Modeling Competitiveness strategy with game theory: a proposed plan for the case of wireless telecommunication market in Algeria

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Abstract:

Through decades of debate and intellectual theorizing in the field of economics, the great importance of the competition system within the process of economic activity is still emerging. Research and studies are increasingly focusing on this topic and studying its various details; given the role of competition in regulating an important relationship within that process related to producer behavior and consumer behavior.

In this paper, we try to give a proposed plan to modelize the competitiveness situation with game theory in order to optimize the decisions made concerning the confrontation with competitors

Keywords: competition, competitiveness, game theory, modeling, market.

Jel Classification Codes: C72.

1. INTRODUCTION

Through the development of economic thought in its various stages and stations, one of the main preoccupations of thinkers in particular and politicians in general is the search for those pillars that regulate economic behavior in society and rationalize it in a way that allows economic activity to achieve maximum effectiveness and prosperity from the point of view of the actors within this activity.

During the past decades, the debate on the issue of "the role of the state in the economy" and the limits and controls of that role has been emerging . The two prominent theses adopted two opposing positions: a proposal that sees it as the most capable of planning, organizing and directing economic activity in order to achieve the general goals of society and achieve the well-being of its members and achieve optimal exploitation of economic resources, and a proposal that sees that the state should be as it was termed a "guardian state." "It is sufficient to control and protect the territory, individuals and property, and what this requires from a limited intervention related to basic services and supporting infrastructure; That economic activity is left free, governed by the principle of competition, which ensures the proper distribution of resources and the achievement of economic goals and the required welfare...

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On the other hand; the quantitative approach has known revolutionary development during the recent decades in general; and the game theory in particular which gives a strong basis to analyze and study the competitiveness strategy.

From this point of view, in this research paper, we will ask the following question:

What is the role of game theory in modeling the competitiveness situation ?

In order to answer it, we will divide the topic into the following main themes:

➢ The concept of competition phenomenon;
➢ Competition Patterns
➢ scopes of competition
➢ Game theory and competitiveness

2. The concept of competition

Although Competition is one of the commonly used concepts, its definition raises a question, especially when attached to its connected term "competitiveness".

Idiomatically , competition is defined as "a pattern of organizing the relationship between three basic components in the market, which are: economic operators on the one hand, their search for the largest possible profit, on the other hand, workers and their quest to obtain the largest salary, and finally consumers and their constant desire to satisfy their material needs or services at the lowest cost (Mohamed, 2014, p. 16).

When defining competition, we can distinguish between two types: (Abdessalam, 1996, p. 25)

2.1. Indirect competition

It is represented in the competition and conflict between institutions in a country or a society in order to win and gain the resources available in this country. Institutions, through their search for profitability, , and superiority over their competitors, seek to win the largest share of these resources and in the best conditions, in terms of quality and cost, which allows the institution to maximize profits in light of the fierce competition known by the global economy and trade, and accordingly we conclude that the concept of indirect competition is represented in those conflicts that occur between various institutions in order to win the resources available in the environment with the best quality and lowest possible cost.

2.2. Direct competition

It is mainly represented in the competition that exists between companies that are active in the same industrial sector or produce The same products or services, and it is this type of competition that concerns institutions more than the first type.

It is noteworthy that competition differs from one sector to another, as some sectors know intense competition and others know limited competition or the so-called oligopoly, while others know monopoly, depending on the number of firms, interventions in the market and the potentials of the stakeholders.

In addition, the definition of "competitiveness" ; the attached term to

« competition » might be useful in the clarification of the subject (Tomasz Siudek, 2014):

