VALUING BENEFITS AND COSTS IN PRIMARY MARKETS

EE465/EE463 Project Evaluation

Semester 2/2014

Topics

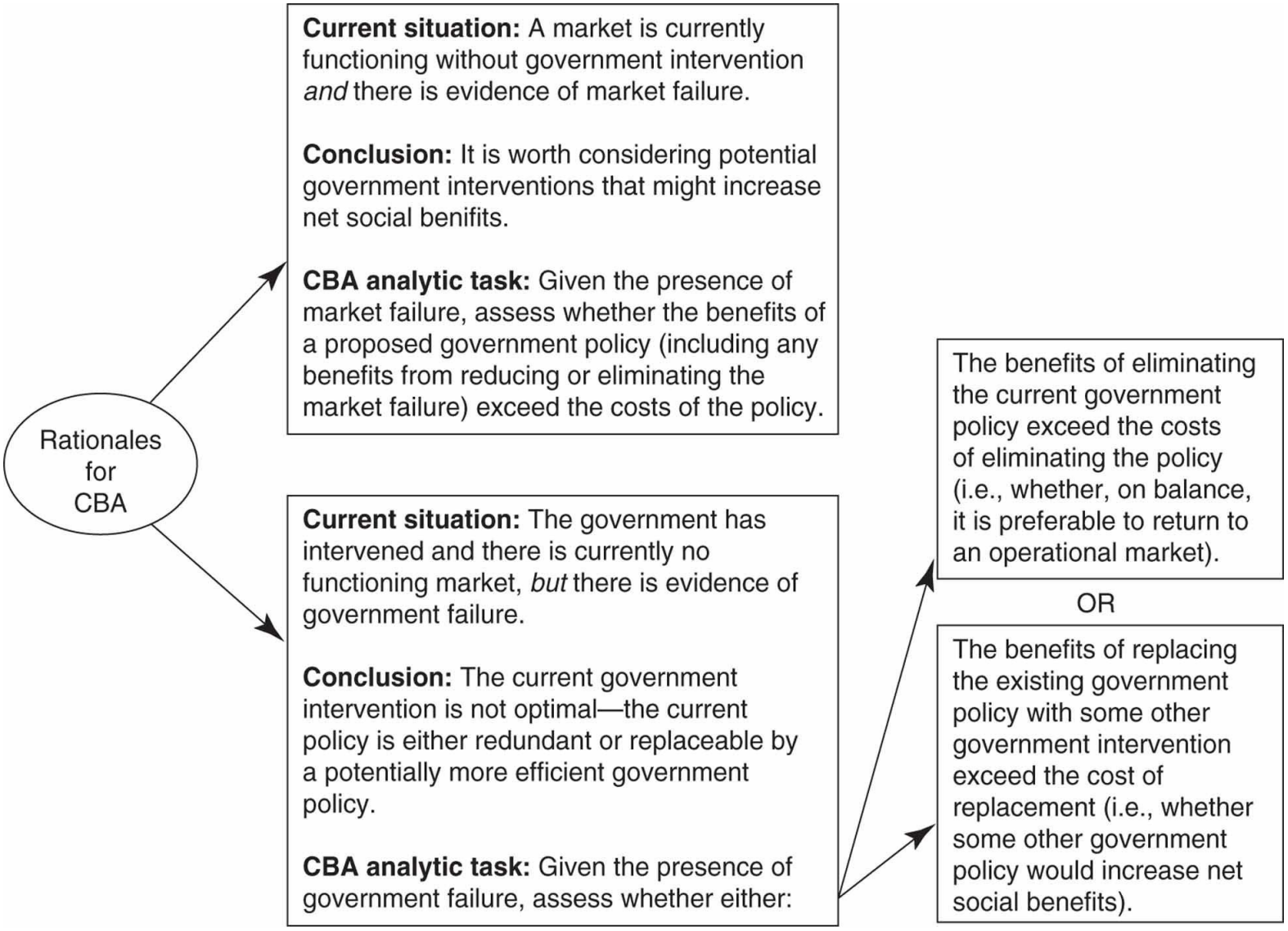
- Actual vs. Conceptually Correct Measures of Benefits and Costs
- Valuing Outcomes: Willingness-to-Pay
  - Valuing Benefits in Efficient Markets
  - Valuing Benefits in Distorted Markets
- Valuing Inputs: Opportunity Costs
  - Measuring Opportunity Costs in Efficient Markets with Negligible Price Effects
  - Measuring Opportunity Costs in Efficient Markets with Noticeable Price Effects
  - Measuring Costs in Inefficient Markets

Introduction

- This topic focus on *primary markets* – markets that are directly affected by a policy or project.
  - Example: If Bangkok administration builds a new subway line, what are the primary markets?
    - The markets for public transportation, markets for materials used in the subway system
- Secondary markets are markets that are indirectly affected.
  - In the above example, what are secondary markets?
    - Car markets, markets for gasoline, etc.
- This section also discusses the rationales for CBA:
  - Market failures – *prima facie* rationale for government intervention
  - Government failures – CBA can be used to determine efficiency of current policy.

ACTUAL VERSUS CONCEPTUALLY CORRECT MEASURES OF BENEFITS AND COSTS

How to Consider Market Failures and Government Failures in CBA



1. ACTUAL VERSUS CONCEPTUALLY CORRECT MEASURES OF BENEFITS AND COSTS

- "Conceptually correct" measures of benefits and costs are preferred, but they are frequently *not* used in actual CBA.
- Why conceptually correct measures differ from actual measures?
  - The easiest measures to obtain are *observed prices*, which may or may not be the conceptually correct measurers.
  - Whether the observed prices are accurate measures of benefits and costs depends on the character of the market (i.e., Well-function or distorted markets).
- When observed prices don't reflect the true value of a good or where prices don't exist, a process called *shadow pricing* is used.
  - Example: The fee for entering Khao Yai National Park

Shadow Pricing

- Shadow pricing is when observed prices are adjusted (or values are assigned when observed prices do not exist) so that they come as close as possible to measuring the social value of the good in question.
- But, even with shadow pricing, the measures of benefits and costs used in actual studies can differ from their conceptually correct counterparts for several reasons.
  - ✓Errors can be made in CBA.
  - ✓It is often difficult to derive an appropriate shadow price.
  - ✓The differences between the actual and the correct measures are small enough that the results are not affected very much.

VALUING OUTCOMES: WILLINGNESS-TO-PAY

2. VALUING OUTCOMES: WILLINGNESS-TO-PAY

- In CBA, costs and benefits are based on the concept of willingness to pay (WTP).
- *Benefits* are the sums of the maximum amounts that people would be willing to pay *to gain* outcomes that they view as *desirable*.
- *Costs* are the sums of the maximum amounts that people would be willing to pay *to avoid* outcomes they view as *undesirable*.
- In this section, we focus on gross benefits, rather than net benefits which would be obtained by subtracting costs.
- Note: Here, *"costs"* refer to *negative changes resulting from a policy*, not the expenses on inputs.

2.1. Valuing Benefits in Efficient Markets

- The valuation of *gross benefits* in efficient markets relies on the following rule:

  "Gross social benefits of a policy equal the net government revenue plus the changes in social surplus."

