

Overview of Economic Theory and Methods

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Tuesday – September 22, 2009

Session goals

- Get familiar with basic concepts of economics
- Get familiar with basic methods of economics
- Understand why this is important to understand

Reality check

- Can't teach economics in couple of hours
- How much do you need to know?
- Some people think economists think differently than other people --that is NOT true
- Other people think differently than economists

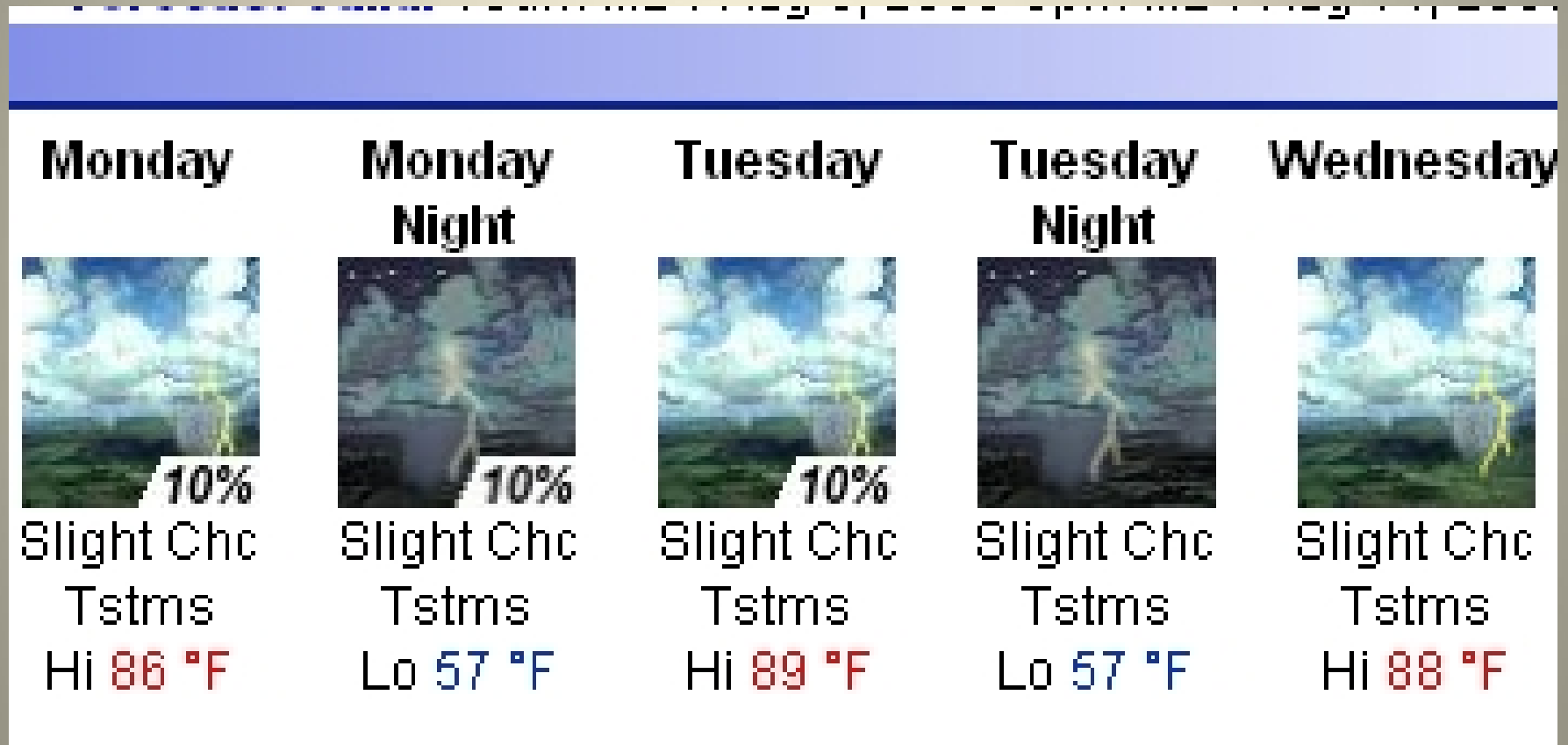
http://www.the-eggman.com/writings/death_stats.html

