Economic Effects of Carbon Programs in Alaska

An Introductory Course or,
more economics than you ever really wanted to hear

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Sources and Disclaimers

- The presentation use standard sources for the data shown here the figures have been developed independently
- All responsibility for anything said here is mine and does not necessarily reflect the opinions or findings of Northern Economics, Inc.
- The focus is on the economics of carbon cap and trade programs and carbon tax programs.
- The presentation tries to be value neutral with respect to whether the programs are good or bad, and whether they will reduce global warming

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Carbon Economics 101

- Currently the monetary of cost of CO2 emissions is zero
- Because CO2 emission is free and has been free, technologies developed in a way takes advantage of the fact that emission have no real cost

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Free Goods

- If something is free, then it makes economic sense to use as much of it as we can.
- Other Free Goods (or at least very cheap)
  - Oxygen
  - Views of the mountains
  - Salmon Fishing on the Russian River
- While free can be good , they can also send the distorted economic signals

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Why Free May not Be Good—Real Life Stories

- Anchorage use to have free street parking for 2 hours
- Many downtown workers would park on the street
- Every 2 hours we would go move our cars to a new block—3 or more moves were required in a day
- At least 1 hour of productivity was lost each day
- We utilized the free good at the expense of higher productivity
- When free parking was eliminated we had to buy permits, but our productivity increased substantially

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Why Impose Carbon Cap and Trade or Taxes?

- Both the Cap and Trade Program and a Carbon Tax Program impose a real cost on the emission of CO2
- Because emitting CO2 is no longer a free good, agents in the economy (you and me as well as Chugach Electric and Exxon) will modify their activities to account for the higher cost.
- Our usage of existing assets will change (we'll drive less, reduce our home heating fuel use, and emit less CO2)
- We will make different choices in the infrastructure investments we make (cars, furnaces, power plants, and transportation systems)

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Recent Energy Prices

Fuel	$/Unit	$/MMBtu
Coal	$40.83 per Short Ton	2.0
Diesel	$2.45 per gallon	17.6
Gasoline	$ 1.75 per gallon	14.1
Natural Gas	$ 5.97 per tcf	5.8

Sources for Prices by Standard Market Unit

Fuel type	Date	Source
Natural Gas Wellhead	Nov-08	http://tonto.eia.doe.gov/dnav/ng/ng_sum_lsum_dcu_nus_m.htm
Bituminous Coal (Nominal)	2007	http://www.eia.doe.gov/emeu/aer/txt/stb0708.xls
Diesel (ULSD)	Dec-08	http://tonto.eia.doe.gov/dnav/pet/pet_pri_gnd_dcus_nus_m.htm
Gasoline (all grades)	Dec-08	http://tonto.eia.doe.gov/dnav/pet/pet_pri_gnd_dcus_nus_m.htm

Prices per MMBtu were calculated by Northern Economics using standard conversion factors.

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CO2 Emissions and Relative Cost

Fuel	CO2 Emissions (lbs/ MMBtu)	$ CO2 Emissions / MMBtu	$ CO2 Emissions as % of $/MMBtu
Coal	208	2.55	126%
Diesel	161	1.98	11%
Gasoline	156	1.92	14%
Natural Gas	117	1.43	25%

- CO2 Emissions data from US Energy Information Authority at http://www.eia.doe.gov/oiaf/1605/coefficients.html
- $ CO2 Emissions / MMBtu assumes the cost per metric ton of CO2 emissions is $27 as estimated by Sergey Paltsev, et. al. in "An Assessment of US Cap and Trade Programs" at http://globalchange.mit.edu/files/document/MITJPSPGC_Rpt146.pdf

