Econ 2: Spring 2014:
Pre-Midterm Review

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Administrivia

- Connie Ballesteros students: Barker 101
- Connie Min students: LeConte 003
- Exam
    - 80 minutes
    - Bring blue books
    - Open book-open notes
    - Not open internet

Run Through Answers to Problem Set 3

- Externalities
- Adverse selection
- Non-excludibility
- Non-rivalry
- Maldistribution
- Elasticity problem
- Externalities problem

Explain why competitive markets in equilibrium subject to externalities will not, unless carefully and correctly tweaked by the government, produce an outcome that maximizes anyone's idea of social welfare

- Markets don't take into account effects on a third party that are economically significant because suppliers and consumers base their decisions on effects on themselves, and third parties don't get a vote in the transaction.

Explain why competitive markets in equilibrium subject to non-excludibility cannot produce an outcome that maximizes anyone's idea of social welfare

- If you can't keep people from using the product even if they don't pay for it, it is really hard to get people to pay for it, and a market cannot sustain itself in that producers can't raise enough money to pay for production at efficient scale.

Explain why *non-rivalry* is a problem for those of us who hope that markets in equilibrium can be competitive and produce an outcome that maximizes anyone's idea of social welfare

- Maximum surplus is generated when no price is charged. But then who pays for production?

Explain why competitive markets in equilibrium in a situation of maldistribution will not, unless carefully and correctly tweaked by the government, produce an outcome that maximizes anyone’s idea of social welfare

- Market treats everyone with a willingness to pay above opportunity cost the same, but suppose someone who really needs it is really poor and hence has a low willingness to pay?

Elasticity

- 6. Suppose we have the demand curve: P_d = 10000 x Q^{-1}; or P_d = 10000/Q
  - a. Pick a point on the demand curve. Calculate the elasticity of demand at that point.
- Let's pick Q = 100…

Two Ways to Calculate Elasticity

- 6. Suppose we have the demand curve: P_d = 10000 x Q^{-1}; or P_d = 10000/Q
  - a. Pick a point on the demand curve. Calculate the elasticity of demand at that point.
- Let's pick Q = 100…
- Derivative:

Elasticity: Derivative

- 6. Suppose we have the demand curve: P_d = 10000 x Q^{-1}; or P_d = 10000/Q
  - a. Pick a point on the demand curve. Calculate the elasticity of demand at that point.
- Let's pick Q = 100…
- Derivative:
  - $dP_d/dQ = -10000 \times Q^{-2}$

Elasticity: Derivative II

- 6. Suppose we have the demand curve: $P_d = 10000 \times Q^{-1}$; or $P_d = 10000/Q$
  - a. Pick a point on the demand curve. Calculate the elasticity of demand at that point.
- Let's pick Q = 100…
- Derivative:
  - $dP_d/dQ = -100000 \times Q^{-2}$
  - $dQ/dP_d = Q^2/10000$

Elasticity: Derivative III

- 6. Suppose we have the demand curve: P_d = 10000 x Q^{-1}; or P_d = 10000/Q
  - a. Pick a point on the demand curve. Calculate the elasticity of demand at that point.
- Let's pick Q = 100…
- Derivative:
  - $dP_d/dQ = -100000 \times Q^{-2}$
  - $dQ/dP_d = Q^2/100000$
  - $(dQ/dP_d)(P_d/Q) = (Q^2/10000)(10000Q^{-1}/Q)$

Elasticity: Derivative IV

- 6. Suppose we have the demand curve: $P_d = 10000 \times Q^{-1}$; or $P_d = 10000/Q$
  - a. Pick a point on the demand curve. Calculate the elasticity of demand at that point.
- Let's pick Q = 100…
- Derivative:
  - $dP_d/dQ = -10000 \times Q^{-2}$
  - $dQ/dP_d = Q^2/10000$
  - $(dQ/dP_d)(P_d/Q) = (Q^2/10000)(10000Q^{-1}/Q)$
  - $(dQ/dP_d)(P_d/Q) = (Q^2/10000)(10000/Q^2)$

Elasticity: Derivative V

- 6. Suppose we have the demand curve: $P_d = 10000 \times Q^{-1}$; or $P_d = 10000/Q$
  - a. Pick a point on the demand curve. Calculate the elasticity of demand at that point.
- Let's pick Q = 100…
- Derivative:
  - $dP_d/dQ = -100000 \times Q^{-2}$
  - $dQ/dP_d = Q^2/100000$
  - $(dQ/dP_d)(P_d/Q) = -(Q^2/100000)(10000Q^{-1}/Q)$
  - $(dQ/dP_d)(P_d/Q) = -(Q^2/100000)(10000/Q^2)$
  - $(dQ/dP_d)(P_d/Q) = -1$