Cause of Death/Age Range	All Ages	
Total Number of Deaths	2,403,351	100%
Major Cardiovascular Diseases	936,923	39.00%
Malignant Neoplasms	553,091	23.00%
Chronic Lower Respiratory Dis.	122,009	5.10%
Diabetes Mellitus	69,301	2.90%
Influenza and Pneumonia	65,313	2.70%
Alzheimers	49,558	2.10%
Motor Vehicle Accidents	43,354	1.80%
Renal Failure	36,471	1.50%
Septicemia	31,224	1.30%
Firearms	28,663	1.20%
Weather related fatalities ('97-'02		
aver.)	1,935,493	0.08025%

How much did you pay for the shoes you are wearing?



How much did you pay for the weather forecast you got this morning?



Why value forecasts?

- Program justification
 - benefit-cost analysis
- Program evaluation
- Guidance for research investment
 - any cases of true comparative analysis?
- Inform users of forecast benefits
- Developing end-to-end-to-end forecast and warning system

Basic Economics

- Topics:
 - value theory
 - consumers and producers
 - supply and demand
 - markets and prices
 - consumer surplus
 - producer surplus
 - net societal welfare
 - market failures
 - value of information

What is value?

Economics is the study of “value.”

First and foremost economic theory is a theory of value.

Study of how “agents” make decisions based on value.

Value is defined by an “objective function.”

Decisions are derived from maximizing this objective subject to constraints.

What is value?

- Nelson and Winter, Technical change in an evolutionary model, Quarterly Journal of Economics, 1976
- Sonia's citations of original articles from meteorology
- Cost-loss model

		Forecast	
		Frost	No Frost
Action	Protect	-C (lost cost)	-C (lost cost)
	Don't Protect	-L (lost crop)	0

What is value?

- Economic values and societal impacts, e.g.,
 - accounting values?
 - revenues and costs?
 - lives saved
 - time saved
 - value of environmental resources
 - impacts on vulnerable populations