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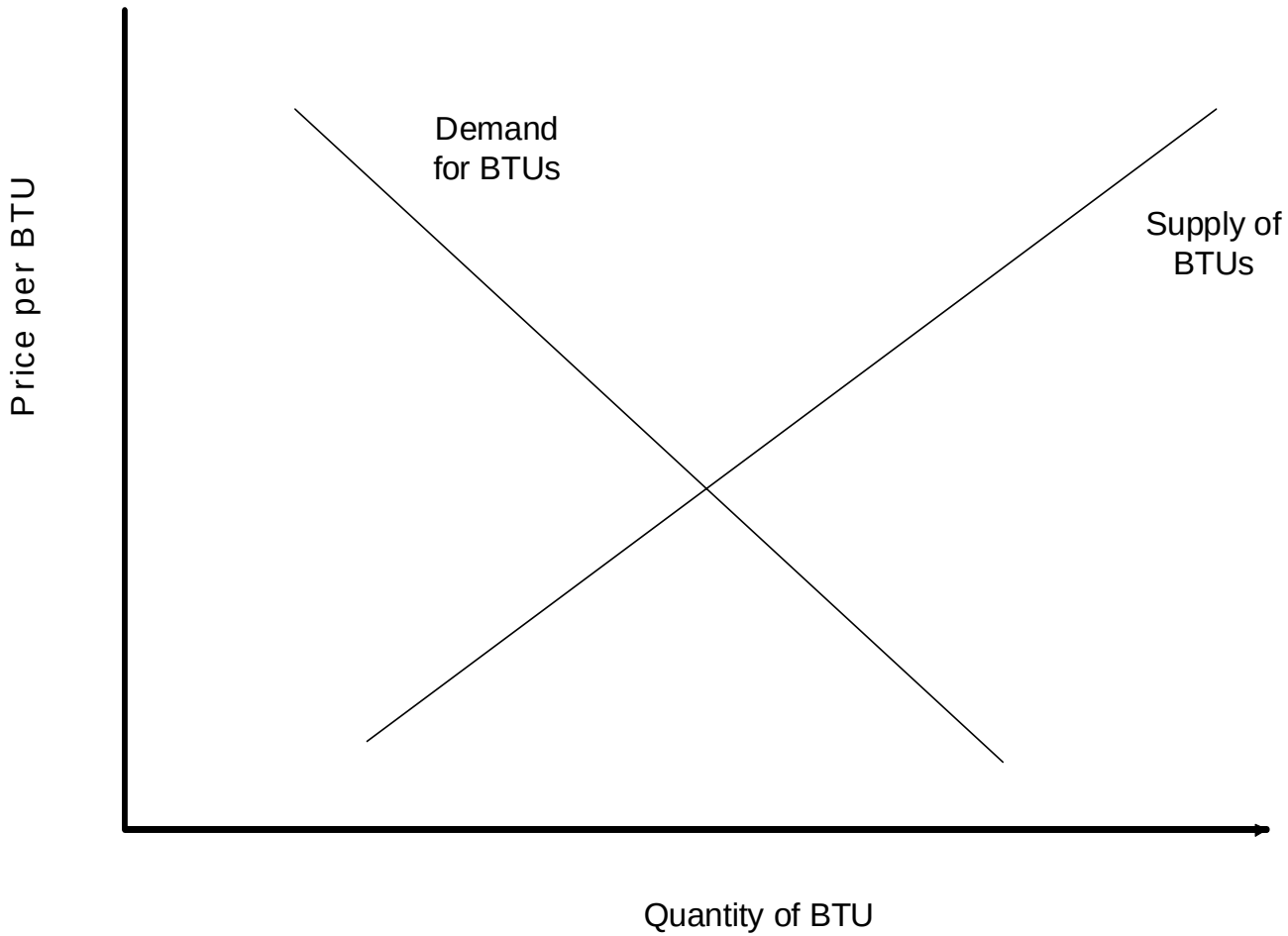
Carbon Economics 204: Natural Gas Example

- Start with Supply and Demand for BTUs



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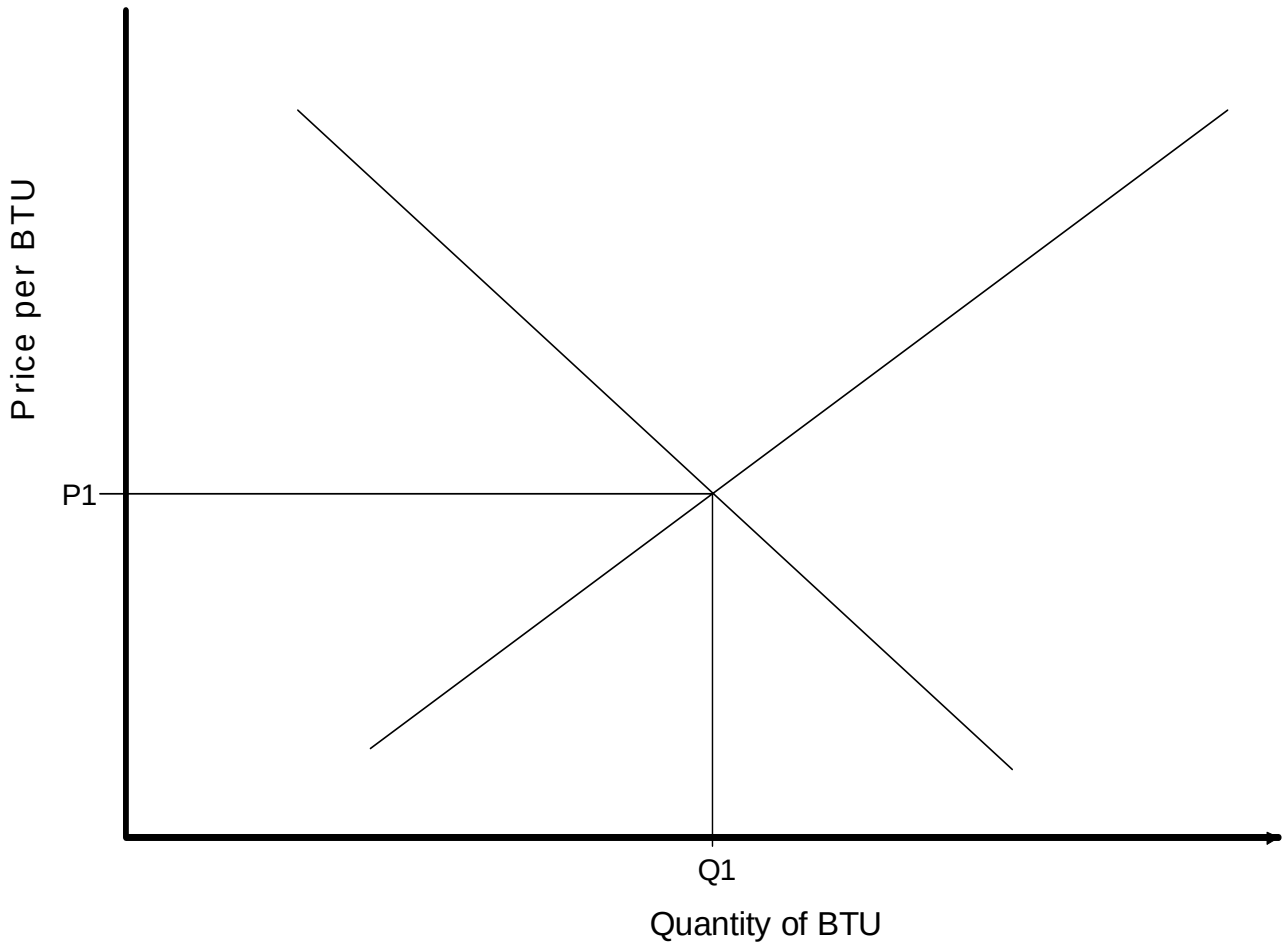
- The price is P1 and amount of BTUs is Q1