Elasticity: Derivative VI

- 6. Suppose we have the demand curve: $P_d = 10000 \times Q^{-1}$; or $P_d = 10000/Q$
  - a. Pick a point on the demand curve. Calculate the elasticity of demand at that point.
- Let's pick Q = 100…
- Derivative:
  - $dP_d/dQ = -100000 \times Q^{-2}$
  - $dQ/dP_d = Q^2/100000$
  - $(dQ/dP_d)(P_d/Q) = (Q^2/100000)(10000Q^{-1}/Q)$
  - $(dQ/dP_d)(P_d/Q) = (Q^2/100000)(10000/Q^2)$
  - $(dQ/dP_d)(P_d/Q) = 1$
  - Normally, we would substitute in for Q here, but there is no need to: elasticity is 1 everywhere…

Elasticity: Finite Differences

- 6. Suppose we have the demand curve: $P_d = 10000 \times Q^{-1}$; or $P_d = 10000/Q$
  - a. Pick a point on the demand curve. Calculate the elasticity of demand at that point.
- Let's pick Q = 100…
- Finite Differences:
  - $(\Delta Q/\Delta P)(P/Q)$
  - Let's pick Q = 100, $\Delta Q = 1$

Elasticity: Finite Differences II

- 6. Suppose we have the demand curve: $P_d = 10000 \times Q^{-1}$; or $P_d = 10000/Q$
- Finite Differences:
  - $(\Delta Q/\Delta P)(P/Q)$; Let's pick $Q = 100$, $\Delta Q = 1$
  - $(\Delta Q/(P(Q+\Delta Q) - P(Q))(P(Q)/Q)$

Elasticity: Finite Differences III

- 6. Suppose we have the demand curve: P_d = 10000 x Q^{-1}; or P_d = 10000/Q
- Finite Differences:
  - $(\Delta Q/(P(Q+\Delta Q) - P(Q))(P(Q)/Q)$
  - $(\Delta Q/(10000(Q+\Delta Q)^{-1} - 10000(Q^{-1}))(10000Q^{-1}/Q)$

Elasticity: Finite Differences IV

- $(\Delta Q/(10000(Q+\Delta Q)^{-1} - 10000Q^{-1}))(10000Q^{-1}/Q)$
- $(1/(10000(101)^{-1}-10000(100^{-1}))(10000(100)^{-1}/100)$
- $(1/(99.00990099 - 100))(1)$
- $(1/-.9900990099)(1)$
- -1.01

Elasticity: Finite Differences V

- $(\Delta Q/(10000(Q+\Delta Q)^{-1} - 10000Q^{-1}))(10000Q^{-1}/Q)$
- $(\Delta Q/(10000))(1/((Q+\Delta Q)^{-1} - Q^{-1}))(10000/Q^{2})$
- $(1/((Q+\Delta Q)^{-1} - Q^{-1}))(\Delta Q/Q^{2})$

Elasticity: Finite Differences VI

- $(1/((Q+\Delta Q)^{-1} - Q^{-1}))(\Delta Q/Q^2)$

$$\left(\frac{1}{\left(\frac{1}{Q+\Delta Q}-\frac{1}{Q}\right)}\right)\left(\frac{\Delta Q}{Q^2}\right)$$

$$\left(\frac{1}{\left(\frac{Q}{(Q)(Q+\Delta Q)}-\frac{Q+\Delta Q}{(Q)(Q+\Delta Q)}\right)}\right)\left(\frac{\Delta Q}{Q^2}\right)$$

$$\left(\frac{1}{\left(\frac{Q-Q-\Delta Q}{(Q)(Q+\Delta Q)}\right)}\right)\left(\frac{\Delta Q}{Q^2}\right)$$

Elasticity: Finite Differences VII

- $(1/((Q+\Delta Q)^{-1} - Q^{-1}))(\Delta Q/Q^2)$

$$\left(\frac{1}{\left(\frac{1}{Q+\Delta Q}-\frac{1}{Q}\right)}\right)\left(\frac{\Delta Q}{Q^2}\right)$$

$$\left(\frac{1}{\left(\frac{Q}{(Q)(Q+\Delta Q)}-\frac{Q+\Delta Q}{(Q)(Q+\Delta Q)}\right)}\right)\left(\frac{\Delta Q}{Q^2}\right)$$

$$\left(\frac{1}{\left(\frac{Q-Q-\Delta Q}{(Q)(Q+\Delta Q)}\right)}\right)\left(\frac{\Delta Q}{Q^2}\right)$$

$$\left(\frac{1}{\left(\frac{-\Delta Q}{(Q^2+Q\Delta Q)}\right)}\right)\left(\frac{\Delta Q}{Q^2}\right)$$

$$\left(\frac{Q^2+Q\Delta Q}{-\Delta Q}\right)\left(\frac{\Delta Q}{Q^2}\right)$$

$$-\frac{Q^2+Q\Delta Q}{Q^2}=-1-\frac{\Delta Q}{Q}$$

Elasticity: Doubling

- b. Go back to the same point you picked in (a). Now pick the point on the demand curve with twice the quantity produced that you originally chose. Which point on the demand curve sees a greater dollar volume of sales?
  - Let's pick Q = 100…

