Market economy and pubic policy 3

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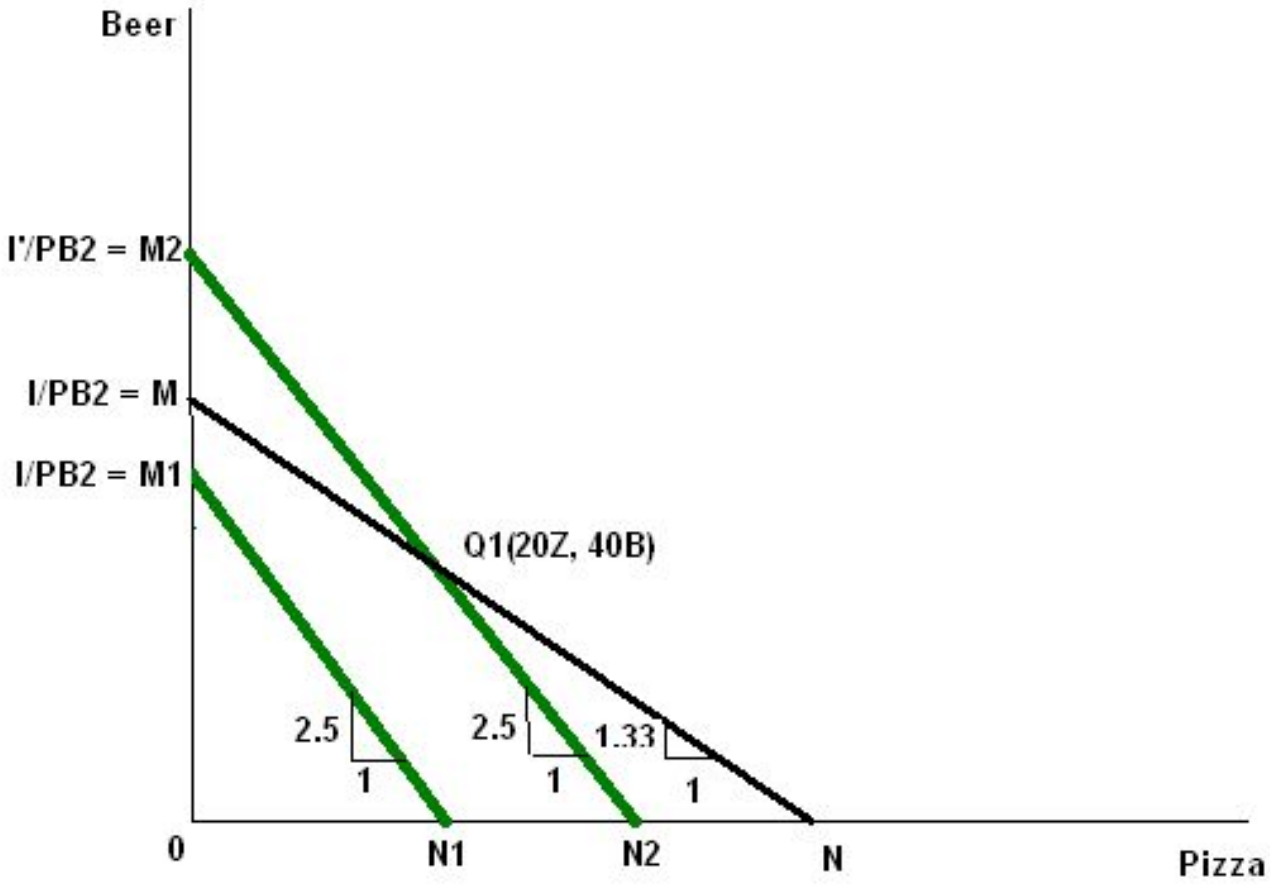
Today

- Homework from last week
- CPI supplement
- Micro and Macro
- D and S
- Soviet Union vs. Free Market
- How S is made?
- Elasticity
- Utility, indifference curve, and wellness
- How utilities explain social problems?
- Guide to more serious researches…for some of you
- Marginal Rate of Substitution --- Homework
- Governmental intervention to market

Consumer Price Index --- shopping “basket”



Consumer Price Index

- Year 1: $I = P^B_1 B_1 + P^Z_1 Z_1 = \Sigma P_1 Q_1$
- Year 2: $I' = P^B_2 B_1 + P^Z_2 Z_1 = \Sigma P_2 Q_1$

- Price Index P^*
- $P^* = I'/I = \Sigma P_2 Q_1 / \Sigma P_1 Q_1$

Various markets (industries, businesses)

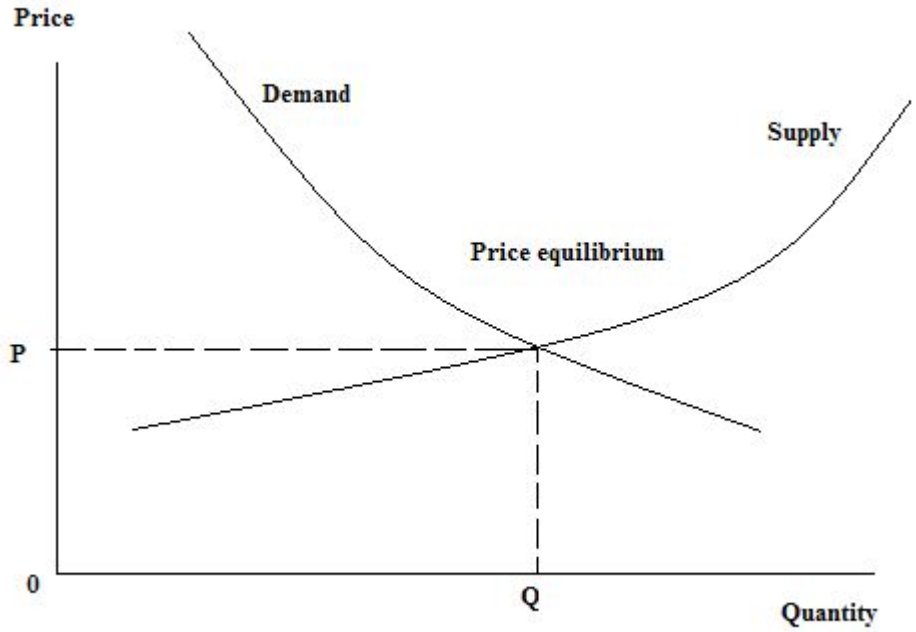
- Energy (oil, gas, coal, hydro, nuclear, solar, wind, biomass, ….)
- Utilities (heating, electricity, water, sewage, ...)
- Public services (post, bus, taxi, train, …)
- Education
- Productions (car, electronics, food, IT, …)
- Finances (bank, credit, stocks, ….)
- Housing, lands, ….
- Export/import trades
- Emission trade (quotas, tradable permit, …..)
- And so on…

List of terminologies

Demand	Supply
Utility Function	Production Function
Indifference Curve	Isoquant
Price	Price -- cost
Quantity	Quantity

How is price made? Why it is changed?

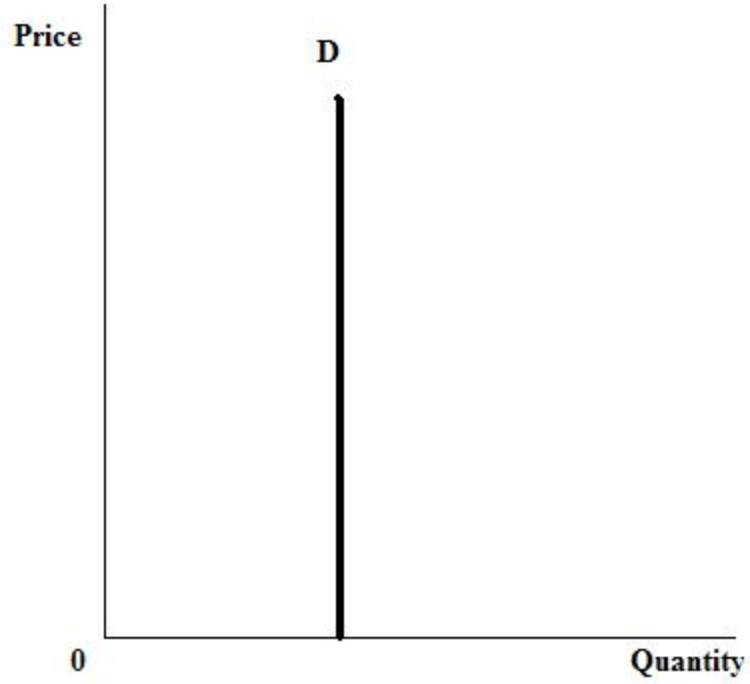
- In competitive market



Question**
Some economists get angry by the comment bellow:

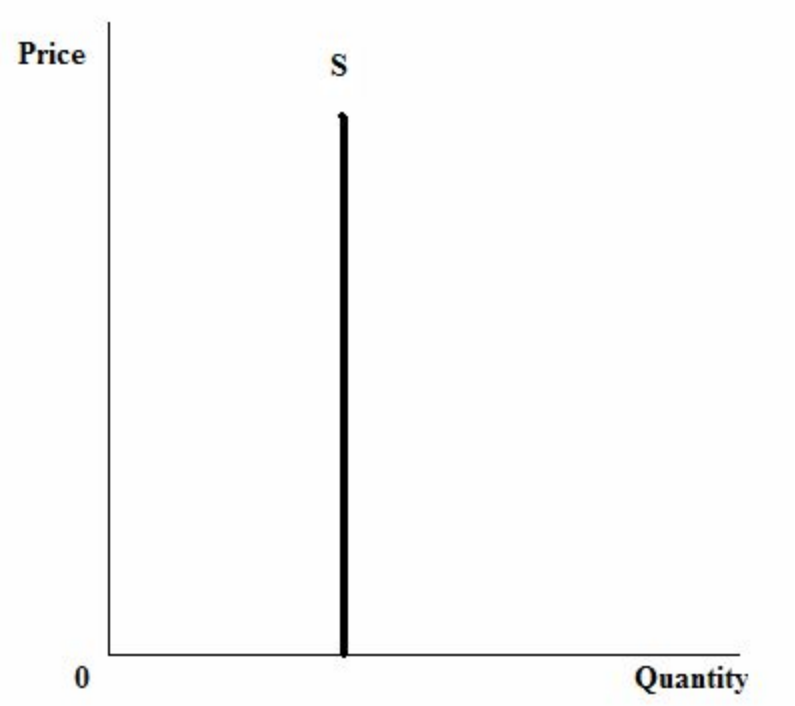
- Education is expensive, but nothing is more valuable.
- Ukraine needs more energy.
- Social Security should cover our basic needs in retirement.

Vertical Demand



How does it look like if Soviet Union's economist draw a picture, using our economics?

Vertical supply

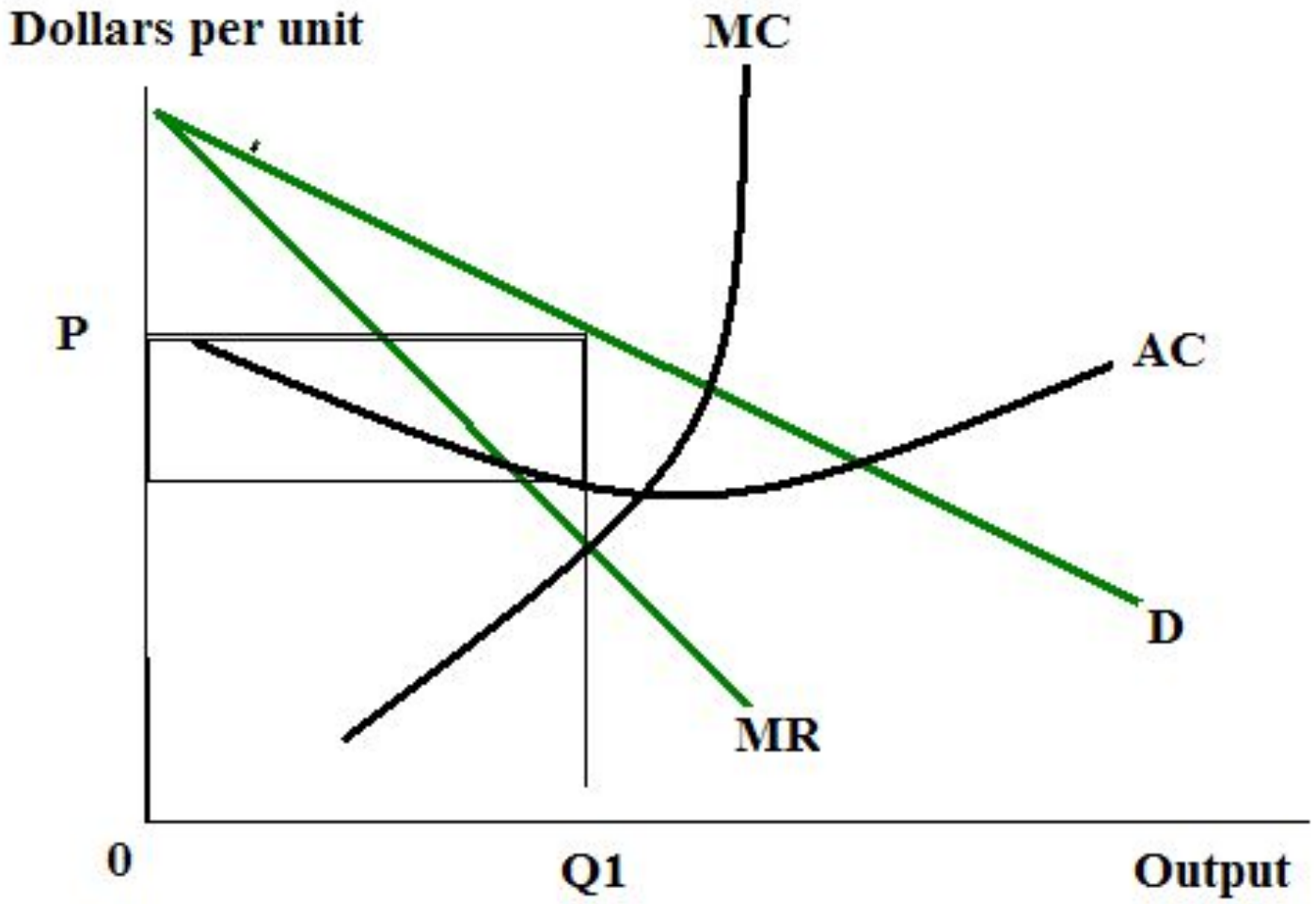


Question

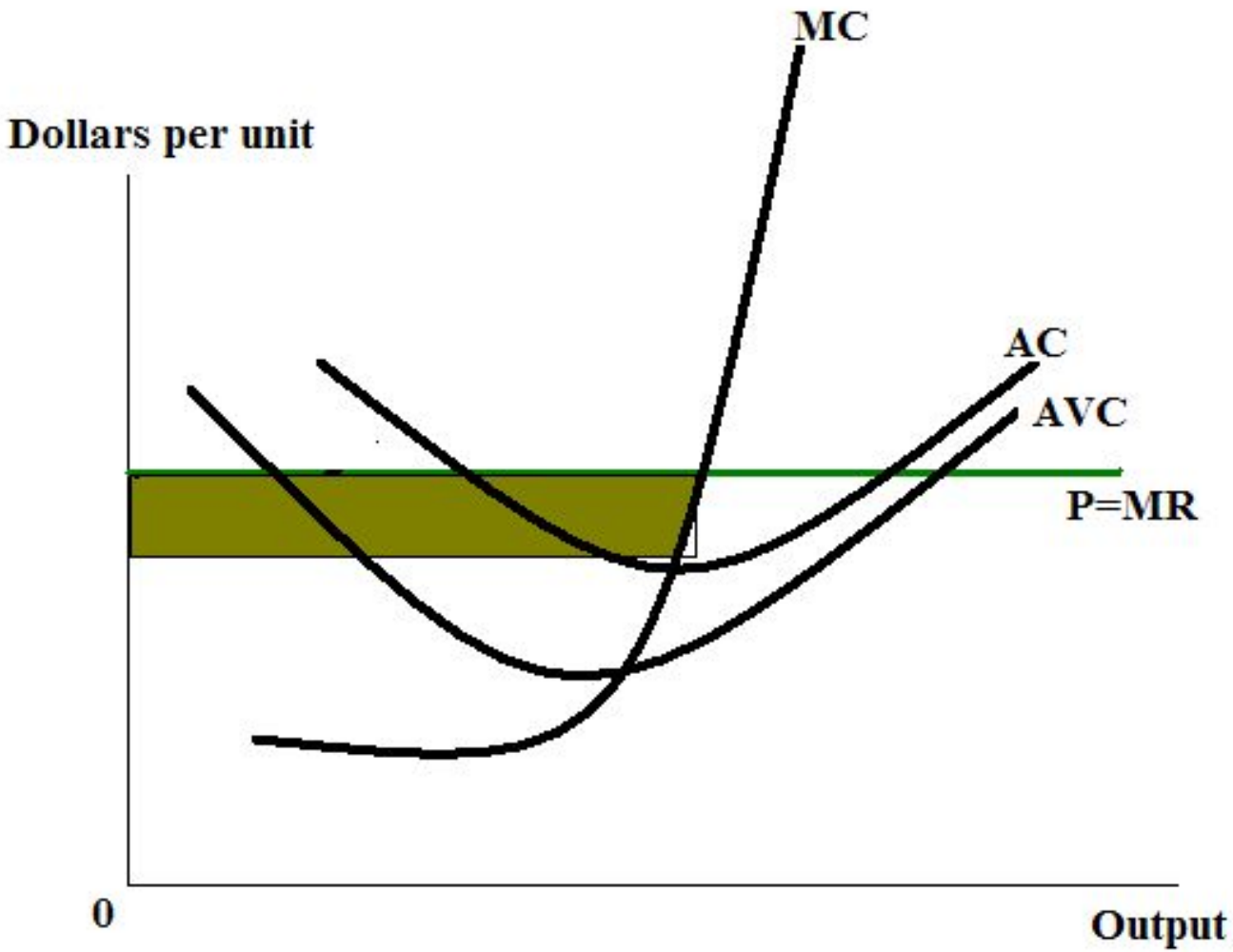
- What is that Soviet Union's system similar to the item in our market economy?

