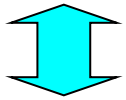
Chapter 4 Valuing Benefit and Cost in Primary Markets

Primary Markets: Directly affected by a policy or project

Secondary Markets: Indirectly affected

Competitive Market (Perfect Competitive):

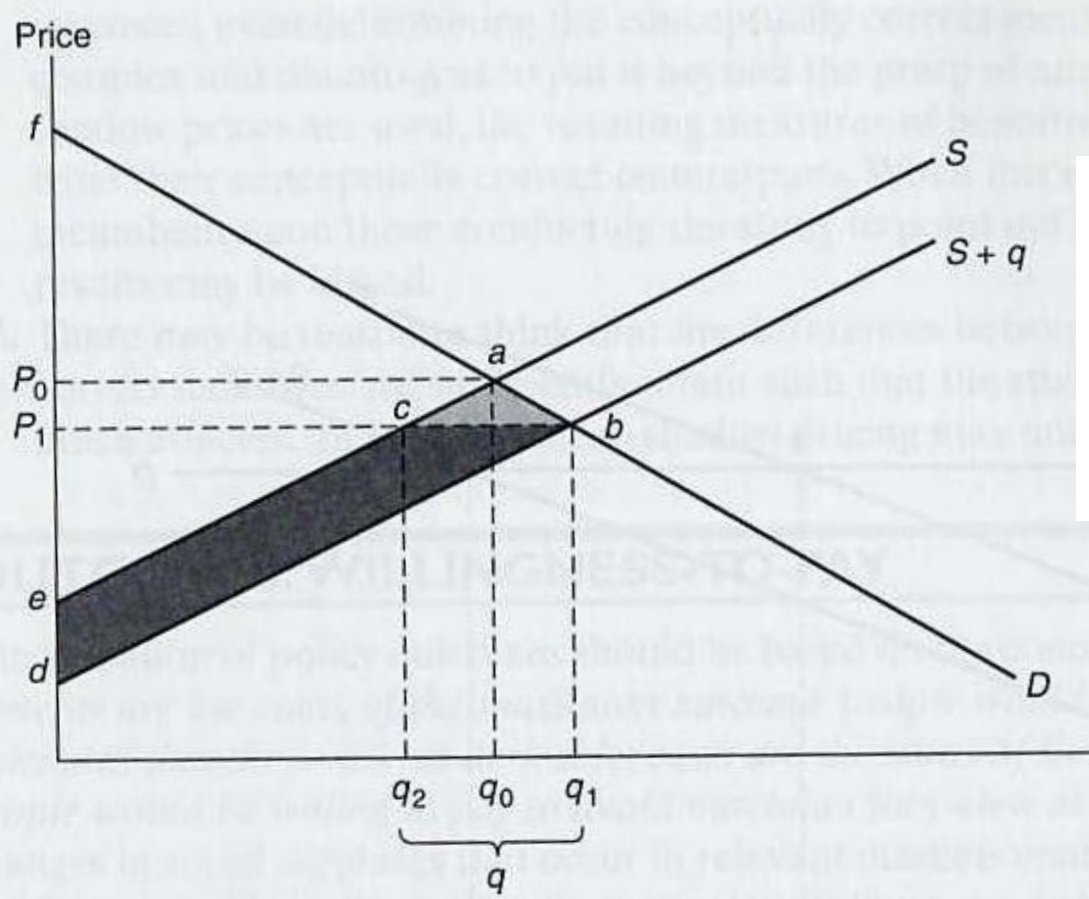
Pareto Efficiency: Ideal Market based on Microeconomics Theory



Distorted Markets (Market Failures or Government Failures)

Pareto Inefficiency: **Monopoly,** Information Asymmetry, **Externalities**, Public Goods and so on.

