

# Mathematical Models for Determining Consumer Co-Efficient in Perfect Competition

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## Abstract:

Even though it is understood that the consumer satisfaction, tastes and preferences are of ordinal measures (none physical or mathematical), there has been an effort to come up with some mathematical models (for study purposes) to evaluate the consumer co-efficient. Furthermore, the paper considers the different facets of the dynamics of demand and supply in an altogether matured market equilibrium with emphasis on the positive side of the consumer welfare. The objective of this paper is to develop a theoretical framework relevant for the analysis of consumer theory within economics. The concept is however premised on the principle of indifference curves which gives us a graphical representation of two dimensions of the consumer choice equation. Then, we demonstrate the usefulness of micro-econometric techniques to this delightfully wide range of applications old and new. Finally, we examine the relevance of expectations in a model of consumer dynamics and for making cross-industry comparisons.

Key Words: consumer, mathematical model, indifference curves, micro-econometric techniques

## 1. Brief Overview of Perfect Competition

Perfect competition may be defined as an extreme, yet manageable grand ideal in which a market is said to function perfectly. The characteristics of perfect competition are: (1) many customers and suppliers, (2) smooth or identical output, (3) free market entry or exit of firms and (4) a perfect knowledge of price and market conditions. There will always be potential sellers in the market ready to sell at the marketplace price due to the laws of supply and demand. Hence, each seller has a set of prices provided by the industry. Therefore, each firm is a price taker since it cannot be in charge of pricing the product it is selling. Within the established market circumstances the performance of each of the institutions will lead to some balance conditions being established. This balance ensures the optimal levels of satisfaction being achieved by all

individuals operating in the economic processes. At the social perspective, perfect competition is the best.

There are specific situations in which perfect competition can be said to exist. They are basic and straightforward conditions. These are assumed in order to provide an insight into the real world, so it's important to specify around what kind of competition they apply. It is very important to study such a market type, as it reveals the factors that set and the amount of output supplied to the market for each product. In other words, understanding resource allocation order under competition can be done through this theory. Hence, in perfect competition, the firm makes a guess of what the consumer would do.

## **Literature Review**

The theory of perfect competition is of fundamental importance to economics in that it shows the conditions under which markets function. A central feature of this model is the price elasticity of demand which indicates the level of consumer satisfaction in relation to the good's price in a competitive market. Grasping how consumer coefficients are derived mathematically is important for both the theory and practice of economics, as it has an impact on the policy, forecasting, as well as the management of the firm's activities. The importance of this study is that it not only improves the models of economics but also understanding of consumers which does not remain the same within different markets. There are several studies shedding light on this phenomenon that in its numerous aspects relies on consumer coefficients in the conditions of perfect competition. A number of authors have stressed the importance of the price in consumer demand and in most cases have incorporated differential equations and optimization methods in establishing models of consumers in response to prices. This is true for Marshall (1890) who began studies on how the actions of individual consumers bring about market equilibrium in cases of perfect competition.

Varian (2010) and other scholars provide advanced mathematical models which include factors such as income and substitution effects, which are important in estimating consumer surplus and welfare with respect to price change. Also, the integration of game theory with the analysis of consumer behavior offered an additional enrichment to the theoretical frameworks as it enabled the study of consumer behavior in a market setting quite fundamentally through interaction of competition forces. But, even so, there have been developments in the region but still there are the empirical gaps in current researches that require addressing. For example, most of the classical models tend to focus on the average homogeneity of the preferences of the consumers, therefore ignoring the practical real-life situations of diversity among consumers' coefficients. Hence, the scope of the

next studies would, most probably include behavioral economics to justify how people and their cognitive biases affect consumers in perfectly competitive scenarios. Further, the accelerated advancement of the digital environment and the relevance of data-based consumption additionally open a series of windows at the same time exposing new problems that need to be solved in relation to the consumers models. These transformations require adjustments of the mathematical models with respect to the online consumption habits as well as the changes in the market conditions which are hardly covered in the present literature.

We will proceed to categorize the next parts of this literature review based on the arguments presented earlier and provide a coherent discussion on the economic models of the consumer coefficients in the framework of perfect competition. First, the reader will be introduced to advances in the science of consumer behavior, and subsequently a critique of the recent approaches and techniques that emerged will be made. The review will then present papers that investigated the theoretical formulations through the empirical method, showing how those formulated equations worked in practical sense. The discussion will then in the final section focus on the existing gaps in research and possible areas for further investigation, stressing the importance of comprehensive economics to the study of consumer behavior which in most cases are often overlooked. As a result, this literature review has worked out as reconciling the two broad strands in the research area as well as providing an agenda for future studies in this niche area of economic research.