  Find the answer from the list shown at the beginning of this lecture today.

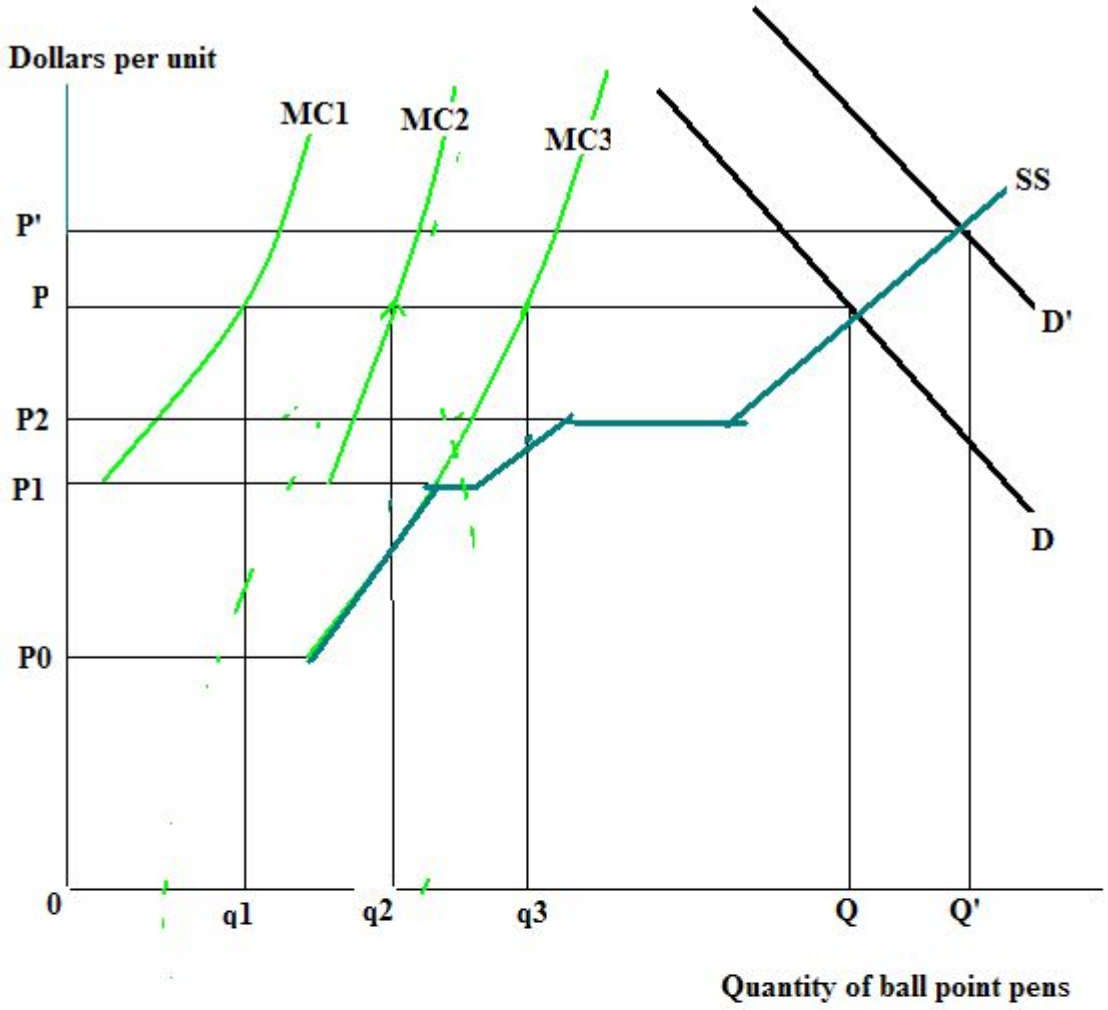
How a company set price in a market, with no competitor?



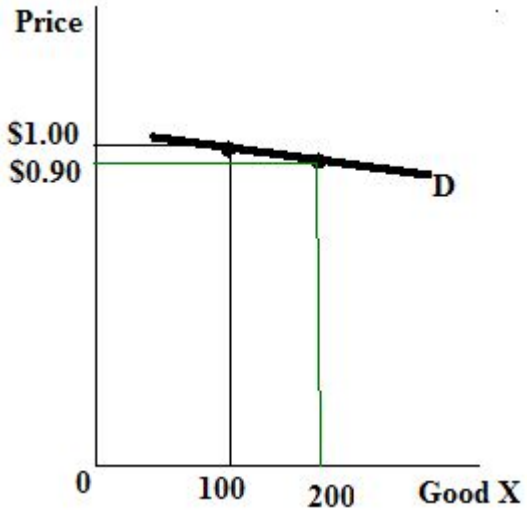
How a company set the price in competitive market?