Measuring Benefits in (Pareto) Efficient Markets



Reductions in Cost (q) to Producers

by "good" public-sector projects

Social surplus change (ignoring costs of project inputs to the government):

Project (a): Direct increase in supply of q —gain of triangle *abc* plus project revenue equal to area of rectangle q_2cbq_1

Project (b): Supply schedule shift through cost reductions for producers—gain of trapezoid *abde*

Monopoly

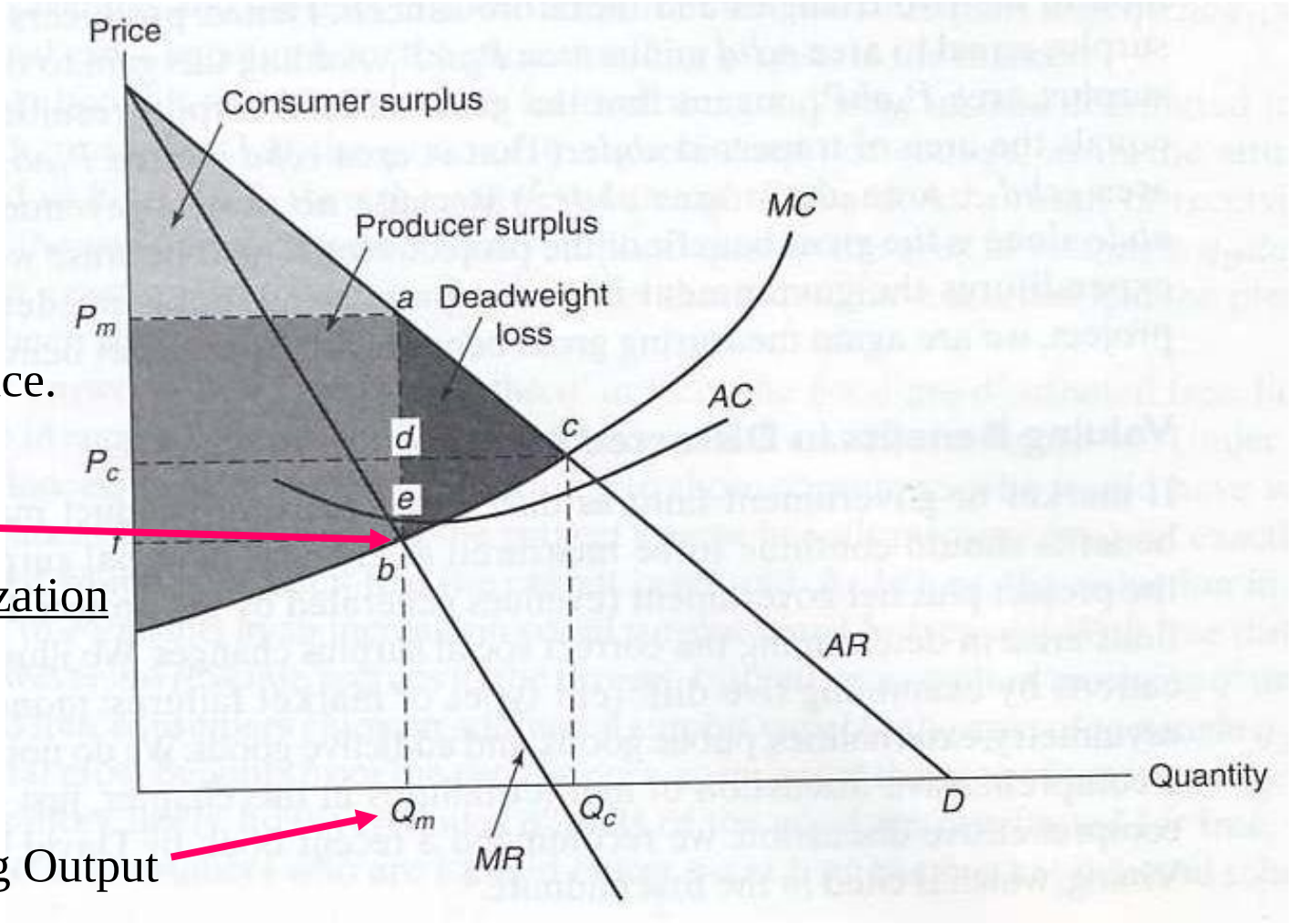
Monopoly: Only one firm in the market
Monopoly firm can choose the level of price and output.

