Economics
2014; 3(1): 9-18
Published online June 10, 2014 (http://www.sciencepublishinggroup.com/j/eco)
doi: 10.11648/j.eco.20140301.12

The theory of time, information and money in a competitive market

Percival S. Gabriel

Faculty of History and International Studies, University of the East, 2219 C. M. Recto Ave., Manila, Philippines

Email address:
profpercivalgabriel@yahoo.com

To cite this article:
Percival S. Gabriel. The Theory of Time, Information and Money in a Competitive Market. *Economics.* Vol. 3, No. 1, 2014, pp. 9-18.
doi: 10.11648/j.eco.20140301.12

Abstract: The aim of this paper is to introduce a theory of competition that incorporates three variables namely the prices of the commodities, the cost of switching to competitive products, the time it takes to switch to competitive products and the amount of information available that would cause consumers to make the switch. The argument of this paper is that, simple plurality of producers and sellers in the market does not make for competition. Even if many producers or sellers selling homogenous products are operating in the market, competition would still be non-existent if buyers would not have equal access to the competing products that they sell. Equal access would permit each competing product to be equally selected if not bought. Normally, a perfectly working competitive market would indicate that all available products in the market would have equal probabilities of getting selected. That is, products would have a probability of 1/n each. With this assumption, the other aim of this paper is to combine the three variables into a single coefficient and since it is assumed that the prices of commodities, cost of switching, convenience to switch as indicated by the time and the amount of information available at the time of switching can affect the chances of commodities' selection, then the coefficient can be multiplied with their probabilities to indicate the decrease or increase in the chances of their selection. The last aim of the paper is to combine all these probabilities in order to measure the degree of competition.
JEL Classification: D40, D11, D21

Keywords: Infrastructure for Competition, Price-Cost Ratio, Time Ratio, Information Ratio, Selection Coefficient, Competition Index, Adjusted Probability, Unified Line

1. Introduction

The neo-classical economic tradition has spurred the idea that margins govern economic decisions for both producers and consumers. While Alfred Marshall came up with the graphical intersection of the supply and demand curve to characterize the dynamics of the market [1], competition is explained as to the behavior of the firm using the intersection of the marginal revenue and marginal cost. But competition is characterized predominantly with the emphasis on the supplier. It is a *ceteris paribus* that consumers are price-takers without imbedding the consumer on the analytical tool of the supplier's behavior acting as maximizer of revenue and minimizer of cost.

Even the primary assumption of perfect competition stops at the idea of multiple sellers in the market and that they have the freedom to enter and exit the market. This does not only place the supplier in a predominant position in the analysis, it also defeats the position of the buyers in terms of access to what they supply. Suppose there are three suppliers spread far apart from each other. The farther they are located, the more inaccessible the buyer would be to switch from one supplier who would even sell relatively the same product. Without access, a seller would even dictate his or her own price as he or she wishes without consideration to the seller located a little far away. But if sellers are located close to each other and buyers can easily switch from one seller to another, no seller would have the utmost freedom to dictate his or her own price without considering the other suppliers because buyers can move to another supplier of a lower price.

This paper will try to bridge the gap in explaining competition with the Theory of Time Information and Money while exploring the idea that competition among products exists because they have equal probabilities of getting selected. This paper argues that multiplicity of suppliers and sellers does not simply make for competition but the equal chances that competing products would get

selected do. Likewise, the idea that competing products would obtain equal probabilities of getting chosen is because of the convenience that consumers enjoy to switch from one competing product to another. Such convenience is governed by three elements which the theory incorporates namely the price of the product and the cost of switching to another product, the time it takes to make the switch and the amount of information available in order to switch to another competing product. In this way, competition can be measured using competition index and the behavior of the firm unified into it. This paper, therefore, has four aims, a) to present the dynamics of the three elements of competition in their ratios, b) to combine these ratios into a coefficient. Since it is assumed that these three elements affect the probability of selecting competing products, it is the aim of this paper c) to show how this coefficient could affect the probability of each product to get selected by multiplying their probabilities with the resulting coefficient, and d) to measure competition by combining all these resulting probabilities as affected by the coefficient of price, cost of switching, time to switch and amount of information available.

2. Review of Theories

Perfect competition has been well covered among the neo-classical literature based on the behavior of the firm on the supply side of the market. The whole theme actually is production efficiency. Perfect competition operates within Pareto optimality or efficiency of competitive equilibrium [1]. "Because in any competitive equilibrium with production, the competitive price is equal to the short-run marginal cost of each firm (and in any long-run equilibrium, price is equal to long-run marginal cost), no further gains from trade are possible. No customer is willing to pay what it costs any firm to produce an additional unit of output" [2].

The question for any producer is how many of these products will he or she produce and at what price would he or she have to offer the product in order to maximize returns. The idea goes around full circle for if you multiply the quantity of products to be produced and the price for which they would be sold considering that they would all be bought would result in the producer's returns. Since the marginal revenue equals the price, then the cardinal answer lies at the intersection of marginal cost and marginal revenue in order to arrive at the quantity of products to be produced. The firm would not produce less than the derived quantity nor more than that since no excessive returns would be gained. Firms in perfect competition, therefore, are efficient in its production.