Table 1. Definitions of competitiveness according to various authors

Author [year]	Definition
Adamkiewicz-Drwiłło [2002]	The competitiveness of a company means adapting its products to the market and competition requirements, particularly in terms of product range, quality, price as well as optimal sales channels and methods of promotion
Altomonte et al. [2012]	External or international competitiveness is the ability to exchange the goods and services that are abundant in home country for the goods and services that are scarce in this country
Ajitabh, Momaya [2004]	Competitiveness of a firm is its share in the competitive market
Barker, Köhler [1998]	Country's competitiveness is the degree to which it can, under free and fair market conditions, produce goods or services meeting the test of international markets, while simultaneously maintaining and expanding the real incomes of its population over the longer term
Bobba et al. [1971]	Competitiveness is the ability of nations, regions and companies to generate wealth being the precondition for high wages
Buckley et al. [1988]	A firm's competitiveness means its ability to produce and sell products and services of superior quality and lower costs than its domestic and international competitors. Competitiveness is a firm's long-run profit performance and its ability to compensate its employees and provide superior returns to its owners
Chao-Hung, Li-Chang [2010]	A firm's competitiveness is its economic strength against its rivals in the global marketplace where products, services, people and innovations move freely despite the geographical boundaries
European Commission [2001]	Competitiveness of a nation is the ability of an economy to provide its population with high and rising standards of living and high rates of employment on a sustainable basis
Flejterski [1984]	Competitiveness is the capacity of the sector, industry or branch to design and sell its goods at prices, quality and other features that are more attractive than the parallel characteristics of the goods offered by the competitors
Krugman [1990, 1994]	If competitiveness has any meaning, it is simply just another way to express productivity. The ability of a country to improve its living standard depends
Porter [1990]	The only meaningful concept of competitiveness at the national level is national productivity. Competitiveness is an ability of an economy to provide its residents with a rising standard of living and a high employment on a sustainable basis
Porter et al. [2008]	The most intuitive definition of competitiveness is a country's share of world markets for its products. This makes competitiveness a zero-sum game, because one country's gain comes at the expense of others
Scott, Lodge [1985]	National competitiveness is a country's ability to create, produce, distribute, and/or service products in international trade while earning rising returns on its resources
Tyson D'Andrea [1992]	Competitiveness is our ability to produce goods and services that meet the test of international competition while our citizens enjoy a standard of living that is both rising and sustainable
WEF [Schwab, Sala-i-Martin 2013]	Competitiveness is the set of institutions, policies, and factors that determine the level of productivity of a country
World Economic Forum – WEF [1996]	Competitiveness is the ability of a country to achieve sustained high rates of growth in GDP per capita

Source: Tomasz Siudek, Aldona Zawojska, competitiveness in the economic concepts theories and empirical research, Oeconomia 13 (1), Warsaw University of Life Sciences, 2014, p93

3. Competition patterns

The prevailing pattern of competition can lead to the emergence of several types of markets that are differentiated according to the degree to which the competition phenomenon controls the movement of the market; To classify markets according to the type of competition, indicators are adopted, most notably (Hassan, 2006, p. 60):

- Too many or few exhibitors: This is indicated if the output of any facility in an industry is very small compared to the total supply, since any increase or decrease in the quantity supplied by a facility will not have a noticeable impact on the prevailing price in the market for the product concerned; In the event of a small number of exhibitors, any enterprise alone or with a few enterprises can influence a large percentage of the total production of the relevant market;

- The extent of product homogeneity and diversity: homogeneity means the sameness of all units produced by all establishments; While in the case of diversity, products are alternatives very close to each other.

Based on the previous indicators, we can separate the most prominent cases as follows:

3.1. Perfect competition market

for the state of perfect competition, the following conditions must be met (Hassan, 2006, p. 25):

- Pluralism: there must be a plurality of producers and consumers so that none of them can have a significant impact on the market if it withdraws from it or remains in it;

- Transparency: It is represented in full knowledge of all conditions prevailing in the market so that every buyer or seller can access information related to the market (prices...);

- Commodity homogeneity: The commodity traded in the market must be identical in terms of quality, and specifications so that the consumer does not find a reason to prefer a particular product over the rest of the other producers' products; Thus, the buyer has the freedom to make a purchase decision or not;

- Freedom of entry and exit from the market: This is achieved if the entry or exit of suppliers or consumers to a market is without restrictions or barriers. Under perfect competition, every economic operator has the right to enter any product market

 Freedom of entry and exit from the market: This is achieved if the entry or exit of exhibitors or consumers to a market is without restrictions or barriers. Under perfect competition, every economic operator has the right to enter any product market of his choice if he has the necessary financial and technical capabilities He also has the right to leave any market in which he exercises his activity if he chooses to do so without anyone being able to force him to remain there.