Elasticity: Doubling II

- b. Go back to the same point you picked in (a). Now pick the point on the demand curve with twice the quantity produced that you originally chose. Which point on the demand curve sees a greater dollar volume of sales?
  - $Q = 100$: $P_d = 10000/Q$
  - $Q = 200$: $P_d = 10000/Q$

Elasticity: Doubling III

- b. Go back to the same point you picked in (a). Now pick the point on the demand curve with twice the quantity produced that you originally chose. Which point on the demand curve sees a greater dollar volume of sales?
  - $Q = 100$: $P_d = 10000/Q$: $QP_d = 10000$
  - $Q = 200$: $P_d = 10000/Q$: $QP_d = 10000$

Elasticity: Basic Property

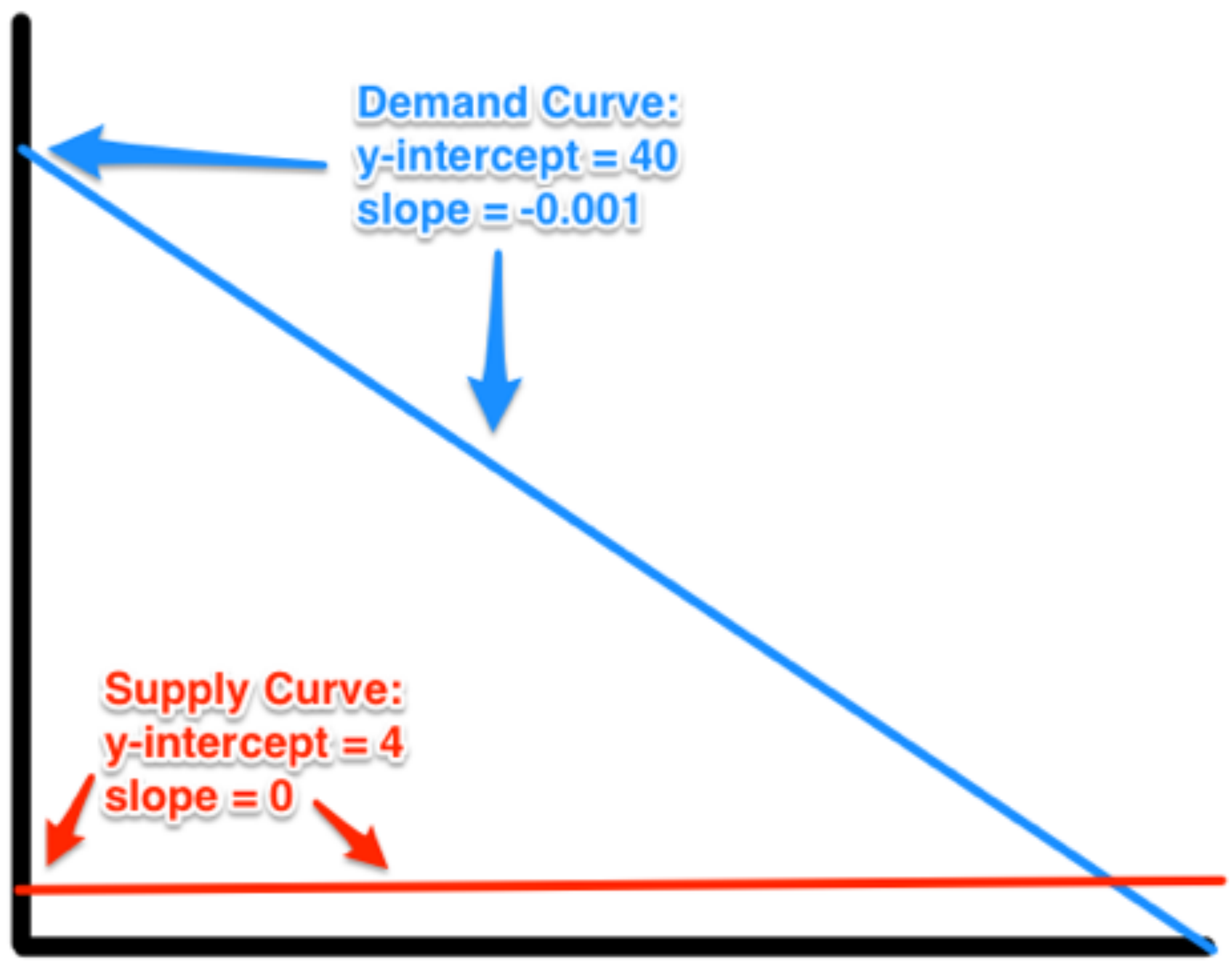
- What is the relationship between your answer to (a) and your answer to (b)?
    - That is the basic property of a demand elasticity of -1: that is why elasticity is defined
    - For an elasticity larger in absolute magnitude than -1, lowering price expands total dollar sales
    - For an elasticity smaller in absolute magnitude than -1, lowering price reduces total dollar sales

