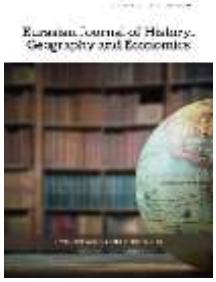

Game Theory and its Application in the analysis of Transportation sector in Iraq

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ABSTRACT

This research aims at investigating whether private or public sectors are able to lead the transportation sector in Iraq. For this reason, the paper will apply the game theory and its participation to choose which of the competitors should lead.
The research found that the private sector was more efficient in these activities that have a high level of profit like land, airways, and sea transportation and the public sector should leave these activities that have a low proportion of added value according to the capital formation, and constraint itself only to activities which give high level of profit.

Keywords: Game Theory, Economic Transportation, Transportation Activities, JEL Classification: N7, N75, C02, C7.

Introduction:

Transport constitutes one of the most important factors of the economical development and commerce, as both depend on it intensely to transport people and commodities.

An account of the importance of the transport and the logistic support which is presented by this sector to other economical activities, because it is distributional activity, in the same time it plays a dynamic rule in the economical production process.

This sector is subjected to especially its infrastructure and operational means destruction during three decade of wars besides the effect of the economic sanctions which imposed on Iraq.

The transport sector has suffered in Iraq of neglect and marginalization for a long time because of the circumstances experienced by Iraq with the destruction of most of the infrastructure for this sector, and in order return the role of it in economy, it is necessary to ask this question.

"Does the government in Iraq able to restore activity to this sector, and work to repair the infrastructure to it, monitoring the investment to it, adequate or is it that in front of the government other option, is to leave process part of the activities in this sector to the private sector, or to inter this like a partner in this process and in any of this activities can be located the private sector, for this purpose of access to the exact answer to this question is the application of game theory will determine which sectors capable to lead and promote the transportation in Iraq."

This research aims at investigating whether private or public sectors are able to lead the transportation sector in Iraq. For this reason, the paper will apply the game theory using the data of added value and capital formation during the period of time (2011-2020) at constant prices of 2007.

The objective: presentation of the role of the game theory and its participation to choose which of the competitors should lead the transportation sector.

The hypothesis: suppose that the choice of suitable strategy by the public and private sectors will maximize the production and then the profit and all that will be raising the efficiency of the sector and decrease the cost and increasing competition capability for the sector.

And according that the research contains the following:

1- The Economic Role of Transport sector 2- The Transport sector in Iraq.
3- The importance of private sector
4- The game theory
5- The application
6- The conclusions

First-The Economic Role of transport sector:

The importance of economic transportation is like many economic activities that are intensive in infrastructures. The transport sector is an important component of the economy impacting on development and the welfare.

When transport systems are efficient, they provide economic and social opportunities and benefits that result in positive multipliers effects such as better accessibility to markets employment and additional investments. When transport systems are deficient in term of capacity or reliability, they can have an economic cost such as reduced or missed opportunities.

Transport also carries an important social and environmental load, which cannot be neglected. Thus, from a general standpoint the economic impacts of transportation can be direct and in direct, as follow: ([1])

1- Direct impacts, related to accessibility change where transport enables larger markets and enable to save time and costs.
2- Indirect impacts, related to the economic multiplier effects where the price of commodities, goods or services drop and or their variety increases.

From other side there is a great effect between transport and economic development that have taken place since the beginning of the industrial revolution have been linked to growing economic opportunities.

Transport by itself is not a sufficient condition for development; however the lack of transport in infrastructures can be seen as a constraining factor on development. In developing countries, the lack of transportation infrastructures and regulatory impediments are jointly impacting economic development by conferring higher transport costs, but also delays rendering supply chain management unreliable.

Investment in transport infrastructures is thus seen as a tool of regional development, particularly in developing countries. The standard assumption is that transportation investments tend to be more wealth producing as opposed to wealth consuming investment such as services. There is also a tendency for transport investments to have declining marginal returns. while initial infrastructure investment tend to have a high return since they provide an entirely new range of mobility options, the more the system is developed the more likely additional investment would result in lower returns.

The impotence of this sector is shown with regards to its effect on the industrial projects. It must be noticeable that one of the most important aims of the project economies is settling the project in the suitable economical places and the deepening of the tendency to expand the industrial project and to increase of its productive units.

On the other hand, we can show the importance of this sector and its effect on the agricultural sector, for agriculture is considered the economic activity that needs the transport most, particularly that this sector is considered the most important for the role it plays in providing the world with its needs of food stuffs, in addition to that, it provides industry with its needs of agricultural requirements. Therefore, we cannot imagine the happenings of an expansion in the

(1) Dr. Jean-Paul Rodrigue. "The Geography of Transport System", 2009 by Routledge, available at: http://people.hofstra.edu/geotrans/eng/ch/en/cone7en/ch7elen.html

agricultural production wit out the presence of developed transport network.

