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15.023J / 12.848J / ESD.128J Global Climate Change: Economics, Science, and Policy
Spring 2008

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The Basics of Economics

(in an hour)

15.023/12.848/ESD.128 Lecture

Feb 20, 2008

Travis Franck



Purpose of Today

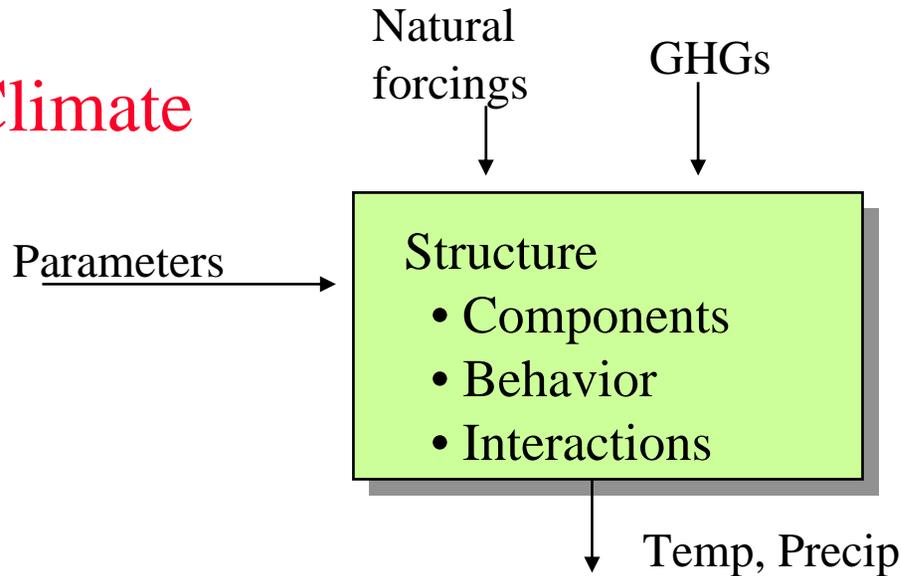
- The Flavor of Economics
 - How do economists think about problems?
 - What is the basic toolset?
 - Standard terminology
 - And a taste of the complexity involved...

Agenda

- Part 1: Overview of economic modeling
- Part 2: Basic Production functions
- Part 3: Supply and Demand
- Part 4: Bigger Picture Concepts

