

TAXATION AND EFFICIENCY

READ: ROSEN, CH. 15 ON THE RELEVANT ISSUES DISCUSSED IN CLASS

CONSIDER A GUY CONSUMES 10 SCOOPS OF ICECREAM PER WEEK
 PRICE OF ICECREAM = 1 € PER SCOOP.
 NOW, GOVT. IMPOSE A UNIT TAX ON ICECREAM, $T = 0.25$ € / SCOOP.
 THIS GUY'S RESPONSE? \Rightarrow HE THEN DECIDES TO CONSUME NO ICECREAM.
 SO, NO TAX REVENUES COLLECTED FROM THIS GUY.

QUESTION RAISED: DO WE WANT TO SAY THAT HE IS UNAFFECTED BY ICECREAM TAX?

ANSWER: NO! ICECREAM TAX DISTORTS HIS CHOICE; HE HAS TO ESCAPE AWAY FROM HIS MOST PREFERABLE CHOICE: 10 SCOOPS/WEEK TO ANOTHER CHOICE. THE NEW CHOICE, OF COURSE, IS LESS PREFERRED.

"EXCESS BURDEN" IS A LOSS OF WELFARE ABOVE AND BEYOND TAX REVENUES GOVT. COLLECTED

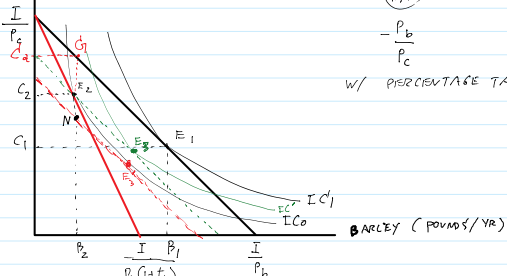
EXCESS BURDEN (BABY VERSION):



EXCESS BURDEN (ADULT VERSION)

CONSIDER 2 COMMODITIES: BARLEY AND CORN
 PLOU HAS FIXED INCOME: I

P_b AND P_c ARE PRICE OF BARLEY AND CORN, RESPECTIVELY
 CORN (POUNDS/YR)



$$\frac{B/P}{C/P} = \frac{P_b}{P_c} \quad \frac{A/P}{B/P} = \frac{P_b(1+t_b)}{P_c}$$

w/ PERCENTAGE TAX = t_b

RESULT 1: AFTER TAX IMPOSED, PLOU'S UTILITY FALLS. NOW SHE CONSUMES LESS B AND MORE C

$$(b_1, c_1) \rightarrow (b_2, c_2)$$

(OLD) (NOW)

RESULT 2: LAST YEAR, IF SHE CONSUMES b_2 , SHE CAN CONSUME $c = c_2$ OR b_2

NOW, GIVEN b_2 CONSUMED, W/ TAX, SHE CAN ONLY CONSUME $c' = c_2$ OR b_2

SO, DISTANCE GE_2 = TAX REVENUES MEASURED IN TERM OF FORGONE UNITS OF CORN SHE COULD NOT CONSUME NOW.

THEN TAX REVENUES = $GE_2 \times P_c$

↑ QUANTITY ↑ PRICE

SUPPOSE $P_c = 1$ POUND/UNIT, THEN GE_2 COULD BE VIEWED AS TAX REVENUES IN TERM OF POUND OR IN TERM OF UNIT OF CORN.

RESULT 3

- | | |
|---|---|
| <p>W/ BARLEY TAX</p> <ul style="list-style-type: none"> TAX REVENUE = GE_2 (COLLECTED) CONSUMER ENDS UP ON IC_0 | <p>W/ LUMP SUM TAX</p> <ul style="list-style-type: none"> TAX REVENUE = GE_2 CONSUMER ENDS UP ON IC' WHICH IS HIGHER THAN IC_0 !!! |
|---|---|

SO, IT IMPLIES THAT BARLEY TAXES CREATES LOSS IN WELFARE ABOVE AND BEYOND TAXES COLLECTED = EXCESS BURDEN.

PART OF CONSUMER SURPLUS

GOT GE_2

GOT GE_1

POINT OF CONSIDERATIONS

IF YOU CAN FEND TAX THAT GENERATE THE SAME REVENUES BUT MAKE SMALLER UTILITY LOSS

(COMPARE E_2 WITH E_3) E_3 LOSSES LESS UTILITY

OR

IF YOU CAN TAX HER BY ANOTHER METHOD, LIKE LUMP SUM TAX, AND GET GREATER REVENUE W/ THE SAME UTILITY LOSS,

(COMPARE E_2 WITH E_3')

GOT ONLY $GE_2 < GN$ (SAME UTILITY LOSS AS E_2 AND E_3' ARE THE SAME IC_0)

MEAN, IF SO, BARLEY TAX CREATES EXCESS BURDEN!

READ

EQUIVALENT VARIATION (EV)

HERE $EV = GN$ IN PICTURE.

= AMOUNT OF MONEY THAT WE WITHDRAW FROM THE CONSUMER TO MAKE HER END UP W/ IC_0 .

