العلوم الاقتصادية
العدد السادس والسبعون/ المجلد عشرون/ اذار 2025

تقدير وتحليل دالة التكاليف لشركة ديالى العامة خلال المدة (2005 – 2021)

محمد نوري فرحان
الاستاذ الدكتور أحمد وهيب حسين
جامعة الفلوجة / كلية الادارة والاقتصاد

تواريخ البحث
تاريخ تقديم البحث : 11/ 8 /2024
تاريخ قبول البحث :25/ 7 /2024
تاريخ رفع البحث على الموقع:
2025/3/15

المستخلص :

تستهدف الدراسة تشخيص مستويات التكاليف الكلية التي تتحملها شركة ديالى العامة، ومن ثم تقدير وتحليل العلاقة الكمية بين البنود المختلفة لهذه التكاليف، بالإضافة لتأثير النشاط الإنتاجي فيها. وتم ذلك من خلال اختيار المتغيرات المختلفة المؤثرة في التكاليف وبنودها المختلفة للشركة محل الدراسة، وبالاعتماد على البيانات الصادرة من الشركة خلال المدة (2005 – 2021)، مستندين على منهجية تجمع بين الأسلوبين الوصفي والقياسي من أجل تقدير وتحليل دالة التكاليف في الشركة المعنية.

توصلت الدراسة حسب الدالة المقدرة لتكاليف الشركة محل الدراسة إلى أن قيمة الإنتاج تؤثر في التكاليف الكلية بنسبة 56.7%، والرواتب والاجور بنسبة 58.1%، والمستلزمات السلعية بنسبة 40.5%، و12.4% لتأثير المستلزمات الخدمية في التكاليف، ونسبة 1.4% للفوائد وايجارات الأراضي، مع استبعاد عدد من البنود للتكاليف المالية التي تتحملها الشركة نتيجة عدم تجاوزها للاختبارات الاحصائية والقياسية والاقتصادية. كما إن نتائج معلمة الزمن T المعبرة عن مستوى التغير التكنولوجي في داخل شركة ديالى العامة أثبتت معاناتها من التقادم للآلات والمكائن. وبينت نتائج معلمة المتغير الوهمي DV التأثير السلبي للظروف غير المستقرة في مستويات التكاليف للشركة محل الدراسة.

الكلمات المفتاحية :التكاليف الكلية, النشاط الانتاجي, التغير التكنولوجي, المتغير الوهمي

Estimating and Analyzing the Cost Function of the Diyala State Company during the period (2005-2021)

Mohammed Noori Farhan **Professor Dr: Ahmed Wahib Hussein**

college of Administration and Economics - University of Fallujah

Abstract :

The study aims to diagnose the levels of total costs borne by the Diyala State Company, then estimate and analyze the quantitative relationship between the different items of these costs, in addition to the impact of the productive activity on them. This was done by choosing the different variables affecting the costs and their different items for the company under study, and relying on the data issued by the company during the period (2002-2021), based on a methodology that combines the descriptive and econometric methods in order to estimate and analyze the cost function in the concerned company.

According to the estimated function of the costs of the company under study, the study concluded that the value of production affects the total costs by 56.7%, salaries and wages by 58.1%, commodity requirements by 40.5%, 12.4% for the impact of service requirements on costs, and a rate of 1.4% for interests and land rents. With the exclusion of a number of items for the financial costs incurred by the company as a result of not exceeding the statistical, standard and economic tests. Also, the results of the time parameter T, which expresses the level of technological change within the Diyala State Company, proved its suffering from the obsolescence of machines and machines. The results of the dummy variable parameter DV showed the negative impact of unstable conditions on the cost levels of the company under study.

Keywords: total costs, productive activity, technological change, dummy variable.