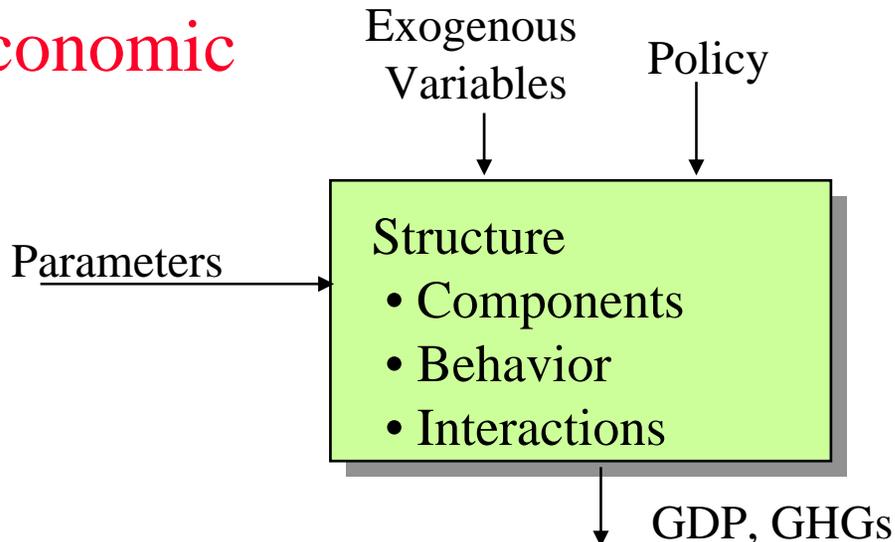
Models: Similarities

Climate



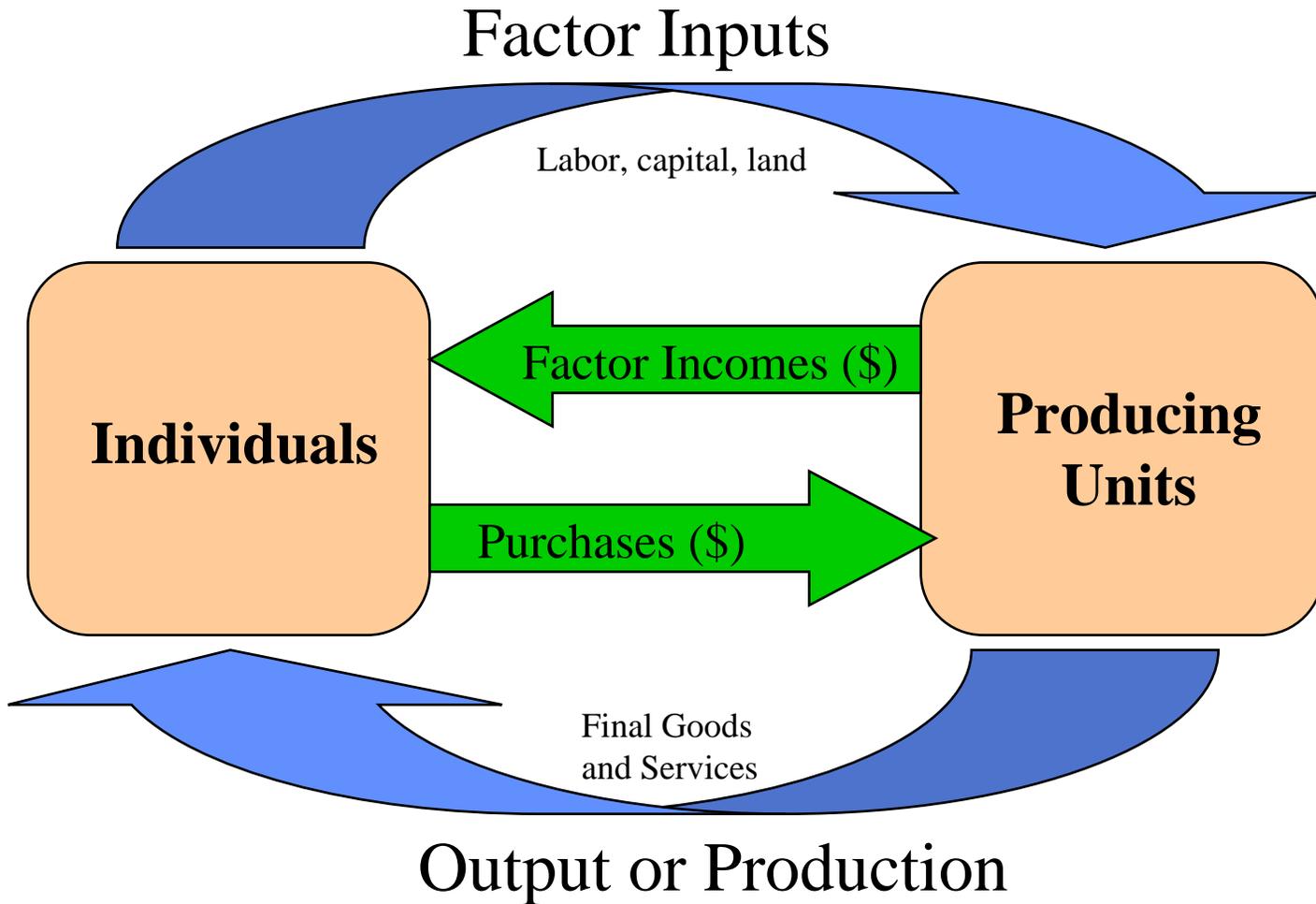
Equilibrium solution
Transient solutions
Estimation, calibration

Economic



Equilibrium solution
Dynamics (investment)
Estimation, calibration

Transactions In a Simple Economy



Basic Assumptions of Markets

- Market efficiency depends on:
 - Perfect information
 - Perfect or complete competition
 - No single entity can influence prices
 - Clear and complete property rights
 - No transaction costs
 - Rational behavior

Next Week

Market-Based vs. Technological Cost

Top-Down

- General equilibrium
 - Full economy
 - Goods, capital, labor
 - Prices endogenous
 - Factors driving growth
 - International trade
- Sacrifice technological detail
 - Production technology
 - Aggregation of sectors

vs.

Bottom-up

- Engineering cost
 - Technical detail
 - Zero-cost opportunities
- Partial equilibrium
 - Key prices exogenous
 - Omit interactions
- Direct costs, ignoring
 - Consumer surplus loss
 - Industrial structure
 - Transactions costs

