VALUE

Value in production (as an input)

Marginal value of water as an input is the increase in personal income (profit, employment income associated with an increase in the amount of water available, or to the decrease in personal income associated with a reduction in the amount of water available

Since this is an increase in income, WTP and WTA coinc

Value in consumption (as a final good.)

Marginal value of water as a final good is the increase in consumer's surplus (measured by WTP or WTA) associated with an increase in the amount of water available, or the reduction in consumer's surplus (WTP or WTA) associated with a reduction in the amount of water available.

On the consumer side, one must note the distinction between a change which is a <u>purely monetary impact</u> (i.e. an expense that reduces disposable income) versus a change which involves a <u>loss of convenience</u>.

This arises in the context of conservation measures.

Cost of Conservation - Monetary Cost or Disutility?

$$u(\underset{z}{\text{convenience}},\ \underset{y}{\text{spending money}})$$

$$u(z,\ y-C)$$

or

$$u(z-\Delta,\ y-C)$$

If purely monetary (out-of-pocket expense) cost is C

WTA = WTP to avoid = C

If there is inconvenience as well,

WTA > WTP > C.

Consequently, if the issue involved was just monetary cost, if you paid the person $C + \varepsilon$, he would immediately agree to comply.

If the issue is also convenience, you would have to pay him <u>more than</u> $C + \varepsilon$ to get him to comply.

How can we measure the value of the inconvenience (the value of the lost utility)?