But perfect competition only materializes in a Walrasian auctioneer that would mimic perfect competition among consumers that are price takers when there are numerous insignificant buyers and sellers to affect the quantity and price in the market aside from the existence of perfect information [2]. Hardly does this happen in real life. Samuelson and Nordhaus [3] identified the determinants of imperfect competition to be that of cost, barriers to competition and strategic interaction. Chamberlin advanced his Theory of Monopolistic Competition where he argued that the market either behaves in a perfect competition or monopoly. He postulated an imperfectly competitive market consisting of a number of smaller markets, each being characterized by a seller's monopoly which is imperfectly isolated from the others [4]. Chamberlin proposed two types of markets in an imperfect competition which Copeland named the genus and species market with two demand curves.

"The extent of divergence of these two demand curves is a reflection of the effectiveness of competition, perfect competition appearing as a limiting case in which the species demand curve is horizontal. In other limiting case absolute monopoly so far as the genus under consideration is concerned, the two curves coincide. When selling costs are introduced, two types of cost curves are found necessary, too, analogous to the two demand curves. Thus for a given price, the species selling-cost-per-unit curve assumes the selling costs of the competing monopolies constant; the average genus selling-cost-per-unit curve assumes the same sales cost by each seller in the genus market" [4].

The Theory of Perfect Competition can be considered theory of production while Chamberlin considered the Theory of Monopolistic Competition as the theory of distribution. While Chamberlin hinted on the gap of the Theory of Perfect Competition by introducing the side of the seller, still the focus of competition is on the supplier. This paper, however, argues that it is first and foremost the kind of products that are in competition and the infrastructure for competition that would suggest the kind of competition that firms engage in. The infrastructure for competition would place competition on the consumer's side rather than on the supplier's arena. The infrastructure for competition would imply the convenience of consumers to switch to another competing product because it incurs them very minimal cost and time and equips them with the essential information to make the switch.

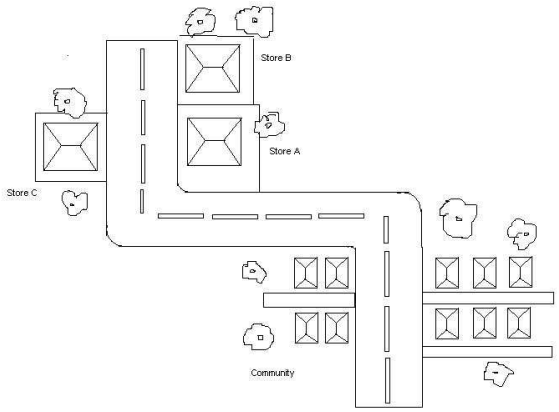

Figure 1. *Suppliers located close to each other.*

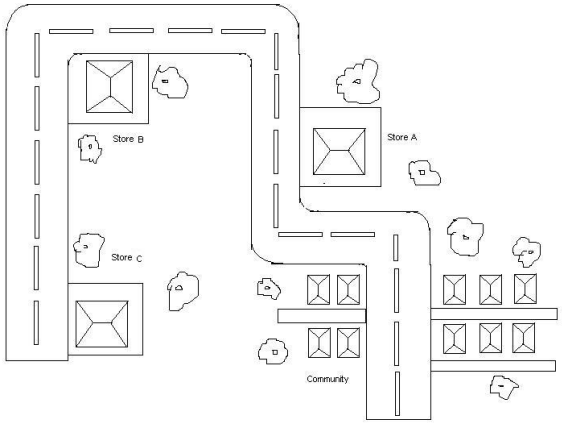

Figure 2. *Suppliers located far from each other.*

Consider stores which are spaced close to each other (Figure 1). If a buyer, originating from the community, would travel to buy from Store A which is selling a certain product and would like to switch to another homogenous product which Store B sells and still would like to explore Store C for its relatively the same product that it sells, switching entails hardly any cost and extra time. The situation is entirely different from that of Figure 2 where stores are located far away from each other. Switching from Store A to B to C would entail extra cost and time. It is for this reason that prices of commodities in Figure 1 may likely be the same, for buyers would have the means to switch from one seller to another at no extra cost and time unlike in Figure 2.This paper then introduces the Theory of Time, Information and Money.

3. The Theory

The theory of time, information and money is a theory of competitive market which assumes that a market is marked with competition if similar or slightly dissimilar yet competing commodities ($X_{1...n}$) in the market have more or less equal probabilities ($P_{X1...n}$) of getting selected. Competition in the market, therefore, is a condition where homogenous or slightly heterogeneous products in competition have more or less equal chances of getting chosen if not bought. The theory further assumes that competition is governed by three elements which can be called infrastructure for competition. These are: a) price-cost ratio which illustrates the minimal cost of transferring to another product; b) time ratio which illustrates the convenience of transferring to another product at very minimal time, and c) information ratio which provides the availability of information to select the other product. Competition, then, can be measured through Competition Index which can be defined as the determinant of all adjusted probabilities ($P'_{x1...n}$) that homogenous or slightly heterogeneous yet competing products ($X_{1...n}$) which are available in the market would have their chances of being selected.

$$P_{X1} = P_{X1+1} = P_{X1+...n}$$

Where:

P = Probability of being chosen

X = Subscript referring to the product

The theory unifies the supply-side behavior of the firm in perfect, oligopolistic or monopolistic competition with the demand-side behavior in distribution if the conditions of price-cost, time and information ratios produce more or less equal chances for products to be selected. While the theory of perfect competition assumes that consumers are price-takers, the theory of time, information and money can explain why. The reason why consumers become price-takers in a perfectly competitive market is because, it is convenient for them to switch to another competitive product, that is, it incurs them less cost and time to select any competing product they prefer and substantial information is available. This makes the probability of selecting the other product also the same as the one being considered.