From all what has been mentioned, we find that this sector has positive effects that help to realize the economical welfare. Alfred marshal said, "The outstanding economical fact in the modern age is not shown by the progress of industrial production, but in the progress that the transport industry has reached[2]".

Second-The transport sector in Iraq:

Iraq's transport sector comprises (40.690 km) of road, two international air ports, and three major domestic air ports, six cargo port, two oil terminals, and (2.456 km) of rail lines.

Because Iraq is a large country with a total land area in excess of (432.000 sq.km), and a population of approximately (40 million), transportation system play a central role in the economy[3].

In Iraq there were some strategies and plan built to reform this sector. Such as in sixties, seventies, and eighties of the past century, the priority of the development plans were concentrated widely on the sector of transportation. Those plan Included the execution of many projects regarding the infrastructure of this sector, most of these projects were strategic, such as in the ports, the strategic purpose were in the sixties of last century was to increase the potential capacity.

But in seventies of the last century, the main aim was strengthening the role of Basra city in industrial sector through the construction of seaport for industrial purpose.

From other side, the main purpose in railway line, in the period of sixties was to transfer metric system in to standard system. In seventies, eighties, the aim was to connect between the industrial production centers with consumption and export centers. The entrance of new technology and development needs for over quality and specifications of the railway lines[4].

The main and strategic aims of the national development for the period of (2010- 2014), were to treat and heal the impact and effects of negligence, because of the economic sanction, working to upgrade this sector.[5]

Now in order to discuss and focus the characteristic of this sector, we must define what is an especial in this important sector which should be taken in to consideration during the definition of the ways and requirements to develop it. The principal characteristics of this sector are as follow[6]:

1. This sector is one of the important sectors in the Iraqi economy, and this importance embodied in the direct effect on the people activities, there for this sector provides the infrastructure in order to supply the services of transportation on the daily basic for the people.
2. There is a strong relationship between this sector and other sectors in Iraq. economy, and its direct effects on the development, and eventually the great impact of it's on the economy integration in Iraq.
3. The expansion of the infrastructure of this sector needs a great and huge investment for installation and maintenance.
4. The rapid and continuous development of new technology and sciences in the transportation sector imposed the necessity of escorting and apply the new methods in order to reach the world progress and provides the opportunities for better and suitable growth and development for it.
5. The great and close correlation between the projects of different activities of this sector.
6. There is a great opportunities for private sector to invest in this sector.

The activities of transportation sector in Iraq:

In general this sector includes the following activates:

I. Ports and sea transportation:

(2)Journal for Arabic land transportation, "Strategic reflections in developing Arabic transportation and its significant upon economic and social sector", Arabic version, Damascus, p35 .

(3)United Nations, World Bank, "Joint assessment for rebuilding and reconstruction in Iraq", Arabic version, 2003, p32.

(4) Iraqi Ministry of Transportation, "Transportation sector report in Iraq", Arabic version, unpublished, p46.

(5) IBID. P3 .

(6) IBID. P2.

Iraq has currently four commercial port, a port of um Qasir, was constructed in 1965, and in the year 1979 a construction of kohr alzubair has been achieved for victory industrial purposes which consist of (12) berth for purpose of the victory of Iron, steel, import of steel, raw material, export of sponge type steel, loading fertilizer, and general goods[7].

The number of berths in the ports business is (48) berth, now at capacity of (17.5) million tons per year, actually (43) berths with capacity (15.90) million ton per year[8].

Port is represented an essential link in the transport industry through the following:

1. In sea transportation, which deals with various types of ships, such as container useless, cargo ships, ro-ro ships and so on.
2. The area of seaport, which deals with sea transport and the efficient operation of ports and the optimal scale for potential employment.
3. The field of marine worst, such as maintenance of ships, and the provision of marine services.

All Iraqi ports and sea transportation are state owned and management, and operated by the general company for Iraqi ports which is public sector.

All the Iraqi port and transportation facing strong competition from port nearly countries as the United Arab Emirates, Qatar, Kuwait, and Saudi Arabia, and soon.

During past and now have great advantages and profits while there is decline in performance and efficiency of the Iraqi ports of any significant development at the local level and globally on this basis, the development of this sector can be exist as:

1. Increasing the capacity and efficiency of this sector.
2. Strengthening the economic independence of Iraq in the import and export of commodities and goods through this sector, and reduce dependence on ports and sea transportation of other countries.
3. Strengthening the geopolitical position of Iraq as link between East Asia and other countries.
4. Convert this sector to attractive and competitive with neighboring countries.