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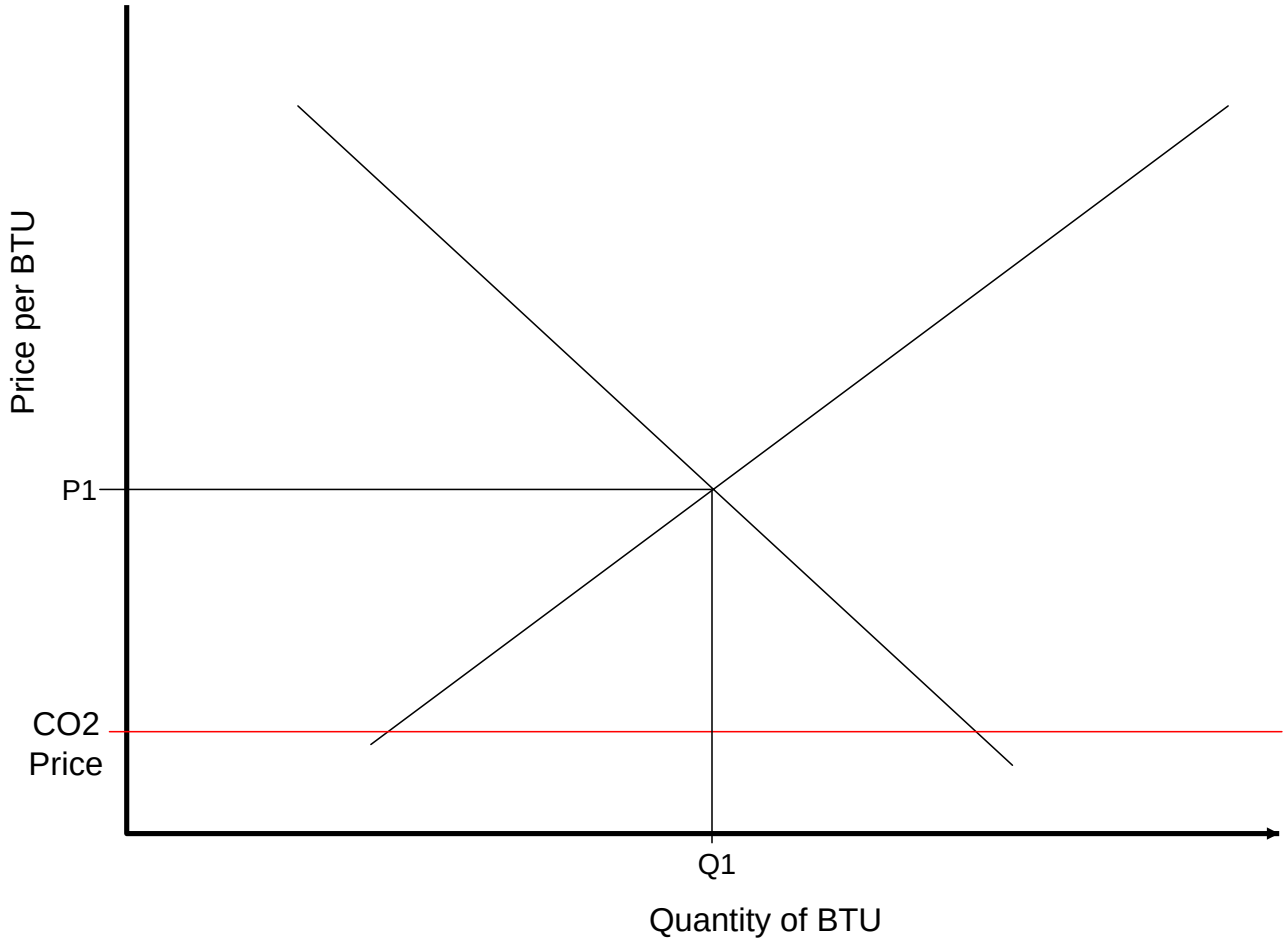
Carbon Economics 204: Natural Gas Example