Due to the increasing sophistication of market forces, later studies started embedding more sophisticated consumer behavior such as sensitivity to price and preferences (Li H et al, 2023). By the end of the 20th century, the emergence of game theory emphasis at the strategic interactions of various actors, firms and consumers included. This viewpoint permitted building of more advanced models which were capable of portraying competitive actions especially in the markets with many sellers and buyers (Zhang W-bin, 2022). In addition, the studies pointed out the relevance of some psychological determinants for

consumers' behavior such as models capturing trust and the perceived value of a product which were otherwise not fully integrated (A Kovalenko, 2022). In the last couple of years, development of computational methods enabled the design of dynamic models which describe consumers' preferences that change overtime. These models make use of data analysis to approximate consumer behavior at different levels which makes the models more realistic in their application (Sundareswaran G et al., 2022). Be it measuring the social forces with respect to buying behavior or measuring marketing efforts in an extremely competitive industry, current studies tend to augment our comprehension through actual verification and modeling (Deng G, 2023), (Zhang J et al., 2022). Therefore, the development of mathematical models of this particular branch of the medical profession is a succession of debates transforming into real practices especially in this day and age of a highly consumptive society (Yu R et al., 2021), (Wan F et al., 2023). In a situation of monopoly competition, mathematical modeling is essential for apprehending consumer behavior. The consumer coefficient, in particular, which is in charge of communicating change on demand as a result of change in price. The connection between consumer demand and elasticity and the structure of the market has been studied in a number of different ways. For instance, the optimal pricing strategies' models provide insight into why as consumers change their tastes and levels of sensitivity, the equilibriums of the market have to move.

Such research highlights that it is important to model economic transactions while focusing on consumer's parameters' behavior to be able to forecast the final results (Collaboration E N Tessore et al., 2024), (Li H et al., 2023). Furthermore, interest in the application of frameworks such as the Stackelberg model in supply chain management explains the role of consumer coefficients to the competitive interaction mechanisms of the firms. Studies show that by a separation of green and ordinary products, the consumer green sensitivity has a positive and substantial effect on the demand and hence pricing policies of the firm (Zhang W-bin, 2022), (A Kovalenko, 2022). This calls for attention on models explaining different consumer segments' preferences that are incorporated into marketing mechanisms in the market under perfectly competitive conditions. Also, agent-based models have been employed to determine the effect of consumer learning behavior on the price competition of retailers.

Here, for different learning paradigms, the strategy of the retailers receives a new spin. Once again, there is no dearth of models to capture this behavioral variation (Sundareswaran G et al., 2022), (Deng G, 2023). The conclusions emphasize the need to study consumer willingness to respond not separately, but as a part of a bigger picture, and therefore, need further studying of these mathematical models so that the intricacy of individual conduct is well embedded, (Zhang J et al., 2022), (Yu R et al., 2021), (Wan F et al., 2023). These types of investigations help the mathematical modeling to evolve and improve consumer dynamics in competitive markets. E Hansen et al. in their research suggests 'Development of mathematical models for assessment of consumer coefficients under conditions of perfect competition is rather of qualitative nature yet different methods provide their advantages for investigation of different aspects of consumer and market behavior'; it is this evolution, which somehow explains how traditional marketing and other factors impact different models that otherwise tend to focus on consumer preferences and demands. Demand functions derived from consumer preferences are generally obtained in aggregate forms within these frameworks as in traditional models. For instance, the fused neoclassical growth models with utility theories placed the maxima utility subject to budget which maximizes utility of consumers with all commercial activities can be described by mathematical models quite a representation of (Collaboration E N Tessore et al., 2024). But some observers reasonably criticize these models for being too advanced and simplistic in the way they present assumptions about a rational actor in the market and concerning the setting itself.

Inspired by the original theories, recent research has modeled and simulated consumers using agent-based approaches; such approaches enhance understanding of how consumers' behavioral interactions take place in competitive settings. Such approaches enable modeling of pricing strategies and consumer reactions over time so that emergent behaviors that previous studies ignored can be captured (Li H et al., 2023).

