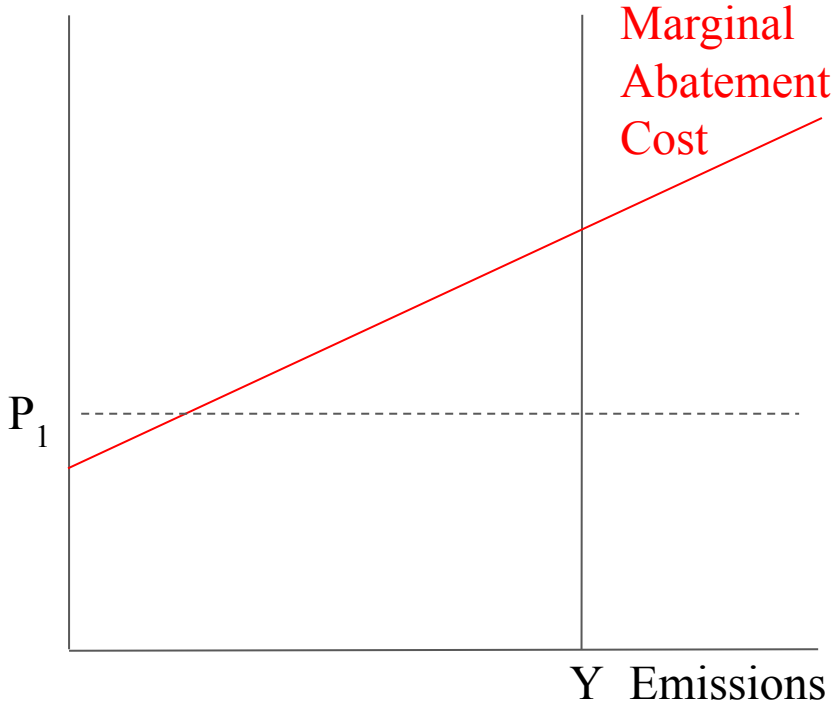

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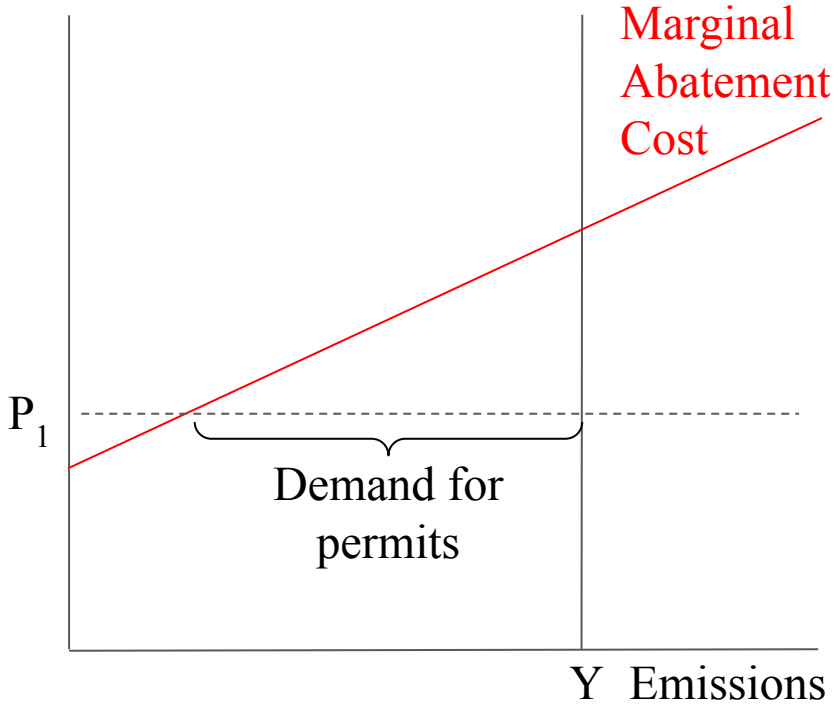