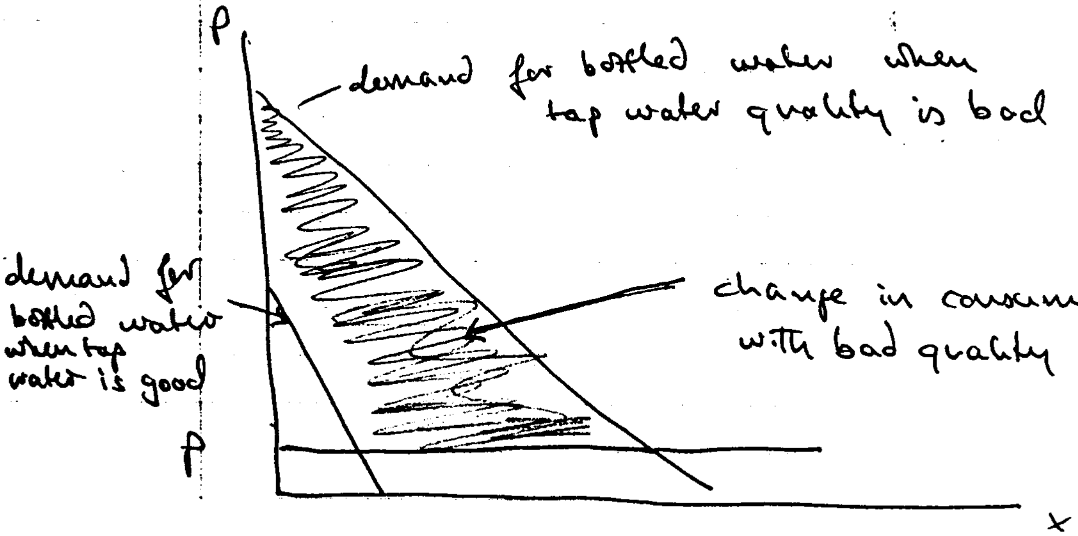
(1) REVEALED PREFERENCE, BASED ON AVERTING BEHAVIOR

(2) STATED PREFENCE, BASED ON CONTINGENT VALUATION

AVERTING BEHAVIOR

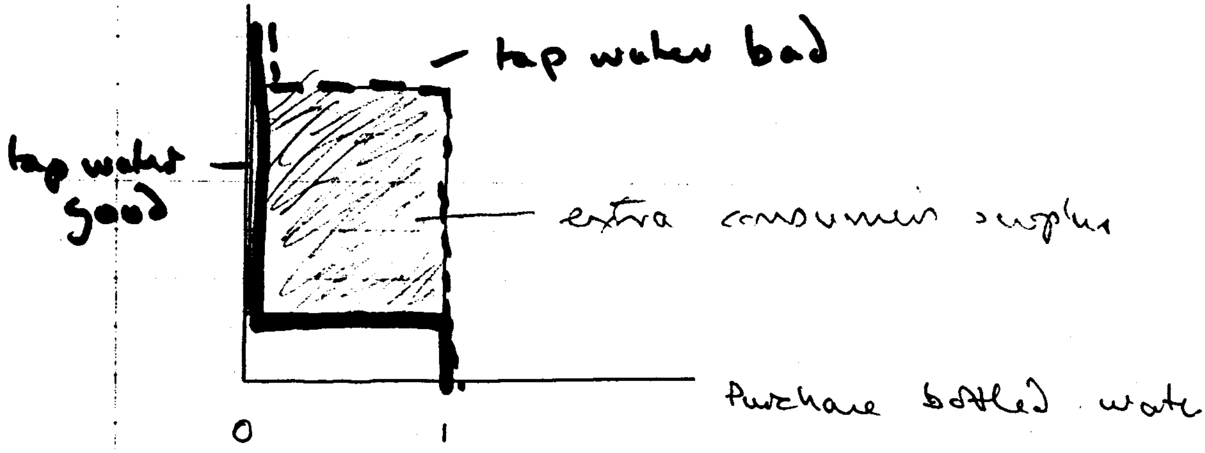
eg buy bottled water = f (cost of bottled water , safety of tap water , taste/odor of tap water)

Can think of this as a demand curve for bottled water



Note: (i) One is using the demand for bottled water as a surrogate for the demand for good quality tap water.

(ii) In the case of bottled water the dependent variable may be binary (does buy / does not buy)



THE LINK BETWEEN BEHAVIOR AND VALUE (PREFERENCE)

Based on the principle of "revealed preference"

This is the notion that one's behavior reveals ones values and preferences

The Economic Concept of Value

In principle, the economic value of an item is *not* the same as its price or cost.

Adam Smith, in explaining what was known as the "paradox of diamonds and water", emphasized the fundamental distinction between:

what something costs

what it is worth.

The paradox is that water is cheap, but it is surely worth more to society than are diamonds – how can this be? Smith's explanation had two parts.

1) Price is determined by the interplay of demand *and* supply as two separate considerations, not just by demand alone. A low price can signify abundant supply, not necessarily low demand. An implication is the need to make the conceptual distinction between supply (cost) and demand (value).

2) One must distinguish *marginal* value from total (or average) value. A low marginal value does not necessarily signify a low total value. At the margin, an additional increment of water may have a lower price than an additional increment of diamonds, but this does not mean that the total lost value of eliminating all the world's water would be smaller than the total lost value of eliminating all the world's diamonds.

Smith also promoted the notion of "value in exchange".

When we say this item is worth X to me, we mean "I would exchange X for this item.".

Generically, there are two possible ways to frame this exchange:

> (A) X is the most I would be willing to give up (pay) to get this item
>
> (B) If I gave up the item, you would have to me at least X to compensate me (X is the minimum I would be willing to accept to give up the item).

(A) is known as the Willingness to Pay (WTP) measure of value.
(B) is the Willingness to Accept measure of value.

In general, the two measures are different, though they are related to one another and can sometimes be close or even the same in magnitude.

- For a pure change in income, WTP = WTA
- For a change in prices, WTP $\neq$ WTA

  Generally, WTA $\geq$ WTP

One has to distinguish GROSS value from NET value.

For a person, the gross monetary value of some item is either the most he would be willing to pay for it (WTP) or the minimum he would accept to be without it (WTA).

The net monetary value of the item is the *excess* what it is worth to him (measured in terms of WTP or WTA) over what it actually costs him.