Hybrids

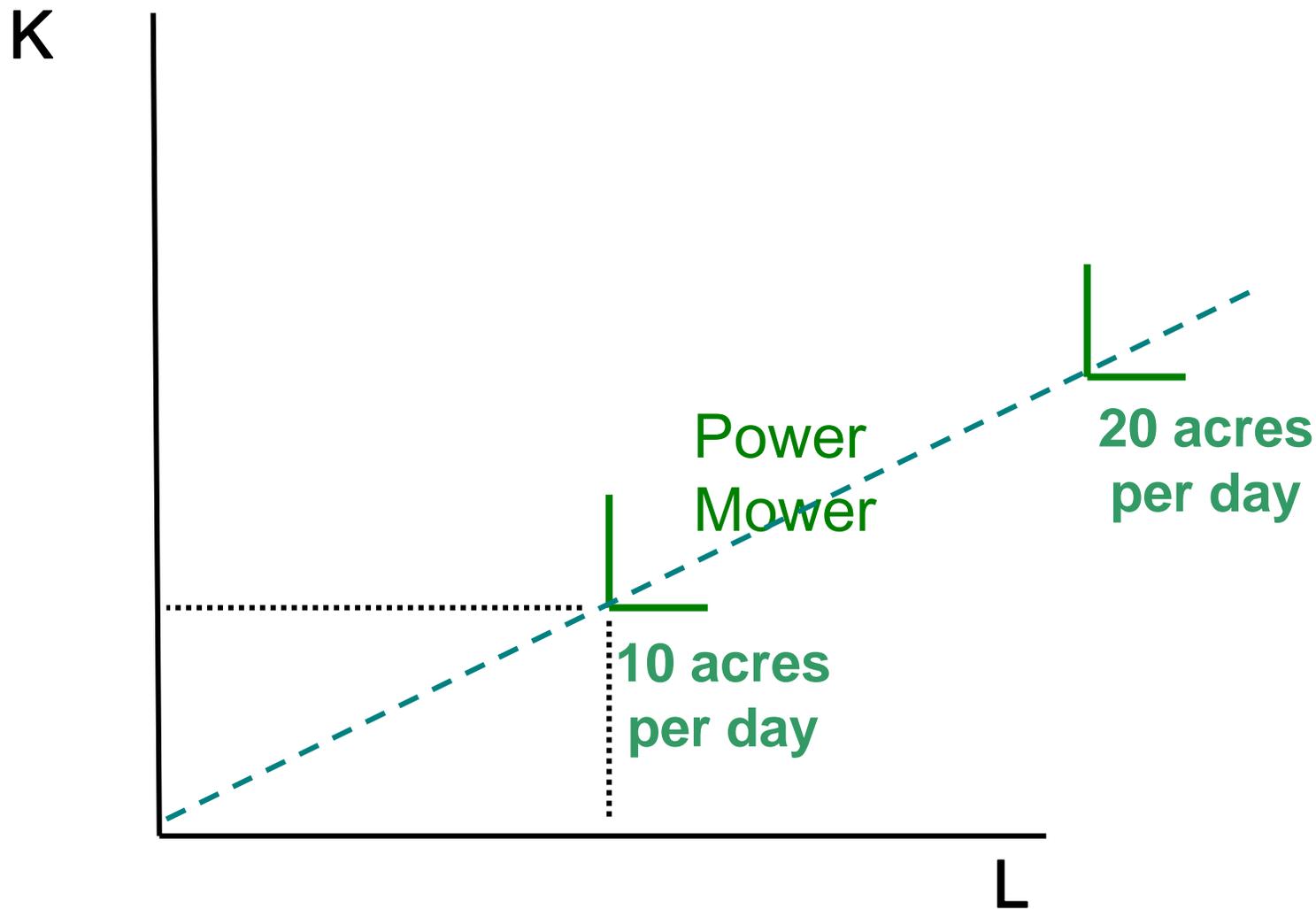
Challenges of Economic Modeling

- Invention of new technologies
- Foresight
 - Learning under uncertainty
- Consumer preferences
 - Attitudes to risk
- Values and political decisions
 - Prescriptive/descriptive dichotomy

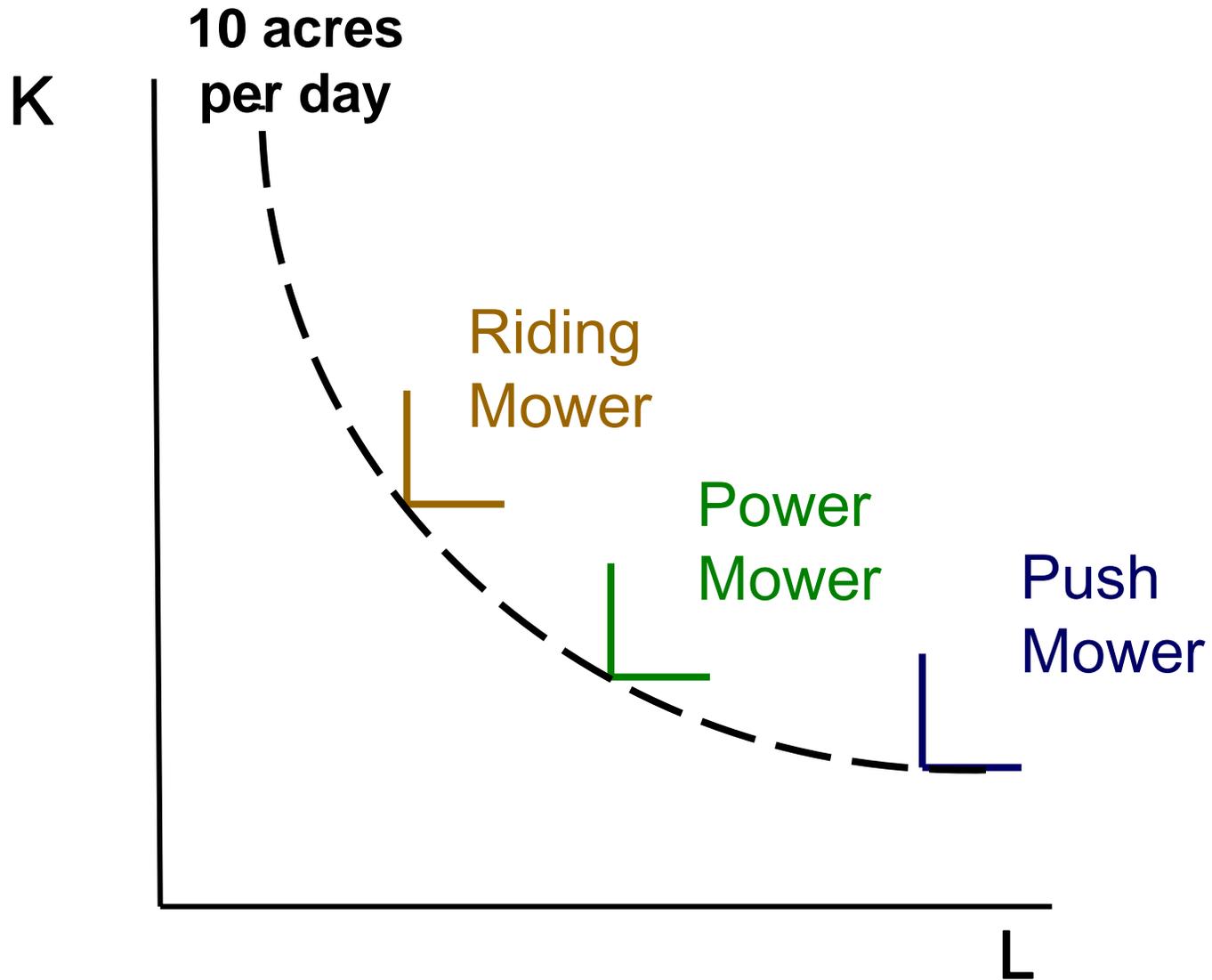
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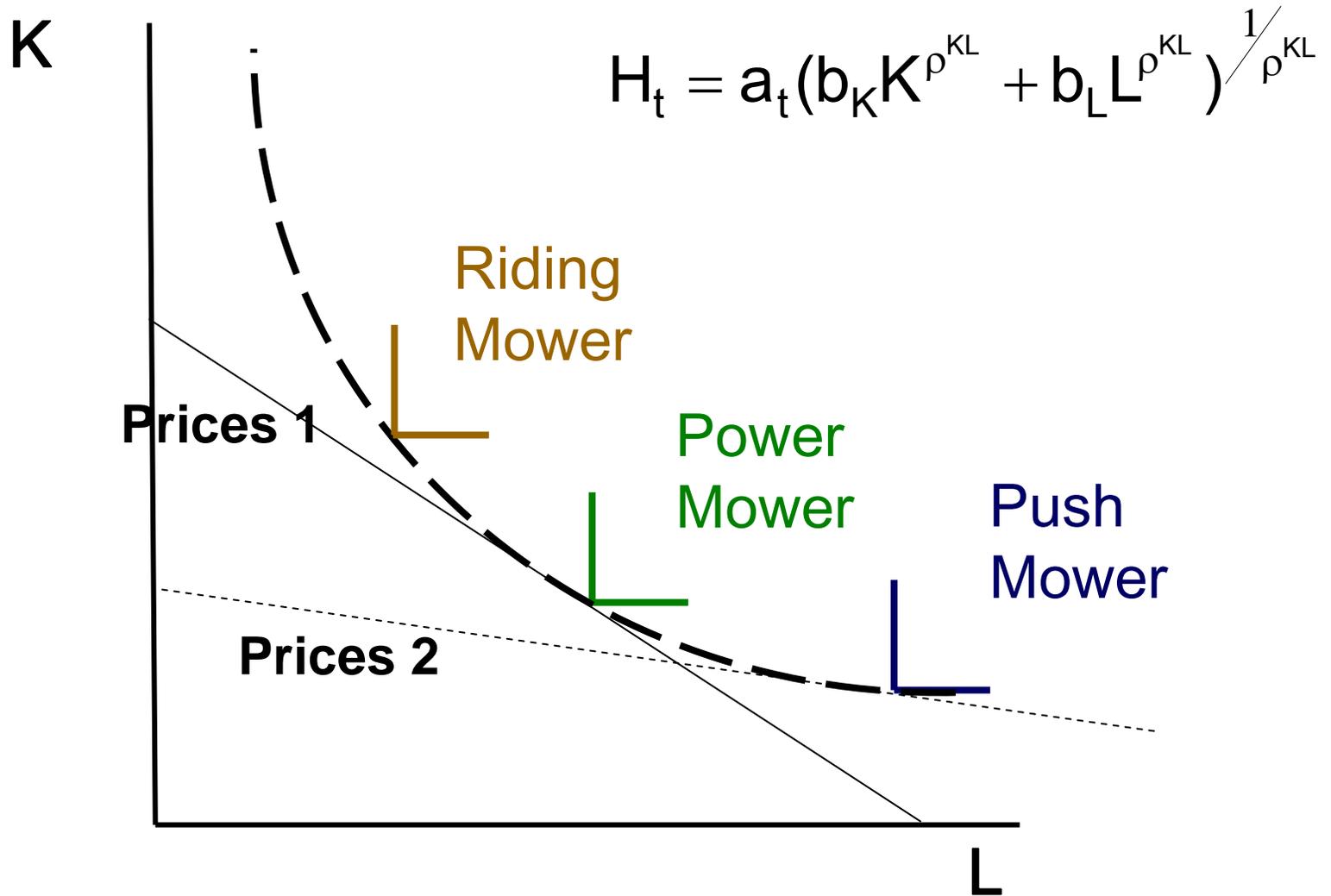
Technology: Cutting Grass