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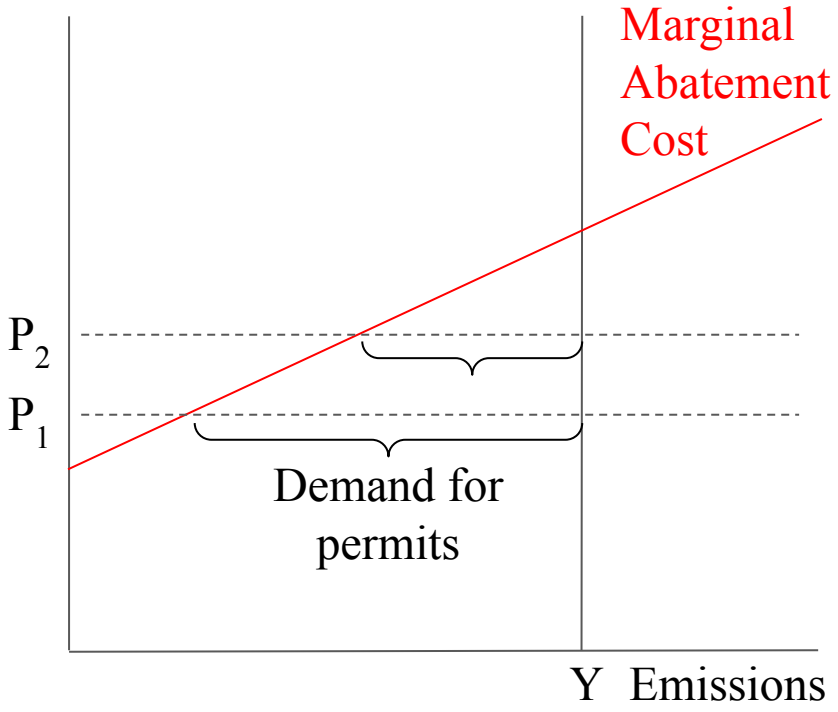

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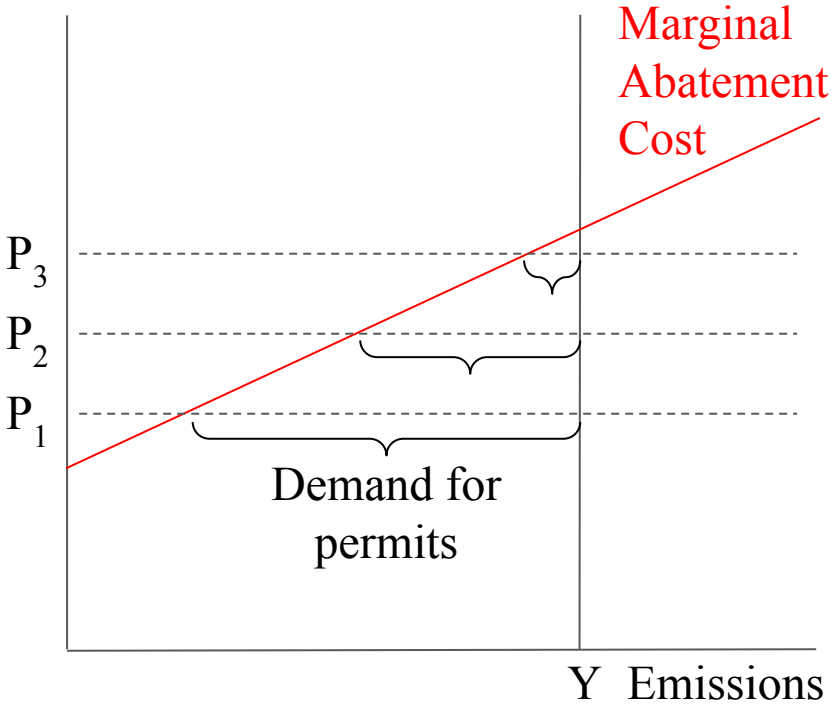