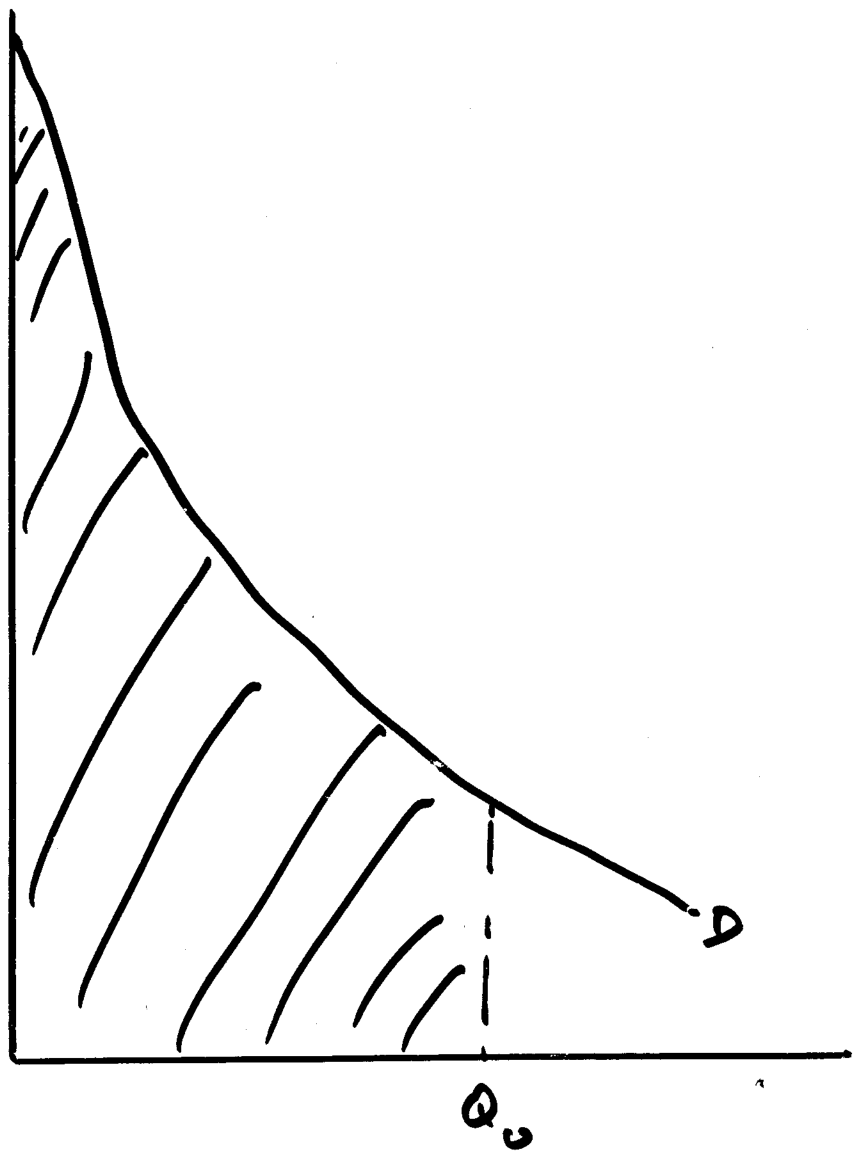
For firms, this is known as producer's surplus (profit)

For consumer's, this is known as consumer's surplus.

Consumer's surplus = the excess of WTP or WTA over cost (actual expenditure).

How to measure gross value and consumer's surplus from a demand function.

The total value of an item to a consumer (WTP or WTA) is approximately equal to the area under the demand curve, up to the quantity of the item being consumed.



The net value (consumer's surplus) is the triangular area under the demand curve above the price

