1.1 BCA Steps

Monday, August 24, 2020 12:36 PM

CBA ↔ BCA

NB = B - C

- Clear about Ref Case
- Alternatives?
- Who is impacted + how?
- Who matters? → STANDING

Technical Steps

- Predict, quantify, monetize, + discount impacts
- Sensitivity analysis

- Analyst recommendation

Cost effectiveness Analysis
Economic Impact analysis
↳ NOT A CBA/BCA

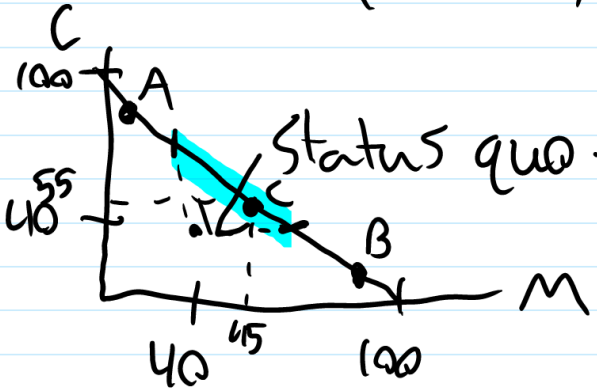
1.2 Measuring Efficiency

Monday, August 24, 2020 12:52 PM

More conceptual foundations

How to measure efficiency?

Pareto efficiency



Status quo → burn $20

Pareto efficient: Nobody loses

Kaldor-Hicks efficiency

↳ if something is potentially Pareto, do it

1.3 More Conceptual Foundations

Monday, August 24, 2020 1:06 PM

B+C?

WTP → Willingness to Pay

Opportunity Cost

$NB = B - C$

$B:C = B/C$

New users	+10
Old users	-5
Const cost	3

↳ NB: 10 - 5 + 3 = 2

↳ B:C = $\frac{10}{8}$ or $\frac{5}{3}$

1.2 1.67

1.4 BCA Limitations

Monday, August 24, 2020 1:16 PM

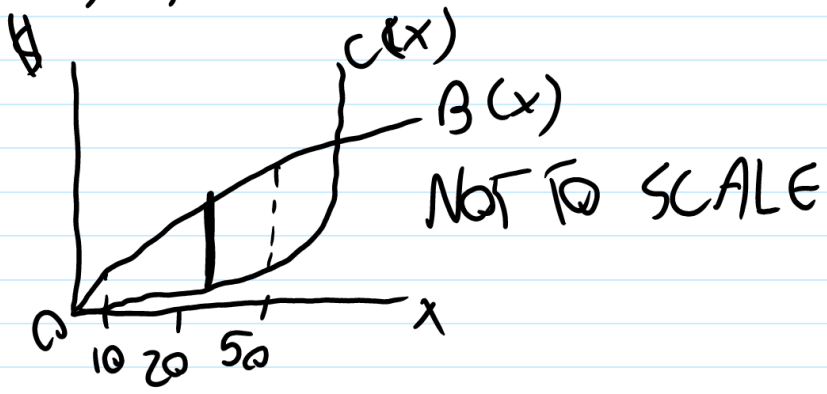
Potential Problems

Arrow's Impossibility theorem
- Depends on wealth distribution
- Standing

Optimum may not be under consideration

$NB = B(x) - C(x)$

0, 10, 50 acres



HW 1.1

Tuesday, August 25, 2020 12:33 PM

Passed Solution review

City doesn't require helmets. I ride without a helmet

a. What are the benefits/costs of an ordinance to require helmets?

Costs	Benefits
Barrier to entry	Increased Safety
Enforcement	Stylishness
Pushback	
decreased Comforts	

b. Societies costs/benefits?

Costs	Benefits
Enforcement	Less medical debt
Pushback	

a) Personal...

Costs
- helmet cost
- reduced comfort
- helmet hair

benefits
- reduced risk of injury

b) Society...

costs
- enforcement
- increased pollution

benefits
- decreased healthcare costs

HW 1.2

Tuesday, August 25, 2020 12:47 PM

Tariffs on kumquats!

a. Growers are the focus! How is net benefit calculated as a spender?

Costs:
Tariff revenues (8m)
Production (6m)
Reduced Consumption (13m)

Benefits
Profits (4m)

4 - 8 - 6 - 13 = **-23m**

b. Treasury behaves as a guardian. How would net benefit be calculated if profit taxes are 20%.

Costs:
Production (6m)
Consumption (13m)

Benefits:
Profits (4m)
Revenues (8m)

4 + 8 - 6 - 13 = **-7m**

Passed Solution review

TEMPLATE	PV (million dollars)	
National government grant	2.2	
Construction and maintenance costs	12.5	
Personnel costs	8.2	
Revenue from municipal residents	8.6	
Revenue from non-residents	2.2	
Use value benefit to municipal residents	16.6	
Use value benefit to non-residents	3.1	
Scrap value	0.8	

3.b Municipal standing	PV (million dollars)	
National government grant	2.2	B
Construction and maintenance costs	12.5	C
Personnel costs	8.2	C
Revenue from municipal residents	8.6	C
Revenue from non-residents	2.2	B
Use value benefit to municipal residents	16.6	B
Use value benefit to non-residents	3.1	-
Scrap value	0.8	B
NSB	-7.5	

3.a National standing	PV (million dollars)	C
National government grant	2.2	-
Construction and maintenance costs	12.5	-
Personnel costs	8.2	B
Revenue from municipal residents	8.6	B
Revenue from non-residents	2.2	B
Use value benefit to municipal residents	16.6	B
Use value benefit to non-residents	3.1	B
Scrap value	0.8	
NSB	29.1	

3.c Municipal guardian	PV (million dollars)	
National government grant	2.2	B
Construction and maintenance costs	12.5	C
Personnel costs	8.2	C
Revenue from municipal residents	8.6	B
Revenue from non-residents	2.2	B
Use value benefit to municipal residents	16.6	-
Use value benefit to non-residents	3.1	-
Scrap value	0.8	-
NSB	-7.7	

3.d Municipal spender	PV (million dollars)	
National government grant	2.2	B
Construction and maintenance costs	12.5	C
Personnel costs	8.2	B
Revenue from municipal residents	8.6	B
Revenue from non-residents	2.2	B
Use value benefit to municipal residents	16.6	B
Use value benefit to non-residents	3.1	B
Scrap value	0.8	B
NSB	29.2	

HW 2.4

Tuesday, September 1, 2020 8:51 PM

Worked w/ Austin
Passed Solution review

Project R has:
20m Benefits
16m Costs

F has:
26m Benefits
20m Costs

W has:
10m Benefits
2m Costs

Road to improve Projects:
16m Benefits to R
10m Benefits to F
-2m Benefits to W
4m Benefits no Projects
8m Costs

a)

Project	Benefits	Costs	B/C	NB
R w/ Road	36	24	1.5	12
R no Road	20	16	1.25	4
F w/ Road	36	28	1.29	8
F no Road	26	20	1.3	6
W w/ Road	16	10	1.6	6
W no Road	10	2	5	8
Road only	4	8	.5	-4

b) Project R with a road should be selected according to the CBA decision rule

HW 2.6

Tuesday, September 1, 2020 9:13 PM

Worked w/ Austin
Asked Solution review

Costs: 500k
600k

Benefits: 900k ← changed to 900k

900k − 500k − 600k = −200k

↑

The book says 900,000 million. I'm going to use 900k

There is a net social loss of 200,000

HW 2.7

Tuesday, September 1, 2020 9:22 PM

Worked w/ Austin
Passed Solution review

Costs:	National or global?
40m	N
220m	N
180m	N

Benefits:	
350m	N
70 m	N
280m	G

NSB = -20m

Required fraction = 20/280 = 1/14

The program has a negative NSB of -20m
The required fraction is 20/280

3.5 Incorporating the social cost of raising revenue through taxation

Excise tax on a good results in deadweight loss
SS is reduced w/ taxes
leakage or excess tax burden = proportion of tax or subsidy that results in deadweight loss
Increase in DL from raising tax $1 = METB
METB = marginal excess tax burden
METB + 1 = MCPF
↳ marginal cost of public funds
SS = CS + PS + (MCPF)GS

3.6 Measuring Changes in Welfare

3.7 Conclusions

CBA aims to efficiently allocate resources

Appendix 3A CS and WTP

Compensating variation
Indifference curves
Income + substitution effects
Demand curves
Marshallian demand uses Income + substitution effects
Utility compensated
Hicksian compensated variation demand curve
Equivalence of CS + compensating variation
Equivalent variation as an alternative to compensating variation

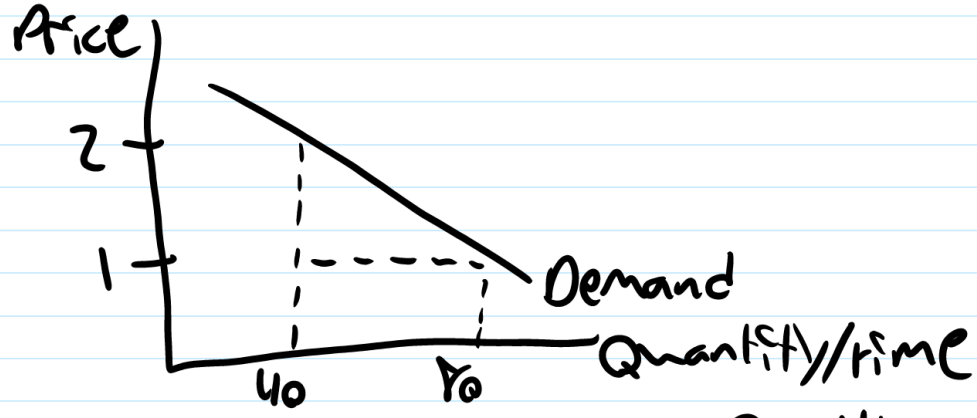
3.1 BCA Demand

Tuesday, August 25, 2020 7:55 PM

Microeconomic foundations:

Demand closely related to willingness to pay (W+P)

"Law of Demand"



slope of demand is $\frac{\Delta Q}{\Delta P} = \frac{+40}{-1} = -40$

$Q = f(Price) \rightarrow$ demand curve

$P = f(Quantity) \rightarrow$ inverse demand curve

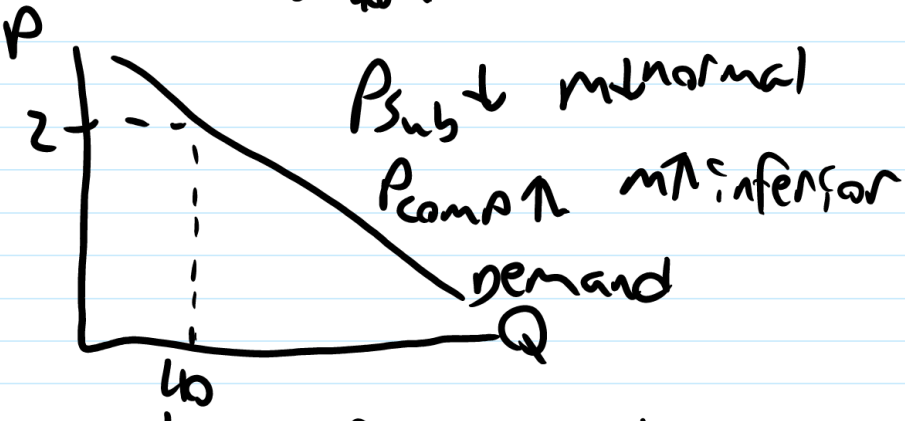
$$\frac{\Delta Q}{\Delta P} = \frac{Q_2 - Q_1}{P_2 - P_1} = \frac{80 - 40}{1 - 2} = \frac{40}{-1}$$

$$\frac{\Delta Q}{\Delta P} = -40 \rightarrow \Delta Q = -40 \Delta P$$

$$(Q - 40) = -40(P - 2)$$

$$Q = 120 - 40P$$

$$P = 3 - \frac{1}{40}Q$$



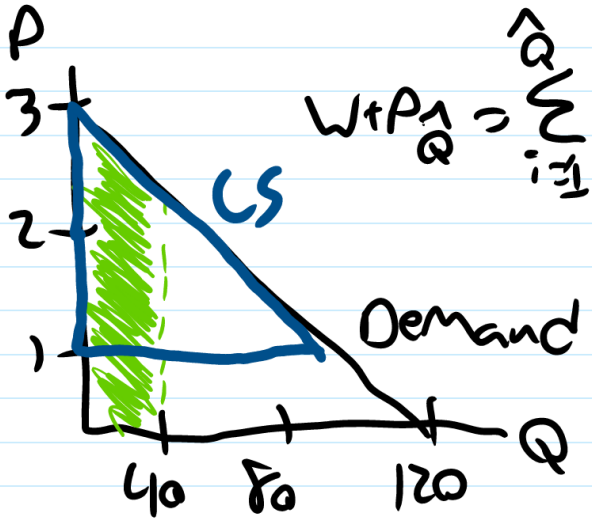
↳ Quantity demanded

$Q = f(P, P_{sub}, P_{comp}, M)$

↳ normal, inferior

3.2 Demand, WtP, and Consumer Surplus

Tuesday, August 25, 2020 8:16 PM



$WtP_{\hat{Q}} = \sum_{i=1}^{\hat{Q}} P(1) + P(2) + \dots P(\hat{Q})$

$WtP = \int_0^Q P(x)\,dx = (2-1)(40-0)$

$+ (3-2)\left(\frac{1}{2}(40-0)\right)$

$= 80 + 20 = 100$

$CS = \frac{1}{2}(3-1)(80) = 80$

$CS \equiv WtP - Payments$

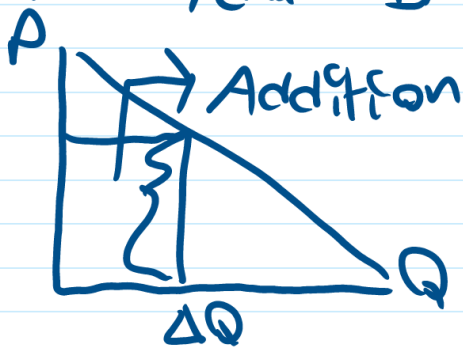
ΔCS

$CS = V(Q) - PQ$

↳ WtP ↳ Payment

$\frac{dCS}{dQ} = \frac{dV}{dQ} - P = 0$

$P = dV/dQ$ = Inverse demand function

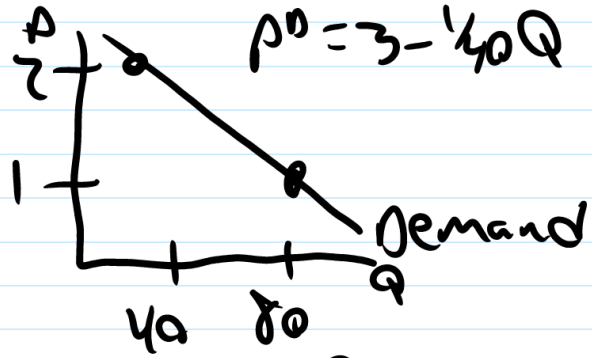


3.3 Elasticity

Tuesday, August 25, 2020 8:29 PM

$\frac{\Delta Y}{\Delta X}$ $\frac{\Delta Q^D}{\Delta P}$

$\frac{\Delta Q^D}{\Delta P}$ $\frac{\%\Delta Q^D}{\%\Delta P} = \zeta_P^D$



$P^D = 3 - \frac{1}{40}Q$

$\%\Delta Q = \frac{80-40}{40} = \frac{40}{40} = 100\%$

$\%\Delta P = \frac{2-1}{1} = \frac{-1}{1} = -100\%$

$\zeta^D = -1$

$\%\Delta Q = \frac{40-80}{80} = -1/2$

$\%\Delta P = \frac{2-1}{1} = 1$

$\zeta^D = \frac{-50\%}{100\%} = -1/2$

$\zeta^P = \frac{\%\Delta Q}{\%\Delta P} = \frac{\Delta Q/Q}{\Delta P/P}$

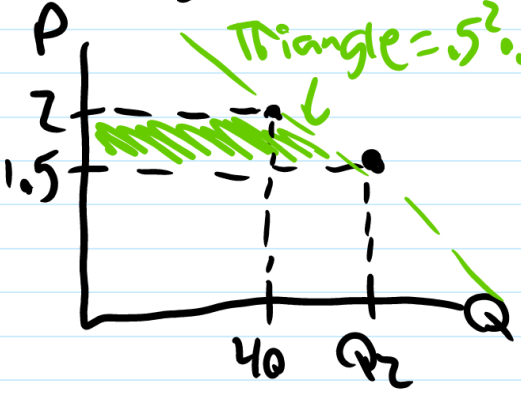
$= \left(\frac{\Delta Q}{\Delta P}\right) \cdot \left(\frac{P}{Q}\right)$