- Two situations in which the rule is applicable are examined:

  1. A policy that directly affects the quantity of the good available to consumers → Supply curve shifts right.

     Ex. A publicly operated childcare centre

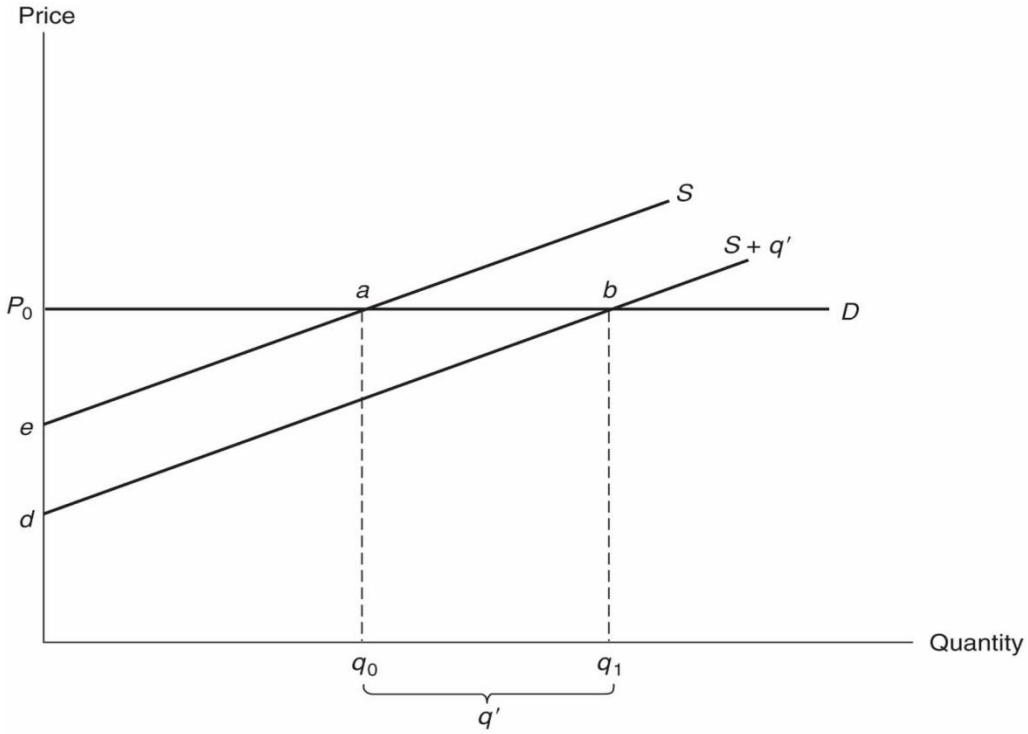
  2. A policy that alters the costs of producing a good → Supply curve shifts down.

     Ex. Blue Flag Program (distribute consumer products in relatively low prices)

2.1.1. Direct Increases in Supply Available to Consumers

- Two situations in which a project directly increases the available supply in a market:
  1. The price is *unaffected* by the increased supply. (Why?)
     - Demand curve is horizontal.
     - Consumer surplus and producer surplus are *unaffected* by the shift in the supply curve.
  2. The price is *affected* by the increased supply.
     - Demand curve is downward sloping.
     - Consumer surplus and producer surplus are unaffected by the shift in the supply curve.
- Note: Ignore the costs of project inputs for now.

Case 1 - Efficient Market with No Price Effect



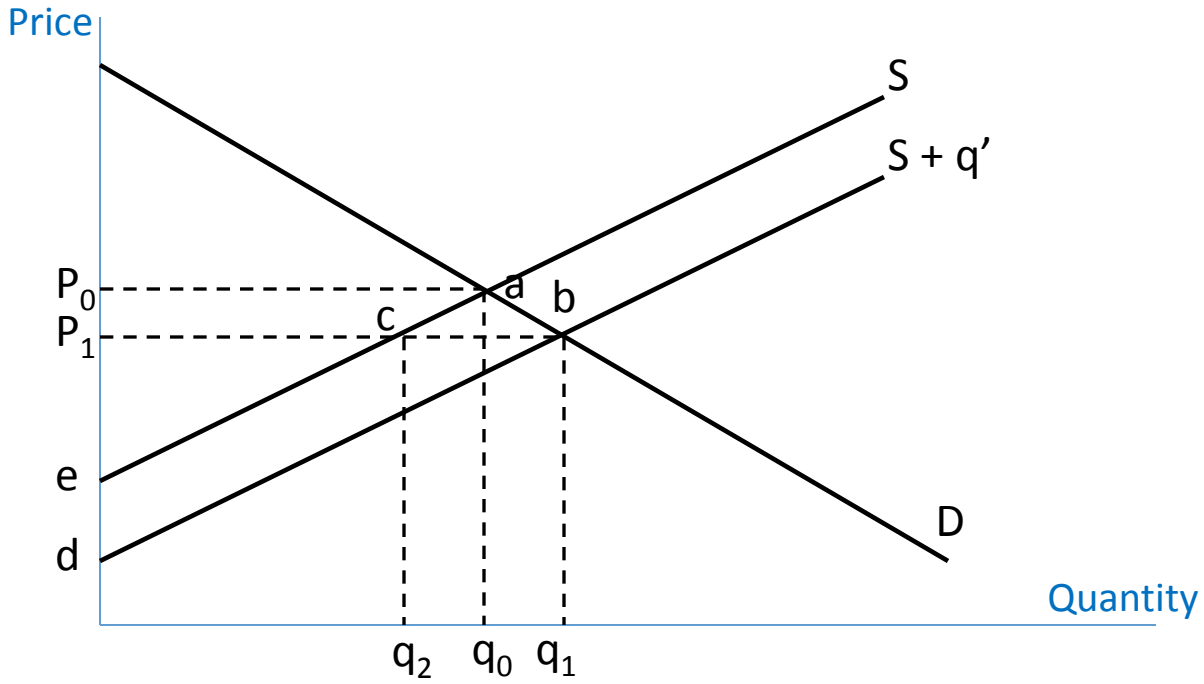
Case 1: Government *sells* additional units (q') *at the market price*.

➔ Gross benefit of the project = $P_0 \times q' = q_0abq_1$ *(Gain of project revenue)*

Case 2: The q' units of the good were *distributed free* to selected consumers.

➔ Gross benefit of the project = $P_0 \times q' = q_0abq_1$ *(Gain in consumer surplus)*

Case 2 - Measuring Benefits in Efficient Market with Price Effect (P↓)



Case 1: Government *sells* additional units (q') *at the market price*.

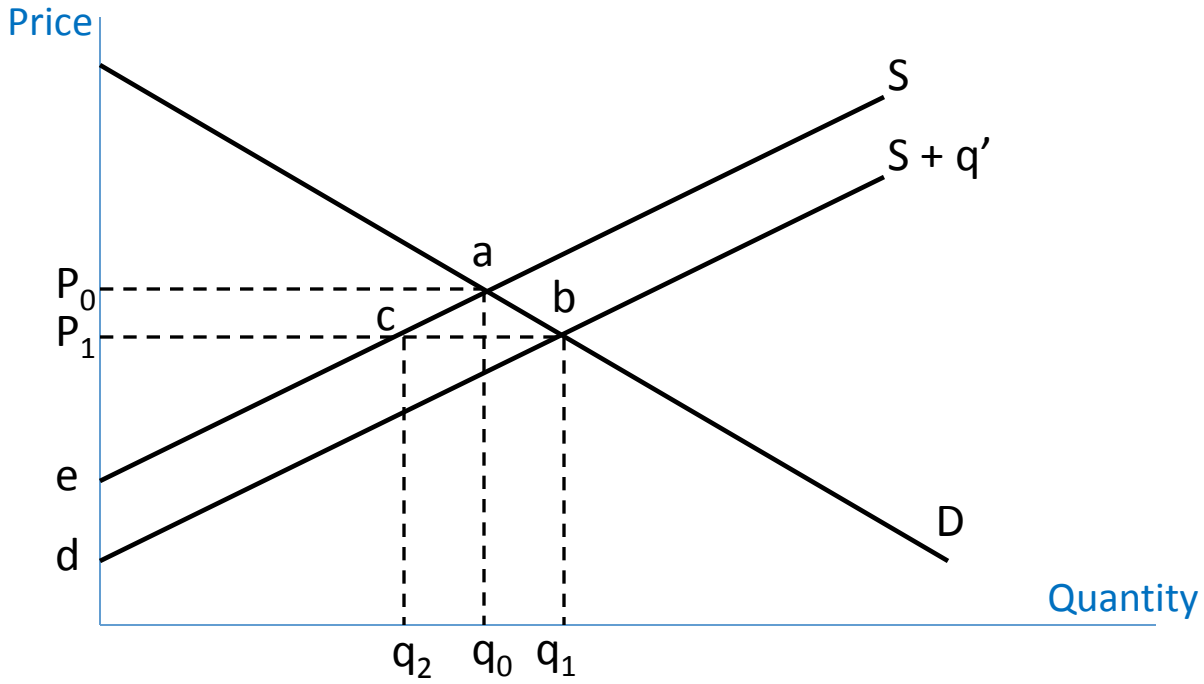
➔ Gross benefit of the project = *abc + Gain of project revenue* = q_2cabq_1

Case 2: The q' units of the good were *distributed free* to selected consumers.