- Impose a CO2 Tax or Cap and Trade System



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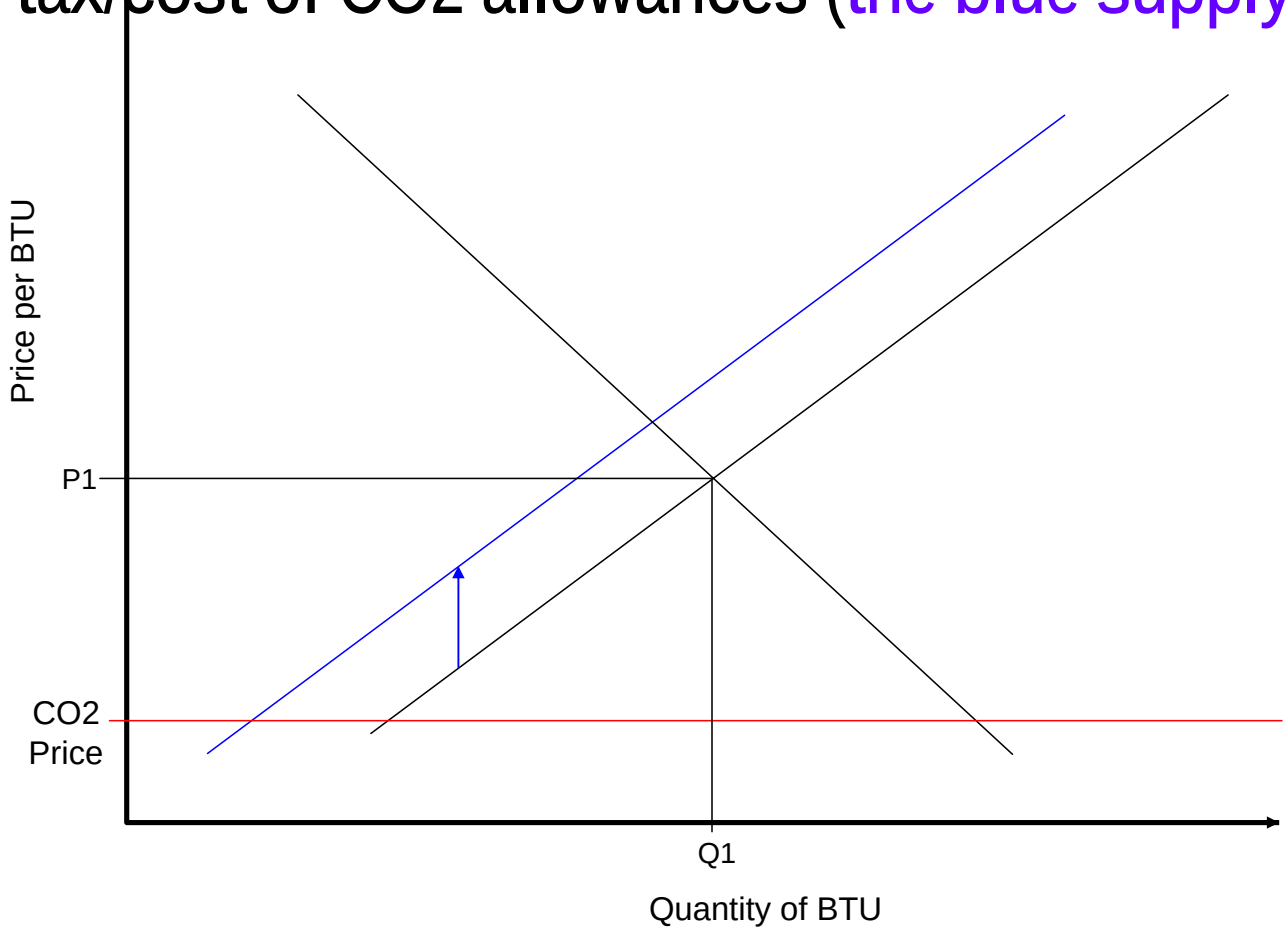
Carbon Economics 204: Natural Gas Example

- The supply line shifts upward by the amount the tax/cost of CO2 allowances (the blue supply line)