"Point elasticity"

3.4 Elasticity to monetize an impact

Tuesday, August 25, 2020 8:41 PM

Using Elasticity to Value Impacts on Consumers



Triangle $= .5^2 .25$ $2,4

$(2-1.5) \cdot 4 = 2$

$\frac{1}{2}(2-1.5)(Q_2-40)$

$30 = -1/2$

$\frac{\Delta Q}{\Delta P} = \frac{Q_2-4}{1.5-2} = -1/2$

$Q_2 - 4 =$

4.25

$\Delta CS = 2\frac{1}{6}$

3.5 Supply and Producer Surplus

Saturday, August 29, 2020 3:00 PM

Supply, Producer Surplus, Factor Surplus

"Diminishing returns to fixed factors"

$\frac{TVC}{Q} = AVC$ TVC = total variable cost

$\pi = Pq - C(q) \rightarrow \frac{d\pi}{dq} = P - \boxed{\frac{dC}{dq}} = 0$

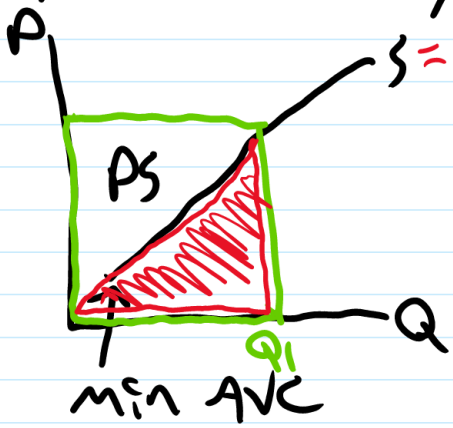
↳ Profit ↳ cost ↳ MC

$P - MC = 0$

$P = MC \rightarrow$ see graph

$Q^S = \sum_{i=1}^{n} q_i(P)$

↳ market supply



TVC $\pi = Pq - TVC - TFC$

↳ Total Fixed cost

$PS = Pq - TVC$

↳ Producer surplus

$SS = CS + PS$

Social = Consumer + Producer

Long run ↔ All inputs are variable

3.6 Producer Surplus, Economic Profit, and Factor Surplus

Saturday, August 29, 2020 3:26 PM

Producer Surplus in the long run

π economic > 0 → enter or expand

$P \downarrow \rightarrow \pi^e \downarrow$

$\pi^e < 0$ → exit or contract

↳ $P \downarrow$, $\pi^e \uparrow$

Factor Surplus

$PS = \pi + FS$

$PS = \pi^e +$ Ricardian rents

↳ FS

$SS = CS + PS$

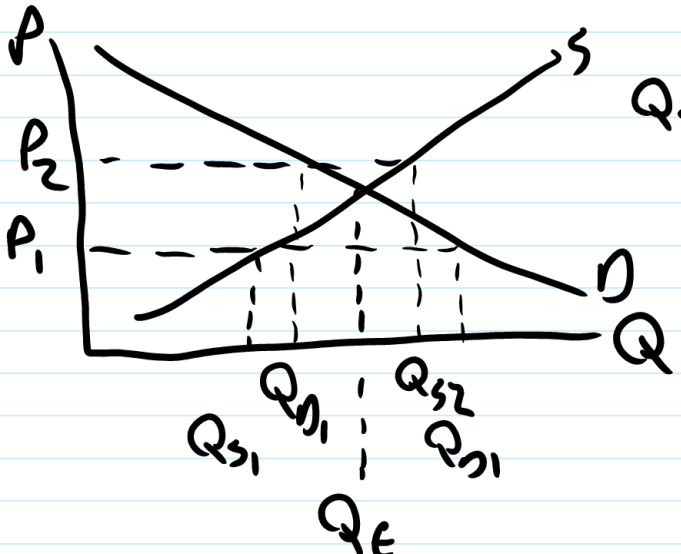
$= CS + \pi^e + FS$

3.7 Equilibrium, SS, and Allocative Efficiency

Saturday, August 29, 2020 3:46 PM

Social Surplus

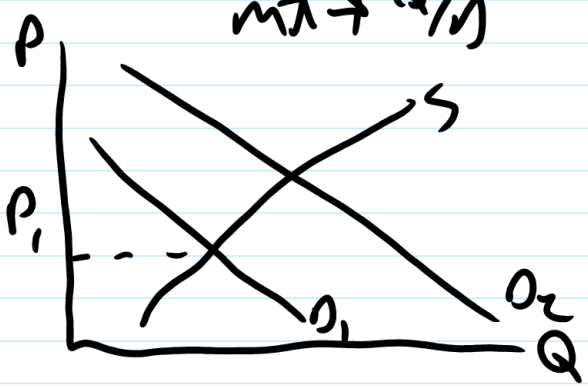
market equilibrium

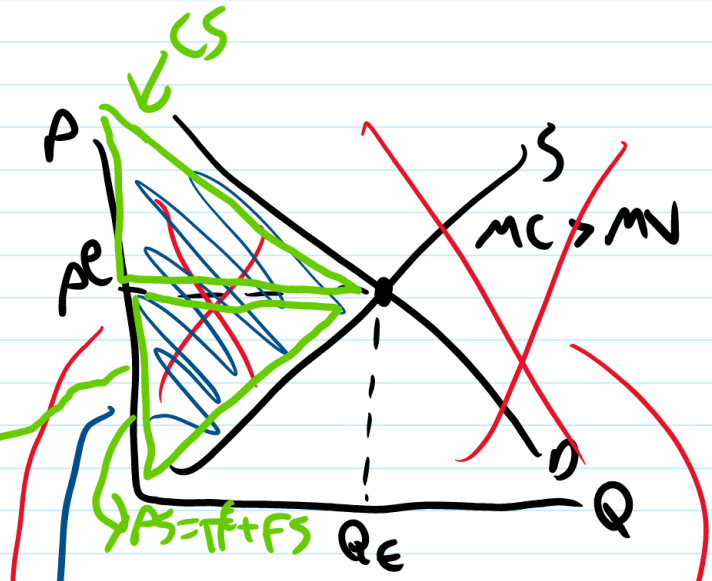


$Q_{S2} > Q_{D2}$ ↳ surplus

$Q_{D1} > Q_{S1}$ ↳ shortage

$MR \rightarrow Q/D$





Allocatively efficient outcome

MV = marginal value

Too much production → produced too little

Max SS

3.8 Factors of Production

Tuesday, September 1, 2020 6:10 PM

Factors of Production:

- Labor
- Land (natural resources)
- Capital (Roundaboutness of Production)

Entrepreneurial Activity

↳ Paid w/ econ. Profit

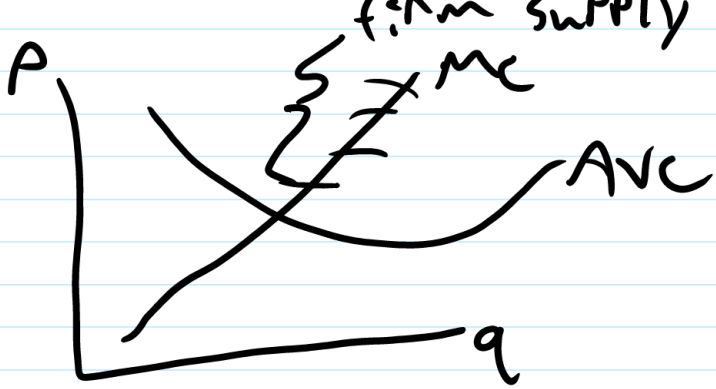
3.9 Long Run Equilibrium and Producer Surplus

Tuesday, September 1, 2020 6:20 PM

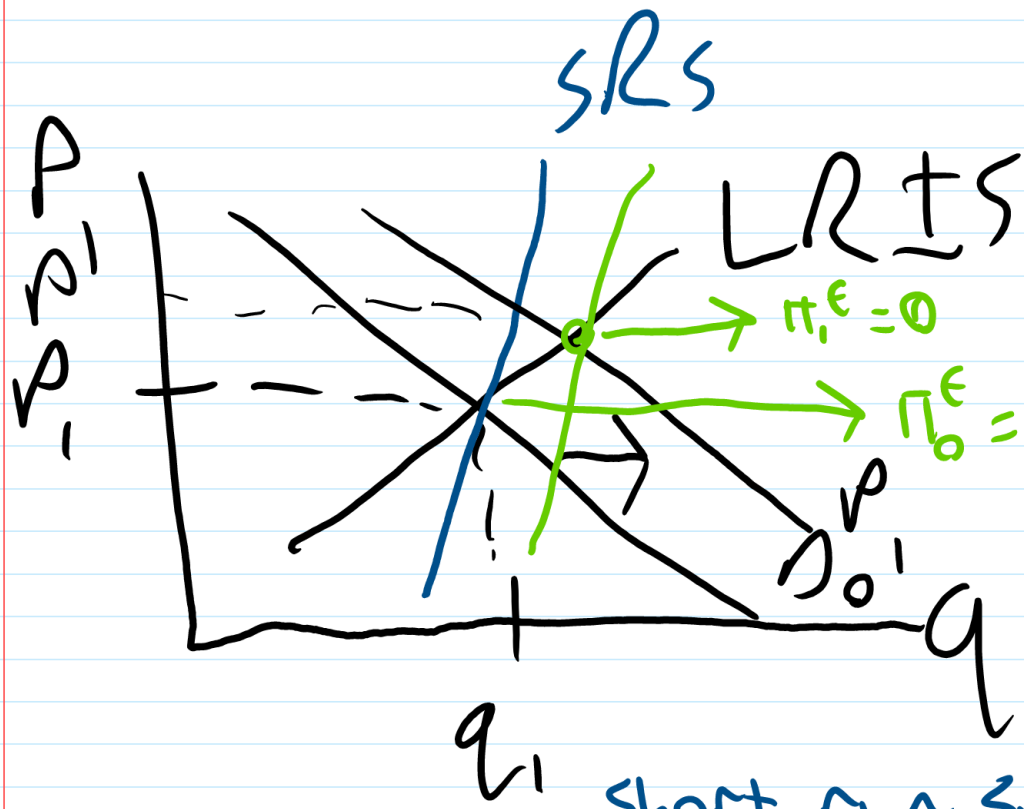
Long Run equilibrium

Profit and Factor Surplus

firm supply curve

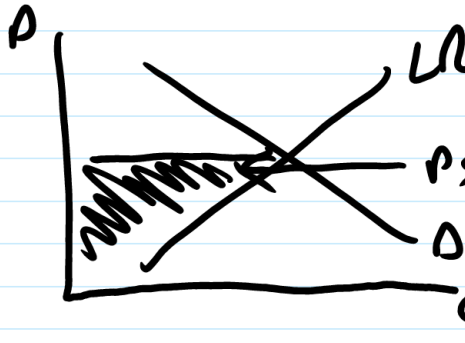


SR $\pi^E > 0$



Short run supply

Long run industry supply



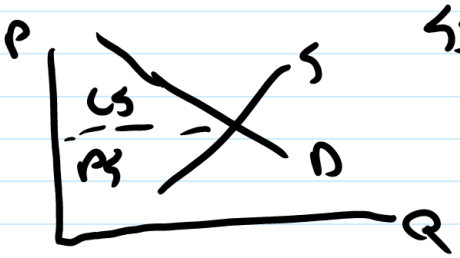
Factor payments wages, interest, rent

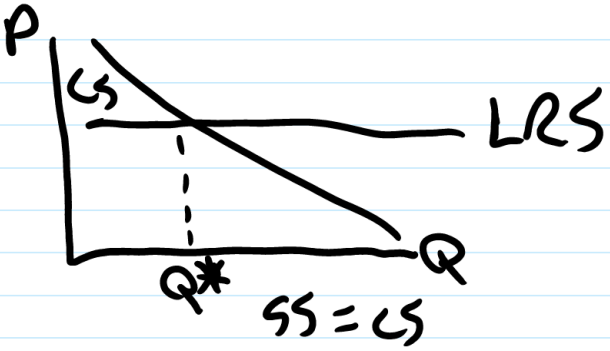
3.10 Social Surplus and Government Surplus

Tuesday, September 1, 2020 7:05 PM

Social Surplus

$SS = CS + PS$





Increasing cost Industry

constant cost industry

Government

$SS_1 = CS_1 + PS_1 \qquad SS_2 = CS_2 + PS_2$

$\Delta SS = (CS_2 - CS_1) + (PS_2 - PS_1)$

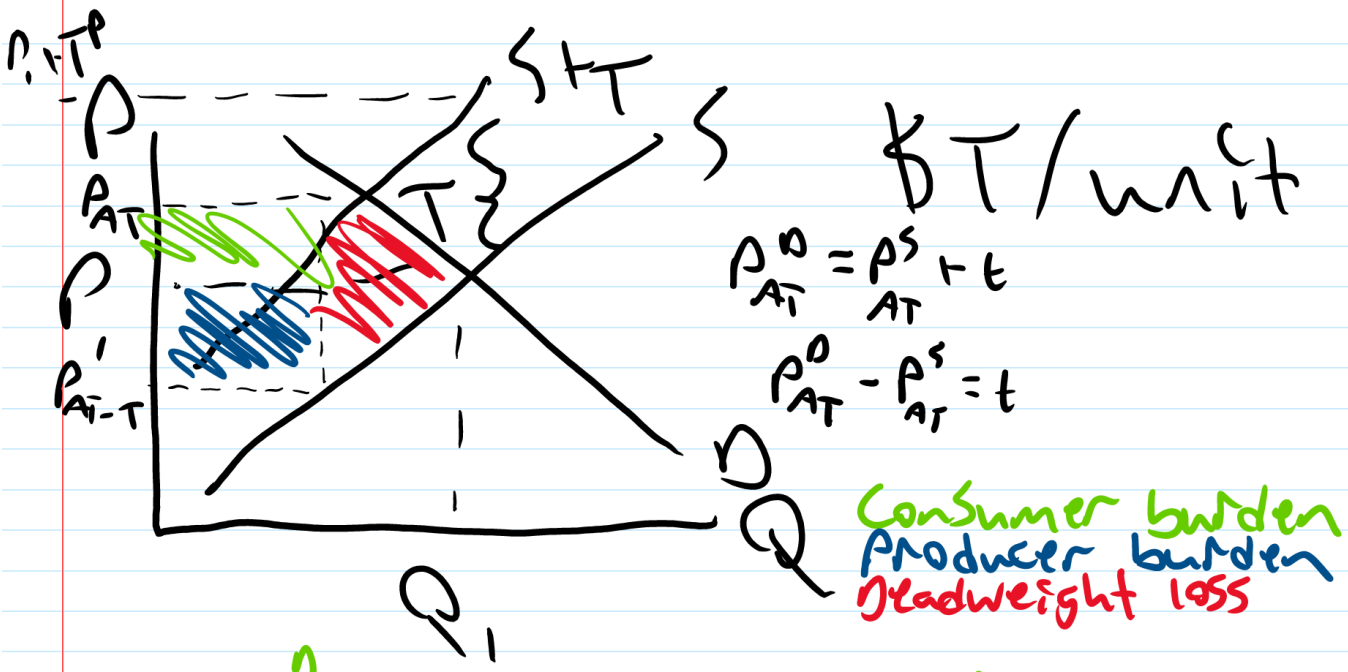
$\Delta SS = \Delta CS + \Delta PS$

$\Delta SS = \Delta CS + \Delta PS + (1 + \lambda)\Delta GS$ ← Budget Surplus

↳ marginal excess burden of taxation

3.11 Tax Burden

Tuesday, September 1, 2020 7:16 PM



$ T/unit

$P^D_{AT} = P^S_{AT} + t$

$P^D_{AT} - P^S_{AT} = t$

Consumer burden
Producer burden
Deadweight loss

$CB = (P^D_{AT} - P_1)\, Q_{AT}$

$PB = (P_1 - P^S_{AT})\, Q_{AT}$

$\text{Tax Rev} = (P^D_{AT} - P^S_{AT})\, Q_{AT}$

$= t \cdot Q_{AT}$

Taxes distort outcomes

$$\frac{CB + PB + DWL}{CB + PB} = \frac{\text{Tax revenue} + DWL}{\text{Tax Rev}}$$

$$= 1 + \frac{DWL}{\text{Tax Rev}}$$

DWL = excess burden

MEBT =

MEBT >? 0

↳ Why have taxes?