Competition is composed of three elements: a) price-cost ratio, b) time ratio and c) information ratio.

3.1. Price-cost Ratio

Equal prices or zero price differential marks perfect competition.

$$L_{X1} = L_{X1+1} = L_{X1+...n}$$

Where:

L = Price of commodity

X = Subscript referring to the product

This means that a buyer can grab any competing commodity and give the commodity equal chance of being selected. A buyer of a commodity, however, does not only bring an equal amount of money to the price of the commodity which he or she chooses to purchase. He or she provides additional money to cover for the cost of purchase (Cp) in order to buy the commodity. For example a buyer would need to provide a certain amount of money for his or her fare to go to the store to buy a commodity. This is the cost of purchase. A buyer, therefore, should carry with him or her a minimum budget equal to the price of the commodity and the cost of purchase.

$$Cp + L = Budget$$

Where:

Cp = Cost of purchase

L = Price of commodity

But the consumer who goes on one store to buy the commodity with the price Lp may opt to switch to another homogenous or slightly differentiated commodity with price Ls but with the additional cost or cost of switching (Cs) in order to go to the next store. In order to facilitate the switch from one homogenous commodity to another, the cost of switching (Cs) should be less than the cost of purchase (Cp) or that the cost of switching is equal to zero.

$$Cs>Cp \text{ or } Cs = 0$$

Where:
Cp = Cost of purchase
Cs = Cost of switching

A consumer, therefore, may be enticed to switch to another homogenous or slightly heterogeneous product if after adding an additional cost or cost of switching to the budget and price, the sum would still be less than the price and cost of purchase of the product at initial purchase. This would mean that the price of the other homogenous product or the cost of switching is very minimal and even after switching would incur the buyer considerable savings.

$$Cp + Ls + Cs > Cp + Lp$$

Where:
Lp = Price of commodity initially being purchased
Ls = Price of the homogenous or slightly heterogeneous commodity being switched to

Thus if the other homogenous or slightly heterogeneous commodity can be purchased in a different site that a cost of switching can be incurred, the price of the next homogenous or slightly heterogeneous commodity should be commensurately lower upon adding the cost of switching, so it can have an equal chance of being selected. Switching to another product happens at the point where a consumer is at the event of making a purchase and the reference to the switch is when the consumer is located at the point of purchase.

The Price-Cost ratio (G) is the proportion of the average cost of purchasing (Cp) a commodity and its price (Lp) which accounts for the initial budget of the buyer over the cost of purchasing (Cp) the initial commodity added to price of the commodity preferred to be switched (Ls) and the cost of switching to it (Cs).

It would be argued, however, that the cost of purchase is relative to every consumer considering the origin of the consumer or other circumstances that consumers are in. In order to generalize the cost of purchase, the average is determined among the consumers who buy the commodity. The cost of switching does not need to be averaged since the distance of stores to be switched does not vary or other fees that consumers need to pay would be the same for other consumers.

$$_{Xp}G_{Xsn} = Cp + Lp \,/\, Cp + Ls + Cs$$

Where:
G = Price-Cost ratio
Lp = Price of commodity initially being purchased
Ls = Price of the homogenous or slightly heterogeneous commodity being switched to
Cp = Cost of purchase or the average cost of purchase
Cs = Cost of switching
Xp = Subscript for the product of initial purchase
Xsn= Subscript for the product to switch to

3.2. Time Ratio

A buyer does not only use money to buy a commodity; he or she consumes time to purchase it. Initially, a buyer who goes to a store has already used up a Time of Purchase (Tp) but upon examining one commodity of a certain price, he or she may decide to look for another homogenous or slightly heterogeneous product which would incur him or her additional Time of Switching (Ts).

$$Tp > Ts$$

Where:
Tp = Time of purchase
Ts = Time of switching

Since everything moves in time as Albert Einstein's Theory of Relativity claims making zero time relative, then the moment we set out a buying activity, we use time though how small a fraction it would be. Therefore, perfect competition is achieved if the time to switch from one commodity to another homogenous or slightly heterogeneous product is relatively very small. This way, switching to another competing commodity is not an inconvenience and the products would have equal chances of getting selected.

Time ratio (S) is the proportion of the average time of purchasing (Tp) an initially preferred commodity over the time of switching (Ts) to another homogenous or slightly heterogeneous product.