➔ Gross benefit of the project = q_2cabq_1

(under certain condition – consumers value q' unit at P_1 or higher.)

2.1.2. Reductions in Costs to Producers



Project: Supply schedule shifts through cost reductions for producers.

➔ Gross benefit of the project = *abde*

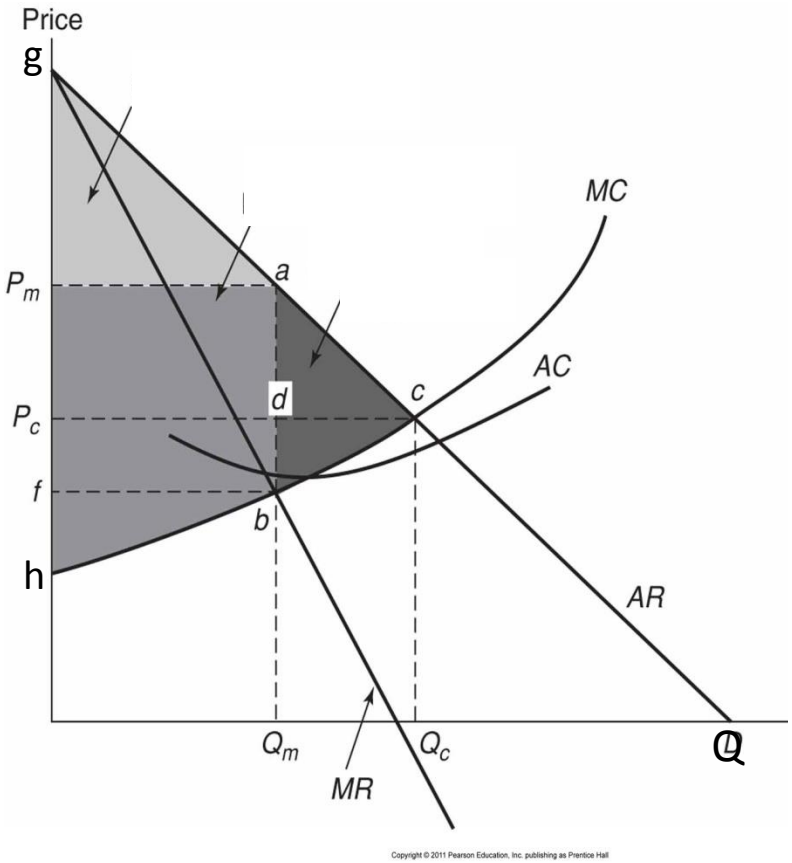
To see this, $\Delta CS = P_0abP_1$, $\Delta PS = P_1bd - P_0ae = ecbd - P_0acP_1$

➔ $\Delta SS = \Delta CS + \Delta PS = ecbd + cab = abed$

2.2. Valuing Benefits in Distorted Markets

- In *distorted* markets or *inefficient* markets, projects are still measured as changes in social surplus plus net revenues.
- However, there are problems in determining the *correct* social surplus changes.
- Five different types of market failures:
  1. Monopoly
  2. Information asymmetry
  3. Externalities
  4. Public goods
  5. Addictive goods

2.2.1a. Monopoly



- What area is social surplus?
  - ➢SS = CS + PS = Area *gabh*

  where CS = Area gaP_m

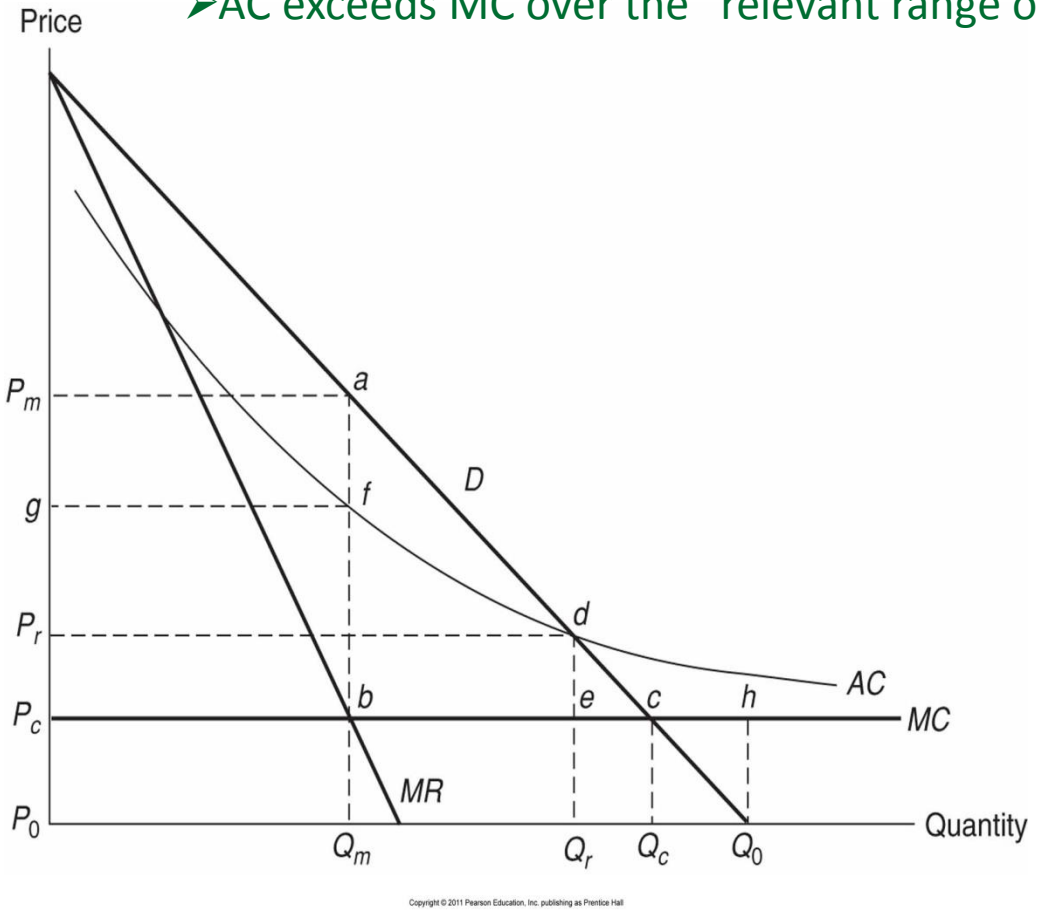
  and PS = Area $P_m abh$
- Is social surplus maximized?
  - ➢No! Why?
- If policy intervention results in $P = P_c$ and $Q = Q_c$,
  - ➢Benefits of govt's actions:

    DWL = 0:
  - ➢A transfer from monopolist to consumer = Area $P_m adP_c$.

2.2.1b. Natural Monopoly

Main characteristic: Natural monopolist has *economies of scale* over a wide range of output .

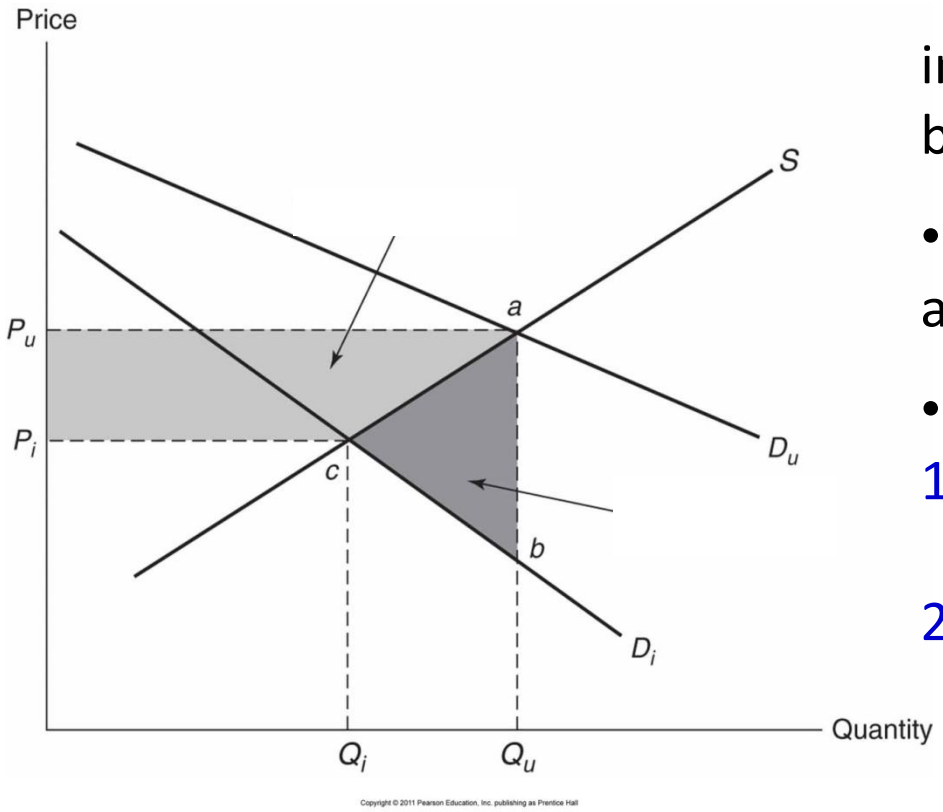
- Fixed costs are very large relative to variable costs. → AC is very high at small Q.
- AC exceeds MC over the "relevant range of output".