With Several Technologies



Technology Choice



Extending the Production Function

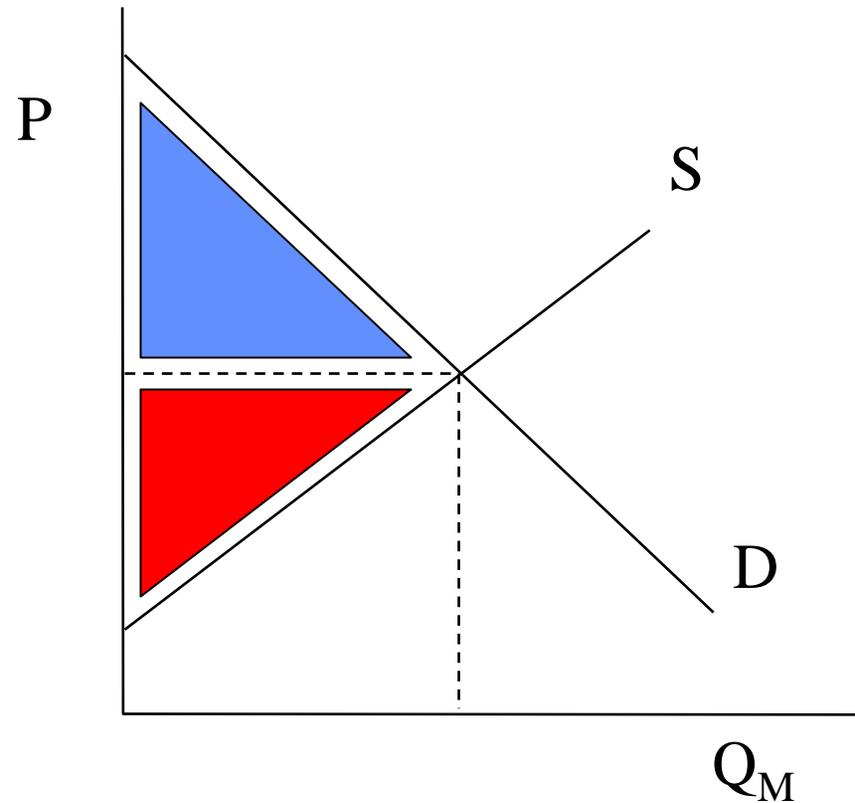
- More than just capital and labor
 - Energy, materials
 - Products of one production function can be inputs to another production function
- Extend to entire sectors
 - Eg, US agriculture