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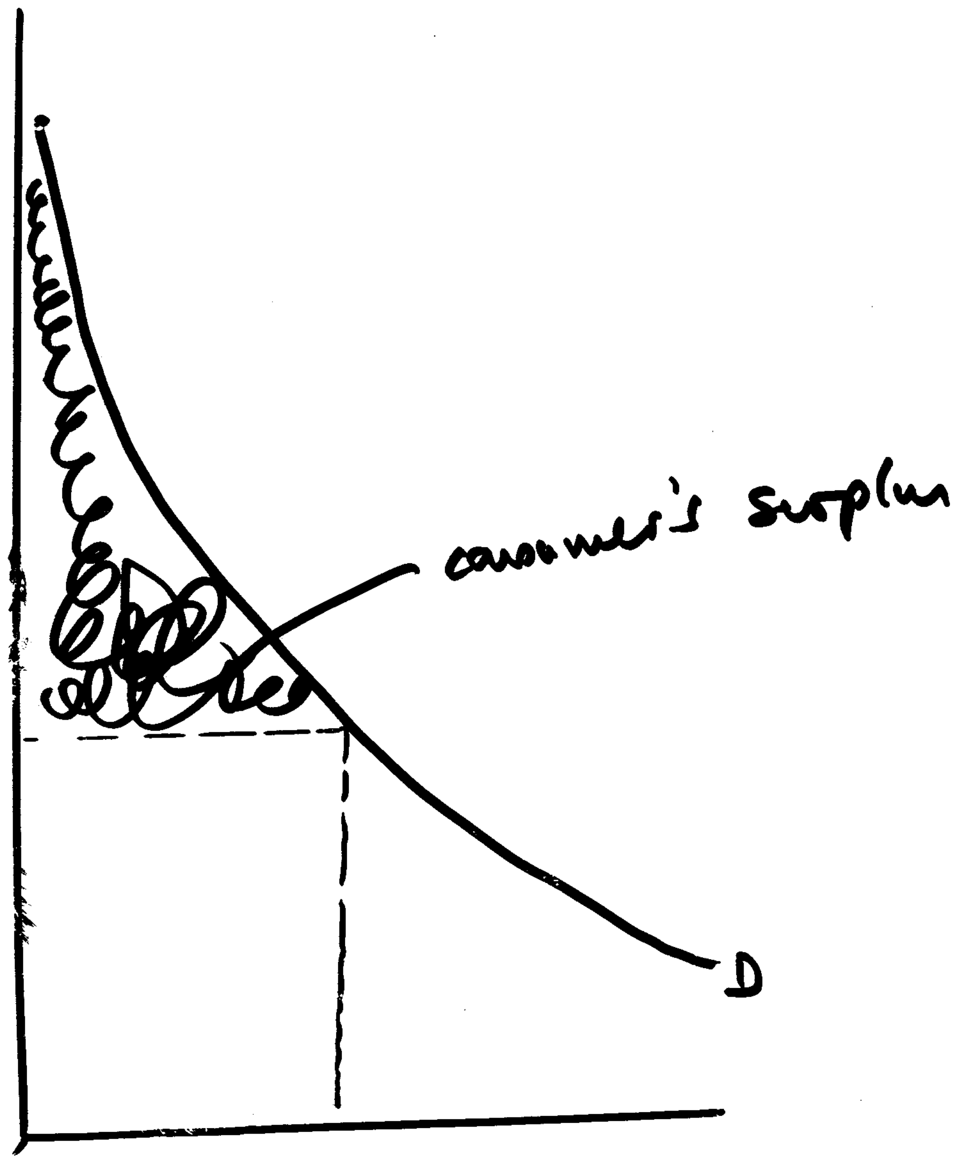
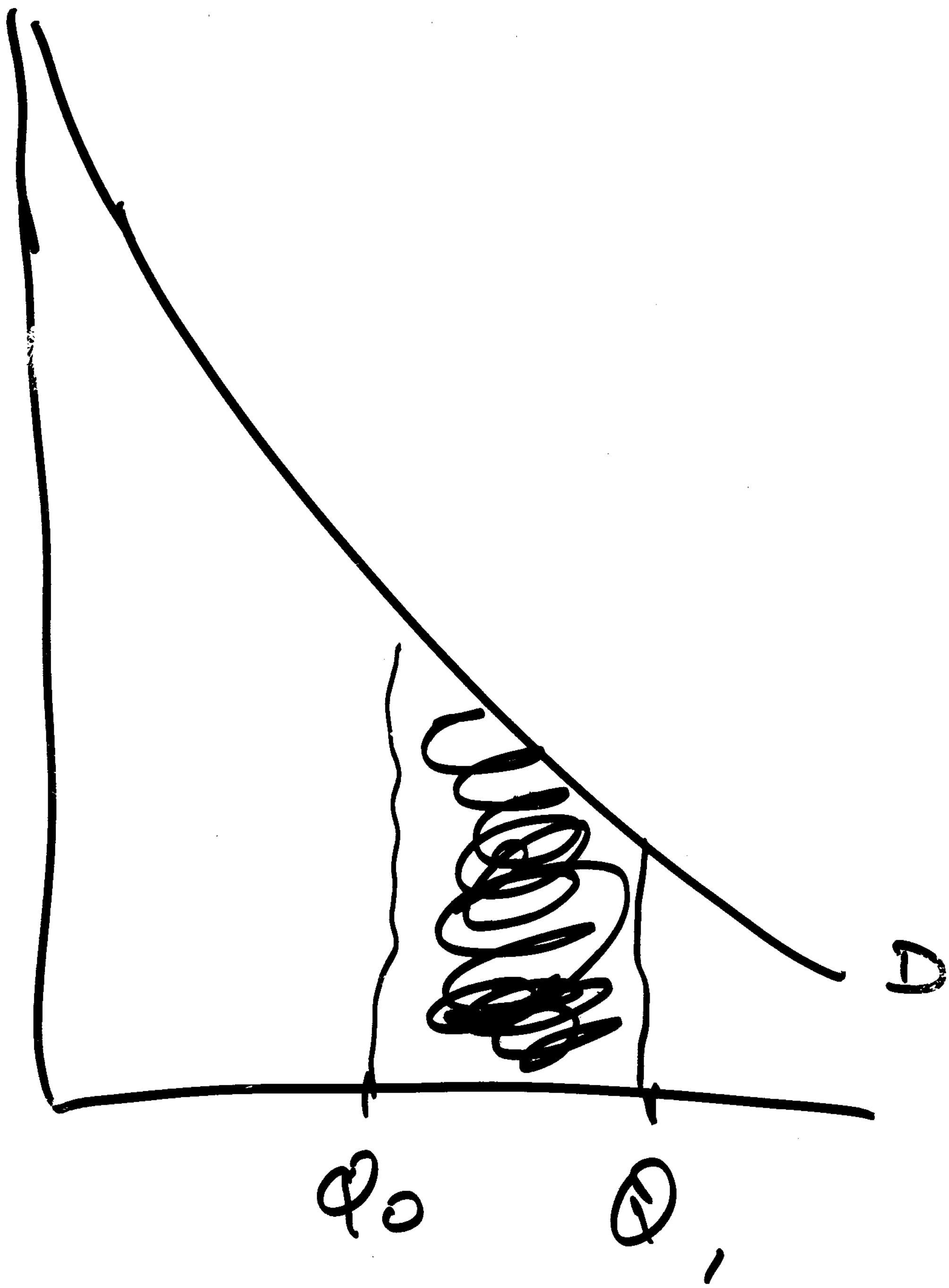
