Externalities

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What is an Externality?

- A cost or benefit to an agent not involved in a transaction.
- Please note:
  - It could be because of production (Example: The colored glass factories in Portland)
  - Or because of consumption (Example: Cigarette butts)

It means that we are missing a property right or that the right is hard to enforce.

The Missing Market

- We often frame externalities as a missing market or property right.
  - The right to quiet after 10pm
  - The right to dump CO_{2e} into the air
- We then analyze the goods market with the externality internalized and not.
- And the hypothetical market with the externality.
  - What would it look like with property rights
  - What does it look like without.

Externalities Cause Over and Underproduction

When you analyze the goods market:

- You include Supply and Demand but only the *private* costs and benefits
- You also show the externality cost/benefit as a shift to supply or demand
  - You can model it either way
  - Supply decrease with an additional, privatized cost, is more common.

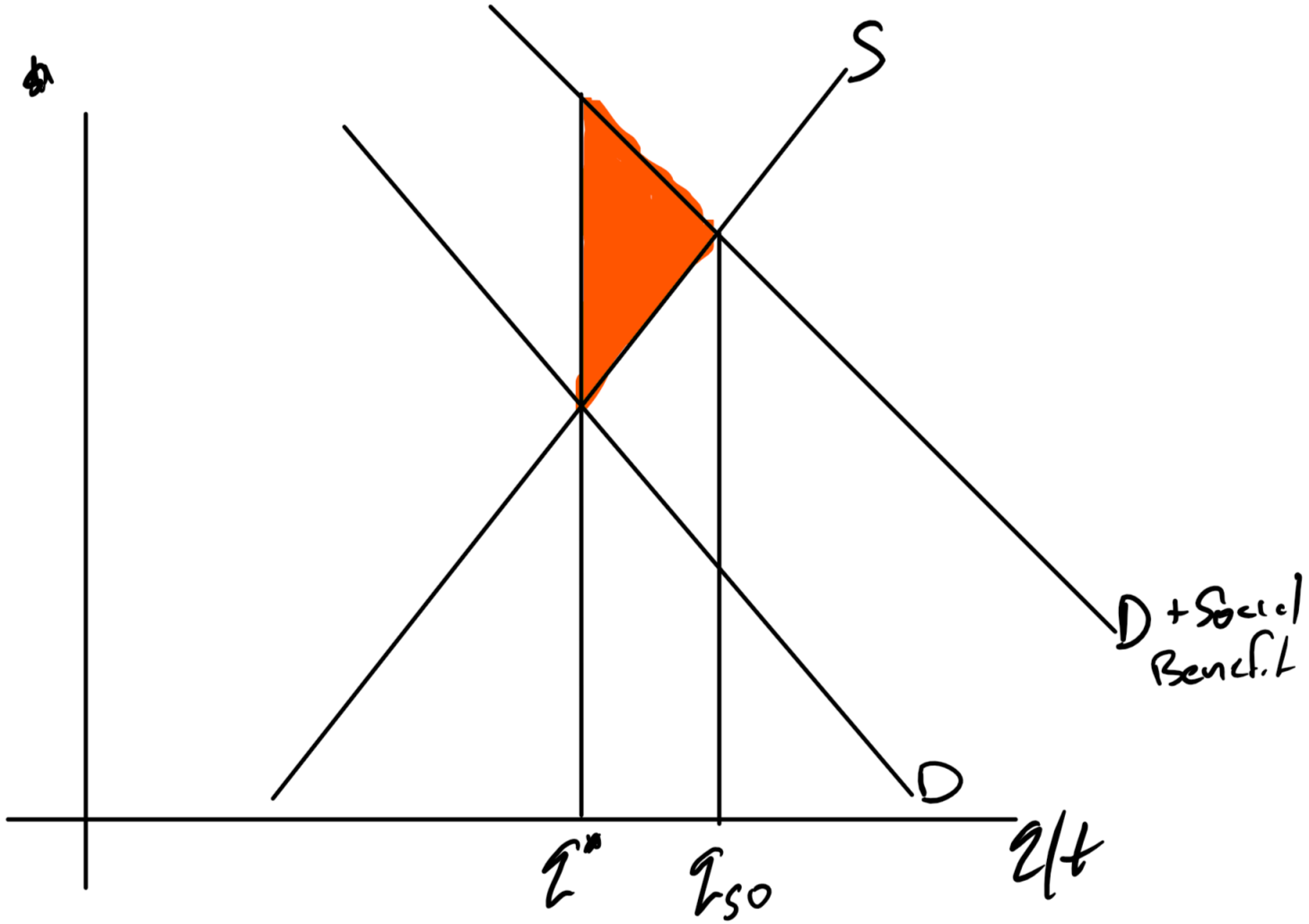
A Positive Externality

This is intended to be a positive effect on others that the buyer or seller can not capture.

In this case:

- We model it as a benefit caused by the consumption of others.
- Consumption causes a benefit to others that the individual can not capture.
- Having a nice yard is an example. It helps surrounding property values.

Welfare Effects of Positive Externalities



Summary

- If you could capture the benefits to others – demand would be higher.
- Socially optimal consumption is higher than when you can't capture the benefits.
- There is a social loss.

