On Three Fundamental Factor of Economics and Their Elasticity

by

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Abstract: Economics is a dual natures of study of human beings' biological, psychological and social behaviours. Before William Standley Javon making a start for scientific economics, the entire subject of economics was a social science that mainly study political economics that was a philosophy and arithmetic and economic thought reasoning combination. Alfred Marsh took Javons' achievements as given and established the entire scientific economics fundamental frame work until today. No matter the students and the experts of economics are familiar with his two factors or say two elements' modal such as "price and quantity" coordinate holding demand and supply "scissor analysis". The two factors' frame works of economics has been developed well since from the 18 century unto today. Economics highly harmony with mathematical analysis and statements laid done the theoretical foundation for the entire economics and also for the entire economic practice. Human beings modern economic prosperous both including structural prosperous and also scale prosperous have been contributing to the human beings' entire modern economy. However, two factors' frame works actually did not and do not truly reflect the real economical foundation both in theory and in the real economy, for there should be three fundamental factors rather than two that are: price, quality and quantity. In this thesis, a three dimensional theoretical frame work modal takes these three factors as the theoretical fundamental factors of economics and establish a brand new fundamental economic theory as a necessary part of the scientific economics today as a breaking-through development of Alfred Marshall's theory.

A. The definition of Economics

Every economist or even theorist who was and is concerning the social economy and its theory had and has given his or her own definition of economics. Since each one had or has his or her own view, making the definition of economics has great different from one to another. However, we would like to take the most popular one and also the most scientific one as our definition of economics.

Let's look at the definition in Oxford English Dictionary, it stated: "The branch of knowledge concerned with the production, consumption, and transfer of wealth.[1]"

The first theory economist in human beings' history, Adam Smith, told us: economics or political economics, in his << An Inquiry into the Nature and Causes of the Wealth of Nations>> (1776),that was, <<The Wealth of Nation>>, defined economics as the title of the book. The theory of the nature and the causes of the wealth of nations [2].

Jean Baptiste Say, the early 19 century French economist, defined the economics as "the science of production, distribution, and consumption of wealth [3]"

As the first marginal economist, William Stanley Jevons whose work, <<A General Mathematical Theory of Political Economy>> (1862) was called the start of the mathematical method in economics described the economics was a political economy[4] .

And another Marginal Economist, Carl Menger defined the economics: "For economic theory is concerned, not with practical rules for economic activity, but with the conditions under which men engage in provident activity directed to the satisfaction of their needs.[5]"

The first scientific economic theorist, Alfred Marshall defined: "Political Economics or Economics is a study of mankind in ordinary business of life; it examines that part of the individual and social action which is most closely connected with the attainment and with use of material requisites of wellbeing. Thus it is on the one side a study of wealth; and on the other and more important side, a part of the study of man."[6]

John Stuart Mill, another 19 century economist defined "the economics as the science which traces the laws of such the phenomena of society as arise from the combined operations of mankind for production of wealth in so far as those phenomena are not modified by pursuit of any other object."[7]

The early 20 century economist, Lionel Robbins defined: "Economics is a science which studies human behaviours a relationship between ends and scarce means which have alternative uses" [8]

From all of these definitions, we might not be able work out exactly what economics was and is easily except for knowing it is a science or a social science that concerning about production, consumption and transfer of wealth. Certainly we also admit that Lionel Robbins' definition of economics was a good definition because he revealed that economics is a science which studies human behaviours, a relationship between ends and scarce means…"

Our definition after taking the reference of all that, is: "Economics is a science and meanwhile a social science which study human beings' biological, psychological and social behaviours concerning the overall relationships system of fundamental living interests and their activities within and without the environments in which they are living, resting and development."

Economics is a dual natures of study of human beings biological, psychological and social behaviours. As fundamental study, economics should be a science rather than a social science for such study is concerning first of the overall relationship system of the human beings' fundamental living interests and human beings' activities. However, due to the scarce or scarcity of materials and substances that would not be possible solving, the nature of social science the economics contained would be remaining forever. Therefore it always become a politicians' strong tool to exercise their policies, wills and ideas and even ambitious, otherwise, cunningness. And it always a find weapon in social controlling and international political exchanging. Therefore, its social science nature would be meanwhile exits forever.

In fact, before the William Stanley Jevous, economics was just political economics, no one would take that as a serious science to study, even though in Adam Smith already clearly knew that the economics meanwhile is a research of the wealth of nations. And Karl Marx[9] had intuitive well understanding this nature and had taken in the limit on which is the fine tool for political movements, such as ownership changing or government replacement. He never ever accepted anything of science for economics. And he thought that it was deception as what you would like to talk about the science of economics.

Well we are upholding different view upon this approach. Tracing back the earlies period of time, when Adam and Eve had been driven out of the Eden Garden and till the earth, the original economy had nothing to do with politics, though in heavens, on the Right and the Left universes, both Jesus and Satan had clearly realized that the nature of the political economics. Therefore, as Jesus himself went to Neptune to preaching the good news to the people of Neptune, he actually applied this fine tools and

method to establish his own organization battling with Satan's. And on earth, even until Jacob's generation, economy was way of life to survive[10].

Population increasing on the surface of the Earth, the human production abilities increasing created the factual opportunity for the gain of living interests even without the need of taking part into economic activities, power gaining and social struggling become direct reasons of gaining living interests much higher and much more than those directly taking part into economic activities, economics then become a servant to service such social demand and politicians' willingness. And such situation in the western world, the early 19 century until twenty century becoming extremity. In one hand, economy rapidly development and in another hand, the social equal and living conditions improvement demands increasing, the economics due natures appealed in the Academic field and social field clearly.

The economists then also split into two: one was political economists, and another was scientific economist who emerged in the middle of 19 century's European. And the later development, basically was the western economists taking the lead of the entire scientific economics making private ownership economy a significant development; and in east, political economics to be practiced, socialism and communism economists had taken the lead of the entire political economics, many of them upholding the strong confidence and believe, public ownership would do better than any private ownership in economy. Cold wars since after the Second World War II, in the year, 1959 to 1989 in which the communism collapsed, worldwide communism failure and collapse, west economy dominated the entire world of human beings, and scientific economics taking the lead.

Socialism and communism collapse implied that political economics was not the truths of economy in human beings' world, it was some arguments for social ethical and social physical mechanism of equality among different social classes, which had not much to do with scientific economics.

Looking back to where the subject begun to detour, economics, somehow, did have its scientific natures, like physics, chemistry, biology ,etc. and furthermore, the scientific nature of economics should be the dominant natures of economics because human beings' biological, psychological and even social behaviours were and are naturally concerning the fundamental living interests and concerning how their daily activities link with their fundamental living interests and how their living interests maintain and develop, which basically are without any political discrimination, class discrimination, race discriminations or even religion and cultural discrimination, which are the reality of foundation of the entire scientific economics. And in this respect, economics just like or similar physics or chemist or biologist, a scientist.

Our definition defined economics is a science, though we have known well, economics has its social science nature that could be continually a social science, political economics.

B. The fundamental factors of economics

Stepping into scientific economics, quite normally, what it needs to firstly try to work out is what the foundation of the subject matter should focus on, its element(s) or its function(s)? In science point of views, focus on element(s) would be always easier at the beginning rather than focus on its function(s). For element is clearer and easier defined than that of a function.

What is or are the fundamental elements of economics? Until the time of 02-11-2017, the entire scientific economics would adopt only two elements modal in microeconomics, which were and are: **price** and **quantity**, or say two factors' coordinate frame work of economics.

It might be possible arguing that what about utility, profit, revenue, capital etc. Is it none of them a fundamental factor of economics?

Without any doubt, those are not fundamental factors, though they were and are factors of economics. More simply, the reason why Mr. Alfred Marshall did not take any other factors to construct his scissor analysis but only took two elements or factors, "Price" and "Quantity" as the coordinate frame work to construct his scissor's analysis [11] was that those factors could not be the fundamental factors of economics. Therefore in scientific point of views of economics, everyone would accept that price and quantity as the two fundamental elements or factors of economics, but not all the others and anyone of the others.

On the day, 02-11-2017, the question concerning the three fundamental factors of economics being put into consideration: "Alfred Marshall had taken the simplest and meanwhile minimum capacity for discussion of economics in the matter of demand and supply via normal economy, which was two elements or factors, Price and Quantity. However, the real economy must at least have three (elements or factors): Price, Quantity and Quality." [12]

General people have known that in the economic daily life, everyone always has to concern either a good or a service he or she has to pay for it: how much should pay? How much or how many had or have got after paying what have to be paid? Are the goods purchased good quality products or bad quality products?

Then why economists did not take that into account in the study of economics?

Well, looking into Alfred Marshall's contribution, a hint can be found.

As an economist of his time, Alfred Marshall had done the best among all of the specialists of the theory of economy, particularly, in the economic science. He was not only contributing to build up the entire microeconomics in scientific fundamental analysis frame works, but also provided a fundamental scientific methodology for research in the scientific economics. Applying the mathematical graphic to simplify the entire complicate theory and conclusively concentrate on only two dimensional scissor analysis for market demand and supply based on only two factors' coordinate that is a coordinate of **price** and **quantity [13]**. He was the first one contributed such methodology and also contributed such scientific frame works for all the later followers. Without his contributions, the modern scientific economics would not be possible forming, though until today, the entire economics none can say is already a science.

Before him, history has taken into account that William Standley Javon[14] was the first one who started the mathematical economics, it would not say that William Standley Javon had done something to contribute scientific economics for the reason of his direct work was Marginal Utility[15] researches and achievements, which somehow, theory might not be that easier to accept for the utility discovered and application as a fundamental concept and factor of economics might not have been realized that it was so important for economics amount all the other factors of economics. It was just likely a general approach for the economical and psychological motivation at the early age of scientific economics.

Willian Standley Javon was the opposition of David Ricardo[16] and he called David Ricardo's labour value theory was a wrongheaded theory.

William himself did not discovered Utility and its functions, the first one who discovered such important factor was a man called Jules Dupuit[17], in the year 1844, he wrote an article in the title: "On the Measurement of the Utility of Public Work" and he described that the public works declining its utility, we are taking such approach in today's economics' jargon as marginal utility.

In fact much more completed work on this discovery was done by a German Economist whose name was H.H. Gossen[18], in the year 1854, ten year after Jules Dupuit[12]. It might be possible, H.H. Gossen had developed Jules Dupuit's creation and discovery, and then made it a completed work for the utility theory.

William Stanley Javon was the one who applied higher mathematics, calculus, for the first time analysing the utility theory so that he became the first one who applied higher mathematics into economics. In this way, the history accepted that he was the first one who first time stepping into the kingdom of scientific economics.

Alfred Marshall had just taken William's work as given and directly applied it in his theory and in his entire scissors' analysis of the microeconomics for the approach of market demand and supply. According to the original work Alfred Marshall had written [19], and also applied higher mathematics for the economics, making the political economics turned out to be a science economics.

In Alfred Marshall's frame work[15] , Alfred Marshall actually used William's utility without any doubt and also he seemed naturally accepting the concepts such as "Value", "Quality", "Money purchasing power" and "Utility" were the same things and the same factors in the point of views of economists'. And sometimes, he even put the "enjoyment of life" and "entertainment" at the same row as that of utility. Only according to the written language needs, he separately used different term of those words; and he himself seemed not reckoning anything different between or among them. If you say there was any, such "any" was indeed too little to be paid attention.

Such professional treatments for the different economic terms, as a method of scientific research, would be too simple. Although, it would help him to complete his work, it left us more troubles than it originally should have to be. However, his method and achievements were so amazing and so important and so convincing that all the later followers of him, none had asked question about his contributions for the scientific economics.

Did Marshall himself have realized that? In some extent, we say, Yes! He did realize the problem. But he could not solve it, which might be he even would not like raising any question for those meanwhile were hard to deal with problems.

In his application of the higher mathematics into his scientific analysis, he had done some important works such as followings:

In his mathematics Appendix[20]

Note I, he pointed out:" The law of diminution of marginal utility may be expressed thus:-------- If u be the total utility of an amount of x of a commodity to a given person at a given time, then marginal utility is measured by

$\frac{du}{dx}\delta x$; while $\frac{du}{dx}$ measures the marginal degree of utility." And then he specially mentioned William Stanley Javon's contribution and wrote: "Javons and some other writers use Final utility to indicate what Javons elsewhere calls Final degree of utility. There is room for doubt as for which mode of expression is the more convenient: no question of principle is involved in the decision. Subject to the qualifications mentioned in the text

$\frac{d^2u}{dx^2}$ is always negative.