In addition, fuzzy logic and genetic algorithms have also been reported to improve the forecasting ability of models. Given the nature of consumer preferences, researchers have also shown how these methods can provide more adaptive pricing in competitive markets (Zhang W-bin, 2022), (A Kovalenko, 2022). But besides metrics for prediction accuracy, these tasks also tackled interactions that come from within firms, between firms and consumers, therefore concerning

different levels of consumer responsiveness to prices in all scenarios and drawing varied outcomes in competition (Sundareswaran G et al., 2022), (Deng G, 2023). Such methodological synthesis is still deepening the investigation of consumer coefficients and therefore highlights the limitations of traditional economics and broadens the scope of economic models. The investigation of market models which seek to explore consumer coefficients under the condition of absolute competition shows a discord of conceptual models.

Walrasian equilibrium is one of the basic model which explains prices by listing consumers as rational who change their behavior accordingly and create equilibrium one where demand equals supply. (Collaboration E N Tessore et al., 2024). However, critiques point to the deficiencies in the theory that assumes consumers possess perfect knowledge and are perfectly rational. For example, some studies suggest that models that include bounded rationality and the use of heuristics can yield different outcomes with those drawn from perfect competition models (Li H et al., 2023). Citizen learning behaviors, however, considerably alter established frameworks, as does the incorporation of consumer learning behaviors into the models. The study about adaptive learning shows that consumers update their preferences in regard to what they had experienced before or what the market has to offer, which is a dynamic change to the inelastic interpretation of consumer behavior in perfect competition. (Zhang W-bin, 2022) The use of evolutionary game theory, while addressing the weaknesses of classical framework, further accentuates the fact that the behavior of consumers are much more complex than what was assumed in classical models. (A Kovalenko, 2022) What's more, this complexity involves the understanding of how consumers view the market as differentiated, viewing products differently and broadens the perspectives on how demand is viewed in the price structures.

Studies show that in the market, people have both price sensitivity and quality concerns which create an equilibrium whereby firms can react to these specific needs from the different consumers ((Sundareswaran G et al., 2022), (Deng G, 2023)). Given the widespread, most individuals will undoubtedly be in a position to illustrate that understanding the coefficients pertaining to the consumer in an allocative environment of pure competition is fundamentally a special case, and requires a variety of theoretical perspectives, from static economic models, through to more modern

behavioral economics or even evolutionary strategies approaches to the more complex aspects of the consumer decision making process 'Zhang J et al., 2022; Yu R et al., 2021; Wan F et al., 2023'.

### **1.1. Definition and Characteristics**

In its most basic sense, in perfectly competitive markets or under the assumptions of perfect competition, firms produce identical products or commodities. Many buyers and sellers exist, and none of them has the capability to dictate the price of goods. Every firm or market participant is a price taker as well, and their prices are not affected. In market equilibrium which is perfectly competitive, both buyers and sellers are price takers, meaning that they are too small relative to the size of the market and are able to change the amount of their purchases or sales without affecting the market price. This means that they do not make any efforts to influence prices, but rather accept them as they are. Buyers have the power to choose the quantity of goods they wish to purchase. Producers and suppliers make the decision on how many items to manufacture. The market is left to take care of the rest. It does not matter who the market participants are, how much they produce or consume; the same price is set for all the participants.

Every single commodity can be utilized in units and during the specific period, a certain number of these units can be seen in society. First of all, it can be stated that a good unit of a commodity can be made in several ways but the combination of respective inputs may be different. Each method can have a different cost. How a production method is perceived in any society total cost? If some resources have the same cost to many monopolies which control all the demand for a good, then they will always compete to be the lowest. Every trader will be the price setter. The components of the market will be rigid and demand by any trader has to lead to some market price. So, this is the standard factor while there are many actual or latent competitors in the market which have the same product that is being offered. The fact itself that most of the goods offered to customers are the same, helps to explain why this

thesis has a solid reason. Many of the established businesses or manufacturers outputs are considered to be fractional share that the market can afford, thus, it doesn't matter whether the goods offered are unique in any way or not. We can see price as a single factor that can lead to demand function graph for the target consumers. In these conditions, it would be most advantageous to produce large amounts of standard material such that what is offered for sale is indeed standard. In other words, the goods are in fact manufactured in such a manner that the goods are considered perfect substitutes of each other. A specified number of insurance policies or railroad tickets for instance are considered good irrespective of the seller.