Four policy options:

1. Set price at P_m where MR = MC
   - DWL = Area *abc*; $\pi^m = P_m afg$.
2. Set price at P_r where AC = D
   - DWL = Area *dec*; $\pi^m = 0$.
   - Transfer of SS = area adeb.
3. Set price at P_c where MC = D
   - DWL = 0; but P < AC.
4. Set price at P = 0.
   - DWL = area chQ_0.

2.2.2. Information Asymmetry



- *Information asymmetry* – information about a product may not be equal on both sides of the market.
- Let D_i = WTP *with* full information and D_u = WTP *without* full information
- Effects of information asymmetry:

1) Transfer from consumers to sellers = area $P_u acP_i$.
2) DWL = area *abc*
   - ➢ Rationale for govt intervention
   - ➢ ↓DWL: Benefits to society.

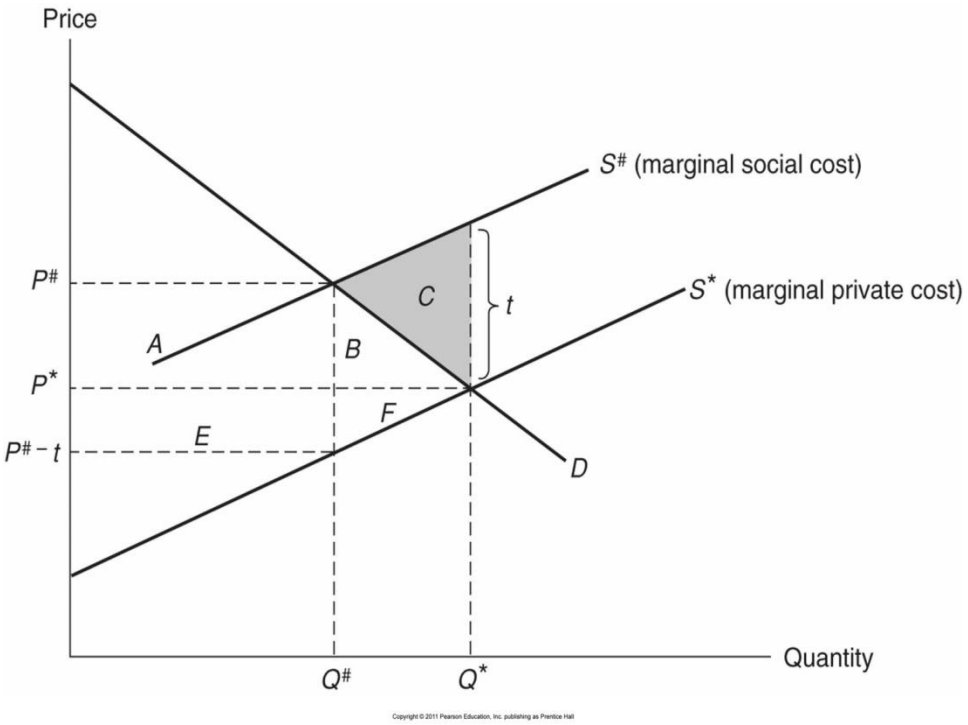
Information Asymmetry (Cont'd)

- The source of missing information is likely to be determined by the type of good:
  - *Search goods*: products with characteristics that consumers can learn about by examining them prior to purchasing them.
    - Information asymmetry may not be a serious problem.
  - *Experience goods*: products about which consumers can obtain full knowledge, but only after purchasing and experiencing them (e.g., movie tickets, restaurants, etc.).
    - Demand for information about experience goods often prompts third parties (e.g. newspapers) to provide information for a price.
  - *Post-experience goods*: goods that consumers may not learn about for a long time, even after purchasing and consuming them (e.g., Adverse health effects from a prescription drug)
    - The information is often expensive to gather and private-sector parties willing to collect it may not exist.
    - Governmental action is required.

2.2.3. Externalities

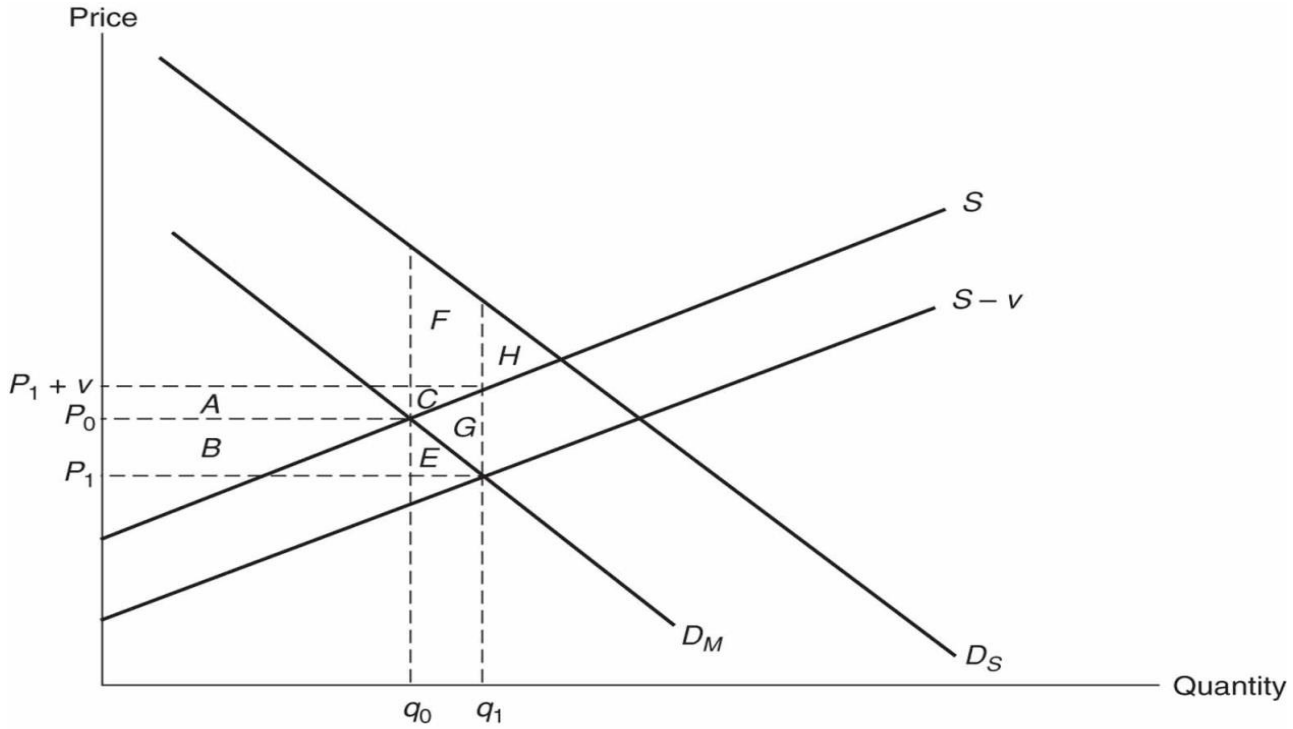
- An externality is an effect (either positive or negative) that production or consumption of a good has on third parties not involved in the production or consumption of the good.
  - Example of positive externalities - education
  - Example of negative externalities - pollution
- The effect of an externality is that the market *underestimates the social costs (negative)* or *underestimates the social benefits (positive)* of the good.
- If left to its own devices, the market sets the *wrong price* for the good because it fails to take account of the effect of the good on third parties.
  - Too much (negative externality) or not enough (positive externality) output is produced. ➔ DWL