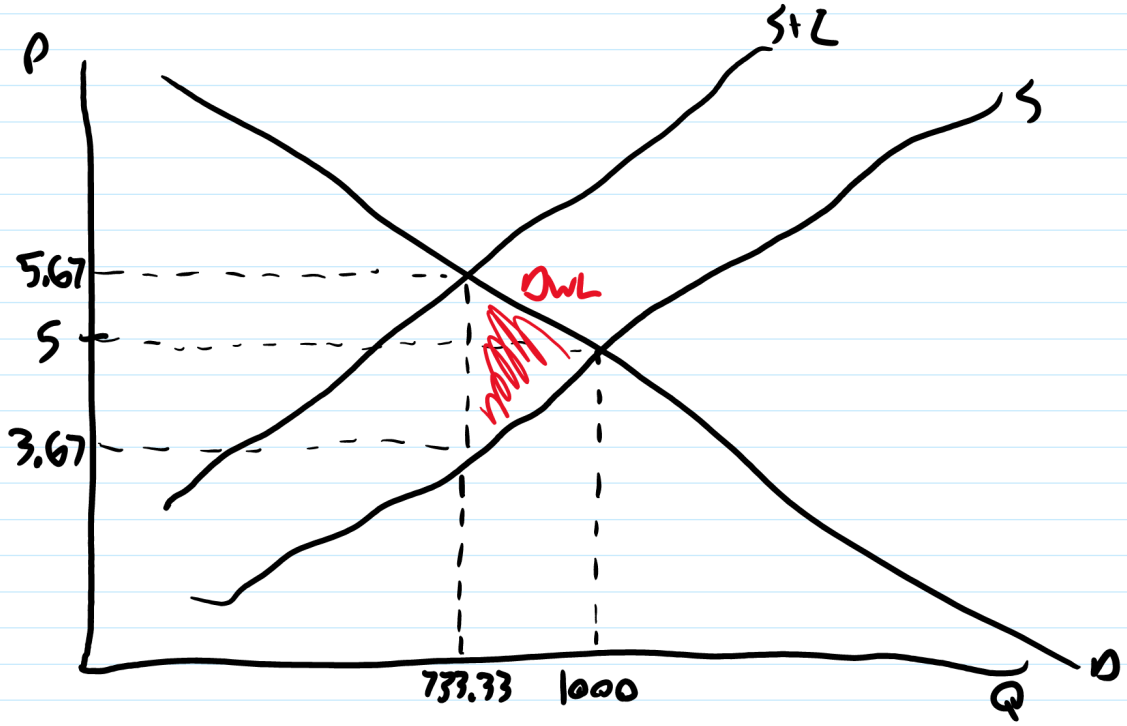
$\Delta SS = \Delta CS + \Delta PS + (1+\lambda)\Delta GS$

Taxes destroy allocative efficiency

3.12 Tax Burden - Full Example

Saturday, September 5, 2020 5:51 PM

$\epsilon = 2 \quad \epsilon^d = -2 \quad \epsilon^s = 1 \quad P_0 = 5 \quad Q_0 = 1000$



$-2 = \frac{Q-1000}{P^D-5} \cdot \frac{5}{1000} \qquad 1 = \frac{Q-1000}{P^S-2}$

$P^D = P^S + t$

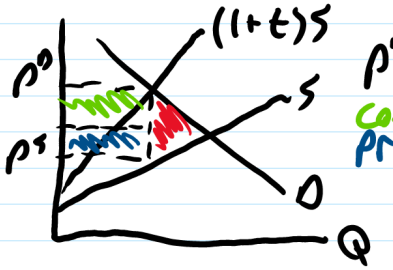
$\frac{-2}{1} = \frac{1/P^D-5}{1/P^D-7} = \frac{P^D-7}{P^D-5} \rightarrow P^D = 17/3 = 5.67$

$\frac{Q-1000}{5.67-7} \cdot \frac{5}{1000} = 1 \rightarrow Q = 733.33$

$\Delta CS = -(5.67-5)\cdot 733.33 + \frac{1}{2}(733.33-1000)\cdot(5.67-5)$
$\Delta PS = (3.67-5)\cdot 733.33 + \frac{1}{2}(733.33-1000)\cdot(3.67-5)$
$\Delta GS = 2 \cdot 733.33 = 1466.67$
$DWL = \frac{1}{2}(1000-733.33)\cdot 2 = 266.67 \rightarrow 266.67/1466.67 = .18$
↳ Excess Burden

Ad-Valorem
t: tax rate
↳ $P^D = (1+t)\cdot P^S$
tax rate

constant tax
$P^D = P^S + t$
constant tax



$P^D = (1+t)P^S$
consumer burden
producer burden

3.13 Income and Substitution Effects and Willingness to Pay

Saturday, September 5, 2020 6:34 PM

Compensating variation: Price goes up, consumers hurt can supplement income to reduce impact

Equivalent variation: Price goes up, what income loss is equivalent?

$|CV| < |CS| < |EV|$

Giffen good has upward demand curve

↳ inferior good. Potatoes in famine. P ↑. Poorer, buy more potato.

3.14 A Few Words on Empirical Approximations

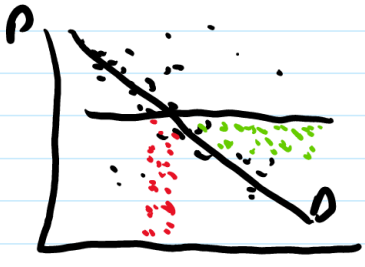
Saturday, September 5, 2020 6:49 PM

Extrapolation

$M = 25{,}000$ $M = [35k, 60k]$ $P = [16, 30]$

only use similar cases

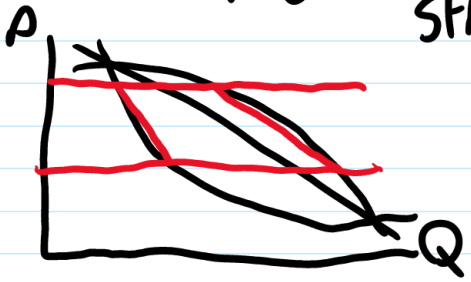
Control Variables



Stay inside sample range

Linear Models

$Q = P^{B_1} M^{B_2} e^{B_0}$



Straight lines are good approximations

3.15 3.16 Gas Tax Full Example

Thursday, September 10, 2020 8:20 PM

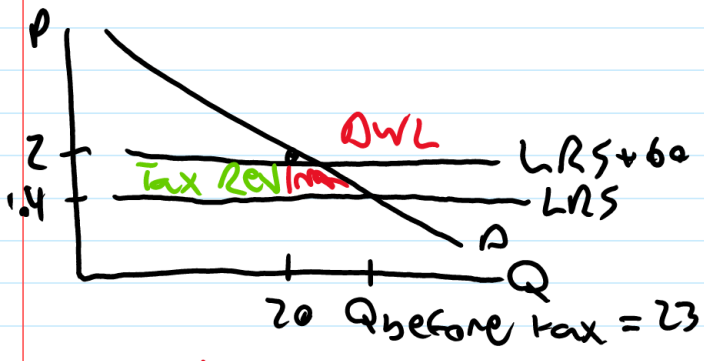
Floridians use about 20 million gallons of automotive gasoline per day. Including federal and state taxes, the tax rate is about $0.60 per gallon. The elasticity of demand for gasoline is approximately -0.5.

1) Illustrate the current equilibrium.
2) Calculate the quantity consumed daily if the price was lower by the amount of the gas tax. Add it to your illustration.
3) How much tax revenue is raised? Label it in your illustration.
4) Calculate the loss of consumer surplus due to the gas tax. Label it in your illustration.
5) How much consumer surplus was lost per unit of revenue raised by the tax?

Assume that the current gas tax is $0.50 per gallon too low to cover the cost of maintaining roadways in a safe condition for driving. If the tax were high enough to cover this cost…

6) What would consumption be? Add it to your illustration.
7) What would tax revenue be?
8) Calculate the loss of consumer surplus going from the original tax to the new tax. Show it in your illustration.
9) Going from the initial tax to the new tax, how much consumer surplus was lost per unit of additional tax revenue raised?
10) Compare your answer in (8) to your answer in (5). Can you explain the difference? What would happen to this ratio if the tax went from $1.1 to $1.15? Don't calculate anything. Just think it through and explain what would change and why.

11) Suppose elasticity of demand reasonably might be as high as 0.7 or as low as 0.3. How sensitive is your estimate of the consumer surplus loss form #4 to these possible differences?



$\varepsilon^D = \frac{\%\Delta Q^D}{\%\Delta P}$

$-.5 = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} = \frac{\Delta Q}{-6} \cdot \frac{2}{20} \rightarrow -.5 = \frac{\Delta Q}{-6} \rightarrow$

$\Delta Q = 3 \rightarrow Q_{after} = 23$

$DWL = \frac{1}{2} \cdot .6 \cdot 3 = 0.9$

Tax Rev = 17

6) $\%\Delta Q / 25\% = -1/2 \quad \%\Delta Q = 12.5\%$

7) $\Delta CS = -.5 \cdot 17.5 - \frac{1}{2} \cdot .5 \cdot 2.5 = 9.375$

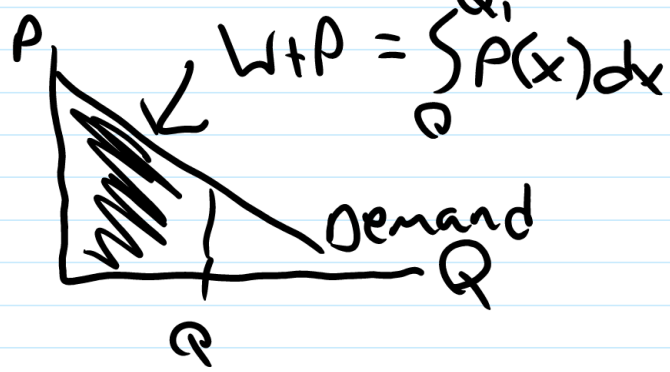
$DCS/DTR = -9.375 / 7.5 = -1.25$

11) $\varepsilon^d = -.7, -.3$

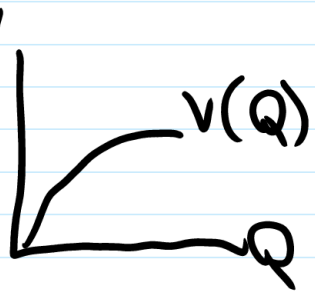
3 Extra Notes

Wednesday, August 26, 2020 2:20 PM

Why is $WTP = \frac{dV}{dQ}$



$V(Q) = aQ - \frac{1}{2}bQ^2$



Maximize $V(Q) - P \cdot Q$

optimal buy where derivative value = Price

HW 3 Cigarette Taxation in Florida

Sunday, September 13, 2020 7:03 AM

Worked w/ Austin, River, + Alex
Passed Solution Review

Suppose the elasticity of supply of cigarettes is 10.

1) Find estimates of the elasticity of demand for cigarettes, the current tax rate on cigarettes, average price, and annual quantity sold in Florida. Provide your sources.

Average price per pack: $5.50
https://www.salestaxhandbook.com/florida/tobacco
Current tax rate: $1.34/pack = 24.36%
https://www.salestaxhandbook.com/florida/tobacco
Elasticity of Demand: -.3
https://opentextbc.ca/principlesofeconomics/chapter/5-3-elasticity-and-pricing/
Quantity smoked: 14.6 cigarettes * .167 smokers/population * 21477737
population = 52,367,018.3534/year
https://www.sun-sentinel.com/health/fl-reg-florida-smokers-20180822-story.html
https://truthinitiative.org/research-resources/smoking-region/tobacco-use-florida-2019
https://www.census.gov/quickfacts/FL

2) How high would the price, including the tax, need to be to cut consumption by half?

$\frac{\%\Delta Q}{\%\Delta P} = -.3 \rightarrow \frac{-.5}{\%\Delta P} = -.3 \rightarrow \frac{-.5}{-.3} = \%\Delta P \rightarrow \%\Delta P = 1.667$

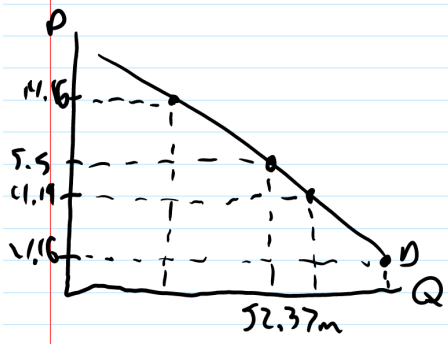
the new price would be $(1.667 \cdot 5.5) + 5.5 = 14.6685$

3) How high would the tax have to be to push the after tax price that high?

$14.1685 - 5.5 = 9.1685$
$9.1685 = (5.5 - 1.34) \cdot X$
$X = 9.1685 / (5.5 - 1.34)$
$X = 9.1685 / 4.16$
$X = 2.2039$

New tax is 220.39% = $9.1685

4) Estimate the consumer and producer burden of the current cigarette tax.



$-.3 = \frac{\Delta Q}{Q}\left(\frac{P}{5.5-P}\right)$ $\quad 10 = \frac{\Delta Q}{Q}\left(\frac{P}{4.16-P}\right)$

$-.03 = \frac{4.16-P}{5.5-P} \rightarrow -.165 + .03P = 4.16 - P$
$1.03P = 4.325$
$P = 4.199$

Tax = 1.34

$CB = (5.5 - 4.199)(52.36m) = \$68.12m$
$PB = (4.199 - 4.16)(52.36m) = \$2.04m$

5) How sensitive are your answers to modest errors in estimates of the elasticities of demand and supply?