Introduction

The Iraqi industrial sector in general and the electrical industries branch in particular witnessed a decline in production, which led to an increase in the costs borne by both the sector and its industrial branches. This is due to the conditions and circumstances that the country witnessed after 2003, which combined with a number of internal factors in public companies, including Diyala General Company. Among these factors is the process of theft and plunder that these companies faced after the American occupation of Iraq in 2003, the spread of the phenomenon of wasting money in wasteful consumer aspects, the technological obsolescence of machinery and machines, and other factors that increased the financial burdens (costs) that these companies spend. Companies. Therefore, it was necessary to estimate the cost function for one of the public industrial sector companies, so the Diyala Public Company was chosen as a model, as this company is considered one of the important and vital companies in the electrical industries, one of the basic pillars in any local economy, and an important contributor to strengthening the balance of payments of the national economy. Diyala General Company worked to supply ministries, public sector institutions, and private sector components with various products from the electrical industries, in a way that contributes to the attempt to achieve economic development in Iraq by supplying the economy with electrical devices and equipment to compensate for the imported devices.

The importance of the study: The importance stems from the fact that studying the costs borne by partial economic units, including the Diyala General Company, is an important aspect of the analysis specialized in microeconomics. Therefore, estimating the cost function with recognized quantitative and standard methods and methods is of great importance.

Objective of the study: The study aims to identify trends in total costs in Diyala General Company and diagnose the levels of relative changes in these costs and their distributions, and then target the relationship between the various items of these costs, and the level of impact of production activity on these costs, and then analyze that and work to estimate the cost function. By standard scientific methods.

Study problem: The problem is that the increase in the total costs of Diyala General Company came as a result of internal and external factors to which the company was exposed, which led to
fluctuation in production activity in the various electrical products produced by the company under study.

Study hypothesis: It is based on the hypothesis that "Diyala General Company bears various items of costs, and the presence of a number of internal and external factors that affect these costs and their distributions among its various items".

Temporal and spatial limits of the study: The spatial limits of the study were represented in choosing the Diyala General Company as one of the public industrial sector companies operating in the Iraqi Diyala Governorate.

Regarding the time limits, the period from 2005 to 2021 was chosen, in order to estimate the cost function for the company under study.

Study methodology: The study relied on a methodology that combines descriptive and analogical methods, whereby the trends in production activity in the company under study and the relative distribution of total costs among its various items were described, and then the economic measurement method was used to estimate and analyze the cost function in the company in question.

The first topic

Conceptual introduction to costs and their functions

1-1- Definition of costs:

Costs are defined as a sum of amounts borne by the producer in order to organize and manage the production process, as they include all expenses on inputs and services used in the production process (Doll, 1978: 20). Costs are usually expressed in monetary form that determines the values of the services of production elements. Used in the production of goods and services, these values are then collected to obtain the total costs, as the costs cannot be obtained in kind due to the difference in the quality of the units produced, their heterogeneity, and their units of measurement (Fawzi, 2005: 244). Costs represent the volume of cash spending by the production unit on wages and bonuses paid to the labor component, purchases of equipment and machinery used in production, payments for the purchase of raw materials, energy, transportation and communications services, and dues from rents, taxes, insurance, etc. (Dagher, 2008: 253). Thus, costs are considered a comprehensive measure of the economic resources (natural and human)

used in the production process, and are necessary for the investment decision maker in determining the financial allocations necessary for investment, and in determining the relationship between production and the levels of expenses that must be paid to carry out the production process, that is, the costs borne by the producer (NIDA, 2001: 12) .

1-2- Types of costs:

Economists divide production costs into several types, including:

A - Opportunity Cost: It is the cost resulting from the loss of an opportunity as a result of directing economic resources towards producing another good (Drury, 2004: 39.(

B - Past Cost and Future Cost: The first cost is an actual cost and the second is a predicted cost. The future cost is concerned with when making administrative decisions related to the production process, which depends on the sum of the costs achieved in the presence of other calculated variables (Dagher, 2008: 253)

T - Explicit and Implicit Costs: Explicit costs are known as the total costs paid by the producer, which were paid in order to obtain the use and services of the inputs involved in the production process (Nicholson, 1994: 227). As for implicit costs, they do not represent cash flows paid by the producer, and are taken into account when comparing between the various available alternatives (Abdul Rahim, et al., 1990: 95) .

D - The cost associated with the circumstances surrounding the production unit: What is meant by the surrounding circumstances is the situation facing the production unit during the period of time. Accordingly, the costs can be divided between fixed and variable costs depending on the period of time (Abdullah, et al., 2016: 184), which can be explained as follows:

1- Short-run costs: The types of these costs can be distinguished as follows: (Al-Naimi and Al-Sayegh, 2003: 10) and (Dagher, 2008: 254-255).