"Note II.(p. 81) If m is the amount of money or general purchasing power at a person's disposal at any time, and μ represents its total utility to him, then

$\frac{d\mu}{dm}$ represents the marginal degree of utility of money to him.

"If p is the price which he is just willing to pay for an amount of x of the commodity which gives him a total pleasure u, then

$$\frac{d\mu}{dm}\Delta p = \Delta u; \text{ and } \frac{d\mu}{dm}\frac{dp}{dx} = \frac{du}{dx}.$$

"If p' is the price which he is just willing to pay for an amount x' of another commodity, which affords him a total pleasure u', then

$$\frac{d\mu}{dm}.\frac{dp'}{dx'} = \frac{du'}{dx'};$$

"and therefore, $\frac{dp}{dx} : \frac{dp'}{dx'} = \frac{du}{dx} : \frac{du'}{dx'}$.

"(Compare Javons' Chapter on the Theory of Exchange[21], p. 151)

"Every increase in his means diminishes the marginal degree of utility of money to him; that is

$\frac{d^2u}{dm^2}$ is always negative.

"Therefore the marginal utility to him of an amount of a commodity remaining unchanged, an increase in his means increases

$\frac{du}{dx} \div \frac{d\mu}{dm}$; i.e. it increases $\frac{dp}{dx}$, that is, the rate at which he is willing to pay

"further supplies of it. We may regard

$\frac{dp}{dx}$ is the function of m, u, and x; and then we have

$\frac{d^2p}{dmdx}$ always positive. Of course, $\frac{d^2p}{dudx}$ is always positive."[22]

These two Notes had shown what Alfred Marshall's fundamental thought had been concerning the relationships of quantity, x, money, m, in term of purchasing power, utility, u and price, p. In the first Note, he expressed that he had accepted Javons' marginal utility ideas except for which mode of expression such marginal utility is more convenient. However, in principle, he did think that Javons' marginal utility was always negative because

$\frac{d^2u}{dx^2}$ is always negative.

In Note one he had not explained why he accepted such expression, nor did he explain the reasons why it was always negative.

However, in Note II, he submitted his own thought in the expression:

$\frac{d^2\mu}{dm^2}$, which can be thought as an variation of Javons' expression of marginal utility and he explained: "Every increase in his means diminishes the marginal degree of utility of money to him, that is,

$\frac{d^2\mu}{dm^2}$, is always negative. "[23]

In Javons' expression, Javons directly used the total utility against the quantity of a commodity, which in Alfred Marshall's opinions was not that good for the mode of "convenient" expression. For it is hard to explain or hard to explain well by the language of economics. Mathematically, it would be OK, for it is a second derive as the roughly guessing of the feature of utility of a commodity that its utility should have its maximum. However, if you would like to translate into economical language, it would not be that easy, for you just cannot tell why the total utility against the quantity of a commodity would be definitely negative. In Alfred Marshall's language, every increase in his total quantity, which would be hard to understand that definitely diminishes the total marginal utility to him. Therefore in Javons' expression,

$\frac{d^2u}{dx^2}$, you can only guessing according to mathematical knowledge for the total utility must have its own maximum rather than minimum. There is impossible for an economist to explain exactly the reasons why for that. Therefore it was a conjecture, not a solution.

And then he applied his "purchasing power of money" for the attempt of solving the problem; and meanwhile employed "the degree of utility" rather than a total utility to a consumer against the money purchasing power to that consumer, hence:

"Every increase in his means diminishes the marginal degree of utility of money to him." That is the reason why

$\frac{d^2\mu}{dm^2}$ is always negative.

Therefore, Alfred Marshall actually solved the problem that was deeply hided in Javons' expression so that the mathematics that had applied for analysis of the marginal utility virtually being harmony with each other.

Here what worth for paying more attention was, particularly, for those who are still not familiar with higher mathematics, the first derive of the degree of utility of the money purchasing power is necessary and accurate, and the second derive of the degree of the utility, in economical language, "Every increase" would result certainly m, the money purchasing power to be diminished; the numerator is negative and the dominator is positive; therefore, the entire expression would be negative, which also well fit Javons' ideas concerning the marginal utility diminishing as the consumption of a commodity increasing to a consumer. Please take it easy for that the second derive did not and does not mean anything except for showing the entre marginal utility was and is having a maximum point rather than having a minimum point.

Alfred Marshall did not satisfied his own such little achievement that made Javons' ideas of marginal utility be more explainable in economics but he stepped forwards furthermore. He applied an usual mathematical method in handling two more variable in one equation, which usually set one remaining unchanged, and then variate the other one that we want to for solving the problem.

He introduced his further advanced idea on the problem in issue,

"Therefore the marginal utility to him of an amount of a commodity remaining unchanged, an increase in his means increases

$\frac{du}{dx} \div \frac{d\mu}{dm}$; i.e. it increases $\frac{dp}{dx}$, that is, the rate at which he is p to pay

"further supplies of it. We may regard

$\frac{dp}{dx}$ is the function of m, u, and x; and then we have

$\frac{d^2p}{dmdx}$ always positive. Of course, $\frac{d^2p}{dudx}$ is always positive."

"Let's do some more maths to easy our understanding for what he was actually talking about:

$$\frac{du}{dx} \div \frac{d\mu}{dm} \Rightarrow \frac{du}{dx} \times \frac{dm}{d\mu} = \frac{dudm}{dxd\mu} = \frac{dp \times \Delta}{dx \times \Delta} = \frac{\Delta dp}{\Delta dx}$$

In that case,

$\frac{d^2p}{dx^2}$ is certainly positive. For $\frac{dp}{dx}$ is the function of m, u, and x, therefore, by the same nature,

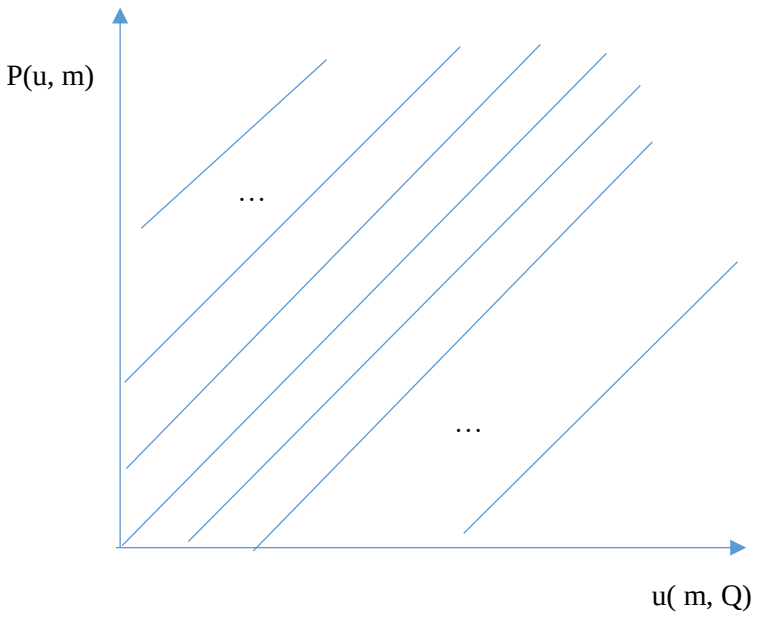
$\frac{d^2p}{dudx}$ is positive. Here we must be careful, the first expression can be simply conversed to:

d^2p = $d(dudm)$ as the numerator and $dudx = dx^2$ as the dominator and the second expression, , $\frac{d^2p}{dudx}$, the dominator should be $dudx = dx^2$, for in Alfred Marshall's category, utility can be expressed as exact amount of the corresponding commodity. However, carefulness must be taken into consideration, $dmdx$ is the application of the purchasing power of money and the corresponding quantity of that commodity a consumer willing to pay for purchasing, and $dudx$ would be the application of utility (total utility) and the corresponding quantity of the corresponding commodity, though, both of them at the end of the day would be the same.

Furthermore, as what we have mentioned above, Alfred Marshall had already realized his own theory's trouble, these two positive expressions have been showing him such consciousness. He knew clearly that

$\frac{d^2p}{dmdx}$ and $\frac{d^2p}{dudx}$, both are positive, which implied that no matter you used money purchasing power against the price of a commodity or you use the utility against the price would not be possible resulting any fixed point existence in a two dimensional coordinate, the demand curve would not be coming to across the supply curve. Therefore, there would be no equilibrium that can be found in such a two factors' coordinate!

Graphically, it would result all the curves if there is any, or lines as they would be the same and/or parallel each other from the original point towards the 45^0 direction out of the coordinate:



In the entire Mr. Marshall's work, he never ever used either utility against price, nor did he use the purchasing power of money against the price or using utility against the purchasing power of money to construct his analysis for his frame work. But only employing the two fundamental factors, **price** against **quantity** to construct the two dimensional coordinate for his work. He himself had not explained the reasons why, however, when the careful examination of his thought being taken, it had found that he had an economist's sensitivity and carefulness for how the mathematics could be applied for analysing the economic behaviours' of human beings in the real market situation. Particularly, when he even explained his own discovery, consumers' surplus and also the producers' surplus, what he used also only the price against the quantity coordinate rather than any others', which would have not involved into the trouble rising from the utility and/or purchasing power of money.

If fact, if using any of these factors to construct what the economist intends to explain about the relevant phenomena by graphic, he or she would find that what Mr. Marshall's worry is truth.

Theoretically, utility does not own sufficient features to be the fundamental factor of economics, nor does the purchasing power of money own sufficient features for that.

Utility is an important concept and factor in economics. However, it contains very broad contents and has very flexible meaning according to different object it focus on and different subject it involves into. And such characteristic has determined it to be hard to carry on the duty of a scientific fundamental factor has to. Mr Marshall actually had also kept high alert for these characters of utility. For the same commodity, according to different object, it can have completely different utility. A commodity to a consumer would have completely different utility as what it would be for a producer. Hence, even though introducing "the degree of utility" for easing the trouble rising from total utility, you would be hard to determine what the exact degree of the utility for a consumer who is willingly purchasing this quantity of this commodity and what exact degree of utility to a producer who is willing supplying this commodity in this quantity.

The value of a commodity, its functions, its out-looking and the purchasing power of money that might be fit for it were and are hard to determine even at the same place and at the same time by applying utility and/or the degree of utility. Therefore it cannot be a scientific fundamental factor of economics.

What about "the purchasing power of money"? The purchasing power of money, in Mr. Marshall's view, was just in term of value or the value of money. Yet, such value of money did not hold any fixed content, nor did it hold any fixed unit of amount or degree such as that of price did for money. The purchasing power of money could be increasing or decreasing invisibly and naturally while meanwhile it could be deliberately made to be so. This concept or factor can be used to against utility for some reasons to explain the reason why consumer who would like to purchase this commodity but not that one and why he or she would like to purchase this amount or quantity of this commodity but not that amount or quantity. However, it never ever be able to fix its unit just like what we may do so in price. Such uncatchable and undeterminable feature of purchasing power of money has determined itself being hard to carry on the necessary duty as that of a fundamental factor of science shall do. It may be deliberately set its unit if anyone wants to do so. However, if you want to or actually employ it as a fundamental factor in scientific analysis of economic phenomenon or phenomena, it would be completely failure. Moreover, there is no any real market behaviour or phenomenon that could and can somehow match such invisible purchasing power of money in reality if the exchange rate of different currency would not be taken into consideration, though you might through the concept to catch some uncertainty guessing of the existence of the purchasing power of money, just like another word of price and only just like this, but you would be never ever sure what you had caught was and is correct.

Alfred Marshall himself had known it very well. He applied this concept to explain some tough things, such as land and the ownership of land, the marginal utility of a commodity, etc. However, he never ever employ it as a fundamental factor as what he did to price and quantity of a commodity. Nor did he apply it as for necessary factor for his fundamental scissor analysis of market equilibrium. Notwithstanding, utility has not had its elasticity, nor has the purchasing power of money had its elasticity.

Now let's further look into the factor of quality.