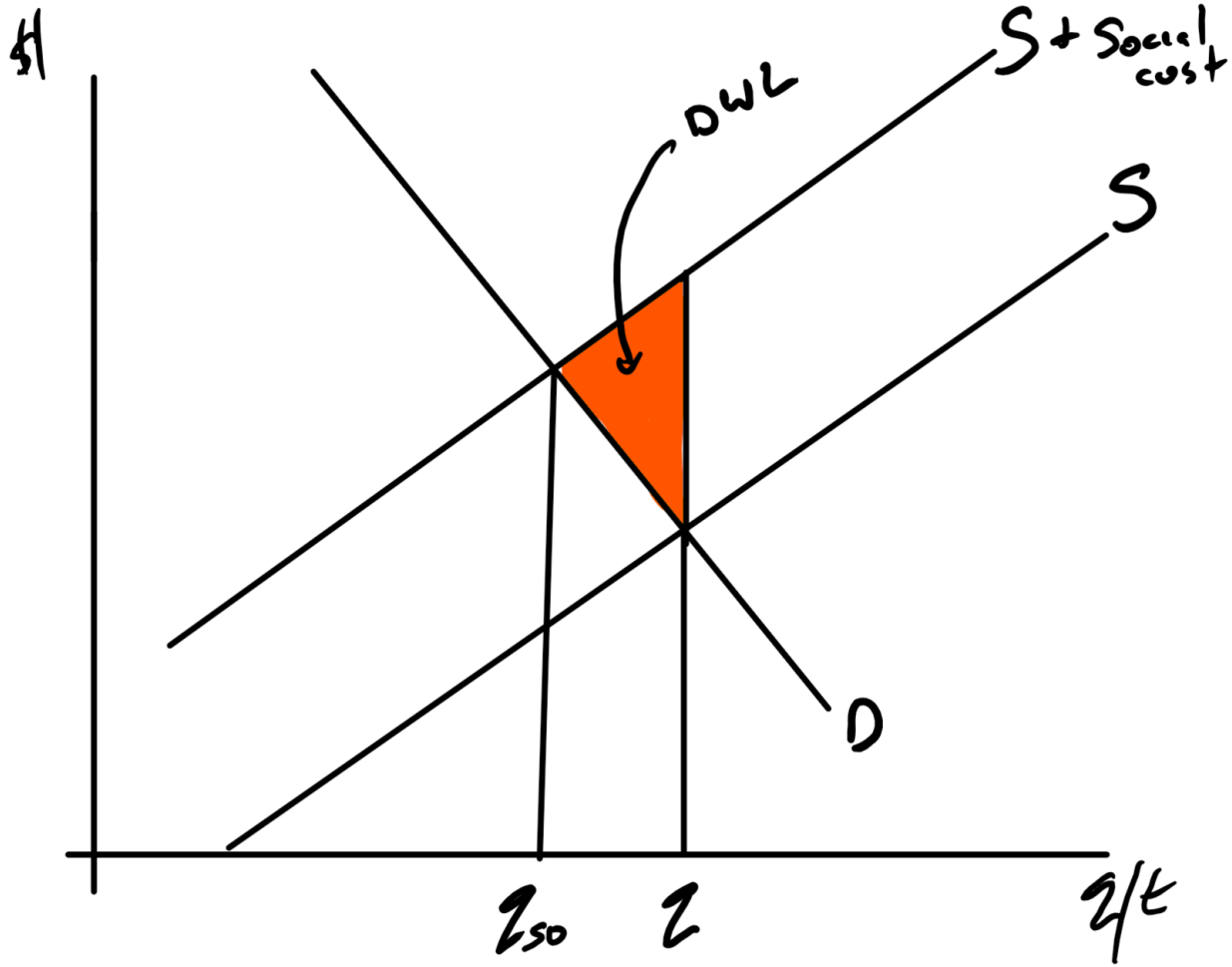
Negative Externality

This is a cost imposed by others that the buyer or seller does not have to pay for.

In this case:

- We model it as a cost, caused by the production, that is imposed on others.
- Production causes a cost to others that the firm avoids.
- Remember those glass factories with the heavy metals.