-Total Fixed Costs (TFC): It is the sum of the obligations incurred by the production unit per unit time for all fixed elements used in production.

-Total Variable Costs (TVC): It is the sum of the obligations that the production unit bears per unit of time for all the variable elements used in production. It is directly linked to the level of production and changes according to its level.

4-Total Costs (TC): It is the sum of the costs incurred by the production unit per unit time for all production elements used to produce a specific product.

-Average Costs (AC): which represent the average or average cost of the producing unit, or is the producing unit's share of costs of various types during the short term.

-Marginal Costs (MC): which represents the cost of the last unit or additional unit, or is the addition to the total costs resulting from increasing production by one unit.

2-Long-run costs: These are the costs that change resulting from a change in the quantities used of production elements that contribute to the production process in order to produce a specific product, and the production unit is able to change the technical and technical conditions available to this unit in order to reduce the cost of the producing unit. (Mankiw, 2001: 283).

1-3- Cost Functions:

These functions express the relationship between what is spent by the producing unit versus the use of economic resources for production. The nature of the total cost function depends on the nature of the production functions derived from it, as the prices of production factors affect the level and slope of the total cost function whether it is a linear function, or it is the inverse of the production function (Mankiw, 2001: 284). Just as economists distinguished between cost functions depending on the time path, these functions are divided into short-term and long-term functions, since these two-term functions are complex functions determined by a set of production factors. In the short term, they consist of the following: (Al-Naimi and Al-Sayegh, 2003: 11 - 12)

TC = f(Q, T, P, K)

In the long term, it consists of the following:

TC = f(Q, T, P)

Where TC expresses the total production costs, Q is the quantity or value of production, T is the technology, P is the prices of the factors of production, and K is the remaining fixed factors of production.

Analysis of production trends and relative distribution of cost items in Diyala General Company

2-1- Historical establishment of the company:

Diyala General Company is one of the general formations affiliated with the Iraqi Ministry of Industry and Minerals. The company is located in Diyala Governorate, 8 km from the city of Baqubah on the Baghdad-Baqubah road. (https://www.dialacompany.com/acontact.htm) .

The company was established pursuant to Resolution No. 14 on 4/12/1974 under the name "Diyala Industrial Complex" within the Light Engineering Industries Complex. The company's articles of incorporation were officially published in the Iraqi newspaper Al-Waqe'i, No. 2575 on 3/14/1977. The industrial complex included: Establishing four main laboratories: the electrical standards laboratory, the electric iron laboratory, the mug candles laboratory, and the ceiling fans laboratory (Report of the General Administration of Diyala General Company, for the year 2021: 1 - 2).

The electrical transformers (distribution and power) project was also opened in 1983, and in 1984 an iron candle factory was implemented as a replacement for the old factory. In the same year, the two previously mentioned factories were merged with the industrial complex factories, so the name was changed to "Al-Qadisiyah General Facility for Electrical Industries." Within this facility, the Arcon factory was implemented to produce oxygen and argon gases in 1990. After converting to the corporate system, the name was changed to "Al-Qadisiyah General Company for Electrical Industries" on January 1, 1998, and in 2002, the "Optical Receiver Factory" was implemented. (Iraqi Ministry of Planning, 2021: 33). Then the name of "Al-Qadisiyah Company" was changed after the events of 2003 to "Diyala General Company for Electrical Industries" (Report of the General Administration of Diyala General Company, for the year 2021: 1 - 2) and (Rajab, 2020: 785).

In 2016, Al-Mansour General Company was merged with the company under study under the name "Diyala General Company," and then a year later this merger was dissolved in 2017 (Iraqi Ministry of Planning, 2021: 33).

Currently, Diyala General Company includes the following laboratories: Distribution Transformers Laboratory, Power Transformers Laboratory, Electrical Measurements Laboratory, Steam Iron Laboratory, Mug Candles Laboratory, Ceiling Fans Laboratory, Oxygen and Arcon Gas Production Plant, and Photovoltaic Lighting Plant.