In Marshall's work, he had quite a few times mentioned this word, "**quality**", however, he actually never ever paid his serious attention on it. From his original work[24], in some occasions, he did feel he need this word to express some economical phenomena which utility could not reach, for example, he wrote: "The demand for things of a higher quality depends much on sensibility: some people care little for a refined flour in their wine provided they can plenty of it; others care a high quality, but are easily satiated."[25]

In this example, we have seen that he indeed already knew quality of a commodity as a scientific factor well, which utility was unable to reach because it was a different approach. Yet, in the most occasions, he had treat "quality" as a kind of utilities and never ever thought that it would be a relative independent factor, let along being a fundamental factor of economics. Therefore in his entire work, he had no any special reasoning or discussion concerning specifically "quality", nor did he have any thought to employ as factor to construct a new coordinate for a new "scissor analysis" of a usual market phenomenon or phenomena. And the entire economics of the later development, none of the economists had paid special attention in "quality".

You might ask: is it necessary for scientific economics to pay attention on quality if there is so much long time, none in the field of economic theory had paid attention on it but it seems still working very well?

Well, it may say, yes, it is necessary to introduce quality for a scientific economics, otherwise, many economic phenomena and also many human market behaviours would not be possible being understood or being understood well. Such as what the example that quoted from Marshall's work above[26]. To the commodity of wine, quite some people or even the major people would be very sensitive to the quality of wine but not utility of wine. In the modern social economy, almost all the people's market behaviours would be more or less associating with the caring of not only the quantity but also the quality, while meanwhile the utility would be also concerned. Not only for consumers but also for producers, quality are always a necessary consideration factor in their productions, none of the producers in the real world who would not pay attention on their products' quality for sake of profit making. Though in the fundamental consideration of the production of a commodity, utility is always the first thing to be considered and then quality. As the utility of a commodity has been set and known, then quality becomes important. Modern economy is a competitive economy, serious market competition driven suppliers turn their attentions onto quality much more than utility while meanwhile utility still maintain its importance as it used to be, consumers' economical behaviours' initiative. In theory, quality would be the fundamental factor that meanwhile already included its utility or its utility being set as unchanged or being known.

From the theory's point of views, unlike utility, quality did and does possess the sufficient features as a fundamental factor of economic science.

Firstly, quality has a unique universal acceptant meaning clearly to be known by all people who are living in the modern society. Here we quoted some of its definitions:

1. The standard of something as measure against other thing of a similar kind; the degree of excellence of something."[27]

2. “General excellence of standard or level.”[28]

3. “A distinctive attribute or characteristic possessed by someone or something.”[] (Oxford Dictionary of English)

4. “The state of superior to something else.”[30] (Farlex Financial Dictionary)

5. “ The totality of the attributes of a good or service meet the requirements of buyers or customers.”[31] (Collins Dictionary of economics, 4th ed. © C. Pass. B. Lowes, L. Davies 2005)

Even if there some different words to be employed in the definition of quality, but they are actually have the consistence of unique meaning that is, quality is the degree of excellences and of total distinctive attribute or characteristic possessed by a good or a service, which has its own meanings that are different from that of utility.

More importantly, unlike utility, quality did not and does not have any flexible meaning that would be different according to different situation, object or subject relevant. Its meaning is universal consistence meaning, not matter in what situation, to whichever object or subject, its meaning is the same meaning that would not be possible confusing anyone. From the point of view of economic science, if a construction of a function or equation is necessary, working out the possibility of the consistence of the same meaning among the factors within the same equation or function is a priority. otherwise it would not be acceptable for mathematics only concerning the quantity of the entire consistence of all the factors of an equation or a function. Among all the elements or factors of an equation or a function, any different or inconsistent meaning would not be eligible to be an element or a factor of this equation or function, which is the common sense of mathematics.

Therefore, if forming an equation with utility, quantity and price together, this equation or function or a fundamental frame work, such as, a coordinator for a scissor analysis of market demand and supply would not be possible being valid for the meanings of utility are inconsistence. Forming an equation or a function with price, quantity and quality together would be without such problem and valid, for these three factors could and can have a consistent meaning that are meeting the needs of our scientific theoretical creation and also application.

Why, because quantity, quality and price can have the same content and meaning as a foundation of economics, which is “value” of a good or of a service. Value is a common psychological measurement of the totality of contents, natures and functions of a good or of a service and meanwhile is the measured totality of the contents, nature and functions of that good or of that service. Price is a unit of money expression on a good or a service for its value contained inside and outside of it. Quality is just the value density that each good or service contained, which has been psychologically measurable by consumers who would like to purchase or even producers who would like to supply. And quantity is an aggregation of value of this or that amount of a commodity that consumers willing to purchase or producers would like to supply. Therefore it would be no problem as we construct any equation or function with such three factors together, nor would it be having any problem for construct a coordinate to be a preform for scientific frame work being done, such as, the scissor analysis of demand and supply curve and also the equilibrium of demand and supply, which either utility or the purchasing power of money can do so.

Moreover, marginal price, marginal quality and marginal quantity are all negative and each of them must have a maximum but not a minimum, basically must be zero. Marginalism is a bit out of the question according to the scale of this thesis.

C. Their Elasticity

Mr. Marshall had contributed his creations and discovery concerning the elasticity of a good or of a service that consumers at a given time and a given market phenomena would naturally respond to scientific economics one more century ago.

He was discussing this topic beginning from what he called, "Want or Desire"[32]. In his work, <<Principles of Economics>> in BOOK III, "Wants and Satisfaction" Chapter II, "Wants in relation to activities" He pointed out: "Human wants and desires are countless in number and very various in kind, but they are generally limited and capable of being satisfied."[33] And said: "He desires not merely large **quantities** of the things he has been accustomed to consume, but better **qualities** of those things; he desires a greater choice of things and things that will satisfy new wants growing up in him."[34]

And in Chapter VI, he further stated: "The only universal law as to a person's desire for a commodity is that it diminishes, other things being equal, with every increase in his supply of that commodity. But this diminishing may be slow or rapid." [35]

And then he gave the elasticity a definition: "The elasticity (or responsiveness) of demand in a market is great or small according as the amount demanded increase much or little for a give fall in price, and diminishes much or little for a give rise in price."[36]

And he had related many different situations of the elasticity for different classes of people and for different commodity, such as high price goods, medium price goods and lower price goods. And said: "The elasticity of demand is great for high price , and great, or at least considerable for medium prices, bit it declines as price falls; and gradually fades away if the fall goes so far that satiety level is reached."[37] The is a general rule of elasticity, "save only that the level at which high prices end and low prices begin, is different for different classes, so again is the level at which low prices end and very low prices begin."[38]

His thought concerning the elasticity had been more precisely expressed in his Mathematics Note III[39]. "(pp.86-7) Let P, P' consecutive points on the demand curve; let PRM be drawn perpendicular to ox, let P, P' cut ox, oy in T and t respectively; so that P'R is that increment in the amount demanded which corresponds to a diminution PR in the price per unit of the commodity.

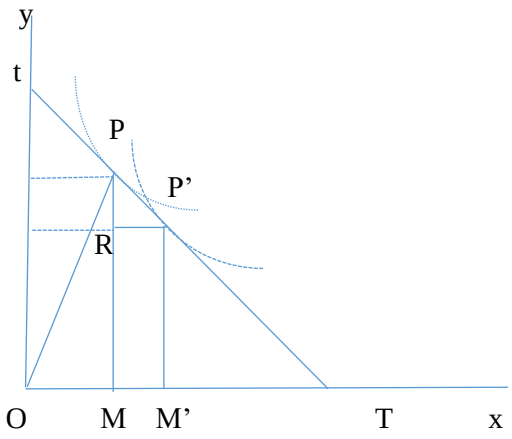
"Then the elasticity of demand at P is measured by

$$\frac{P\prime R}{OM} \div \frac{PR}{PM}, \text{ i.e. } \frac{P\prime R}{PR} \times \frac{PM}{OM};$$

$$\text{i.e. by } \frac{TM}{PM} \times \frac{PM}{OM},$$

$$\text{i.e. by } \frac{TM}{OM} \times or\ by\ \frac{PT}{Pt}.$$

“



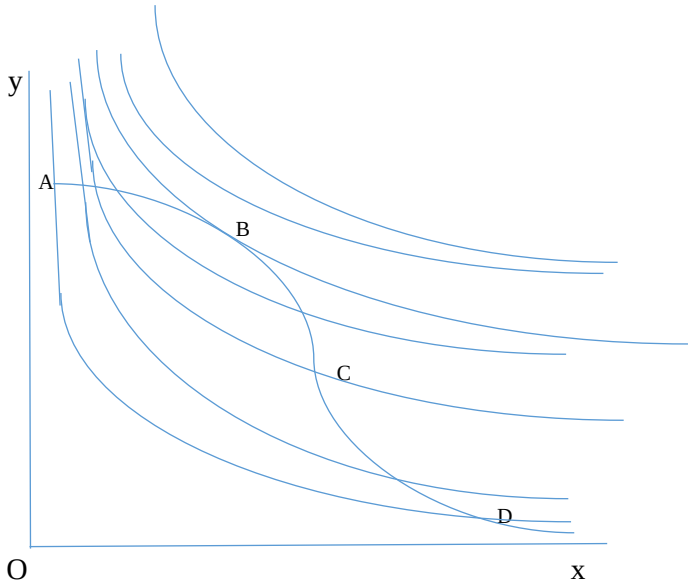
“When the distance between P and P’ is diminished indefinitely, PP’ becomes the tangent; and thus the proposition stated in pp. 86-7 is proved. It is obvious, a priori that the measure of elasticity cannot be altered by altering relatively to one another the scales on which distances parallel to ox and oy are measured. But a geometrical proof of this result can be got easily by the method of projections: while analytically it is clear that

$\frac{dx}{x} \div \frac{-dy}{y}$, which is analytical expression for the measure of elasticity, does not change its value if the curve $y = f(x)$ be drawn to new scales so that its equation becomes:

$qy = f(px); where\ \ p\ and\ q$ are constants.

“If the elasticity of demand be equal to unity for all prices of the commodity, any fall in price will cause a proportionate increase in the amount bought and therefore will make no change in outlay which the purchasers make for the commodity. Such a demand may therefore be called a constant outlay demand. The curve which represents, a constant outlay curve, it may called, is a rectangular hyperbola with ox and oy asymptotes; and a series of such curves are represented by the dotted curves in the following figure.

[40]



“There are some advantage in accustoming the eye to the shape of these curves; so that when looking at a demand curve one can tell at once whether it is inclined to the vertical at any point at a greater or less angle than the part of a constant outlay curve which would pass through that point. Greater accuracy may be obtained by tracing constant outlay curves on thin paper, and then laying the paper over the demand curve. By this means it may, for instance, be seen ta once that the demand curve represents at each of the points, A. B. C and D elasticity about equal to one; between A and B, and again between C and D. it represents an elasticity greater than one; while between B and C, it represents an elasticity less than one. It will be found that practice of this kind makes it easy to detect the nature of the assumptions with regard to the character of the demand of a commodity, which are implicitly made in drawing a demand curve of any particular shape; and a safeguard against the unconscious introduction of improbable assumptions. The general equation to demand curves representing at every point an elasticity equal to n is

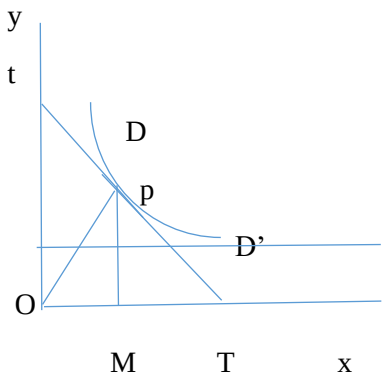
$$\frac{dx}{x} + n\frac{dy}{y} = 0, \text{ i.e. } xy^n = C.$$

“It is worth noting that in such a curve $\frac{dy}{dx} = -\frac{C}{y^{x+1}}$; that is, the proportion in which the amount demanded increases the consequence of a small fall in the price varies inversely as the $(n + 1)^{th}$ power of the price. In the case of the constant outlay curves it varies inversely as the square of the price; or, which is the same thing in this case, directly as the square of the amount.”[40]

Now make sure getting understanding of all what he told in his work. The first part seems a bit easier for understanding because all the drawing inside the first area of the coordinate are straight lines, originally, is should be having two curvature lines above the PP’ line, and one intersect with the PP’ line at the point P, and another intersects with PP’ line at the point P’. For the PP’ is a tangent line as the PP’ extending infinitely (or as what he said, diminishing infinitely).