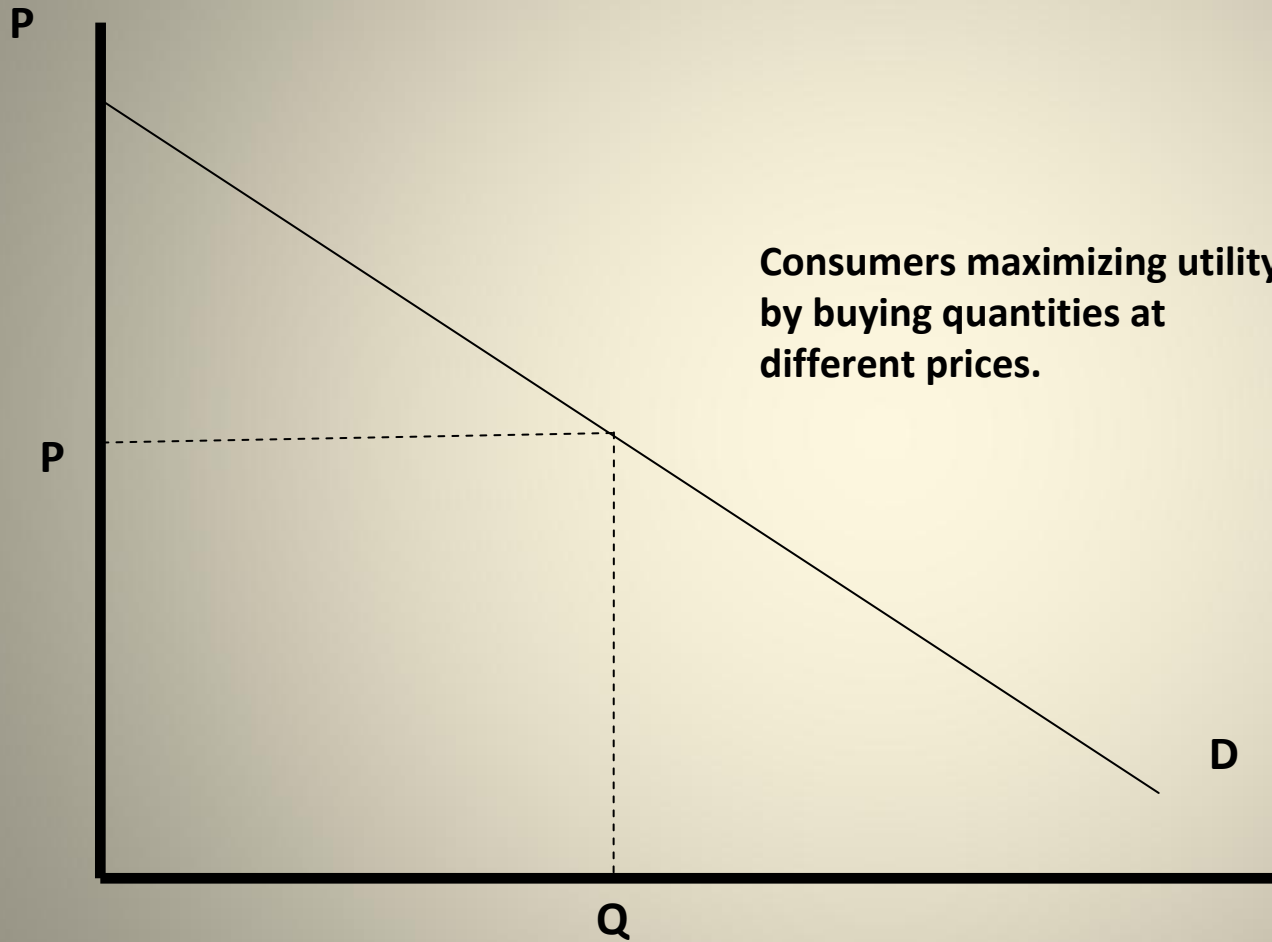
Basic economic model

- Three "economic agents"
 1. Consumers
 2. Producers
 3. Government
- Assumptions
 1. People have rational preferences
 2. Individuals maximize utility
 3. Firms maximize profits
 4. Agents act independently using full information
- Neoclassical theory includes or extends to:
 - Competitive equilibrium
 - Non-market and intrinsic values
 - Social welfare theory (incl. benefit-cost analysis)
 - Value of information (VOI)

Basic Economic Model - Consumer

- Producer Perspective
 - Maximize utility subject to income constraint
- Firms take income and prices of goods as given
- Will buy and consumer more as long as price paid is less than cost of purchasing
 - buy more as long as price is less than marginal benefit
 - demand curve
- Total benefit = Sum of marginal benefits
- Expenditures = price x quantity
- Consumer surplus = total benefit minus total expenditure