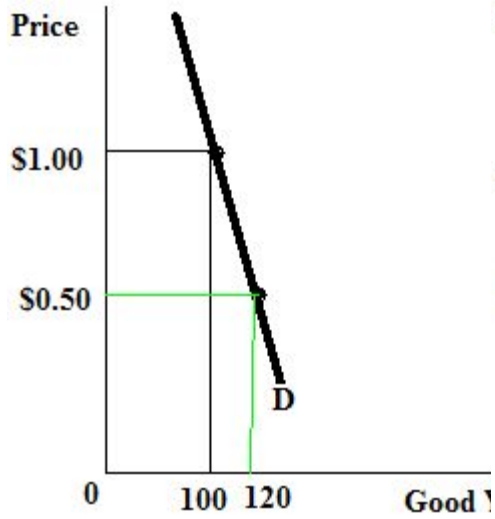


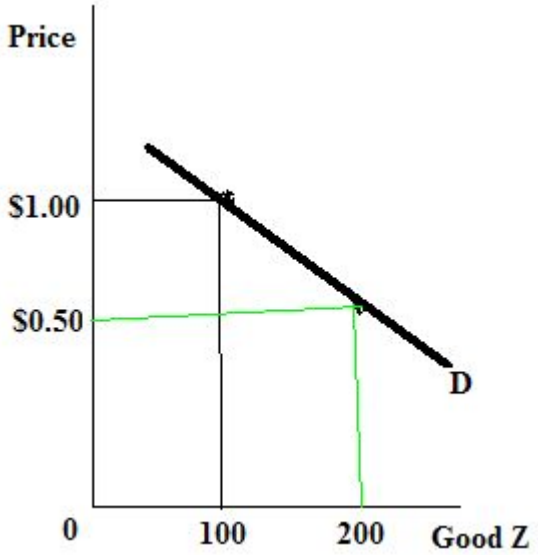
Marginal cost to supply curve



Price Elasticity of Demand

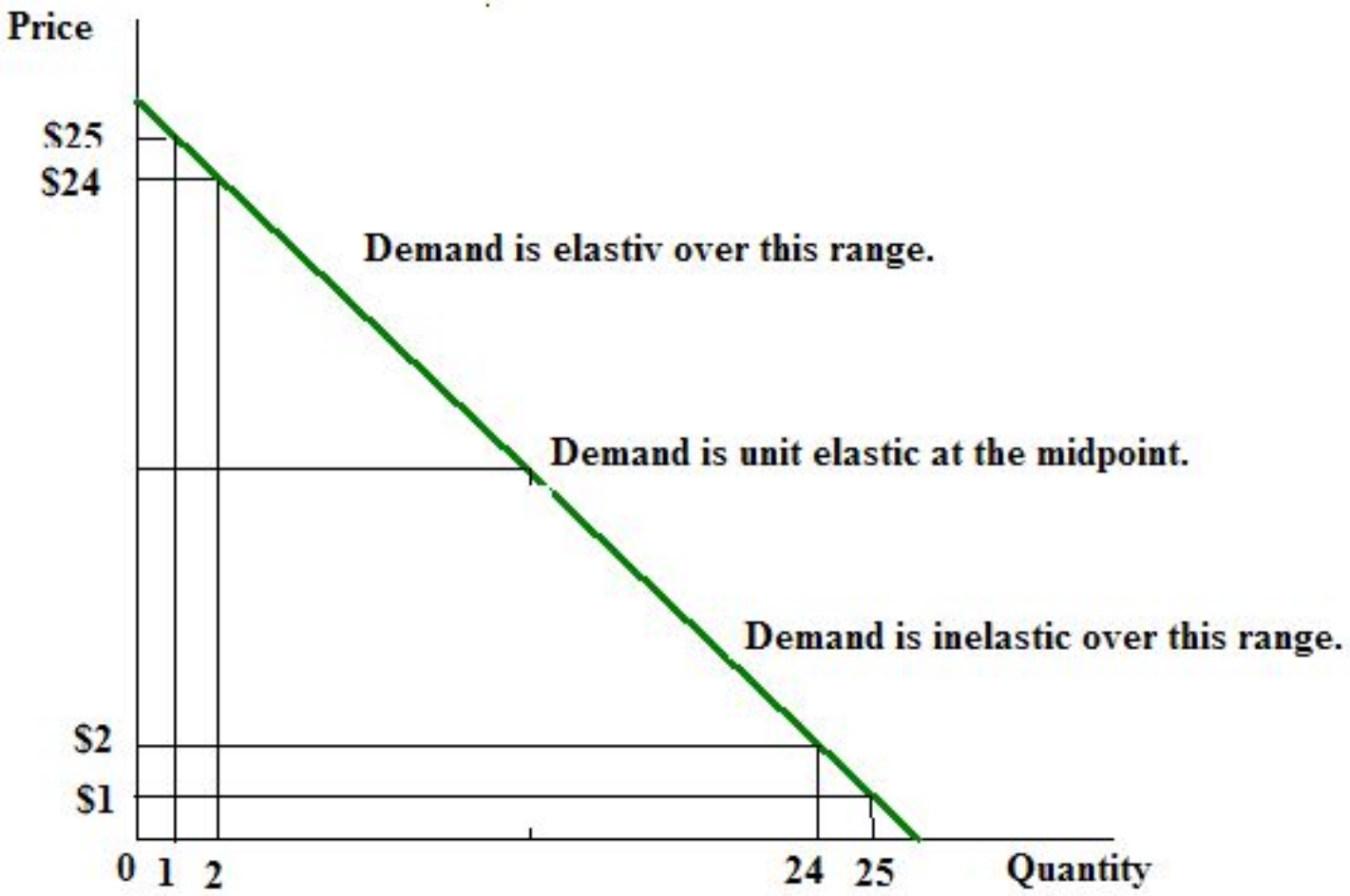






$\eta = (\Delta Q/Q)/(\Delta P/P)$

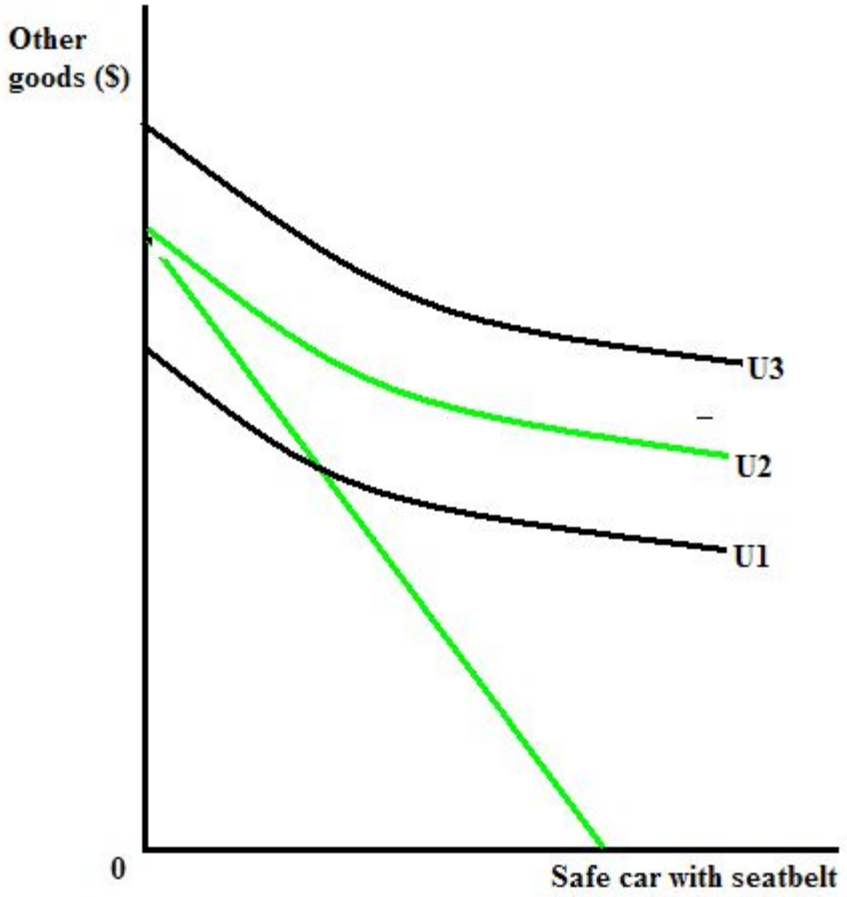
Elasticity of Demand on a linear Demand curve



Examples of Demand Elasticity

	Short run	Long run
Salt		0.1
Cigarettes		0.30
Beer		0.7-0.9
Water		0.4
Housing		1.0
Physicians; services	0.6	
Medical and hospitalization insurance	0.3	0.9
Gasoline	0.2	0.5
Automobile		1.5
Chevorolets		4.0
Electricity (household)	0.1	1.9
Gas (household)	0.1	10.7
Intercity bus	2.0	2.2
Air travel	0.1	2.4
Motion picture	0.9	3.7

Corner solution



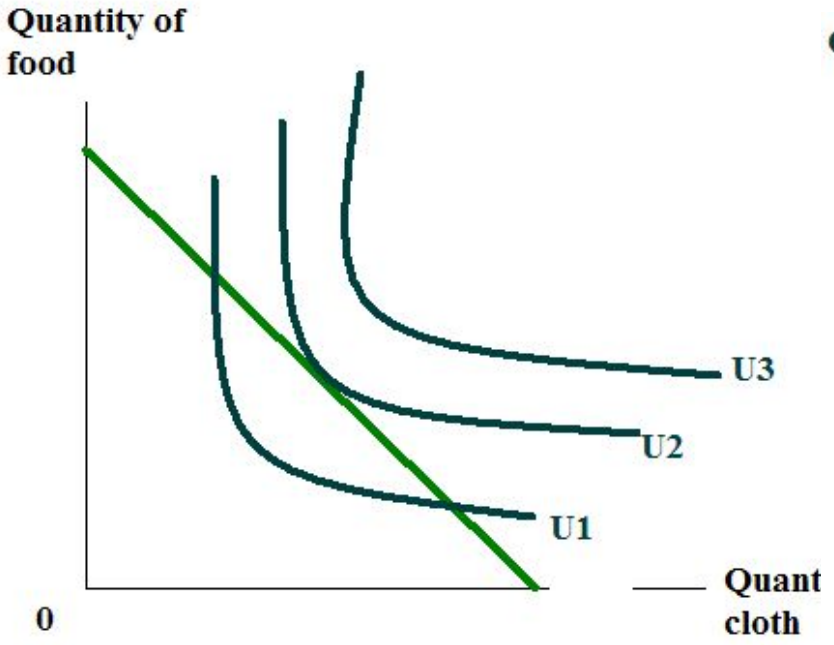
Equilibrium lies at one of the intercepts of the budget line, in this case, at point M, where only other goods are purchased.

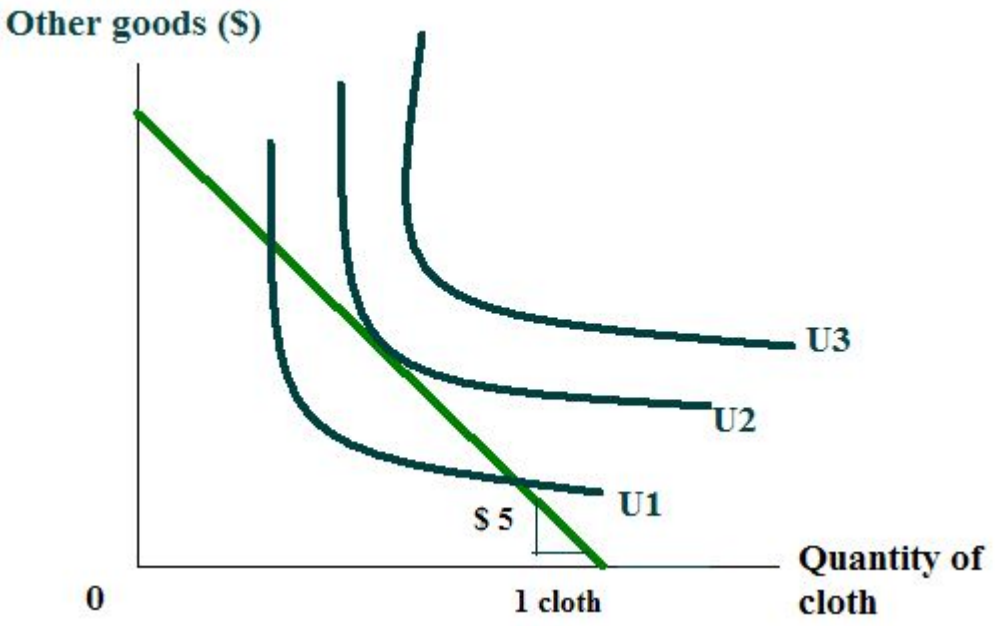
Question***
Car seat-belt

- Before seatbelt was not required by law, it was available as an option.
- The drivers knew that seatbelts reduced the injuries from accidents.
- But, the drivers did not buy them.