The Codfish

- Suppose we have a demand curve for Atlantic cod right now this year , in tons of fish and thousands of dollars per ton: $P_d = 40 - 0.001Q$; and suppose we have a supply curve for Atlantic cod of $P_s = 4$
  - Draw the supply and demand curves.

The Codfish II

- Suppose we have a demand curve for Atlantic cod right now this year , in tons of fish and thousands of dollars per ton: $P_d = 40 - 0.001Q$; and suppose we have a supply curve for Atlantic cod of $P_s = 4$
    - Draw the supply and demand curves.



The Codfish III

- Suppose we have a demand curve for Atlantic cod right now this year , in tons of fish and thousands of dollars per ton: $P_d = 40 - 0.001Q$; and suppose we have a supply curve for Atlantic cod of $P_s = 4$
  - Calculate the equilibrium price and quantity. Calculate the equilibrium producer and consumer surplus.

The Codfish IV

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$

The Codfish V

- Demand: P_d = 40 - 0.001Q; Supply: P_s = 4
    - 4 = 40 - 0.001Q

The Codfish VI

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$
    - $4 = 40 - 0.001Q$
    - $36 = 0.001Q$

The Codfish VII

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$
    - $4 = 40 - 0.001Q$
    - $36 = 0.001Q$
    - $36/0.001 = Q$

The Codfish VIII

- Demand: P_d = 40 - 0.001Q; Supply: P_s = 4
  - 4 = 40 - 0.0001Q
  - 36 = 0.0001Q
  - 36/0.0001 = Q
  - Q = 36000

The Codfish IX

- Demand: P_d = 40 - 0.001Q; Supply: P_s = 4
    - 4 = 40 - 0.0001Q
    - 36 = 0.0001Q
    - 36/0.0001 = Q
    - Q = 36000
    - P = 4

The Codfish: Surplus

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; $Q = 36000$; $P = 4$
- Producer Surplus

The Codfish: Surplus II

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; $Q = 36000$; $P = 4$
- Producer Surplus
  - TC = AC = MC = P = 4
  - There is no producer surplus

The Codfish: Surplus III

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; $Q = 36000$; $P = 4$
- Producer Surplus: TC = AC = MC = P = 4: There is no producer surplus
- Consumer Surplus:

The Codfish: Surplus IV

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; $Q = 36000$; $P = 4$
- Producer Surplus: TC = AC = MC = P = 4: There is no producer surplus
- Consumer Surplus:
  - Maximum WTP = 40, Price = 4

The Codfish: Surplus V

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; Q = 36000; P = 4

- Producer Surplus: TC = AC = MC = P = 4: There is no producer surplus

- Consumer Surplus:

  - Maximum WTP = 40, Price = 4

  - Average WTP = 22

The Codfish: Surplus VI

- Demand: P_d = 40 - 0.001Q; Supply: P_s = 4; Q = 36000; P = 4
- Producer Surplus: TC = AC = MC = P = 4: There is no producer surplus
- Consumer Surplus:
    - Maximum WTP = 40, Price = 4
    - AWTP - P = 22 - 4 = 18

The Codfish: Surplus VII

- Demand: P_d = 40 - 0.001Q; Supply: P_s = 4; Q = 36000; P = 4

- Producer Surplus: TC = AC = MC = P = 4: There is no producer surplus

- Consumer Surplus:

  - Maximum WTP = 40, Price = 4

  - AWTP - P = 22 - 4 = 18

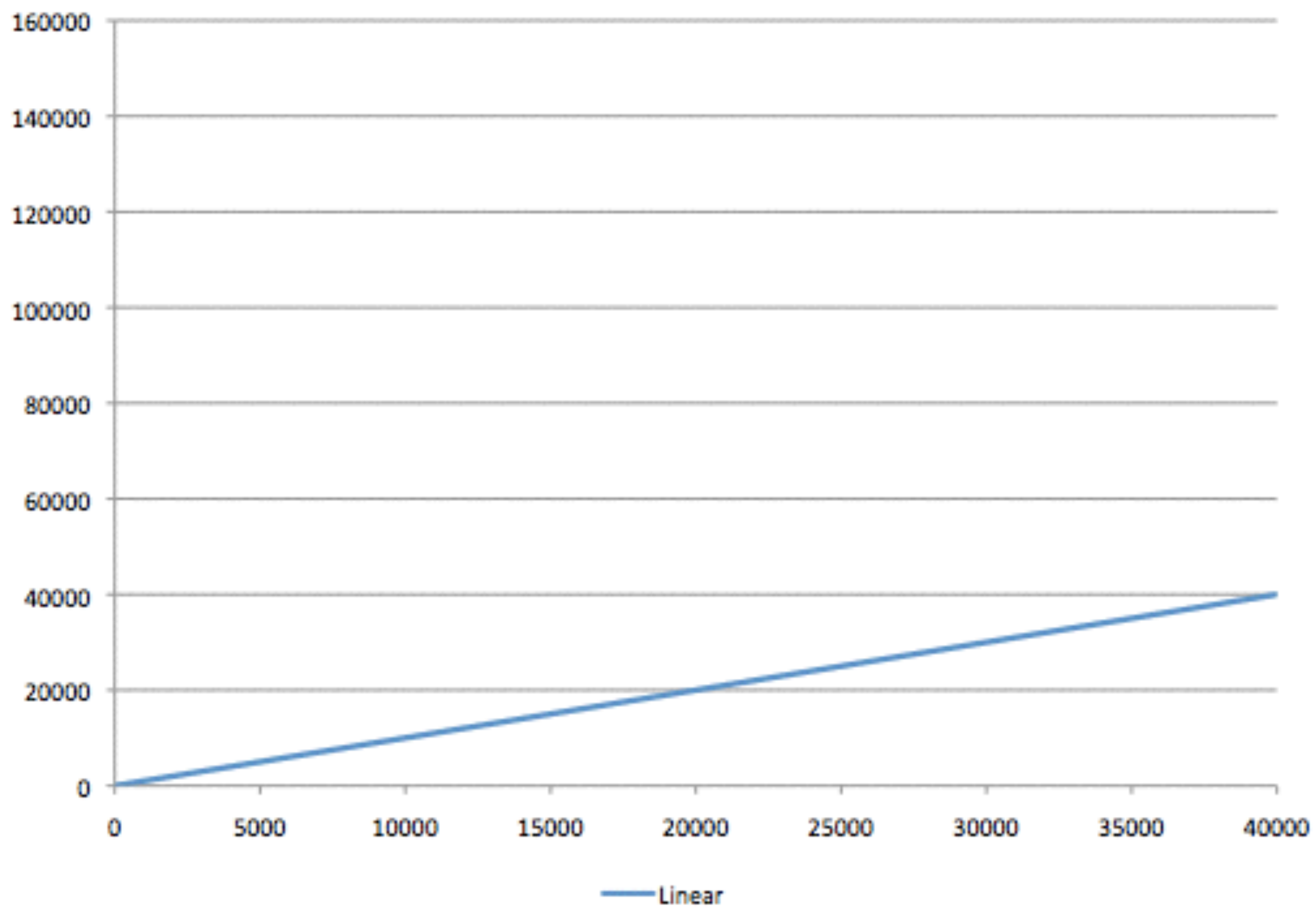
  - Q x (AWTP-P) = 36000 x 18 = 648000

The Codfish: Resource Depletion Externality

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; $Q = 36000$; $P = 4$
- Resource Depletion Externality: $XC = 6.5 \times 10^{-15} \times Q^3$