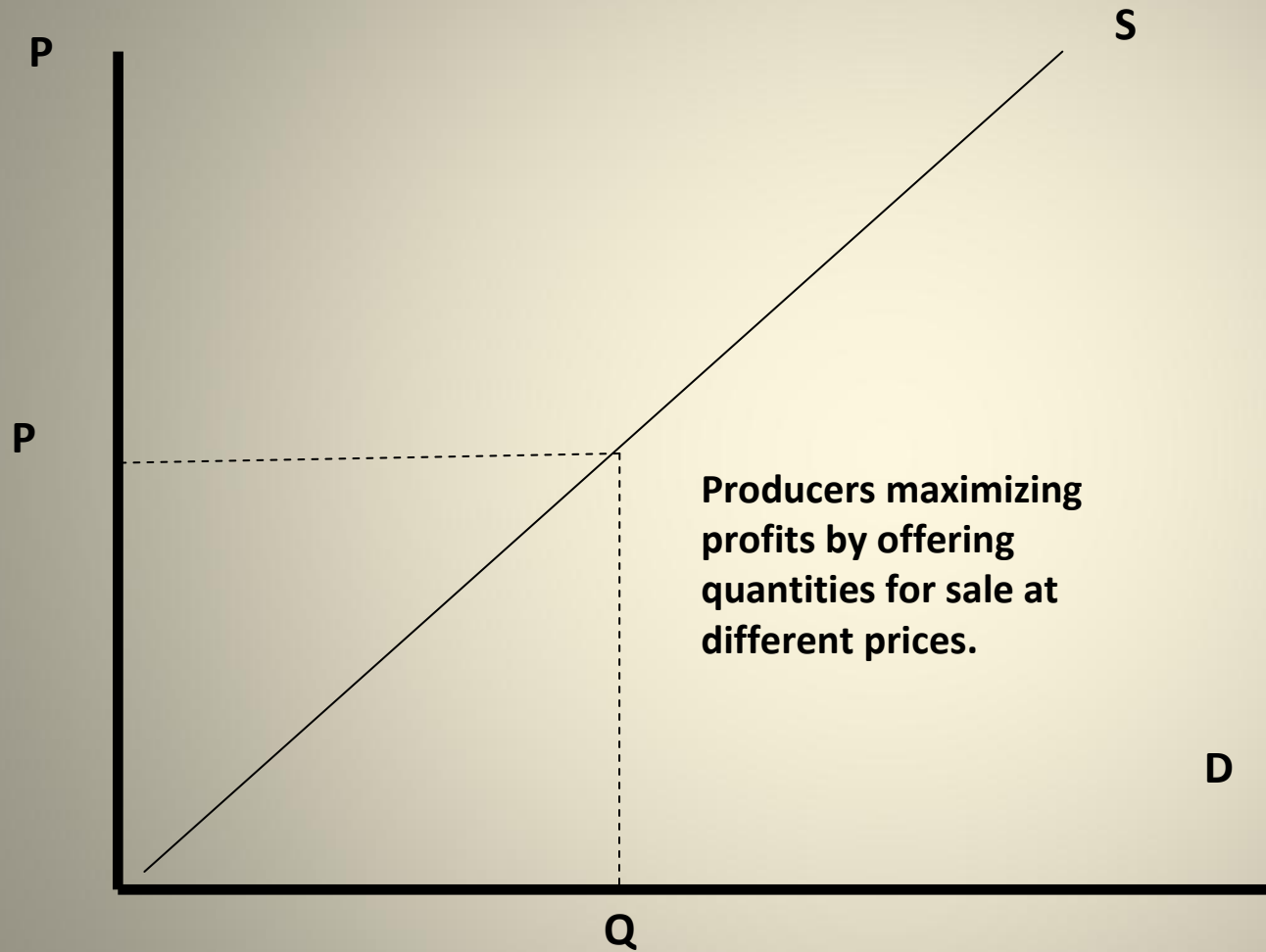
Basic Economic Model



Basic Economic Model - Producer

- Producer Perspective
 - Maximize profits subject to technology
- Firms take prices of inputs as given (capital, labor, energy, materials; weather forecasts)
- Will produce and sell more as long as price received is greater than cost of producing
 - sell more as long as price is more than marginal cost
 - supply curve
- Total cost = Sum of marginal costs
- Revenue = price x quantity
- Producer surplus = total revenue minus total costs