- Are the drivers irrational?

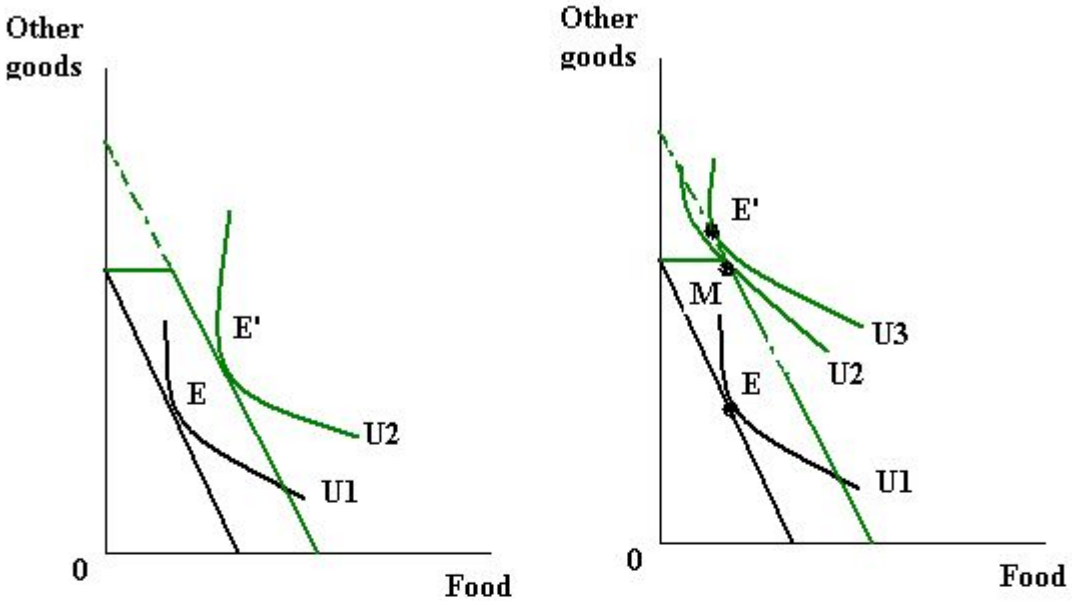
How utility explains price?



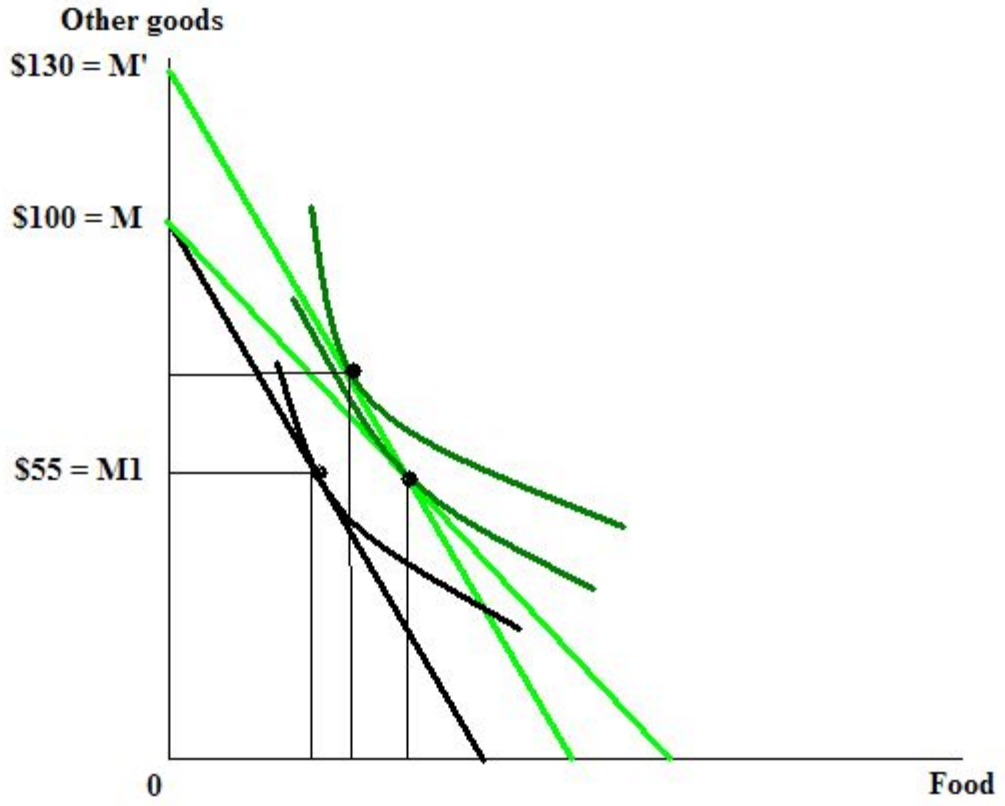


Some examples to show how indifference curves explain various economical/social problems