As the company's products are of great importance and are used in projects related to electricity and oil, and the company's products conform to local manufacturing specifications with international specifications IEC60076 (Iraqi Ministry of Planning, 2021: 33), in addition to that the company does not face local competition

(but there is foreign competition For the company's products), which led to an increase in demand for its products, especially electrical transformers and electrical meters, so the company aims to access the available energy*[1] after rehabilitating and modernizing its machines by purchasing modern machines and devices and renewing its production lines in order to improve the quality of its products within the electrical industries and developing the company's work using the current experience of its employees (Report of the General Administration of Diyala General Company, for the year 2021: 1 - 2).

2-2- Analysis of production trends in the company under study:

In order to study and analyze trends in the growth of production activity in Diyala General Company for the period from 2002 to 2021, the production value was chosen to diagnose and estimate the level of production activity in the company under study, as the production value is one of the important indicators in knowing the growth and stability level of any company's activity and its extent. Development in production levels and trends, as follows:

Table (1)

Trends in production value in Diyala General Company during the period (2005 - 2021)

Items Years	Production value)Million dinars(	Annual growth rate *(%)	Items Years	Production value)(Million dinars	Annual growth rate *(%)
2005	**14952**	-	**2017**	**29977**	**329.2**
2006	**16273**	**8.8**	**2018**	**33380**	**11.4**
2007	**11173**	**-31.3**	**2019**	**65230**	**95.4**
2008	**21002**	**88.0**	2020	29643	**-54.6**
2009	**28984**	**38.0**	**2021**	**46422**	**56.6**
2010	**53157**	**83.4**	**Compound growth rate of duration (2005-2013)**(%)**	**27.95**	**.**
2011	**89354**	**68.1**	**Compound growth rate of duration (2014- 2021 **(%))**	**-10.3**	**.**
2012	**101433**	**13.5**	**Compound growth rate of duration (2005- 2021) **(%)**	**7.337**	**.**
2013	**107467**	**5.9**			
2014	**99123**	**-7.8**			
2015	**39099**	**-60.6**			
2016	**6985**	**-82.1**			

Source: Diyala General Company, final accounts for the period (2005 – 2021).

*Annual growth rates were extracted by researchers.

**The compound growth rate was extracted by researchers, using the following equation:

* The value of the annual production capacities of Diyala Public Company's factories in 2021: amounted to 286,812 million dinars for the design capacity, the available capacity amounted to about 182,393 million dinars, and what was planned (planned capacity) amounted to 77,679 million dinars. Source:
- Diyala General Company, production and sales summary report for 2021, p. 3.

$r = [\{((Q_t / Q_o)^{1/n-1} - 1\} \times 100$

Where: Qt represents the production value in the comparison year, Q0 represents the production value in the base year, and n is the number of years. Source:

- Prajneshu, Chandran. (2005). Computation of Compound Growth Rates in Agriculture: Revisited, Agricultural Economics Research Review, Vol. 18, P. 321.

It is noted in Table (1) the relative fluctuation of production value trends in Diyala General Company during the selected study period. The compound growth rate reached 7.337% during the

studied period. The production value of the Diyala General Company increased relatively during the period (2005 - 2013), as this value increased during this period from 14,952 million dinars to 107,467 million dinars, with annual growth rates that ranged between (-31.3% - 88.0%), and with a compound growth rate of 27.95%, this is due to the production activity in Diyala General Company being affected by the lifting of economic sanctions on Iraq that were imposed in the nineties of the last century, and the relative rise in oil prices, which led to an increase in demand for electrical products produced by Diyala General Company. It is added To the relative improvement in the security situation, especially in the years 2010 and 2011, which helped to achieve relative stability in production within the company. As for the trends in the value of production in the Diyala General Company during the period (2014 - 2021), it tended towards relative fluctuation, so this value during the period referred to previously reached between (6985 - 99123) million dinars, with fluctuating annual growth rates that ranged between (82.1% - %) 329.2%), with a negative compound growth rate of -10.3%. This is due to the company being affected by a number of reasons, including: the deterioration of the security conditions, especially in the years 2014, 2015 and 2016 due to the armed groups' control over important parts of Diyala Governorate, which led to the company's laboratories stopping and not The possibility of workers carrying out their production activities, and the reluctance of some official bodies (the Ministries of Electricity and Communications) to purchase the company's products despite the reduction in the prices of the company's products, and the company was affected by a shortage in the availability of cash liquidity necessary to purchase production supplies, which led to the cessation of production in 2016 and the company achieving Financial losses. The company was also affected in the years 2019, 2020 and 2021 by the Corona pandemic, which affected the reduction in production in the company, as well as the decrease in demand for its products, in addition to the difficulties of importing the raw materials necessary to continue production due to the measures that accompanied the pandemic at the beginning of its appearance.