### **1.2. Importance of Consumer Coefficient**

Consumer coefficient also known as the consumer sensitivity is regarded as the most important concept in perfect competition. Simply put, it is a measurement of how much customers react to fluctuations in the parameters guiding market price. Hence the rise in the prices will lead to a percentage drop in the amount demanded. Based on idea, it can be predicted that consumers will likely respond appropriately when the prices go down. Some markets are going to be efficient and simple to increase the number of consumers when the prices decrease. This theory could be utilized by any firm in a competitive market.

This theory will be useful for any marketing for firms, particularly with regards to pricing strategy, in order to capture the market. When attempting to imitate the entire market, a strategy must be implemented. Make cost simulations by also incurring price regeneration costs. A firm in perfect competition which possesses the price equation attends trade in the matured equilibrium. The highest welfare is achieved by the consumers. There is a need to put in place a system of estimating consumer satisfaction. Field studies show that estimates of the elasticity of consumer coefficients lie between  $-2.0$  –  $4.0$ . The techniques of calculating consumer coefficients apply a total difference method. It has been hypothesized that an estimation of a moving

demand curve should be applied. The consumer market has a partial equilibrium. Whole market models, for fear of one prediction, tend to take no account of other changes. The price of the commodity is of the note short run. The values of consumer's surplus and those of the consumer coefficient are expected to be achieved. In order to calculate the change values, the values of the consumer coefficient have to be given. In order to achieve the correct equilibrium, it is necessary to obtain the precise amount for movements.

### **2. Consumer Coefficient in the Classical School of Economic Thought**

The interaction of the consumers with the market forms the foundation for any economic system. As one constructs a plausible theory of consumers' behavior, the interaction process elevates the status of the consumers. These people are believed to have distinct preferences for the types of goods they purchase. Their purchasing power and the amount of property they own is represented within their budget. Apart from the consumers, the interplay of factors and the activities of the business firms also do shape the behavior of the consumers, thus the consumer problem is also quite critical to the business firm. As soon as the industry is informed of and comprehends the nature of the demand, they can then proceed to organize and forecast the corresponding output supply. Such business firms operate against these competing appetites, and this has increased the relevance of the consumer's study.

A specific way of how the consumer uses money is the demand schedule or the demand equation for the consumer. The consumers combine their preferences and their budget in determining the quantity of a particular product. When speaking of consumer demand, it is understood that preferences and income remain fixed. A small change in the price of a commodity could bring about a drastic change in the demand or vice versa. The intensity of this change is referred to as the price elasticity of demand. In a completely competitive market, the consumer coefficient is also relevant. The price that the seller takes in a perfectly competitive market is said to be fixed,

because an increase of the price above this level will cause all customers to be lost. An understanding of consumer behavior is critical for a business manager looking to the future. It is what ultimately dictates how the manager will survive, grow and make profits. All consumers or buyers in this ideal market are in totality rational, are aware of the market situation, alternatives as to the time and place of the purchase, and the vastness of the world of knowledge.

This consumption theory placing emphasis on individualism, further states that people will tend to garner those factors of production which will suit their needs best. In addition, it is also taken for granted that consumers are well aware of the pricing of each and every item and having an idea about their income, think through their decisions, and hence avoid glitches of any kind.

### **2.1. Conceptual Framework**

The analysis of the consumer coefficients in this case presupposes that the market structure is competitive in its purest form. The market structure constitutes the market conditions, consumer behavior, producer behavior, resources and the market as an interacting transactional system. While the consumer is seeking to maximize satisfaction, he is also seeking to minimize cost. As such, maximum satisfaction usually results in demand for more goods or services and satisfaction or utility is expected in return. Consequently, every time he visits the market, his goal is to get the highest level of satisfaction or utility possible. His utility is solely dependent on his preferences and the amount of money that he has. So in this case, the consumer may apply more than one set of consumption equilibrium of the same commodity, or, assuming certain preferences and the level of income, be driven to the single equilibrium.