Agenda

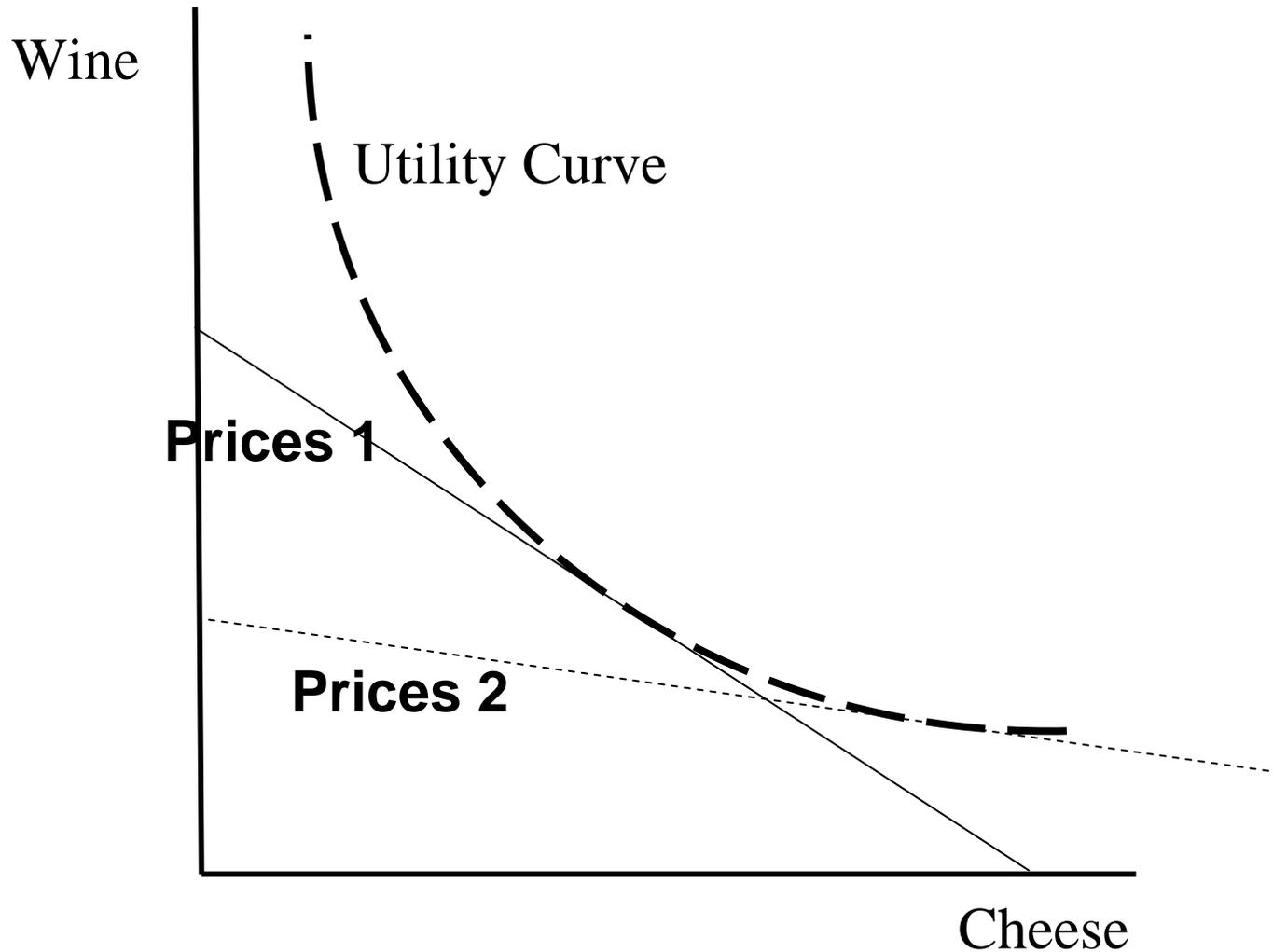
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Supply and Demand

An ideal market
maximizes societal
surplus.