In other hand, the company of maritime transport, which is responsible for this activity, and it is national carrier in field of sea transportation, which operating maritime transport, maritime agency, accordance with the provisions of law establishing the maritime transport company Itd no 80 for the year 1983 and law agency of navy no.56 for the year 1985[9].

Iraq has currently (3) ships, and is a plan to purchase some other ships to strengthen to Iraqi naval fleet, or manufacturing new ships.

The quantitative objectives of this sector is to provide vessels for transfer of Iraqi imports and exports of goods, especially grain, food and seek to form the nuclens of the Iraqi naval business.

There are some problems and challenges facing this activity, like it is need large amount of investment to establish the new Iraqi naval fleet, include ships, containers and cargo ship.

This sector needs more than (207) million Dollars investment[10].

The Role of private sector in ports and sea transportation:

The private sector can plays major role in the development of some infrastructure through the investment law no.13 of year 2006, operation and service delivery, and could open the door to this sector to run the container docks class basis.

The role of this sector is currently in the ports activities concentrate on the work of unloading and shipping operator, and maintenance of some equipment.

From other side the role of this sector in sea transportation, seems very limited at the moment, is limited to the possession of small

(7) United Nations, World Bank, "Joint assessment for rebuilding....", Op.Cit. P 34 and Iraqi Ministry of Transportation, "Transportation sector report in Iraq", Op.Cit. P17.
(8) IBID. P18.
(9)Iraqi Ministry of Transportation, "Transportation sector report in Iraq", Op.Cit. P21 .
(10) United Nations, World Bank, "Joint assessment for rebuilding....", Op.Cit. P 89

vessels due to the huge investment required by the building large ships.

II. Railway transportation:

Transportation by railway lines regarded as one of the vital activities in the fields of transportation in Iraq, for both passenger and goods. This kind of transportation deal with long distance places with cheep or suitable prices.

Iraq is regarded as pioneer state in the field of using transportation by railway lines in the area, because it has very big network cover vast areas in the country, the first train that operated in Iraq was in June 1914[11].

At the beginning of railway lines, there were a great concerned and reliability on this sector from the beginning for transportation of goods and other commodities, because there was the only mean of transportation. But later the transportation of goods transferred to land transportation.

The length of the railway lines were (2295 km) at year 2008 more or of it suffer from being old and damaged a lot because of wars, and this led to the reduction of it capability and the level of operation, there for the procedures are going on to begin rehabilitated and re constructed the rail way lines, designs, improve its abilities.

The consideration vision to rail way transportation activity, is to rehabilitate of the existing railway lines network and upgrade its capacity, and up rise the specifications of the infrastructure and services quality, transferring to international activity, in order to face the goods, and this kind of transportation requirement a great investment must the government supplied it[12].

This sector need (1120) million Dollar as investment[13].

The role of private sector in railway transportation:

The railway transportation characterized by huge and big investment that needed to execute and rebuild the infrastructure of this sector. Therefore this sector attraction by the investors will be very limit especially for the rebuild of infrastructure except in the fields and positions that have a great economic feasibility, such as in transportation of goods, but in the field of operation and service, it is possible for private sector to work on.

III. Airways Transportation:

The Iraqi airways, is the national carrier, it was establishment in 1988, but the first creation to Iraqi air ways was in 1946[14].

In 2014, and as a result of the economic sanction, there were only international transport relying on flights to Syria and the internal transport has been limited. In 2004 this company received their positions, and started there construction and began actual operation on 2016.

This company owned now (2) aircraft, and rented (3) aircraft.

Despite the relative improvement to this company in 2008 but still there is a need of a lot of development to achieve the provision of international air transport and convenient procedure. The mission is to provision of modern aircraft to face the increasing demand for the air transport, and open new lines with the countries of the world, and strengthening the of Iraqi air ways as the national carrier. Of (23) aircraft owned Iraqi airways, prior to the war some of this aircraft damaged, and now this company need to establishment a new fleet, and that need more than (329) million dollars[15].

The Role of the private sector

The private sector can contribute more broadly in the provision of services, either in the field of employment; the private sector can contribute in dependently or through joint operation.

There is suggestion to transfer some activities to the private sector like:

(11) Iraqi Ministry of Transportation, "Transportation sector report in Iraq", Op.Cit. P3.
(12) IBID. P16.
(13) United Nations, World Bank, "Joint assessment for rebuilding....", Op.Cit. P 88.
(14) Iraqi Ministry of Transportation, "Transportation sector report in Iraq", Op.Cit. P22.
(15) United Nations, World Bank, "Joint ding....", Op.Cit. P 88.

1. Daily Ratians.
2. Maintenance of the aircrafts.
3. Cargo.
4. Provide services to aircrafts while they are at the airport.
5. Joint operation for air transport.

IV. Land Transportation:

The General Company of land transportation is one of the formations of the ministry of transport.