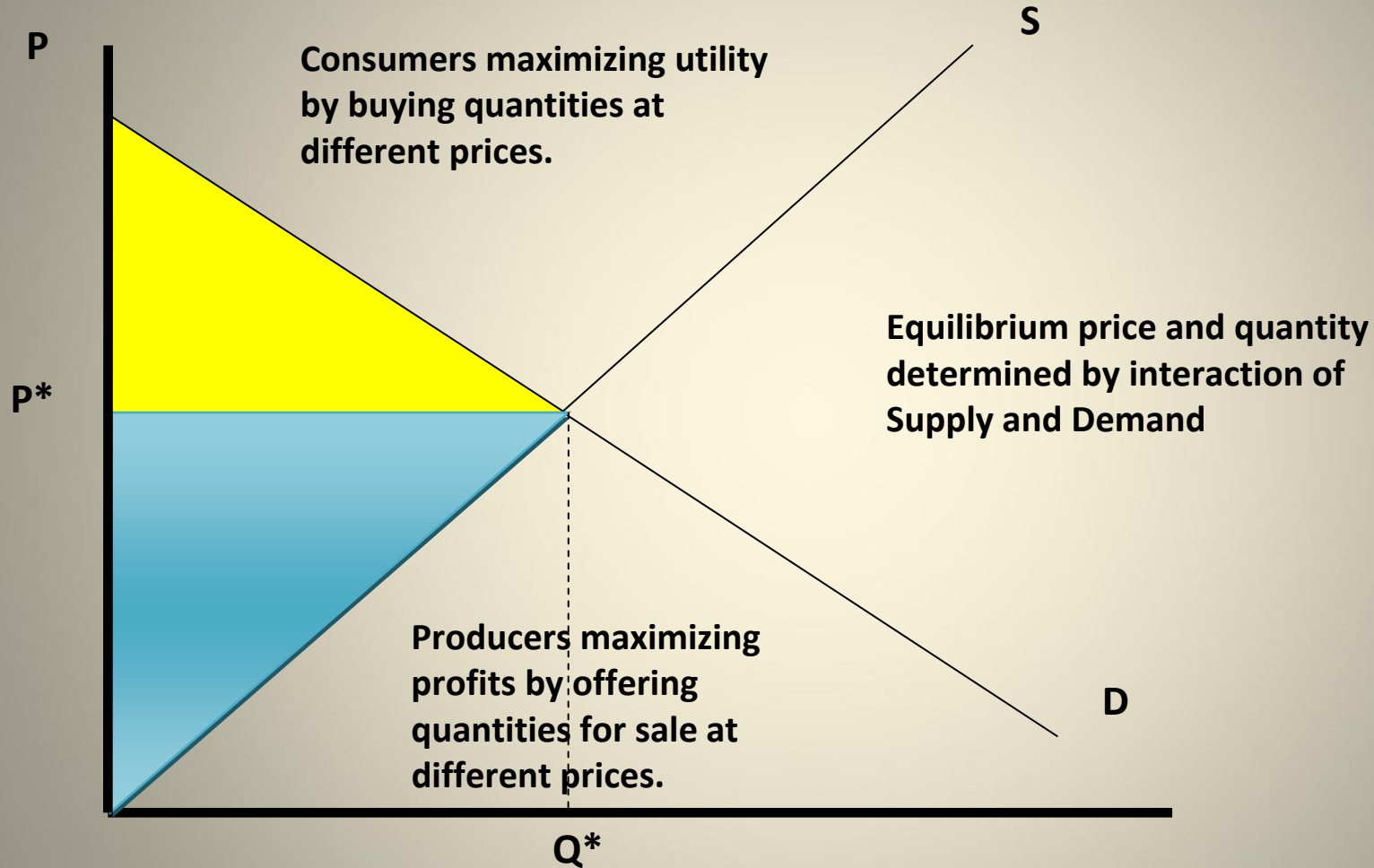
Basic Economic Model



Basic Economic Model - The Market

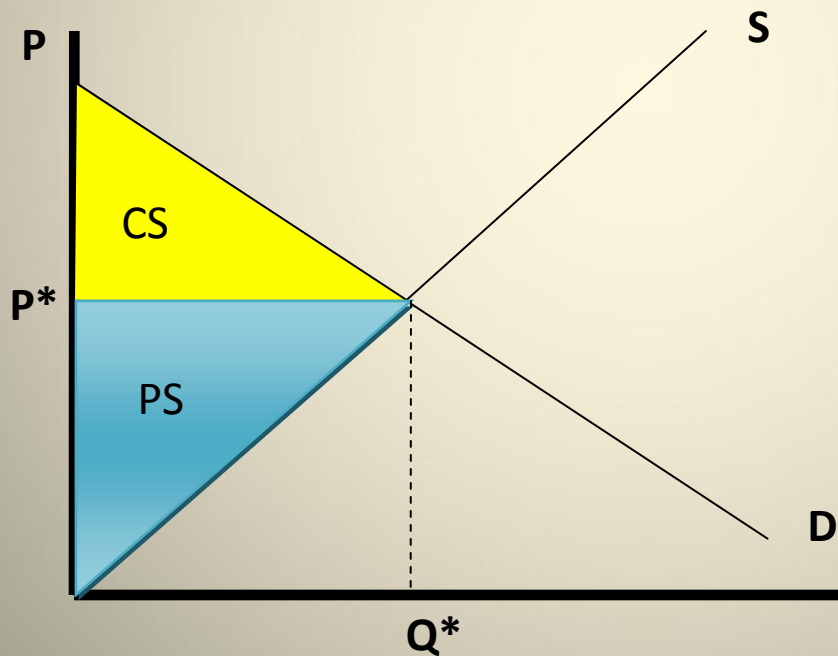
- Market Perspective
- Consumers and producers interact independent of each other
- Equilibrium market price and quantity
- Producer not willing to sell more at the market price
- Consumers not willing to buy more at that market price