The elasticity of demand is relatively small, so it is less sensitive to small changes while the elasticity of supply is a larger number and therefore more sensitive to small changes.

6) Do you think the tax creates a DWL or improves efficiency? Why?

I'm not really sure if it creates a DWL or improves efficiency. I can't imagine that raising the tax is very efficient. Most people who smoke are addicted and will continue to purchase cigarettes no matter the cost.

HW 3.1

Tuesday, September 1, 2020 9:32 PM

Worked w/ Austin
Passed solution review

Demand for sizmos: $q = 6 - .5p + .0002I$

I = income = 60k

a) $Q = 6 - .5p + .0002(60k)$
$Q = 6 - .5p + 12$
$Q = 18 - .5p$
$.5p = 18$
$p = 36$

b) $q = 6 - .5(10) + .0002(60k)$
$q = 6 - 5 + 12$
$q = 18 - 5$
$q = 13$

c) $PED = \%\Delta Q / \%\Delta P = (\Delta Q / \Delta P)(P/Q)$
$PED = -.5 \cdot (10/13) = -.38$

d) $\frac{1}{2} \cdot 13 \cdot (36 - 10) =$
$\frac{1}{2} \cdot 13 \cdot 26 =$
$13^2 = 169$

e) $q = 6 - .5(12) + .0002(60k)$
$q = 6 - 6 + 12$
$q = 12$
$\frac{1}{2} \cdot 12 \cdot (36 - 12) = 6 \cdot 24 = 144$
$169 - 144 = 25$
The loss in CS is 25

f) $Q = 6 - .5p + .0002(80k)$
$Q = 6 - .5p + 16$
$Q = 22 - .5p$
$.5p = 22$
$p = 44$

$q = 6 - .5(10) + .0002(80k)$
$q = 6 - 5 + 16$
$q = 17$

$q = 6 - .5(12) + 16$
$q = 6 - 6 + 16$
$q = 16$

$\frac{1}{2} \cdot 17 \cdot (44 - 10) = 8.5(34) = 289$
$\frac{1}{2} \cdot 16 \cdot (44 - 12) = 8 \cdot 32 = 256$
$289 - 256 = 33$
The loss in CS is 33

HW 3.2

Sunday, September 6, 2020 9:04 AM

Worked w/ River
Passed Solution review

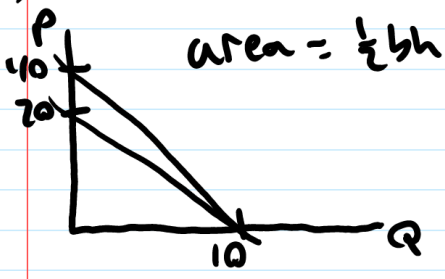
2. At the current market equilibrium, the price of a good equals $40 and the quantity equals 10 units. At this equilibrium, the price elasticity of supply is 2.0. Assume that the supply curve is linear.
   a. Use the price elasticity and market equilibrium to find the supply curve. (Hint: the supply curve has the following form: $q = a + (\Delta q/\Delta p)p$. First, find the value of $\Delta q/\Delta p$; then, find the value of a.)
   b. Calculate the producer surplus in the market.
   c. Imagine that a policy results in the price falling from $40 to $34. By how much does producer surplus fall?
   d. What fraction of the lost producer surplus is due to the reduction in the quantity supplied and what fraction is due to the fall in price received per unit sold?

a) $2 = \frac{\Delta q}{\Delta p} \cdot \frac{p}{q} \rightarrow 2 = \frac{\Delta q}{\Delta p} \cdot \frac{40}{10} \rightarrow 2 = \frac{\Delta q}{\Delta p} \cdot 4 \rightarrow \frac{\Delta q}{\Delta p} = .5$

$q = a + .5p \rightarrow 10 = a + .5(40) \rightarrow 10 = a + 20 \rightarrow a = -10$

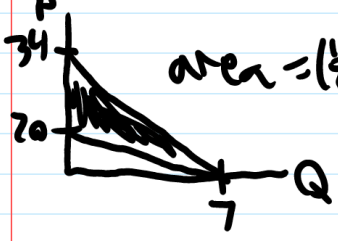
Supply schedule: $q = -10 + .5p$

b) $q = -10 + .5p \rightarrow .5p = 10 + q \rightarrow p = 20 + 2q$



area $= \frac{1}{2}bh \rightarrow (\frac{1}{2})(20)(10) = 100$

c) $q = -10 + .5(34) \rightarrow q = -10 + 17 \rightarrow q = 7$



area $= (\frac{1}{2})bh \rightarrow (\frac{1}{2})(14)(7) = 49$

$100 - 49 = 51$

d) $PS = (6 \cdot 7) + (\frac{1}{2})(6)(7)$

$PS = 42 + 21$

$PS = 63$

Price loss due to q: $21/63 = 1/3$

Price loss due to P: $42/63 = 2/3$

4 Book Notes

Saturday, August 29, 2020 1:46 PM

Change in SS are areas, usually triangles or trapezoids

4.1 knowing the slope or price elasticity of demand

MPC - Marginal Private cost
MSC - Marginal Social Cost

4.1.1 Linear demand curve

$q = \alpha_0 + \alpha_1 P$ where: q = quantity at price = P

α_0 quantity if $P = 0$

α_1 change in q if price increases by 1

$\epsilon_d = \alpha_1 \frac{P}{q} \rightarrow \alpha_1 = \epsilon_d \frac{q}{P}$

Construction of a linear demand curve to measure changes in SS requires an estimate of slope or ϵ_d and P and q or ϵ_d

4.1.2 Constant elasticity demand curve

$q = \beta_0 P^{\beta_1} \rightarrow \ln(q) = \ln(\beta_0) + \beta_1 \ln(P)$

$\text{Area} = \left(\frac{1}{\beta_0}\right)^{1/\beta_1} \left(\frac{q^\rho - \gamma^\rho}{\rho}\right)$ where $\rho = 1 + \left(\frac{1}{\beta_1}\right)$

4.2 Extrapolating from a few observations

4.3 Econometric Estimation w/ many observations

linear regression is a good starting point

4.3.1 Model specification

$q = F(P, I, T)$

- P → Price
- I → Income
- T → temperature

OLS = ordinary least squares

4.3.2 Types of data

Cross-sectional vs time series

- cross-sectional: single or multiple units
- time series: repeated on same unit

GLS = generalized least squares

Can mix cross-sectional + time series

4.3.3 Identification

Endogenous variables: variables determined simultaneously

Exogenous variables: variables that are fixed or determined outside the model

4.3.4 Confidence intervals

4.3.5 Prediction vs Hypothesis testing

Appendix 4A Multiple regression

Independent = explanatory

β_0 = intercept parameter or constant

R^2 = square of correlation between actual + predicted value of dependent variable

Multicollinearity = explanatory var can be written as linear combo of others

5 Book Notes

Saturday, September 5, 2020 7:06 PM

Intro

Change in allocative efficiency:

$\Delta SS = \Delta SS_O + \Delta SS_I + \Delta SS_S$

(output, input, secondary markets)

5.1 Shadow Pricing

When no market price exists or it is observed, shadow pricing exists

5.2 Valuing Impacts in Efficient Markets

5.2.1 Direct increase in supply available to consumers

5.2.2 Direct reduction in costs to producers

5.3 Valuing Impacts in distorted markets

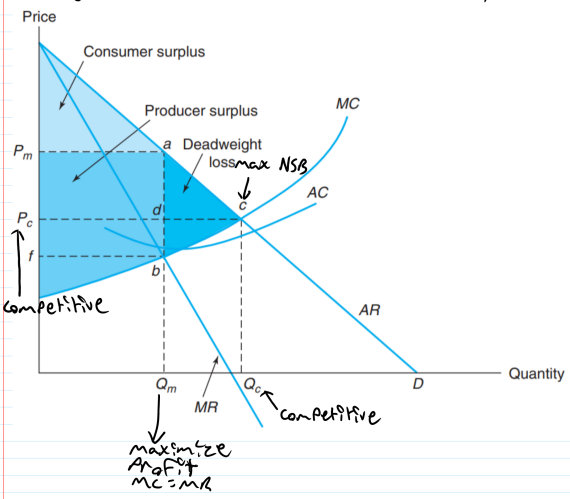
If output market becomes distorted, hard to determine correct surplus changes

Five types of failures:
- monopoly
- information asymmetry
- externalities
- public goods
- addictive goods

5.3.1 Monopoly

results in DWL and reduces SS

marginal revenue (MR) is below demand (AR)



SS = CS + PS

Monopolist maximizes profits

5.3.2 Natural Monopoly

Natural monopoly enjoys economies of scale over a wide range of outputs

Large fixed costs relative to variable costs

MC < AC over range

5.3.3 Information asymmetry

Government can intervene + provide missing info

1) Search goods: Products with researchable characteristics
2) Experience goods: consumers can only gain full knowledge after purchasing
3) Post-experience goods: consumption does not necessarily reveal information

5.3.4 Externalities

- an effect that production or consumption has on third parties
- by product for which there is no market
- problem of "missing markets"
- negative imposes social costs
- positive produces benefits
- To reduce DWL from negative externalities, increase taxes

5.3.5 Public goods
- non-excludable goods = everyone has access
- Pure public goods are non-excludable + non-rivalrous
- non-excludable = jointness in supply
- Can cause free-rider problem
- non-rivalry = one's use does not exclude another's
- non-rivalry causes market failure
- toll goods are non-rivalrous + excludable
- open-access resources are non-excludable + rivalrous

5.3.6 Addictive goods
- rational addiction: When consumers take consequences into account
- negative intrapersonal externalities: harm imposed on future self by current self

5.1 Valuing Impacts

Saturday, September 5, 2020 7:06 PM

Output + Input Markets

Efficient or distorted markets

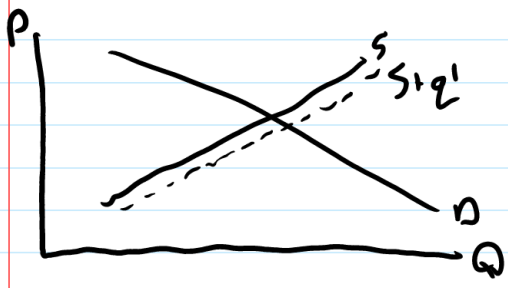
Primary or Secondary markets

5.2 Efficient Output Markets - Introduction

Friday, September 11, 2020 11:57 AM

a) q' sold @ mkt price

$\Delta CS = P \cdot q'$



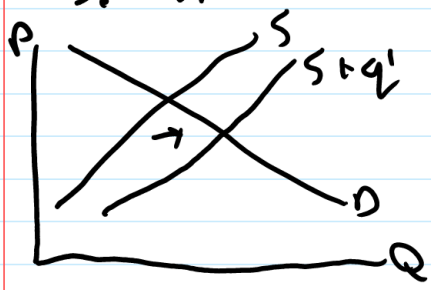
q/q' is tiny

b) gov't gives it away

- best case $\Delta CS = P \cdot q'$
- resale possible
- worst case $0 \leq \Delta CS \leq P \cdot q'$
  - resale not possible

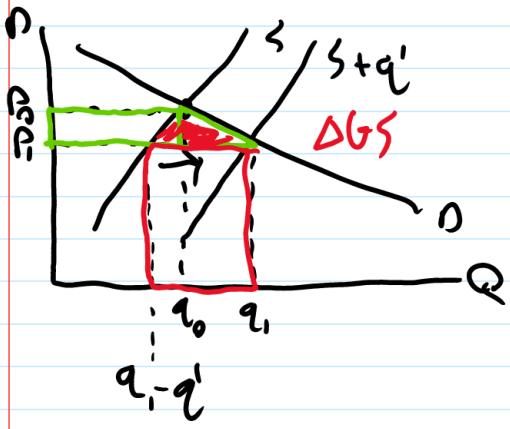
When things are free, they're hard to value

5.1 - ??



5.3 Efficient Output Markets - Direct Supply

Friday, September 11, 2020 12:05 PM



$$\Delta PS = -(P_0 - P_1)\cdot(q_1 - q') = \frac{-1}{2}(P_0 - P_1)(q_0 - q_1 + q')$$

$$\Delta CS = (P_0 - P_1)q_0 + \frac{1}{2}(P_0 - P_1)(q_1 - q_0)$$

$$\Delta PS + \Delta CS = q' \cdot (P_0 - P_1)\cdot\frac{1}{2}$$

$\Delta GS = P_1 \cdot q_1$

- assuming Gov't sells at market price P_1

$$\Delta SS = \alpha_C \Delta CS + \alpha_P \Delta PS + (1 + MEBT)\cdot \Delta GS$$

$\alpha_C = \alpha_P = 1$

$$= q' \cdot (P_0 - P_1)\cdot\frac{1}{2} + (1 + MEBT)\cdot P_1 \cdot q'$$

assume given away, resale possible

$\Delta GS = 0$

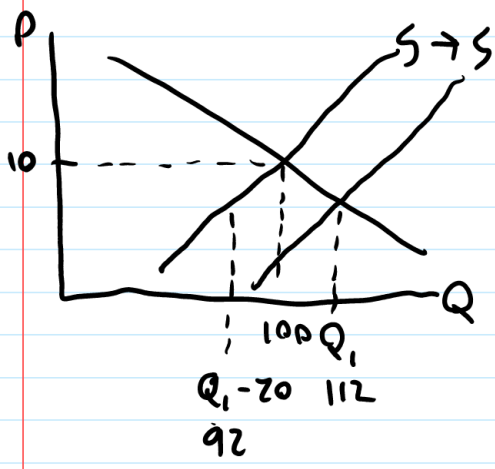
ΔCS is higher by $P_1 \cdot q'$

- given away, no resale

5.4 Efficient Output Markets - Direct Supply - Example

Friday, September 11, 2020 12:35 PM

$\varepsilon^S = 2,\ \varepsilon^D = -3,\ P_0 = 10,\ Q_0 = 100,\ q' = 20$



$$\frac{Q_1 - 100}{P_1 - 10} \cdot \frac{10}{100} = -3 = \varepsilon^D$$

$$\frac{Q_1 - 20 - 100}{P_1 - 10} \cdot \frac{10}{100} = 2 = \varepsilon^S$$

$$\rightarrow \frac{Q_1 - 100}{Q - 120} = -1.5$$

$\rightarrow Q_1 = 280/2.5$

$= 112$

$$\frac{12}{P_1 - 10} \cdot \frac{10}{100} = -3 = \varepsilon^D$$

$(100 \cdot 3.6) + \frac{1}{2} \cdot 12(10 - 6.4)$

$360 + 6 \cdot 3.6$

$381.6 = \Delta CS$

$\Delta PS = -3.6 \cdot 92 =$

$\Delta GS = 6.4 \cdot 12 =$

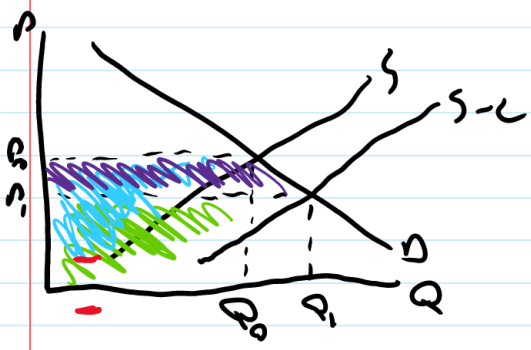
$\Delta SS = 381.6 - 345.6 + (1 + MERB) \cdot 76.8 = 132$