It plays an important and effective role in the support of the Iraqi economy; it transports the agricultural, industrial, and supply shares and supports governmental departments in transporting all kinds of goods inside and outside Iraq.

The company was established in 1990, and it started work practically in December 1991, with a fleet consisting of 140 trucks of different kinds. It continued to expand and develop its fleet until it reached the number of 1051 trucks at the beginning of 2003. After the events of 9 April 2003 the fleet was a subject of theft, and only 550 trucks remained([16]).

The Role of the private sector:

The role of the private sector in supporting the company's activities is represented in the following:

1. The compensation for the lack in the number of lorries through than 15 private sector. The company has contracted more than 15 private sector companies that own 650 trucks, even though, the contribution rate of the company with the private sector in transporting general and foodstuff goods is still low, that it doesn't exceed 15% of the volume of the goods imported through Iraqi ports, which amounted to 12 million ton in 2010.
2. The work in the manner of common operation with the private sector, as the company provides facilities and services including allotment of quantities of the loads for the benefit of the private sector, which contracted the company, and in return for that, the general company of land transport gets a percentage no less than 15% of general revenues of transport.

V. Other kind of transportation:

The private sector which is controls this kind of transportation.

This sector used medium size vehicles with capacity (9-27) person, inside Iraq, after year 2003, became the private sector the sole dominant over transportation activities in side cities and other cities.

After the improvement in security situation and conditions, the demand become more and more for this kind of transportation even in land or sea transportation.

Third the importance of the private sector in the economy:

Prosperities period of privatization ideas, therefore it is applied in all fields of economy including transport sector and its activities, the private sector started playing a great role in practicing the principal activities in transport, more ever became acceptable at large world wide acceptance under different justifications while most of it about, the improvement of efficiency and performance. And because this importance role of this sector, we can ask the following questions:

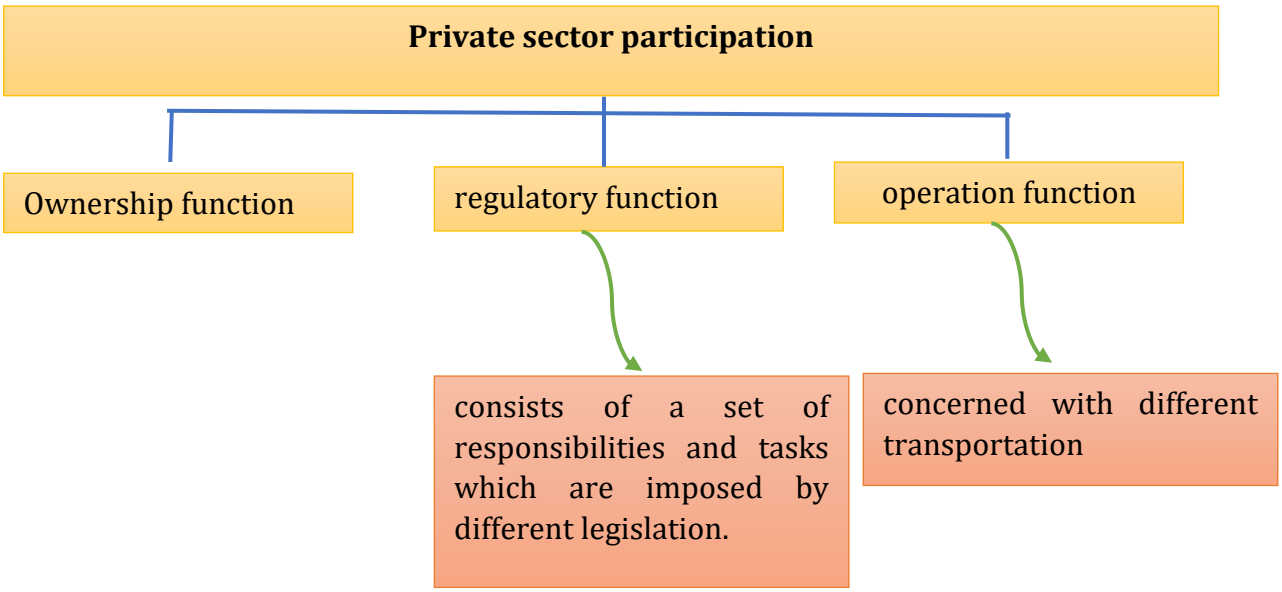
1. What are the activities that private sector is allowed to clubbing or participate? 2. 2. Dose the privatization of transport sector achieved the planned objectives?
3. Is the privatization of transport sector International phenomenon?

According to these questions, we can determine the role of this sector as following

1. Financing the investment
2. Performance of service
3. To reduce the public expenses, through transfer some certain services to private sector in different ways such as renting, licenses, or concession contracts.
4. We can illustrated the role of the private sector in the transportation sector this shape.