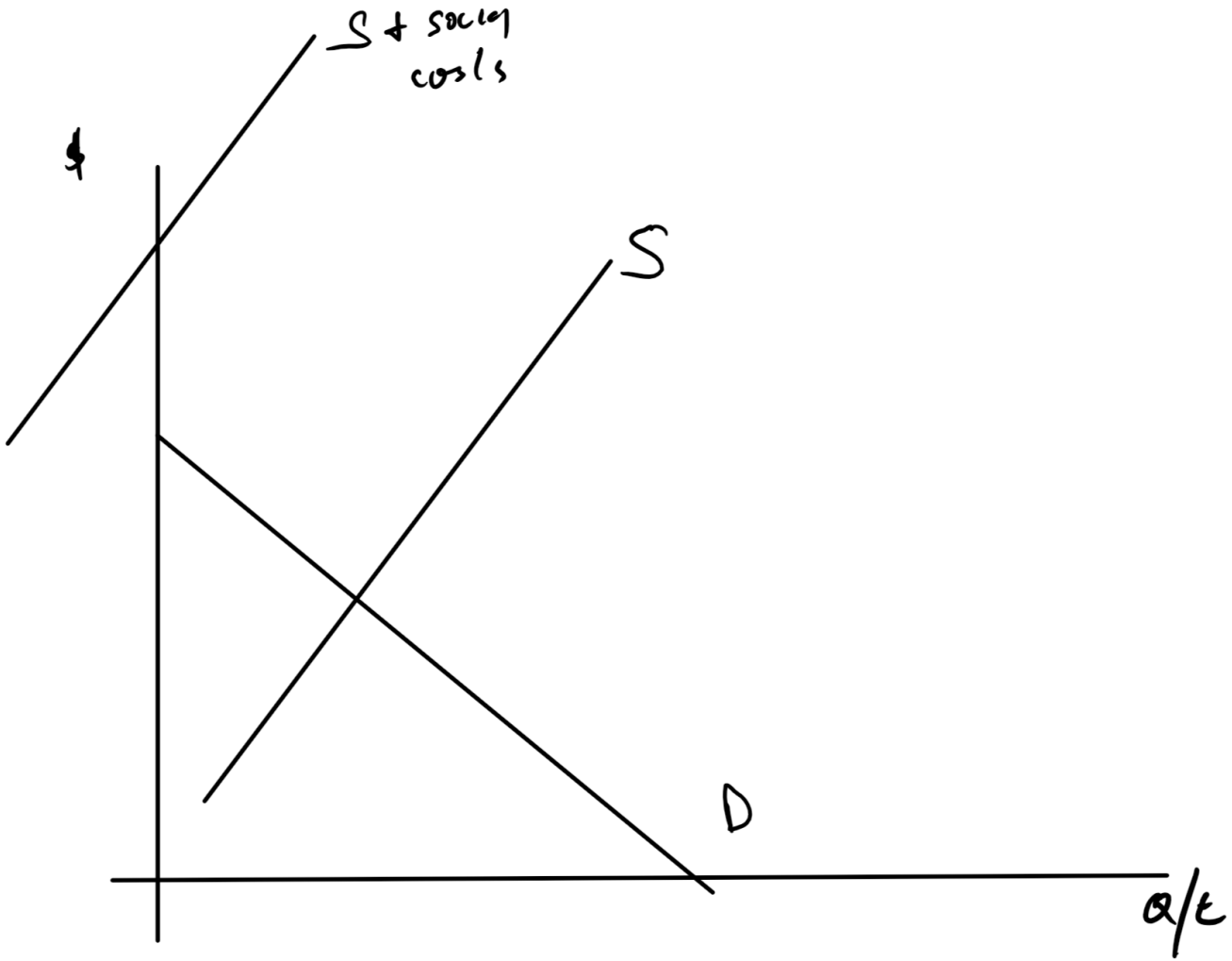
Welfare Effects of Negative Externalities



Summary

- If someone could charge for the cost – supply would be lower.
- Socially optimal consumption is lower than when you can't charge for the costs.
- There is a social loss.

Yes, somethings should not be produced but are . . .

