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Compensatory and equivalent changes in market structure of Natural Resources and Environment

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ABSTRACT

Natural resources and environment are special kind of public articles which decision-making about their consuming and extracting is an irreparable action. The key difference of public goods is that these kinds of goods cannot be divided. So if there are natural source in the market definitely, the net price is zero due to the equality with the final cost, it means when there is a no scarcity, the scarcity rents are equal to zero.
In other hand, in comparison to normal goods to change price, responsibility level, equally compensate, consumer cannot reduce the consumption about public good, it means an additional limitation in the budget line limitation. In this study, the consequences of responsibility of competitive market to maximize the profit instead of a social planner are discussed and equivalent and compensatory changes will be presented. Keywords: compensatory changes, Equivalent changes, market structure of natural resources, the market structure of environment, public goods market

1- INTRODUCTION

Many natural and environmental resources are not exchangeable through market processes or are exchanged incompletely. For example, a large part of the Earth's atmosphere is not exchanged and in addition to the contaminated negative good which is not exchanged through the market system.

Unlike many of the capital items, natural resources and environmental resources often cannot be sold or used through the market.

However, many environmental resources are exchanged through the market.

Much of the mineral resources are fungible. Since, there are cash or current markets and the natural resource are developed, it is not rational to consider self market for such goods. Because these resources are being at the moment and self markets are imperfect markets.

2. LITERATURE REVIEW

The issue of environmental protection and natural resources by preventing its degradation has been proposed as one of the most important global challenge and therefore numerous meetings and conferences and many international and regional conventions have been held. One of most important factors to keep natural sources and environment is the structure of market of such goods and the attitude of the government to the production price and optimizing the consumption these goods. This issue has been focused by several scholars and researcher like:

1- Hart Wick & Ole Wiler 1986.
2- D'Arge&Kogika 1972.
3- Johnnson 1987.
4- Dasgupta 1990.
5- Common 1995.
6- Maler 1985.
7- Fisher 1981.
8- Maler 1985

2- Theoretical study

3.1 The scarcity of environmental resources

Today, one of the major issues facing humanity is the scarcity of non-renewable resources such as mineral deposits, fossil fuels and other products. In every moment, we are dealing with a limited amount of resources; of course we do not know exactly the amount of reserves and resources. Over time, research can increase our awareness to this issue. In any case the decision on the extraction and use of these resources is an irreversible and irreparable action. When we consider the extraction and use of natural resources, we must understand the notion of saving natural resources.

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Although the situation is not the same non-renewable and renewable resources, but also the exploitation of renewable resources over a period of time is quite limited. For example, we can't store energy sources such as wind or sun or inhibit the use of energy resource of the nature requires the use of natural energy resources directly or indirectly from other rare sources.

3.2 Renewable resources

Renewable natural resources including population, certain forms of life and organisms that can reproduce, grow and die. The current sources of renewable resources are forests, fisheries, solar energy and wind energy.

Some of these features are combined with a biological reserve to harness and use them in the current period does not reduce their stockpiles in the next period.

3.3 perfect competition

Perfect competition market is where a large number of buyers and sellers exchange information and freedom of entry and exits in the long term, so that; there is no particular advantage to sell to the consumer. A seller or buyer of acts as if there is no change in prices and adapting to market conditions [2]

3.4 exclusive resources

In a monopoly market, the manufacturer is the industry and there is no rival for his industry. In fact, a product is produced which has no close substitutes and in fact, the curve is the market demand curve. Therefore, manufacturers often are sole determinant of pricing.

3.5 exhaustible natural resources (not- renewable)

Exhaustible resource includes supply of energy resources such as fossil fuels and non-energy minerals.

This resource has been created over millions of years of geological changes and will not be renewed after operation and as long as the rate of consumption of these resources are positive, is finishing.

2. The classification of resources and reserves

A category of resources is the criterion of action to achieve them. A division of resources into several categories

1-Identified resources: significant part of natural reserves which their location, quality and quantity is specified by geographical information.

2-measurable resources like:

-approved: the resource which their quality and quantity is estimated less than 20% through geological studies.