$MERB = .25$

$\Delta SS = \Delta CS - \Delta PS + (1 + MERB) \cdot \Delta GS$

5.5 Efficient Output Markets - Producer Cost Reductions

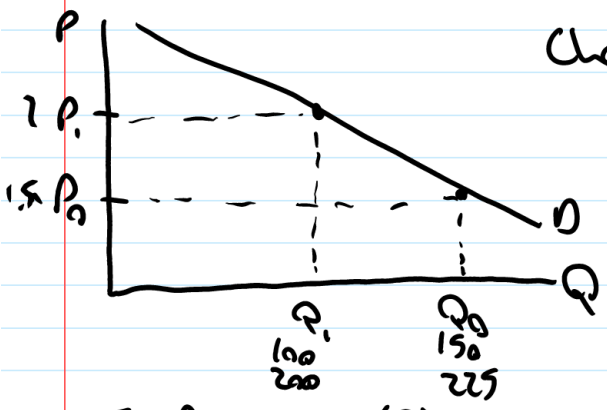
Friday, September 11, 2020 12:58 PM



$/unit lower cost is direct affect of program

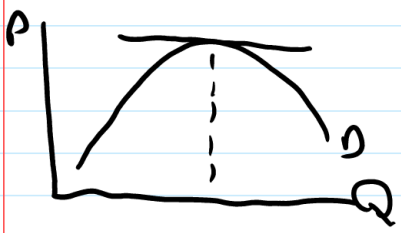
5.6 Monopoly Review - Demand and Revenue

Saturday, September 12, 2020 6:26 PM



Choose to sell at price or by quantity but not both

$\pi = P(Q) \cdot Q - C(Q)$



$R = P(Q) \cdot Q \rightarrow \frac{dR}{dQ} = \frac{dP}{dQ} \cdot Q + P(Q) \cdot 1$

$MR = P + \frac{dP}{dQ} \cdot Q = P\left(1 + \frac{dP}{dQ} \cdot \frac{Q}{P}\right)$

↑ Inverse of $\frac{P}{Q}$

$MR = P(1 + 1/\varepsilon_d)$

5.7 Monopoly Review - Profit Maximization

Saturday, September 12, 2020 7:12 PM

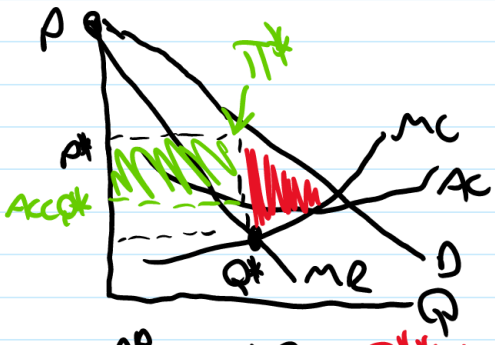
$\Pi = P(Q) \cdot Q - C(Q)$

$\frac{d\Pi}{dQ} = \frac{dP}{dQ} \cdot Q + P - \frac{dC}{dQ} = 0$

$MR = MC$

		Sell?
10	5	Yes
7	12	No

MR > MC? Sell!



$P^D = a - bQ$ $Q^{**} \rightarrow$ Loss

$MR = a - 2bQ$

$P^D = a - bQ$

$R = P \cdot Q = (a - bQ)Q$

$\frac{dR}{dQ} = -b \cdot Q + a - bQ = a - 2bQ$

MR is twice as steep as D

$MR = a - 2bQ = P\left[1 + \frac{1}{3^0}\right]$

ACC Q* = Average cost of Q*

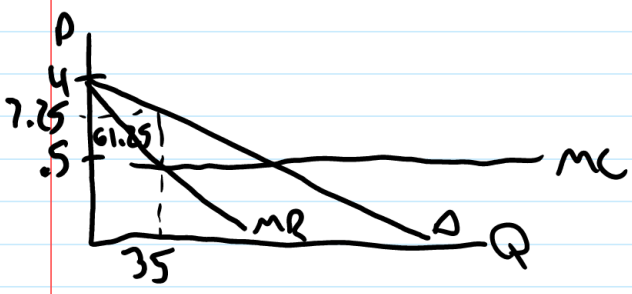
Profit/unit = P* − ACC Q*

5.8 Monopoly Review - Numeric Example

Saturday, September 12, 2020 7:29 PM

$P = 4 - .05Q$ $C = 10 - .5Q$

$C(Q) = F + CQ$



$MR = 4 - .1Q$

$.5 = 4 - .1Q$

$3.5 = .1Q$

$Q = 35$

$P = 4 - .05 \cdot 35$

$P = 2.25$

$\pi = 1.75 \cdot 35 = \$1.25$

5.9 Monopoly Review - Why do they persist

Saturday, September 12, 2020 7:35 PM

1) $\pi^E > 0$ → Should attract entry → Barrier to entry
2) DWL > 0 → Society wants to get rid of monopoly

Natural Monopoly → Utilities

5.10 Valuing Direct Supply in Monopoly Markets

Thursday, September 17, 2020 4:08 PM

Valuing Impacts in Monopolized Markets

Program provides q', sold at market price

$D - q'$ = Residual demand

$\Delta GS = P_2^m \cdot q'$

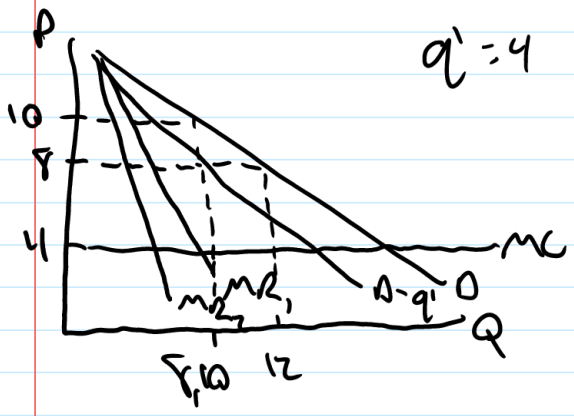
$\Delta CS = (P_1^m - P_2^m) \cdot Q_1^m + \frac{1}{2}(P_1^m - P_2^m)(Q_2^m + q' - Q_1^m)$

$\Delta PS = (P_1^m - MC) \cdot Q_1^m - (P_2^m - MC) Q_2^m$

= DWL

5.11 5.12 Valuing Direct Supply in Monopoly Markets - Examples

Thursday, September 17, 2020 4:28 PM



$q' = 4$

$\Delta CS = (10-8)\cdot 10 + \frac{1}{2}(10-8)(12-10) = 22$

$\Delta PS = (10-4)(10) - (8-4)(8) = -28$

$\Delta GS = (8)(4) = 32$

$MRTS = .2$

$\Delta SS = 22 - 28 + 1.2 \cdot 32$

$P_0 = 10,\ Q_0 = 10,\ q' = 4,\ \zeta^D = -2$

$-2 = \frac{\Delta Q}{\Delta P}\cdot\frac{P}{Q} \rightarrow -2 = \frac{Q-10}{P-10}\cdot\frac{10}{10} \rightarrow -2(P-10) = Q-10 \rightarrow 30 = Q-2P$

$Q = 30 - 2P$

$P = 15 - .5Q$

Residual demand $\Rightarrow Q - q' \rightarrow Q^{res} = 30 - 2P - 4 = 26 - 2P$

$MR \rightarrow 2P = 26 - Q \rightarrow P = 13 - .5Q$

$MR = MC \rightarrow MR = P(1 + 1/\zeta^D) = MC$

$10(1 + 1/-2) = MC$

$10(1/2) = MC$

$MC = 5$

$13 - Q = 5$

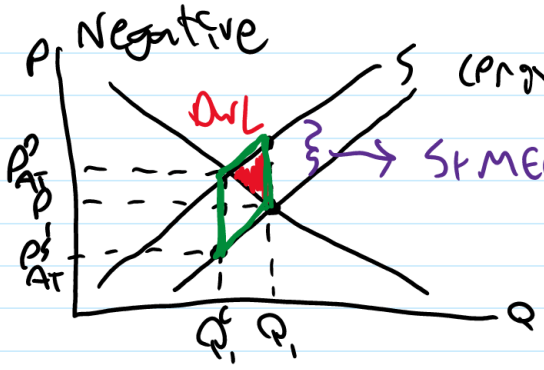
$Q = 8$

$P = 13 - \frac{1}{2}8 = 9$

Embodies Pareto efficiency

5.13 Externalities

Saturday, September 19, 2020 1:55 PM



(private) → marginal external cost (MEC)

S + MEC = Social

tax = MEC → Q_{eff} → eliminate DWL

$P^0_{AT} - P^S_{AT} = t = MEC$

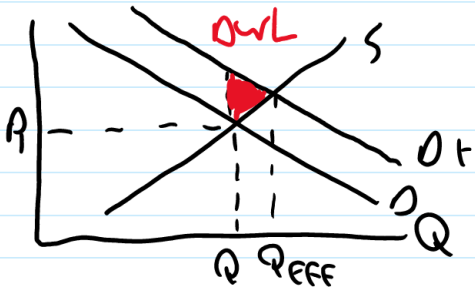
$\Delta CS = -(P^0_{AT} - P_1) \cdot Q_{eff} - \frac{1}{2}(P^0_{AT} - P_0)(Q_1 - Q_{eff})$

$\Delta PS = (P_1 - P^S_{AT}) \cdot Q_{eff} - \frac{1}{2}(P_1 - P^S_{AT})(Q - Q_{eff})$

$\Delta G = t \cdot Q_{eff} = MEC \cdot Q_{eff}$

Δ External Value $= MEC \cdot (Q_1 - Q_{eff})$ External Gain

Positive externalities



fix subsidy?

D + MEB → marginal external benefit

5.14 Distorted Output Markets - Addiction

Saturday, September 19, 2020 2:16 PM

Person is resistant to treatment and adds value to drugs

Addicts are 2 people and Acts against themselves

Who has standing?

5.15 Distorted Output Markets - Asymmetric Information

Saturday, September 19, 2020 2:20 PM

All markets are uniquely distorted

- moral hazard
  "Peltzman effect" → people push limits
- adverse selection
  "market for lemons" → (used cars)
- Insider information

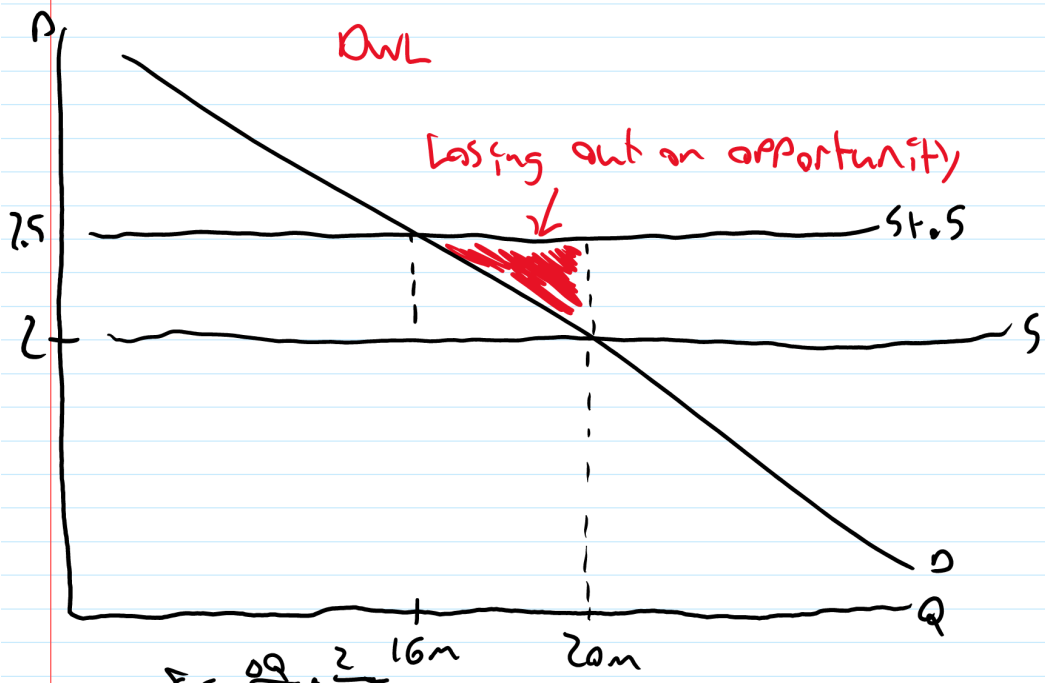
5 Extra Problems

Friday, September 11, 2020 2:02 PM

Suppose the current price of gasoline is $2 per gallon, at which price 20 million gallons are consumed daily. The elasticity of demand is -0.8. Suppose that in addition to the private costs of production and sales born by sellers, each gallon of gasoline consumed releases carbon and pollutants into the air imposing a burden on the rest of society equivalent to $0.50 per gallon. Assume this is a constant cost industry and that the METB is 0.2.

1) Over consumption of gasoline will lead to a DWL. How much overconsumption is there? Hint: You must first calculate the allocatively efficient quantity, which would balance the full costs against the benefits of consumption.
2) Illustrate.
3) How big is the DWL? Include it in the illustration.
4) How might the DWL be corrected?
5) All things considered, what would be the net benefit of that correction?

$\}^d = -.8$ $Q = 20m$ $P = 2$ METB $= .2$ $\}^s =$



$-.8 = \frac{\Delta Q}{\Delta P} \cdot \frac{2}{20m}$

$-.8 = \frac{\Delta Q}{.5} \cdot \frac{2}{20m} \rightarrow -.8 = \Delta Q = -4m$

$\frac{1}{2}(.5)(4) = -2 \cdot .5 = -1 =$ DWL

If DWL is negative, flip triangle to above demand

NSB of 50¢ tax

1. Suppose a profit maximizing monopolist is charging a price of $12, and the best available estimate of the elasticity of demand is -4. If the monopolist's marginal cost is constant, estimate its value.

$\}^D = -4$

$-4 = 12/Q \cdot$

$MR = MC$

$MR = \Delta R / \Delta Q$

$MR = P(1 + 1/3^D)$

HW 5 Cost and Demand Approximation

Tuesday, September 22, 2020 5:37 PM

Passed solution review

A profit maximizing monopolist charges $20 and sells 100 units. Elasticity of demand is -2.5. The monopolist's cost function is C(Q)=F+cQ where F is a fixed cost and c is the constant per unit variable cost.

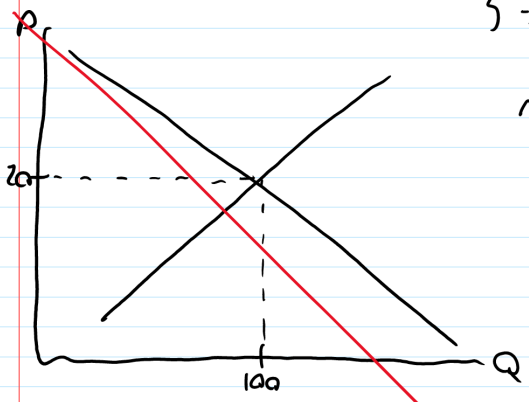
a) What is the per unit variable cost?

b) What is the highest fixed cost could be if the monopolist has not chosen to exit the industry?

c) Write a linear approximation of both demand and inverse demand around the current price. Hint, use the formula for point elasticity and the current price and quantity, then rearrange for Q to get demand and P to get inverse demand.