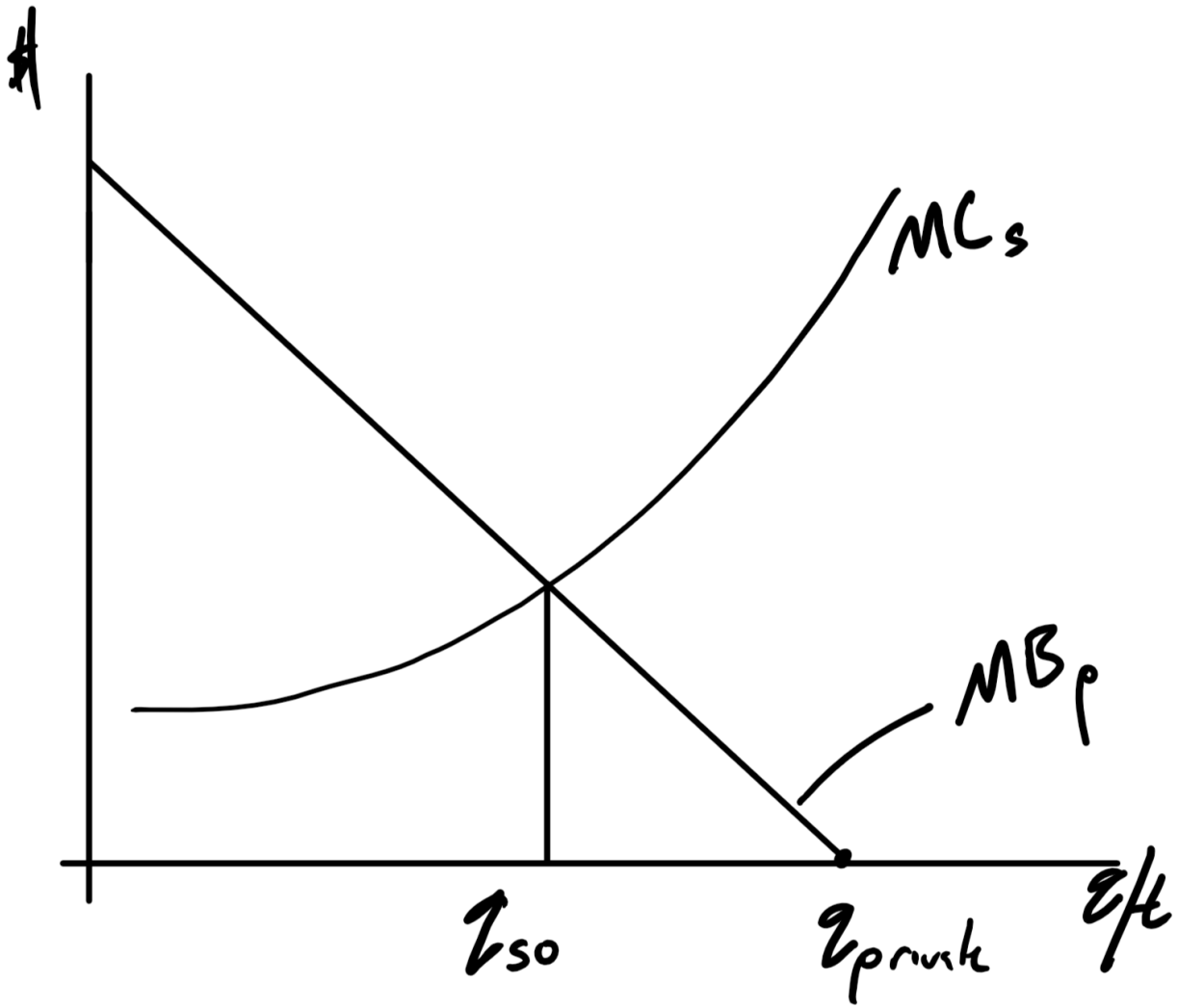


You can also look at the Externality Market

This is a theoretical market where a price exists for the externality

- It often assumes a property right.
- There is a socially optimal level of the externality
  - Yes, even pollution
  - If nature can process some of the toxins over time, then yes
- The current law price of the externality is often zero.

When There are No Property Rights



The Major Approaches

- Command and Control
  - In equipment
  - In levels
- Pigouvian Taxes
- Cap and Trade

There are also hybrids, cap and trade with price ceilings and floors.

A word on costs

There are a few interesting issues about costs

- Value of a statistical life
  - $9.1 million (Environmental Protection Agency, 2010)
  - $7.9 million (Food and Drug Administration, 2010)
  - $9.6 million (Department of Transportation, Aug. 2016)
- Perceived vs Actual risk
  - The driving vs flying phenomena
- Different Costs
  - Damage Cost – What happens if you don't clean it up
  - Abatement Cost – What it costs to clean up
  - Prevention Cost – What it cost to not put it out.