-probability: the resources which their quality and quantity is estimated by sample analysis and other part by geological methods.

3-deductive resources: the available resources which have not been exploited along with approved resources.

4-unexplored resources: non-specified part of the Mine which the reserves are guessed based on geological theory.

5-imaginary resources: unexplored resources which are predicted in a certain area based on geological situation.

6-expectional resource: unexplored resources including known or unknown which exist in the geological complex.

A dual classification for natural resources can be considered. One of the physical properties and the time scale for adjustment processes. Physically it can be divided into three categories: biological resources, mineral resources, regardless of oil and gas and energy resources distributed. Classified in terms of the development of these resources over time and restore them into three categories expendable property, renewable and exhaustible.

	Accessibility		**Physical feature**	
Expendable	Biological	Non-energy mineral resources	Energy	Energy
	Crops such as corn, grains,	Salt	The radiation from the sun, the water, ethanol	The radiation from the sun, the water, ethanol
Reproducible	Forests, fish, livestock, animal husbandry, wood, whales, flowers, insects		Wood for burning, hydropower, geothermal	Wood for burning, hydropower, geothermal
Finitude	Endangered species	Most species of minerals such as iron, iron ore, bauxite, salt, cover the top of the soil	Oil, natural gas, coal, uranium, oil impregnated rocks	Oil, natural gas, coal, uranium, oil impregnated rocks

2-Public Goods

Many of Natural Resources create Environment, the final cost of the environmental features are public. Markets even with positive net benefits are rarely able to provide and maintain public goods in a very low pure

market economy, so even if the private market spread (possibly weak), the result will not be effective. Therefore, government intervention would be effective to create interest.

Consider a product, service or resource with the following features. First, when a person consume son unit of this product, someone else will be deprived of its use.

Theseproductsfeatureavarietydivisionorreductionofknownvulnerabilities

Secondly, a product can have its own features that prevent access to other people, and consumption of goods. Goods that have these characteristics are called a monopoly.

Private good is a product that has the monopoly and divisible property. In any case, all commodities and natural resources are both divisible and are not exclusive. Most of environmental natural resources don't have these properties and individual are competing to use these services, because the usage rate of these services is not reduced by increasing consumer number and consuming by one person don't lead to decrease the desirability. In this sense we can understand the services provided by natural resources as undivided. New consumer cost is zero, because the additional consumption of natural resources by the last one is not required to increase the supply of natural resources.

First, individuals cannot be prevented from taking a lot of goods. There are two concepts. First concept is related to ownership right. If a property is not under an individual or group ownership, no one can prevent the consumption by others. Secondly, apart from the issue of property rights, the physical characteristics of an asset may not be allowed to monopolize it to anyone. For example, intact natural areas may be privately owned, but visitors cannot become the monopoly of the incentives.

Public good term is used in two way in the economy literature. According to some authors, public goods are non-exclusive and non-dividing both features simultaneously apply both of these goods.

Another group of authors divided the consumption of public goods is undeniable. This is likely to be more indivisible goods (public) will be non-exclusive.

In other words, if you do not pay for an item, it is difficult to imagine the existence of a market. Therefore, we conclude that public goods are goods which in addition to being non-exclusive, pure economic markets are not supplied.

Separating the notion of exclusivity (exclusive of) the definition of a public good (or indivisible) gives us the opportunity to introduce a new category of goods, Goods that private property rights cannot be defined for them.

This category of public ownership of goods and commodities and natural resources are available. Examples of such products include watersheds, forests, Sturgeon fish catching stations, the Earth's atmosphere and unspoiled natural areas, many of which are private goods but can also be public goods. [3]

2-The market structure of natural resources and the environment

The quite competitive market is considered and monopolistic markets also studied.

6-1 fully competitive markets

If market is responsible to maximize the profit instead of social planner, what are the consequences? The difference between these two states is that in the second state other situation are constant and other results are identical. Since, all institutions are facing constant price in the competitive market, the market price is identical in all institution. Each institution selects a level of sale and maximizes the profit (Roger Perman)

In addition, markets are communicating each other's clearly and institutions could replace extract in the different period. The static interpret of competitive equation should b identical and this is not correct. The competitive balance is for non-renewable resource which should be established in each time period.