$\zeta^D = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$

$MR = P \cdot (1 + (1/\zeta^D))$



a) $20/100 = .2$ dollars per unit

b) $\zeta^D = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} \rightarrow -2.5 = \frac{Q_1 - Q_0}{(F+cQ) - 20} \cdot \frac{20}{100} = \frac{Q_1 - 100}{F + (.2)(100) - 20} \cdot \frac{20}{100}$

If $F = 20$, then no profit can be made. But so long as $F < 20$, then at least some profit can be made

c) $\zeta^D = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$

$-2.5 = \frac{Q_1 - Q_0}{P_1 - P_0} \cdot \frac{P_0}{Q_0} \rightarrow -2.5 = \frac{Q_1 - 100}{P_1 - 20} \cdot \frac{20}{100} \rightarrow -2.5 = \frac{Q-100}{P-20} \cdot .2$

$-12.5 = \frac{Q-100}{P-20} \rightarrow -12.5(P-20) = Q - 100 \rightarrow -12.5P + 250 + 100 = Q$

$Q = -12.5P + 350$

$Q - 350 = -12.5P \rightarrow P = \frac{Q-350}{-125} \rightarrow P = 28 - .08Q$

Restarted w/ Austin + River

a) $y = mx + b$

$P = \frac{1}{3}Q + b$

$20P = -2.5Q + 100$

$P = -.125Q + 5$

$MR = P(1 + 1/\zeta^D) = MC$

$MR = 20(1 + 1/-2.5) = MC$

$MR = 20 + 20/-2.5 = MC$

$MR = 12 = MC$

Variable cost = 12

b) Π = revenue - cost

$\Pi = (20 \cdot 100) - (F + cQ)$

$\Pi = 2000 - F + (12 \cdot 100)$

$\Pi = 2000 - F + 1200$

$F = 800$

c) It turns out I got this right by myself!

$\zeta^D = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$

$-2.5 = \frac{Q_1 - Q_0}{P_1 - P_0} \cdot \frac{P_0}{Q_0} \rightarrow -2.5 = \frac{Q_1 - 100}{P_1 - 20} \cdot \frac{20}{100} \rightarrow -2.5 = \frac{Q-100}{P-20} \cdot .2$

$-12.5 = \frac{Q-100}{P-20} \rightarrow -12.5(P-20) = Q - 100 \rightarrow -12.5P + 250 + 100 = Q$

$Q = -12.5P + 350$

$Q - 350 = -12.5P \rightarrow P = \frac{Q-350}{-125} \rightarrow P = 28 - .08Q$

HW 5 Taxation 1

Friday, September 11, 2020 4:41 PM

Worked w/ Alex, Austin, + River

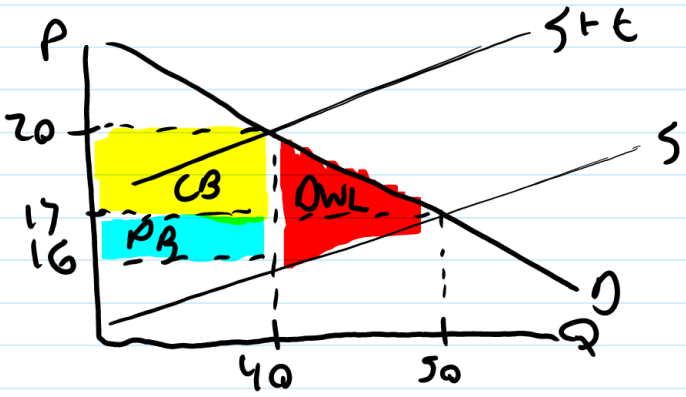
At the current market equilibrium, price is $17 and quantity is 50. A tax of 25% is imposed, after which the price paid by consumers including the tax is $20 and the new equilibrium quantity is 40. Sketch a figure illustrating the equilibrium before and after the tax. Calculate tax revenue, the producer burden, the consumer burden, and the excess burden. Label each.

Hint: If τ is the tax rate, the price paid by consumers is (1+τ) times the price received by suppliers once the tax is remitted to the government.

Posted Solution Review

$P = 17 \quad Q = 50 \quad t = 25\%$

$P+t = 20 \quad Q+t = 40$



Tax revenue: $(20-16)\cdot 40 = 4\cdot 40 = \$160$

Producer burden: $(40-0)\cdot(17-16) = 40\cdot 1 = \$40$

$P_p = 15.75 \quad Q_p = 40$

$P_e = 17 \quad Q_e = 50$

$P_c = 20 \quad Q_c = 40$

consumer burden: $(20-17)\cdot(40-0) = 3\cdot 40 = \$120$

DWL: $\frac{1}{2}(50-40)(17-16) + \frac{1}{2}(50-40)(20-17) = \frac{1}{2}(10)(1) + \frac{1}{2}(10)(3)$

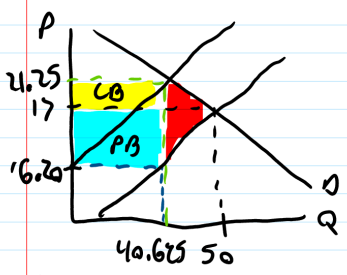
$= 5 + 15 = 20$

HW 5 Taxation 2

Tuesday, September 15, 2020 7:57 PM

Worked w/ Alex, Austin, + River

At the current market equilibrium, price is $17 and quantity is 50. A tax of 25% is imposed. The elasticity of demand is -0.75 and the elasticity of supply is 4. Find the new equilibrium quantity ✓ the after tax price paid by consumers ✓ the after tax price received by suppliers ✓ tax revenue ✓ the producer burden ✓ the consumer burden ✓, and the excess burden ✓. Draw a figure to illustrate. Hint: It will help to sketch the figure noting what you know and what you need to figure out before starting the algebra!



$\varepsilon^D = -.75$ Passed Solution review

Big Yikes

demanded

supplied

DWL

Equilibrium Quantity: $\Delta P = 17 \cdot .25 = 4.25$ $\varepsilon^D = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$ ← Should've done $(Q_2 - Q_1)/Q_1 / (P_2 - P_1)/P_1 = \varepsilon^d$

$-.75 = \frac{\Delta Q}{4.25} \cdot \frac{17}{50} \rightarrow -\frac{3}{4} \cdot \frac{50}{17} = \frac{\Delta Q}{4.25} \rightarrow -\frac{150}{68} = \frac{\Delta Q}{4.25} \rightarrow \Delta Q = -9.375$

That mistake carries

$Q_2 = 40.625$

After tax Pd: $4 = \frac{\%\Delta Q}{\%\Delta P} \rightarrow \%\Delta P = \frac{(-9.375/50)}{4} \rightarrow \%\Delta P = -.7969$

$P_2 = 16.203$

After tax consumer: $17 \cdot 1.25 = 21.25$

CB: $(40.625)(21.25 - 17) = 40.625 \cdot 4.25 = 172.65625$

PB: $(40.625)(17 - 16.203) = 40.625 \cdot .797 = 32.378125$

Tax revenue: $172.65625 + 32.378125 = 205.03$

DWL: $\frac{1}{2}(50 - 40.625)(17 - 16.2) + \frac{1}{2}(50 - 40.625)(21.25 - 17)$

$= \frac{1}{2}(9.375)(.8) + \frac{1}{2}(9.375)(4.25) = 3.75 + 19.92 = 23.67$

Using ε^D:

$\frac{Q - 50}{50} / \frac{P_d - 17}{17} = -.75 \rightarrow Q = 87.5 - 2.21 P_d$

Using ε^S

$\frac{Q - 50}{50} / \frac{P_s - 17}{17} = 4 \rightarrow Q = -150 + 11.76 P_s$

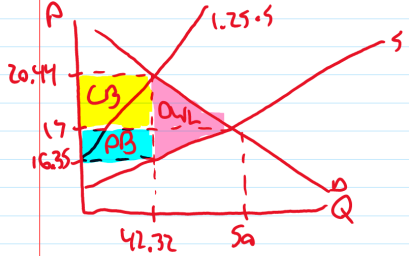
Therefore... $1.25 P_s = P_d$

Solving w/ substitution

$-150 + 11.76 P_s = 87.5 - 2.21 \cdot 1.25 P_s \rightarrow P_s = 16.35$

$P_d = 1.25 P_s \rightarrow P_d = 1.25 \cdot 16.35 \rightarrow P_d = 20.44$

$Q = -150 + 11.76 \cdot 20.44 \rightarrow Q = 42.32$



Revenue $= .25 \cdot 16.35 \cdot 42.32 = 173.03$

CB $= (20.44 - 17) \cdot 42.32 = 145.69$

PB $= (17 - 16.35) \cdot 42.32 = 27.34$

DWL $=$ EB $= (20.44 - 16.35)(50 - 42.32)/2 = 15.69$

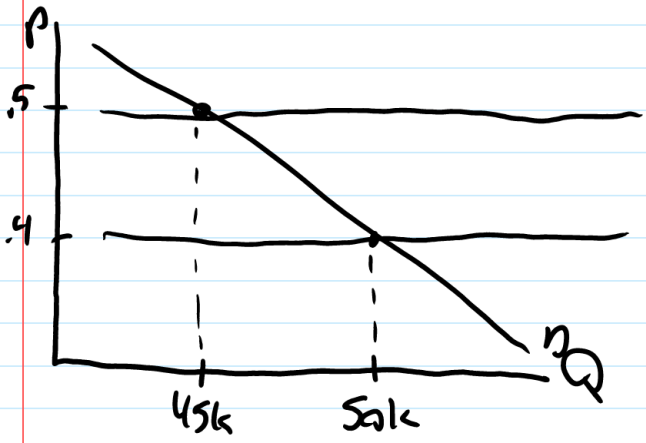
HW 5.1

Friday, September 11, 2020 3:40 PM

Passed Solution review

Suppose the government is considering an increase in the toll on a certain stretch of highway from $.40 to $.50. At present, 50,000 cars per week use that highway stretch; after the toll is imposed, it is projected that only 45,000 cars per week will use the highway stretch.

Assuming that the marginal cost of highway use is constant (i.e., the supply curve is horizontal) and equal to $.40 per car, what is the social change in surplus attributable to the increase in the toll? (Hint: the toll increase will cause the supply curve, not the demand curve, to shift.)



$\Delta SS = \frac{1}{2}(.5-.4)(50-45)$

$= \frac{1}{2}(.1)(5)$

$= .05 \cdot 5$

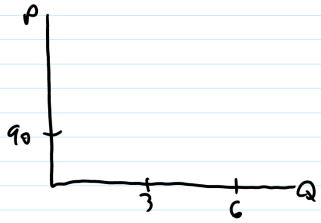
$= .25k = 250 = \Delta SS$

HW 5.2

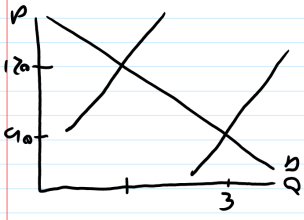
Friday, September 11, 2020 4:14 PM

Passed Solution review

A country imports 3 billion barrels of crude oil per year and domestically produces another 3 billion barrels of crude oil per year. The world price of crude oil is $90 per barrel. Assuming linear curves, economists estimate the price elasticity of domestic supply to be 0.25 and the price elasticity of domestic demand to be 0.1 at the current equilibrium.



a. Consider the changes in social surplus that would result from imposition of a $30 per barrel import fee on crude oil that would involve annual administrative costs of $250 million. Assume that the world price will not change as a result of the country imposing the import fee, but that the domestic price will increase by $30 per barrel. Also assume that only producers, consumers, and taxpayers within the country have standing. Determine the quantity consumed, the quantity produced domestically, and the quantity imported after the imposition of the import fee. Then estimate the annual social benefits of the import fee.



$\eta^D = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} = -.1$

$\Delta Q = 30\left(\frac{-.1}{15}\right)$

$\Delta Q = -.2$ consumed

$\eta^S = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} = .25$

$\Delta Q = 30\left(\frac{.25}{30}\right) = .25$ Produced

$Q_D = 6 - .2 = 5.8$

$Q_S = 3 + .25 = 3.25$

$Q_D - Q_S = Q_T$

$5.8 - 3.25 = 2.55$

forgot to do Parts B + C

b. Economists have estimated that the marginal excess burden of taxation in the country is 0.25 (see Chapter 3). Reestimate the net social benefits assuming that 20 percent of the increase in producer surplus is realized as tax revenue under the existing tax system. In answering this question, assume that increases in tax revenues less the cost of administrating the import fee are used to reduce domestic taxes.

CS = -177b

After tax P_S = 75b

Net tax gain = 95b

Net tax gain · MERB = 23.75b

Net benefits = 16.75b

c. The reduction in the country's demand for imports may affect the world price of crude oil. Assuming that the import fee reduces the world price from $90 to $80 per barrel, and thus, the after-tax domestic price is $80 + $30 = $110 per barrel, a net increase in domestic price of $20 per barrel, repeat the analysis done in parts a and b.

$-.1 = (\Delta Q/\Delta P)(P/Q)$ ← quantity consumed

$\Delta q = (-.1)(\Delta P)(q/P)$

$\Delta q = (-.1)(20)(66)(90)$

$\Delta q = -.133$ b

Change in domestic supply

$\Delta q = (.25)\Delta P(q/P)$

$\Delta q = (.25)(20)(36)(90)$

$\Delta q = .167$b

CS = 118.67 b

PS gain = 61.67 b

Net tax gain = 80.75b

Net social benefits = 47.08

6 Book Notes

Friday, September 25, 2020 11:44 AM

Valuing Impacts in Input Markets

opportunity cost of resources used = ass input markets

6.1 Valuing costs in Efficient Markets

6.1.1 Perfectly elastic Supply Curves

Small Purchases see horizontal supply curves

Reasonable to assume that expenditures for project inputs equal their social costs

6.1.2 Perfect inelastic Supply Curves

6.1.3 Efficient Markets w/ Noticeable Price Effects

big projects have upward sloping supply curves

6.2 Valuing costs in Distorted Markets

When efficient, P = MC

6.2.1 Purchases at below opportunity costs

Jury stipend/per diem

6.2.2 Purchases when inputs are in fixed supply

6.2.3 Hiring unemployed labor

unemployed workers are "in surplus"

Five measures of social cost of hiring L unemployed workers

E < actual < B

6.2.4 Hiring labor when Rural → urban migration within a developing country is important

Rural → urban for higher wages

L = city workforce size E = employed (L-U)
U = # unemployed

Migrate if RW < UW(E/L)

Urban projects draw urban workers

6.2.5 Purchases from a monopoly

monopoly rents

budgetary expenditures > social costs

6.2.6 The general rule

opportunity cost = expenditures on inputs - gains in PS or CS

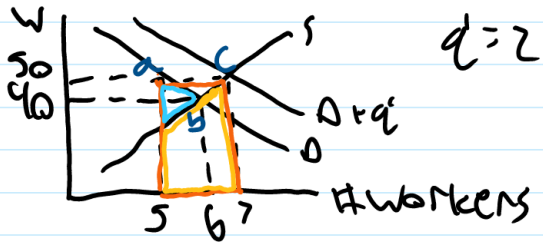
6.1 6.2 Opportunity Cost of Inputs in Efficient Markets

Saturday, September 26, 2020 3:59 PM

Impacts in efficient Input Markets

Land, labor, capital, materials → opportunity cost?