- Possibility of movement of production factors between different production sectors: There are no actual or legal obstacles preventing the transfer of different production factors from one sector to another within the same market or to the market of other products.

In fact, experience has shown that a perfect competition system cannot be achieved;

As the behavior of the actors within the markets often leads to a reality that is incompatible with the case of perfect competition; The disadvantages of releasing free trade were manifested, which results in the concentration of capital in the hands of a few who control the markets and dominate the process of setting prices and dividing markets and control the process of setting production quotas. It is a natural result of major projects dominating the markets in order to achieve their own goals and maximize their profits (fatehi, 1990, p. 14).

Therefore, economists have traditionally divided markets according to the degree of competition in them into five types (Maghawri, 2004, p. 33):

➢ Perfect Competition Markets: Its conditions have already been discussed, and its ideality and unrealism have been clarified.
➢ Monopolistic competition markets: characterized by the large number of exhibitors and the diversity of products;
➢ Oligopoly markets: characterized by few exhibitors and homogeneity of products;
➢ Duopolistic markets: characterized by the presence of two exhibitors who dominate the market;
➢ Absolute monopoly markets: one dominant exhibitor.

3.2. Monopolistic competition markets

The monopolistic competition market is characterized by competitive and monopolistic characteristics at the same time, which can be summarized as follows:

➢ The presence of a large number of producers of goods that are differentiated between the producers, whether in terms of shape, color, packaging... which results in a bit of monopoly power for each product, as is the case with television producers, soap... as it can be seen that each of the market producers is Monopolistic producer as a monopoly on a part of the total supply of that commodity, and at the same time subject to competition with other producers, which limits the power of his monopoly on the commodity in question (Daoued, 1984, p. 293).
➢ The traded goods are characterized as being substitutes for each other, where the same need is saturated in an equal manner to a large extent, such as washing powders, for example;
➢ Competition is not limited to price, but may be in quality and try to adapt to the customer's desires, such as providing services and adapting the shape and design;
➢ The ability to raise the price of a commodity above a certain limit remains limited due to the possibility of customers switching to other goods.

3.3. Oligopoly market

This is due to the small number of sellers, so that any of them can directly affect the market, and this is what affects other producers, so the actions are sensitive and very cautious, because any process carried out by the producer results in the reaction on the part of other producers, and here may There is an implicit or explicit agreement between all producers to follow one price policy, and the matter may reach the extent of market fragmentation among them, and things remain as they are in the market as

long as any producer cannot control the market alone and get others out of it (betit Ahmed, 2015, p. 18).

3.4. Duopoly market

In this case, the market consists of two producers who offer the same commodity, or each of them has a commodity that can be a good substitute for the other commodity.

3.4. Total Monopoly Market

In this case, "monopoly can be considered as one of the most important forms of market organization in which the enterprise is alone in the production of a commodity that has no alternatives close to it" (Selvatore, 1994, p. 239).

meaning that the market of complete monopoly is characterized by the following characteristics (Chanak, 2010, p. 34):

➢ The presence of a single economic dealer in the market;
➢ The absence of substitutes for the commodity produced by the monopolistic producer;
➢ There are major obstacles preventing the entry of new institutions to the market.

4- Scopes of competition

In order to occupy a strong or dominant position in the market, institutions compete in several areas, the most important of which are:

4.1.time based competition

Where competition is taking place between institutions to shorten the time in all operations, especially those related to the cycle (supply, production, marketing), and shorten the time between each innovation and the introduction of a new product, i.e. shortening the product life cycle, and on this basis time has become a resource of the institution , and an important factor, and it took a strategic dimension (Mostafa, 1990, p. 2).