Let’s compare with his drawing in pp.86:

“



Please refer to the figure 2 of page 86. In the 86 figure, he did not displayed the price move. But directly discussed the relationship amount of the elasticity proportions:

" We may say that the elasticity of demand is the one, if a small fall in price will cause an equal proportionate in the amount of demand: or as we may say roughly, if a fall of one per cent in price will increase the sales by one per cent.: that it is two or a half, if a fall of one per cent. in price makes an increase of two or one half per cent. respectively in the amount demanded, and so on.(This statement is rough; because 98 does not bear exactly the same proportion to 100 that 100 does to 102.) The elasticity can be best traced in the demand curve with the aid of the following rule. Let a straight line touching on the curve at any point of P meet ox in T and oy in t, then the measure of elasticity at the point P is the ratio of PT to Pt.

"If PT were twice to Pt, a fall of one per cent. in price would cause an increase of 2 per cent.in the amount of demand; the elasticity of demand would be two. If PT were one-third of Pt, a fall of one per cent. in price would cause an increase of $\frac{1}{3}$ per cent. in the amount demanded; the elasticity of demand would be one-third; and so on.

"Another way of looking at the same result is this :---------- the elasticity at the point P is measure by the ratio of PT to Pt, that is, MT to MO, (PM being drawn perpendicular to om); and therefore the elasticity is equal to one when the angle TPM is equal to the angle OPM; it always increases when the angle TPM increases relatively to the angle OPM, and vice versa."

And then he illustrated an illustration of a case of the demand of green peas.

This explanation can help us to understand what he related in his mathematics appendix, Note III. And what he tried to tell us is the proof of the pp. 86 illustration.

Now we can be easier understand what Mr. Marshall told us in his Not III of Mathematics Appendix. Let's first make a very simple explanation for his first figure that he drew in his Note III. It is a very straight forwards illustration.

If the price of y on P falls to P', then the quantity of the demand would be increased from OM to OM', which is the entire story talking about. The question rising is that if the price of y on P fall, that means that the price of this or that commodity is now reducing or decreasing unto P'; what would the consumers respond such price fall? And how much of the demand of this or that commodity by the laws of elasticity, would increase? The ratio that showing the price fall in the proportionate of the quantity of demand for this or that commodity would rise, which we call it elasticity. (Please refer to Marshall's definition of the elasticity.)

In this illustration of mathematical figure, he tried to prove what he had said and displayed in pp86. And he did the geometrical proof first:

$$\frac{P\prime R}{OM} \div \frac{PR}{PM\prime};$$

What is it ? Well, Quantity rise ratio over the price diminishing ratio. For $\frac{P\prime R}{OM}$ is the ratio of quantity of demand rising and $\frac{PR}{PM\prime}$ is the price fallen or diminished. In another view, if the price rise from P' to P, then the quantity of demand for this or that commodity would be decreased from OM' to OM. According to the geometry laws among the triangle that was divided by parallel lines within the same triangle, then he displayed differences of the elasticity expressions, such as:

$$\text{i.e. } \frac{P\prime R}{PR} \times \frac{PM}{OM};$$

$$\text{i.e. by } \frac{TM}{PM} \times \frac{PM}{OM},$$

$$\text{i.e. by } \frac{TM}{OM} \times or\ by\ \frac{PT}{Pt}.$$

And because of these demonstrations, the rule of the elasticity had been proved. And then he pointed out that:

"But a geometrical proof of this result can be got easily be the method of projections: while analytically it is clear that

$\frac{dx}{x} \div \frac{-dy}{y}$, which is analytical expression for the measure of elasticity, does not change its value if the curve $y = f(x)$ be drawn to new scales so that its equation becomes:

$qy = f(px); where\ \ p\ and\ q$ are constants."

In another word, geometrical proof would not be that easy to understand without as in the way of analytical expression for the measure of elasticity. Therefore he shew that

$\frac{dx}{x} \div \frac{-dy}{y}$; we shall pay our attention on this expression in the way of analytical mathematics would result exactly as the geometrical expression in scale and ratio but only is much more clearer and easier to understand.

For $\frac{dx}{x}$ is the ratio of quantity change that relevant to the price change $\frac{-dy}{y}$; and $\frac{-dy}{y}$ is the price change ratio relevant to the quantity change$\frac{dx}{x}$. What make it clearer is that the elasticity is a negative ratio. And if meanwhile concerning the marginal elasticity, then the marginal elasticity would be also negative, but this thesis would not involve into this discussion furthermore here.

Here, the thing worth of knowing a little bit more is that if making a small variation of this expression, such as,

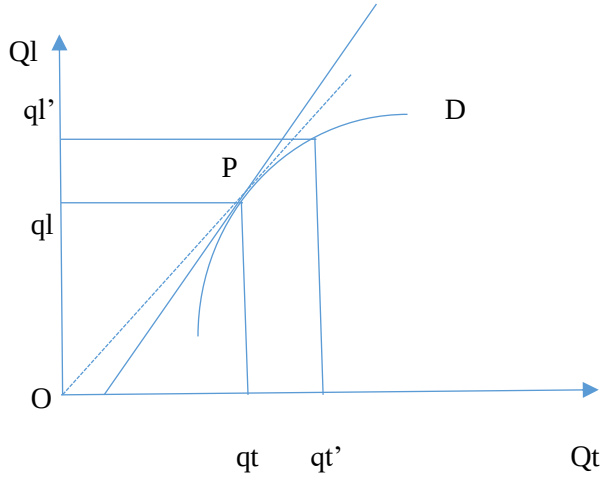
$$\frac{dx}{x} \div \frac{-dy}{y} \Rightarrow \frac{dx}{x} \times -\frac{y}{dy} = -\frac{dx}{dy} \times \frac{y}{x} = -\frac{dQ}{dP}\frac{P}{Q} = -\frac{PdQ}{QdP};$$

The normal elasticity expression in modern economics then can be seen clearly. Here P is the price of a commodity, and Q is the quantity of demand of this commodity.

As what it had been pointed out in the prior, the real economy requires the economics becoming science, and the elasticity of the scientific economics should be the three fundamental factors relationships over the ratio of every factors' change related to the others' ratio of change.

Now Let this fundamental approach of scientific economics be discussed:

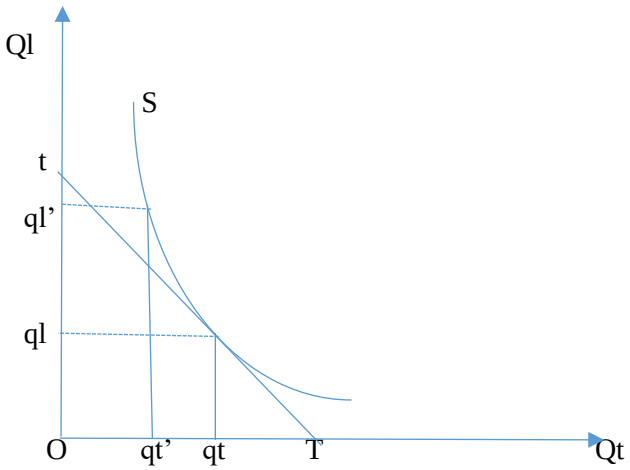
Let P denotes the price of a commodity, Qt denotes the quantity of this corresponding commodity, and Ql denotes the quality of this corresponding commodity. Then first of all what we shall gain would be a two dimensional view of these three factors and get the analytic expression concerning their elasticities. By setting the Price of this commodity as given or maintaining the same or maintaining the corresponding automatically change of market price of a commodity, then we got only two factors, Qt and Ql, Quantity and Quality of this commodity. By employing the Qt against Ql, we may construct a two dimensional coordinate, such as:



This is a general demand curve of a commodity. The tangent line that intersect the demand curve at the point P , we named it P. From the demand curve tendency, we have known the law of this tendency, named **theorem 2**: if the quality of a commodity increasing, the demand of the quantity for this commodity would be also increasing if the market price of this commodity is maintaining unchanged; vice versa, if the quality of this commodity decreasing, then the demand of the quantity for this commodity would be also decreasing.

Here we can see that if the quality at ql, then the quantity that would be bought would be at qt. However, if the quality is rising to ql', then the quantity that would be bought would be increasing up to qt'. In another word, the elasticity of demand would be positive as the quality against the quantity being a coordinate of a commodity.

Now let the supply be measured

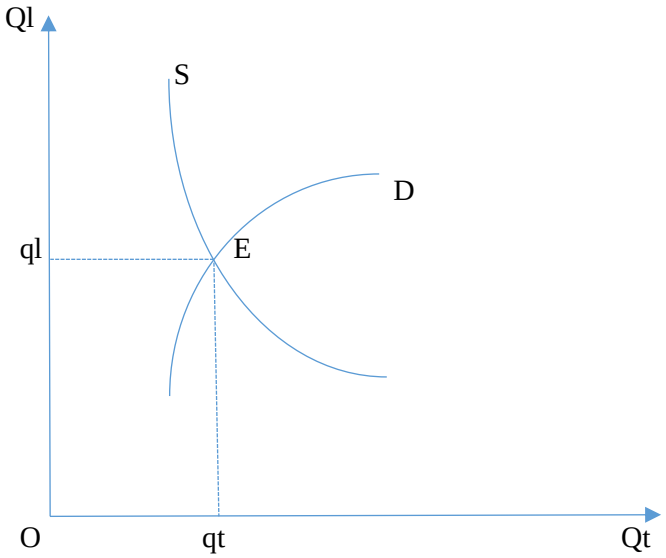


As the price remaining unchanged, then the law would be, **Theorem 4**: if the quality of a commodity is increased, then the amount of supplying of this commodity would be decreased; and vice versa, if the quality is decreased, the amount of supplying this commodity would be increased.

In this figure, the tangent line intersect the supply curve at the point of P, we called, P. and the quality at that give time and give circumstance would be a perpendicular line to the quality vertical axis (Ql) and intersect the vertical axe at ql, and the quantity the supplier would like to supply at such quality and at such give time would be at qt of the horizontal axe Qt.

The figure also shows that, as the quality rises up from ql to ql', then the quantity of supplying this commodity would be reduced from qt to qt'.

Certainly, if we put the demand curve and supply curve together in one coordinate area, the equilibrium can be seen, for they would form a scissor that looked like figure shown:

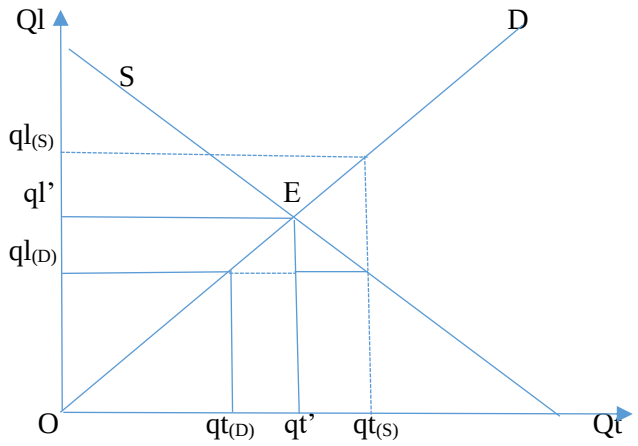


Here, the two curve intersect each other at the point of E, named E, is the equilibrium of the demand for a commodity at a given time and given circumstance in an open and competitive market . ql is the equilibrium quality that intersect the quality vertical axis Ql at the point of ql, named ql. And the qt is the equilibrium quantity that intersect the horizontal quantity axis at the point of qt. named qt.

Special discussion of equilibrium is out of the scope of this thesis. There would be no further more discussion about it here.