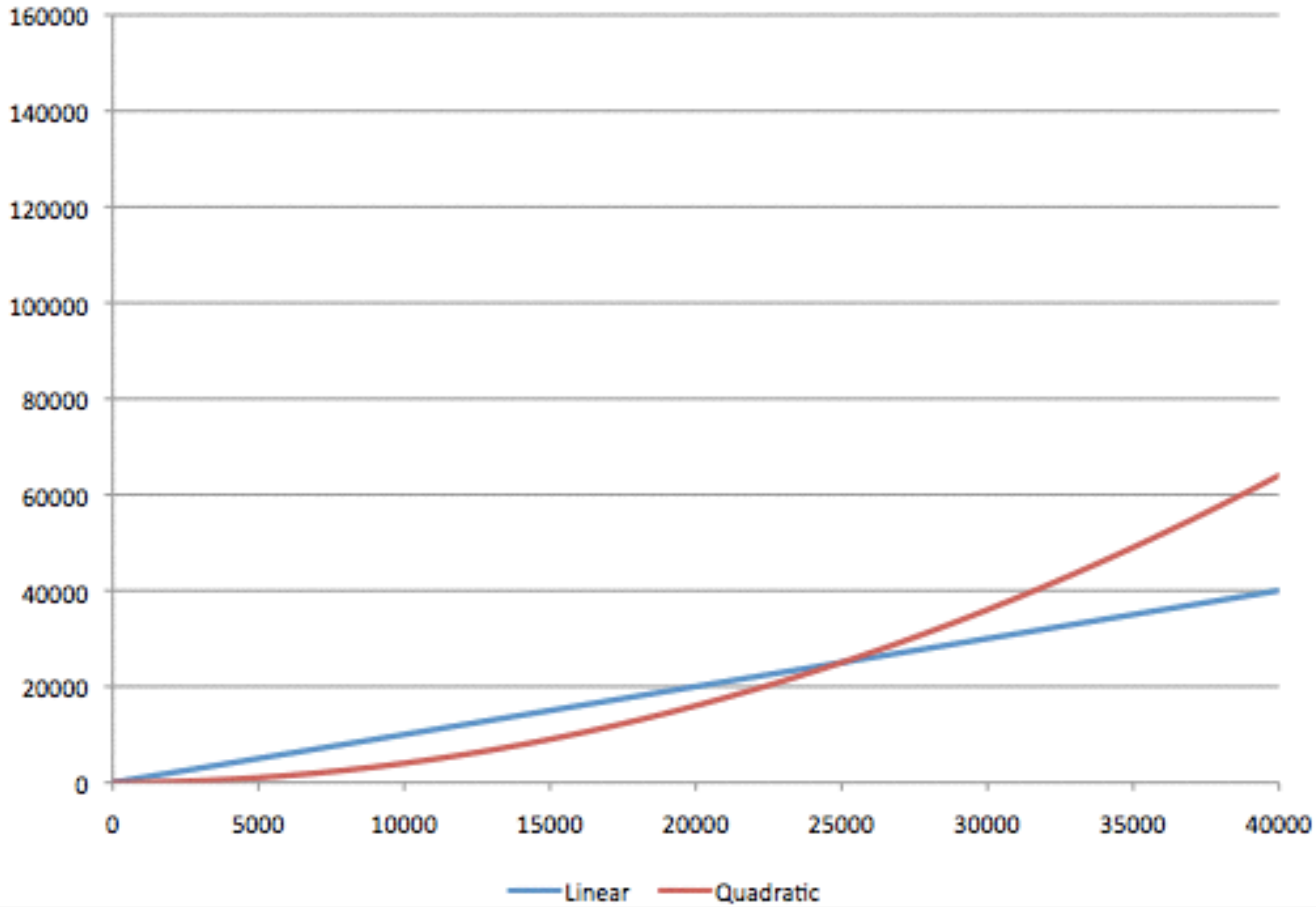
The Codfish: Resource Depletion Externality II

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; $Q = 36000$; $P = 4$
- Resource Depletion Externality: $XC = 6.5 \times 10\text{-}15 \times Q^3$