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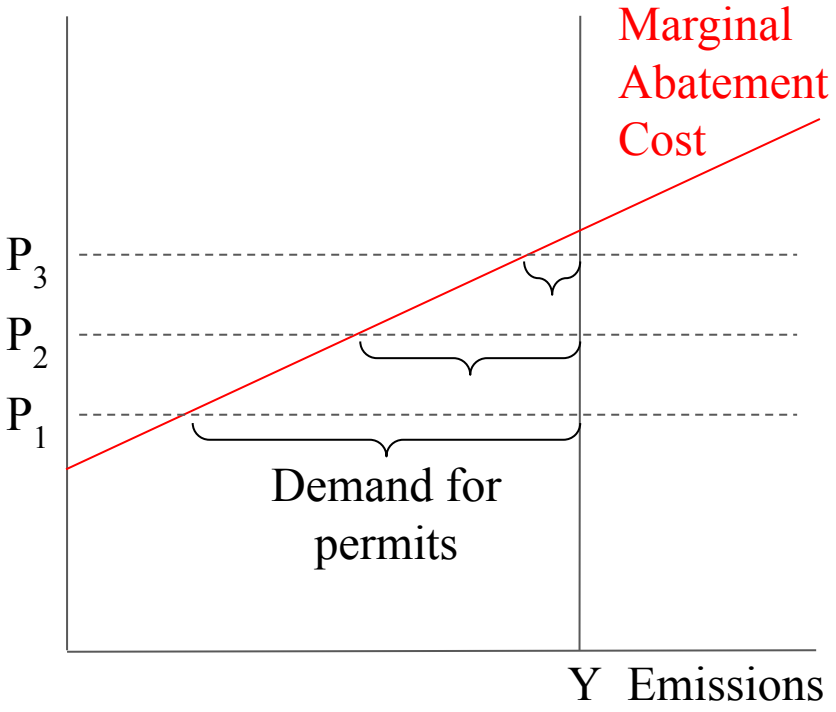
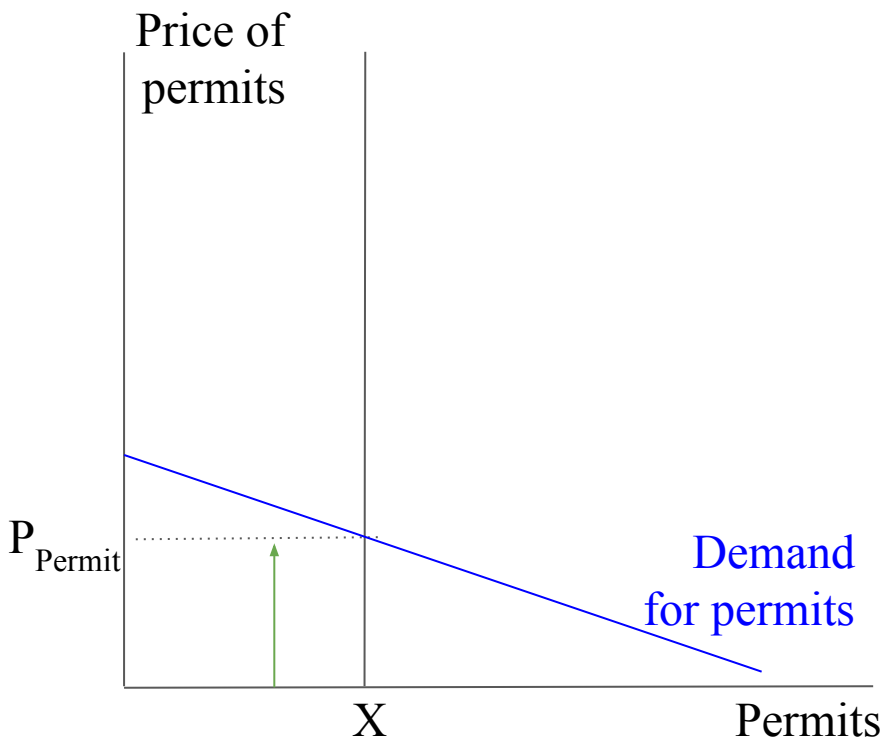
- And P_2…
- And P_3…
- Downward-sloping Demand for permits
- On the margin, abatement cost is equal to the price of a permit



Back to the Auction

- Auction will set price equal to cost of abating marginal unit of CO_2
- This is essentially a tax on production that generates emissions
  - "If you want to produce, pay P_{Permit}."