Economic theory is made up of a certain set of economic theories related to consumer's behavior. In this regard, it assists when making choices of what goods and services to consume based on limited resources. Its expansion can be attributed to the use of some demand functions and the consumer problem in completely ordered partial

differential calculus. The variations in the equilibrium quantities of the commodities effectively exchanged depend on the consumer's routing. There is a deep consideration of a well-informed and logical person which is used to assess the applicability of the actual world in such a situation. From the examination of a rational consumer, it is suggested that preferences and the law of diminishing marginal utility are the aspects of the study of consumer behavior. The consumer aims mainly at the maximization of the utility gained from the consumption of the commodities. All things considered, satisfaction and purchasing power on the other hand will be easy to establish looking at the propensity to spend some money. The above outline corresponds with the following points: that the operation of all consumers will reflect a rational act. The use of the cross consumption multiplier will resolve in equilibrium quantities of corporate consumption.

Here, the relative income of the consumer will also be recovered in a direct ratio to the amount of marginal utility of the purchased commodities. The said framework considers all possibilities of realignment where the marginal utility of consumer's earnings is such as combinations and ratios of commodities, and so forth, meaning that any alterations in the commodities will be transcribed in the ratios into the law of the framework.

In competitive party exchanges where interaction is free with little or no interference, a consumer sticks to equilibrium which he originally chose with regard to the goods in question. In fact, economists can also propose that in practice, such equilibrium is actually reached in small easy steps, which we observe is the first derivative test of maxima and minima in calculus. But this theoretical framework brings us now to the principle of indifference curves, which also allows us to graphically represent the consumer choice equation in two-dimensions. What do the consumers buy and why? The consumers' preferences and choices are often determined by the transactions or purchases in the market during a particular time frame. The preferences are always changing either to the positive or the

negative levels due to advertisement, income, and credit facilities. Also, preferences change due to changing tastes and fashions, habits, or even health. The preferences require certain skills to deviate from the usual reliance of the indifference curves.

## **2.2. Relevance with Perfect Competitors Responding to Perfectly Elastic Demand**

It is arguably acceptable to make certain conclusions about the transformations which this consumer coefficient undergoes in the conditions of perfect competition. In the first place, the coefficient reflects the change in the demand that may be expected from the introduction of a price within a given competitive market. Secondly, the coefficient is also shown to, in conjunction with its scale, under conditions of competition determine the price of the competitive equilibrium quantity supplied. Isolated product markets faces some limits on the increase of demand while decreasing the price. When the demand curve in product markets is inelastic, then the consumer coefficient in respect to this product will not be more than 1.0. It follows that a less inelastic demand curve would lead to greater C values.

Hence it can be understood that one practical application of measuring consumer coefficients could be in checking for contemporaneous coefficients to see the economies that are likely to suffer from the improvements made by demand elasticity comparison. Demonstrating Hamiltonian changes to the coefficients we have been mentioning the existence of once the elasticity of price and income in the demand of a given individual product has been clearly evidenced serves as a further use of proceedings. Finally, coming back to the considerations which the consumer coefficients focuses also relates to the structural weakness in the economic market models base estimation entirely based on perfect competition situation. In a case where the market posses certain monopoly characteristics, the predetermined price eliminates the full use of coefficient estimates in the absorption side.

## **3. Mathematical Models for Determining Consumer Coefficient**

In economic literature, many papers with different mathematical models have been used to determine the consumers' coefficient. Well, these models are just different ways of representing figures of a set of people's expenditure on commodities in a mathematical algebra. Certainly, it is not possible to have actual empirical results in the discussion of economic terms like the indifference curve and the budget line if some randomly selected conditions are placed. Nonetheless, in the circumstance where the consumer coefficient is supposed to be part of some multiplicative type dependency model, then it is logical that the relationships of certain factorial variables like price, income and sales promotion to the average dependency variable, i.e. purchase or redemption demand, should be stated in functional terms. The construction of this functional relationship will be with the aid of economic principles and the psychology of the consumer. It may further emphasize that, it is the inclusion of the consumer coefficient in the demand prediction equation that assists in converting the nature of the consumer into income and substitution effects, but in the case of a substitutive product like the mutual funds, it is not necessary because schemes are competing against each other to be held by an individual.