Competitive balance: competitive balance is same as competitive equation for common goods in the economic science. Competitive balances are occurred when institutions or owner is less and don't effects on the price and in all time period, the extracted energy by all individual and institutions are equal to the market demand.

Suppose, E^i_t is value of extracted good in i institution in time t. in time t, Q_t is all extracted value in all institutions, means

(1) $Q_t = \sum_i E_t^i$

This equation includes all functions related to the prices of goods in the market now and in the future, the amount remaining in the source repository, cost functions in each tank, and the rate of return on investment. The effects of these factors on the supply function are derived directly from the impact on each tank individually.

Market demand for goods by applying is shown by static function. Although demand dynamics can be examined, but simple formula is applied. QD (Pt, t) is demand functioned time. We assume that this function is a continuous function of the price reduction.

Competitive equation or price sequence in the time and supposed supply and demand in each t is equal.

(2) $Q_t = \sum_i E_t^i = Q^D(P_t, t)$for all t

For further analysis, it is better to use reverse demand function *P (Q_t, t)*

For further analysis, we apply demand function to specify inverse function of the market equilibrium price determined as a function of the value.

(3) $P_t = P(Q_t, t)$

Inverse demand function is defined as the available for all levels

$Q^D(P(Q_t, t), t) = Q_t$

If the demand for Pt = 0 is given, the inverse demand for all values greater than or equal zero at a price of zero. Ina competitive equilibrium, the following equations (4 to 8) for each firm should workEquations1and 2 firms are connected to each other through the market.

(4) $P_t = \frac{\mathrm{d}C_t}{\mathrm{d}E_t} + \lambda e^{rt}$ if $E_t > 0$

$P_t \geq \frac{\mathrm{d}C_t}{\mathrm{d}E_t} + \lambda e^{rt}$ if $E_t = 0$

(5) $\lambda S_t = 0$

$\frac{\partial \mathcal{L}}{\partial E_t} = \left[P_t - \frac{dC_t}{dE_t}\right] e^{-rt} - \emptyset_t e^{-rt} \begin{cases} = 0 \text{ if } E_t > 0 \\ \leq 0 \text{ if } E_t = 0 \end{cases}$

$\frac{\partial \mathcal{L}}{\partial S_{t-1}} = -\frac{\partial C_t}{\partial S_{t-1}} e^{-rt} - \emptyset_{t-1} e^{-r(t-1)} + \emptyset_t e^{-rt} = 0 \text{ for } t \leq T$

$\frac{\partial \mathcal{L}}{\partial S_T} = -\emptyset_T e^{-rt} + \mu = 0 \text{ for } t = T$

$\mu S_t = 0$

The initial condition is obtained the optimization equation

(6)

$P_t = \frac{\partial C_t}{\partial E_t} + \emptyset_t \ if \ E_t > 0$

$P_t \leq \frac{\partial C_t}{\partial E_t} + \emptyset_t \ if \ E_t = 0$

(7)

$\emptyset_t = \emptyset_{t-1} e^r + \frac{\partial C_t}{\partial S_{t-1}} \quad for \ t < T$

(8)

$\emptyset_t S_t = 0; \quad \emptyset_t \geq 0; \ S_t \geq 0$

Finitude Resources will lead us to this topic. The competitive balance a ceiling limit on the amount accumulated in demand tanks there the whole time.

(9) $\sum_{t=1}^{T} Q^D(P_t, t) = \sum_{t=1}^{T} \sum_i E_t^i = \sum_i \sum_{t=1}^{T} E_t^i \leq \sum_i S_0^i \triangleq S^A$

Equation 9, SA shows the area which our resource are there. Finitude resources limited demand which is not greater than the initial value of the cumulative area. For a long time favorite T is selected, the cumulative demand is limited by the amount of natural resources. For indefinite time horizon, so the price must rise up to demand to zero.