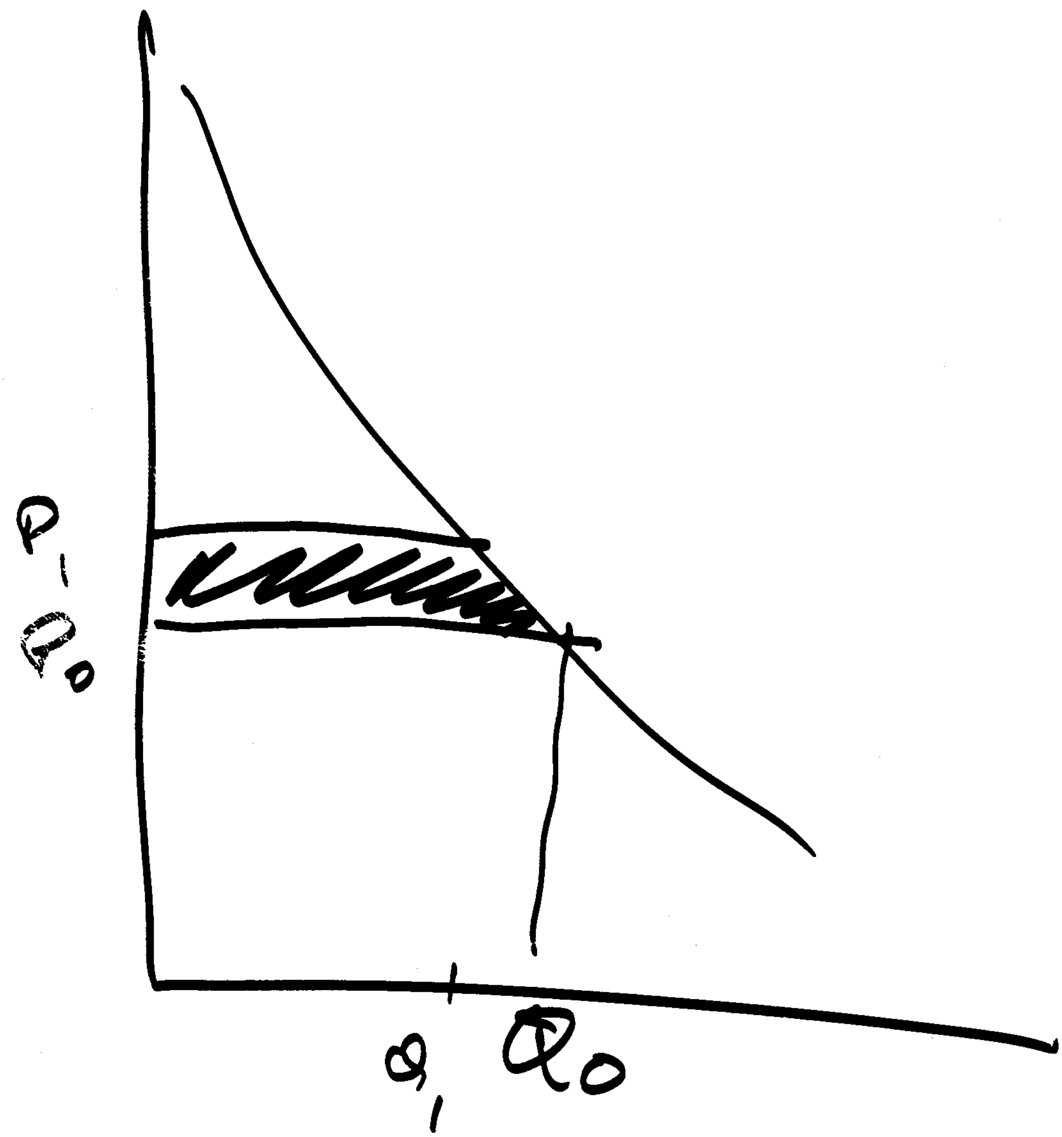
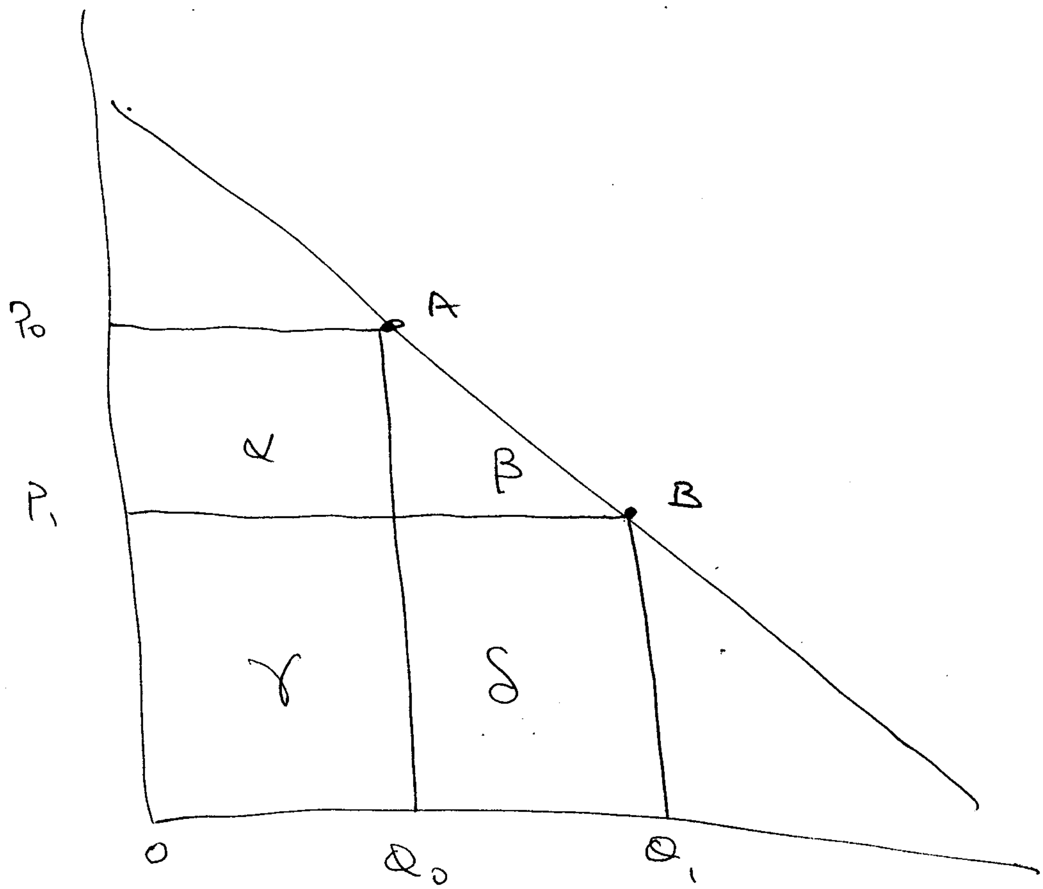