4.2 Cost based competition

Cost-based competitiveness is the ability of the enterprise to produce one unit at a cost less than the cost of production in competing enterprises, and the importance of controlling the cost of production is that "it is not possible to prepare a price policy for the enterprise's products without continuous control over costs in order to rationalize them and control expenditure levels, because This will contribute to reducing the cost of the product, and thus the freedom to choose the appropriate prices, and thus increase the profit margin compared to competitors (Belkacem, 2002).

4.3 Price based competition

Price is one of the most important competitive tools between institutions; Price-based competitiveness means that the institution has the flexibility to determine the price and the freedom to reduce or raise it without affecting the volume of demand for its products or the size of its profits.

However, the institution's adoption of a competitive strategy based on price is

influenced by several restrictions, most notably (Dayan, 1999, pp. 112-115):

> ➢ Laws: including the exchange policy applied in the state, which makes periodic interventions in order to adjust prices and margins and achieve trade balance, balance the balance of payments and thus control the price ceiling, and in general, these laws limit the freedom of the institution to reduce and raise its prices;

> ➢ Productive capacity: Since the ability of the institution to reduce its prices is related to the extent of its production capacity to meet the volume of production.The high demand that accompanies this drop in prices;

> ➢ Production costs: They are considered the most important constraint affecting the determination of product prices, since the value of selling prices is related to the cost price;

> ➢ The type of market to which the institution belongs: It means the structure of the market to which the institution belongs in terms of the degree of competition and the number of competitors, suppliers, consumers and customers, as the price level takes into account the type of market and the elements forming it;

> ➢ The stage of the product life cycle: where the price level of the product is related to the stage it is going through, the institution does not maintain the same level of prices during all stages of the product life cycle, but rather that each stage has the appropriate level for it; As for the launch stage, the institution enters at high prices, to compensate for the costs of research, development and product design... and to curb the initial demand in order to reduce the restriction on production at its beginning. As for the growth stage, in the case of the success of the product launch stage, the institution maintains its price level. It resorts to lowering its prices, in order to increase its sales, obtain new customers and confront competitors. As for the maturity stage, which is a critical stage for the product, the institution resorts to reducing its prices to maintain its market share, and to confront competing products.

> ➢ Demand: It is considered an important constraint for determining prices, as the volume of demand is characterized by its flexibility with the change in the price level, so The institution should take this into account in its price competitiveness;

> ➢ Applicable price in the market: where the institution must take into account the prevailing prices in the market, especially competitive prices, by studying and analyzing competitive prices, and the reaction to their prices, which are measured from the old and current competitive prices.

4.4 Excellence based competition

Competitiveness based on excellence means "the ability of the institution to provide a distinct and unique product that has a high value from the consumer's point of view, with its high quality, unique characteristics of the product, and after-sales services...etc." (Khalil, 1998, p. 87)

The institution can achieve excellence in the face of competing institutions through several strategies, most notably (Kotler P, 2000, p. 68):

> ➢ Excellence through the product: through the characteristics that characterize the company's products, which lead to gaining a competitive advantage, and these characteristics are:
> ➢ Graphics, their attractiveness and ability to promote products and their presence in the largest and most important market sectors;
> ➢ The ability of the institution to maintain the confidence of the customers of the product through continuous research and study of consumer behavior and the development of the quality of the product and its permanent improvement;
> ➢ The validity of the product, which is represented in its ability to maintain its validity for the longest possible period of time;
> ➢ The composition of the product and the availability of its parts, which consists of shape, size and physical appearance, and the availability of its composite parts, especially industrial products. ;
> ➢ The shape or general or external appearance of the product, and is concerned with models that achieve many advantages for customers such as comfort and luxury;
> ➢ The extent to which the product performs the function assigned to it, meaning the added value it provides and the results that the product achieves. The presence of a difference is an advantage for the institution that has the best.

b-Excellence through the service provided: These capabilities are as follows:

> ➢ Ease of placing orders: by using the easy means and methods through which it is possible to place orders for a product or service, such as the Internet, fax...etc;
> ➢ Delivery period, which represents the extent to which the institution controls the distribution processes and the delivery of consumer orders in their required time;
> ➢ Advice and instructions expressed in the set of equipment provided by the institution to the consumer in technical cards about the product or in advertising flashes regarding the ways and methods of its use and the extent of its contribution to rationalizing consumer behavior;
> ➢ After-sales services provided by the institution free of charge or at symbolic prices to its customers after sales operations, such as warranty and maintenance operations