It is possible that there is a demand for zero cost. In this case, there is always a price path that satisfies the inequality9. The price is the price at which demand is close to zero call obstruction prices. It is possible to freeze the price is a function of time.

The price can be derived from the demand for energy and the supply function is a good alternative. On the demand side, consumers may use a product or a batch of goods will be no price increase. Goods can be divided into two main categories Essential and Non-essential. If demand for certain goods not be zero, this is essential and a good with price obstruction is non-essential.

In the supply part, the technology maybe doesn't permit to produce high or infinite value of an complete replace in a certain price. These technologies are called backstop technologies and could guarantee obstruction price. The obstruction price is average or final price of backstop technologies. Also, about essential goods maybe there are obstruction price.

If there is obstruction price, inequality 9 could be zero and be satisfied for higher price. We assume obstruction price in our calculations.

If there is infinite natural resource, net price in the competitive market will be zero. Product price is equal to final price and this result is obtained at long-term balance in the complete competitive market.

6-2-natural resources in the exclusive

Net price monopoly or royalties and production levels are set so that the profits are maximized. In the competitive market, the market price is external for each institution, while the exclusive market is not constant price and the price level depends on institution production.

The final income is less than the price unlike competitive market. But the reality is that most of the products are bought and sold in competitive markets are incomplete.

For example, the Petroleum Exporting Countries OPEC and a major power in the market have a strong influence on the price of crude oil or copper cartel that affect the market price of copper.

In this review, the exact opposite of the previous section, we studied the market dominance of a firm or individual that the extraction of natural resources. Such a monopoly, which is quite a different effect on market equilibrium prices competitive markets and competitive behavior.

Monopoly in the market for a single firm to manage and track all vessels exhaustible extraction is chosen to maximize the value of their profits. On the other hand, a lot of people, consumers and purchasers are interested of this product.

We assume that the monopoly situation in front of the competitive enterprises, with the exception of the fact that it contains all of the tanks, the costs in cured and revenues resulting from the extraction collects. N monopoly control repository that canbefrom1 to N.

Like the competition, if the market equilibrium price is determinedbytheinversedemandequation3. ItankEit amount of revenue on product prices and also the total amount of all tanksares old. Total income monopoly on Rt (E1t, E2t, ...,ENt).

(10) $R_t(E_t^1, E_t^2, \dots, E_t^N) = \sum_i R_t^i(E_t^1, E_t^2, \dots, E_t^N) = \sum_i E_t^i P_t\left(\sum_i E_t^i\right)$

Optimize the impact of each of the tanks have to be extracted from a reservoir on all prices are calculated by extracting all cylinders. Cost that a monopolist faces the sum of all the costs that are all tanks. Cost functions can be simple or complex functions. Final cost depends on the rate of extraction and the remaining tank. Thus, the monopoly can write:

(11) $\text{Max } \Pi = \sum_i \sum_{t=1}^{T}\left[R_t^i(E_t^1, E_t^2, \dots, R_t^N) - C_t^i\left(E_t^i, S_{t-1}^i\right)\right]e^{-rt}$

$S_t^i = S_{t-1}^i - E_t^i, \quad E_t^i \geq 0, \ S_T^i \geq 0$

6-3conditions for optimization

Optimization of the monopoly could be done through Lagrange equation:

$$\text{Max } \mathcal{L} = \sum_i \left\{\sum_{t=1}^{T}\left\{\left[R_t^i(E_t^1, R_t^2, \dots, R_t^N) - C_t^i\left(E_t^i, S_{t-1}^i\right)\right]e^{-rt} - \left[S_t^i - S_{t-1}^i + E_t^i\right]\emptyset_t^i e^{-rt}\right\} + \mu^i S_T^i\right\}$$

Initial eligibility requires that the Lagrange equation is fixed at the optimal point for any Sitand Eit. $\mathcal{L}$ Derivative with respect to each variable gives us the following equation:

(12) $\frac{\partial R_t}{\partial E_t^i} = \frac{\partial C_t^i}{\partial E_t^i} + \emptyset_t^i \quad if \ E_t^i > 0$

$$\leq \frac{\partial C_t^i}{\partial E_t^i} + \emptyset_t^i \quad if \ E_t^i = 0$$

(13) $\emptyset_t^i = \emptyset_{t-1}^i e^r + \frac{\partial C_t^i}{\partial S_{t-1}^i} \quad for\ t < T$

(14) $\emptyset_T^i S_T^i = 0$

Equation44canbederivedfromtheratio to determine the market equilibrium price:

(15) $R_t^{'} \triangleq \frac{\partial R_t}{\partial E_t^i} = P_t(Q_t) + Q_t \frac{\partial P_t}{\partial Q_t} = P_t(Q_t)\left(1 - \frac{1}{\varepsilon_t(Q_t)}\right) < P_t(Q_t)$

Where R't is final income at time t and Qt source market value and εt (Qt) demand elasticity. The elasticity of demand is a positive number. R'tQt is a function of the inversed and function is dependent on the shape. [1]

6-4-identifysolutionsexclusivelyto the competitive equilibrium

Equations are similar toequations6 to8and 12to 15.In addition, Equation 1andEquation 3istheoptimal route for competitive reservoirs except one exception is specified. The final income elasticity of demand depends on the tolerance factor can also be used instead of the price.

In competitive industries, each tank is small enough that it can affect the price extracted from vision to be a tank or a company director. This is also true in a monopoly situation. The repository manager is faced with the price and the final earnings that he alone can have a major impact on it. But non-significant effect on the level of the tank can be used in all the company's exclusive patented technique is important. The sole director of industry should pay more attention to the final income, as owner of a vessel in competitive industries at the expense of special attention. In both market conditions are optimized for individual vessels can be considered separately: final income for corporate monopoly and competitive price. All differences in the equilibrium paths of the difference come in the final income and price.

Equation 15 shows that there is a path for each demand an ultimate price to earnings. For the treatment of moderate demand functions, marginal revenue steady increase of prices.

If price is an obstruction exists, then the final income and the price is the price point of obstruction. The rest of the final revenue is always less than the price

Comparison

If you are destined for the end of the source sufficient incentives exist, the monopolist can alter the market price by changing the final cumulative extraction. The only thing you can do is to move the extraction time for the total amount. Monopolist can increase your profits when the differences in value when the gap between price and marginal revenue exists. Another name for the gap function is incomplete markets.

The function with constant tension, the gap between price and marginal revenue is equal to Pt / ε. With zero extraction costs, the price and the final earnings gap with a rise in interest rates. Thus, the present value of the gap is independent of time. There is no time difference and thus to stimulate monopolist chooses the path extraction in competitive industries.

However, in competitive industries will extract all the tanks, but may not derive more practical. This contradiction leads us to point out that the exclusive price of the competitive equilibrium price will be much more basic.

In this context, it is possible to extract monopoly from now to coming pass. By early times higher prices and lower prices later times to determine the initial price. [1] +

3-Compensating and equivalent variations

CV and EV are accurate measure of welfare change to be calculated. We have two different criteria in the definition of welfare change. The logical question is, which measure is superior to another? Unfortunately we cannot answer this question. Once the probability of simultaneous changes in income and price changes are discussed, some selections are determined.

Lack of a clear preference for a standard selection is unpleasant, but both can be improved to some extent according to these criteria. First, many of the issues of interest to calculate the welfare of both criteria lead to the same results. The wrong choice may be minimal losses. Secondly, while the values of CV and EV are not observed practically, but have little to do with each other. We are often forced to make changes using the function being computed Marshall Demand. [3]