Negative Externalities



Benefits and Costs of the government's tax policy		
	Benefits	**Costs**
Consumers of good		
Producers of good		
Third parties		
Government revenue		
Social Benefits		

Social Benefits for Direct Supply of a Good with a Positive Externality

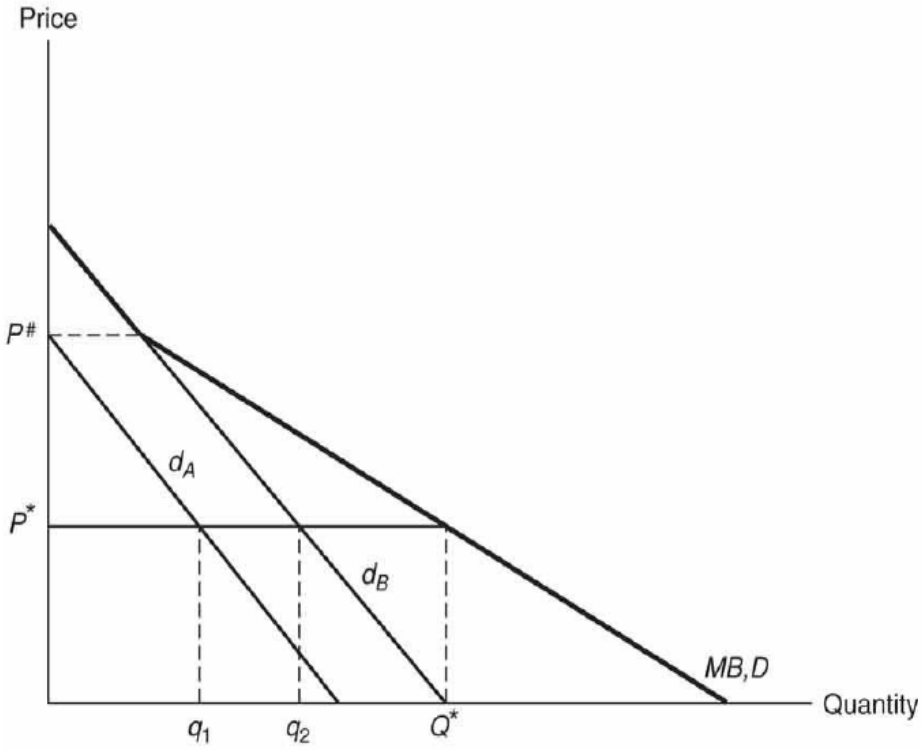


Gain to consumers in target neighborhood	
Gain to persons in nearby neighborhood	
Gain to producers	
Program costs	
Net benefits	

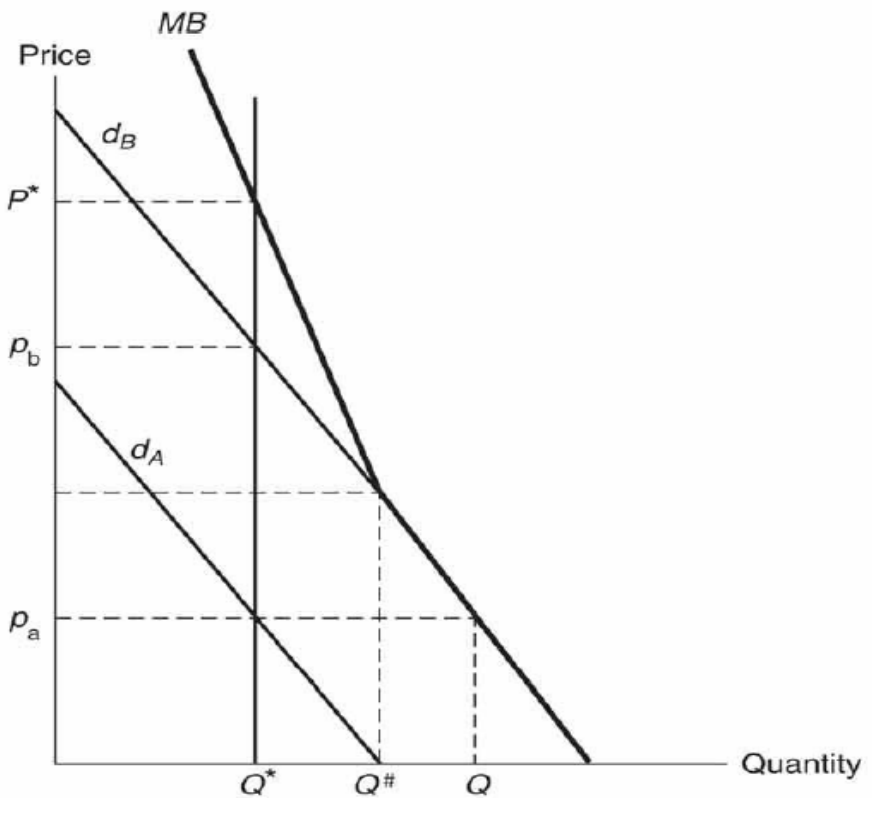
2.2.4. Public Goods

- Two key attributes: *nonexcludability* and *nonrivalry*.
- A good is *nonexcludable* if it is impossible, or at least impractical, for one person to prevent others from consuming it.
  - '*Jointness in supply*' - If supplied to one consumer, it is available for all consumers.
  - Because there is no way to charge for its use, a *free-rider problem* results.
    - Hence, there is *no incentive* for the private sector to provide it.
- A good is *nonrival* if one person's consumption of a good does not keep someone else from also consuming it.
  - More than one person can obtain benefits from a *given* level of supply *at the same time*.
  - This also causes a free-rider problem.

Rivalrous Good and Nonviralrous Good



Rivalrous Good



Nonrivalrous Good

Public Goods (Cont'd)

- Private markets, if left to their own devices, tend to produce *less public goods* than is socially optimal.
  - Need government intervention
- Some goods are *either* nonrivalrous *or* nonexcludable, *but not both*.
  - A *nonrivalrous, but excludable*, good is called a *toll good* (or *'club' good*).

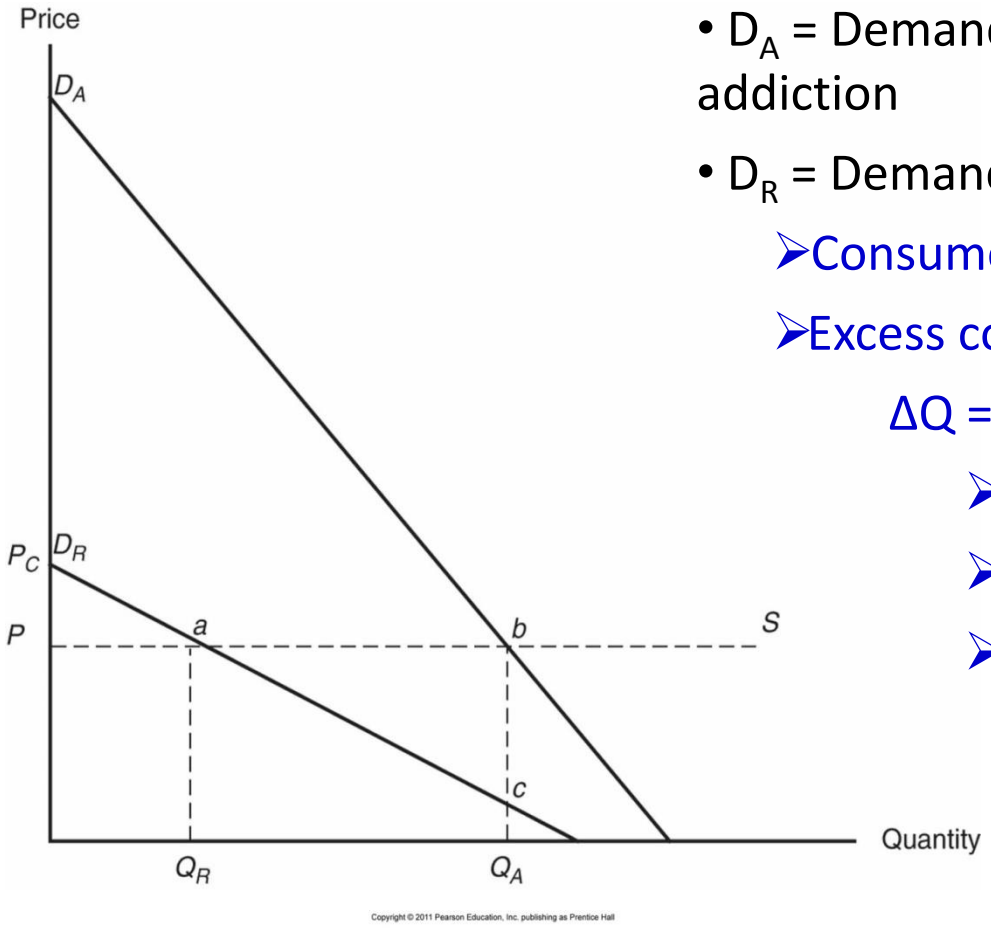
    Ex. A toll road, private parks. What else?
  - A *rivalrous, but nonexcludable* good, is called an *open access resource* (or *common-pool resources*).