C- Excellence through employees: the organization, by owning a group of employees characterized by a set of characteristics, can achieve competitive advantages, the most important of which can be mentioned:

> ➢ Credibility and trust that exists among the members of the institution;
> ➢ The method of communication between the members of the institution themselves, and the extent of integration between them on the one hand and the institution and customers on the other hand;
> ➢ Better presentation and good performance of tasks from the competence, experience and ability possessed by the workers;

➢ Good treatment as well as courtesy, especially on the part of agents who are distributed through various points of sale, and who have a direct business relationship with customers.

d- Discrimination through points of sale; This is achieved through:
    ➢ Protection and security of the various points of sale;
    ➢ The experience of salesmen in various distribution and sales centers in achieving the best deals;
    ➢ Good performance of salesmen and the extent to which a high value of sales is achieved.

e- Excellence through the corporate image; This is done through:
    ➢ The history of the institution, its depth and richness, and the richness of its traditions;
    ➢ Symbols and labels that distinguish it from other competitors, such as the commercial department or the brand;
    ➢ The media used to promote its products and the extent to which it enjoys a good reputation with customers, especially audio-visual ones;
    ➢ The physical environment of the institution, that is, the extent of the institution's building and the connotations that it can suggest in the mind of the customer;
    ➢ Events and actions carried out by the institution that deviate from the economic nature, by working on financing and investing in the cultural and sports field, or carrying out charitable and humanitarian work, which leads to giving a good image and impression to the dealers.

5. Game theory and competitiveness

5.1 Theoretical background

Game theory is a branch of mathematics that aims to help decision-making when studying strategies in cases of competition or confrontation between two or more parties (two individuals, two companies, two countries...), where each one of them is called a player ; in other words it is "the science of strategy, or at least the optimal decision-making of independent and competing actors in a strategic setting" (HAYES, 2022).

Each player has several opportunities to choose from among a variety of strategies; And each alternative of them affects what he and the other player achieves in terms of return due to the existence of a conflict in the objectives and the attempt of each party to maximize its returns or inflict the greatest loss on the other party; Therefore, one of the most prominent applications of this theory is the study of competition between companies in order to make some decisions such as setting product prices or some marketing strategies.

The games are divided according to several bases; On the basis of the number of players, they are divided into: games with two players, and games with more than two

players. In terms of the outcome of the game, we distinguish between "zero-sum games", meaning that the first party's profit is the same as the loss of the second party, and games with a non-zero outcome.

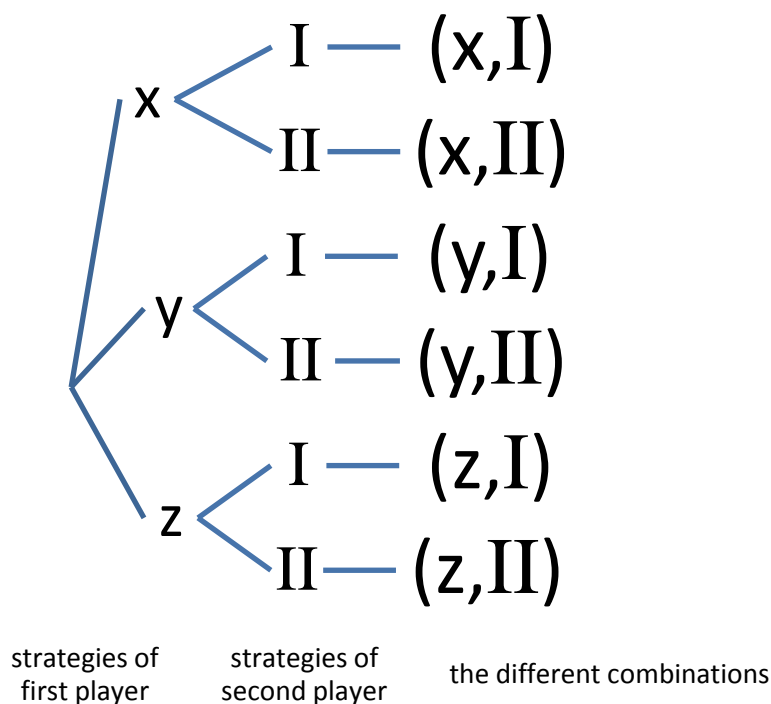Game theory uses some basic terms, the most important of which are:

-Player: Each party in the game is called player; And he must make the decisions leading him to win the game;

-Strategy (possible decisions): each of the alternatives available to the player is called a "strategy";

- pure strategy : a game in which a player chooses one strategy throughout the time of the game is called a "pure strategy game";

- Mixed strategy: A game in which a player uses more than one strategy in certain proportions during the game is called a "Mixed Strategy game".

- Return matrix: represents the results that each player gets as a result of applying the various strategies available to him; The two players to be assigned on both sides of the matrix rows and columns; So that the rows represent what the first player gains from the second player, and the columns represent what the second player loses in favor of the first player at the intersection of the various strategies;

game value: It is the value that one player wins and the other is willing to pay

The most important hypotheses on which the game theory is based are:

-The strategy that a particular player chooses from among the alternatives available to him is not known to the other; It affects how much the player gains and how much his opponent gains;

- Players' decisions are taken simultaneously (at the same time);

- The number of players is defined and not less than two;

For example, if we have two players (A) and (B) playing a particular game and the first player has three strategies (x,y,z) and the second has two strategies (I,II), the returns from each intersection between the strategies can be determined by the probability tree:

I — (x,I)

x

II — (x,II)

I — (y,I)

y

II — (y,II)

I — (z,I)

z

II — (z,II)

| strategies of first player | strategies of second player | the different combinations |

The tree above reveals the various possible combinations of the encounter between the strategies of the first player and the strategies of the second player; For example, the binary (x,I) expresses the situation in which strategy (x) of the first player confronts strategy (I) of the second player; And for each binary, the resulting return should be estimated.

If we have the return matrix for this game as follows:

		Strategies of player (B)	
		I	II
Strategies of	X	-3	3
player (A)	Y	-2	4
	Z	2	3

Positive values represent Player A's earnings and are the same as Player B's losses, and negative values represent Player A's losses and are the same as Player B's earnings; When player (A) chooses strategy (x) and that coincides with player (B) choosing strategy (I), (A) loses (3 monetary units) to player (B);...

The game is resolved by searching for the so called "saddle point", if it exists; This point is expressed in the form:

$$V \rightarrow Maxi \min(v) = Mini \max(v)$$

That is, the value of the game is the value at which the maximum of minima values are equal to the minimum of maxima values; To determine it, we follow these steps:

We define the minimal value in each row of the matrix; in the previous example:

		Strategies of player (B)		min
		I	II	
	X	-3	3	-3
Strategies of	Y	-2	4	-2
player (A)	z	2	3	2

a- We define the maximal value in each column of the matrix:

		Strategies of player (B)		min
		I	II	
	X	-3	3	-3
Strategies of	Y	-2	4	-2
player (A)	z	2	3	2
max		2	4	

b- Determine the maximal value from the values extracted in step "a" and determine the minimal value from the values extracted in step "b":

c- If the two values extracted in the previous step are equal, this means that there is a "saddle point" which is at the intersection of the two arrows and has been placed inside a circle ; then since:

$$V \rightarrow Maxi\min(v) = Mini\max(v) = 2$$

This means that the game is stable and the saddle point is located in the third row and first column; That is, the value of the game: This means that the optimal strategy for player (A) is (z) and the optimal strategy for player (B) is (I), and the winner of the game is (A) because the value of the game is positive.

In the case of games that do not have a saddle point, that is:

$$Maxi\min(v) \neq Mini\max(v)$$

Then the players' strategies will not be pure -like the previous case-, but rather will be mixed strategies; That is, the player will play a certain strategy during part of the game time and a second strategy during another part of the game...and so on, which calls for modeling the mixed strategy for each player.