2-3- Relative distribution of cost items in the company sample of study:

The costs borne by the Diyala General Company are distributed among the following items: (final accounts of the Diyala General Company, different years, and various pages)

A - Salaries and wages paid for the services of the labor component contributing to the production process.

B - Expenses on commodity supplies that pay for the purchase of raw materials and raw materials, the purchase of fuel and oils, and other miscellaneous supplies necessary to facilitate production in the company's factories and departments.

T - Expenditures on service supplies that are spent on maintaining machines, machines, administrative buildings, production plants and their lines, and expenses on means of transportation for goods and workers in the company, in addition to other service expenses.

D - Interest payments and land rents that are in exchange for the use of funds borrowed from banks, and in exchange for the use of rented buildings necessary for the work of the company's departments and laboratories.

C - Depreciations that are calculated according to the unified accounting system (the straight-line method), as in the depreciation of buildings, the depreciation of machinery, equipment, means of transportation, production blocks, and other depreciations.

H - Transfer expenses that are spent on the contribution of central and affiliated production units, compensation, fines, taxes and fees, and other transfer expenses.

g - Other expenses, which include incidental expenses and capital losses.

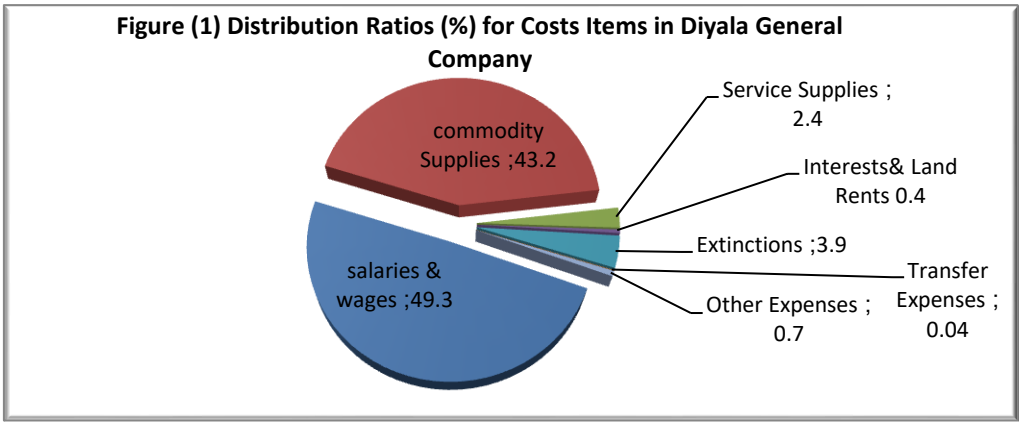
The averages of the relative distribution of the previous cost items have been listed in Table (2) and Figure (1) as follows:

Table (2)

Averages of the relative distribution of cost items in Diyala General Company

Averages items	Average cost values (million dinars)	Average relative distribution of costs (%)	**Types of costs**
Salaries and wages	22083906	49.3	Fixed
Commodity supplies	24603209	43.2	variable
Service supplies	1088326	2.4	variable
Interest and land rents	129341	0.4	Fixed
Extinctions	2177527	3.9	Fixed
Transfer expenses	24917	0.04	variable
Other expenses	413239	0.7	variable
Total costs	50520465	100	college

Source: Averages were prepared by researchers based on the data contained in Appendix (1).



Source: Prepared by researchers based on Table (2) .