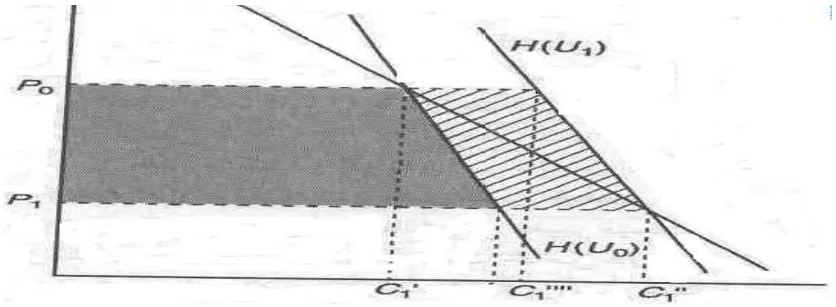

Figure 1- Compensatory changing and equivalent changing

To reduce price in C2

$$CV = (Y0 - Y1) = \int_{P1}^{P0} H(U0)dp = SHADOW\ AREA$$

$$EV = (Y2 - Y1) = \int_{P}^{P} H(U1)DP = CV + SHADED\ AREA$$

8-1-estimate CV and EV in Action

Since CV and EV based on demand, we may have been invisible to define criteria to measure changes in the utility's useful anyway. In practice, we have to estimate the CV and EV compensation function Marshall's demand. Given the demand function Marshall Consumer surplus is equal to the area under the curve between the initial and final level surrounded demand and prices. Overall consumer surplus equal to CV or EV and therefore there is a decisive criterion for the calculation. Considering the above graph it is clear that for any reduction in the price of EV Greater than the consumer surplus and consumer surplus is smaller CV. It can be concluded that the criteria for calculating the consumer surplus can be more or less than the amount provided CV or EV.

The above estimates for small changes in price, quantity and when the income elasticity of demand is small are very good. This is a unique situation, when the income elasticity of demand for the product in question is zero, then the demand function Marshall Hicks demand function is identical.

Thus, consumer surplus will = CV = EV. Decreasing Prices, consumer real income increases and rising real income has no effect on consumer demand. The income effect of the price change is zero. In this case, moveon Marshall's demand curve includes only the substitution effect of price change. It also shows what the demand function Hicks. In this particular case the demand function Marshall Hicks fully comply with the demand function. [3]

8-2-compensating surplus and surplus of the public goods

Now we examine the change in the supply of natural resources. The key difference arises from the fact that public goods are useless. So no one can adjust the level of their commodities. Consider a situation where a change has increased the amount of public goods, thus reducing its price. Suppose the consumer is in a position to maximize the utility of the price - value.

The following diagram illustrates the utility maximizing consumption before and after the change to the points a and b.

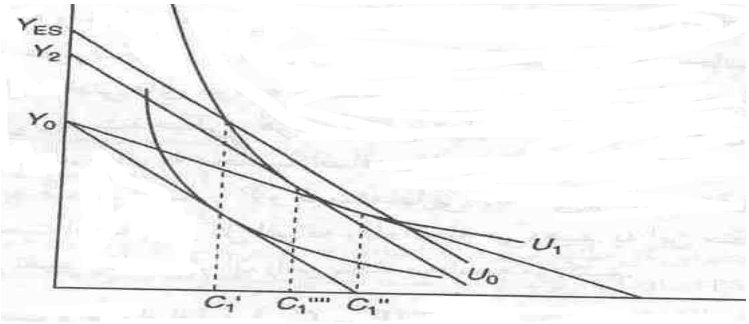

Figure 2- welfare surplus equivalent to increasing value

To calculate the CV of the desirability of U0toU1, the amount of income spent by the consumer (the new relative prices) to achieve utilitylevelU1is known. Content to spend money according to the diagram is equal toY0 - YCV. This requires the consumption of C"1C1toC " '1is reduced, but it is not possible. Consumers can't reduce the consumption of public goods. Compensating surplus is equal toY0 – YCS or loss of income to remain in the initial utility level U0, so that his consumption of public goods remain in the C"1. Note that the point Y consumer in difference point U = U0andnonewbudgetline. Because here there is an additional constraint, In addition to the usual budget constraints limit the utility of an additional restriction on the nature of public goods

Equivalent ES considerably rising surplus value is equal to the amount which the consumer loses interest, if the projected increase in the supply of public goods. If the consumer is able to adjust their consumption, price cuts led to change the doseofC1 "toC2 "and the change in the valueofY2 - Y0.However, the aforesaid goods in the consumption of a public good, and under such circumstances are limited. The ES is also greater than YES - Y0[3]