Let the elasticity is to be measured:

Since the demand curve of this commodity shows the tendency of the demand of this commodity of which the consumers would like to purchase driven by the law of market, **Theorem 1**, and their elasticity may be shown as: If adopting Mr. Marshall's method of geometrical proof, then



Taking the geometrical proof for the demand curve elasticity first. By axiom1, it would be:

$$\frac{ql}{qt} \div \frac{ql'}{qt'};\ \text{i.e. by } \frac{ER}{RP} \div \frac{Oql'}{Oqt'};$$

$$\text{i.e. by } \frac{EP}{EO} \div \frac{ql'ql}{ql'O};$$

$$\text{i.e. by } \frac{RP}{qt'O} \div \frac{ER}{Eqt'}. \text{ Or…}$$

Taking the

$$\frac{ql}{qt} \div \frac{ql'}{qt'} \rightarrow \frac{ql}{qt} \times \frac{qt'}{ql'} = \frac{ql}{ql'} \times \frac{qt'}{qt} = \frac{qlqt'}{ql'qt}.$$

Now let us introduce the analytical method for easy understanding and accurate expression:

$$\frac{d(ql)}{ql} \div \frac{d(qt)}{qt} \rightarrow \frac{d(ql)}{ql} \times \frac{-qt}{d(qt)} = \frac{d(ql)qt}{d(qt)ql} = -\frac{qtd(ql)}{qld(qt)}.$$

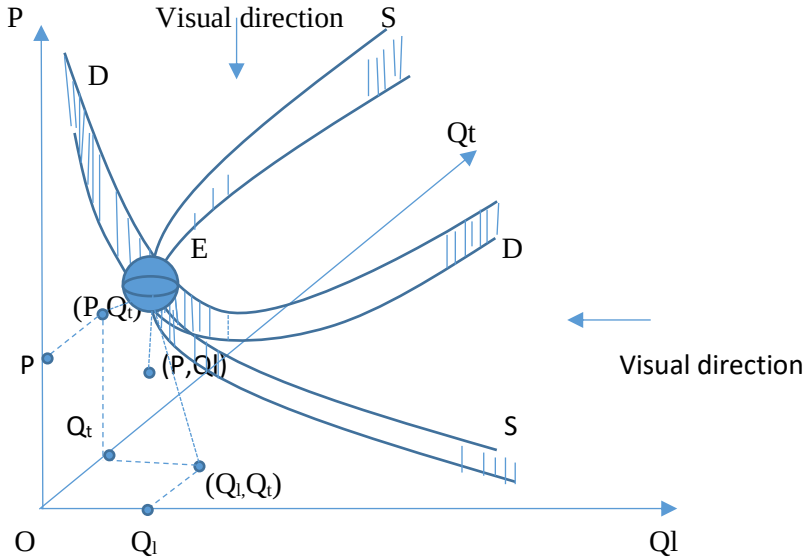
By the same way, according to **Theorem 2,** we may get the supply elasticity:

$$-\frac{qtd(ql)}{qld(qt)}.$$

Actually, the supply elasticity has no any different from the demand elasticity by nature, what the different is on the rate between them would be just opposite each other, hence, the demand elasticity would be a positive elasticity and the supply elasticity would be negative elasticity, which is just opposite that of the two factors situation, price against the quantity, in which the demand elasticity is a negative elasticity and the supply elasticity is a positive elasticity(Please refer to Marshall' analysis). The rising of the quality, in one hand would cause the demand of quantity increasing, and meanwhile would cause the supply of the quantity decreasing; and vice versa, the rising of the quality of a commodity would cause the quantity being supplied decreased, and the quantity purchased increased.

Due to the quality is one of the fundamental factors of scientific economics, then the basic frame work of the scientific economics should be upgraded unto three elements or three factors, and the coordinate should be from two dimensional coordinate up to three dimensional coordinate so that the three fundamental elements or factors may be taken into consideration simultaneously. The following shows this effort:

Visually, the three dimensional coordinate may be looked like this:



Carefully study this graphic, what may us surprise is that there is an amazing discovery, it was discovered by the author of this thesis on 05-12-2017, it was written on his on-going Book,<<Scientific Principles of Economics>> manuscript: "Following the visual direction from the right to the left and also from the top to the bottom,…, what make us surprise is that the quality and the quantity scissors' axiom (10) and (11), that is, (axiom(1) and (2) in this thesis), do not against the price and that of the quantity scissors'(axiom(3) and (4)) but well harmony and evidence each other. It is a great thing for us to know that the consumers' demand behaviours responding the quality variation of a good or a service and the producers' supply behaviours responding the quality are just in another respect to prove what the consumers' demand behaviours responding the price variation and the producers' supply behaviours responding the price variation are true!"[41]

What this statement talked about is that the demand curve in the three dimensional coordinate is only one curve and the supply curve in the three dimensional coordinate is also one curve. As looking at them from the top to the bottom within the three dimensional coordinate, the demand curve would become the demand curve on the two dimensional coordinate quality against quantity; and the supply curve would also become the supply curve in the two dimensional coordinate quality against quantity, henceforth, the elasticity of the demand curve would be positive, and the elasticity of the supply curve would be negative; by axioms(1) and (2), the elasticity of demand of a commodity would be: quality rising up would cause the quantity of the demand of this commodity also rising up and vice versa; and the elasticity of the supply of a commodity would be: if the quality rising up, the quantity of supplying this commodity would be decreasing; if the quality reducing, then the quantity of supplying this commodity would be rising up; however, at the same time and in the same coordinate, if looking them from the right to the left onto the two dimensional coordinate, price against quantity; we would find that the elasticity of the demand curve would be negative and the elasticity of the supply curve would be positive; the price of a commodity rising up, the quantity of the demand of this commodity would be decreasing; and the price of a commodity reducing, the quantity of demand of this commodity would be rising up. To the supply, if the price rising up, the quantity of supply of this

commodity would be also rising up; if the price reducing, then the quantity of the supply of this commodity would be also reducing.

In other words, in the two factors' coordinate' axioms would be exactly the same as the axioms in the three factors' coordinate, there would be not conflict or different can be found between two dimensional coordinate and the three dimensional coordinate, for they are the same curves, demand curve is still demand curve in both two dimensional coordinate and in three dimensional coordinate! So is the supply curve.

Let us recall Mr. Marshall's contributions in his work, <<Principles of Economics>>, as what we have discussed above. If we, for example, employ utility, u, or employ the purchasing power of money, m, to against the price and form a coordinate, utility against price, or utility against quantity, or employ the purchasing power of money against price or quantity, two coordinate, then no matter the supply curve of a commodity or a demand curve of a commodity would be all positive, even if we put these two curves together, we could not actually find any fixed point, and there would be no equilibrium, that is, these two curves intersection could be found, for all the curves would be parallel each other. And therefore, Mr. Marshall had never ever employed either utility, u or the purchasing power of the money, m to construct coordinate and displayed the elasticity of either demand of a commodity or a supply of a commodity, though, mathematically, we may actually build a function to show the elasticity of demand or of supply by employing these elements, u and m.

This then become the a hidden weak point in scientific economics, no one actually has paid attention to the three dimensional fame work in economics' research, and no one discovered the quality and quantity could be meanwhile considered as one of fundamental aspect as the complement aspect of the price and quantity model. Nor would have anyone discover the secret when three fundamental factors being put together in a three dimensional coordinate.

Let's put in this way, if in the two dimensional coordinate, quality against quantity, the demand curve of a commodity would be a different curve from the demand curve in the two dimensional coordinate ,price against quantity, then the thing would become not only complicate, but also would not be possible having any harmony solution for both elasticity of the demand curve in economics for one positive and another negative, the elasticity of the demand curve in the quality-quantity coordinate would be different from the elasticity of the demand curve in the price-quantity coordinate. They are just opposite each other. If we compare with these two elasticities by putting them together, they would cancel out each other. The same situation would happen on the supply curve, for the elasticity of supply in the quality-quantity coordinate is just opposite the elasticity of supply in the price-quantity coordinate, if putting them together, they would cancel out each other.

However, when carefully examining the three dimensional coordinate, price-quantity-quality, we would find that the demand curve in the quality-quantity coordinate is exactly the same demand curve in the price-quantity coordinate, they are actually only one curve but not two curves, just because of from different visual angle(or direction) looking into them from different aspect, they seemed like two curves having two opposite features . This discovery provided us for the possibility to solve their elasticities in three dimensional coordinate and simultaneously consider all three fundamental factors together, which we have drawn out the conclusive six elasticity equations as the original Ture God's given and blessings by which 24 secular equations can be obtained of either demand elasticity or supply elasticity.

In three dimension coordinate, the visual of the two of the three dimensional curves, demand and supply, crossing each other may be looked like the drawing in figure 4 above. If doing geometrical proof, it would be easy, particularly, in the visual drawing in a three dimensional space. Therefore, we may directly apply the analytical method to gain the elasticities of both a demand of a commodity and

a supply of a commodity in the three factors or elements coordinate that is a three dimensional coordinate. Displaying as the followings:

$$E_{(e|\,p,\,qt,\,ql)}= \frac{d(Qt)d(Ql)}{dPd(Ql)} \div \frac{P}{Qt}; \quad (1)$$

$$E_{(e|\,p,\,qt,\,ql)} = \frac{d(Qt)d(Ql)}{dPd(Ql)} \div \frac{P}{Ql}; \quad (2)$$

$$E_{(e|\,p,\,qt,\,ql)}= \frac{d(Qt)d(Ql)}{dPd(Ql)} \div \frac{Qt}{Ql}; \quad (3)$$

$$E_{(e|\,p,\,qt,\,ql)} = \frac{d(Qt)d(Ql)}{dPd(Ql)} \div \frac{Ql}{Qt}; \quad (4)$$

$$E_{(e|\,p,\,qt,\,ql)} = \frac{d(Qt)dP}{d(Qt)d(Ql)} \div \frac{P}{Ql}; \quad (5)$$

$$E_{(e|\,p,\,qt,\,ql)}= \frac{d(Ql)dP}{d(Qt)d(Ql)} \div \frac{P}{Qt}. \quad (6)$$

These six equations, theoretically, have filled the gaps in scientific economics about the elasticity of both of demand and supply, the original equations were the true God's givens, for secular people, they are not that easy to understand, However, when do some variation, these six equations then become somehow more direct expressions of the elasticities of the demand and of supply in a three dimensional coordinate. Let's start from the first equation, step by step unto all their equations to be completed:

$$\Rightarrow E_{(e|\,p,\,qt,\,ql)}= \frac{d(Qt)d(Ql)}{P} \div \frac{-\,dPd(Qt)}{Qt} = \frac{d(Qt)d(Ql)}{P} \times -\frac{Qt}{dPd(Qt)} = -\frac{Qtd(Qt)d(Ql)}{PdPd(Qt)}. \quad (1)$$

This one is valid if and only if in a very special monopoly market with resources scarcity. In the future of human beings' world, all the unreproducible resources being exhausted or in almost exhausted state, such as iron, aluminium, copper, natural oil and also all the other rare mentals would be unavoidably being exhausted, all the goods that made by such resources would become a situation in which the quantity production and trade would be by allotments. It would be either without elasticity or quantity controlling price setting. And this situation would happen also in war time economy, such situation would be making this elasticity valid.

$$\Rightarrow E_{(e|\,p,qt,ql)} = \frac{d(Qt)d(Ql)}{P} \div \frac{-\,dPd(Ql)}{Qt} = \frac{d(Qt)d(Ql)}{P} \times -\frac{Qt}{dPd(Ql)} = -\frac{Qtd(Qt)d(Ql)}{PdPd(Ql)}. \quad (2)$$

This one is valid if and only if in a very special monopoly market with resources scarcity and in war time economy just as what the comments have been made above in (1).

$$\Rightarrow E_{(e|p,\ qt,\ ql)} = \frac{d(Qt)d(Ql)}{P} \div \frac{-d(Qt)dP}{Ql} = \frac{d(Qt)d(Ql)}{P} \times -\frac{Ql}{d(Qt)dP} = -\frac{Ql\ d(Qt)d(Ql)}{Pd(Qt)dP}. \qquad (3)$$

Generally speaking, this elasticity does not valid in scientific economics' point of view, though, mathematically, it would be O.K. This equation is showing us the full view of how the three fundamental factors or elements can be considered simultaneously, even if it is not valid just like (1)and(2) above.

$$\Rightarrow E_{(e|p,\ qt,\ ql)} = \frac{d(Qt)d(Ql)}{P} \div \frac{-dPd(Ql)}{Ql} = \frac{d(Qt)d(Ql)}{P} \times -\frac{Ql}{dPd(Ql)} = -\frac{Ql\ d(Qt)d(Ql)}{Pd(Qt)d(Ql)}. \qquad (4)$$

This is not valid in scientific economics, though, in mathematics it is OK

$$\Rightarrow E_{(e|\ p,qt,ql)} = \frac{d(Qt)dP}{P} \div \frac{-d(Qt)d(Ql)}{Ql} = \frac{d(Ql)dP}{P} \times -\frac{Ql}{d(Qt)d(Ql)} = -\frac{Qld(Ql)dP}{Pd(Qt)d(Ql)}. \qquad (5)$$

This is not valid in scientific economics, though, in mathematics it is OK

$$\Rightarrow E_{(e|\ p,qt,ql)} = \frac{d(Qt)dP}{P} \div \frac{-d(Qt)d(Ql)}{Qt} = \frac{d(Qt)dP}{P} \times -\frac{Qt}{d(Qt)d(Ql)} = -\frac{Qtd(Qt)dP}{Pd(Qt)d(Ql)}. \qquad (6)$$