The time of purchase, however, is also relative to every consumer depending upon each consumer's origin. In order to generalize the time of purchase, the variable is averaged unlike the cost of switching which is the same for every circumstance since the distance of stores are the same.

$$_{Xp}S_{Xsn} = Tp \,/ Tp + Ts$$

Where:
S = Time ratio
Tp = Time of purchase or average time of purchase
Ts = Time of switching
Xp = Subscript for the product of initial purchase
Xsn= Subscript for the product to switch to

3.3. Information Ratio

Homogenous commodities can only have equal chances of getting selected if a buyer is equipped with a minimum amount of information for him or her to make the switch. Otherwise, he or she would just be content with the initial commodity he or she had the chance to get hold of. In order to make the switch, a buyer should be armed with the following pieces of information:

1. The buyer knows there is a commodity to switch to
2. The buyer knows the store where it can be purchased
3. The buyer knows how to get there
4. The buyer knows how much it would cost him or her to get there
5. The buyer knows its price or hinted with the estimate of its price
6. The buyer knows the competitive promise of the other commodity

A buyer who does not know that another homogenous product exists will be content with the product he or she had the initial chance to grab. If he or she knows that the alternative product exists but does not know the store where it could be purchased, then he or she would wander around looking for it, thus increasing the cost of switching and spending more time to switch. If a buyer knows the store but does not know how to get there, then he or she would be increasing the time of switching. If he or she knows how to get there but does not know how much it would cost him or her to get there, then he or she may increase his or her cost of switching and even the time of switching to it. Since a consumer is presumed to be a price-taker, then a hint of the price is also necessary to consider if he or she wishes to switch to another product. Given these bits of information to enable the consumer to switch to another product, a consumer would all the more be enticed to switch to it if he or she is informed of the promise or the unique qualities that the alternative product may have against its competitor.

Perfect competition, therefore, is achieved if all six bits of information are present at the time of purchase in order to facilitate the switch. Thus, if a homogenous commodity is located away from the initial commodity being purchased, fliers or billboards would inform the buyer of another store where the commodity is available, inform him or her of its location, distance and direction where time and cost can be calculated and make it known to him or her of the uniqueness of the product so that the existing homogenous product can have equal chances of being selected.

Information ratio is the proportion of the number of bits of information available at the location of the product initially being purchased over the ideal number of pieces of information which is 6.

$$_{Xp}U_{Xsn} = Ia / 6$$

Where:

U = Information ratio

Ia = Number of bits of information available at the moment of purchase

Xp = Subscript for the product of initial purchase

Xsn= Subscript for the product to switch to

3.4. Selection Coefficient

Selection coefficient (Q) is the ratio of the unified price-cost, time and information ratios over their maximum combined ratios.

Unifying the price-cost, time and information ratios can be combined through Pythagorean technique creating a unified line which can be used as the radius of a there-dimensional sphere (Figure 3).

$$_{Xp}r_{Xsn} = (_{Xp}G_{Xsn}^{\ 2} + _{Xp}S_{Xsn}^{\ 2} + _{Xp}U_{Xsn}^{\ 2})^{1/2}$$

Where:

r = Unified line

G = Price-cost ratio

S = Time ratio

U = Information ratio

Xp = Subscript for the product of initial purchase

Xsn= Subscript for the product to switch to

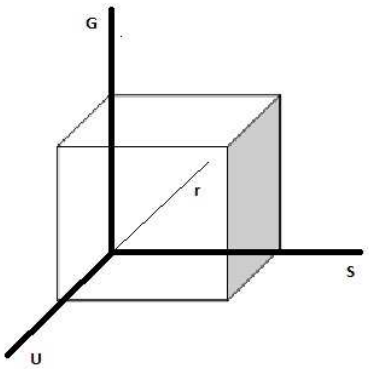

Figure 3. *Three-dimensional Plot of the Price-cost, Time and Information Ratios.*

The ideal selection coefficient which is a constant φ can be obtained by assuming that all ratios are equal to 1 or that competition is 100%.

$$\varphi = (G^2 + S^2 + U^2)^{1/2}$$
$$= (1^2 + 1^2 + 1^2)^{1/2}$$
$$= (3)^{1/2}$$
$$=1.73205$$

Therefore, selection coefficient (Q) is the unified price-cost, time and information ratios against the constant 1.73205.

$$_{Xp}Q_{Xsn} = {}_{Xp}r_{Xs} / \varphi$$

Where:

Q= Selection coefficient

r = Unified line

φ = 1.73205

Xp = Subscript for the product of initial purchase

Xsn= Subscript for the product to switch to

Selection coefficient is derived out of the comparison of two products, the product of initial purchase (Xp) as the one being compared from and the product to switch to (Xsn) as the product being compared to in regard to the unified price cost, time and information ratios. The selection coefficient can increase or decrease the probability of being chosen once multiplied with it. The ideal probability (P_{xn}) is the probability that a commodity will be chosen regardless of the price-cost, time and information available by simply considering the number of competitors. Thus if there are three products competing in the market, each product would ideally have 1/3 as the probability of being chosen in a perfectly competitive market.

$$P_{X1} = 1/3; P_{X2} = 1/3; P_{X3}=1/3$$

But competition is governed by the variables of price-cost, time and information. Thus with the ideal probability multiplied with the selection coefficient (Q) the result will be the adjusted probability of two products after considering the price-cost, time and information available. This will bring about a probability which can be denoted by $P'_{X1,X2}$ which can be read as adjusted probability of product 1 to product 2. If we then consider switching from one competing commodity to another, or product 1 (X_1) to product 2 (X_2), we will denote product 1 as the product of initial purchase (Xp) and product 2 (X_2) as the product to switch to (Xsn).