For example, let's have the following game:

	B			min	
	4	2	-1	-1	
A	2	3	4	2 ← Max	
	3	0	1	0	
max	4	3	4		

Min ↑ (under column 2)

note that the game is unstable, which means that the strategy of each player will be mixed and not pure; This is what calls for modeling that strategy:

Let's have the variables: $\{p_1, p_2, p_3\}$ Representing, respectively, the percentage of playing the first, second, and third strategy by player (A), and its counterpart variables $\{q_1, q_2, q_3\}$

Denotes, respectively: the percentage of playing the first strategy, second, and third by the part of player (B).

The player (A) seeks to maximize return; so his objective function: $\{Max : (z) = V\}$
Under constraints:

$$\begin{cases} 4p_1 + 2p_2 + 3p_3 \geq V \\ 2p_1 + 3p_2 + 0p_3 \geq V \\ -p_1 + 4p_2 + p_3 \geq V \\ p_1 + p_2 + p_3 = 1 \end{cases}$$

To get rid of (V) on the right-hand side of the constraints, we divide both sides by (V):

$$\begin{cases} 4\dfrac{p_1}{V} + 2\dfrac{p_2}{V} + 3\dfrac{p_3}{V} \geq 1 \\[2mm] 2\dfrac{p_1}{V} + 3\dfrac{p_2}{V} \qquad \geq 1 \\[2mm] -\dfrac{p_1}{V} + 4\dfrac{p_2}{V} + \dfrac{p_3}{V} \geq 1 \\[2mm] \dfrac{p_1}{V} + \dfrac{p_2}{V} + \dfrac{p_3}{V} = \dfrac{1}{V} \end{cases}$$

Let's put: $\quad x_1 = \dfrac{p_1}{V}, x_2 = \dfrac{p_2}{V}, x_3 = \dfrac{p_3}{V}$

The constraints become as follows:

$$\begin{cases} 4x_1 + 2x_2 + 3x_3 \geq 1 \\ 2x_1 + 3x_2 \qquad \geq 1 \\ -x_1 + 4x_2 + x_3 \geq 1 \\ x_1 + x_2 + x_3 = \dfrac{1}{V} \end{cases}$$

Since: $\left\{ Max(v) \Leftrightarrow Min(\dfrac{1}{v}) \right\}$

The model becomes:

$$Min : (z) = x_1 + x_2 + x_3$$

$$\begin{cases} 4x_1 + 2x_2 + 3x_3 \geq 1 \\ 2x_1 + 3x_2 \qquad \geq 1 \\ -x_1 + 4x_2 + x_3 \geq 1 \end{cases}$$

And using the software (Storm), we get the optimal solution as follows:

```
Untitled1
OPTIMAL SOLUTION - SUMMARY REPORT (Nonzero Variables)
        Variable              Value              Cost

1            X1             0.1053            1.0000
2            X2             0.2632            1.0000
3            X3             0.0175            1.0000

Objective Function Value = 0.385965
```

That is: $\left\{\dfrac{p_1}{v}=0.1053, \dfrac{p_2}{v}=0.2632, \dfrac{p_3}{v}=0.0175\right\}$

And since: $\left(p_1+p_2+p_3=1\right)$

Then: $\left\{\dfrac{1}{v}=0.385965 \rightarrow v \cong 2.59\right\}$

Then the values of the variables are: $\{p_1=0.2727, p_2=0.6817, p_3=0.0453\}$

That is, player (A) has to play the first strategy (27.27%) of the game time; And he plays the second strategy (68.17%) of the game time, and he plays the third strategy (04.53%) of the time, which makes him achieve the maximal gain of (2.59).