The gross value of a change in quantity is approximately measured by the change in the area under the demand curve between the old and new quantity of the item.



The net value of a change in price is the change in consumer's surplus.





Gain − increase in Gross value to consumer

$$G \equiv \text{area } Q_0ABQ_1 = \beta + \delta$$

change in expenditure for consumer

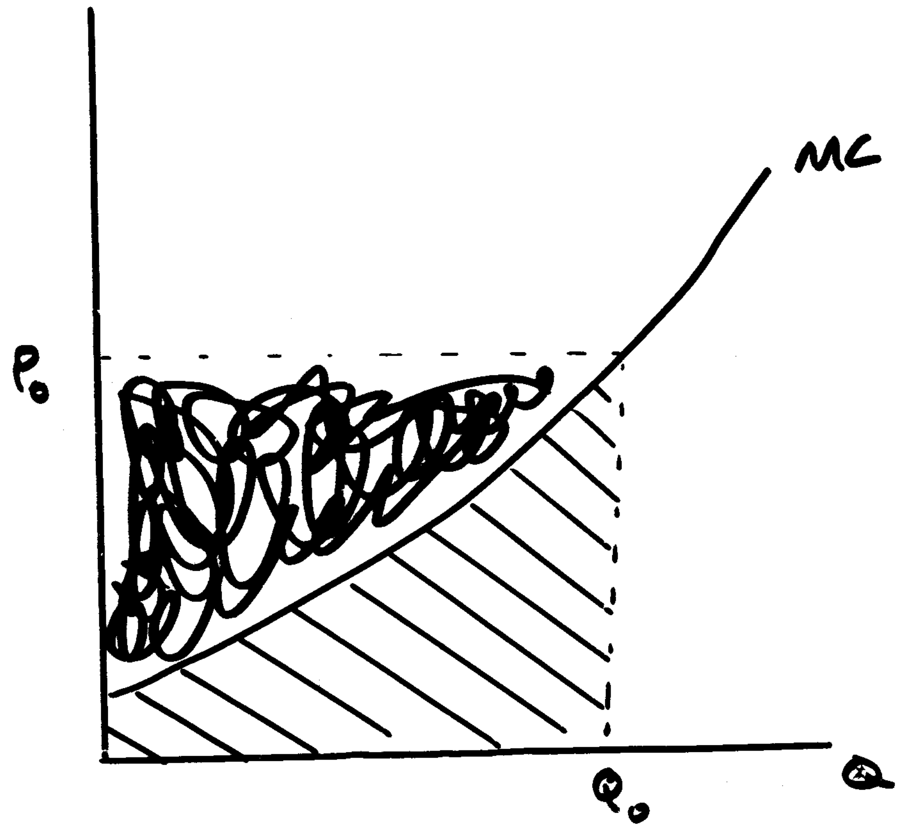
$$\Delta E \equiv \text{area}(OP_1BQ_1) - \text{area}(OP_0AQ_0) = \delta - \alpha$$

$$\text{Net Gain} = G - \Delta E = (\beta + \delta) - (\delta - \alpha)$$

$$= \beta + \alpha$$

and producer surplus

How to measure profit from a supply function (marginal cost function)



Total cost is measured by the area under the MC curve up to the quantity being supplied.