It is clear from Table (2) and Figure (1) that salaries and wages were in first place with a percentage of contribution to total costs, with an average percentage of 49.3%, and an average value of these salaries amounting to 22,083,906 million dinars. The reason for these salaries being in first place was unemployed employment. Studied by the management of Diyala General Company, and as a result of the increase in these salaries after 2003, this may indicate a decline in work productivity and wages within the company. Then, expenses for commodity supplies came in second place with an average contribution to total costs of 43.2%, with an average value of 24,603,209 million dinars. The reason for this was due to the heavy reliance on purchasing raw materials and raw materials from imported external sources. As for the third place in the distribution of costs, it was for obsolescence, as its percentage of contribution to the total costs reached 3.9%, with an average value of 2,177,527 million dinars, as what is noted is the obsolescence of machinery and buildings in the Diyala General Company, and the difficulty of renewing them as a result of the large costs that the company bears, and its dependence on aid and subsidies. Provided by the Iraqi Ministry of Industry and Minerals, as a result of workers not keeping pace with modern technical and industrial methods, as they wish to remain in production methods and methods that rely on old machines and machines.

The rest of the costs were in the following order: service supplies, other expenses, interest and land rents, and transfer expenses. The average relative distribution was: 2.4%, 0.7%, 0.4%, and 0.04%. The average cost values reached, respectively: 1,088,326, 413,239, 129,341, and 2,417 million dinars

The third topic

The estimated formula for the cost function for Diyala General Company

3-1- Description of the estimated formula for the cost function:

In order to test the validity of the research hypothesis or not and to achieve the goal of the research in estimating the cost function for Diyala Public Company based on the data for the selected period*, a number of cost function

variables will be chosen to determine the best estimate for this function, and by relying on the results of the statistical program EViews 10, and using Ordinary least squares** OLS method.

The selected research variables necessary to estimate the cost function for the company under study were:

A - The dependent variable: It is represented by the variable that is affected by the estimated model, as it is affected by the independent variables, and its value is determined from within the model through the parameters and independent variables (Bakhit and Fathallah, 2009: 27). Since the research aims to estimate the cost function, total cost data was chosen, and its symbol is TC.

B - Independent variables: These are the variables that affect the estimated model but are not affected by it, and their value is determined by independent factors outside the model (Bakhit and Fathallah, 2009: 27). A number of independent variables were chosen in order to estimate the cost function of the company under study, as follows:

A: Production value: It is the monetary value of the production activity in the company under study, and it is coded with PV. It is noteworthy that the reason for choosing the production value is in order to achieve homogeneity between the selected study variables in terms of units of measurement. All of these variables are measured in (million dinars), and in order to The production value is a substitute for the production quantity of the company under study.

B- Components of cost items: As previously explained, they are (salaries and wages, symbol W, commodity supplies, symbol M, service supplies, symbol S, benefits, and land rents, symbol IR).

Other independent variables: Other variables were adopted within the estimated model, which are can be explained in the following table:

Table (3): Selected study variables and their symbols used in the cost function for Diyala Public Company

Variable type	Variable name	Variable Symbol
continued	Total Costs	TC
independent	Production Value	PV
independent	Salaries and Wages	W
independent	Merchandise Supplies	M
independent	Service Supplies	S
independent	Interest and Land Rent	IR
independent	Time	T
independent	Dummy Variable	DV
Random variable	Error Term	E_t

Source: Table prepared by researchers based on what was previously described for the variables selected in estimating the cost function .

In order to estimate the cost function for Diyala General Company, a number of standard formulas were used, represented by linear and non-linear formulas (quadratic, cubic, double logarithmic, and semi-logarithmic), with

the aim of obtaining the best possible estimate of the cost function for the company under study. The best estimated function was the non-linear formula. Represented by the double logarithmic formula, based on the results of statistical, econometric and economic tests, where in this formula the natural logarithm was added to some of the variables selected in the estimation, and because some variables did not exceed the statistical, econometric and economic tests, they were excluded from the estimated cost function, and they are: losses, transfer expenses. Other expenses.