But if these products are sold in different stores, then if a buyer is buying the first commodity with probability P_{XP} and would consider switching to the second competing product with probability P_{XS1}, then the first product would have Lp as the price and the second product would have Ls as its price. With the selection coefficient ($_{Xp}Q_{Xs1+1}$) computed, then the new probabilities would have the following configuration:

$$P'_{Xs1} = P_{Xs1}\,(_{Xp}Q_{Xs1})$$

$$P'_{Xs1+\ldots n} = P_{Xs1+\ldots n}(_{Xp}Q_{Xs1+\ldots n})$$

$$P'_{Xp}=1-(P'_{Xs1}+P'_{Xs1+\ldots n})$$

Where:

P=ideal probability
P'=adjusted probability
Xp=Subscript referring to the product of initial purchase
Xsn=Subscript denoting the product to switch to

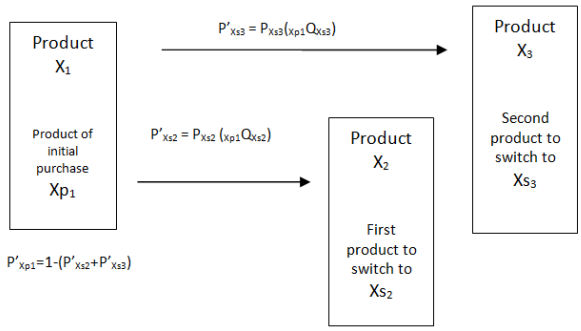

Figure 4. *Illustration of three products and the application of adjusted probabilities.*

As an example (Figure 4), Product X_1 is the initial product of purchase leading to the possibility of switching to Product X_2 as the first product to switch to and Product X_3 as the second product to transfer. The combination of Product X_1 and X_2 yields the adjusted probability P'_{Xs2} and the combination of Product X_1 and X_3 results in the adjusted probability P'_{Xs1+n}. The remaining probability for Product X_1 is equal to P'_{Xp1}. This is just one round of possibility or combinations. Another possibility makes Product X_2 as the initial product of purchase and so on. This will result to several adjusted probabilities derived from the different combinations and probable rounds of selection (Table 1).

Table 1. *Adjusted Probabilities Obtained from various Rounds of Selection.*

Probable Rounds of Selection	**Commodities**		
	X_1	**X_{1+1}**	**$X_{1+\ldots n}$**
First round (X_1 as Xp_1)	P'_{Xp1}	$P'_{Xp1,Xs1}$	$\ldots P'_{Xp1,Xs1+\ldots n}$
Second round (X_2 as Xp_2)	$P'_{Xp1+1,Xs1}$	P'_{Xp1+1}	$\ldots P'_{Xp1+1,Xs1+\ldots n}$
Nth round (X_n as Xp_n)	$P'_{Xp1+\ldots n,Xs1}$	$P'_{Xp1+\ldots n,\,Xs1+1}$	$\ldots P'_{Xp1+\ldots n}$

Competition index (Ci), as the determinant of all adjusted probabilities, then, can be computed in the following manner:

$$Ci = \begin{vmatrix} P'_{Xp1} & P'_{Xp1,Xs1+1} & \ldots P'_{Xp1,Xs1+\ldots n} \\ P'_{Xp1+1,\,Xs1} & P'_{Xp1+1} & \ldots P'_{Xp1+1,Xs1+\ldots n} \\ P'_{Xp1+\ldots n,\,Xs1} & P'_{Xp1+\ldots n,\,Xs1+1} & \ldots P'_{Xp1+\ldots n} \end{vmatrix}$$

Suppose three instant noodles (X_1, X_2, X_3) are sold in the supermarket with prices L_{X1}=\$8.25, L_{X2}=\$8.00 and L_{X3}=\$8.60. Since the supermarket is located a few kilometers away from where the population of a community is located, a transportation fare (Cp) of \$8.00 is needed to reach the supermarket and would take 10 minutes (Tp) to cover the distance. In the supermarket, however, the instant noodles are stacked in a shelf side by side each other which takes as little as 3 seconds or 0.05 minutes (Ts) to switch and would incur a buyer 0 cost (Cs) to transfer. The buyer is also equipped with all the 6 pieces information (Ia) right at the price tag to the label of the instant noodles which the buyer would prefer to switch to. The buyer knows where the alternative product is located right there next to it, he or she knows how to get there for it is just a few steps away. This incurs no cost at all to step a little to where the alternative product is situated. He or she is already informed of the price and the promise of the other competing product. If the buyer would proceed from considering product X_1 to X_2 then the Price-Cost ratio (G), Time ratio (S) and Information ratio (U) can be computed in the following manner.

$$\begin{aligned} {}_{Xp1}G_{Xs2} &= Cp + Lp \,/\, Cp + Ls + Cs \\ &= 8.00 + 8.00/8.00+8.25+0 \\ &= 16.00/16.25 \\ &= 0.9846 \end{aligned}$$

Where:

Lp = L_{x1}
Ls = L_{X2}

$$\begin{aligned} {}_{Xp1}S_{Xs2} &= Tp \,/Tp+ Ts \\ &= 10/10+0.05 \\ &= 10/10.05 \\ &= 0.9950 \end{aligned}$$

$$_{Xp1}U_{X2s} = Ia / 6$$
$$= 6/6$$
$$=1$$

$$_{Xp1}r_{Xs2} = (_{Xp1}G_{Xs2}{}^2 + {}_{Xp1}S_{Xs2}{}^2 + {}_{Xp1}U_{Xs2}{}^2)^{1/2}$$
$$= (0.9846^2 + 0.9950^2 + 1^2)^{1/2}$$
$$= (0.9694+0.99+1)^{1/2}$$
$$= (2.0594)^{1/2}$$
$$= 1.7203$$

$$_{Xp1}Q_{Xs2} = {}_{Xp1}r_{Xs2} /\varphi$$
$$= 1.7203 / 1.732058$$
$$= 0.9932$$

Between commodities X_1 and X_3, the selection coefficient ($_{Xp1}Q_{Xs3}$) would be computed in this manner having calculated all the components:

$$_{Xp1}Q_{Xs3} = {}_{Xp1}r_{Xs3}/\varphi$$
$$= 1.7085 / 1.732058$$
$$= 0.9864$$

The adjusted probabilities would be computed in this manner:

$$P'_{Xs2} = P_{X2}\,(_{Xp1}Q_{Xs1})$$
$$= 1/3\ (0.9932)$$
$$=0.331$$

$$P'_{Xs3} = P_{X3}\,(_{Xp1}Q_{Xs3})$$
$$=1/3\ (0.9864)$$
$$= 0.3288$$

$$P'_{Xp1}=1-(P'_{Xs2}+P'_{Xs3})$$
$$=1-(0.6548)$$
$$=0.3402$$

The matrix of the adjusted probabilities would be (Table 2):

Table 2. *Computed Adjusted Probabilities of the Product in Example.*

Probable Rounds of Selection	Commodities		
	X1	X2	X3
1st (X_1 as Xp_1)	0.3402	0.331	0.3288
2nd (X_2 ax Xp_2)	0.3345	0.3351	0.3304
3rd (X_3 as Xp_3)	0.337	0.3352	0.3278

Using matrix algebra, the Competition Index (Ci) would be:

$$Ci = \begin{vmatrix} 0.3402 & 0.331 & 0.3288 \\ 0.3345 & 0.3351 & 0.3304 \\ 0.337 & 0.3352 & 0.3278 \end{vmatrix}$$

Ci = 0.0004

With the measure shown in Table 3, we find the competitive index of 0.0004 to be very strong. The measurement of competition (Ci) then, operates in inverse fashion where strong competition takes smaller numeric value while weak competition obtains higher numeric value.

Table 3. *Example of Competition Index Scale for Two Products in Competition*

Ci=0.0016	Ci=0.2224	Ci=0.5	Ci=0.72125	Ci=0.9994144
Very Strong or Perfect Competition	**Strong Competition**	**Moderate Competition**	**Weak Competition**	**Very Weak or Imperfect Competition**
G=1 S=0.995 U=1 The prices of commodities are the same and the cost to switch is either zero or very minimal. It takes very little time to switch, at 0.5% of the initial time of purchase, making switching very convenient and all pieces of information to make the switch are available	G=0.75 S=0.75 U=0.83 or (5/6) The price of the other commodity and the cost to switch is almost 60% of the price of the other product. Time to switch is almost 3.33% of the initial time of purchase and 83% of the pieces of information to make the switch are available.	G=0.5 S=0.5 U=0.5 or (3/6) The price and cost of switching is almost 33.33% of the price of the other commodity. Time to switch is almost 100% of the initial time of purchase and 50% of the information to make the switch is available.	G=0.25 S=0.25 U=0.33 or (2/6) The price and cost of switching is almost 14.29% of the price of the other commodity. Time to switch is almost 300% of the initial time of purchase and 33.33% of the pieces of information are available.	G=0 S=0.001 U=0 or (0/6) The other product is almost free while switching takes almost 99900% of the initial time of purchase and there is no information available to make the switch.

4. The Behavior of Firms

The behavior of the firm in a competitive market depends on the kind of product the firm produces and sells and the infrastructure for competition. Thus it is both the type of product and the facility to switch that will dictate the competition in the market. In a perfect competition, the homogenous products are not just perfect substitutes of each other but the probability that each product can get selected is the same for all the rest of the products because switching from one product to another entails no extra cost, the duration to do the switching takes very minimal time and all the pieces of information to do it are available at the time of the switch. One good example is the mall or supermarket where a consumer can get hold of a product he or she prefers in the shelf and decide to switch to another brand in the same shelf or in a store within the mall where no extra money is consumed to transfer to another brand, it takes only seconds to skim to another shelf or walk into the nearby stall and all pieces of information necessary to make the switch on the price tag or on the label of the product to switch to or on the store where the alternative product are available.