    Ex. Fish stocks, congested non-toll road

2.2.5. Addictive Goods

- Economic models of *addictive goods*, such as tobacco, assume that today's consumption depends on the amount of previous consumption.
  - *Rational addition* occurs when consumers fully take account of the future effects of their current consumption.
  - If consumers *fail* to take full account of future risks, *negative intrapersonal externalities* result because they impose harm on their future selves.
- This suggests that consumer surplus from the consumption of an addictive good should be measured under the demand curve that would exist *in the absence of addiction*, rather than under the demand curve that exists in the presence of addiction (i.e. presence of negative intrapersonal externalities).

Consumer Surplus in the Presence of Gambling Addiction



- D_A = Demand for gambling in the presence of addiction
- D_R = Demand for gamblers who are not addicted
  - ➢Consumer surplus when not addicted = PaP_c
  - ➢Excess consumption due to addiction:

$$\Delta Q = Q_A - Q_R$$

  - ➢Cost of $\Delta Q = Q_R abQ_A$
  - ➢Value of $\Delta Q = Q_R abQ_A$
  - ➢Loss from consuming ΔQ = area *abc*

VALUING INPUTS: OPPORTUNITY COSTS

3. VALUING INPUTS: OPPORTUNITY COSTS

- Almost all public policies incur *opportunity costs.*
  - Conceptually, these costs equal *the value of the goods and services that would have been produced if the resources used to implement the policy had been used instead in the best alternative way*.
  - The relevant opportunity costs are *what must be given up today and in the future*, *not* what has already been given up (or "sunk" costs).
- Theoretically, the area under the supply curve is an appropriate measure of opportunity costs.
- Practically, the most obvious and natural way to measure the value of the resources used by a project is simply the direct budgetary outlay needed to purchase the resources.

Opportunity Costs (Cont'd)

- To determine when budgetary outlays should and should not be used, the conceptually appropriate measure of costs is compared with the direct budgetary outlay measure of costs in three situations:

1. When the *market for the resource is efficient* and purchases of the resource for the project will have a *negligible effect on the resource price*.

➢Budgetary outlays usually accurately measure project opportunity costs.

2. When the *market for the resource is efficient*, but purchases for the project will have a *noticeable effect on prices*,

➢Budgetary outlays often only slightly overstate project opportunity costs.

3. When the *market is inefficient* (i.e., there is a market failure),

➢Expenditures may substantially overstate or understate project opportunity costs.

3.1. Measuring Opportunity Costs in Efficient Markets with Negligible Price Effects

- Consider two cases:

Case 1 – Supply curve is *perfectly elastic*.

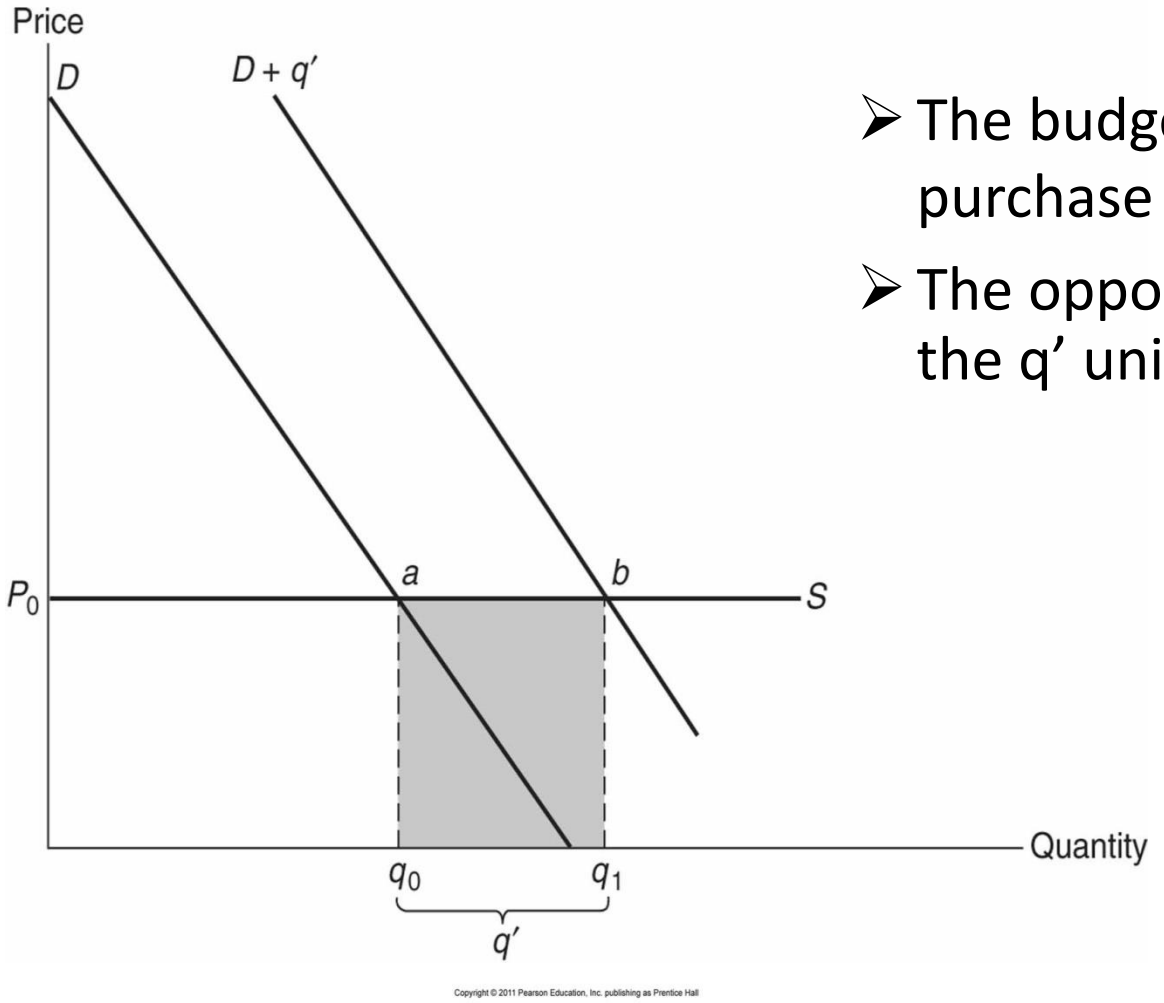
- Example: A government agency purchases pencils for trainees, and the amount of pencils bought (q') is a small proportion of total pencils sold in the market. Suppose the market price is P_0.
  - Project expenditures = $P_0 \times q'$.

Case 2 – Supply curve is perfectly inelastic.