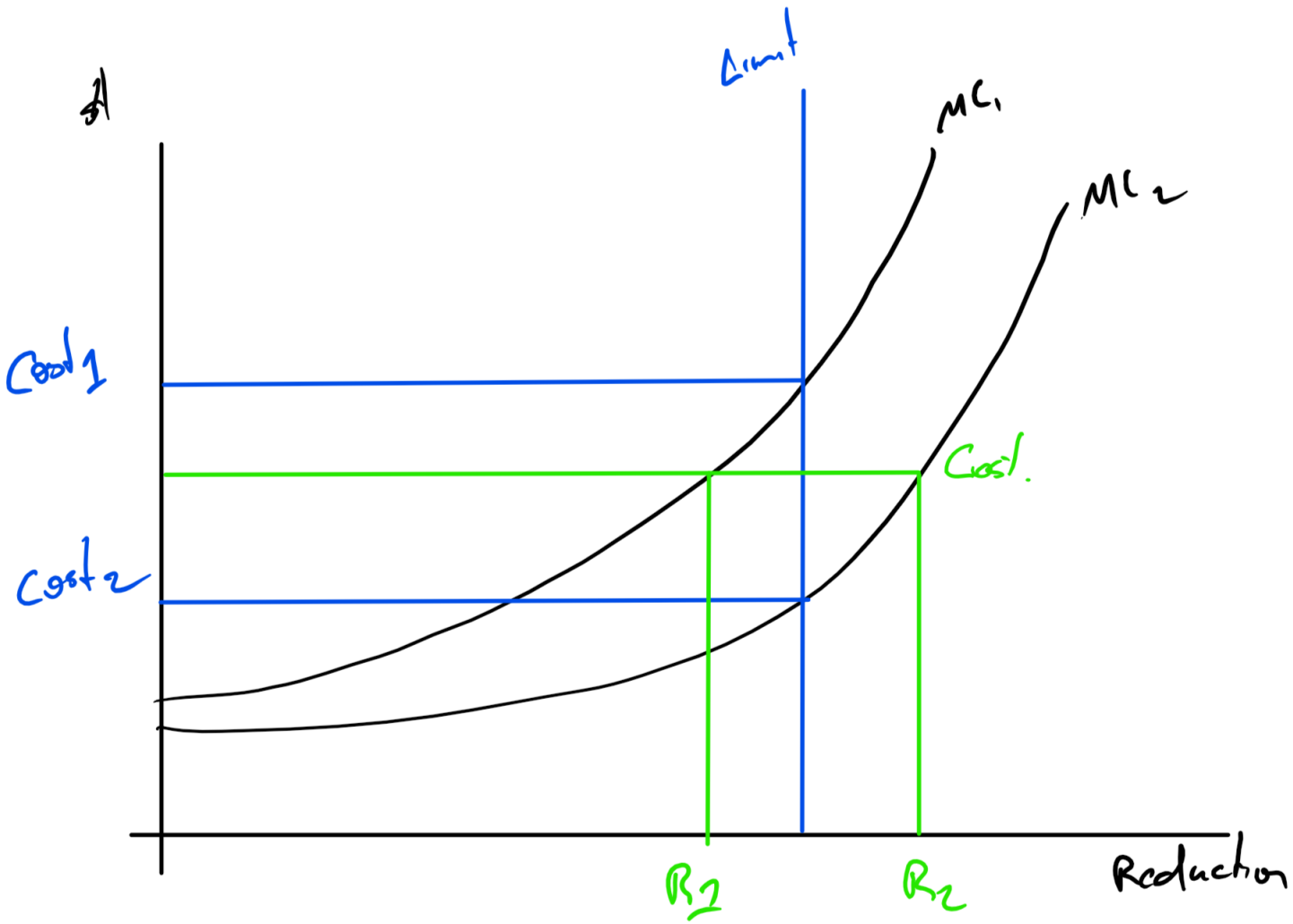
Command and Control

- Two cases, required equipment and individual limits
- Required equipment
  - This often slows down innovation
  - No advantage to do anything different
  - No advantage to develop new control strategies
- Individual limitations
  - Usually the most expensive way to achieve a reduction
  - Different firms have different cost to reduce externalities
  - Those that find it cheap to reduce should do more

Individual Limits

- Everyone has the same limit
- Different costs to reduce the externality
- We can get to the same level cheaper by:
  - Having the high cost firm do less and the low cost firm do more.
  - Transfer money from one to the other.

CC Graph

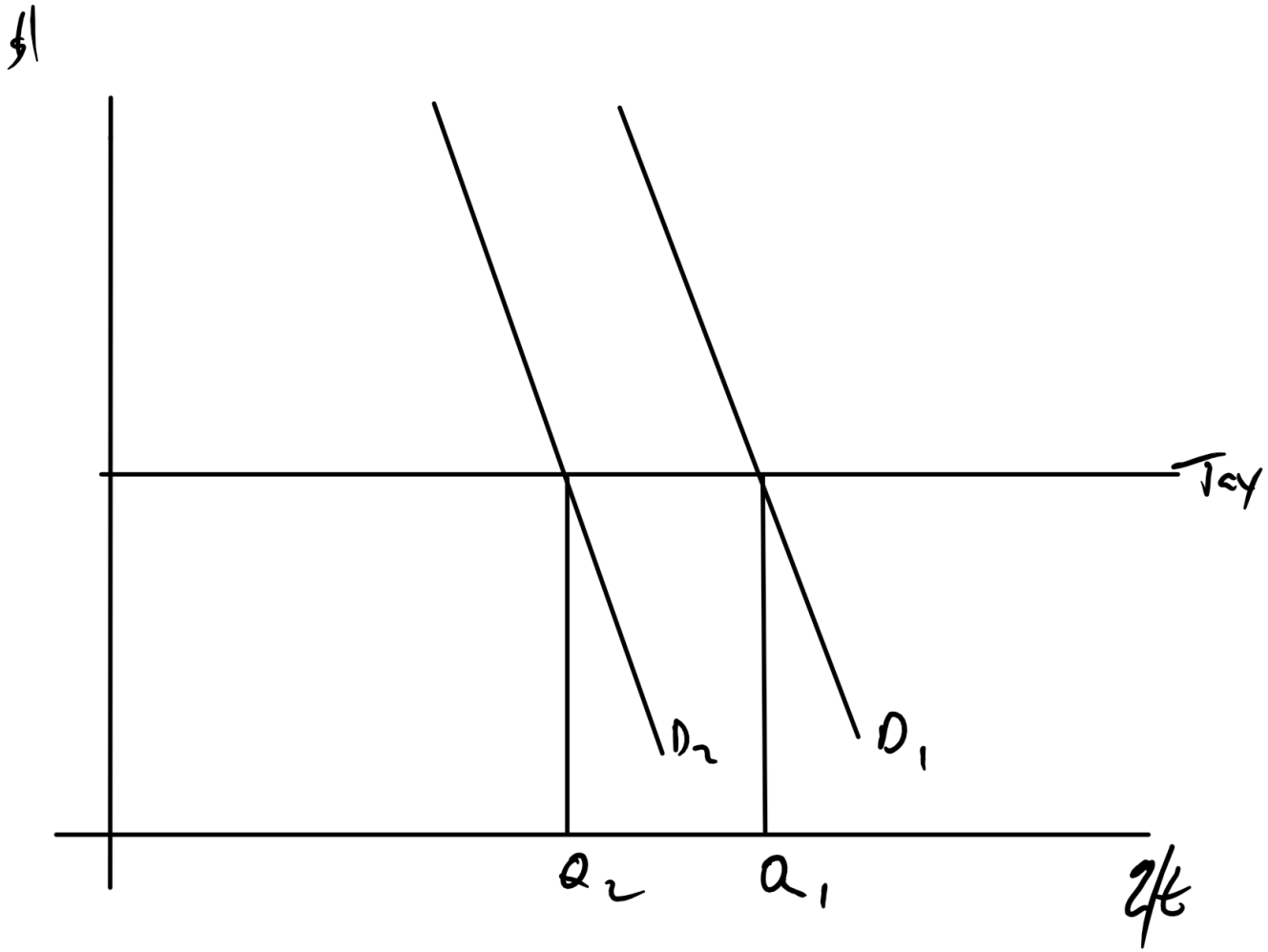


Tax It

Another classic solution is the Pigovian tax/subsidy.