MR > MC
should produce
more output.

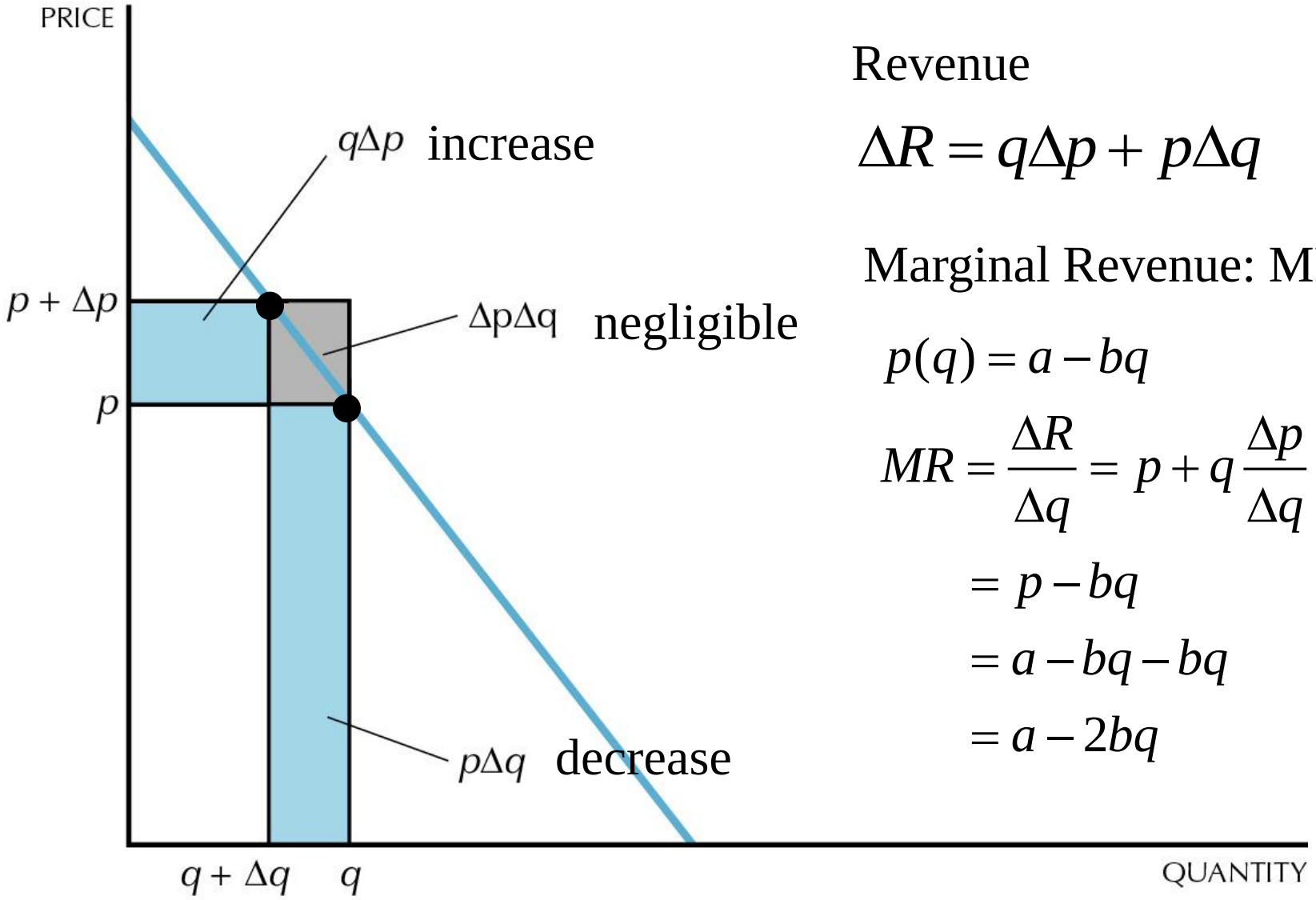
MR < MC
should stop produce.

