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**
- Parameters
- Structure
  - Components
  - Behavior
  - Interactions
  - Equilibrium solution
  - Transient solutions
  - Estimation, calibration
- Natural forcings
- GHGs
- Temp, Precip

**Economic**
- Parameters
- Structure
  - Components
  - Behavior
  - Interactions
  - Equilibrium solution
  - Dynamics (investment)
  - Estimation, calibration
- Exogenous Variables
- Policy
- GDP, GHGs
Transactions In a Simple Economy

Factor Inputs

Labor, capital, land

Individuals

Factor Incomes ($)

Producing Units

Purchases ($)

Final Goods and Services

Output or Production
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
<table>
<thead>
<tr>
<th>Market-Based vs. Technological Cost</th>
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<tbody>
<tr>
<td><strong>Top-Down</strong></td>
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<tr>
<td>• General equilibrium</td>
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<td>– Full economy</td>
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<tr>
<td>• Goods, capital, labor</td>
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<td>– Prices endogenous</td>
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<td>– Factors driving growth</td>
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<td>– International trade</td>
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<td>• Sacrifice technological detail</td>
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<td>– Production technology</td>
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<td>– Aggregation of sectors</td>
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<tr>
<td><strong>vs.</strong></td>
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<td><strong>Bottom-up</strong></td>
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<td>• Engineering cost</td>
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<td>– Technical detail</td>
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<td>– Zero-cost opportunities</td>
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<tr>
<td>• Partial equilibrium</td>
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<tr>
<td>– Key prices exogenous</td>
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<tr>
<td>– Omit interactions</td>
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<tr>
<td>• Direct costs, ignoring</td>
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<tr>
<td>– Consumer surplus loss</td>
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<tr>
<td>– Industrial structure</td>
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<td>– Transactions costs</td>
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**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
Agenda

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• Part 2: Basic Production functions
• Part 3: Supply and Demand
• Part 4: Bigger Picture Concepts
Technology: Cutting Grass

K

L

Power Mower

20 acres per day

10 acres per day
With Several Technologies

- 10 acres per day
- Riding Mower
- Power Mower
- Push Mower
Technology Choice

\[ H_t = a_t \left( b_K K^{\rho_{KL}} + b_L L^{\rho_{KL}} \right)^{\frac{1}{\rho_{KL}}} \]
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
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An ideal market maximizes societal surplus.
Demand Functions

Wine

Price 1

Utility Curve

Price 2

Cheese
Price Elasticity of Demand

\[ E_p = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} \]

\( E_p = 0 \) (Inelastic)

\( E_p = \text{infinite} \) (elastic)
Aggregating Demand Functions
Consumer/Producer “Surplus”
Taxes, Quotas, and Surplus Effects

Diagram showing the effects of a quota and a tax on a market with supply (S) and demand (D) curves. The quota and tax are marked on the price (P) and quantity (QM) axes, respectively. The blue triangle represents the deadweight loss due to the quota and tax.
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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

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<th>Price</th>
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<tr>
<td>CFL Lightbulbs</td>
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<td>Double Pane Windows</td>
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<td>Solar Panels</td>
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$\text{CO}_2$ reduction
Questions?

- (next week: Environmental Economics)