Basic Economic Model



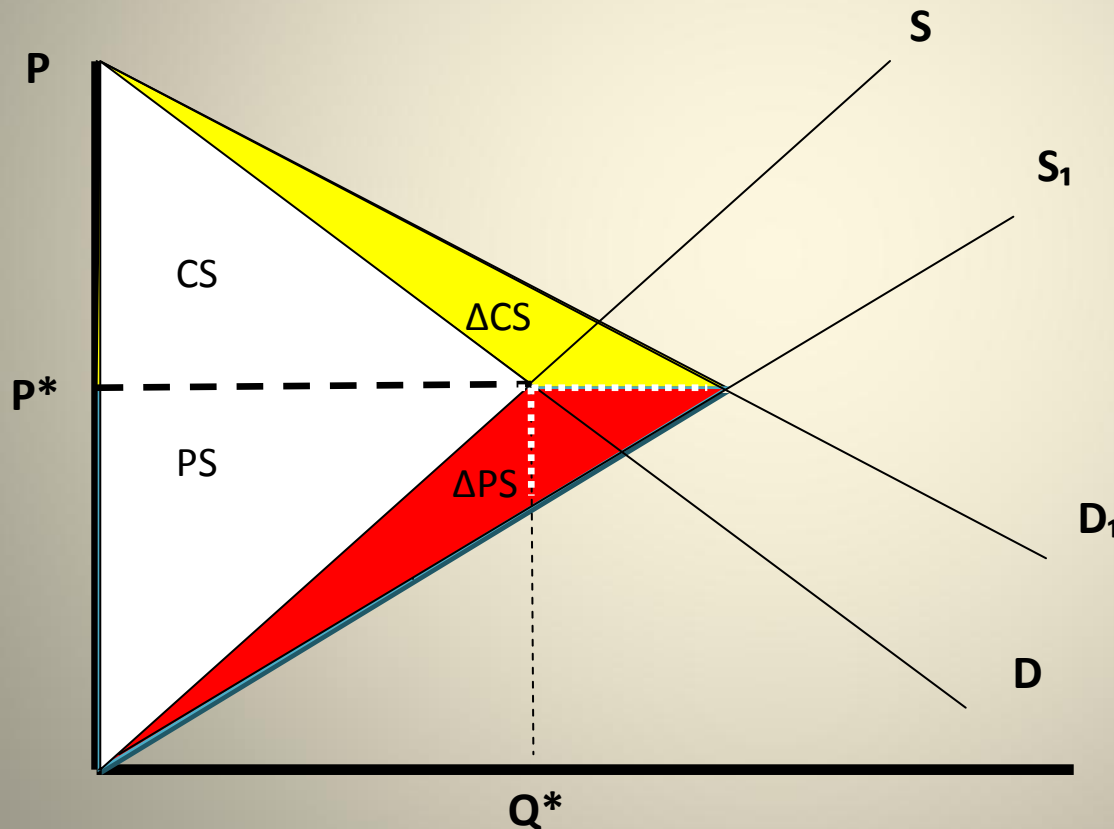
Basic Economic Model

- Total social benefit = Consumer benefit + Producer Benefit



Basic Economic Model

- What is a change in value from change in factors affecting supply and demand?



Basic Economic Model

Willingness to Pay (WTP)