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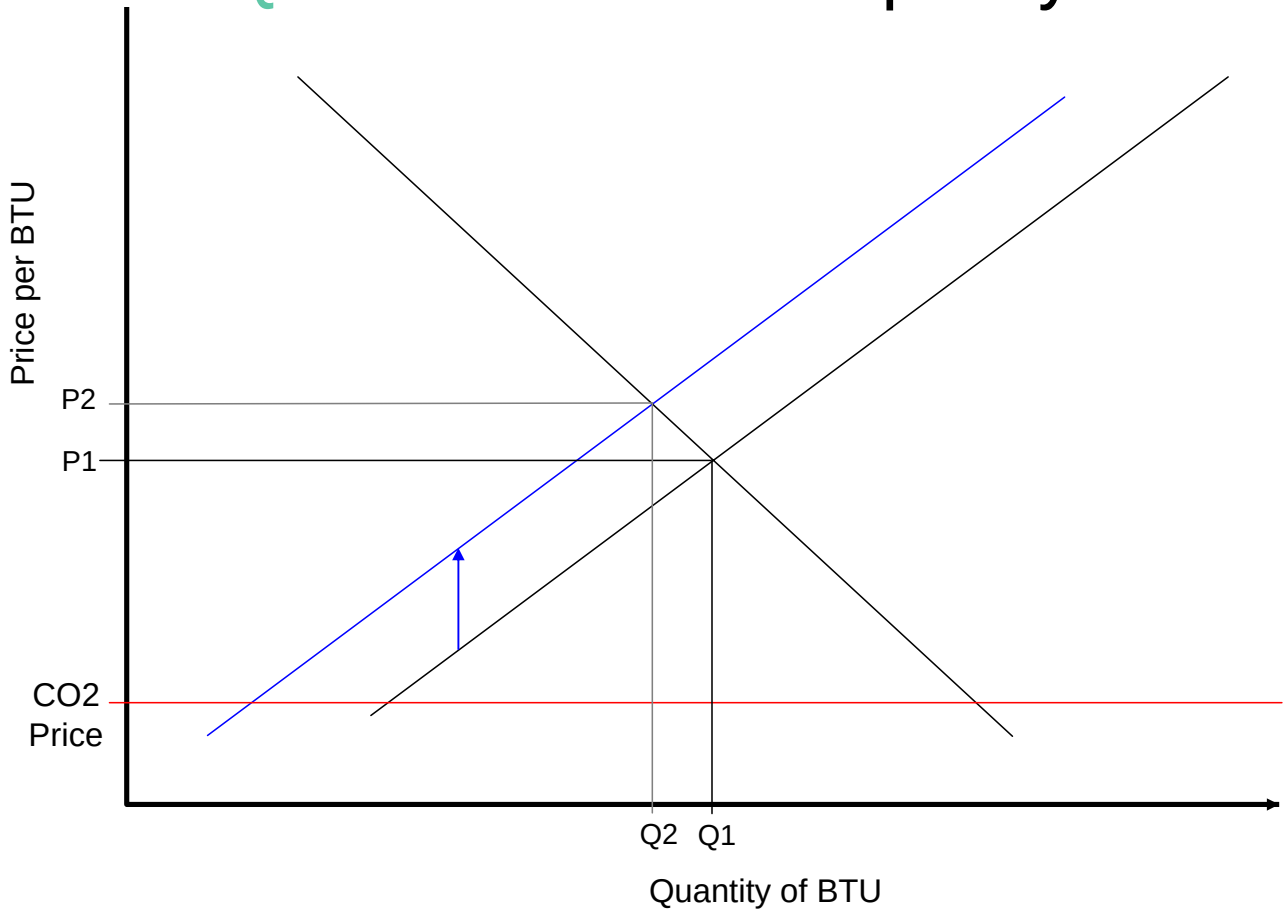
- A new higher price and lower quantity are found at P2 and Q2—but these are temporary.



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Carbon Economics 204: Natural Gas Example

- The same types of changes are happening with all fossil fuel supply and demand systems
- The key is that the cost increases are based on a ton of CO2 emissions
- Different fuels emit different levels of CO2 per BTU
- Since each type of fuel has a different price per BTU, the relative effect of the cost increase is different.
- The relative cost increase for cleaner fuels like natural gas will be less than the cost increase for fuel that emit more CO2 (coal, diesel for example)
- So there will be an overall increase in the demand for N.Gas

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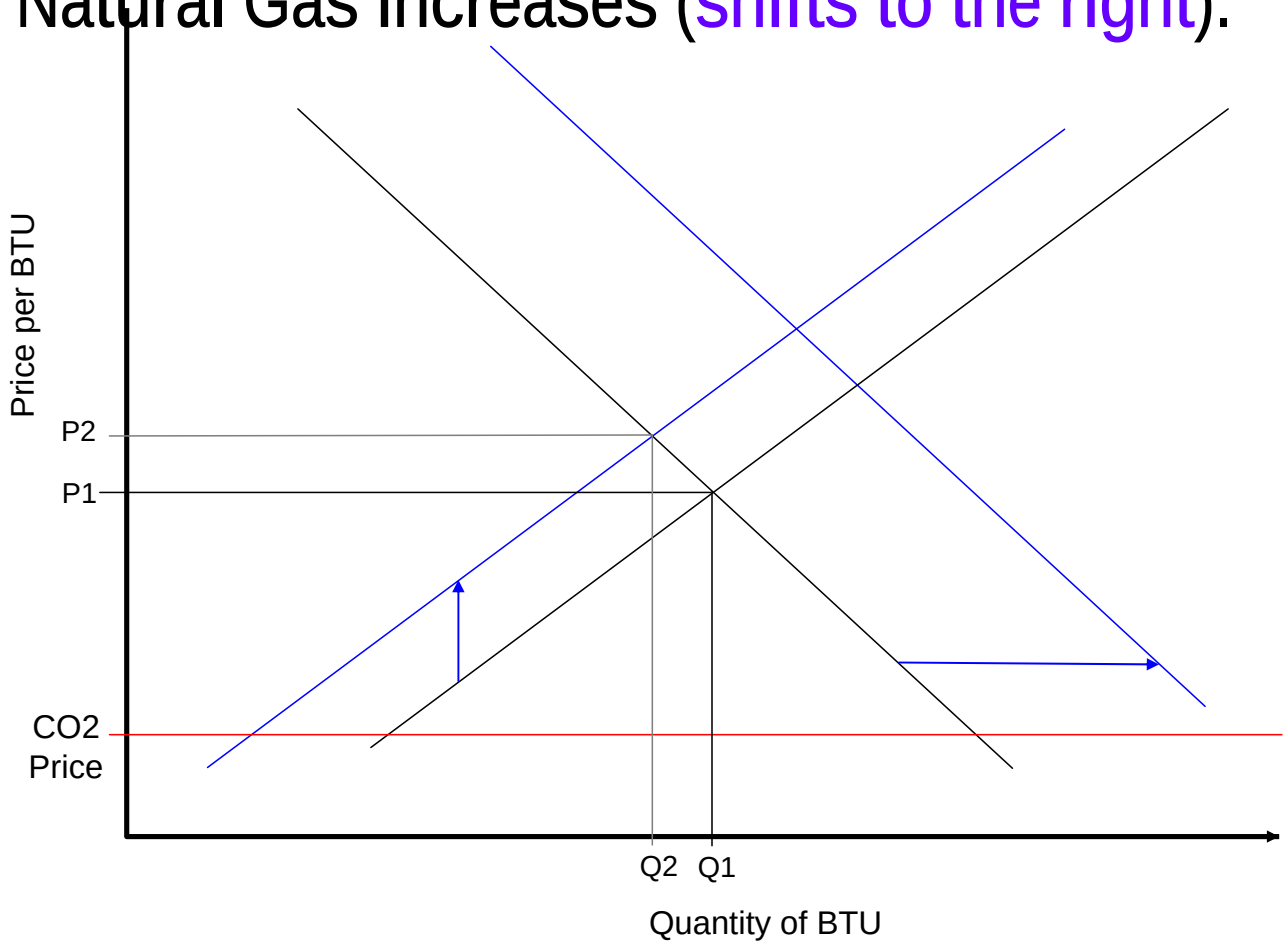
Carbon Economics 204: Natural Gas Example