Previously, it has been recalled that in relation to a commodity, there is a need to predict consumers' expenditure. Also, the forecasting of demand in regard to an industry of consumers also involves forecasting of their behavior with respect to a number of variables. Here comes into the picture the significance of some mathematical model. There is a solution to the question posed above by making use of the mathematical relationship. With such tools, it is possible for the authorities of a country so utilizing the model as to predict appropriately and with certainty the demand for the commodity in question for some foreseeable future. Because the model is nothing but a mathematical formulation of the actual situation, it is bound to have certain assumptions. Theoretical models have been developed from a conceptual viewpoint which enables them to predict actual occurrences and the interactions between real variables. The

construction of the model is achieved by means of analogy and logical inference from the general and particular, already discussed, axiomatic features of consumer behavior. Each one of the proposed mathematical model has a theoretical approach towards the problem which is formulated. Some of the consumer behaviors which were logically expected to take place in the earlier sections of this chapter find their mathematical images in the models considered.

### **3.1. Linear Demand Function Approach:**

The approach that is most frequently used and easiest of all is the linear demand function which can be applied in estimating the coefficient of consumers' surplus. In fact, the linear demand function is the most straightforward because it is the most popular and used by many people as the equations that relate to the demand curve can be easily arrived at through estimations. The major reason, however, is quite a different one, the very fact that it is so simple that there are great advantages from a mathematical standpoint. The elasticity of demand can also be derived with ease from a linear demand function. The linear demand function can be expressed in this way:  $Q_d = a + bP$ . This is the systematic way of writing the demand equation in which  $Q_d$  is the variable of interest,  $a$  is a constant, and  $b$  is a figure that describes the steepness of the graph. Linear demand function posits that the relationship between the price and the quantity demanded is that the quantity demanded varies linearly with the price. For the linear demand function, the equation's 'a' term refers to the value of demand when the price goes to zero. 'b' represents the steepness of the straight-line demand function which indicates the amount of the good that is demanded when the price of the good changes.

If the value of 'b' is negative, then it means high prices result in low quantity demanded and negative slope demand curves have a negative slope. It shows that price and quantity demanded are inversely related. On the other hand, when 'b' is positive, the demand curve becomes positively sloped and the quantity demanded will also rise as price increases. The intercept term also partly tells us about the level of the elasticity or inelasticity of the demand curve. Elasticity can also be defined as the ratio of an infinitesimal change in the dependent variable to a small change in the independent variable: in this case, the price. Such a definition is represented in this case as change in quantity over change in price. As the slope of the demand function is constant to its counterparts, it's

important to note that the price elasticity of demand will also be constant across a straight line or linear demand function. If the price is linear, the same situation would apply.  $b$  bears a figurative in terms of more negative that particular demand in disequilibrium would be more elastic. There are many advantages and limitations to linear demand models and even if the assumptions in reality are unrealistic they have been used extensively for testing consumers' responsiveness towards the product.

In conducting market preferences, two main components of consumption are usually evaluated: the coefficient of price as one factor and the constant as another. The constant in the equation of demand is usually referred to as the consumer coefficient and has a negative sign.

### **3.2. Cobb-Douglas Utility Function Summary**

The most frequently used model for deriving consumer coefficients is the Cobb-Douglas function. This function has proved a flexible mathematical form to exhibit various degrees of elasticity between the demand for different goods. One of the distinctions of the Cobb-Douglas utility function is that it is a cardinal utility function which possesses characteristics of the well-known Leontief utility function. Two characteristics that are exhibited by the Cobb-Douglas utility function are: exhibition of proportionate relation and demonstration of diminishing marginal rate of substitution (MRS). It is claimed that the utility from Cobb-Douglas can approximate the way consumers spend their income on different goods. It illustrates the various options the consumer has to exercise in the distribution of income and also in the purchase of various goods types. It also depicts the preferences of the consumers for the types of goods and services constituting the consumption basket. The Cobb-Douglas function has its elasticity not in the relative descriptions of the consumers choice but how the trade offs are across the different goods.

The coefficients  $a$  and  $b$  in the Cobb-Douglas utility function capture the consumer's tastes for good  $x$  and good  $y$  respectively. An increment in the value of any parameter like  $\alpha$  translates to the amount the buyer favors good  $x$  as relative to good  $y$ , and an increment in  $\beta$  means the vice versa. Also, the value of  $\alpha$  is greater than unity, which dislocates the proportionate in favor of  $x$ . Also, the above formula shows that the value of elasticity of substitution,  $\sigma$ , in the Cobb-Douglas utility function is a unique constant, which leads the MRS to decline in an exponential

manner. Besides these constraints, the ease with which consumers are able to replace one good by another and vice versa can be described by the constant parameter  $\sigma$ . The parameters order could also be reversed in that a large value for  $\sigma$  means that consumers find it difficult to make this sort of substitution. In other words, the larger the value of  $\sigma$ , the less substitutable the two goods are in nature. A consumer is said to be in a state of maximum satisfaction if after employing all the resources at his disposal, the consumer still can have some quantity of the goods or services which are not readily available.