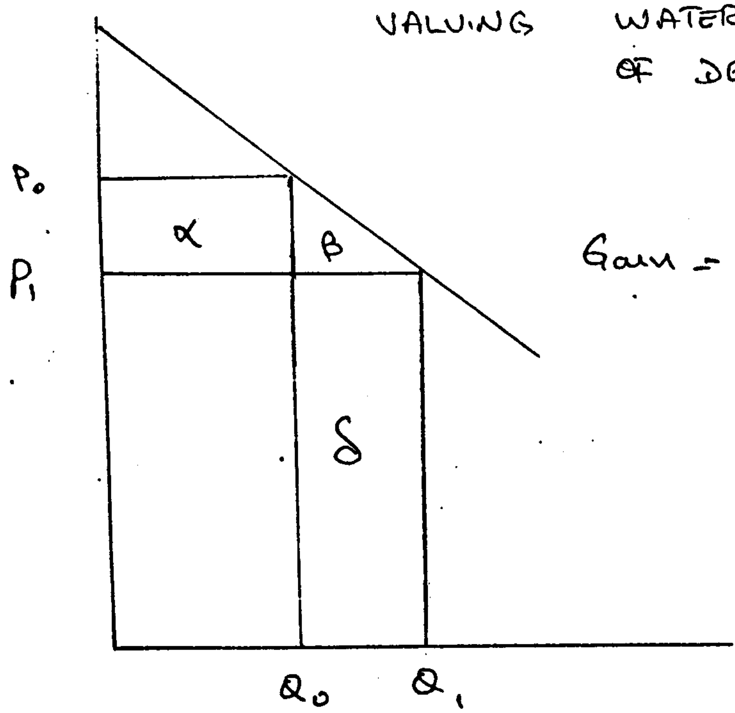
Revenue is rectangle $P_0 \cdot Q_0$

Profit = Revenue − Cost =

↑

known as "Producer's Surplus"

VALUING WATER USING THE ELASTICITY OF DEMAND



Gain = $\beta + \delta$

$$\beta = \tfrac{1}{2}\,\Delta Q \cdot \Delta p$$

$$\delta = p' \cdot \Delta Q$$

$$\alpha = Q_0 \cdot \Delta p$$

For a linear demand function, $Q = a - bp$,

$$\tfrac{1}{2}\,\Delta Q \cdot \Delta p = \frac{b(p' - p^0)^2}{2}$$

$$p' \cdot \Delta Q = b\,(p^0 - p')\,p'$$

$$Q_0 \cdot \Delta p = (a - bp^0)\cdot(p^0 - p')$$

<u>Relation to Elasticity of Demand.</u>

$$\beta + \delta \approx \Delta q \cdot P_1 + \tfrac{1}{2}\,\Delta q \cdot \Delta p$$

$$= \Delta q \left(P_1 + \tfrac{1}{2}\,\Delta p\right)$$

$$= \Delta q \left(P_1 + \tfrac{1}{2}\left(\frac{\Delta p}{\Delta q}\,\frac{q_1}{P_1}\right)\frac{P_1}{q_1}\,\Delta q\right)$$

$$= \Delta q \left(P_1 + \frac{\Delta q}{2\varepsilon}\,\frac{P_1}{q_1}\right) \text{ where } \varepsilon = \frac{\Delta q}{\Delta p}\cdot\frac{p}{q}$$

$q := 600000$

$D := 90000$

$p := 500$

$e := .1, .3 \, .. 1.1$

e	$D \cdot p \cdot \left[1 + \left[\dfrac{D}{2 \cdot e \cdot q}\right]\right]$
0.1	$7.875 \cdot 10^{7}$
0.3	$5.625 \cdot 10^{7}$
0.5	$5.175 \cdot 10^{7}$
0.7	$4.982 \cdot 10^{7}$
0.9	$4.875 \cdot 10^{7}$
1.1	$4.807 \cdot 10^{7}$

e	$D \cdot p \cdot \left[1 + \left[\dfrac{D}{2 \cdot e \cdot q}\right]\right]$
0.01	$3.825 \cdot 10^{8}$
0.03	$1.575 \cdot 10^{8}$
0.05	$1.125 \cdot 10^{8}$
0.07	$9.321 \cdot 10^{7}$
0.09	$8.25 \cdot 10^{7}$