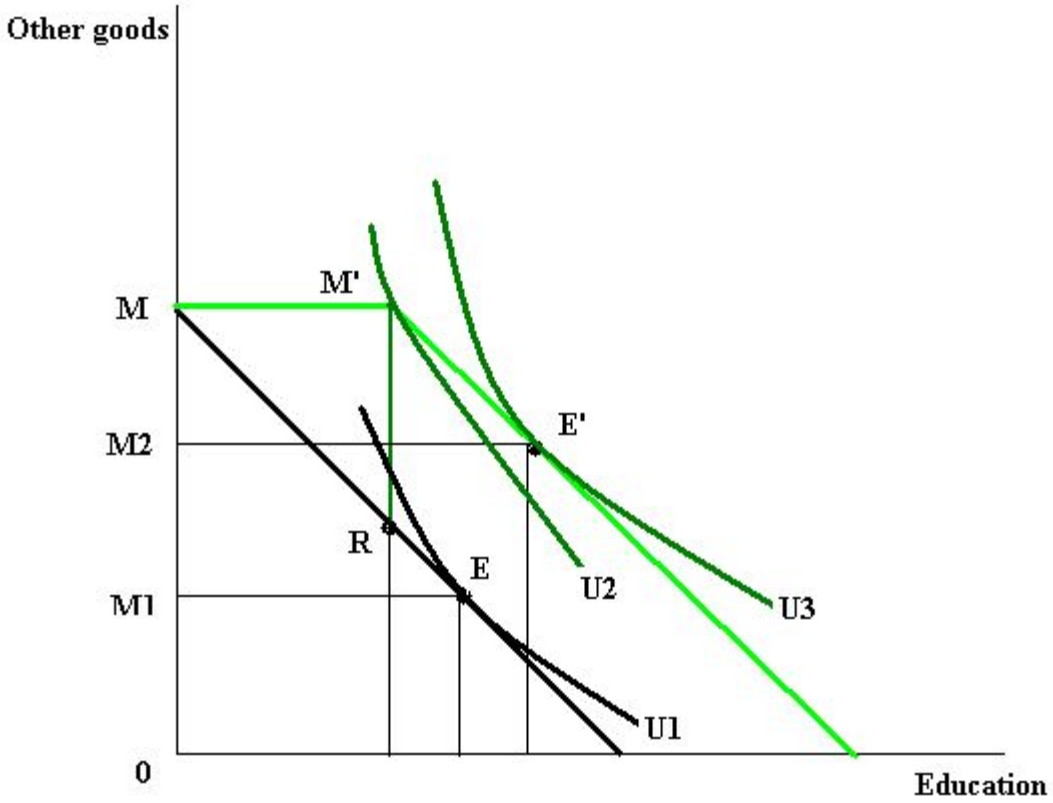
Effect of food stamp program on



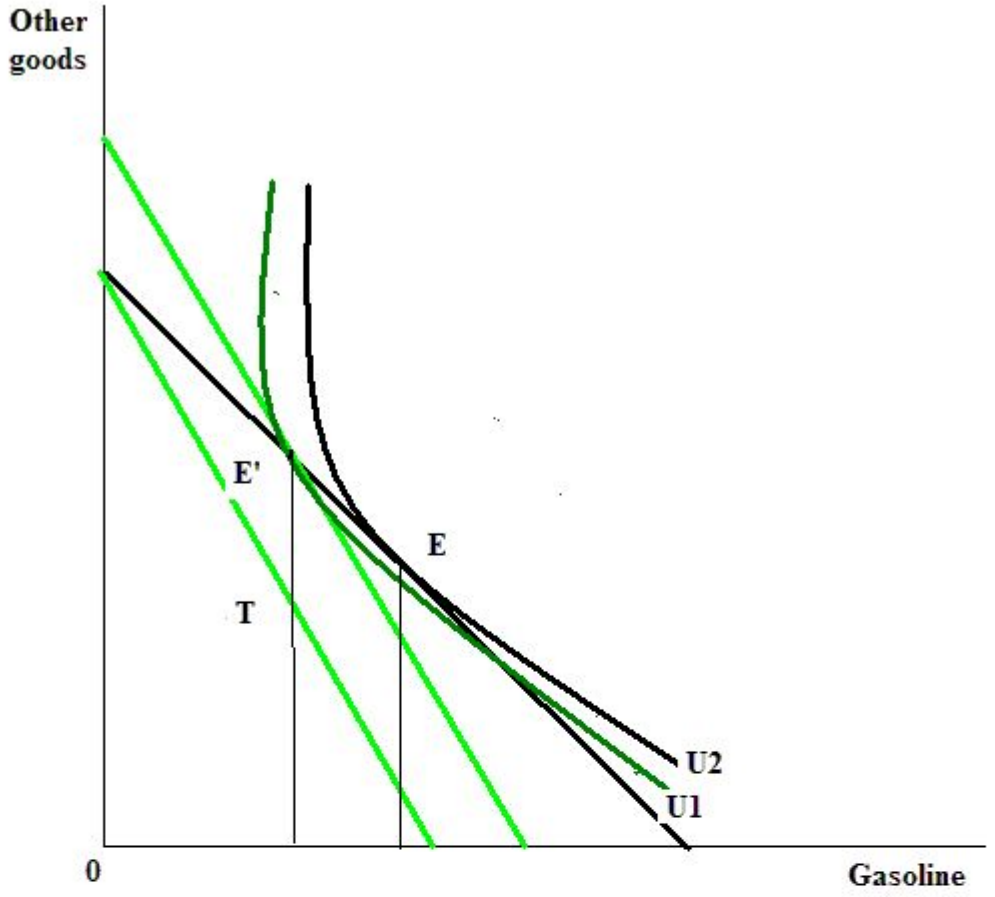
Excise subsidy vs. Lump-sum subsidy



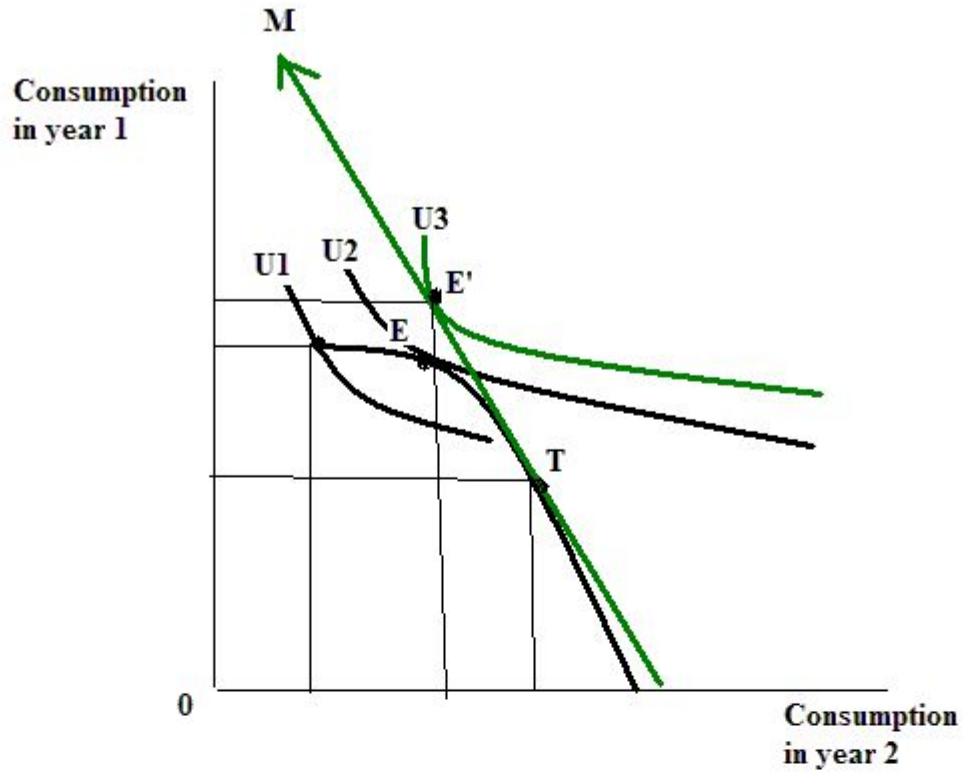
Fixed-quantity subsidy: Education



Tax and Rebate Program



Investment in education and borrowing



References

[1] Browning E.K., Browning J.M., Microeconomic Theory and Application, Third Edition, Scott, Foresman and Company (Glenview, Illinois), 1989. –637p.

[2] Goldberger A. S., A Course in Econometrics, Harvard University Press, Cambridge, Massachusetts, (1991) –405p.

[3] Matsuki Y., Bidyuk P., Theory, algorithm and condition for aggregating economic benefit and health damages of coal fuel combustion, System Research & Information Technologies, 3' 2013, Institute for Applied System Analysis, Kyiv, Ukraine (2013) pp. 19-29

[4] Matsuki, Y. Bidyuk, P., Kozyrev V., Empirical investigation of the theory of production function with the data of the alloy production in Ukraine, System Research & Information Technologies, 2' 2014, Institute for Applied System Analysis, Kyiv, Ukraine (2014) pp. 29-39.

For Empirical study to check theory by data

Utility Function

$$I = \sum_{i=1}^{n} P_{x_i} X_i \quad \text{.....(1)}$$

$$L = U(X_1, X_2, X_3, \ldots X_n) + \lambda(I - \sum_{i=1}^{n} P_{x_i} X_i) \quad \text{.....(2)}$$

$$\partial L / \partial X_i = \partial U / \partial X_i - \lambda P_{x_i} = 0 \quad \text{.....(3)}$$

$$\partial L / \partial \lambda = I - \sum_{i=1}^{n} P_{x_i} X_i = 0 \quad \text{.....(4)}$$

$$\frac{\partial U / \partial X_i}{\partial U / \partial X_j} = \frac{P_{X_i}}{P_{X_j}} \quad \text{.....(5)}$$

where, $i \neq j$.

2. Non-linear model (Cobb-Douglas function [1]):

$$U = \prod_{i=1}^{n} X_i^{C_i} \quad \text{.....(17)}$$

where,

$$\sum_{i=1}^{n} C_i = 1 \quad \text{.....(28)}$$

$$X_i = \frac{I}{P_{X_i}} \frac{C_i}{\sum_{j=1}^{n} C_j} \quad \text{.....(18)}$$

$$\frac{C_i}{\sum_{j=1}^{n} C_j} = \beta_i \quad \text{.....(29)}$$

Production function

$$C^o = \sum_{i=1}^{n} P_{x_i} X_i \quad \text{...(1)}$$

$$Z = Q(X_1, X_2, X_3, \ldots X_n) + \lambda(C^o - \sum_{i=1}^{n} P_{x_i} X_i) \quad \text{...(2)}$$

$$\partial Z / \partial X_i = \partial Q / \partial X_i - \lambda P_{x_i} = 0 \quad \text{..(3)}$$

$$\partial Z / \partial \lambda = C^o - \sum_{i=1}^{n} P_{x_i} X_i = 0 \quad \text{..(4)}$$

$$\frac{\partial Q / \partial X_i}{\partial Q / \partial X_j} = \frac{P_{X_i}}{P_{X_j}} \quad \text{(5)}$$

$$Q = \sum_{i=1}^{n} a_i X_i \qquad \text{..........(6)}$$

where,

$$\sum_{i=1}^{n} a_i = 1 \qquad \text{..........(7)}$$

$$Z = \sum_{i=1}^{n} a_i X_i . + \lambda(C^o - \sum_{i=1}^{n} P_{X_i} X_i) \qquad \text{..........(8)}$$

$$\partial Z / \partial X_i = a_i - \lambda P_{X_i} = 0 \qquad \text{..........(9)}$$

$$\partial Z / \partial \lambda = C^o - \sum_{i=1}^{n} P_{x_i} X_i = 0 \qquad \text{..........(10)}$$

where, $i = 1, 2, ...n$.

$$P_{X_i} = \frac{a_i}{\lambda}$$

$$C^o = \sum_{i=1}^{n} P_{X_i} X_i \quad \text{.......(12)}$$

$$C^o = P_{X_i} X_i + \sum_{i=1}^{n-1} \frac{a_j}{\lambda} X_j \quad \text{.......(13)}$$

where $i \neq j$.