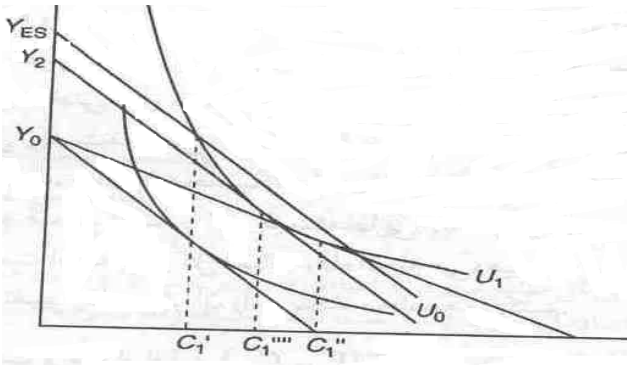

Figure 3- compensatory welfare surplus related to increasing the value

8-3 changing the producer welfare surplus

It is required to examine welfare effect in addition to consumer welfare surplus. Increasing supply of public good lead to surplus cost for government to prepare these good which should be deduced the consumer welfare surplus. Generally, changing the p rice can change the producer welfare. This welfare changing should be calculated. Fortunately, these articles are simple. The given concept is producer welfare surplice. Producer welfare surplus is defined as surplus of institution earning toward producer final costs. Producer welfare surplus shows

Clearly, changing the owner level is considered when all welfare effects caused by price changing are estimated completely. Supply curve and common demand are used to have easier calculation. Improving environmental issues lead to decrease final cost of C1 product and supply is changed from P1 'TO P1''. Now, Marshal consumer welfare surplus and Marshal Producer welfare surplus is evaluated based on primary and final cost. Note, all calculations are based on primary price for total of welfare surplus. For this reason, value changing due to price changing, welfare changing and its effect on institution are considered.

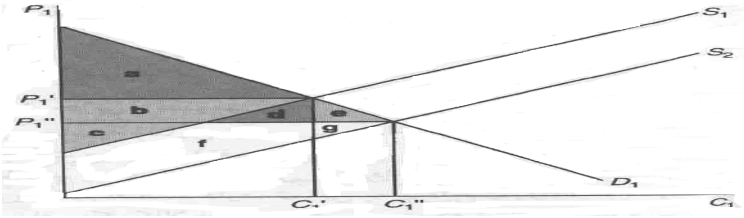

Diagram 4- producer and consumer surplus

•

surplus in price and the initial value of P1 ', C1'
Consumer surplus a=
Producer surplus b + c=
Total of welfare a + b + c=
•surplus in price and the final amount P1 ", C1"
Consumer surplus a + b + d + e=
Producer surplus c + f + g=
Surplus of a + b + c + d + e + f + g=
•Change in surplus by moving from P1 ', C1' to P1 ", C1"
Increase consumer welfare b + d + e=
Increase welfare manufacturer f + gb=
Increase total surplus (b + d + e) + (f + gb) = d + e + f + g=
P_1' , C_1':

a+b+c =total surplus welfare } CS=a , PS=b+c

P_1'' , C_1''

a+b+c+d+e+f+g = total surplus welfare
}c+f+gCS= a+b+d+e , PS =

So the benefits of the surplus is equal to d + e + f + g, CS surplus producer and consumer surplus is PS. [3]

2- Conclusion

When a product or service is exchanged in different markets, the market price is known as final value index. The observed price of confidence index may be not accessed to pricing product or services, but are applied in the financial analysis of environment.

Maybe, markets in different situations are not able to create effective results. There is no way to rely the obtained results and the efficiency of market structure is a valuable purpose and lead to desirable results.

The difference between social decision-maker and competitive market is that the situation is constant in the second state and all results are identical. If there is infinite natural resource, the net price in the competitive market is zero. The product price is doubled the final price. This result is obtained in the competitive market. In other word, when there is no scarcity, scarcity rant is zero.

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