MR = MC
for Profit maximization

Profit Maximizing Output



Revenue and Marginal Revenue



Revenue

$$\Delta R = q\Delta p + p\Delta q$$

Marginal Revenue: MR

$$p(q) = a - bq$$

$$MR = \frac{\Delta R}{\Delta q} = p + q\frac{\Delta p}{\Delta q}$$

$$= p - bq$$

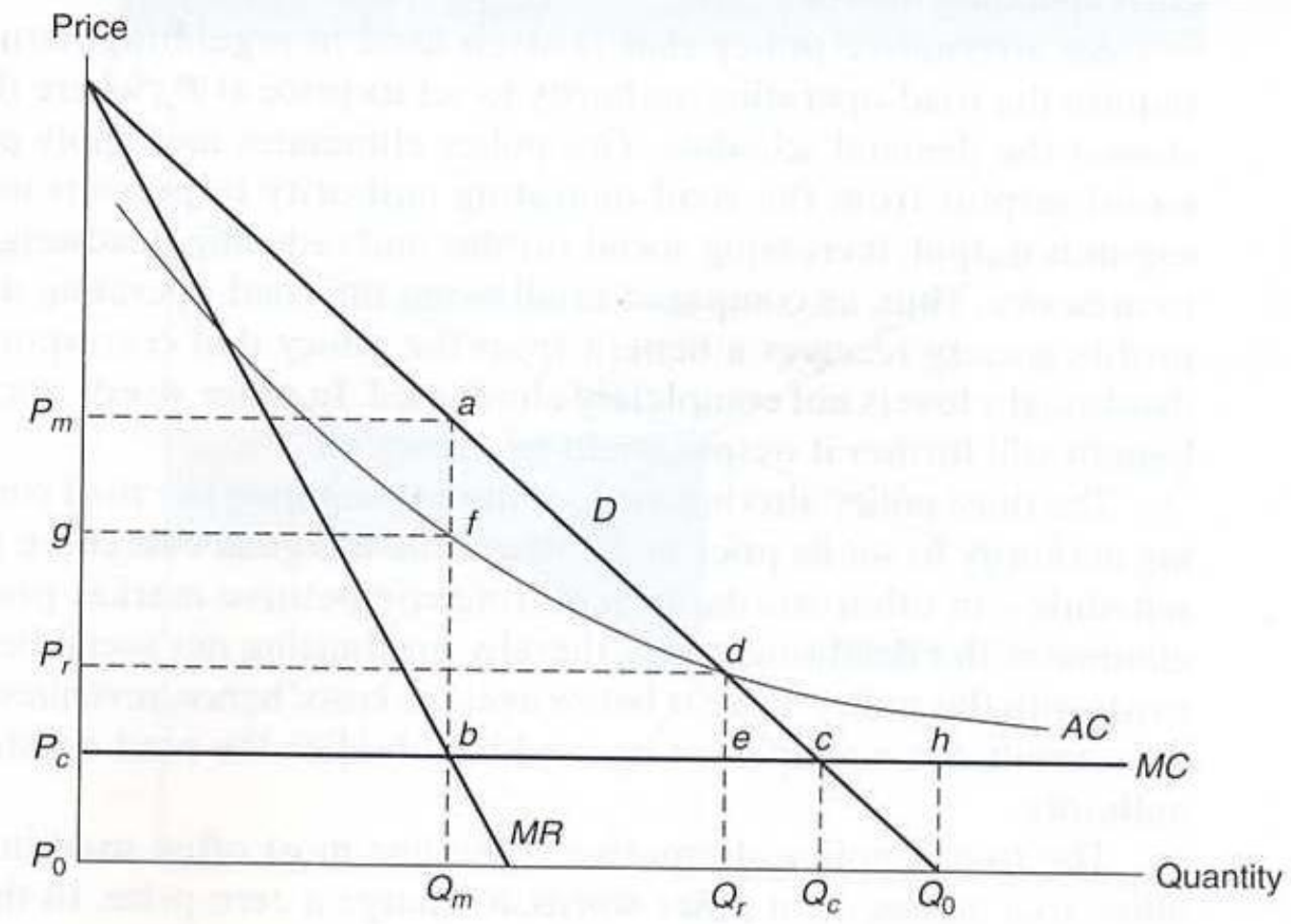
$$= a - bq - bq$$

$$= a - 2bq$$

Natural Monopoly

Large fixed costs and small variable cost → Subsidy
Regulation

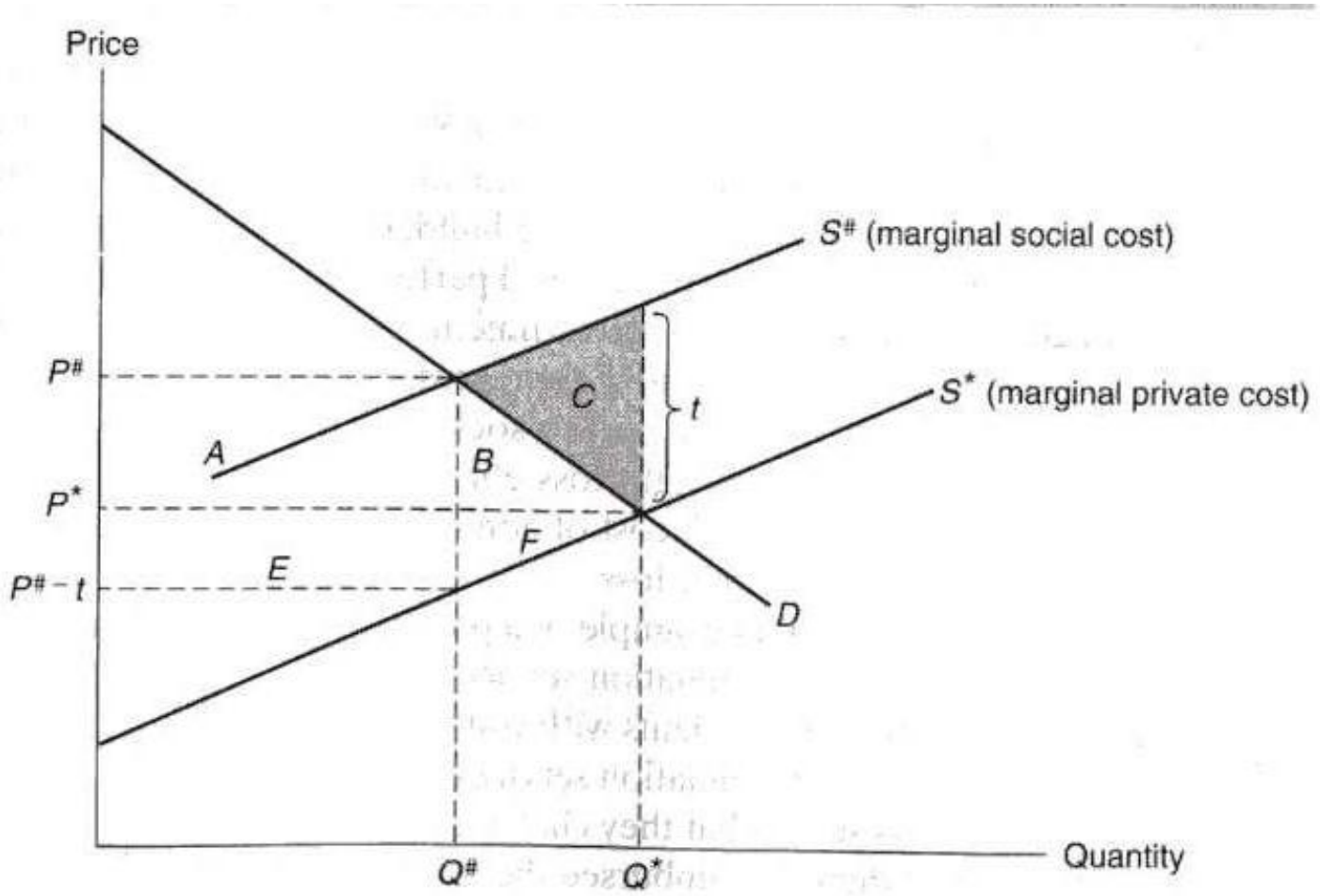
Public utilities (roads, railway, bridges, gas, electricity)