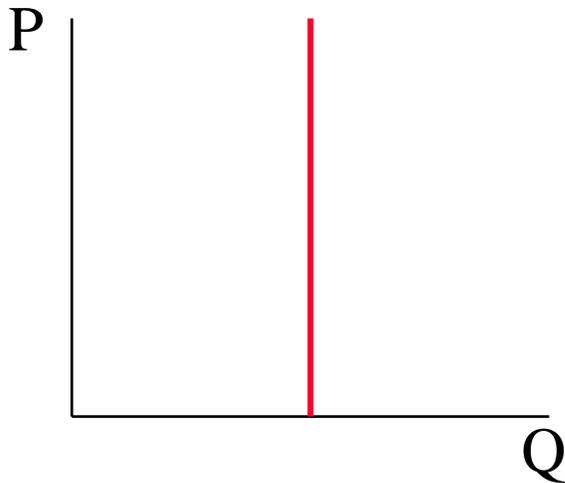
Demand Functions



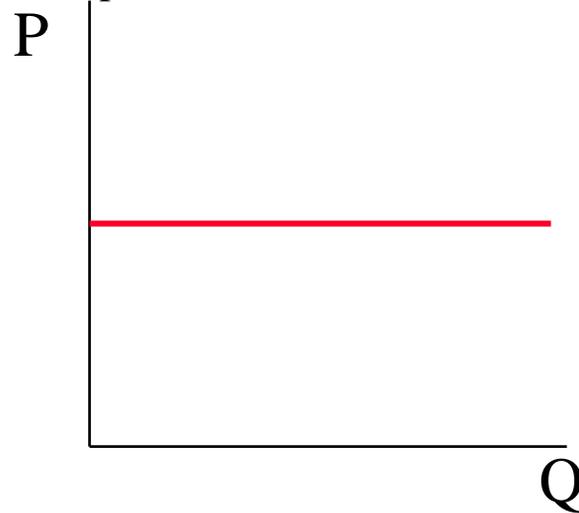
Price Elasticity of Demand

$$E_p = \frac{(\Delta Q / Q)}{(\Delta P / P)}$$

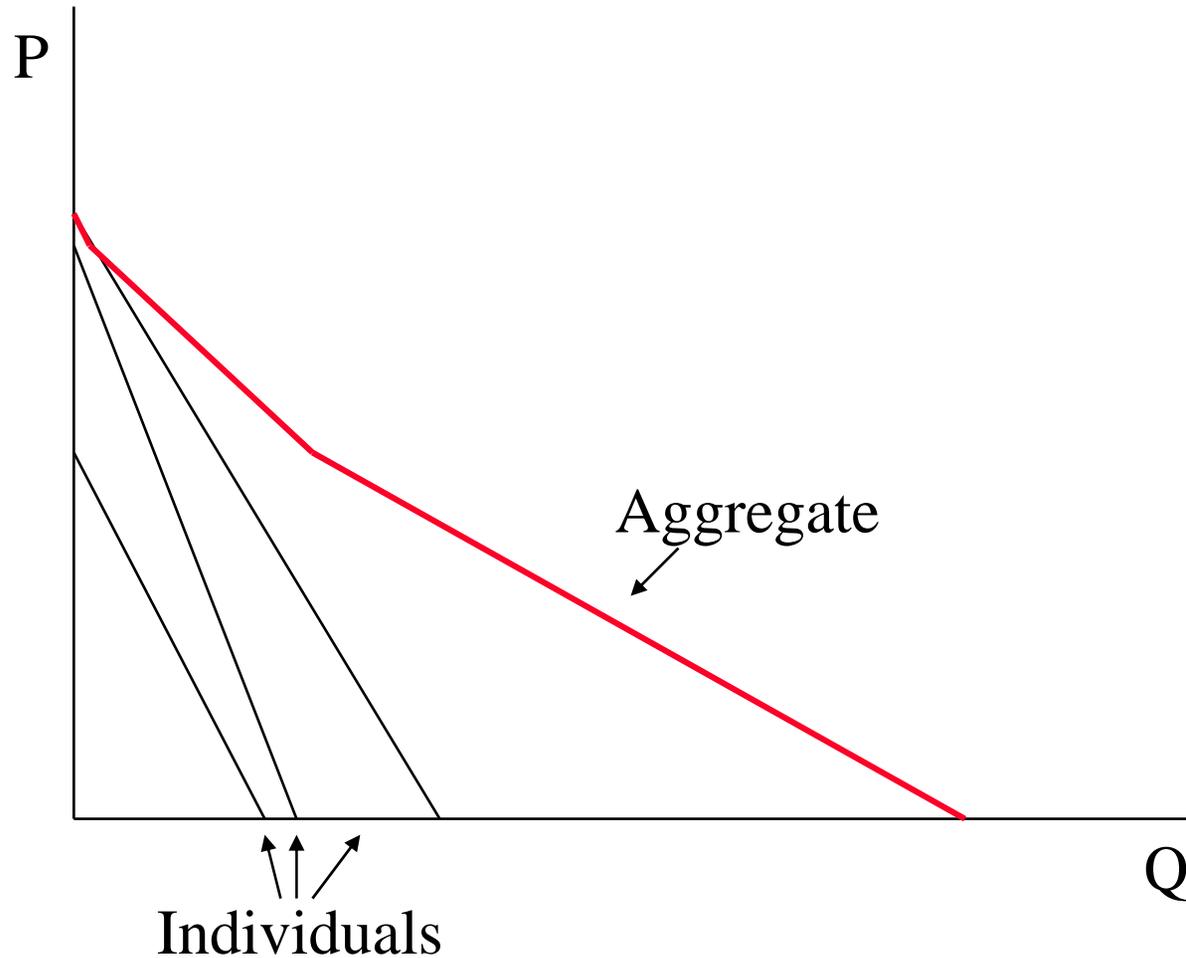
$E_p = 0$ (Inelastic)