$$\frac{1}{\lambda} = \frac{P_{X_i}}{a_i} \quad \text{.......(14)}$$

$$X_i = \frac{C^o}{P_{X_i}} - \sum_{j=1}^{n-1} \frac{a_j}{a_i} X_j \quad \text{.......(15)}$$

$$\frac{a_j}{a_i} = \alpha_{ij} \quad \text{.....(16)}$$

$$X_i = \frac{C^o}{P_{X_i}} - \sum_{j=1}^{n-1} \alpha_{ij} X_j \quad \text{.....(17)}$$

where, $\frac{\sum_{j=1}^{n-1} a_j}{a_i} = \sum_{j=1}^{n} \alpha_{ij}$ .....(18)

$$\sum_{i=1}^{n} a_i = a_i + \sum_{j=1}^{n-1} a_j = 1 \quad \text{.....(19)}$$

$$\frac{1-a_i}{a_i} = \sum_{j=1}^{n-1} \alpha_{ij} \quad \text{.....(20)}$$

$$\frac{a_j}{a_i} = \alpha_{ij} \quad \text{.....(16)}$$

$$X_i = \frac{C^o}{P_{X_i}} - \sum_{j=1}^{n-1} \alpha_{ij} X_j \quad \text{.....(17)}$$

where, $\frac{\sum_{j=1}^{n-1} a_j}{a_i} = \sum_{j=1}^{n} \alpha_{ij}$ .....(18)

$$\sum_{i=1}^{n} a_i = a_i + \sum_{j=1}^{n-1} a_j = 1 \quad \text{.....(19)}$$

$$\frac{1-a_i}{a_i} = \sum_{j=1}^{n-1} \alpha_{ij} \quad \text{.....(20)}$$

$$1 - a_i = a_i \sum_{j=1}^{n-1} \alpha_{ij} \quad \ldots\ldots(21)$$

$$a_i\left(\sum_{j=1}^{n-1} \alpha_{ij} + 1\right) = 1 \quad \ldots\ldots(22)$$

Therefore, $a_i = \dfrac{1}{1 + \sum_{j=1}^{n-1} \alpha_{ij}}$ ……(23)

R-squared

a. Calculate the predicted value of Y (i.e., $\hat{Y}$) with the following equation:

$$\hat{Y} = c_1 + \sum_{j=2}^{k} c_j x_j \quad \text{.....(25)}$$

$$where, \quad j = 2, 3, \ldots\ldots k.$$

b. Calculate the value of R^2 by the following equation:

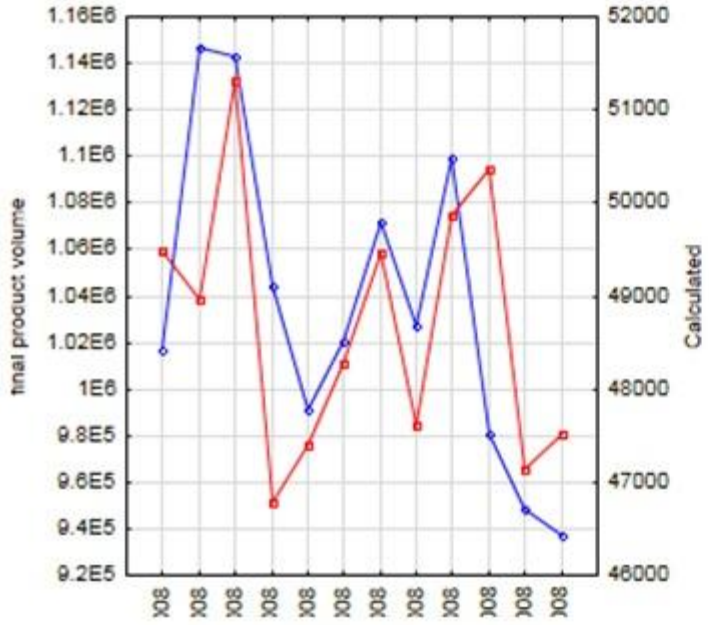
$$R^2 = \frac{\sum_{i=1}^{n}(\hat{Y}_i - \overline{Y})^2}{\sum_{i=1}^{n}(Y_i - \bar{Y})^2} \quad \text{.....(26)}$$

$where, \bar{Y} = {}^{1}/_{n} \times \sum_{i=0}^{n} x_i.$

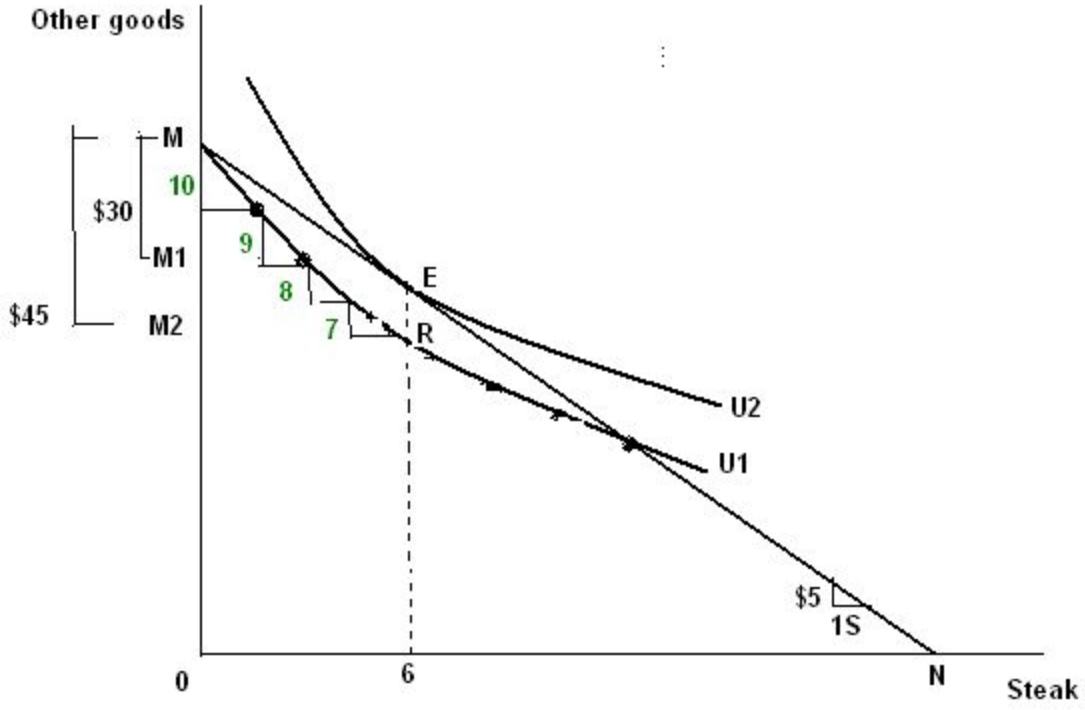
$where, i = 1, 2, \ldots., n, and\ n\ is\ the\ total\ number\ of\ the\ samples\ of\ the\ variable, x_i.$

Table 3 R^2 of the linear functions

No	Model of equation (6)	Model of equation (15)	R^2
1	$Q=a_1*X_{lime}+a_2*X_{bentonite}+a_3*X_{electricity}+a_4*X_{ore}+a_5*X_{gas}$	$X_{lime}=\alpha_1+\alpha_2*C^o/P_{lime}+\alpha_3*X_{bentonite}+\alpha_4*X_{electricity}+\alpha_5*X_{ore}+\alpha_6*X_{gas}$	0.3645
		$X_{bentonite}=\alpha_1+\alpha_2*C^o/P_{bentonite}+\alpha_3*X_{lime}+\alpha_4*X_{electricity}+\alpha_5*X_{ore}+\alpha_6*X_{gas}$	0.2611
		$X_{electricity}=\alpha_1+\alpha_2*C^o/P_{electricity}+\alpha_3*X_{bentonite}+\alpha_4*X_{lime}+\alpha_5*X_{ore}+\alpha_6*X_{gas}$	0.1801
		$X_{ore}=\alpha_1+\alpha_2*C^o/P_{ore}+\alpha_3*X_{bentonite}+\alpha_4*X_{electricity}+\alpha_5*X_{lime}+\alpha_6*X_{gas}$	0.1015
		$X_{gas}=\alpha_1+\alpha_2*C^o/P_{gas}+\alpha_3*X_{bentonite}+\alpha_4*X_{electricity}+\alpha_5*X_{lime}+\alpha_6*X_{ore}$	0.1364
2	$Q=a_1*X_{lime}+a_2*X_{bentonite}+$	$X_{lime}=\alpha_1+\alpha_2*C^o/P_{lime}+\alpha_3*X_{bentonite}+\alpha_4*X_{electricity}+\alpha_5*X_{ore}$	0.3559
		$X_{bentonite}=\alpha_1+\alpha_2*C^o/P_{bentonite}+\alpha_3*X_{lime}+\alpha_4*X_{electricity}+\alpha_5*X_{ore}$	0.2582


1.16E6
1.14E6
1.12E6
1.1E6
1.08E6
1.06E6
1.04E6
1.02E6
1E6
9.8E5
9.6E5
9.4E5
9.2E5
final product volume
52000
51000
50000
49000
48000
47000
46000
Calculated

Marginal rate of substitution (MRS)