Externalities

Goods, but <u>not sold on markets</u> (positive and negative)

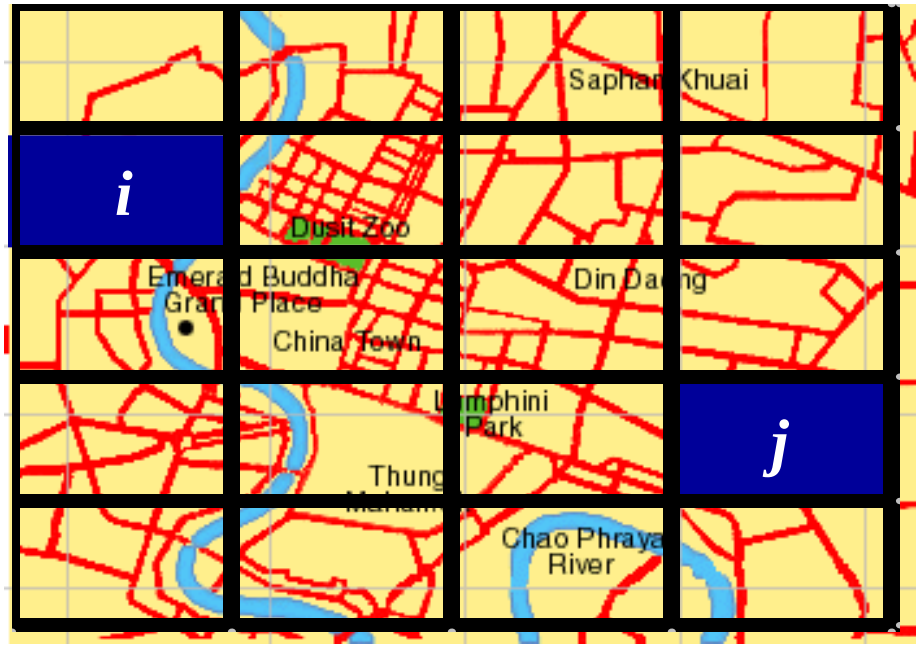
Social Cost = private cost + impose on other agents



How to “monetize” impacts?
Case of Transport Project

Generalized Cost

is an amount of money representing the overall disutility (or inconvenience) of traveling between origin *i* and destination *j* by a particular mode.



Zoning

Origin *i*

Destination *j*

Components of Generalized Cost

Public Transport

Fare, Giving up time, …..

Car

Giving up time,

Toll Charge,

VOC (Vehicle Operating Costs):

Fuel, Oil, Tire & Tube, Maintenance and Depreciation

Other components?