- Figure out the cost of the externality
- Set up a measuring system
- Charge per usual

Tax It Diagram



Comments on Carbon Tax

- Really hard to estimate the right number
- Harder to get it implemented (It is almost always, "too expensive" or "costs jobs")
- Price is very stable – business likes
- Quantity is highly variable – environmentalists hate
- What WA tried to get in 2018

Cap and Trade

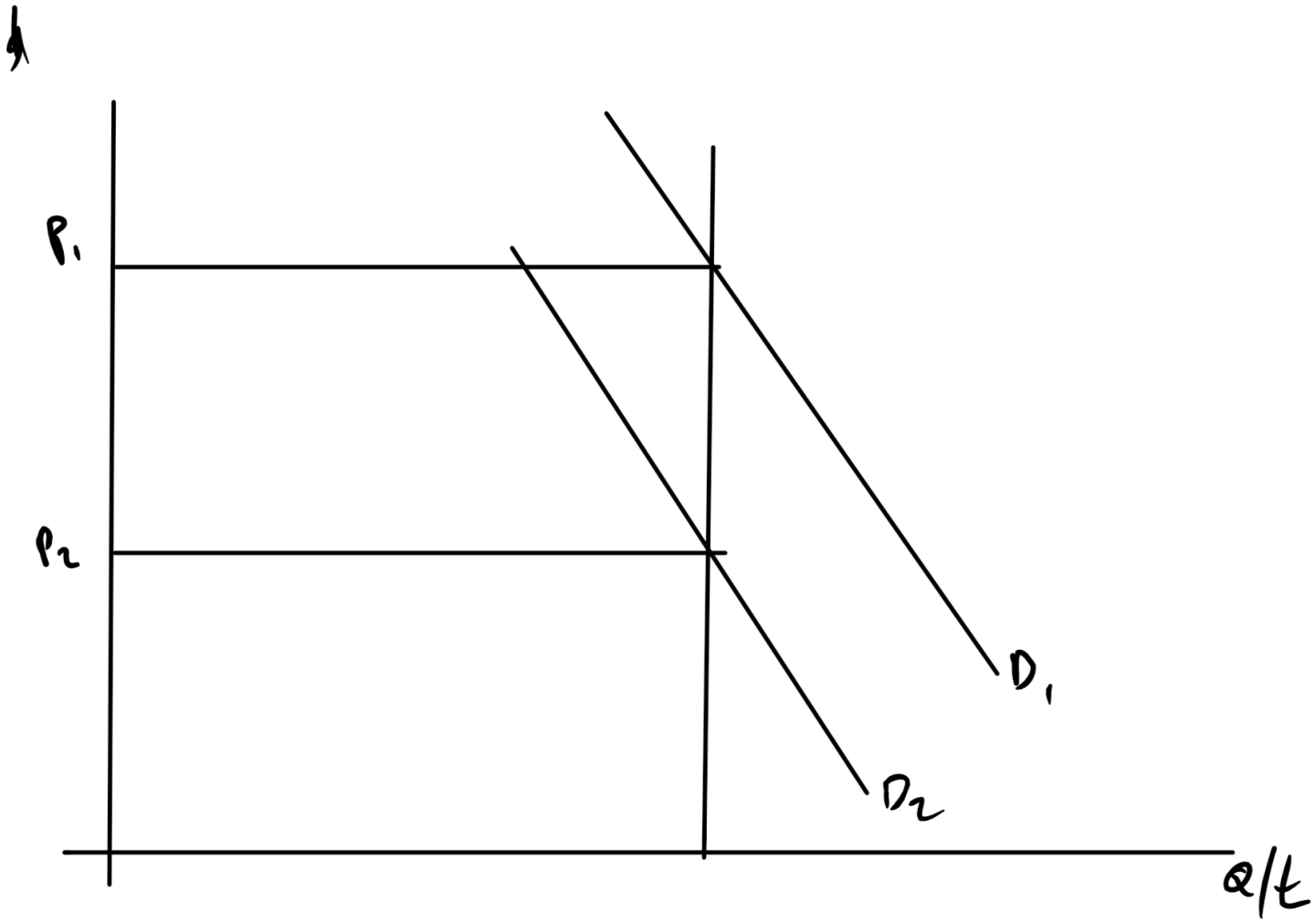
Another classic solution is cap and trade.

- Allocate the rights to pollute, called *allowances*
  - Gov't takes all or gives away often doesn't matter.
- Create a market
  - Those with low cost to reduce or low need to pollute, sell.
  - Those with high cost to reduce or high need to pollute, buy.

Classic Cap and Trade

- Create a market
- Those with low cost to reduce or low need to pollute, sell.
- Those with high cost to reduce or high need to pollute, buy.