- After all external effects settle, the overall demand for Natural Gas increases (shifts to the right).



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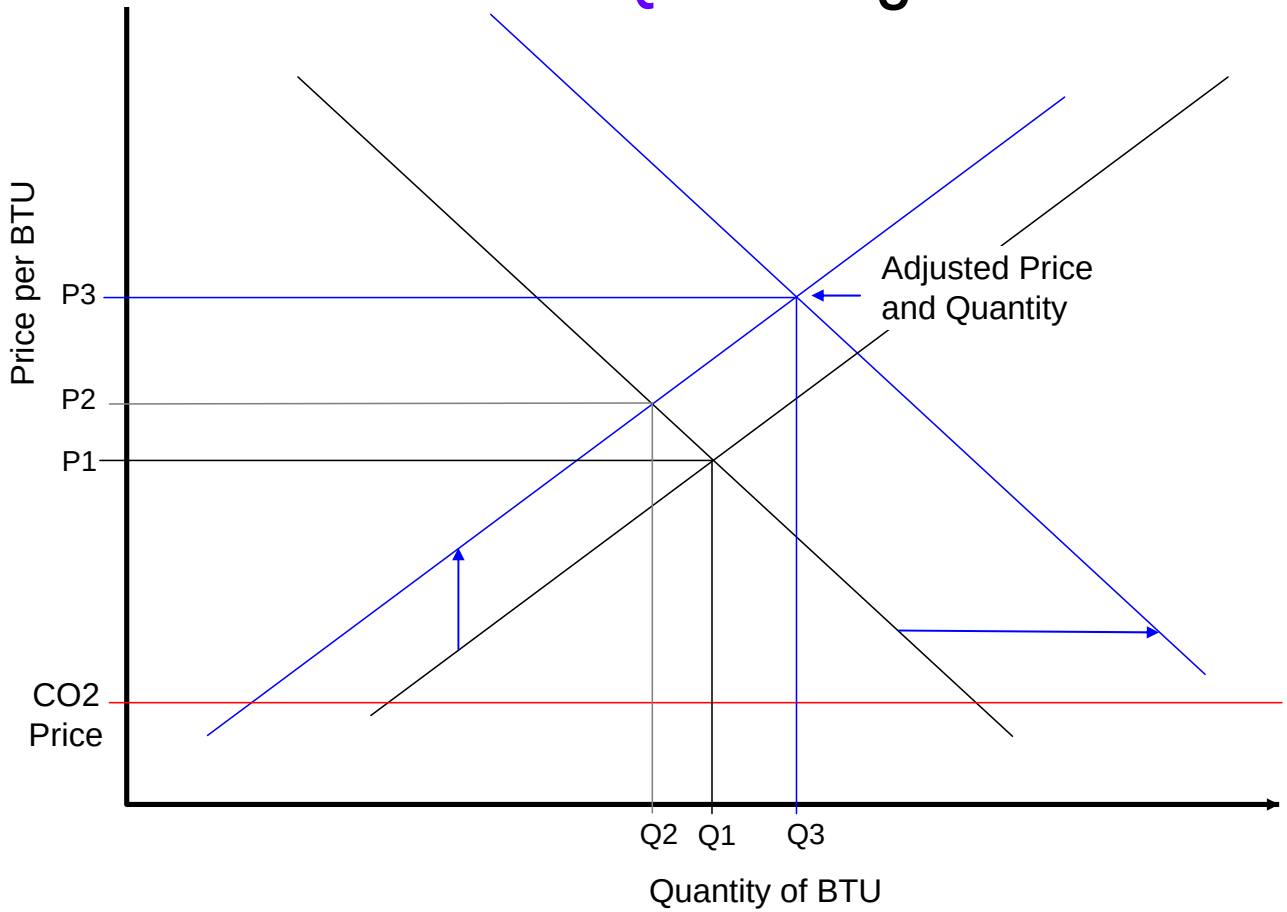
Carbon Economics 204: Natural Gas Example

- New prices and quantities for Natural Gas are found—both P3 and Q3 are higher.