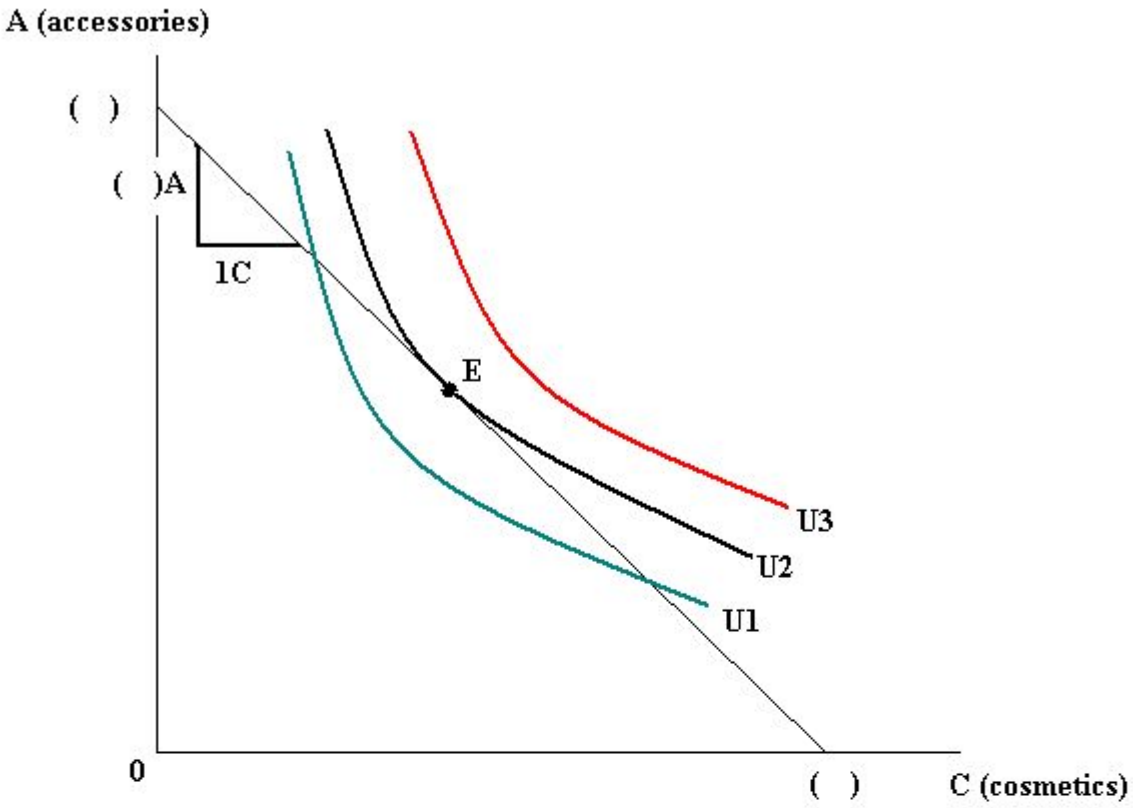


MRS: Other goods/Steak

Homework

- Monica spends her entire monthly income of $600 on cosmetics and accessories.
- The price of cosmetic is $30, and the price of accessory is $10.
- If she consumes 12 cosmetics and 24 accessories, her MRS is 1A/1C. Is she in equilibrium at this point on her budget line?
- Show the result in a picture.

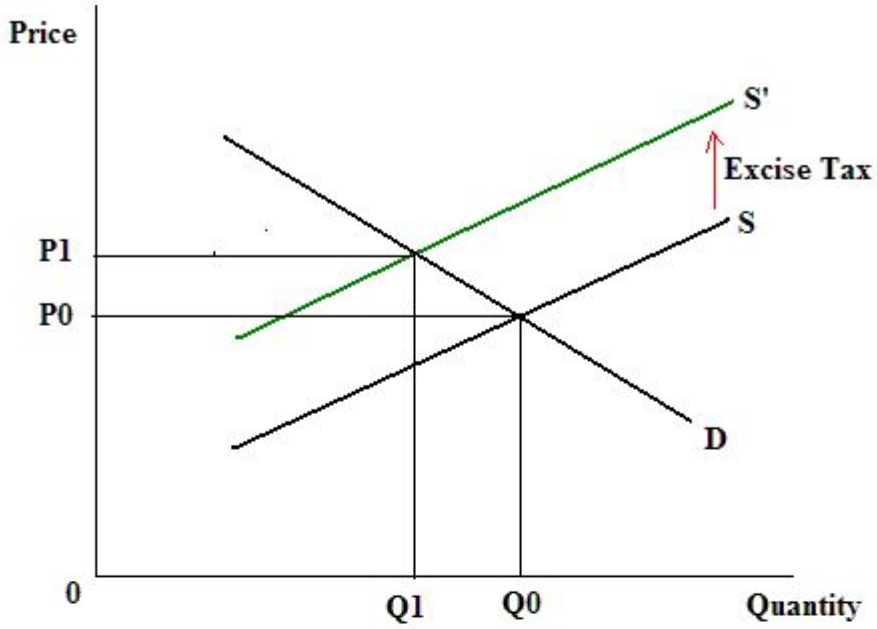
Hint



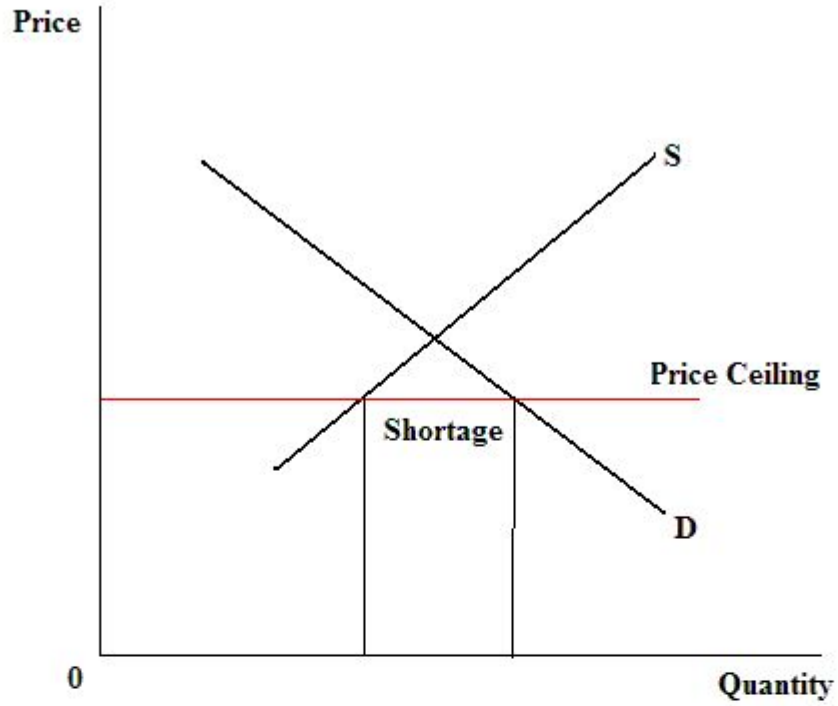
Homework 2
Translate to Ukrainian language

- Price Elasticity of Demand
- (Demand Elasticity)
- Price Elasticity of Supply
- (Supply Elasticity)
- Marginal rate of substitution

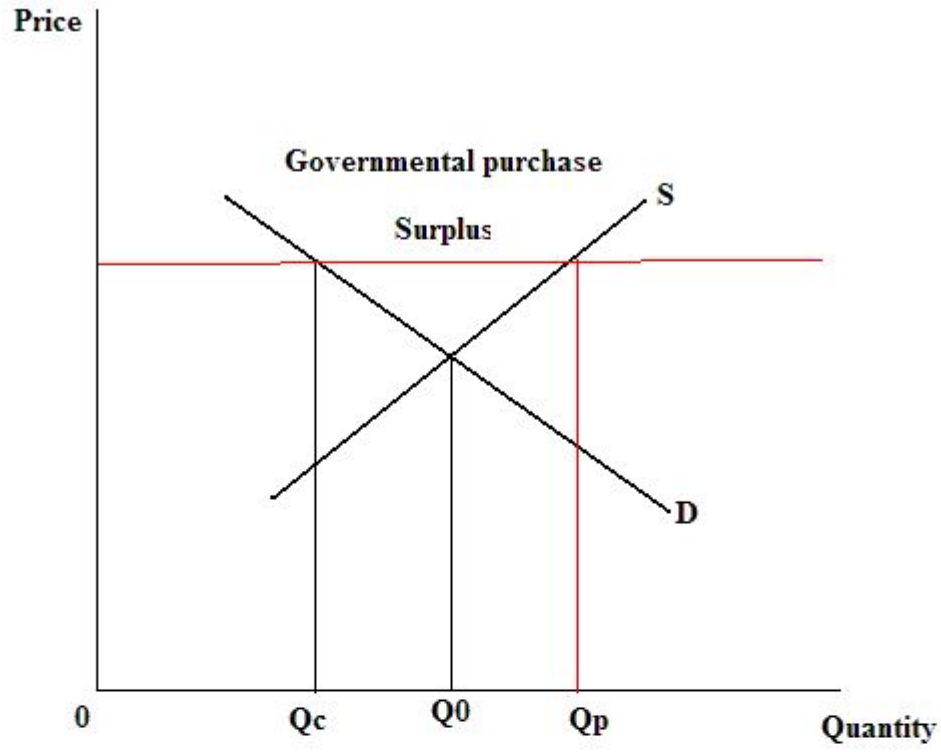
Intervention by government (1) Tax



Price Ceiling



Government purchase



Emission trade ?