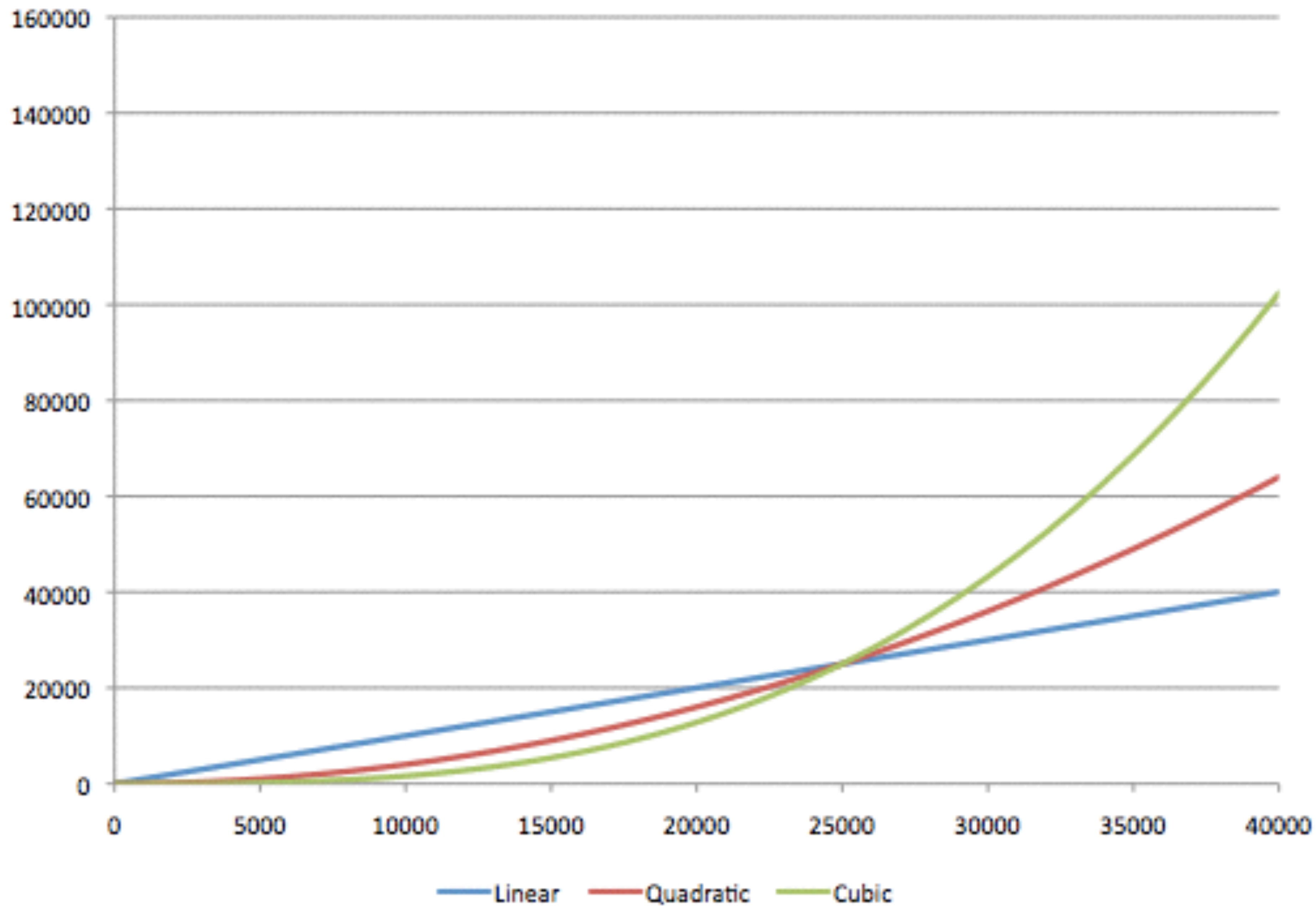
The Codfish: Resource Depletion Externality III

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; $Q = 36000$; $P = 4$
- Resource Depletion Externality: $XC = 6.5 \times 10\text{-}15 \times Q^3$