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Carbon Economics 204: Natural Gas Example

- WARNING!!!
- Every thing you've just seen is highly simplified
- It assumes that nothing else in the world changes
- No wars break out
- No embargo's are imposed
- No new technologies are invented
- In the real world things are much more complicated
- Everything is really in a constant state of change

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Carbon Economics: Graduate School

- The real world is much more complicated …

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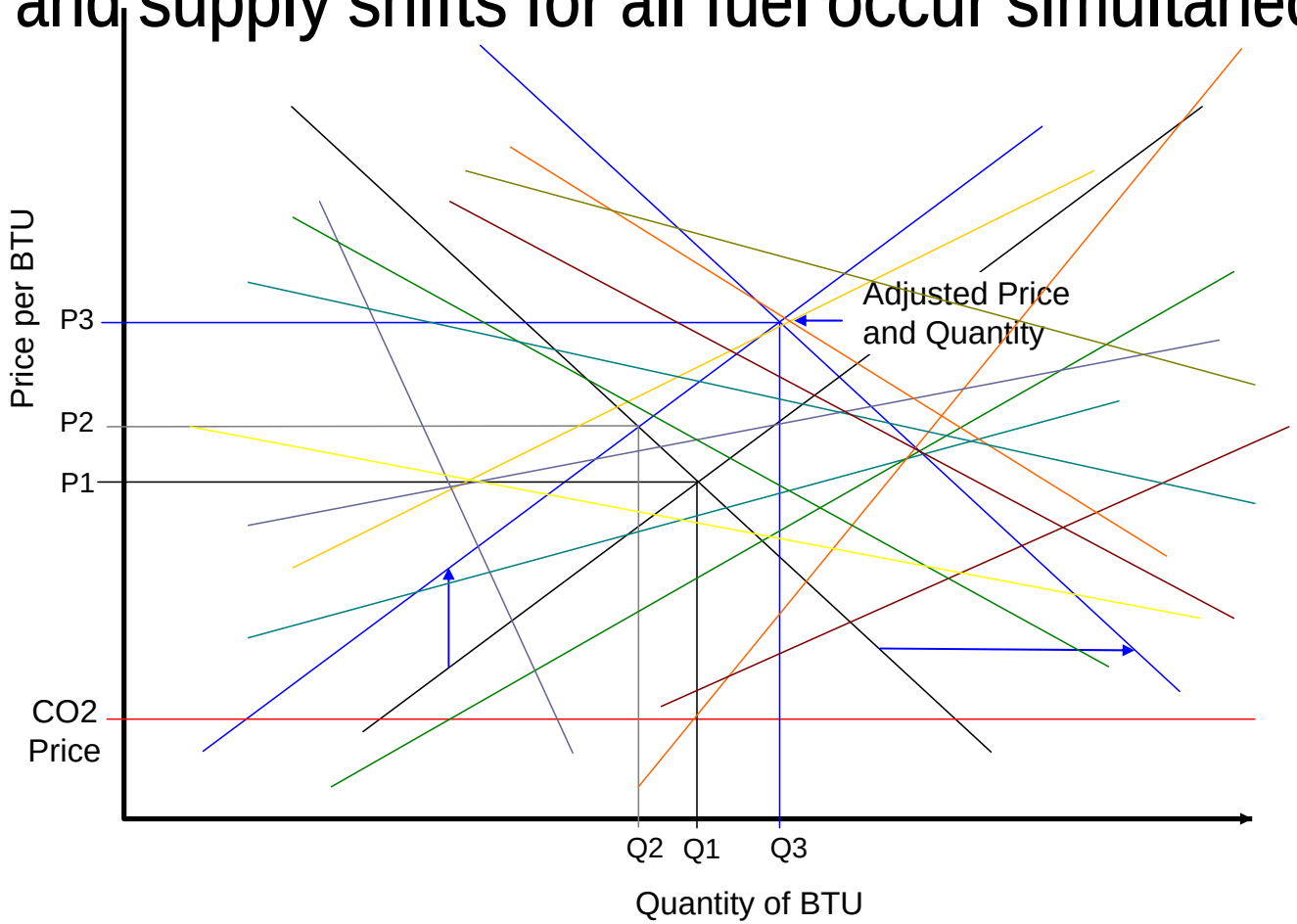
Carbon Economics: Graduate School

- The real world is much more complicated …demand and supply shifts for all fuel occur simultaneously