- Example: A government purchases a parcel of land for a park, and the amount of land is fixed at *A* acres. Suppose the market price is *P* per acre.
  - Project expenditures = $P \times A$.

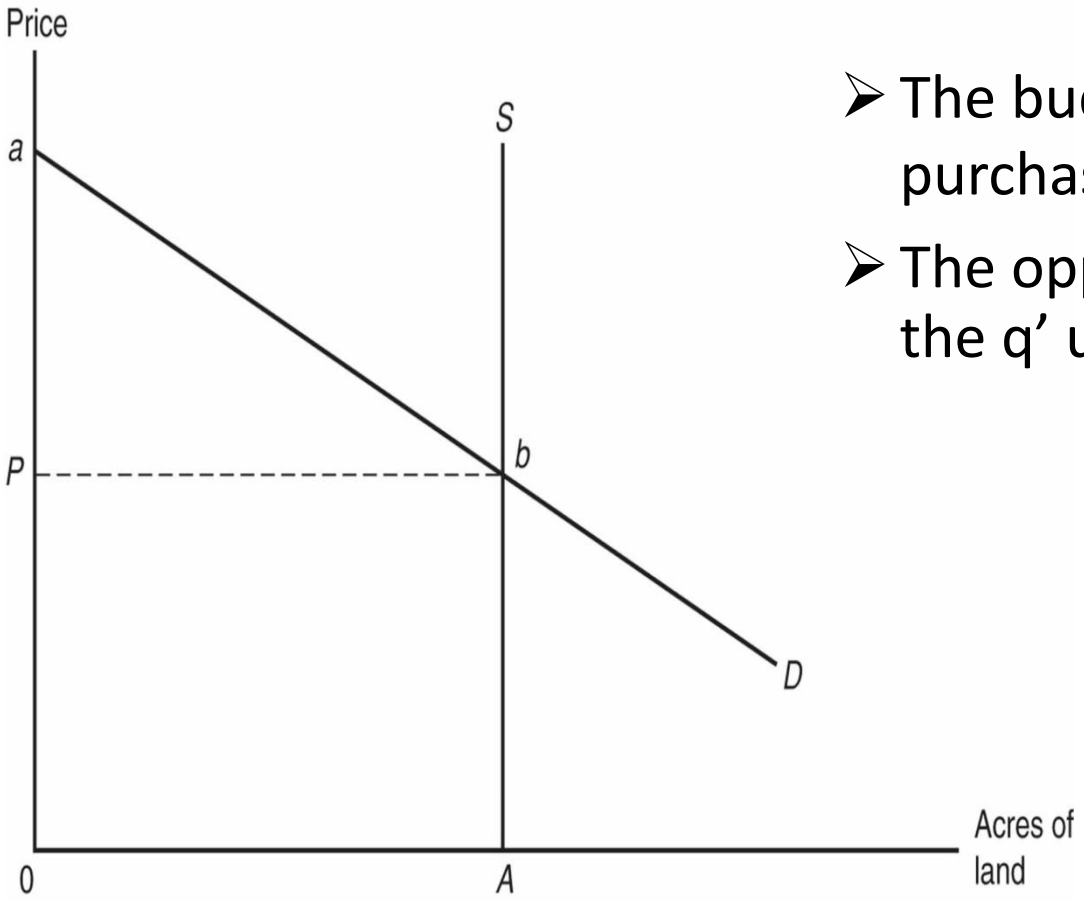
- Question: In these cases, would the budgetary outlays (costs) be the same as the social costs?

Opportunity Costs with No Price Effects (Perfectly Elastic Supply)



- The budgetary outlay required to purchase q' unit is: $P_0 x\ q' = abq_1q_0$
- The opportunity cost to society of the q' unit is: abq_1q_0

Opportunity Costs with Inelastic Supply Curve

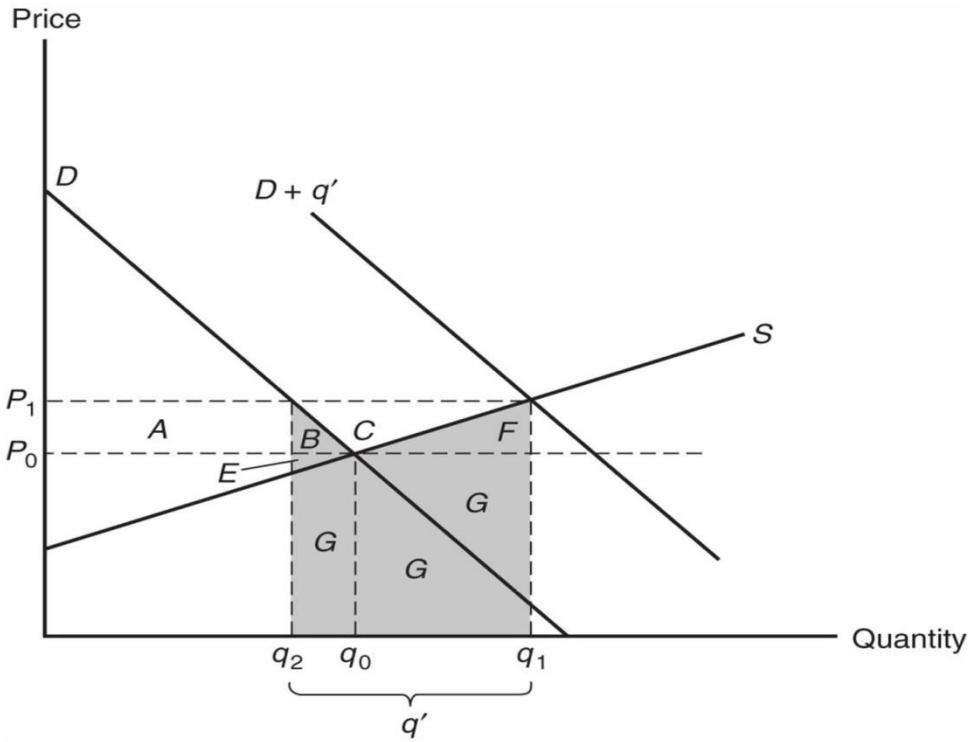


- The budgetary outlay required to purchase q' unit is: *PbA0*
- The opportunity cost to society of the q' unit is: *abA0*

3.2. Measuring Opportunity Costs in Efficient Markets with Noticeable Price Effects

- When a *large quantity* of a resource (say *q'*) is purchased, its price may increase, even if there's no market failure.
  - The project faces an upward sloping supply curve for the resource.
- The *q'* units of the resource purchased come from 2 sources:
  (1) Units bid away from their previous buyers
  (2) Additional units sold in the market.
- In computing the opportunity cost, the price change must be taken into account in computing the opportunity cost.
- General rule: *Opportunity cost equals expenditure less (plus) any increase (decrease) in social surplus occurring in the factor market.*
  - When prices change, budgetary outlays *do not* equal social costs.

Opportunity Costs with Price Effects



	Benefits	Costs
Original buyers		
Sellers		
Project expenditures		
Net Social Cost		

3.3. Measuring Costs in Inefficient Markets

- Different sources of inefficiency: absence of a working market; *market failures*; and *distortions due to government interventions* (e.g., taxes, subsidies, price ceilings/floors).
  - Any of these distortions arising in factor markets can complicate the estimation of opportunity cost.
- In this lecture, we consider three situations, in which shadow pricing is needed to accurately measure the opportunity cost of the inputs:
  1. The government purchases an input at a price below the factor's opportunity cost.
  2. The government hires unemployed labor.
  3. The government purchases inputs from a monopolist.