(16)Iraqi Ministry of Transportation, "General Company for Land Transport", Unpublished report.

Figure (1) the role of the private sector in Iraq



Source: Dr. Muhamad Muhamed Ali Ibrahim, world experiences in sea ports privatization lessons and precautions, paper submitted to the general trade agreement in services seminar (GATS), Cairo, 3-5 October.

Fourth-The game Theory:

It is a mathematical analysis to situations of conflict of interest for the decisions under the given circumstances leading to the desired result[17].

General of this theory has been developed by the French mathematician Emile Borel, who wrote more than an article on games of chance, and the development of methodologies to play, is the real world of Mathematics - Hungarian American Jon von Neumann, who established through a series articles spanning over ten years (1920-1930), mathematical framework for any development on the theories of the subcommittee.

This theory was structured by Morgensterin Neumann in 1947, to analyze the strategic interaction between player (organization, entities or characters).

Actually, the game theory is a tool used to study the strategic interactions among the player, with a pay off matrix and decision trees approach. The game theory had John Nash contributions where competitors make their choices based upon his opponents. The game could be cooperative, when participants negotiate contracts, which enable the balance among coordinated strategies, or not cooperative, when agreements are not possible[18].

The concept of the game:

1- The game: at least there are two player, who are making a decision

2- The player have a rational behaviour, and they are tring to make the profit process more probability or likely.

(17)The game theory, http://en.wikipedia.org/wiki/Game theory

And for more information look at:

• Robert pindyck and Daniel Rubinfeld, "Mikro Ökonomie", 7aktulisierte Auflage, 2004.P.622-671.

• Hillier, Frederick S. and Lieberm, "Introduction to Operations Research", by Hillier, 7th Edition, 2001, PP726-743.

(18) Macelo Sampaio and others, "Application of game theory to strategic decision Making: will Ethanol complement or Replace gasoline?", coppleuniver sidad federal do Rio de Janeiro and ceet/centro Federal de Egucacao Tecno logica, A venid Marcan, p134 available at: http://www.rio9.com/programme/Book of Proceedings 22 BM Marciel Final 3.pdf .

3- Players behave strategically that is, they calculate or predict the movement of opponent or other player([19]).

- The game can be divided into:

a- Static games: the players must choose their strategies that they are all at the same time means that both of them make a decision at the same moment, and cannot see, what did the first rival and then decide.

b- Dynamic Games: players can make their own decision in that one after the other.

- Game with complete information, all the players know the intentions, like what is the result that he wants opponents to reach them, and their rivals and their rivals know that they know that their rivals know it.

- Or in complete information games: at least one of the players does not have full knowledge of the intentions of his rivals[20].

The types of the game:

The game theory distinguish between various forms of games, according to the number of players and playing

1 - Game per person: where there is no conflict of real interest of the player the individual himself, and in this game, the chance is the structure of the basic game.

2- Game of two players: this type is more prevalent, and in game bilateral all the options and possible moves as well as for the results to be expected, but when there are three or more players, the prospects of complex random choices and opportunities arise in the circumstances to form a cooperative, or knit, or a collision between the players.

3- Game of two people zero sum game: if the total profit minus output at the end of the game is zero total. That means the amount of profit or intolerable equal exactly the amount of loss[21].

According to the game theory, our analysis could be accomplished by observing the interaction between the public and private sector in transport sector in Iraq. This model is represented by matrix, which calls pay "off matrix" and with this matrix the optimal strategies of public and private sector can be explored in order to maximize the profit, in addition to help the decision-maker in Iraq to take the correctndecision in terms of the transformation to private sector (privatization) in the one hand, on the other hand, the matrix can show, which one of the sector is efficient. Eventually, the matrix could be used to solve the problem of reallocation the resources, and to measure the production capacity of both sectors.

Fifth the Application:

1. We used the criteria of maxi-mini and mini-max, which help the competitor to choose the optimal strategies by maximizing the profits or Lessing the losses.
2. The value of cach activity in the pay off matrix represents the additional value rate to the capital formation as the average of the period (1999-2008) as shown in tables (2)
3. The pay off matrix is defined by the rows for public sector and column for private sector as shown in tables (3-5)

(19) The game theory, op-cit .

(20) IBID.

(21) "What is the game theory, http://en.wikipedia or Game_theory#Types of games.

Table (1) the additional Value rate to capital formation

Public sector	Private sector
1- sea transportation (5.79)	1-Sea transportation (0.82)
2- Land transportation (0.57)	2- Land transportation (0.20)
3- Railway transportation (0.21)	3- Railway transportation (0.14)
4- Airway transportation (2.25)	4- Air way transportation (0.24)
5- other kinds of transportation (0 zero)	5-other kinds of transportation(14.16)

Source: calculated by the researcher depends on table; Ministry of Transport, Department of planning and statistics, Baghdad, Various years.