- Neo-classical economics --utility theory

Problem

$$U = U(X_1, X_2; w^1) \text{ s.t. } P_1X_1 + P_2X_2 \leq Y^1$$

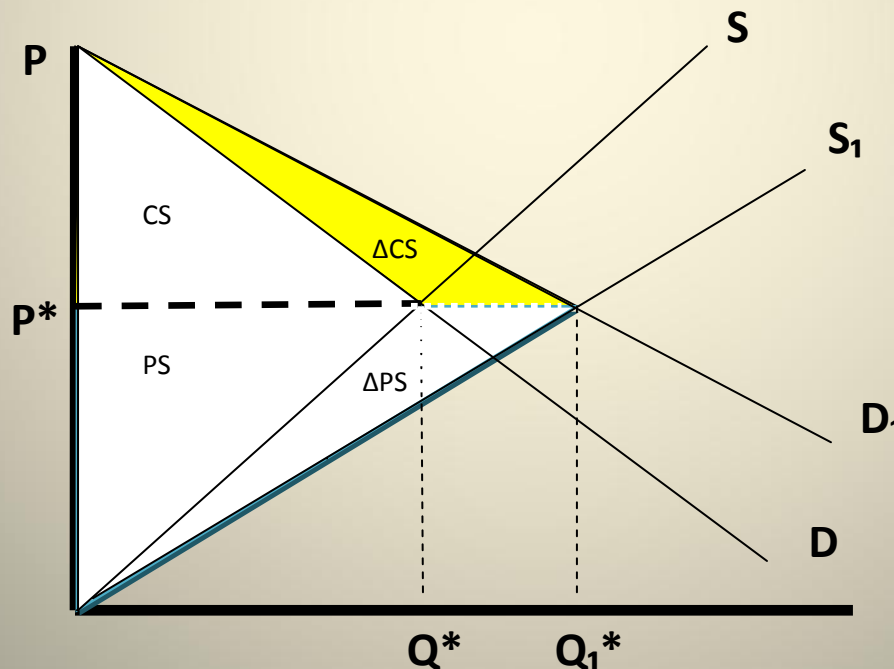
Choose X_1 and X_2

$$U^1 = V(Y^1, \bar{P}, w^1)$$

$$V(Y^1, \bar{P}, w^1) = V(Y^1 - WTP, \bar{P}, w^2) \text{ and } w^1 \succ w^2$$

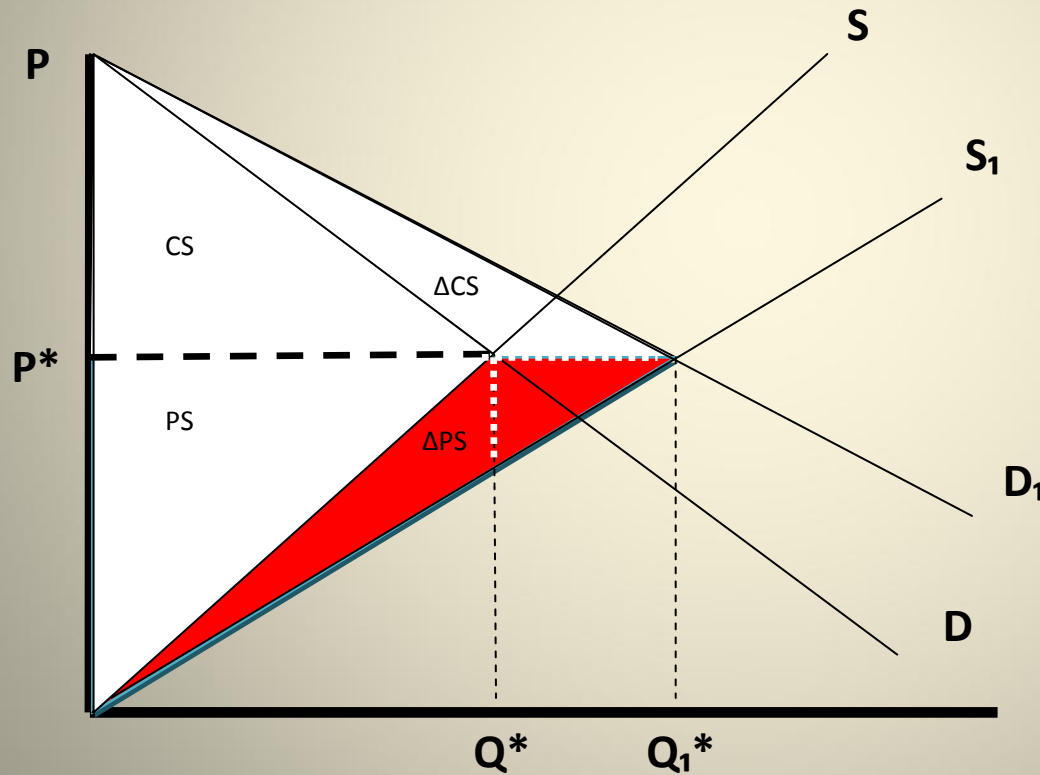
Basic Economic Model

- WTP: How much income could be taken away from the individual who receives improved weather forecasts while keeping him at the same level of utility
- $V(Y^1, \bar{P}, w^1) = V(Y^1 - WTP, \bar{P}, w^2)$



Basic Economic Model

- $V(Y^1, \bar{P}, w^1) = V(Y^1 - WTP, \bar{P}, w^2)$
- $\Delta PS = WTP$



Market failures

- Public goods
- Market power
- Externalities
- Information
- All these provide economic justification for government intervention in market system

Basic Economic Model

Public goods

- Weather forecasts are public goods
- Public good is:
 - Nonrival: One person's use of the good does not reduce the value of that good to someone else (e.g. one person knowing what the high temperature forecast for tomorrow does not reduce the value to someone else of also knowing it)
 - Nonexclusive: Once the good is provided it cannot be excluded from anyone who would like to use it (it is not worth the cost to exclude someone from using the forecast)

Basic Economic Model

Public goods

- Problems of public goods
 - No observable price information
 - No provision by private markets
- Producers cannot prevent anyone from using the weather forecast once it is provided.
- Because they cannot prevent anyone from using it, they cannot charge a price and collect revenue and thus will not provide the good in the first place.

Basic Economic Model Solution ?

How to deal with public goods?

- Government provision
- Subsidies and joint products
- Introduce exclusion mechanism

- Exclusion mechanism for weather forecasts
- Weather forecast are a quasi-public good or semi-public good

What Should Be Valued?

- Weather impacts
 - Dutton - \$3T US
- Forecasts
- Improved forecasts
- Research to improve forecasts
- How forecasts are used

No information	Climatology	Persistence	Current information	Improved information	Perfect information			

Take home messages

- Rigorous economic theory - theory of value
- Economic values are not the same as accounting values
- Weather forecasts are (quasi-) public goods
- Private sector will not provide the societally optimal level of weather forecasts
- Markets will not provide information about the societal value of weather forecasts