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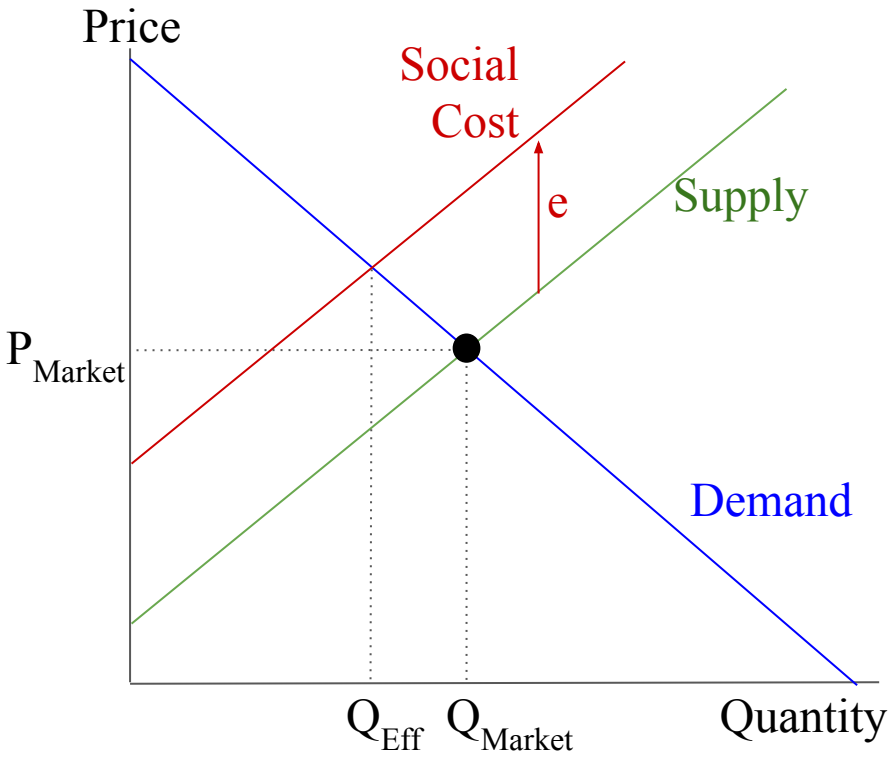
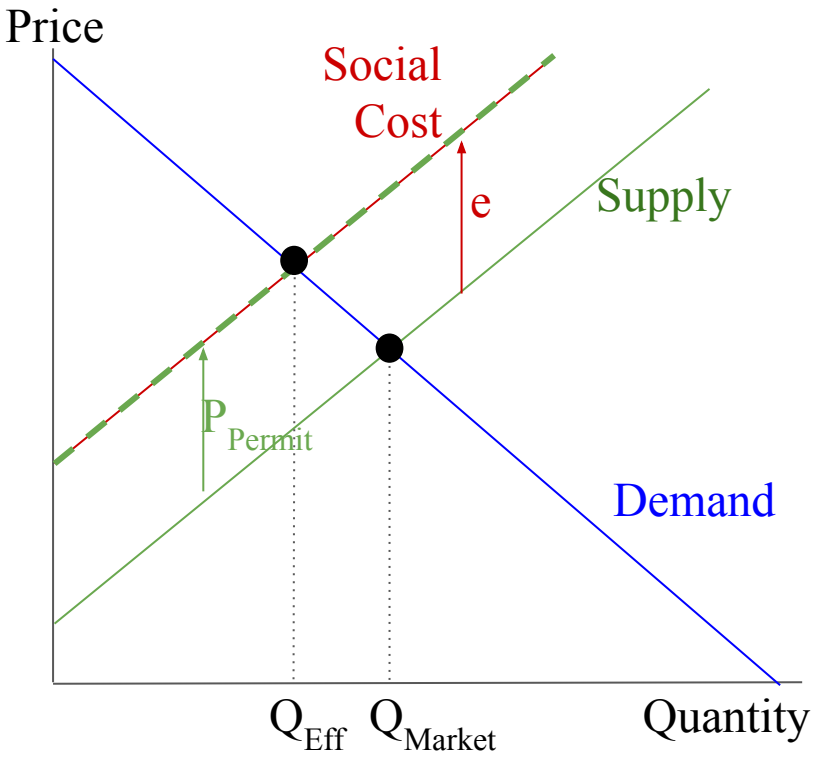