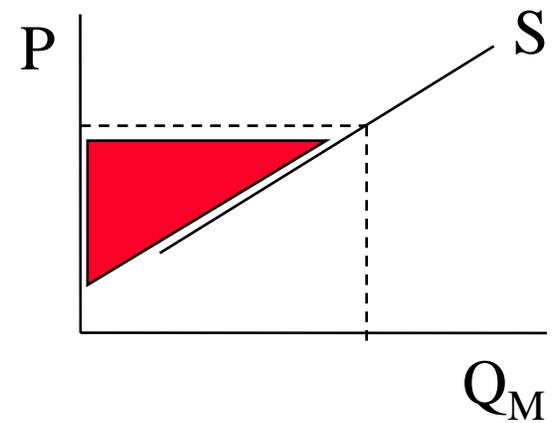
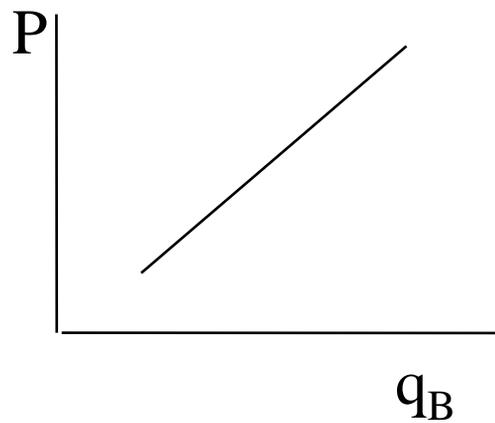
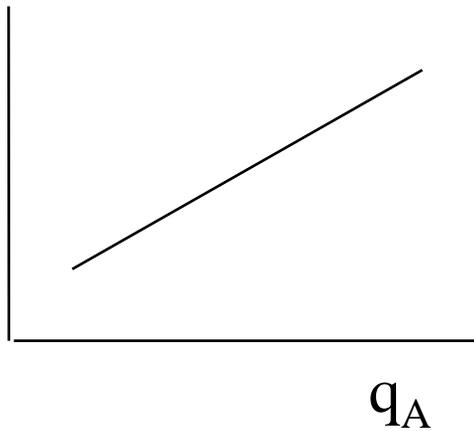
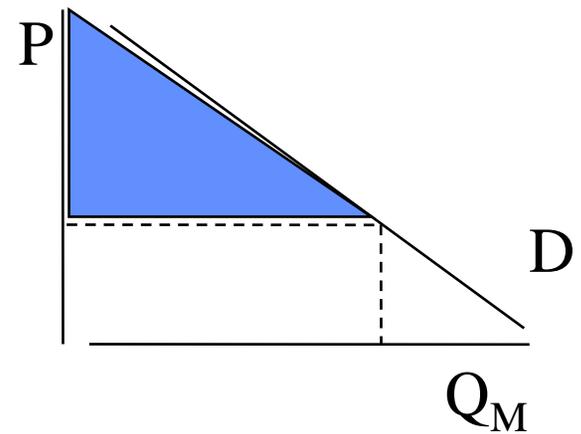
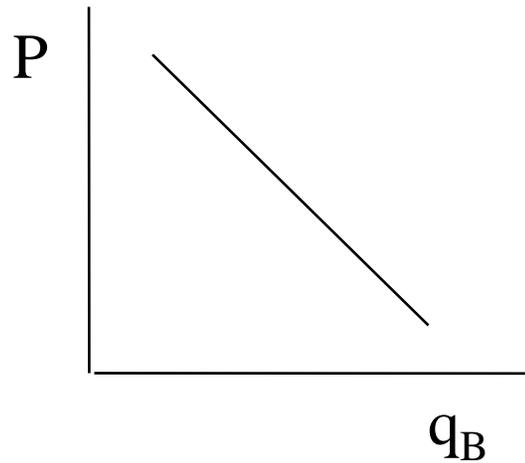
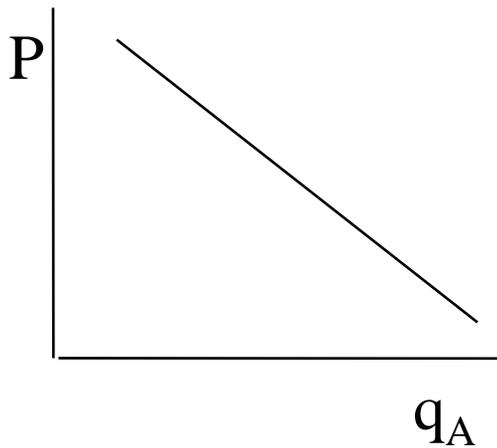
$E_p = \text{infinite}$ (elastic)