Table (2) Pay off matrix for public and private transportation sectors in Iraq- first case

private / public	Sea Trans (1) 0.82	Land Trans (2)0.20	Airways Trans (3)	Railway Trans(3) 0.24	Other (5) 14.19
1) Sea Trans. **5.79**	**4.94**	**5.59**	**5.55**	**5.62**	**-8.43**
2) Land Trans. **0.57**	**-0.25**	**0.37**	**0.28**	**0.43**	**-13.62**
3) Airways Trans. **2.25**	**1.43**	**2.05**	**1.96**	**2.11**	**-11.99**
4) Railway Trans. **0.21**	**-0.61**	**0.01**	**-0.08**	**0.07**	**-13.98**
5) Other **0.0**	**-0.82**	**-0.2**	**-0.29**	**-0.14**	**-14.19**

Source: calculated by the researcher depends on table (1).

1. The payoff matrix in table 2 represents the profit of public sector in each row if the sign is positive (+), and this sector has five policies.
2. The negative sign (-) reflects the loss of the public sector.
3. Each negative number reflects profit for private, and positive number reflects loss and this sector has five policies shown in the columns.
4. According to above points, each sector will choose the optimal strategy. 5. We obtain all the elements in the matrix as follow:

all = 5.76 -0.82 = 4.94

And the element

a21= 0.57 -0.82= -0.25

6. The last row represents profit for private sector because the public sector has no investment in this kind of transportation.

Table (3) Pay off matrix for public and private transportation sector in Iraq- Second case

public \ private	Sea Trans (1) 0.82	Land Trans (2) 0.20	Airways Trans (3)	Railway Trans(3) 0.24	Other (5) 14.19
1) Sea Trans. **5.79**	**4.94**	**5.59**	**5.55**	**5.62**	**-8.43**
2) Land Trans. **0.57**	**-0.25**	**0.37**	**0.28**	**0.43**	**-13.62**
3) Airways Trans. **2.25**	**1.43**	**2.05**	**1.96**	**2.11**	**-11.99**
4) Railway Trans. **0.21**	**-0.61**	**0.01**	**-0.08**	**0.07**	**-13.98**

Source: calculate by the researcher depends on table (1).

- In order to exclude the effect of other kinds of transportation from the optimal resolution for public sector and lead it to choose its optimal policies with four available policies, we exclude of the fifth row from it.
- The second case explains the five policies of private sector.

Table (4) Pay off matrix for public and private transportation sector in Iraq- Third case

public \ private	Sea Trans (1) 0.82	Land Trans (2) 0.20	Airways Trans (3)	Railway Trans(3) 0.24
1) Sea Trans. **5.79**	**4.94**	**5.59**	**5.55**	**5.62**
2) Land Trans. **0.57**	**-0.25**	**0.37**	**0.28**	**0.43**
3) Airways Trans. **2.25**	**1.43**	**2.05**	**1.96**	**2.11**
4) Railway Trans. **0.21**	**-0.61**	**0.01**	**-0.08**	**0.07**

Source: calculate by the researcher depends on table (1).

- The payoff matrix in table (4) reflects the competitive case between public sector and private sector in all kinds of transportation activities, this pay off represents that the public sector has four strategies and the private sector has four strategies and each strategy of public sector represents the profit of it toward other sector in every activity of transportation after exclusion the effect of other transportation.

The Optimal Strategies:

In order to determine the optimal strategy, we must choose pay off matrix for searching for pure strategy and the equilibrium point by using maxi-mini and mini- max criterion, and these criterion are applied on the matrix of tables (5, 6, and 7) and the result shown as;

Table (5) the optimal strategy of pay off matrix for the first case

private / public	Sea Trans (1) 0.82	Land Trans (2) 0.20	Airways Trans (3)	Railway Trans(3) 0.24	Other (5) 14.19	Mini-max
1) Sea Trans. 5.79	4.94	5.59	5.55	5.62	-8.43	-8.43
2) Land Trans. 0.57	-0.25	0.37	0.28	0.43	-13.62	-13.62
3) Airways Trans. 2.25	1.43	2.05	1.96	2.11	-11.99	-11.99
4) Railway Trans. 0.21	-0.61	0.01	-0.08	0.07	-13.98	-13.98
5) Other 0.0	-0.82	-0.2	-0.29	-0.14	-14.19	-14.19
Maxi-mini	**4.94**	**5.59**	**5.55**	**5.62**	**-8.43**	

Source: calculate by the researcher depends on tables (2).

The optimal strategy for the competitors which symmetry the mini-max, and max- mini value, and the game value was (-8.43) for the benefit of the private sector.