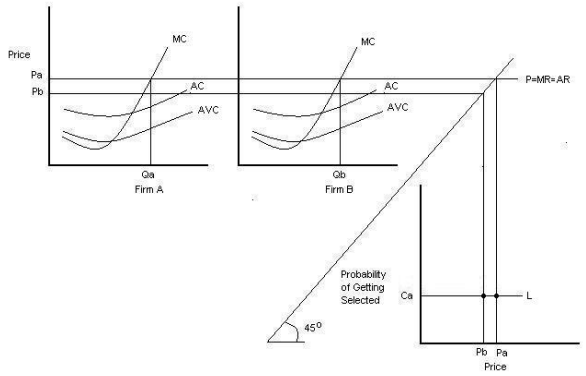

Figure 5. *Firms in Perfect Competition also Selling Competing Products.*

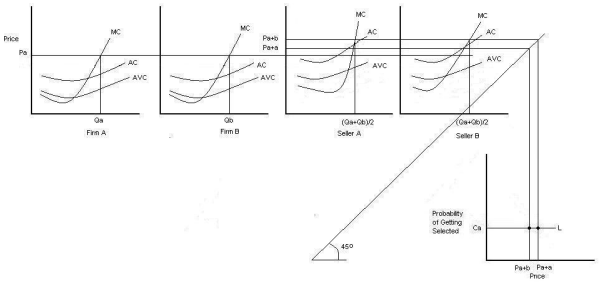

Figure 6. *Firms in Perfect Competition with Competing Sellers Distributing Competing Products.*

Perfectly competitive market assumes that there are a number of sellers and buyers that no individual seller or buyer can significantly influence the price. These sellers offer products that are perfect substitutes of each other. Provided that there are no externalities, these sellers have all the freedom to enter and exit the market… the only question is when.

Firms enter the market when the price of the commodity is sold above the intersection of the lines Marginal Cost (MC) and Average Total Cost (ATC). The firm would choose to stop operation in between the region of the Average Total Cost (ATC) and Average Variable Cost (AVC). This is the region where the price has become too low and the firm is already losing profit. The firm leaves the market totally or closes down within the region below AVC [5]. On the other hand, the firm is maximizing profit at the line above ATC where the Price (P) of the commodity is equal to that of Average Revenue (AR) and Marginal Revenue (MR). In Figure 5, we find Firm A in perfect competition with Firm B. Line Pa could be presumed that both companies are also operating in the same maximizing profit capacity having the same price, average revenue and marginal revenue. Line Pa, however, results in the probability of their commodities being selected at point Ca which is the intersection of lines Pa and L. This could indicate that the cost to switch is very minimal or zero; the time to switch takes very little time and consumers have all available information to switch. This scenario could happen in stores that are located very close to each other or in a department store where products are stacked on nearby shelves. If Firm B lowers the price of its commodity at Pb, Firm A would naturally follow, making the probability of getting selected at the same line L.

Perfect competition, therefore, could exist if the ratios of the price-cost, time and information result in the probabilities of homogenous products to be selected to be equal. This would mean that switching to these homogenous products incurs less or no cost at all, takes not so much to do so and presents all information to get by them. Competition index is almost zero. This makes switching very convenient. This can happen in stores geographically located close to each other or in malls, department stores or supermarkets.

But it is not only the producers that compete with each other. Sellers also do. In Figure 7, Firms A and B are in perfect competition and their products end up in two competing sellers which are also in perfect competition with each other. The price Pa that the competing firms offer become a factor of cost for the sellers. If the Seller A reduces the price of the competing commodities from Pa+b to Pa+a, the probability of getting selected at Ca results in a flat line L since the Seller B will also bring down the price of the competing commodity sold in its store, resulting in the same probability of competing commodities to get selected.

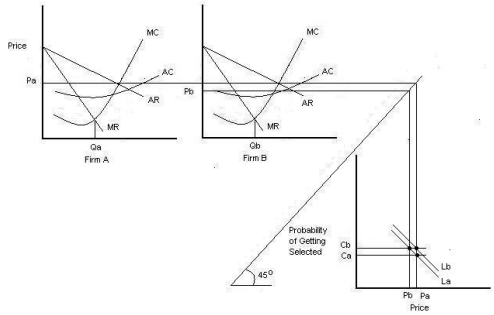

Figure 7. *Firms in Monopolistic Competition also Selling their Slightly Heterogeneous yet Competing Products.*

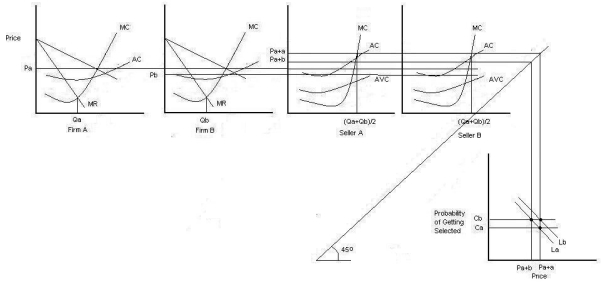

Figure 8. *Firms in Monopolistic Competition and Perfectly Competing Sellers Selling Slightly Heterogeneous yet Competing Products.*