Further, it analyzes the market of mixed goods and services where long-run equilibrium prevails and assumption of perfect competition is applicable. A consumer's actions conform with the purpose of consumption which is to maximize satisfaction. The consumer is therefore said to be rational if he chooses consumption in such a combination that facilitates the highest level of indifference curve along the goods. The scheme in which a single click combines all goods is that of a consumer who is a rationalist who does everything as economically as possible. The number of goods a consumer mixes tells how scarce these goods are. To an average consumer however completely different inert goods will be the most productive. A number of economists have applied this Cobb-Douglas utility function and obtained various empirical results from this function and others alter how they measure the efficiency of its application by scale returns. As it has a fixed MRS, thus elasticity of demand has always been 1 (unit).

The elasticity of demand of commodities is mainly determined by these along with income and pricing. Of the two situations that arise here, the share of these two in income suggests that the demand for these two categories of goods is quite inelastic. The weakness of the Cobb-Douglas utility function, however, is the fact that it is an unrealistic function because some commodities exhibit a certain characteristic that overrides the diminishing marginal rate of substitution which in this case is the use of quinine to the real marginal rate of substitution of which is 0.0. This limitation is further aggravated by the view of the two goods  $x$  and  $y$  such as in as being discrete; meaning it is possible to buy or sell a fraction of a kilo or a fraction of a meter of the goods  $x$  and  $y$ . Furthermore, the form is limited, since it applies

to good for which income and prices are the sole determinants of consumer choice. Nevertheless, the statistical work confirmed the model to be applicable since the choice data were linear. Lastly, the demand schedules that are formed from this type of model are one of many demand schedules formed from a similar model that best fit the data demand schedules.

#### **4. Empirical Studies and Applications**

Over the bit later, many empirical studies emerged with the content of the coefficients of consumer, the consumer's surplus and the elasticity, which were predominantly based on the theory. At first, though, most attention of the economists was to the consumer's surplus. Daily, among the classical economists, was perhaps the first in history who, in his works, used consumers' surplus as a measuring rod. Later on, different initiatives were undertaken to ground the pure theoretical notion on empirical data. Consequently, forecasts about the coefficients of the consumer, the elasticities of the consumer and the consumer surplus were made in approximate amounts. There was a prevailing opinion that it is possible to derive the terms for the consumers' coefficient through normal economic techniques of a number of estimation of the problems such as the use of regression, but to relate the consumers' surplus as such to these methods is an impossible task. The available works, which applied the methods on the collected data, had problems with the consumer's surplus but not so much with the consumers' coefficients since the latter turned out to be much easier than the consumers' surplus.

While we have previously treated employed data from a focus group in a case, in this case, a complete population of consumers was used to estimate saying both the simple and the surplus modified demand curves. Arguments regarding this issue tend to be rather skeptical, as they question the stance, taken by the mainstream economists, which assumes that there is a consistent price change when there is a change in the quantity demanded, linking to the debate on boom and bust. Most of these practical

evaluations and the numerical evaluations of theory contemplate workable and sanitized 'shadows' of general theory, and how these negative effects place the classical uniform competitive economy in pole position as the most effective controlling mechanism. Successful estimate was obtained for the readiness of the "potential consumer" for the maximum degree of sacrifice within the frame of total war effort. The consumers' cooperative is given other numerous useful applications. Such citations do, however, represent only some of the many works that are typically placed under the title of empirical or applied economics, which employ the idea of the consumers' coefficient derived from the theory of value of competitive capitalism. More recently, in the context of dumping issues and discussions about this issue in market practice, the proposal was put forward to extend competitive theory to proposals of imperfect competition.

As a rule, the end result of manufacturing a product is more than what the physical needs and wants of mankind are. It means that the society in question intentionally establishes the proportionate degrees of the discomforts that are required in the implementation of the economic strategy in terms of utilizing the productive forces and the means available to the society in question, in the diversification of productive activities which imparts to the overcharged product the characteristic taste of the local market.