Cap and Trade Diagram



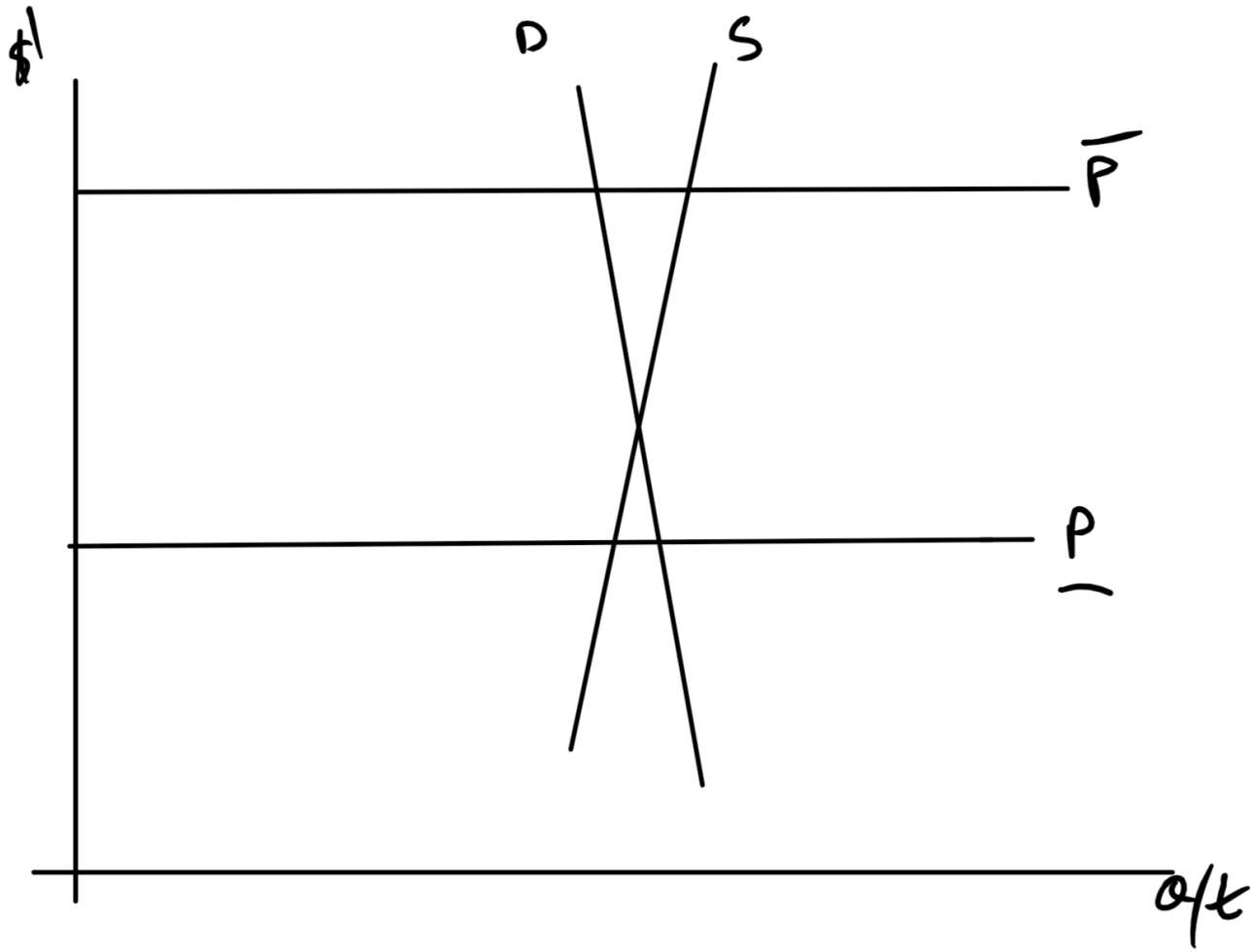
Comments Cap and Trade

- Slightly easier to get the right number
- Often not everyone is 'covered' since sometimes hard to measure
  - Land use and agriculture often excluded in CO_{2e} cap and trade.
- Price is very unstable – business hates
  - Mostly because off very inelastic supply and demand
- Quantity is very stable – environmentalists like
- What OR tried to get in 2018.

Compromise

- Have cap and trade but put a max and min on the price
- Better than a tax for environmentalists
- Better than pure cap and trade for business
- Diagram has a few features
  - Supply is not vertical – allow some offsets and banking
  - Banking – save allowances for later and use or sell
  - Offsets – make extra reductions in uncovered areas, like Ag, and sell those on the market.

Cap and Trade with Ceilings and Floors



Complications

- How do you impose the floors and ceilings?
- Can I save the allowance from one year to the next
- What about those offsets?

Shortage and Surpluses

- At the ceiling, people want more allocations than exist.
- At the floor, people want fewer allocations than are for sale.

You need a mechanism to allocate when you can't user price. BTW, the slow increase in the price floor makes this much less prominent.

Ignore it

Just ignore it:

- At the ceiling, some people will be able to buy allowances and others will not.
- At the floor, some people will be able to sell and others will not.

The floor is rough if you counted on selling the allowances for revenue. The ceiling it rough if you need an allowance and can't buy.

Market Maker Approach

Someone (Government) stands ready to buy and sell allocations at all times:

- They buy when prices hit the floor
  - Hope you don't run out of money before you get to sell.
- They sell when the prices hit the ceiling.
  - Hope you bought enough when you were at the floor.
- CA does this with the Price Containment Reserve (https://www.arb.ca.gov/cc/capandtrade/reservesale/reservesale.htm)

No guarantee of revenue neutrality. History shows that these spend a lot of time at the floor value.

Why so much time on the floor?