This one is valid if and only if in a very special monopoly market with resources scarcity, just like what the comment has been made above in (1).

$$\Rightarrow E_{(e|\ p,qt,ql)} = \frac{d(Ql)dP}{P} \div \frac{-d(Qt)d(Ql)}{Ql} = \frac{d(Ql)dP}{P} \times -\frac{Ql}{d(Qt)d(Ql)} = -\frac{Qld(Ql)dP}{Pd(Qt)d(Ql)}. \qquad (7)$$

This is not valid in scientific economics, though, in mathematics it is OK

$$\Rightarrow E_{(e|\ p,qt,ql)} = \frac{d(Ql)dP}{P} \div \frac{-d(Qt)d(Ql)}{Qt} = \frac{d(Ql)dP}{P} \times -\frac{Qt}{d(Qt)d(Ql)} = -\frac{Qtd(Ql)dP}{Pd(Qt)d(Ql)}. \qquad (8)$$

This one is valid if and only if in a very special monopoly market with resources scarcity, just like what the comment has been made above in (1).

$$\Rightarrow E_{(e|\ p,\ qt,\ ql)} = \frac{d(Qt)d(Ql)}{Qt} \div \frac{-dPd(Qt)}{P} = \frac{d(Qt)d(Ql)}{Qt} \times -\frac{P}{dPd(Qt)} = -\frac{Pd(Qt)d(Ql)}{QtdPd(Qt)}. \qquad (9)$$

This one is valid in a general full competitive open market.

$$\Rightarrow E_{(e|\ p.qt.ql)} = \frac{d(Qt)d(Ql)}{Qt} \div \frac{-dPd(Ql)}{P} = \frac{d(Qt)d(Ql)}{Qt} \times -\frac{P}{dPd(Ql)} = -\frac{Pd(Qt)d(Ql)}{QtdPd(Ql)}. \qquad (10)$$

This one is valid in a general full competitive open market.

$$\Rightarrow E_{(e|\ p.qt.ql)} = \frac{d(Qt)d(Ql)}{Qt} \div \frac{-dPd(Qt)}{Ql} = \frac{d(Qt)d(Ql)}{Qt} \times -\frac{Ql}{dPd(Qt)} = -\frac{Qld(Qt)d(Ql)}{QtdPd(Qt)}. \qquad (11)$$

This one is valid in a general full competitive open market.

$$\Rightarrow E_{(e|p.qt.ql)} = \frac{d(Qt)d(Ql)}{Qt} \div \frac{-dPd(Ql)}{Ql} = \frac{d(Qt)d(Ql)}{Qt} \times -\frac{Ql}{dPd(Ql)} = -\frac{Qld(Qt)d(Ql)}{QtdPd(Ql)}. \qquad (12)$$

This one is valid in a general full competitive open market.

$$\Rightarrow E_{(e|\ p,qt,ql)} = \frac{d(Qt)dP}{Qt} \div \frac{-d(Qt)d(Ql)}{P} = \frac{d(Qt)dP}{Qt} \times -\frac{P}{d(Qt)d(Ql)} = -\frac{P\ d(Qt)dP}{Qtd(Qt)d(Ql)}. \qquad (13)$$

This one is valid in a general full competitive open market.

$$\Rightarrow E_{(e|\ p,qt,ql)} = \frac{d(Ql)dP}{Qt} \div \frac{-d(Qt)d(Ql)}{P} = \frac{d(Ql)dP}{Qt} \times -\frac{P}{d(Qt)d(Ql)} = -\frac{Pd(Ql)dP}{Qtd(Qt)d(Ql)}. \qquad (14)$$

This one is valid in a general full competitive open market.

$$\Rightarrow E_{(e|\,p,qt,ql)} = \frac{d(Ql)dP}{Qt} \div \frac{-\,d(Qt)d(Ql)}{Ql} = \frac{d(Ql)dP}{Qt} \times -\frac{Ql}{d(Qt)d(Ql)} = -\frac{Qld(Ql)dP}{Qtd(Qt)d(Ql)}. \qquad (15)$$

This one is valid in a general full competitive open market.

$$\Rightarrow E_{(e|\,p,qt,ql)} = \frac{d(Qt)dP}{Qt} \div \frac{-\,d(Qt)d(Ql)}{Ql} = \frac{d(Qt)dP}{Qt} \times -\frac{Ql}{d(Qt)d(Ql)} = -\frac{Qld(Qt)dP}{Qtd(Qt)d(Ql)}. \qquad (16)$$

This equation is also valid both in mathematics and in scientific economics.

$$\Rightarrow E_{(e|\,p.qt.ql)} = \frac{d(Qt)d(Ql)}{Ql} \div \frac{-dPd(Ql)}{Qt} = \frac{d(Qt)d(Ql)}{Ql} \times -\frac{Qt}{dPd(Ql)} = -\frac{Qtd(Qt)d(Ql)}{QldPd(Ql)}. \qquad (17)$$

This one is valid if and only if in a very special monopoly market with resources scarcity, just like what the comment had been made above in(1).

$$\Rightarrow E_{(e|\,p.qt.ql)} = \frac{d(Qt)dP}{Ql} \div \frac{-d(Qt)d(Ql)}{P} = \frac{d(Qt)dP}{Ql} \times -\frac{P}{d(Qt)d(Ql)} = -\frac{Pd(Qt)dP}{Qld(Qt)d(Ql)}. \qquad (18)$$

This is not valid in scientific economics, though, in mathematics it is OK

$$\Rightarrow E_{(e|\,p.qt.ql)} = \frac{d(Qt)dP}{Ql} \div \frac{-d(Ql)d(Qt)}{Qt} = \frac{d(Qt)dP}{Ql} \times -\frac{Qt}{d(Ql)d(Qt)} = -\frac{Qtd(Qt)dP}{Qld(Ql)d(Qt)}. \qquad (19)$$

This one is valid if and only if in a very special monopoly market with resources scarcity, just like what the comment had been made above in (1).

$$\Rightarrow E_{(e|\,p,\,qt,\,ql)} = \frac{d(Qt)d(Ql)}{Ql} \div \frac{-\,dPd(Qt)}{P} = \frac{d(Qt)d(Ql)}{Ql} \times -\frac{P}{dPd(Qt)} = -\frac{Pd(Qt)d(Ql)}{QldPd(Qt)}. \qquad (20)$$

This is not valid in scientific economics, though, in mathematics it is OK

$$\Rightarrow E_{(e|\,p,\,qt,\,ql)} = \frac{d(Qt)d(Ql)}{Ql} \div \frac{-\,dPd(Qt)}{Qt} = \frac{d(Qt)d(Ql)}{Ql} \times -\frac{Qt}{dPd(Qt)} = -\frac{Qtd(Qt)d(Ql)}{QldPd(Qt)}. \qquad (21)$$

This one is valid if and only if in a very special monopoly market with resources scarcity, just like what the comment had been made above in (1).

$$\Rightarrow E_{(e|\,p,\,qt,\,ql)} = \frac{d(Qt)d(Ql)}{Ql} \div \frac{-\,dPd(Ql)}{P} = \frac{d(Qt)d(Ql)}{Ql} \times -\frac{P}{dPd(Ql)} = -\frac{Pd(Qt)d(Ql)}{QldPd(Ql)}. \qquad (22)$$

This is not valid in scientific economics, though, in mathematics it is OK

$$\Rightarrow E_{(e|p,\,qt,\,ql)} = \frac{d(Ql)dP}{Ql} \div \frac{-\,d(Qt)d(Ql)}{P} = \frac{d(Qt)dP}{Ql} \times -\frac{P}{d(Qt)d(Ql)} = -\frac{P\,d(Qt)dP}{Qld(Qt)d(Ql)}. \qquad (23)$$

This elasticity is not valid in scientific economics, though in mathematics it is O.K.

$$\Rightarrow E_{(e|\,p,qt,ql)} = \frac{d(Ql)dP}{Ql} \div \frac{-\,d(Qt)d(Ql)}{Qt} = \frac{d(Ql)dP}{Ql} \times -\frac{Qt}{d(Qt)d(Ql)} = -\frac{Qtd(Ql)dP}{Qld(Qt)d(Ql)}. \qquad (24)$$

This one is valid if and only if in a very special monopoly market with resources scarcity, just like what the comment had been made above in (1).

Therefore, totally, the overall three fundamental elements or factors getting together in a three dimensional coordinate, there would be 24 elasticities equations or called formulas can be evaluated based on the six equation that the true God blessed. Among them eight of them are not valid in scientific economics, though in the view of mathematics they are O.K.; and other eight are valid only in a rare market situation or a rare economy, such as monopoly with resource scarcity, or war time economy. There are only eight are valid in a general full competitive open markets.

Furthermore, these eight valid elasticities are just for one curve in a three dimensional coordinate, either for demand curve that is, for the demand of a commodity in the three dimensional coordinate, or for the supply of a commodity in a three dimensional coordinate. They are just sign different, but all the equations, elements and operation sign and functional equation would be the same. If 4 the demand elasticities in the P- Qt coordinate are negative, conversely, all the suppliers' elasticity in such arear would be positive. However the 4 elasticities of demand in Ql-Qt coordinate would be positive while the suppliers' would be negative. Since the sign of the equations are different, totally valid formulas would 16, 8 are demand elasticities and 8 are supply elasticities.

Further discussions concerning the three fundamental factors of the economics and their elasticities would be a great help for understanding this breaking through creation and invention in the scientific economics. The entire approach concerning this breaking through research has shown clearly that what and how such approach is very important for the scientific economics in modern society, which has clearly revealed that the sixteen general situations of the market behaviours of both consumers' and producers'.

Here drawing out the relevant axioms and theorems can be possible:

Axiom 1: An equilibrium price and an equilibrium quantity would be a certain consequence as the tendency of both consumers' elastic behaviours as well as the suppliers' elastic behaviours within the market movement of a full competitive open market.

Axiom 2: An equilibrium quality and an equilibrium quantity are also the eventual consequence of the tendency of both consumers' elastic behaviours as well as the suppliers' elastic behaviours' tendency in relevant demand and supply of the market movement of a full competitive open market.

Theorem 1 To a commodity of an open and full competitive market, as the price increase, the purchased quantity for this commodity would be decreased; vice versa, as the price of this commodity decreases, the purchased quantity of this commodity would increase if the quality of this commodity is remaining unchanged.

Theorem 2 To a commodity of an open and full competitive market, as the quality of this commodity increases, the purchased quantity of this commodity would increase also; vice versa, as the quality of this commodity decreases, the purchased quantity of this commodity would decrease as well if the price of this commodity is remaining unchanged.

Proof theorem 1:

Let the induction method to be employed for the proof, assume that it is not the case.

Then there are only four possibilities need to be considered two are the directly associated with P-Qt two dimensional coordinate of the three dimensional coordinate, P-Qt-Ql; the other two are directly associated with Ql-Qt two dimensional coordinate of the three dimensional coordinate, P-Qt-Ql, let the two possibilities that directly associate with P-Qt be considered first,

Then: one is that the elasticity of the quantity of a targeted commodity that consumers who are willingly to purchase must be zero, write:

$$E_{(E|\ P,\ Qt,\ Ql)} = 0;$$

Another possibility is:

$$E_{(E|P,\ Qt,\ Ql)} = -E_{(E|P,Qt,Ql)} = +E_{(E|P,Qt,\ Ql)}$$

These are the only two possibilities in all the relevant elasticities that are associated with

P-Qt two dimensional coordinate of the three dimensional coordinate, P-Qt-Ql.