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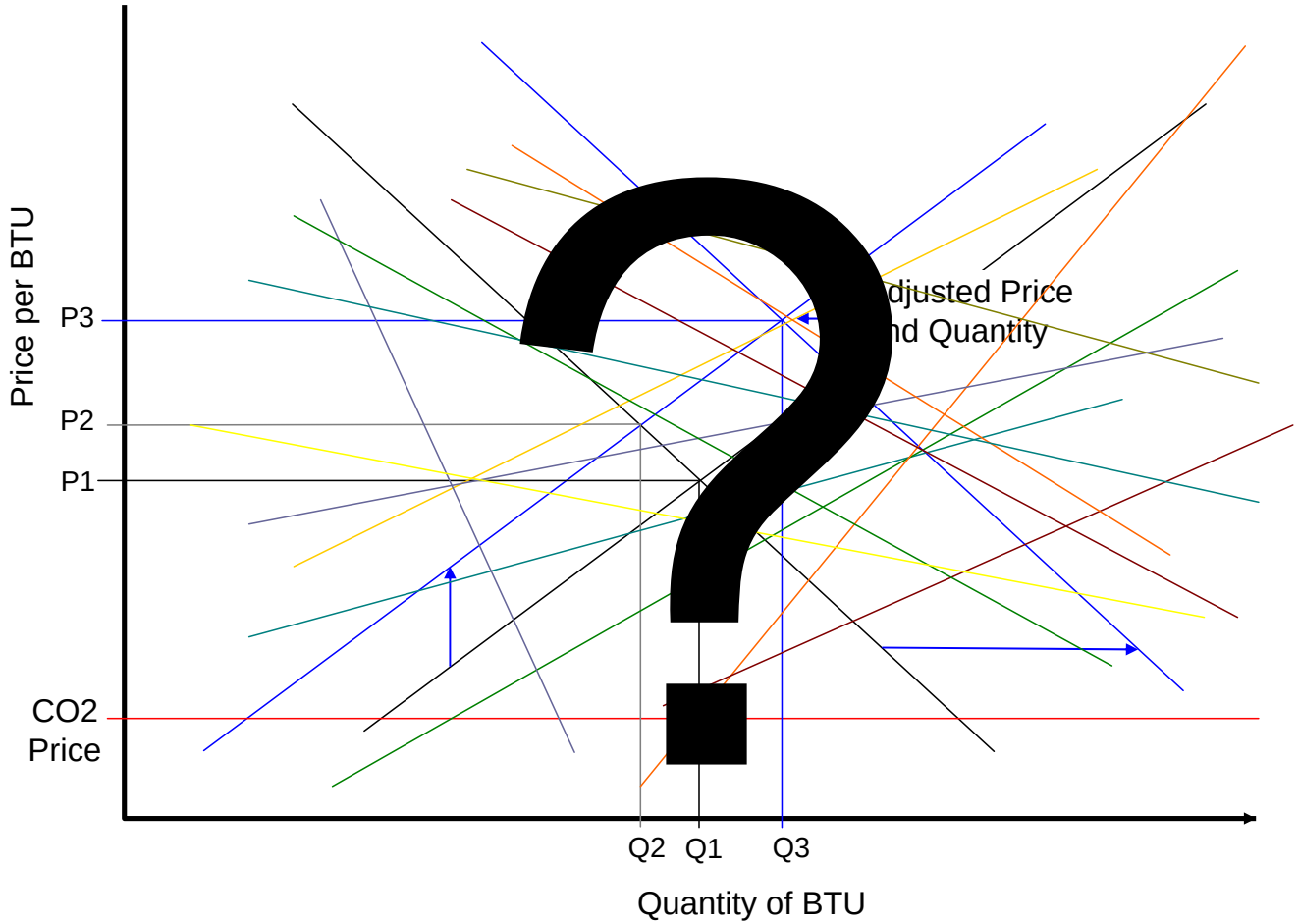
Carbon Economics: Graduate School

- … and we really can't predict things very well



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General Conclusions: Reasonably Certain

- Natural Gas prices in the lower 48 should increase at least in near term
- The quantity used of Natural Gas should increase in the near term (assuming new supplies)
- The quantity of diesel and gasoline used should decrease over all periods
- Coal prices should decline in the near term
- The quantity of Coal used should decline in the near term
- Technology should reduce the cost and supply of clean coal and renewable energy in the not so near term

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General Conclusions: Uncertainies

- The price of oil is uncertain
  - The decline in demand will offset either: 1) some, 2) all, or 3) more than all, of the cost increase due to CO2 emissions
  - There are lots of market forces and the additional cost of CO2 emissions may be not be as important as other forces
- Nuclear power use and costs are uncertain
- Global CO2 reduction programs—if the US leads, will others (China and India in particular) follow?

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Cap and Trade compared to Taxes

- Theoretically taxes and cap and trade are not that different, both impose a price for the emission of carbon.
- Taxes provide price certainty—we should know what the tax is and can adapt to that known price—but C02 reductions are uncertain
- Cap and Trade provides certainty with respect to the amount of emissions allowed—but the cost of the reduction is uncertain.
- But…We live in a very political world and anything can be changed. Both taxes and caps can be changed by congress or EPA. In the end nothing is certain and nothing is final.

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Impacts in Alaska

- Higher natural gas use and prices could positively affect the feasibility of the Natural Gas Pipeline and generate $$ for Alaska Government and Businesses
- The effect of the programs on the North Slope Oil price is uncertain
- Affect on State revenue streams for oil is uncertain
- Rural Communities are likely to see higher electric costs unless there are programs to mitigate and adapt to new technologies

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Government Revenues to Mitigate Impacts

- Under both programs it is likely that governments will receive $$ to mitigate impacts
- How much $$ is not known because we don't know how the program will be implemented
- Government Funding could be used to research new technologies and / or to assist local communities in converting to lower carbon emission fuels

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Ways to Adapt and Mitigate

- Repower: Converting old, less efficient diesel engines to more modern diesel engines
- Aggregate: Larger generators are more efficient than smaller generators, so look for way to form regional generation and transmission systems
- Convert to Wind, Solar and Hydropower. Currently these may not be cost effective, but with new technologies and higher cost for fossil fuels, they may be more cost effective
- Produce bio-fuels—investigate options for AK

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Offset Programs

- Some programs promote investment in offsite areas as a way to take credit for carbon emissions
- Rural Alaska has relatively high emissions per capita
- Rural Alaska has the potential to benefit from Offsets.
- Current offset programs (the Climate Trust in Oregon)
  - Using $5 – 10 per ton of CO2 emission as a standard
  - They will funds projects if the reduce diesel fuel use by 450,000 gallons per year
  - If carbon tax is $15 – 20 then it would likely be feasible to fund projects that reduce diesel use by 225,000 gallons / year

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