Table (6) the optimal strategy of pay off matrix for the second case

private / public	Sea Trans (1) 0.82	Land Trans (2) 0.20	Airways Trans (3)	Railway Trans(3) 0.24	Other (5) 14.19	Mini-max
1) Sea Trans. 5.79	4.94	5.59	5.55	5.62	-8.43	-8.43
2) Land Trans. 0.57	-0.25	0.37	0.28	0.43	-13.62	-13.62
3) Airways Trans. 2.25	1.43	2.05	1.96	2.11	-11.99	-11.99
4) Railway Trans. 0.21	-0.61	0.01	-0.08	0.07	-13.98	-13.98

Maxi-mini	**4.94**	**5.59**	**5.55**	**5.62**	**-8.43**

Source: calculate by the researcher depends on tables (3).

We find that the optimal strategy in the second case has the same result which is represented in the table (5).

Table (7) the optimal strategy of pay off matrix for the third case

private / public	Sea Trans (1) 0.82	Land Trans (2) 0.20	Airways Trans (3)	Railway Trans(3) 0.24	Mini-max
1) Sea Trans. **5.79**	**4.94**	**5.59**	**5.55**	**5.62**	**-8.43**
2) Land Trans. **0.57**	**-0.25**	**0.37**	**0.28**	**0.43**	**-13.62**
3) Airways Trans. **2.25**	**1.43**	**2.05**	**1.96**	**2.11**	**-11.99**
4) Railway Trans. **0.21**	**-0.61**	**0.01**	**-0.08**	**0.07**	**-13.98**
Maxi-mini	**4.94**	**5.59**	**5.55**	**5.62**	

Source: calculate by the researcher depends on table (4).

The optimal strategy for both competitors is (all) which symmetry the mini-max, and max-mini value, and the game value was (4.94) for the benefit of the public sector, and the public sector will choose the first pure strategy which represents sea transportation in order to maximize lesser profit.

Sixth the Conclusions

1. The study found that the private sector was more efficient in other activities of transportation than the public sector.
2. The private sector is also more efficient in these activities that have high level of profit like land, airways, and sea transportation as shown in the pay off matrix at the first case.
3. According to the previous two points, the private sector is more efficient in distributing investment among transportation activities than the public sector.
4. The public sector should leave these activities that have a low proportion of added value according to the capital formation to the private sector, and itself only to activities which give a high level of profit.

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6. Robert pindyck and Daniel Rubinfeld, "Mikro Ökonomie",7aktulisierte Auflage, 2004. 7. The game theory, http://en.wikipedia.org/wiki/Game theory
8. United Nations, World Bank, "Joint assessment for rebuilding and reconstruction in Iraq", Arabic version, 2003.
9. What is the game theory, available at: http://en.wikipedia.org/wiki/Game_theory #Types of games

Table (1) The added value and capital formation in sea transportation- public sector 2011-2020(at constant price of 2007)
Million ID

Year	Added value(1)	Capital formation(2)	The additional value rate to capital formation (3) 1:2
2011	33.24	120.3	0.27
2012	21.63	29.25	0.73
2013	68.47	14.4	4.75
2014	54.50	7.02	7.76
2015	1.80	5.75	0.37
2016	17.65	5.9	2.99
2017	15.14	1.44	10.51
2018	21.95	3.97	5.5
2019	47.01	11.37	4.13
2020	13.74	3.69	3.72
Total (57.9)Avarage (57.9/10)=5.79			

Source: Ministry of Transport, Department of planning and statistics, Baghdad, Various Years.

Table (2) The added value and capital formation in sea transportation- private sector 2011-2020(at constant price of 2007)
Million ID

Year	Added value(1)	Capital formation(2)	The additional value rate to capital formation (3) 1:2
2011	9.30	11.33	0.82
2012	0.21	22.7	0.09
2013	0.11	3.22	0.03
2014	0.17	6.18	0.02
2015	0.10	1.15	0.08
2016	0.11	14.01	0.07
2017	0.67	10.75	0.06
2018	3.78	28.45	0.13
2019	3.24	1.36	2.38
2020	2.60	0.55	4.72
Total (8.256)Avarage (8.256/10)=0.82			

Source: Ministry of Transport, Department of planning and statistics, Baghdad, Various Years.

Table (3) The added value and capital formation in Land transportation- public sector 2011-2020(at constant price of 2007)
Million ID

Year	Added value(1)	Capital formation(2)	The additional value rate to capital formation (3) 1:2
2011	11.31	26.83	0.42
2012	0.24	15.91	0.01
2013	1.01	34.13	0.02
2014	1.39	8.73	0.15
2015	0.46	2.44	0.18
2016	0.71	8.46	0.08
2017	1.58	2.17	0.72
2018	1.39	0.60	2.31
2019	0.92	12.8	0.07
2020	0.63	0.58	1.08
Total (5.77)Avarage (5.77/10)=0.57			

Source: Ministry of Transport, Department of planning and statistics, Baghdad, Various Years.