Let the 4 valid elasticity equations relevant to the P-Qt coordinate of the three dimensional coordinate and the price of each commodity is the determination to be displayed here:

$$\Rightarrow E_{(e|\ p,\ qt,\ ql)}= \frac{d(Qt)d(Ql)}{Qt} \div \frac{-dPd(Qt)}{P} = \frac{d(Qt)d(Ql)}{Qt} \times -\frac{P}{dPd(Qt)} = -\frac{Pd(Qt)d(Ql)}{QtdPd(Qt)}. \qquad (9)$$

$$\Rightarrow E_{(e|p.qt.ql)}= \frac{d(Qt)d(Ql)}{Qt} \div \frac{-dPd(Ql)}{P} = \frac{d(Qt)d(Ql)}{Qt} \times -\frac{P}{dPd(Ql)} = -\frac{Pd(Qt)d(Ql)}{QtdPd(Ql)}. \qquad (10)$$

$$\Rightarrow E_{(e|p,qt,ql)}= \frac{d(Qt)dP}{Qt} \div \frac{-d(Qt)d(Ql)}{P} = \frac{d(Qt)dP}{Qt} \times -\frac{P}{d(Qt)d(Ql)} = -\frac{P\,d(Qt)dP}{Qtd(Qt)d(Ql)}. \qquad (13)$$

$$\Rightarrow E_{(e|\ p,qt,ql)}= \frac{d(Ql)dP}{Qt} \div \frac{-d(Qt)d(Ql)}{P} = \frac{d(Ql)dP}{Qt} \times -\frac{P}{d(Qt)d(Ql)} = -\frac{Pd(Ql)dP}{Qtd(Qt)d(Ql)}. \qquad (14)$$

That is:

$$E_{(E|P,\ Qt,\ Ql)} = -\frac{Pd(Qt)d(Ql)}{QtdPd(Qt)}; \qquad (9)$$

$$E_{(E|\ P,\ Qt,Ql)} = -\frac{Pd(Qt)d(Ql)}{QtdPd(Ql)}; \qquad (10)$$

$$E_{(E|\ P,\ Qt,Ql)} = -\frac{P\,d(Qt)dP}{Qtd(Qt)d(Ql)}; \qquad (13)$$

$$E_{(E|\ P,\ Qt,Ql)} = -\frac{Pd(Ql)dP}{Qtd(Qt)d(Ql)}; \qquad (14)$$

Taking the (9) as the sample one for the proof of the first possibility, Let,

$$E_{(E|P,\ Qt,\ Ql)} = -\frac{Pd(Qt)d(Ql)}{QtdPd(Qt)} = 0$$

$$\Rightarrow -Pd(Qt)d(Ql) = 0;$$

$$\Rightarrow -P = 0;$$

$$\Rightarrow d(Qt) = 0;$$

$$\Rightarrow d(Ql) = 0.$$

All of these three functions are owning three full possibilities, they are, positive, zero or negative. Therefore none of these three functions is able to be undetermined.

$\therefore E_{(E|\ P,\ Qt,\ Ql)} = 0$ is not determined.

Now, let $E_{(E|\ p,\ qt,\ ql)} = -\frac{Pd(Qt)d(Ql)}{QtdPd(Qt)}$ be positive. And both the dominator and the numerator of the function would be changing in the same direction, so that

$$E — (-\frac{Pd(Qt)d(Ql)}{QtdPd(Qt)}) = 0; \qquad (9)$$

$\Rightarrow E(Q_t)dPd(Q_t) - (-Pd(Q_t)d(Q_l)) = 0,$

$\Rightarrow d(Q_t)\,(EQ_t\,dP - (-Pd(Q_l)) = 0$, and also $d(Q_t) = 0;$

If $d(Q_t) = 0$, then it will be the same as what we have discussed above concerning $(E = 0)$,

$d(Q_t)$ would be undetermined.

However, in the situation, as such

$\Rightarrow EQ_t\,dP - (-Pd(Q_l)) = 0,$

$\Rightarrow \frac{EQ_t dP}{Pd(Q_l)} + 1 = 0,$

$\Rightarrow \frac{EQ_t dP}{d(Q_l)} = -1.$

∴ It is contradiction by axiom 3 and axiom 4.

∵ (9) has been proved, so do all the others including (10), (13) and (14), therefore theorem 3 has been proved.

To consumers, the overall behaviours, though the price of a commodity is the dominate factor of their consideration, and their psychological responding and even their cultural economic interests measurement, they would meanwhile concern the quality of the commodity, especially when many choice and options he or she is facing in a full competitive open market, there are always at the beginning, price would be first impression among three factors, afterward, the quality would become preference. Hence, the price determination to be proved first and then the quality determination shall be proved.

Proof theorem 2,

Now, let the other four valid elasticity equations relevant to the Q_l-Q_t coordinate of the three dimensional coordinate to be shown here as well:

$$\Rightarrow E_{(e|\ p,qt,ql)} = \frac{d(Ql)dP}{Qt} \div \frac{-\,d(Qt)d(Ql)}{Ql} = \frac{d(Ql)dP}{Qt} \times -\frac{Ql}{d(Qt)d(Ql)} = -\frac{Qld(Ql)dP}{Qtd(Qt)d(Ql)}. \qquad (15)$$

$$\Rightarrow E_{(e|\ p,qt,ql)} = \frac{d(Qt)dP}{Qt} \div \frac{-\,d(Qt)d(Ql)}{Ql} = \frac{d(Qt)dP}{Qt} \times -\frac{Ql}{d(Qt)d(Ql)} = -\frac{Qld(Qt)dP}{Qtd(Qt)d(Ql)}. \qquad (16)$$

$$\Rightarrow E_{(e|p.qt.ql)} = \frac{d(Qt)d(Ql)}{Qt} \div \frac{-dPd(Ql)}{Ql} = \frac{d(Qt)d(Ql)}{Qt} \times -\frac{Ql}{dPd(Ql)} = -\frac{Qld(Qt)d(Ql)}{QtdPd(Ql)}. \qquad (12)$$

$$\Rightarrow E_{(e|p.qt.ql)} = \frac{d(Qt)d(Ql)}{Qt} \div \frac{-dPd(Qt)}{Ql} = \frac{d(Qt)d(Ql)}{Qt} \times -\frac{Ql}{dPd(Qt)} = -\frac{Qld(Qt)d(Ql)}{QtdPd(Qt)}. \qquad (11)$$

that is,

$$E_{(E|\ P,\ Qt,\ Ql)} = -\frac{Qld(Ql)dP}{Qtd(Qt)d(Ql)} \qquad (15)$$

$$E_{(E|\ P,\ Qt,\ Ql)} = -\frac{Qld(Qt)dP}{Qtd(Qt)d(Ql)} \qquad (16)$$

$$E_{(E|\ P,\ Qt,\ Ql)} = -\frac{Qld(Qt)d(Ql)}{QtdPd(Ql)} \qquad (12)$$

$$E_{(E|\ P,\ Qt,\ Ql)} = -\frac{Qld(Qt)d(Ql)}{QtdPd(Qt)} \qquad (11)$$

Let the (15) be taken as the sample for the proof, then there are only two possibilities for the consumers' elasticities that need to be considered by induction:

a. $E_{(E|\ P,\ Qt,\ Ql)} = -\frac{Qld(Ql)dP}{Qtd(Qt)d(Ql)} = 0;$

$\Rightarrow Qld(Ql)dP = 0$, then,

$\Rightarrow Q_l = 0;$

$\Rightarrow d(Ql) = 0;$

$\Rightarrow dP = 0.$

None of these three factors can be determined.

b.

$$E_{(E|\ P,\ Qt,\ Ql)} = -(-E_{(E|\ P,\ Qt,\ Ql)})$$

$$\Rightarrow \quad E_{(E|\ P,\ Qt,\ Ql)} + (-\frac{Qld(Ql)dP}{Qtd(Qt)d(Ql)}) = C;$$

$$\Rightarrow \quad E\big(Qtd(Qt)d(Ql)\big) + (-(Qld(Ql)dP)) = C(Qtd(Qt)d(Ql));$$

$$\Rightarrow \quad E\big(Qtd(Qt)d(Ql)\big) + (-Qld(Ql)dP) = C(Qtd(Qt)d(Ql));$$

$$\Rightarrow \quad E\big(Qtd(Qt)d(Ql)\big) + (-Qld(Ql)dP) - C(Qtd(Qt)d(Ql)) = 0;$$

$$\Rightarrow \ E\big(Qtd(Qt)d(Ql)\big) - C(Qtd(Qt)d(Ql)) + (-Qld(Ql)dP) = 0;$$

$\Rightarrow d(Ql)(\ EQtd(Qt) - CQtd(Qt) - QldP) = 0;$

$\Rightarrow d(Ql) = 0;$ This is undetermined.

$\Rightarrow(\ EQtd(Qt) - CQtd(Qt) - QldP) = 0;$

$\Rightarrow[(E-C)\ (Qtdt)]-QldP = 0;$

$\Rightarrow \frac{[(E-C)\ (Qtdt)]}{QldP} - 1 = 0;$

$\Rightarrow \frac{[(E-C)\ (Qtdt)]}{QldP} =$ 1. This is contradiction by axiom 3, axiom 4. Here C is a positive constant. Since the (15) has been proved, so have been (16), (12) and (11).

Theorem 3, if the price of supplying a commodity is increased, the quantity of supplying this commodity would be increase also as the quality of this commodity is remaining unchanged; vice versa, if the price of supplying a commodity is decreased, the quantity of supplying this commodity would be decreased as well as the quality of supplying this commodity is remaining unchanged.

Theorem 4, if the quality of supplying a commodity is increased, the quantity of supplying this commodity would be decreased as the price of supplying this commodity remaining unchanged; vice versa, if the quality of supplying a commodity is decreased, the quantity of supplying this commodity would be increased as the price of supplying this commodity is remaining unchanged.

Proof theorem 3 and theorem 4,

By just reversing the method of proving theorem 1 and theorem 2, theorem 3 and theorem 4 can be proved completely! for the supply functions in three dimensional coordinate have the exact same contents, elements and formation in every corresponding equation as that of the demand function, what the difference is only the sign different, when the demand function should be negative, the supply function must be positive, vice versa, as the demand function is positive, the corresponding supply function would be negative. Therefore the 4 valid equations of price determination in the three coordinate, for consumers, each one of them must be negative; conversely for suppler, each one of them must be positive; vice versa, the 4 valid equations of quality determination in the three dimensional coordinate, to consumers, each one of them is positive; conversely, to suppliers, each one of them must be negative.

Although, there would be almost no consumers would like to accept the quality of a commodity to be a dominator in their market's activities, for the quality even if is very important, however, it seems that it would a bit far from the direct concerning of the crucial elements of the goods and services in a full competitive market where the quality of a commodity almost would be very similar. The consideration of the quality is still very important for them even if at the first impression, they might not pay their much attentions, however, they would like to turn their attention from only the price consideration to meanwhile the quality consideration, especially, after a few times of experiencing those cheap commodities' malfunctions, they would like to pay more attention on the quality of the goods' or services' they would like to purchase. They would be much carefully measure the relationship between price and its quality. And these four equations have shown all the laws for evidences.

Proposition 1. If the price of a commodity has decreased, and meanwhile, its quality has increased, the quantity that consumers willing to purchase would be larger and even largest for they would feel this commodity is "cheap and good". As they have purchased this or that quantity of that commodity, they would feel better-off.

Propersition 2. If the price of a commodity has increased, and meanwhile, its qulity has decreased or even reaminded unchanged, the quantity that the consumers willing to purchase would be decreased, if they still purchaged the quantity as usual before the price decreased, they would feel gaining worse-off.

According to the theorem 3 and theorem 4, this proposition can be afirmed.

The scientific frame work of the three fundamental factors of economics has inestimable effective, functional and powerful application both for consumers and for producers in a full competitive open market. However, if any accurate application being applicable, what the first thing need to be done is working out how to calculate the elasticity of each commodity.

All of 8 valid equations are the formulas that provide a way of calculate every product's elasticity. However, in practice, more work need to be done and then actually calculation of them can be possible. According to the equations, the calculation may be actually worked out how to calculate the elasticity of each commodity in the real market situation. However, for the real function of each of commodity would be different according to the given time and given circumstance. Hence firstly working out what the actual function, either demand function or supply function, is, and then applying these functions into the equations for calculation.

Each element or factor or called, variable, in each equation is just a representative of a function of demand for a commodity or a function of a supply for a commodity. When the real demand function being worked out for this or that commodity, and then applying these functions into each valid equation to work out its elasticity either for demand elasticity or for supply elasticity.

Here, let a simple example for calculate the elasticity of a commodity be considered, such as for knives demand, that had been used by Mr. Marshall in his work <<Principles of Economics>>[43]:

Mr. Marshall displayed his consideration concerning the practical function to calculate the elasticity mainly in his two notes of the mathematics appendix, they are Note XIV and Note XV[44]. His Note XIV is general discussion about the demand and supply functions in a competitive markets (in Modern Economics jargon) and in Note XV, he gave an example, a commodity, Knives, for demonstration of the practical calculation.