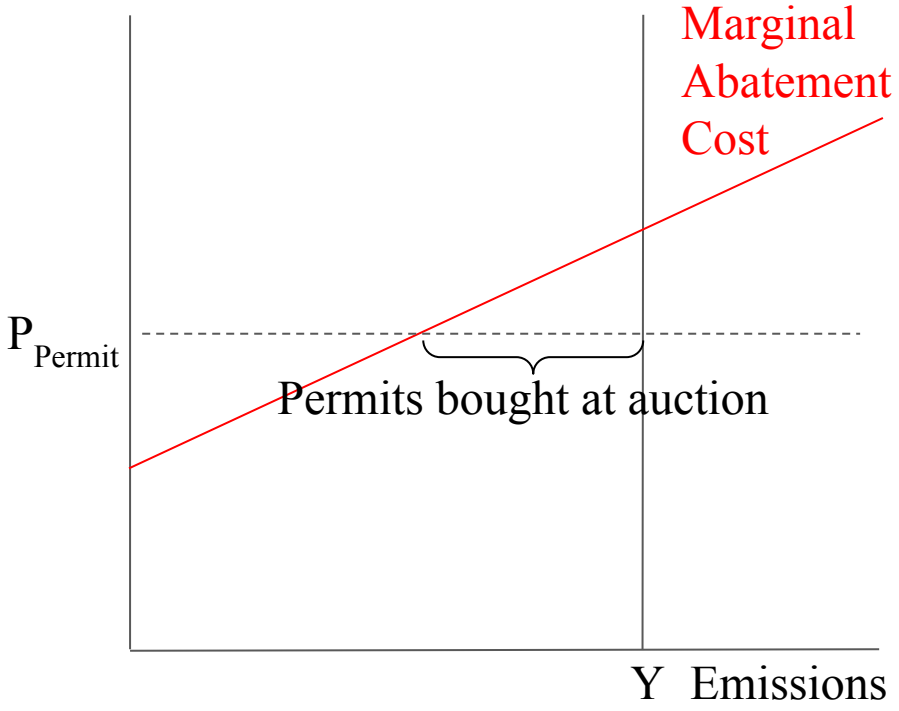
Back to the Auction

- Auction will set price equal to cost of abating marginal unit of CO_2
- This is essentially a tax on production that generates emissions
  - "If you want to produce, pay P_{Permit}."
- Supply Curve shifts up, reducing quantity
- At the optimum, P_{Permit} = e
- Marginal abatement cost = externality
  - Cost of abating one more emission (P_{Permit}) equals the cost of not abating it (e)
  - Only if X is chosen correctly will this happen