Table (4) The added value and capital formation in Land transportation- private sector 2011-2020(at constant price of 2007)
Million ID

Year	Added value(1)	Capital formation(2)	The additional value rate to capital formation (3) 1:2
2011	6.34	79.33	0.07
2012	2.10	46.81	0.04
2013	0.26	47.60	0.05
2014	0.23	53.34	0.04
2015	0.22	9.75	0.02
2016	0.72	28.85	0.03
2017	3.69	23.62	0.15
2018	6.26	30.47	0.20
2019	7.12	9.03	0.78
2020	7.69	10.06	0.76
Total (2.059)Avarage (2.059/10)=0.20			

Source: Ministry of Transport, Department of planning and statistics, Baghdad, Various Years.

Table (5) The added value and capital formation in Railway transportation- public sector 2011-2020(at constant price of 2007)
Million ID

Year	Added value(1)	Capital formation(2)	The additional value rate to capital formation (3) 1:2
2011	24.5	118.9	0.20
2012	26.08	200.84	0.12
2013	11.61	251.03	0.01
2014	21.07	170.32	0.12

2015	19.04	154.13	0.12
2016	23.13	137.68	0.16
2017	39.33	52.40	0.52
2018	6.93	28.38	0.24
2019	8.54	18.57	0.45
2020	10.68	47.63	0.22
Total (2.16)Avarage (2.16/10)=0.21			

Source: Ministry of Transport, Department of planning and statistics, Baghdad, Various Years.

Table (6) The added value and capital formation in Railway transportation- private sector 2011-2020(at constant price of 2007)
Million ID

Year	Added value(1)	Capital formation(2)	The additional value rate to capital formation (3) 1:2
2011	19	315.31	0.06
2012	42.36	716.9	0.05
2013	51.06	518.15	0.09
2014	32.22	381.71	0.08
2015	29.82	328.22	0.09
2016	32.29	254.69	0.12
2017	27.35	123.41	0.20
2018	27.35	112.87	0.24
2019	27.13	61.33	0.44
2020	15.83	95.66	0.16
Total (1.45)Avarage (1.45/10)=0.14			

Source: Ministry of Transport, Department of planning and statistics, Baghdad, Various Years.

Table (7) The added value and capital formation in Airways transportation- public sector 2011-2020(at constant price of 2007)
Million ID

Year	Added value(1)	Capital formation(2)	The additional value rate to capital formation (3) 1:2
2011	27.9	94.9	0.29
2012	0.45	96.66	0.05
2013	0.27	143.02	0.01
2014	0.29	42.07	0.06
2015	0.19	42.46	0.02
2016	16.72	66.62	0.25
2017	46.18	91.46	0.50
2018	28.62	4.64	6.16
2019	33.65	8.11	6.58
2020	43.99	5.06	8.69
Total (22.50)Avarage (22.50/10)=2.25			

Source: Ministry of Transport, Department of planning and statistics, Baghdad, Various Years.

Table (8) The added value and capital formation in Airways transportation- private sector 2011-2020(at constant price of 2007)

Million ID

Year	Added value(1)	Capital formation(2)	The additional value rate to capital formation (3) 1:2
2011	32.84	13.66	0.02
2012	1.06	76.61	0.01
2013	0.30	7.16	0.01
2014	0.15	1.13	0.13
2015	0.09	0.93	0.09
2016	0.05	3.81	0.01
2017	0.04	1.30	0.03
2018	0.62	0.38	0.68
2019	0.66	0.64	1.03
2020	0.58	0.63	0.92
Total (2.46)Avarage (2.46/10)=0.24			

Source: Ministry of Transport, Department of planning and statistics, Baghdad, Various Years.

Table (9) The Other Kind of transportation- private sector 2011-2020 (at constant price of 2007)

Million ID

Year	Added value(1)	Capital formation(2)	The additional value rate to capital formation (3) 1:2
2011	26.19	0.44	54.52
2012	26.37	4.79	6.15
2013	29.48	2.0	16.32
2014	32.65	0.95	40.23
2015	38.22	59.61	0.78
2016	46.70	4.64	8.78
2017	40.78	105.14	0.48
2018	51.26	12.55	4.04
2019	50.76	10.01	4.39
2020	43.95	26.13	1.27
Total (141.69)Avarage (141.69/10)=14.16			

Source: Ministry of Transport, Department of planning and statistics, Baghdad, Various Years.

The public sector dose not invest in this Kind of transportation, so the value of this activity equal to zero.