We are following his ideas, and showing some examples of calculation for his sample commodity, knives, here: At the beginning, he set five functions: "Let demand equation for knives be

$$y = F(x) \quad \text{.....(1)}$$

Let the supply equation for knives be,

$$y = \Phi(x) \quad \text{.....(2)}$$

Let that for handles be

$$y = \phi_1(x) \quad \text{.....(3)}$$

Let that for blades be Type equation here.

$$y = \phi_2(x) \quad \text{.....(4)}$$

Then the demand equation for handles is

$$y = f(x) = F(x) - \phi_2(x) \quad \text{.....(5)}$$

The measure of elasticity for (5) is

$-\{\frac{xf_1(x)}{f_1(x)}\}^{-1}$, that is,

$-\{\frac{xF'(x)-x\phi_2'(x)}{f_1(x)}\}^{-1}$;

that is,

$$\{-\frac{xF'(x)}{F(x)} \bullet \frac{F(x)}{f_1(x)} + \frac{x\phi_2'(x)}{f_1(x)}\}^{-1}.''^{[44]}$$

Now, let the production function being constructed as the followings and then introduce some real figures for this function:

Let $F(x) = (px^2 + px + c) + (\beta x^2 + \beta x - d)$, here p = 1:00; c = 6; $\beta = 0.50, d = 3$;

Then $F(x) = (1 \times x^2 + 1 \times x + 6) + (0.5x^2 + 0.5\,x + 0.5\,x - 3)$;

Solve this equation, either $-\,x = ?$ or $+x = ?$ May be obtained:

If $F'(x) = [(px^2 + px + c) + (\beta x^2 + \beta x - d)]'$

$=(px^2 + px + c)' + (\beta x^2 + \beta x - d)'$

$= px + p + \beta x + \beta$

$= (p + \beta)(x + 1)$

$x = -\frac{1}{p+\beta} = ?$

By the similar way, $f_1(x) and\ also\ \phi_2(x)$ may be obtained, and then the entire equation can be solved and the elasticity can be found. It is a very straight forward method, which also the method that is usually used to find the elasticity of any commodity in the real market.

Although, Marshall's method is for his two dimensional factors' formula, but it can be directly transferred into for three dimensional factors' calculation, let this method be employed for the three dimensional factors' calculation:

Let the demand equation for knives be

$$y = F(x, z) \text{ .....(1)}$$

$$z = G(x, y) \text{.....(2)}$$

Let the supply equation for knives be

$$y = \Phi(x, z) \text{.....(3)}$$

$$z = \Omega(x, y) \text{.....(4)}$$

Let that for handles be

$$y = \phi_1(x, z) \text{.....(5)}$$

$$z = \phi_2(x, y) \text{.....(6)}$$

Let that for blades be

$$y = \phi_3(x, z) \text{.....(7)}$$

$$z = \phi_4(x, y)\text{.....(8)}$$

Then the demand equation for handles is

$$y = f_1(x, z) = F(x, z) - \phi_3(x, y)\text{.....(9)}$$

$$z = f_2(x, z) = G(x, y) - \phi_4(x, y)\text{.....(10)}$$

The measure of elasticity for (9) is

$-\{\frac{xf_1(x,z)}{f_1(x,z)}\}^{-1}$ and $-\{\frac{xf_2(x,y)}{f_2(x,y)}\}^{-1}$, that is

$-\{\frac{xF'(x,z)-x\phi_3'(x,z)}{f_1(x,z)}\}^{-1}$ and $-\{\frac{x\Omega'(x,y)-x\phi_4'(x,y)}{f_2(x,y)}\}^{-1}$

that is

$$\{-\frac{xF'(x,z)}{F(x,z)} \bullet \frac{F(x,z)}{f_1(x,z)} + \frac{x\phi_3'(x,z)}{f_1(x,z)}\}^{-1} \text{ and } \{-\frac{x\Omega'(x,y)}{\Omega(x,y)} \bullet \frac{\Omega(x,y)}{f_2(x,y)} + \frac{x\phi_4'(x,y)}{f_2(x,y)}\}^{-1}.$$

Here, (i) that $-\frac{xF'(x,y)}{F(x,y)}$, which is necessary positive, be large, and $-\frac{x\Omega'(x,y)}{\Omega(x,y)}$, is necessary negative, be small, i.e. that the elasticity would be small, it is worth for paying attention to that, due to the demand has only one curve, but not two. As being observed from different aspect, there would two function systems, one is showing the price as the dominator, another one is showing the quality as the dominator. Therefore, $-\frac{xF'(x,y)}{F(x,y)}$ and $-\frac{x\Omega'(x,y)}{\Omega(x,y)}$ have no conflict at all: one must be positive in the point of views of the two dimensions, (P, Q_t), and another must negative, in the point of view of the two dimensions of (Q_l, Q_t).

(ii) that $\phi_3'(x, z)$ be positive and large, i.e. that the supply price for blades should increase rapidly with an increase quantity ; and diminish rapidly with a diminution of the amount supplied, and that $\phi_4'(x, y)$ be negative and small, i.e. that the supply quality for blades should decrease slowly with an decreasing, and increase slowly with an increase quantity supplied.

(iii) that $\frac{F(x,z)}{f_1(x,z)}$ should be large; that is, that the price of the handles should be but a small part of the price of knives, in another expression, that $\frac{\Omega(x,y)}{f_2(x,y)}$ should be small, that is, the quality of handles should be but a quite large part of the price of knives.

How can the elasticity be calculated?

Let the demand function be constructed as followings:

$F(x, z) = \{^{px^2+qx+jz^2+c}_{\alpha z^2+\beta z+\gamma x^2+\delta x-d}$. Here,(p, q, j,$\alpha, \beta, \gamma, \delta$) are all parameters, and c, d, are constants. Solving this group of functions, x and z may be obtained.

$\Omega(x, y) = \{^{tx^{-2}+ux^{-1}+vz^{-2}+wz-e}_{\theta y^2+\rho y+\sigma x^{-1}+\tau x^2+h}$. Here, (t, u, v, w, θ, ρ, σ and τ are all parameters. And e and h are constants). Either insert the x obtained in the solution of $F(x, z)$ into the functions $\Omega(x, y)$ and then obtain y, or directly solving these two unknowns group of functions to obtain the x and y. Either way will do and do it well. In the reality, all the parameters and constants can be found or obtained through real market testing and/or investigation. Therefore, as long as the necessary variable(s) to be found, solving the production functions and obtain the values of each variable is not difficult.

Elasticity is a very important concept for scientific economics, and its three dimensional frame work could be even more profound and determinant for our later research of the entire system of scientific economics and also for the application for the entire modern economy, especially for the private ownership majority society, and the competitive open markets are the main market system. Luckily, the True God did revealed such scientific secret for us so that we may step forward one more step towards a scientific economic world. Thanks God for HIS blessing.

D. Conclusion:

Economics is a dual natures of study of human beings' biological, psychological and social behaviours.

Mr. Alfred Marshal was the mature founder of scientific economics. His two dimensional scissor analysis frame work of the complicate market phenomena in figures first time gave us a visual view to understand the complicate scientific issues of economics, which had laid down the basis frame work for the entire scientific economics.

Utility is a very important factor or element in scientific economics. However, due to its own multi-meaning natures and flexible position in the fundamental economics, it does not own full features to be a fundamental concept or factor or element in scientific economics. Quality of a commodity or of a service has its own stable and single clear and consistence meaning as a representative of real economy phenomena in the real economy, it has owned sufficient features and natures to be a necessary fundamental factor in economics. Therefore a scientific economics should have its three dimensional fundamental frame work rather than that of the two dimensions'.

In quality against the quantity two dimensional frame work, demand curve appears to be an outwards curve showing its positive elasticity features that is just opposite the corresponding supply curve that is an inward curve showing its negative elasticity features as in the two dimensional coordinate.

Through three dimensional frame work study, the demand curve in two dimensional frame work quality against quantity currying positive feature of elasticity is the exact one curve that shows its negative features of elasticity in two dimensional frame work, price against quantity. So are the supply curve in quality against quantity two dimensional frame work and that in price against quantity frame work.

Three dimensional fundamental frame work of economics is a breaking-through new research and new achievement in scientific economics. Three fundamental factors of scientific economics are price, quality and quantity. Their elasticities totally have 24 formula or say 24 elasticities according their different combinations. Among them 8 are not valid in the view of scientific economics, though in mathematics' point of view, they are a normal equations. The other 8 of them are only fitting for the rare economical phenomena, such as monopoly product with high scarcity of resource and also such as war time economy. They are not fitting for an open and full competitive market economy. There are only 8 of them are valid formulas for both of scientific economics and mathematics in an open and full competitive market economy. Four of them are price determinate direct associate with price – quantity two dimensional frame work, and four the others are quality determinant directly associate with quality – quantity frame work.

By apply these 8 elasticity formulas, the normal market demand theorems can be proved and meanwhile as well as the normal supply theorems with two basic axioms.

Although Mr. Alfred Marshal had done two dimensional frame work's calculations for the elasticity, such as demand elasticity; it is easier to variate it so that it becomes a fitting method for the three dimensional elasticities' calculation.

E, Reference:

[1] Oxford English Dictionary online version.

[2] Adam Smith <<The Wealth of Nation >>(1776)

[3] Jean Batiste Say <<Treaties on Political Economics or the Production, Distribution and Consumption of Wealth>> (1803)

[4]William Standley Javon <<A General Mathematical Theory of Political Economics>>(1862)

[5] Carl Menger

[6]Alfred Marshall <<Principles of Economics>> pp.

[7]John Stuart Mill

[8]Lionel Robbins <<Essay on the Nature and...>>

[9]Karl Marx <<Das Kapital>>(1876)

[10]YUCHUNZHONG <<HOLY BIBLE.NEW>>(2016)

[11]Alfred Marshall, Scissor's analysis

[12]YU CHUN ZHONG <<Scientific Principles of Economics>>, Manuscript

[13] Alfred Marshall <<Principles of Economics>>

[14]William Standley Javon << A General Mathematical Theory of Political Economics>>(1862)

[15]William Standley Javon, Marginal Utility

[16]David Ricardo <<Comparative advantage relative cost; fundamental explanation for gains from trade>>(1817)

[17]Jules Dupuit<<On the Measurement of Utility of Public Work>>(1844)

[18] German Economist, H.H. Gossen(1854)

[19]Alfred Marshall <<Principles of Economics>> Mathematics Appendix

[20]Alfred Marshall <<Principles of Economics>>, Mathematics Appendix, Note I

[21]William, Standley Javon's chapter in <<Exchange Theory>> pp.151

[22]Alfred Marshall<<Principles of Economics>>, Mathematics Appendix, Note II

[23]Alfred Marshall<<Principles of Economics>>, Mathematic Appendix, Note II

[24]Alfred Marshall<<Principles of Economics>>, Mathematic Appendix, Note II

[25] Alfred Marshall<<Principles of Economics>>, Mathematic Appendix, Note II

[26] Alfred Marshall<<Principles of Economics>>, Mathematic Appendix, Note II

[27]<<Oxford English Dictionary>> Online version

[28] <<Oxford English Dictionary>> Online version

[29] <<Oxford English Dictionary>> Online version

[30]Faxlex<<Financial Dictionary>> online version

[31]<<Collins Dictionary of Economics>> 4th Edition

[32]Alfred Marshall << Principles of Economics>> Mathematics Appendix Note II

[33]Alfred Marshall<<Principles of Economics>> Mathematics Appendix Note II

[34] Alfred Marshall << Principles of Economics>> Mathematics Appendix Note II

[35] Alfred Marshall << Principles of Economics>> Mathematics Appendix Note II

[36] Alfred Marshall << Principles of Economics>> Mathematics Appendix Note II

[37] Alfred Marshall << Principles of Economics>> Mathematics Appendix Note II

[38] Alfred Marshall << Principles of Economics>> Mathematics Appendix Note II

[39] Alfred Marshall << Principles of Economics>>pp.86

[40] Alfred Marshall << Principles of Economics>> pp.691, it is not the exact original drawing of the book.

[41] Alfred Marshall << Principles of Economics>> Mathematics Appendix Note XIV

[42]YU CHUN ZHONG <<Scientific Principles of Economics>>Manuscript

[43]Alfred Marshall<<Principles of Economics>> Mathematics Appendix Note XIV

[44] Alfred Marshall<<Principles of Economics>>Mathematics Appendix Note XV