#### **4.1. Case Studies in Different Industries**

We demonstrate the measurement in a number of different industries how it is essential to integrate expectations into a model of consumer behavior. The relevance of the micro-econometric techniques to a number of including both classical and contemporary applications is demonstrated. The different choice of application purpose for each industry is determined by the different aspects of consumer behavior that each series is intended to explore. They are meant to be taken in sum rather than separately. This time, we start with gasoline, which is a standard simple application but one that illustrates well the use of the techniques in relation to a rather simple

problem. We then go on to focus on the elderly and sick market, which is a completely different type of market that is more complicated and illustrates a number of other inadequacies. Then we go through some additional work that was done recently with the intention of providing further evidence on how consumers form expectations looking at vices and cars. In practice, we always begin and end in the same way. We begin explaining how we as a method first tackle the data issues. This includes market or the product described in the case.

Furthermore, basic statistics related to the past and the present situation in the market, such as price changes, market concentration, or the price of an average product, will be provided to help the readers understand the scope of the study carried out. The authors then, as one might expect, examine in greater depth the gathering of consumers' patterns over time. They then introduce and detail their research style which helps to map importance in their use of modeling techniques. After thinking it through, we then present the econometric estimation that we've relied upon in examining the issues raised. Having set out our approaches, special attention is paid to the consumer dynamics modeling, as well as inter-industry comparisons. We include limitations in this work, as well as opportunities for subsequent activities.

Mathematical models which allowed us to establish the consumer co-efficient under conditions of perfect competition market have also drawn our attention. As we shall see later in the results of this policy, the level of consumer activities and the consumer coefficient is one of the most important and perhaps the most dominant variables in the structured competitive markets. It has been stated before in a different political economy related work that such policy interventions achieve market efficiency but are also able to elicit certain consumer behavior. An orderly commercial adjustment, apparently, could take place in an effective manner when price reactions were instant or in the economic short run, flash-like. The literature revealed that  $0 < I < 1$ . It has been suggested in a private conversation that the conditions, both  $I = 0$  (zero) and  $I = 1$ , where such occurs have not yet been axiomatized. The classification of markets according

to consumers behavior has been established by earlier literature.

One of the limitations in the study is that we could not incorporate a number of previous similar studies such as how consumers respond to different price strategies. We provide below four research questions surrounding aspects that we chose to ignore. RQ2: RQ2: What is the response of consumers in welfare programs such as co-production or marketing for social welfare in the case of mixed markets: public education versus. private education or private water utilities versus. non-profit organizations? Are consumers themselves in the markets perceived as segmented, contestable or monopoly markets? With the proliferation and spread of smart meters and big data/informatics that are gradually being deployed for real time demand and dynamic pricing, how will consumer coefficients get re-estimated in the digital economy? Future dynamic markets which are still at the incubation stage, go beyond dynamic pricing mechanisms by including marketing concept in which a firm utilizes direct and indirect marketing of its products and services. In the digital economy, there will be a progressive change in the consumers in the market as the firm changes in its product and the value of use/ experience of the product changes as well.

### **5. Conclusion and Future Research Directions**

However, in order to match the constantly varying value to the appropriate consumer, dynamic markets that seek to address the digital economies of the future must disintegrate the market into the number of current and potential segment. The concept of value differs from market to market for a product and towards this end, the firm requires a set of influenced by consumer coefficient, which is unique for each market segment  $i$  and enables a more precise assessment of consumer coefficient,  $v_i$  not simply a few increase in  $\rho$ . The conclusions derived inductively in the area of the analysis of this essay can also be more straightforward within the border of the most related disciplines of economics if we were able to borrow such a construction or such a model as the time-consumption response function equilibrium setting which was used to expose different market structures. Most future related efforts ought to refund, at least partially, resources spent for the development of this broader theoretical framework. However, as with all things complex, such theories require empirical validation and innovation. The next research program which has

not been fully exploited in this manner is time series and econometric testing.

While other time series models that do not return or the mean consumer matrix exist, it would be worthwhile considering given the future growth in econometric. As seen in welfare programs, policymakers use consumer's co-efficient as resource allocation in a harsh economy. An extension of the consumer co-efficient derived is that a firm can know which portions of the market are rapidly drifting towards market demand due to shifts in consumer choices or how to incorporate the idea of consumer co-efficient in the earlier work on consumer response to mixed models. Such a proper theory should be established and scrutinized or otherwise, inefficiency will follow.

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