Market in Transport Service

Price = Generalized Cost

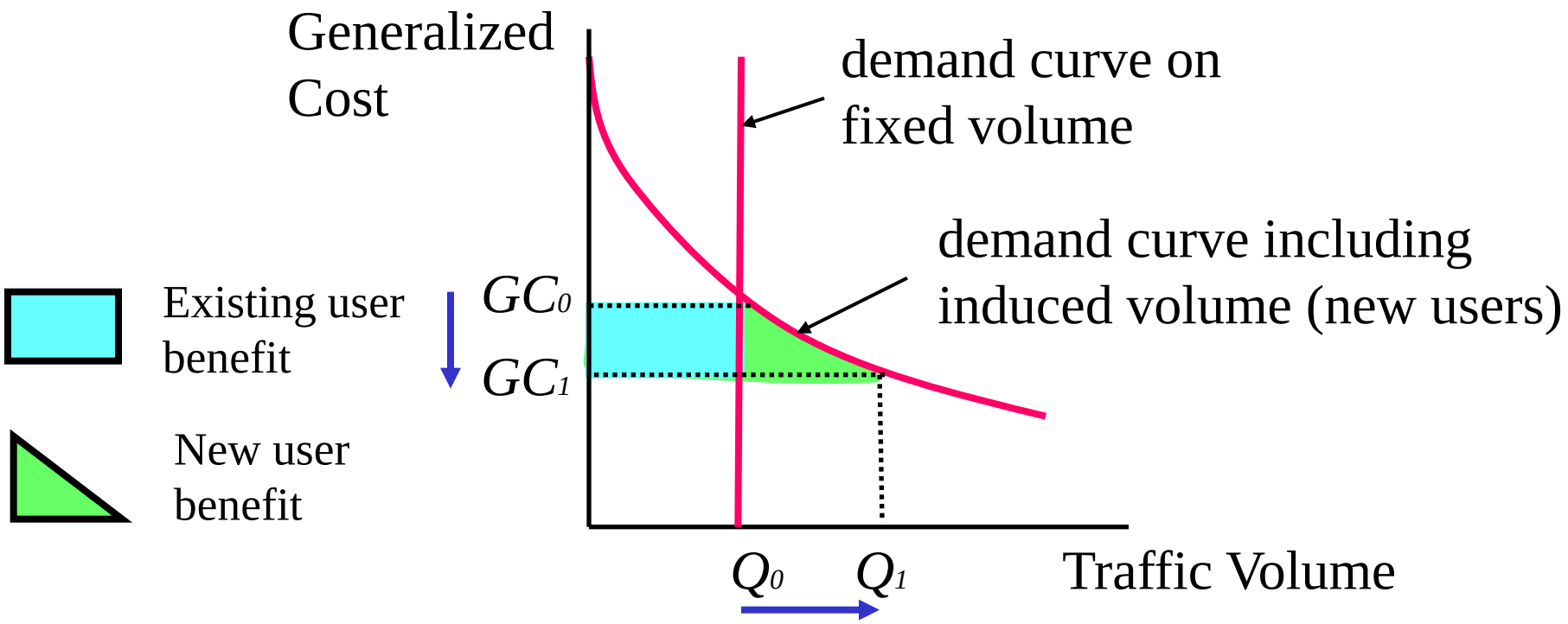
WTP is the maximum amount of money that a user would be willing to pay to make a trip. (can be interpreted as a maximum generalized cost that they are prepared to accept a trip)

Definition of User Benefit Change in Consumer Surplus

$UB = CS_1 - CS_0$

CS_1: do-something = with-project

CS_0: do-minimum = without-project



Improved transport condition by the transport project

Reduction of Generalized Cost e.g. time saving

accidents reductions

Rule of a Half

$$UB = \int_{GC1}^{GC0} D(GC)dGC = \frac{1}{2}(GC_0 - GC_1)(Q_0 + Q_1)$$

Generalized Cost Function

$$GC = \alpha T + \beta L$$

GC: generalized cost by day and by vehicle type [yen/ vehicle]
α : value of time by day and by vehicle type [yen/ vehicle*minute]
β : VOC by vehicle type [yen/ vehicle*km]
T : average travel time by vehicle type [minute]
L : travel distance by vehicle type [km]

User benefit (per day) m: vehicle type. i,j: origin and destination.

weekday $BU_n = \sum_{m,i,j} \frac{1}{2}(GC_0 - GC_1)(Q_0 + Q_1)$

holiday $BU_s = (h\,\text{factor}) \cdot \sum_{m,i,j} \frac{1}{2}(GC_0 - GC_1)(Q_0 + Q_1)$

annual user benefit $BU_n \times 243 + BU_s \times 122$

Measurement of Value of Time

1) **Resource value**, based on Opportunity Cost

a) Average (expected) gross wage rate (per hour)

b) National annual income data (instead of gross wage rate)

ex. VOT = GDP / number of employment / working time

2) **Behavioral value**, based on Generalized Cost Function

$Utility = GC = -0.147TW - 0.0411TT - 2.24C$

(estimated by mode choice model)

VOT = 0.0411 / 2.24

= 1.10 US$/ hr / person