- Plenty of direct regulation, e.g., RPS, coal bans, to reduce GHG emissions.
- The annual limitations, supply, must make sense given the price floor.
- The annual allocations have been far too large given the floors.

Allocation prices on the floor are not evidence that direct regulation is all we need, it indicates we picked the wrong floor/annual allocation combination.

Why being on the floor is bad

Besides allowances there are also “offsets”

Offsets are new reductions in GHG:

- Geologic sequestration of existing.
- Methane capture
- Agricultural land management that reduces emissions.

If the price is low, you don’t invest to make these reductions.

Current State of Affairs

- Started as a placeholder bill from the 2017 session SB 1070 "Cap and Invest" (https://olis.leg.state.or.us/liz/2017R1/Measures/Overview/SB1070)
- They held work groups to explore the ideas and get feedback (https://www.oregonlegislature.gov/helm/Pages/clean-energy.aspx)
  - Meeting material and video online.
  - If you have the time watch the videos
    - "Steakholder" group with a few experts thrown in
    - Sen Beyer used to be on PUC and was the executive director.
    - Carl Fink is very good
- 2018, HB 4001 Bill Failed (https://olis.leg.state.or.us/liz/2018R1/Measures/Overview/HB4001)
  - Clause for referral to Oregon Supreme Court about the "revenue bill" decision.
  - No R support

Continues

- 2019 Walkout
- 2020 Walkout and Timber Unity
- Executive order 20-04, March 10 https://www.oregon.gov/gov/Documents/executive_orders/eo_20-04.pdf
  - Wait for the court cases. This does things about carbon but PUC needs legislation.
  - Have not analyzed.

Degree of Magnitude Costs

Assuming \$10/Ton

- \$0.10 per gallon of gasoline
  - Cost ~\$2.70/Gal
  - Person 50 gal per month
  - ~ \$5 month
- \$0.007 per kWh
  - Cost ~\$0.098 per kWh
  - HH ~1,000 kWh per month
  - ~ \$7 month
- \$0.05 per therm
  - Cost ~\$0.05 per therm
  - HH ~ 50 therms per month
  - ~ \$2.50 month

Current Prices

- EU: 25-30 EUR/tonne
- CA: ~15 $/ton

What is covered.

The intent is to require allowances for:

- Natural Gas
- Electricity
- Motor Vehicle Fuel
- Point sources more than 20kT CO_2

Note that agriculture and Forestry are not connected to this system. A firm level list is on p. 69 (http://www.oregon.gov/deq/FilterDocs/ghgmarketstudy.pdf)

Why Not Everything?

- Somethings are easy (cheap) to meter
  - These are the covered entities
  - Use the stick (force to buy allowances)
- Some are hard (expensive) to meter
  - Ag and others
  - Use the carrot (Offsets)
  - They pay for monitoring

Point of Regulation

"Point of Regulation" where do you put the meter and who pays.

Key Needs:

- Easy to meter at that point.
- Hard to avoid
- Makes sure nobody pays twice.

Point of Regulation: Electricity

- Must cover in-state merchant generators
- Must cover out of purchases
- Must cover in-state IOU generation

Complications:

- Some generation is gas fired (Avoid double counting)
- Out of state purchases must not run afoul of the commerce clause (Interstate trade is Federal)
- Co-gen?
- Bonneville Power Administration (Federal) is a balancing authority
- Wheeling (Generated out of state, passing through but to elsewhere.)

Point of Regulation: Natural Gas

- Interstate pipelines
- LNG terminals
- Marketers

Complications:

- Ontario has seen marketers split to avoid 20kT limit.
- Mix of inter and intra state pipelines

Point of Regulation: Motor Fuel

- Pipelines (https://www.eia.gov/state/maps.php?v=Petroleum)
- Trucking – We move a lot of motor fuel by truck.

Complications:

- Dyed (untaxed diesel)
- Oregon Constitution requires use of "Fuel taxes" on highways.

Point of Regulation Other

Mish mash of:

- Concrete
- Chemicals
- Landfill

This is hard

Consignment, Free Allocations, Direct Expenditures

There are a few ways to allocate ownership of "allocations" (Sorry about allocate being used two ways)

- Free allocations: Given to those intended to use the proceeds for their self interest.
  - Current intent is for EITE industries
- Sale by the state: Used to generate revenue for the state
  - Current for majority of allowances.
- Consignment: Given to a party so that the proceeds of the sale can be used to benefit others.
  - Current for IOUs and LDCs for the benefit of low-income household transition.

What the Markets Look Like

- Western Climate Initiative (http://www.westernclimateinitiative.org)
  - Multi-state/province set of rules
  - Trading platform
  - Oregon has an on and off relationship with this.
- California (http://calcarbondash.org/)
- Futures Market (https://www.theice.com/products/31687042/California-Carbon-Allowance-Vintage-2017-Future/specs)
  - California is big enough.
  - Futures markets are where most price discovery takes place
  - Way more transactions.

Offsets

- Offsets protocols https://www.arb.ca.gov/cc/capandtrade/offsets/offsets.htm#protocols
- Offset verification (https://www.arb.ca.gov/cc/capandtrade/offsets/verification/verification.htm)
- Note that:
  - These can be clawed back for overstating even 5%.
  - Trade at a discount because of this.
  - Don't cheat

CA limited this.

8% total now 4% with 2% in state.

Little action because the price of allowances are not high. On the floor.