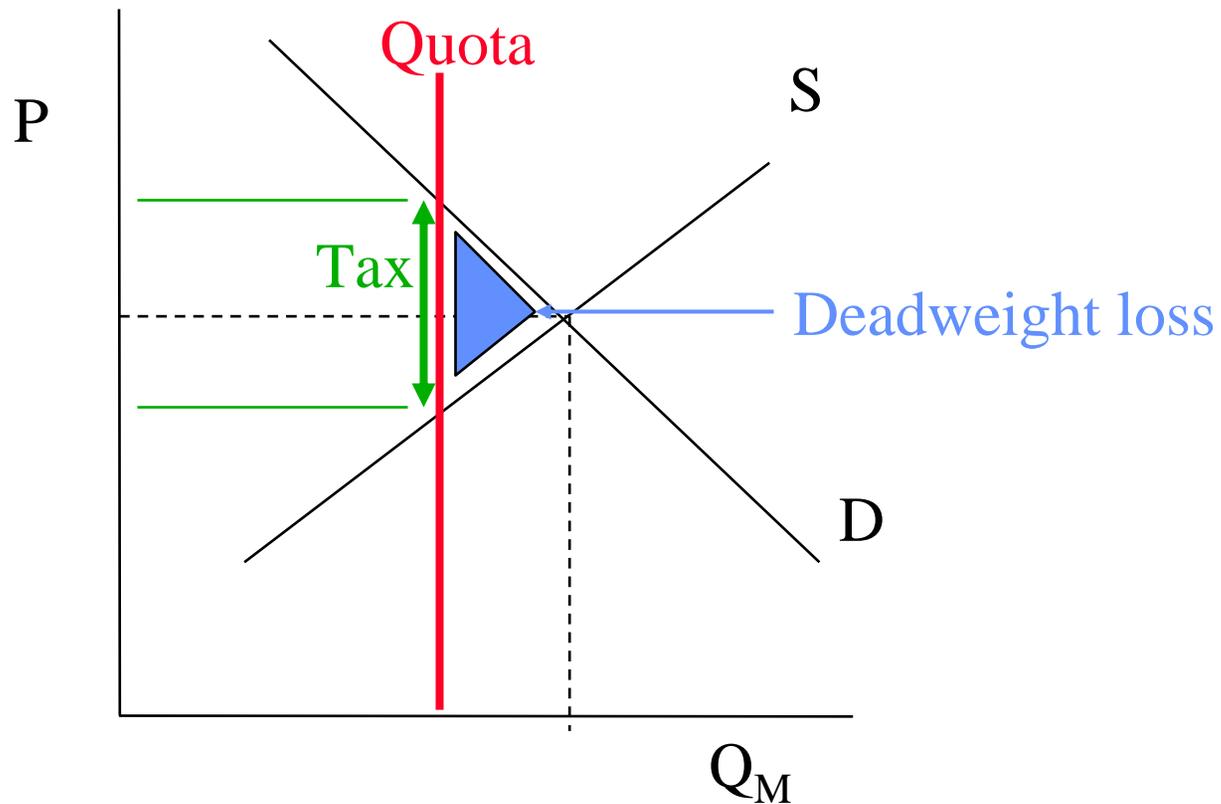
Aggregating Demand Functions



Consumer/Producer “Surplus”



Taxes, Quotas, and Surplus Effects



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General Equilibrium

- Supply/demand relationships do not exist in a vacuum.
 - If the US were to put a \$2 tax on gasoline what would happen?
 - 1st: Solve supply/demand equation for gasoline. Reduction in gasoline usage, reduction in gasoline price
 - In the US, goods that use gasoline as an intermediate will increase in price
 - Outside the US, lower gasoline prices will lead to increased consumption (“leakage”)
 - Eventually, consumers will move in order to drive less
 - Propagate changes until a new equilibrium is reached

Discount Rate

- Composed of:
 - Rate of Time preference
 - Marginal productivity of capital * marginal utility of money
- Discount Rate is not Inflation: we use “constant” dollars
- Usual expression:

$$B_t = (1 + r)^{-t}$$

- Net Present Value = sum of all time periods, appropriately discounted.
- Value judgment? Revealed preference? Long time horizon?

Cost/Benefit Analysis

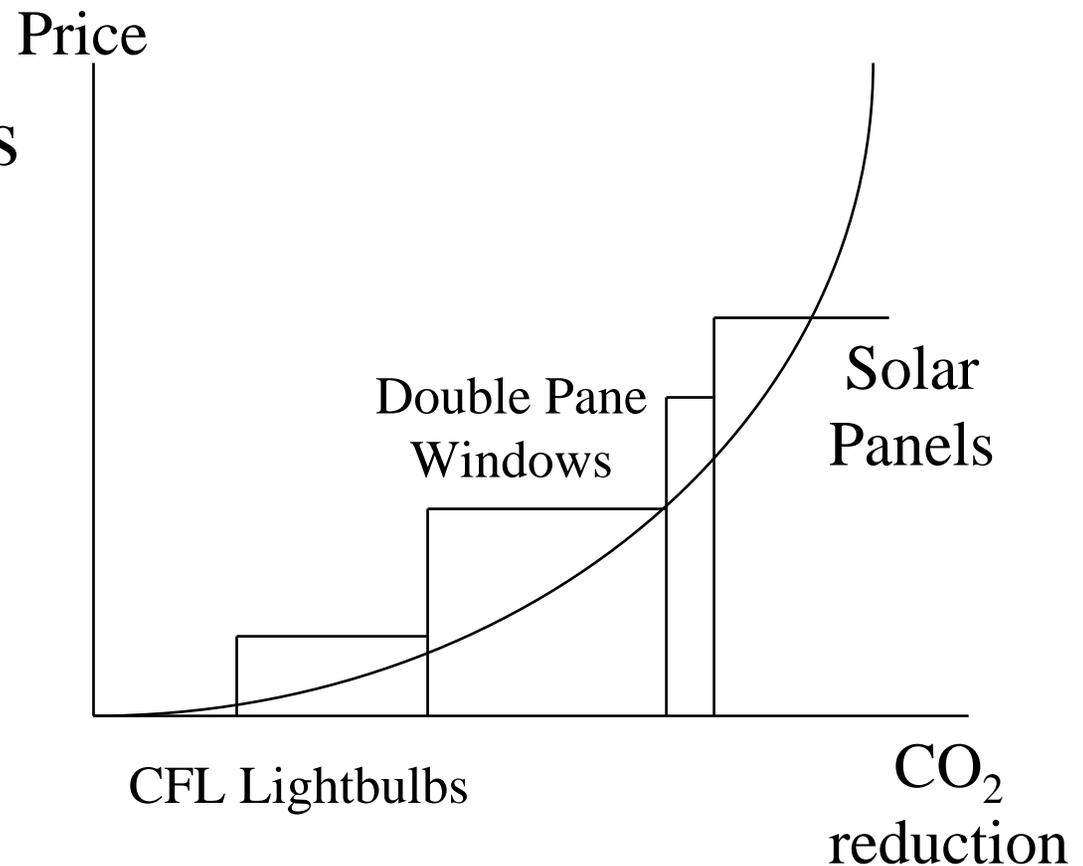
- Cost of a decision
 - Money spent, opportunity cost
- Benefit
 - Calculate quantity abated
 - Discount rate
- The total benefit minus total cost is maximized at the point where the marginal cost = marginal benefit
- Valuation
 - Revealed preferences, value of a human life, existence value, etc
 - But every decision has an implicit valuation

Opportunity Cost

- Most valuable alternative use of resource
 - Time, money, capital
 - Owning vs. renting
 - Opportunity cost of watching a free movie

Marginal Abatement Cost

- “MAC curve”
- Include all options for reduction, ordered by price, with quantity available at that price



Questions?

- (next week: Environmental Economics)