While milk, for example, directly produced by farms and made available in the market is conducive for perfect competition, firms can process the milk and add some unique qualities which the other processed milk do not have. This makes for monopolistic competition. Monopolistic competition assumes that there are many sellers offering slightly differentiated products. If the firm

also sells its products in the market, then Figure 8 could characterize the market with a downward sloping line called Average Revenue (AR) that mimics the demand curve. Since profit is maximized at the intersection of MR and MC, and the firms produce their slightly unique products, the firms can increase the price of their products beyond the intersection of MR and MC [6]. If Firm A offers its product at price Pa it has a corresponding probability to be selected at point Ca. If Firm B lowers the price of its commodity at Pb, the corresponding probability that its products will get selected will be higher at point Cb. Connecting these two points will create a down sloping line unlike a flat line produced in prefect competition. However Firm A, even with slightly higher price, can equalize the probability of getting selected if the cost of switching is lessened or the time to switch is made faster or more essential information is offered at the place of purchasing the initial preference. This can be characterized by the line Lb that shifted to the right. This can be done if stores of these monopolistic competitors which are geographically located far apart, like Firm A will relocate to a nearer location where the cost to switch and the time to switch would be less while adding more directions and ready information at the place where Firm B sells its products.

There are, however, other products of monopolistically competitive nature but are offered in distributors or sellers which are perfectly in competition with other distributors or sellers. An example is soap. One firm can produce certain soap with slightly different selling point against another brand but both are offered in a department store which may be competing with another store. In this case, the price offered by the firm becomes a factor of cost for the sellers as in Figure 8. Since prices would vary, then the probability of getting selected at a price of the seller Pa+a incurs a probability of Ca. Lowering the price at Pa+b would achieve a higher probability that the product offered will get selected at Cb. But lowering the cost to switch and the time to switch or by adding more information necessary to make the switch would increase the probability of the commodity to be selected at line Lb.

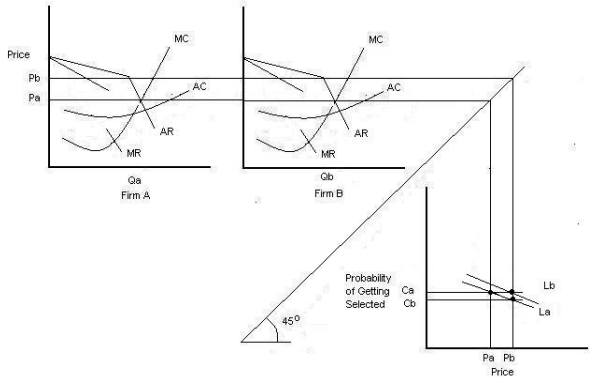

Figure 9. *Firms in Oligopolistic Competition Selling Slightly Heterogeneous Products.*

Oligopolistic competition in Figure 9 assumes that that there are very few sellers offering homogenous or slightly differentiated products. But a kinked demand curve (AR) would suggest that even if the price Pb plunges at Pa, very slight difference in the quantity of demand is experienced [6]. The reason would probably be because the stores which oligopolists also owns or franchises are located far apart from each other that switching from one store to another incurs a lot of cost in terms of money and time. Thus even with the difference of the prices Pa and Pb, the probability of the products getting selected which exemplifies the distance between Ca and Cb would be very small. However, if the stores of oligopolists are located just very close to each other and the essential information are available or can be seen or read right at the store of purchase then the probability that the alternative product will get selected will be increased with the same probability as the other product.

5. Conclusion

What makes consumers price takers? This theory responds: it is because consumers have access to alternative products and the market is built with an infrastructure that would facilitate the capability of consumers to switch from one alternative product to another. This is because it incurs no cost to switch to, it does not require too much to time to transfer to the alternative product and consumers have all the necessary information to switch to it. This makes competing products to have almost equal probabilities of being selected. If suppliers should have the freedom to enter and exit the market, consumers should also be accorded the wide latitude for choice and this can be done if they would have the facility to switch to products of their choice at minimal cost and time.

It would be deduced that competition is a continuum from weak to strong, from imperfect to perfect state. It would be deduced from the measurement of competition and from this theory that monopoly is not part of the spectrum. This is because a monopolist offers only one brand of the product in the market and such market structure presents no alternative product where consumers can switch to and which this theory can not measure.

Firms in perfect competition which offer homogenous products in the market may not present their products in perfect or very strong competition unless there is very minimal or zero cost of switching, very minimal time to make the switch and if all necessary bits of information to make the switch are available at the moment of purchase or switch. In the same manner, firms in oligopolistic competition where few products are presented or firms in monopolistic competition where dissimilar products are available would still present their products in perfect or very strong competition if the conditions of consumer access and convenience are met.

References

[1] B. Sandelin, H.M. Trautwein, and R. Wundrak, A Short History of Economic Thought 2nd ed. New York: Routledge, 2008, p. 55.

[2] C.B. Eaton, D.F. Eaton, and D.W. Allen, The Theory of Perfect Competition, Pearson Microeconomics, (http://wps.prenhall.com/ca_ph_eaton_microecon_6/22/5851/1497893.cw/index.html).

[3] P. Samuelson and W. Nordhaus. Economics, 19th edition, New York: McGraw Hill, 2010, p.189.

[4] M.A. Copeland, The Theory of Monopolistic Competition. Journal of Political Economy, vol. 42, no. 4, pp. 531-536, August 1934.

[5] G.N. Mankiw, Principles of Economics. New York: The Dryden Press, 1998, pp. 288-290.

[6] A. Thompson Economics of the Firm: Theory and Practice, 5th edition, New York: McGraw Hill, 1985, p. 304.