HERE, TAX REVENUES FROM BARLEY TAX = GE_2

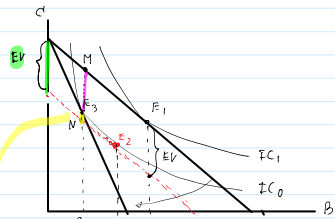
EXCESS BURDEN = EV - TAX REVENUE

= $GN - GE_2$

= E_2N !!! #

MEASURING WELFARE LOSS BY USING EQUIVALENT VARIATION (EV) CONCEPT

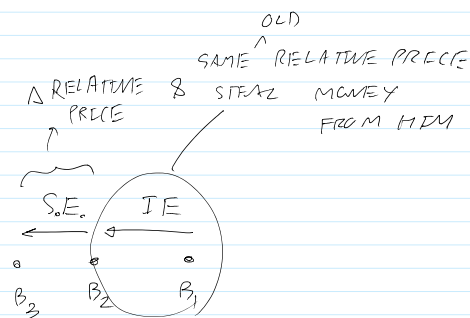
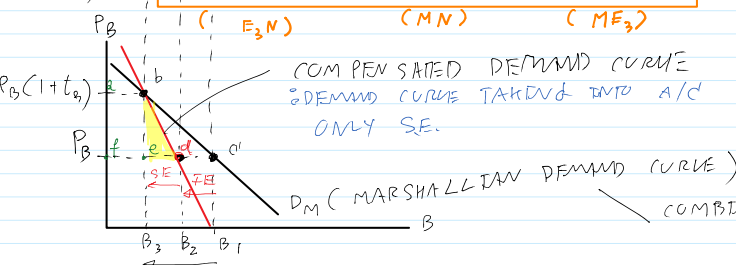
EV = MONEY WE TAKE AWAY FROM THE CONSUMER SO THAT IT WILL BRING HIM/HER FROM A UTILITY LEVEL TO ANOTHER UTILITY LEVEL GIVEN THE OLD RELATIVE PRICE.



OLD CHOICE (O/F TAX) : E_1
 NEW CHOICE (A/F TAX) : E_3 , UTILITY FALLS...
 OLD RELATIVE PRICE : $\frac{P_B}{P_C}$
 NEW RELATIVE PRICE : $\frac{P_B(1+t_B)}{P_C}$

EV = MN
 TAX REVENUE = ME_3 (MEASURED IN TERM OF FORGONE CORNS)
 (RECALL THAT B/F TAX IF B_3 IS CONSUMED, HE CAN CONSUME $C = MB_3$. BUT NOW, IF B_3 IS CONSUMED, HE CAN ONLY CONSUME E_3B_3 OF CORNS.
 SO, ME_3 IS SOME \approx TAX REVENUE IN TERM OF CORN FORGONE)

EXCESS BURDEN = EV - TAX REVENUE
 (E_2N) (MN) (ME_3)

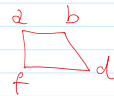



Q. WELFARE LOSS = ?

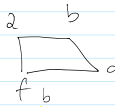
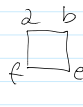

WITH CONSUMER SURPLUS CONCEPT : $\Delta CS = \int_a^b$

WITH EV CONCEPT : WELFARE LOSS WILL CONSIDER ONLY S.O.E.
 SO, WELFARE LOSS = \int_a^b


WITH EV CONCEPT : WELFARE LOSS WILL CONSIDER ONLY

S.O.E.
SO, WELFARE LOSS = 

TAX REVENUE = 

SO, EXCESS BURDEN = EV - TAX REVENUE
 =  - 
 = 

NOTICE THAT TAX REVENUE < EV. IT WOULD IMPLY THAT THIS BARELY TAX 'CREATES' EXCESS BURDEN

EXCESS BURDEN (EB) =  bed

IN TAXATION ANALYSIS, WE CAN MEASURE

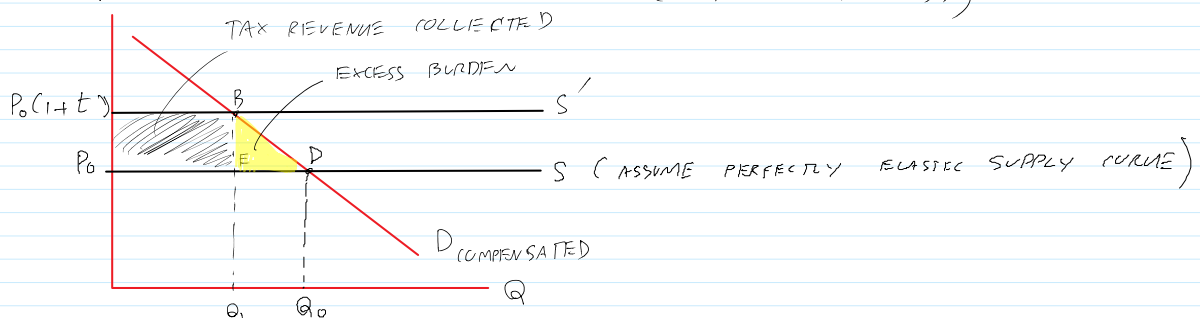
EFFICIENCY LOSS RATIO = $\frac{\text{AREA BED}}{\text{AREA OF TAX REVENUE}}$


EX: TAX REVENUE = 100
 EB = 40

EL RATIO = 0.4 \Rightarrow EACH BAHT OF TAX REVENUE CREATES EB =

0.4 BAHT.
 EB IS CAUSED BY TAX-INDUCED DISTORTIONS IN BEHAVIOR

Q: WHAT FACTORS DETERMINE EXCESS BURDEN (= EFFICIENCY LOSS)?