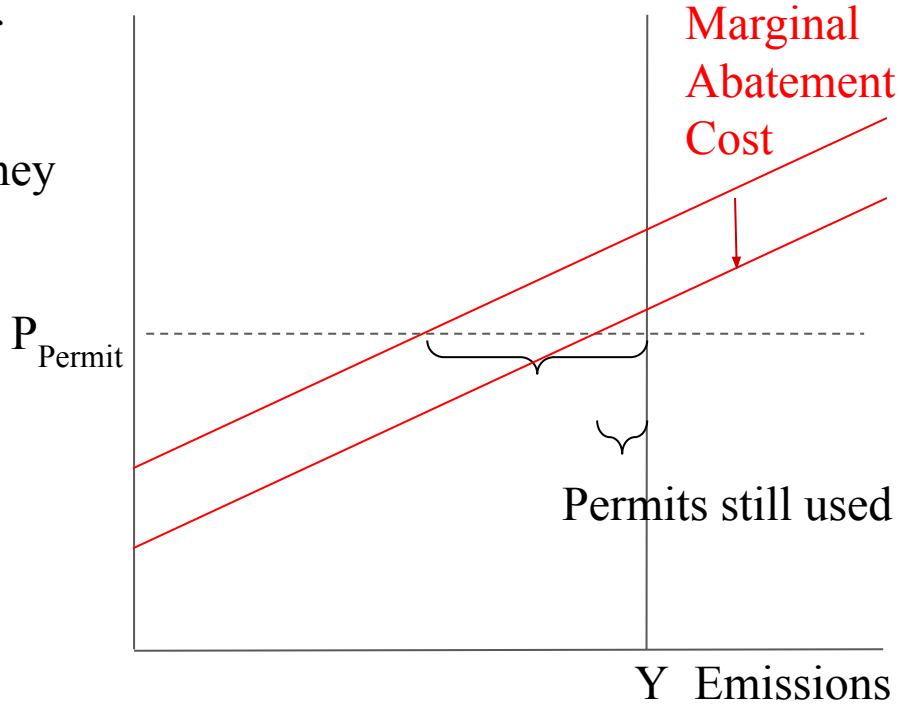
Trading the Permits

- Return to our example firm
- Given the P_{Permit}, they use a certain amount of permits



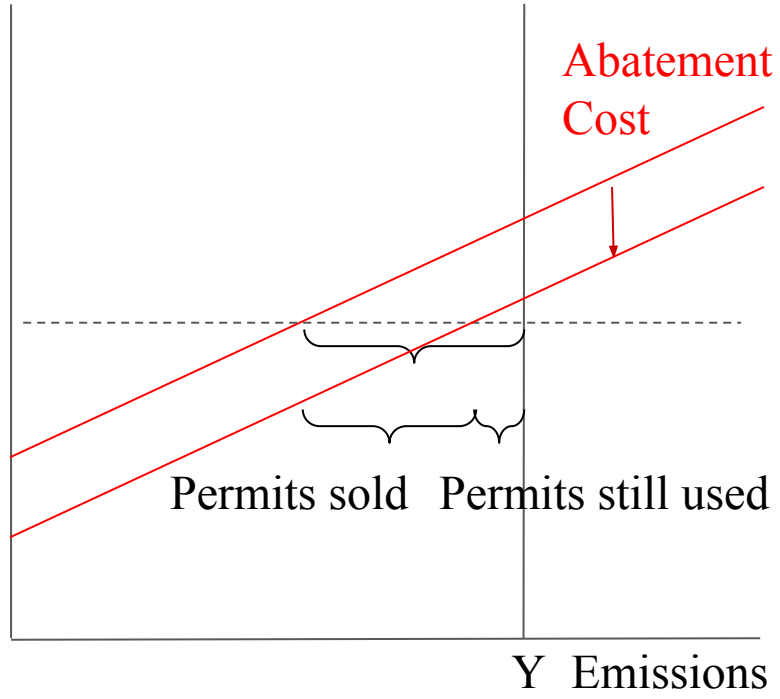
Trading the Permits

- Return to our example firm
- Given the P_{Permit}, they use a certain amount of permits
- If they improve their abatement technology, they do not need as many permits