1) No impact on price → budgetary expenditure (1+MERB)
2) Drive up price



$q = 2$

$Exp = 50 \cdot (7-5) = 50 \cdot 2 = 100$

How much is cost of something else?
Part of social cost
Net value in private market

Social cost $= (7-5)(50) - abc + (MERB)(7-5)(50)$
$= (1+MERB)(7-5)(50) - abc$

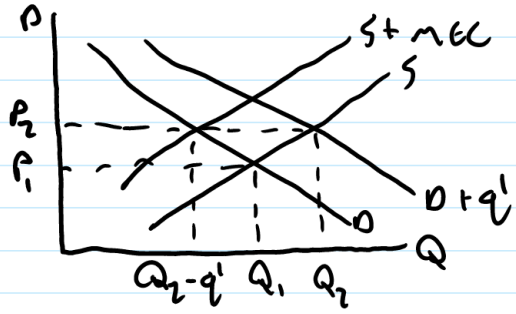
$\Delta CS = (50-40)(5) - \frac{1}{2}(50-40)(6-5) = -55$
$\Delta PS = (50-40)(6) + \frac{1}{2}(50-40)(7-6) = 65$
$Exp = (7-5)(50) = 100$
$MERB = .25$
$\Delta SS = 65 - 55 - (1+.25)(100)$

$abc = \frac{1}{2}(50-40)(7-5) = 10 = \Delta PS - \Delta CS \rightarrow abc = \Delta PS - \Delta CS$

6.3 Opportunity Cost of Inputs Purchased in Distorted Markets

Saturday, September 26, 2020 4:27 PM

- Externalities
- Price unchanged → $Q_2 - Q_1 = q'$
  - ↳ cost = $(1 + MERB)(EXP) + (MEC)(q')$
    $= (1 + MERB)(P)(q') + (MEC)(q')$
- Price changed



Δ External cost $= (Q_2 - Q_1)(MEC)$

$Q_p^0 = Q_2 - q'$

- Tax to another jurisdiction?
  MERB · Revenue Paid
- Legal restrictions on price?
  Juror compensation
  $15/hr but wage = $50/hr → not compensated
  Cost = $50q' + (MERB)(15)(q')$

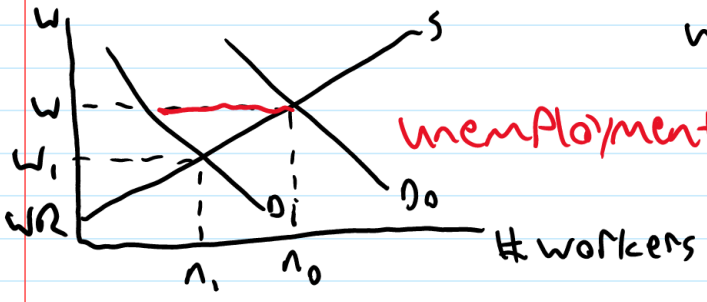
6.4 Opportunity Cost of Labor in Markets with High Unemployment

Saturday, September 26, 2020 4:40 PM

Natural rate of unemployment = 2.5-4 %

↳ Lowest unemployment before inflation

Wages are sticky on the way down



WR = lowest pay

unemployment → excess/surplus workers

SWAG

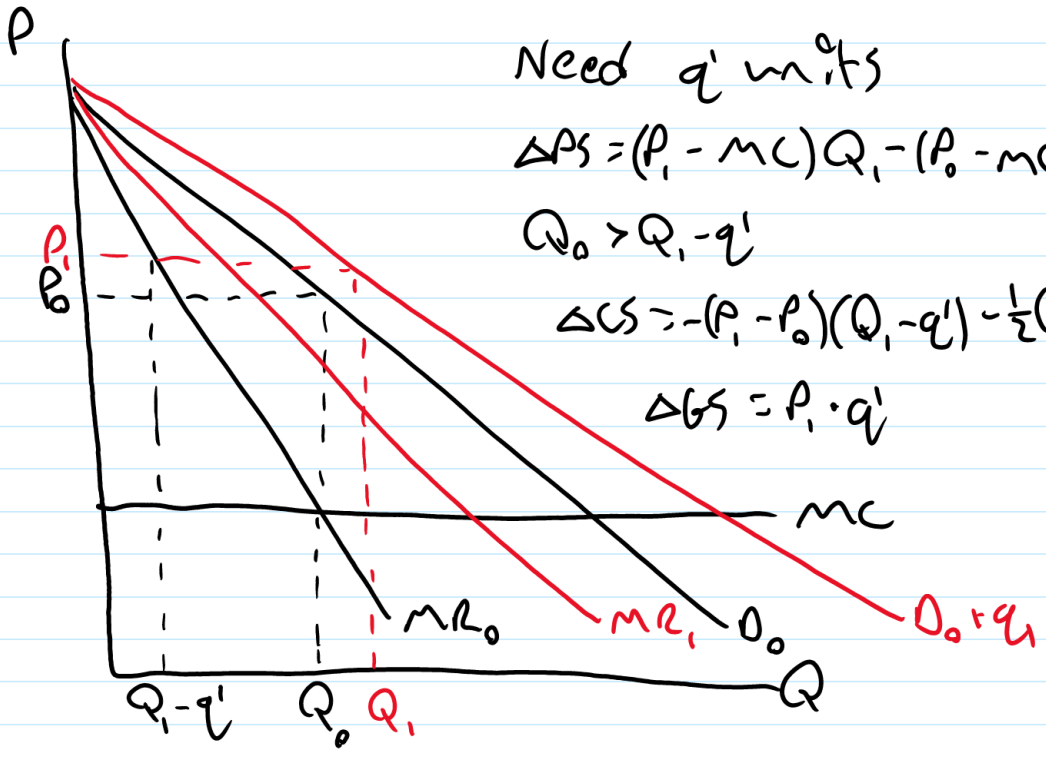
OC per worker = $(W + W_2)/2 = (50+20)/2 = 35$

Social cost = $35q' + .5(MCerB)(q')$

WR = ? WR = 0 W/2 = OC/worker

6.5 Opportunity Cost of Inputs Purchased from a Monopolist

Wednesday, September 30, 2020 5:12 PM



Need q' units

$\Delta PS = (P_1 - MC)Q_1 - (P_0 - MC)Q_0$

$Q_0 > Q_1 - q'$

$\Delta CS = -(P_1 - P_0)(Q_1 - q') - \frac{1}{2}(P_1 - P_0)(Q_0 - Q_1 + q')$

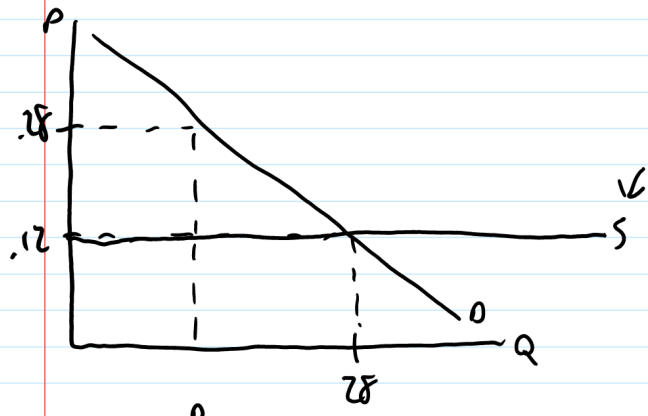
$\Delta GS = P_1 \cdot q'$

HW 6 BCA of Florida Carbon Emissions Tax

Sunday, September 27, 2020 4:59 PM

worked w/ Nick Lane
Asked Solution review

$\zeta = -.75$ $P_0 = .12$ $MC = .12$ $Q_0 = 28$ $MEC = .05/1$ $MEB = .25$



flat because electricity utility is a monopoly

$-.75 = \frac{Q-28}{P-.12} \cdot \frac{.12}{28}$

$Q = \frac{Q-28}{P-.17} \cdot \frac{.12}{28}$

$-.75 = (Q-28)/(P-.12) \cdot 3/700$

$-175 = Q-28/P-.12$

$-175P + 21 = Q - 28$

$Q = -175P + 49$

$Q = (-175P+49)/(P-.17) \cdot 3/700$

Numerator has to be 0

$Q = -175P + 49$

$175P = 49$

$P = .28$

Sorry! We got stuck here :(

We're going to use P and Q instead of real numbers

$Q = (-175P + 49 - 28)/(P-.17) \cdot 3/700$

$Q = -175P + 21$

$175P = 21$

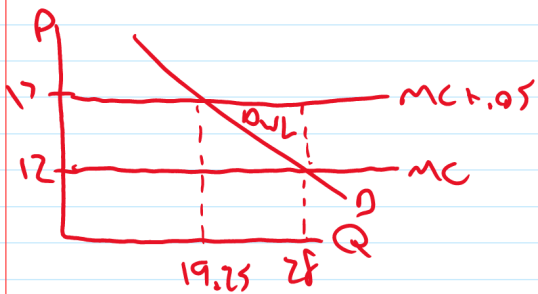
$P = .12$

2) Cost = 21 500,000 P
benefit to ~~tax~~ Buyers = .05Q
decreased emissions $\zeta(Q - Q_0) \cdot 21{,}500{,}000$

3) $\frac{(Q-Q_0) \cdot 21500000}{76000000000} = 43(Q-Q_0)/15200$

4) Emissions could be effectively regulated in cities and other areas with high smog such as LA or cities in India and China. This is because smog is usually very local to the city and has a large negative impact.

1)



$\Delta CS = -.05 \cdot 19.25 - .05 \cdot \frac{8.75}{2} = -1.18$
$\Delta PS = 0$
$\Delta GS = .05 \cdot 19.25 = .9625$
$\Delta SS = -1.18 + 1.25 \cdot .9625 = .021875$

2) $\frac{1.18 \text{ Person}}{\text{day}} \cdot \frac{365 \text{ day}}{\text{year}} \cdot 21.5\text{m people} = 9.44\text{B/year gain}$

$\frac{.9625 \text{ Person}}{\text{day}} \cdot \frac{365 \text{ day}}{\text{year}} \cdot 21.5\text{m people} \cdot 1.25 = 9.27\text{B/year cost}$

$\frac{8.75 \text{ kwh}}{\text{Person day}} \cdot 21.5\text{m People} \cdot \frac{365 \text{ day}}{\text{year}} \cdot \frac{.05}{\text{kwh}} = 3.43\text{B/year benefit}$

floridian benefits = 21.5m/7.6B = .283% or 9.7m/year

HW 6 Elasticity Given

Sunday, September 27, 2020 6:47 PM

Worked w/ Austin
Assisted Solution review

Initially, a profit maximizing local monopolist charges $15 and sells 500 units per week. Elasticity of demand is -3. The monopolist's cost function is C(Q)=F+cQ where F is a fixed cost and c is the constant per unit variable cost.

a) What is the per unit cost of the product?

b) What are the demand and inverse demand functions?

Now assume the local government begins to provide 100 units per week at the market price.

c) What is the residual demand left for the monopolist?

d) Find the new price and the monopolist's quantity and the total market quantity.

e) Assume the METB is 0.25. Find the changes in CS, PS, GS, and SS.

f) Depict all of this in a diagram. You probably want to sketch the diagram right at the start of the problem for reference as you work, and then to redraw a neat version to submit.

a) per unit $= 15/500 = .03$/unit

b) $\varepsilon = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q}$

$-3 = (Q-500)/(P-15) \cdot 15/500$

$-100 = (Q-500)/(P-15)$

$-100P + 1500 = Q - 500$

$Q = 2000 - 100P$

$Q - 2000 = -100P$

$P = 20 - Q/100$

c) $Res = Q - q'$

$Res = (2000 - 100P) - 100$

$Res = 1900 - 100P$

$P = 19 - .01Q$

d) $P = 19 - .01Q$

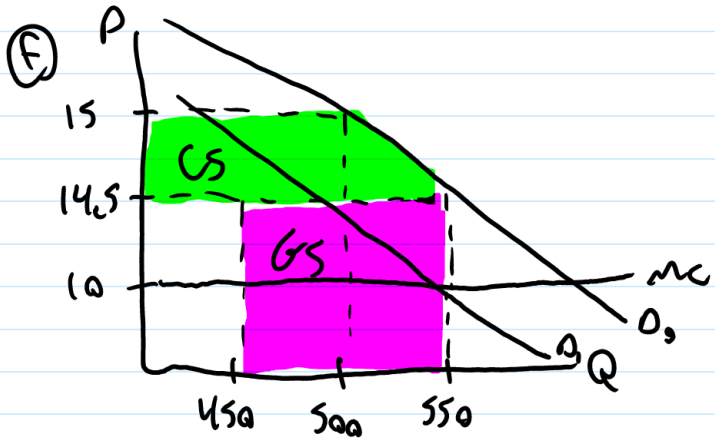
$P = 19 - (.01 \cdot 450)$

$P = 14.5$

$Q = 1900 - ((100 \cdot 14.5))$

$Q = 450$

f)



e) $\Delta CS = (.5 \cdot 500) + (\frac{1}{2} \cdot 50 \cdot .5)$

$\Delta CS = 262.5$

$\Delta PS = (-1 \cdot .5 \cdot 500) - (50 \cdot 4.5)$

$\Delta PS = -475$

$\Delta GS = (100 \cdot 14.5)$

$\Delta GS = 1450$

$\Delta SS = 262.5 - 475 + (1.25 \cdot 1450)$

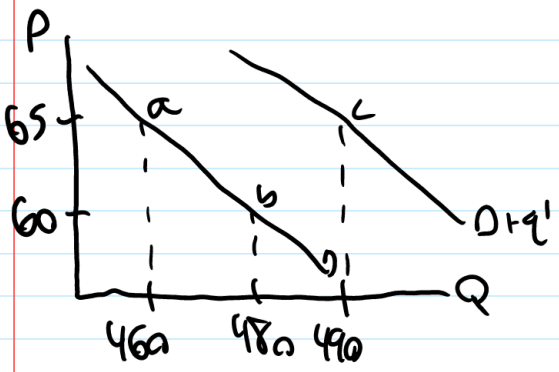
$\Delta SS = 1600$

HW 6 Opportunity Cost of Inputs 1

Sunday, October 4, 2020 5:04 PM

Passed solution review

Suppose a project needs to hire 10 electricians. At the initial wage of 60K/year (including benefits) 480 are currently employed in the local area and 20 are estimated to be unemployed. The MEBT is 0.2. Estimate the opportunity cost of hiring the workers. Explain, and defend any assumptions you make.



Assuming new wage is 65k as it does in problem 2

$q' = 10$

$abc = \frac{1}{2}(65-60)(.49-.46) = 75{,}000$

$SC = (490-460)\cdot 65000 - abc + METB(490-460)(65000)$

$SC = 30\cdot 65000 - 75000 + (.2\cdot 30\cdot 65000)$

$SC = 2{,}265{,}000$

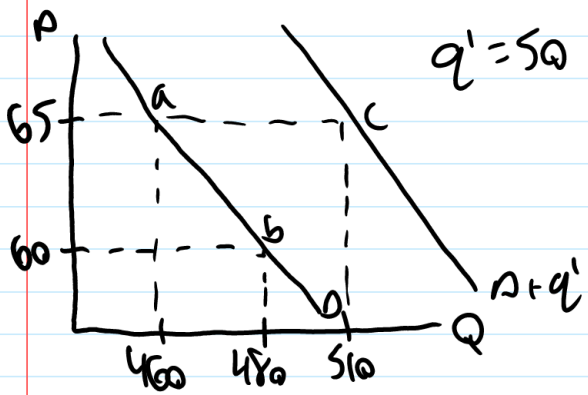
Since there is low unemployment, worker time is valued at market rate. Since the number hired is a small amount compared to total workforce, hiring does not affect the wage. Thus, $SC = 1.02\cdot 60\cdot 10 = 720$

HW 6 Opportunity Cost of Inputs 2

Sunday, October 4, 2020 5:20 PM

Passed solution review

Suppose a project needs to hire 50 electricians. At the initial wage of 60K/year (including benefits) 480 are currently employed in the local area and 20 are estimated to be unemployed. The MEBT is 0.2. After electricians are hired for the project, the local wage increases to 65K/year and the number employed locally increases to 510. Estimate the opportunity cost of hiring the workers. Draw a diagram to illustrate. Explain, and defend any assumptions you make.