EB =  = $\frac{1}{2} \cdot dQ \cdot dP$
 = $\frac{1}{2} \cdot (dQ) \cdot (tP_0) \approx \frac{1}{2} \Delta Q \cdot t \cdot P_0$

$$\epsilon_d = \frac{\frac{dQ}{Q} \times 100}{\frac{dP}{P} \times 100} = \frac{dQ \cdot P}{dP \cdot Q}$$

$dQ = \epsilon_d \cdot dP \cdot \frac{Q}{P}$

$EB = \frac{1}{2} \cdot \left[\int_{P_0}^{P_0(1+t)} \epsilon_d \cdot dP \cdot \frac{Q_0}{P} \right] \cdot tP_0$

$$EB = \frac{1}{2} \cdot \left[\epsilon_d \cdot dP \cdot \frac{Q_0}{P_0} \right] \cdot t P_0$$

$$= \frac{1}{2} \cdot \left[\epsilon_d \cdot t P_0 \cdot \frac{Q_0}{P_0} \right] t P_0$$

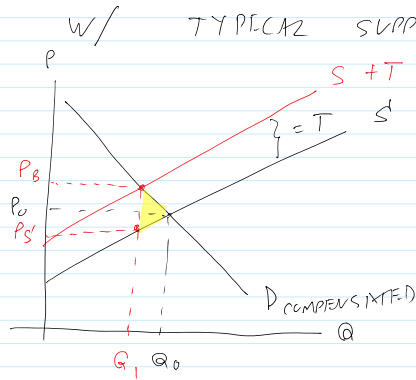
$$EB = \frac{1}{2} \cdot \epsilon_d \cdot P_0 \cdot Q_0 \cdot t^2$$

EB DEPENDS ON (1) ϵ^d : THE HIGHER ϵ^d , THE HIGHER EB.
 (\checkmark FOR EFFICIENCY ASPECTS'
 \checkmark FOR EQUITY ASPECTS')

(2) $P_0 \cdot Q_0$: THE HIGHER THE ORIGINAL VALUE OF TRANSACTION ($P_0 \cdot Q_0$), THE HIGHER THE EB.

(3) t^2 : THE HIGHER THE t , THE HIGHER EB IN SQUARED FASHION!

CASE 2



$$EB = \frac{1}{2} \cdot T \cdot \Delta Q \quad \text{--- (1)}$$

$$T = P_B - P_S \quad \text{--- (2)}$$

$$\Delta P_B = P_B - P_0 \quad \text{--- (3)}$$

$$\Delta P_S = P_0 - P_S \quad \text{--- (4)}$$

$$\epsilon^d = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} \quad \text{--- (5)}$$

$$\epsilon^s = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} \quad \text{--- (6)}$$

$$EB = \frac{1}{2} T^2 \cdot \frac{Q}{P} \left[\frac{\epsilon^d \cdot \epsilon^s}{\epsilon^d + \epsilon^s} \right]$$

D-I-Y :
 VERIFY THIS ...

WELFARE COST OF TAXATION !!!

ABOVE IS EXCESS BURDEN IN CASE OF LUMP SUM TAX.

HOW ABOUT THE EXCESS BURDEN IN CASE OF AD VALOREM TAX ?

$$T = P_B - P_S$$

$$= (1+t) P_0 - P_0$$

$$= t P_0$$

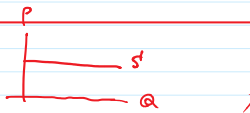
SUBSTITUTE (8) INTO (7) :

$$EB = \frac{1}{2} t^2 (P \times Q) \left[\frac{\epsilon^d \cdot \epsilon^s}{-d \cdot -s} \right]$$

SUBSTITUTE (8) INTO (7):

$$EB = \frac{1}{2} t^2 (P \times Q) \left[\frac{E^d \cdot E^s}{E^d + E^s} \right]$$

$$EB = \frac{\frac{1}{2} P \times Q \times t^2}{\left(\frac{1}{E^d} + \frac{1}{E^s} \right)} \quad \text{--- (9)}$$

IF $E^s \rightarrow \infty \equiv$ 

EB IN EQ (9) WILL CHANGE TO BE:

$$EB = \frac{1}{2} P \cdot Q \cdot E^d \cdot t^2$$

↓
SAME AS CASE (1)

WHEN S CURVE IS HORIZONTAL!