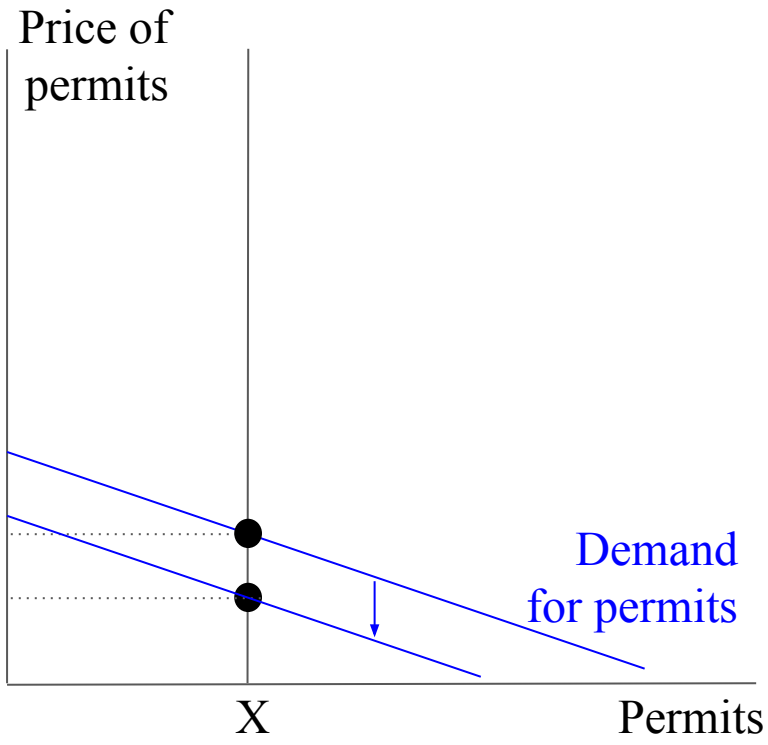
Trading the Permits

- Return to our example firm
- Given the P_{Permit}, they use a certain amount of permits
- If they improve their abatement technology, they do not need as many permits
- It can now sell the remainder!
  - Money made from sale more than swamps the cost of abating those units
- So Cap-and-trade maintains the incentive to innovate clean technology



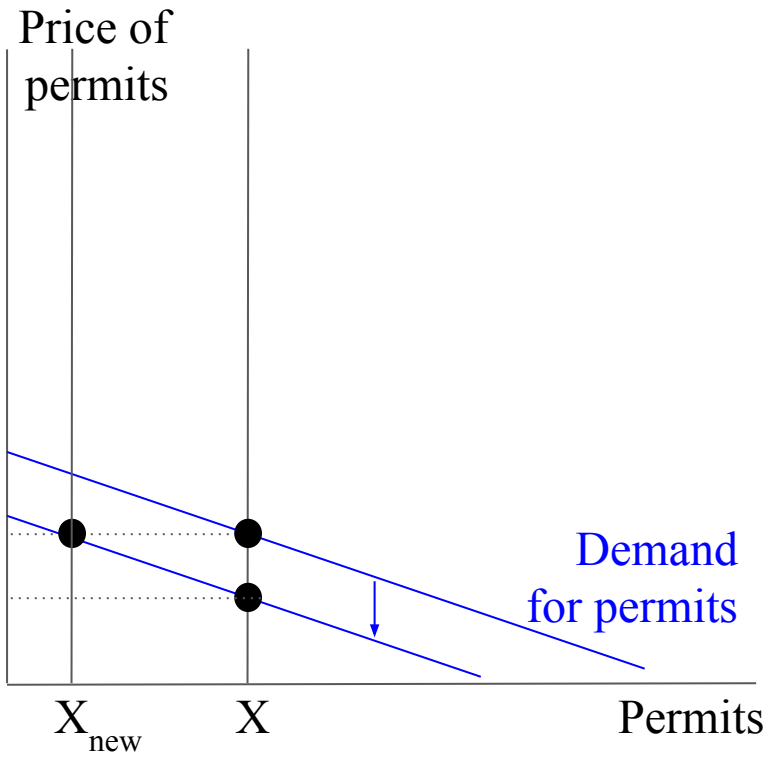
Removing Permits

- As firms get better at abating pollution, P_{Permit} will fall
- This signals to the government that abatement costs are low…
  - P_{Permit} < externality



Removing Permits

- As firms get better at abating pollution, P_{Permit} will fall
- This signals to the government that abatement costs are low…
  - P_{Permit} < externality
- And it makes sense to restrict emissions even further
  - P_{Permit} = externality



Cap-and-Trade vs. Pigouvian Tax

- Cap-and-Trade seems very different from Pigouvian Tax, but is in fact deeply similar
  - Both force market participants to bear additional cost, more in line with Social Cost
    - Internalize the externality
  - Both, therefore, incentivize the development of clean technology
  - If you know the externality and the Supply and Demand curves, you can get the efficient outcome with either approach
- Cap-and-Trade is preferable if you know the quantity you want and/or really do not want uncertainty on quantity
  - Pick the X (cap) you want, but price of permits could end up being very high
- Pigouvian Tax is preferable if you want to make sure you don't end up with very high price
  - Pick a tax you find "reasonable," but it may not reduce emissions as much as you want