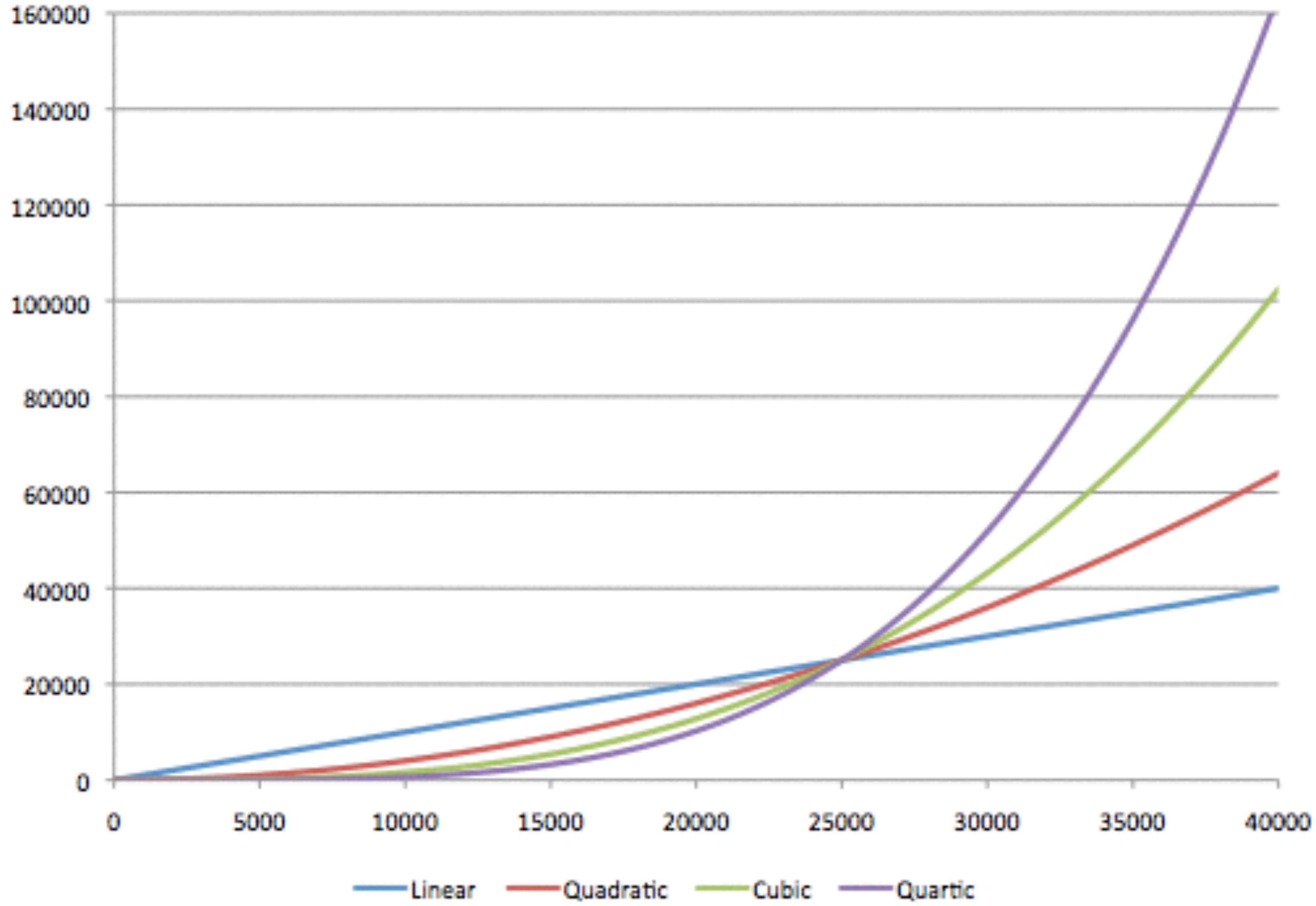
The Codfish: Resource Depletion Externality IV

- Demand: P_d = 40 - 0.001Q; Supply: P_s = 4; Q = 36000; P = 4
- Resource Depletion Externality: XC =6.5 x 10-15 x Q^3



The Codfish: Resource Depletion Externality V

- Demand: P_d = 40 - 0.001Q; Supply: P_s = 4; Q = 36000; P = 4
- Resource Depletion Externality: XC =6.5 x 10-15 x Q^3



The Codfish: Resource Depletion Externality VI

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; $Q = 36000$; $P = 4$
- Resource Depletion Externality: $XC = 6.5 \times 10^{-15} \times Q^3$
- What is the resource depletion cost at $Q = 36000$?

The Codfish: Resource Depletion Externality VII

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; $Q = 36000$; $P = 4$
- Resource Depletion Externality: $XC = 6.5 \times 10^{-15} \times Q^3$
- What is the resource depletion cost at Q = 36000?
  - $6.5 \times 10^{-15} \times Q^3 = 6.5 \times 10^{-15} \times 46{,}656{,}000{,}000{,}000$
  - $= 6.5 \times .046656$
  - 0.303

The Codfish: Resource Depletion Externality VIII

- Demand: $P_d = 40 - 0.001Q$; Supply: $P_s = 4$; Q = 36000; P = 4
- Resource Depletion Externality: $XC = 6.5 \times 10^{-15} \times Q^3$
- What is the resource depletion cost at Q = 36000?
  - $6.5 \times 10^{-15} \times Q^3 = 6.5 \times 10^{-15} \times 46{,}656{,}000{,}000{,}000$
  - = 6.5 x .046656
  - 0.303
- Much too small to worry about…

The Codfish: Resource Depletion Externality IX

- Suppose that fishers miscalculate, and in aggregate 50% of the time catch 20,000 tons more and 50% of the time catch 20,000 tons less than they had planned when they set out to sea. Would this change the amount of tax you charged? If so, why?

The Codfish: Resource Depletion Externality X

- Suppose that fishers miscalculate, and in aggregate 50% of the time catch 20,000 tons more and 50% of the time catch 20,000 tons less than they had planned when they set out to sea. Would this change the amount of tax you charged? If so, why?
    - In this case, not

The Codfish: Resource Depletion Externality XI

- Suppose that fishers miscalculate, and in aggregate 50% of the time catch 20,000 tons more and 50% of the time catch 20,000 tons less than they had planned when they set out to sea. Would this change the amount of tax you charged? If so, why?
  - In this case, not
  - In other cases, very much so…