From player B's point of view, the goal is the opposite of player A's goal; i.e. he aims to minimize (A) gains: $\{Min:(z)=V\}$ under the constraints:

$$\begin{cases} 4q_1+2q_2-q_3 \leq V \\ 2q_1+3q_2+4q_3 \leq V \\ 3q_1 \quad + \quad\;\; q_3 \leq V \\ q_1+q_2+q_3=1 \end{cases}$$

As we proceeded previously; we put: $\left\{x_1=\dfrac{q_1}{V}, x_2=\dfrac{q_2}{V}, x_3=\dfrac{q_3}{V}\right\}$ we obtain finally the following model:

$$Max:(z)=x_1+x_2+x_3$$
$$\begin{cases} 4x_1+2x_2-x_3 \leq 1 \\ 2x_1+3x_2+4x_3 \leq 1 \\ 3x_1 \quad + \quad\;\; x_3 \leq 1 \end{cases}$$

Using the software "STORM" we find the optimal solution for the player (B):

```
Untitled1
OPTIMAL SOLUTION - SUMMARY REPORT (Nonzero Variables)
        Variable            Value            Cost

1            X1            0.2778           1.0000
3            X3            0.1111           1.0000

Slack Variables
6   CONSTR   3            0.0556           0.0000

Objective Function Value = 0.388889
```

From the results above we have:

$$\{q_1 = 0.2778v = 0.719502, \quad q_2 = 0, \quad q_3 = 0.1111v = 0.287749\}$$

That means the player (B) should play his first strategy (72%) of the game's total time and (28%) of that time assigned to the third strategy, while cancelling the second strategy, and this mixed strategy allows him to minimize his loss.

5. 2 proposed plan for modeling the competitiveness in wireless telecommunication market in Algeria

In Algeria three companies are competitors in the market of telecommunication: "MOBILIS", "NEDJMA" and "DJEZZY".

From the point of view of one actor (let's choose "MOBILIS" for example) and due to lack of accurate data concerning the indicators of this sector; we propose the following plan to modelize its situation in the market:

    a- How to set the players?
      We discuss in this Item who are the players in our game; as proposal we suggest to consider "MOBILIS" the first player, and the second player may be: either the two companies as a counterpart; or the more dominant in market according to the market portion indicators; let's consider the second proposal an choose "NEDJMA" as the competitor of the first player (MOBILIS);

    b- How to set the strategies of the players?
      We suggest to consider the different offers issued by each company as its own strategies;

    c- Choose the time horizon: we discuss in this step the suitable time to consider as "duration of the game"; we suggest to deduce this duration from studying the life cycle of the offers; because we suppose that any change in the structure of the offers changes the structure of the game; so for each company we set the different offers given to customers and we choose the lowest life offer; then its duration will be the duration chosen for the game;

    d- Set the different values of return for each combination between the strategies of the two players; we suggest here to investigate the switch of customers from a company to the other and the amount of their expenses as gains to one player or losses;

    e- Finally we modelize the strategy of each player as explained before and get the optimal solution.

6. CONCLUSION

    The developments witnessed by the economy from both sides: on the level of intellectual and theoretical theorizing; As well as on the level of practice and reality to highlight the importance of the phenomenon of competition in raising the effectiveness of economic activity from the point of view of the various actors within the production and exchange process.

    The competition-based mode of exchange allows to regulate the relationship between three prominent components of the market:

- productive institutions: by regulating their behavior in pursuit of the greatest possible profit;

- the workers: by regulating their behavior in pursuit of the highest possible money wage;

-Consumers: regulating their behavior based on the desire to achieve maximum satisfaction of their needs at the lowest possible cost.

Besides; the quantitative approach becomes very important in analyzing the process of decision making in general and especially the game theory which can contribute efficiently in modeling the competitiveness situation of the company and help the decision maker to get the optimal strategy.

From the above mentioned, the most important recommendations can be deduced as follows:

- Launching the economic initiative and liberalizing economic activity in a way that contributes to valuing the resources available in society and raising the efficiency of their exploitation;

- Studying the legal system related to the establishment of projects and institutions and organizing their work in a way that encourages them to engage in constructive competition that contributes to the prosperity of the economy and society;

-establish appropriate laws to prevent harm to the mechanism of competition and to avoid the economy and society from monopoly problems and practices incompatible with organized and legitimate competition.

- from the micro economic view point we recommend that companies introduce the game theory as a tool in the decision making of strategies related to competition.

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