$abc = \frac{1}{2}(65-60)(.51-.46) = 125k$

$SC = (510-460)\cdot 65k - abc + (MEBT)(510-460)(65000)$

$SC = (50)\cdot 65k - 125k + (.2\cdot 50\cdot 65000)$

$SC = 3,175,000$

We're assuming opportunity cost = social cost

HW 6 Opportunity Cost of Inputs 3

Passed Solution Review

Sunday, October 4, 2020 5:55 PM

Worked w/ Nick L + Austin

Imagine a rural area with a current wage rate of $20 at which 1500 workers are employed and 500 are unemployed. A government project will hire 50 workers at the going wage rate. Assume reservation wages for those hired are more or less uniformly distributed between $2 and $20. The METB is 0.2. Estimate the expected opportunity cost of project labor.

OC/worker $(20+2)/2 = 11$ → reservation wage

worker $OC = 11 \cdot 50 = 550$

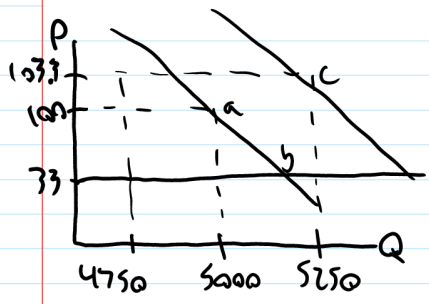
overall $OC = (11 \cdot 50) + (20 \cdot .2 \cdot 50) = 750$

HW 6 Opportunity Cost of Inputs 4

Monday, October 5, 2020 2:41 PM

Passed Solution review

A project requires signing buying 500 cubic yards of concrete per week for the next year from the only local provider. The currently price is $100 per yard and the provider sells 5,000 yards per week. Assuming marginal cost is constant, elasticity of demand at the current price is -1.5, and using a linear demand approximation, estimate the opportunity cost of the weekly government purchase. The METB is 0.2. Note you will need to find the original demand, the new demand, the new price, and the new quantity purchased by those other than the government in the process.



$-1.5 = \frac{Q-5000}{P-100} \cdot \frac{100}{5000}$

$MC' = 500$

$MC = P(1+1/\varepsilon^d) = 100(1+1/-1.5) = 33\frac{1}{3}$ ✓ $P = MC(\eta/(1+\eta))$

$(-1.5)(50)(P-100)+5000 = Q = 12500 - 75P$ ✓

$Q^m = Q + q' - 75P = 13000 - 75P$

$75P = 13000 - Q^m$

$P = \frac{13000 - Q^m}{75}$

~~$MR = 173.\overline{3} - .026 = 33.3$~~ $MR \to P = 166.67 - 1/75q \to MR = 166.67 - 2/75q$

$-.026Q^R = -140$

$Q^R = 5250 = Q^2$

$5250 = 13000 - 75P \quad q = 13000 - 75P$

$75P = 7750$

$P = 103.\overline{3}$

25

$SC = (5250-4750)\cdot 103\frac{1}{3} - \left(\frac{1}{2}\cdot(103\frac{1}{3}-100)(5250-4750)\right) + (.2)(5250-4750)(103.\overline{3})$

$SC = 5000 \cdot 103\frac{1}{3} - 625 + 10333\frac{1}{3}$

$SC = 51666.\overline{66} - 625 + 10333\frac{1}{3}$

$SC = 61,175$

New MR:

$Q = 13000 - 75A \to A = 173.33 \to MR = 173.33 - 2/75q$

New q: $MR = MC \to 173.33 - 2/75q = 33.33 \to q = 5250$

Private $q = 5250 - 500 = 4750$

New P: $5250 = 13000 - 75P \to P = 103.33$

New Surplus:

$\Delta CS = -3.33 \cdot 4750 - 3.33 \cdot 250/2 = -16331.75$

$\Delta PS = 70 \cdot 5250 - 66.67 \cdot 5000 = 34150$

$\Delta GS = -103.33 \cdot 500 = -51665$

$\Delta SS = -4700 + 4950 - (1.2 \cdot 51665) = -61748$

HW 6 P & Q Given

Sunday, September 27, 2020 6:20 PM

Worked w/ Austin

Passed solution review

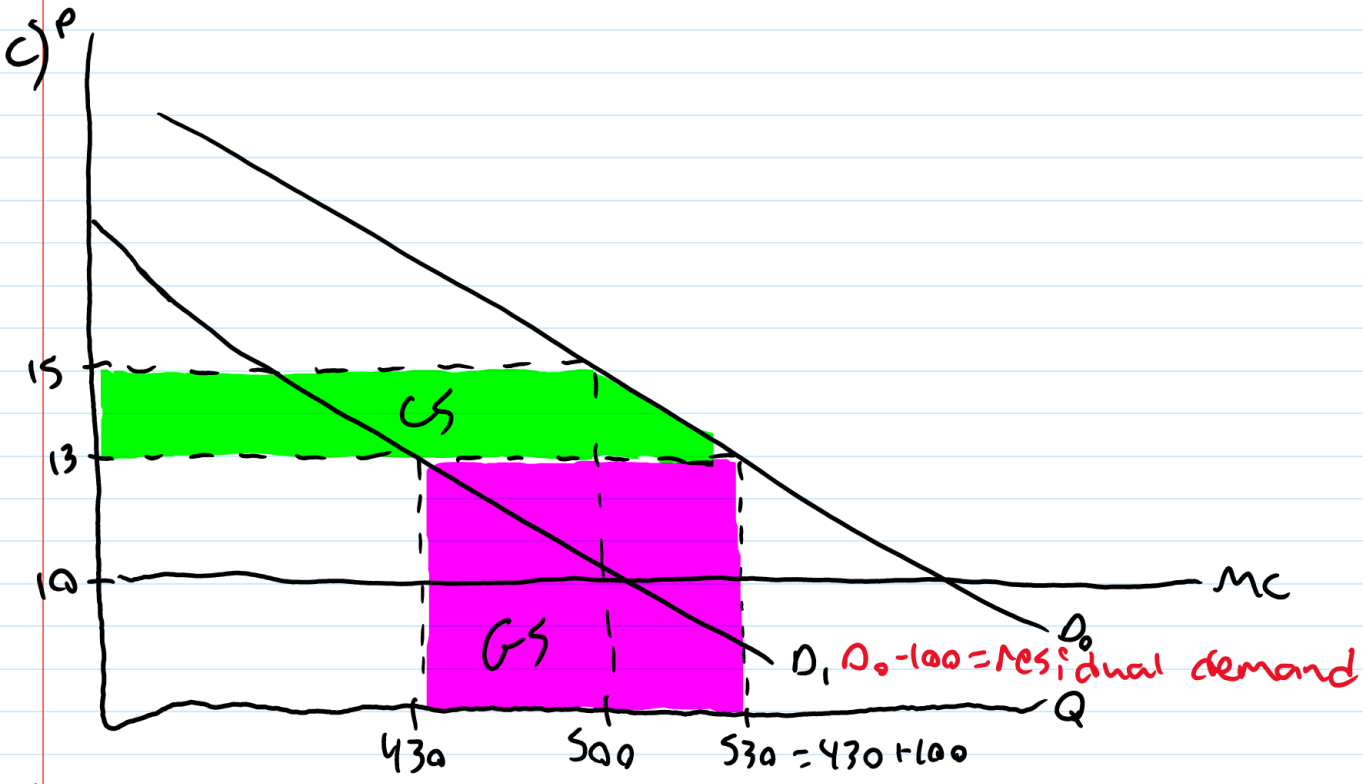
Initially, a profit maximizing local monopolist charges $15 and sells 500 units per week. Per unit variable cost is $10. Now assume the local government begins to provide 100 units per week at the market price. As a result, the market price falls to $13 and the quantity sold by the monopolist falls to 430.

a) Find the changes in CS, PS, and GS created by the monopoly.

b) Assume the METB is 0.25. Find the changes in SS.

c) Depict all of this in a diagram. You probably want to sketch the diagram right at the start of the problem for reference as you work, and then to redraw a neat version to submit.

c)



a) $\Delta CS = (2 \cdot 500) + (\frac{1}{2} \cdot 2 \cdot 30)$

$= 1000 + 30$

$\Delta CS = \$1030$

$\Delta PS = (-1)(15-13)(500) - (500-430)(13-10)$

$= (-1 \cdot 2 \cdot 500) - (70 \cdot 3)$

$= -1000 - 210$

$\Delta PS = -1210$

$\Delta GS = (530 - 430)(13)$

$\Delta GS = 1300$

b) $\Delta SS = \Delta CS + \Delta PS + (1 + METB)(\Delta GS)$

$= 1030 - 1210 + (1.25 \cdot 1300)$

$= -180 + 1625$

$\Delta SS = 1445$

Midterm - Gus Lipkin

Friday, October 9, 2020 1:56 PM

5+6 are switched

Passed solution review

1) What is the difference between Pareto efficiency and Hicks-Kaldor efficiency, and why is it relevant to benefit cost analysis? If helps some+hurts none. Hicks-Kaldor if total benefits exceed total costs. BCAs use Hicks-Kaldor or nothing would ever happen to change the status quo.

In Pareto efficiency, so long as one person is better and no one is worse off, it is Pareto efficient. In Hicks-Kaldor efficiency, it is efficient so long as people benefit more than those who are worse off so long as the people worse off could be compensated by the benefits. It is relevant because when doing a BCA of a project, especially a public project, it is important to consider how the community will be affected and to consider how a project can be made Pareto efficient so that no one is worse off after the project is finished.

2) Why are benefit cost ratios inappropriate for evaluating alternative projects? 1) can be manipulated by counting effects as benefits or costs

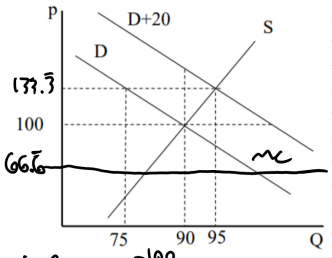
Benefit-cost ratios are inappropriate for evaluating alternative projects because the ratio is not indicative of total value added. It would be better to gauge projects by the net benefits. A project that has a benefit value of 15 and a cost value of 14 will have a much lower ratio than a project with 5 benefits and 1 cost.

2) a project w/ a low ratio may have large net benefits

3) Suppose your company is preparing a benefit-cost analysis to use to lobby the local government for a policy you want passed. Why would you want to know if the relevant decision makers are guardians or spenders? Spenders would focus on benefits while guardians would focus on revenues to the local government

The distinction between guardians and spenders is important because that largely controls their decisions on how to spend money. Guardians will be less likely to pass a new policy if it involves spending money while a Spender will be more likely to pass a policy if the money spent benefits the greater good.

4) A government project directly purchase 20 units in a local market. The METB is 0.2. The elasticity of demand is -2/3. Other pertinent information is summarized in the figure provided. Calculate the changes in PS, CS, GS, and SS associated with the purchase.



$MC = 133.3(1-1/2) = 200/3$

Calculate new price

$\%\Delta Q = -15/90 \cdot 100 = -16.7\%$

$-50/3 = \%\Delta P \cdot (-2/3) \rightarrow \%\Delta P = 25\%$

$\frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} \rightarrow -\frac{2}{3} = \frac{95-75}{P-100} \cdot \frac{100}{90} \rightarrow -\frac{3}{5} = \frac{20}{P-100} \rightarrow P-100 = -\frac{100}{3}$

$P = 200/3$

or $-\frac{2}{3} = \frac{20}{100-P} \cdot \frac{100}{90} \rightarrow 100-P = -100/3 \rightarrow P = 100+100/3 = 400/3$

$\Delta CS = (100/3 \cdot 90) + (100/3 \cdot 5 \cdot \frac{1}{2}) = 3083.3$ $(-25 \cdot 75) - (\frac{1}{2} \cdot 25 \cdot 15) = -2062.5$

$\Delta PS = (100/3 \cdot 75) - (200/3 \cdot 90) = -3500$ $(25 \cdot 90) + (\frac{1}{2} \cdot 25 \cdot 5) = 2312.5$

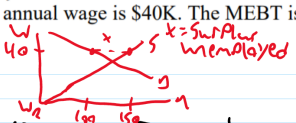
$\Delta GS = 100 \cdot 20 = 2000$ $(-125 \cdot 20) = -2500$

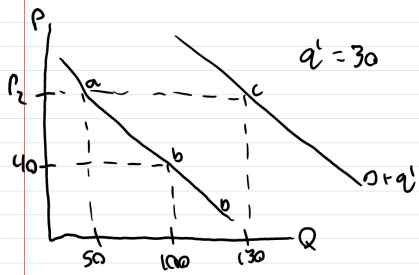
$\Delta SS = 3083.3 - 3500 + (1.2 \cdot 2000) = 1983.3$ $(-2062.5 + 2312.5) - (\frac{1}{2} \cdot 2500) = -2250$

6) A local government project requires 30 workers for a year from a market in which currently 100 workers are employed, 50 are unemployed, and the annual wage is \$40K. The MEBT is 0.2.

a) Draw a figure illustrating the state of the market.

b) Calculate the opportunity cost of hiring the workers.





According to official solution for opportunity cost I, since unemployment is small, wage doesn't change. I don't believe it applies here, but I did it that way so I would have an answer. Unemployment is high so wage overestimates OC of labor

$abc = \frac{1}{2}(P_2 - 40k)(130-50) = 40(P_2 - 40k)$ OC of hire is 1/2way between W^R and wage, don't know W^R so use Q. High SC of unemployment so

$SC = 1.2 \cdot 40{,}000 \cdot 30 = 1{,}440{,}000$ OC is \$20

Net SC $= (30 \cdot 20) + (.2 \cdot 30 \cdot 40) = 840{,}000$

5) Suppose:

i) the price of gasoline is \$2 per gallon

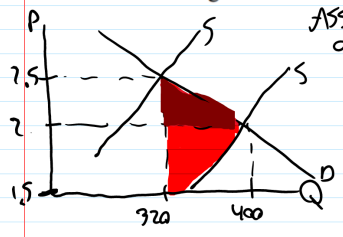
ii) current consumption is 400 (million) gallons per day

iii) the elasticity of demand is -0.8

iv) retail provision of gasoline may be approximated as a constant cost industry

v) there is an external cost of \$0.5 per gallon of gas ← tax!

Calculate deadweight loss associated with the externality. Draw a figure to illustrate.



Assuming tax is what changes (is added)

$-.8 = \frac{Q-400m}{2.5-2} \cdot \frac{2}{400m} \rightarrow Q = 320m$

= DWL

$-.8 = \frac{320-400}{2-P} \cdot \frac{2}{400} \rightarrow P = 1.5$

$DWL = (2.5-1.5)(\frac{1}{2})(8bn) = 40{,}000{,}000$

$DWL = (\frac{1}{2})(2.5-2)(8bn) = 20{,}000{,}000$