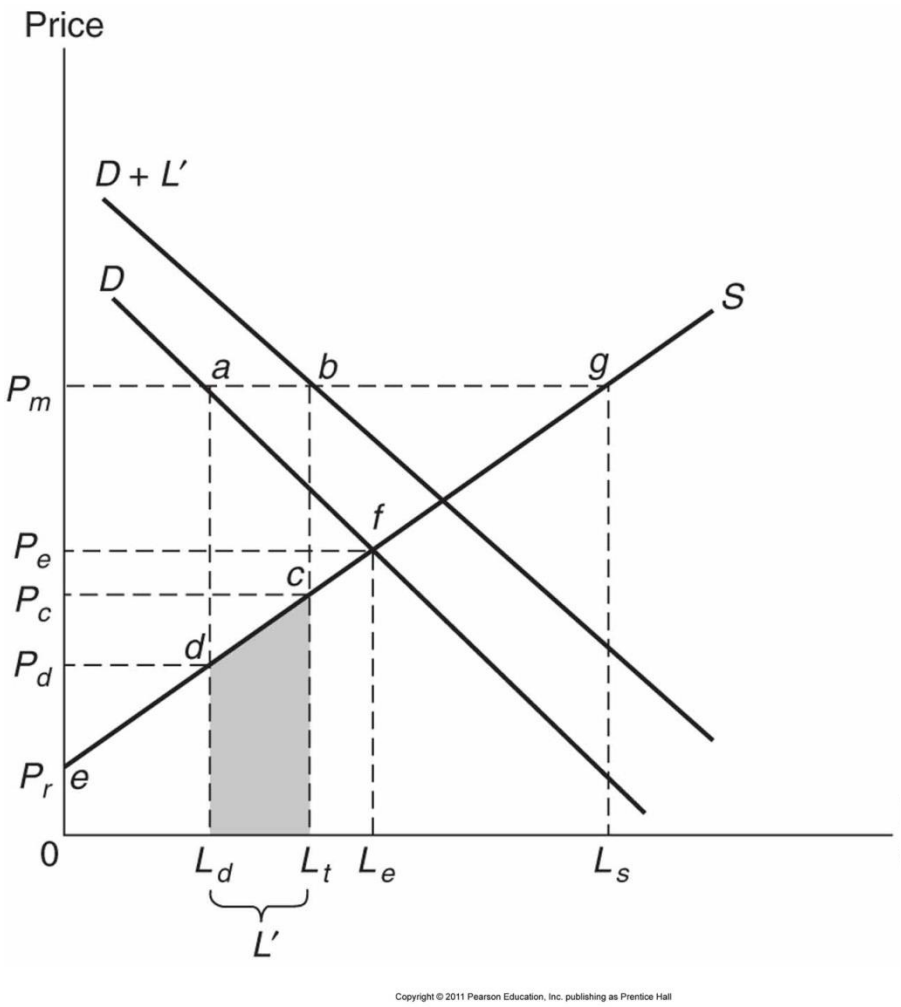
3.3.1. Purchases at Below Opportunity Costs

- As an example, consider a policy that requires government officials to monitor or audit an ongoing project in other locations (say, it requires > 5 hours travelling).
- The usual payments that the officials receive are:
  - Per diem
  - Commuting costs and accommodations
- Do these payment correctly the opportunity costs of these officials?
  - No! Why? → it understates the opportunity costs of the officials' time.
  - A better estimate of the officials' opportunity costs should include their commuting expenses plus the number of official-hour times either their average hourly wage rate.

3.3.2. Hiring Unemployed Labor

- Suppose a minimum wage policy results in a wage floor that keeps the wage rate above the market-clearing level.
  - This creates unemployed labor, say L'.
- These unemployed workers are sometimes said to be *in surplus*.
- We want to examine the opportunity costs of surplus labor (i.e. the opportunity costs when they are hired for a government project.)
- Can you think of any policy/project that reduces the number of unemployed workers?

Opportunity Costs with a Price Floor



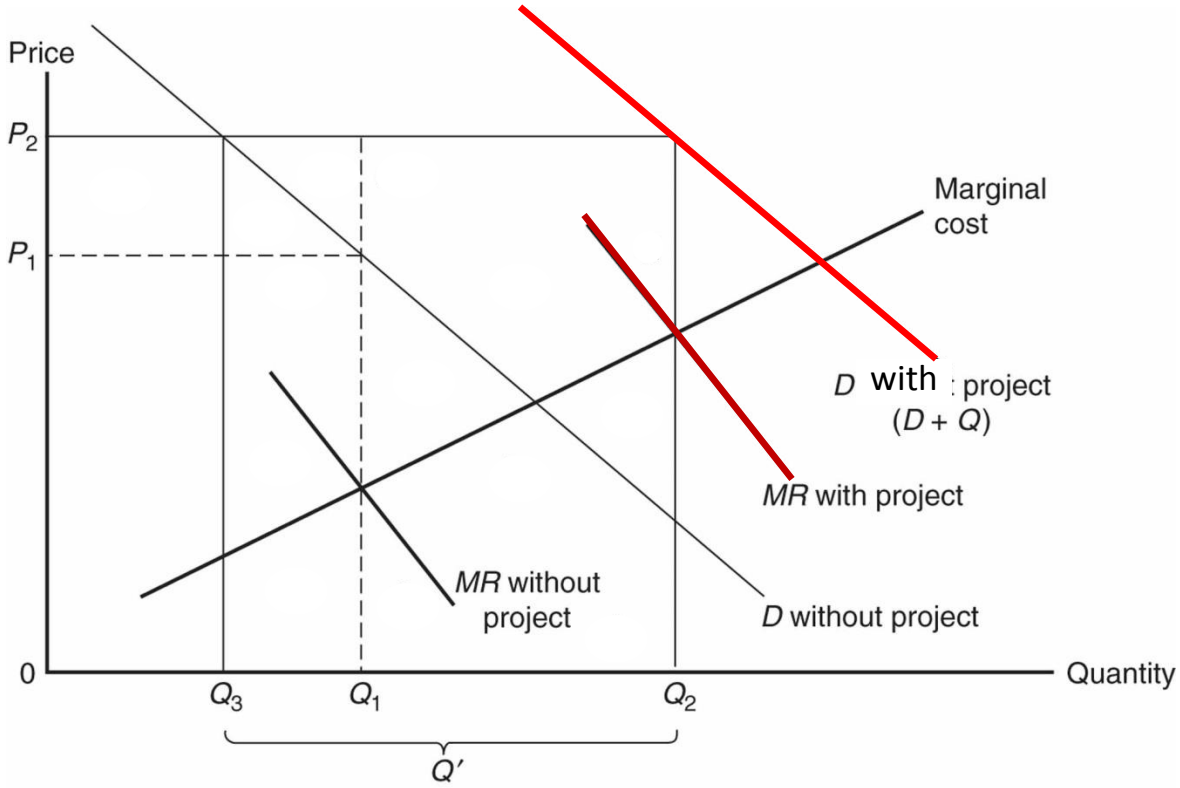
Alternative measures of social costs of hiring *L'* unemployed workers:

1. Measure A: Opp. Cost per L= zero.
2. Measure B: Opp. Cost per L = P_m.
   → Total budgetary expenses = P_m x *L'*.
3. Measure C: P_m x *L'* subtracted by PS.
   → Social costs of *L'* = Area cdL_tL_d .
4. Measure D: Average value of time = $\frac{1}{2}(P_m + P_r)$.
   → Social costs of *L'* = $\frac{1}{2}(P_m + P_r) * L'$.
5. Measure E: Average value of time = $\frac{1}{2}(P_m+0) = \frac{1}{2}P_m$
   → Social costs of *L'* = $\frac{1}{2}P_m * L'$.

3.3.3. Purchases from a Monopoly

- In the case of government purchases from a monopoly, the demand curve for the input shifts to the right and the price and quantity sold increases.
  - The monopolist's producer surplus increases.
  - The original buyers' consumer surplus decreases.
    - The government's budgetary outlay *overstates* the true social costs.
- To correct the overstatement of social costs, the price should be adjusted <u>downward</u> using shadow pricing.
  - The size of the bias depends on how much the price the monopoly charges exceeds its marginal costs (i.e., how much monopoly power it actually has).

Opportunity Costs When Buying from a Monopoly



	Benefits	Costs
Original buyers		
Monopolistic seller		
Project expenditures		
Net Social Cost		

The General Rule

- Other market distortions can also affect opportunity costs.
- A summary of the biases created by these distortions is as follows:
  - When supply is *taxed (subsidized)*, direct expenditure outlays *overestimate (underestimate)* opportunity cost.
  - When supply exhibits *positive externalities (negative externalities)*, expenditures *overestimate (underestimate)* opportunity cost.
- The general rule to determine opportunity costs in such cases is: "Opportunity cost equals direct expenditures on the factor minus (plus) gains (losses) in social surplus occurring in the factor market."