The variables used in estimating the cost function for the company under study can be expressed through the following functional formula:

TC = f(PV, W, M, S, IR, T, DV)

The above formula can be written in non-linear (logarithmic) form as follows:

$$LnTC = B_0 + B_1 LnPV + B_2 LnW + B_3 LnM + B_4 LnS + B_5 LnIR + B_6 T + B_7 DV + E_t$$

Where: Bi represents the parameters of the selected independent variables, respectively. Parameter B6 represents the time parameter that shows the level of technological change. Parameter B7 expresses the effect of the years that faced abnormal conditions in the production process, and thus these conditions affected the total costs borne by the Diyala General Company.

3-2- Analysis of the results of stability and cointegration tests for cost function variables:

3-2-1- Stationary stability test: In this test, the extent of stability of the variables used in estimating the cost function for the company under study (the variables in their logarithmic form) will be analyzed through the use of the Augmented Dickey - Fuller test (ADF). It tests two hypotheses: the null hypothesis H0, which states that the series is unstable over time, and the alternative hypothesis H1, which states that there is stability of the series over time. The results of the ADF test were as follows:

Table (4)

Results of the ADF test (at the first difference) for the cost function variables of Diyala Public Company

the decision	Calculated value of τ						Variables	
	None				Intercept			
	P-value	Value	P-value	Value		Value		
Stable	0.0001	-4.687940	0.0011	-5.783597	stable	-5.083990	LnTC	
Stable	0.0000	-5.412927	0.0018	-5.502781	stable	-5.414797	LnPV	
Stable	0.0088	-2.669093	0.0188	-4.263508	stable	-3.592223	LnW	
Stable	0.0000	-5.691733	0.0013	-5.680565	stable	-5.722411	LnM	
Stable	0.0002	-4.442807	0.0011	-5.761828	stable	-4.857463	LnS	
Stable	0.0000	-7.717183	0.0001	-7.276405	stable	-7.485259	LnIR	
.	.	-2.699769	.	-4.571559	.	-3.857386	%1	Significance level of critical value
.	.	-1.961409	.	-3.690814	.	-3.040391	%5	
.	.	-1.606610	.	-3.286909	.	-2.660551	%10	

Source: Table prepared by researchers based on the results of the EViews 10 statistical program.

It is clear from Table (4) that the variables used in estimating the cost function for the company under study were stable over time at the first difference, that is, we accept the alternative hypothesis H1 and reject the null hypothesis H0, because the value of the calculated τ is greater than the value of the tabulated τ in the three formulas (Intercept). , Trend & Intercept, None), and the Prob-Value results were less than all levels of significance (1%, 5%, 10%).

3-2-2- Co-integration Test: In this test, the long-term equilibrium relationship between the variables used in estimating the cost function for the company under study will be clarified through the Johansen Test, where we obtain the following results:

Table (5)

Johansson J. Test results for the cost function variables of Diyala Public Company

Result	Prob	Eigenvalue	Maximum Eigen Value		Trace test	
			Max-Eigen Statistic	**Critical Value 5%**	**Trace Statistic**	Critical Value 5%
Integrated	**0.0014**	**0.877685**	**37.82081**	**33.87687**	**86.39625**	69.81889
Integrated	**0.0427**	**0.674643**	**28.21097**	**27.58434**	**48.57544**	47.85613
Not integrated	**0.0725**	**0.502147**	**12.55410**	**21.13162**	**28.36447**	29.79707
Integrated	**0.0448**	**0.421812**	**15.86140**	**14.26460**	**15.81037**	15.49471
Integrated	**0.0147**	**0.281435**	**5.948972**	**3.841466**	**5.948972**	3.841466

Source: Table prepared by researchers based on the results of the EViews 10 statistical program.

From Table (5) we notice that the value of the trace test and the Maximum Eigen Value were greater than the critical values at the 5% level of significance, in four vectors of the long-term relationship between the studied variables, that is, four vectors of the cointegration between them. Therefore, we reject the hypothesis. We nullify H0, which states that there is no cointegration, and we accept the alternative hypothesis, H1, which states that there is cointegration.

3-3- Analysis of the results of estimating the cost function for the company under study:

According to the years of the chosen period, 17 observations of the data contained in Appendices (1 and 2) were relied upon. The cost function for Diyala General Company was estimated, to obtain the best results for estimating the target function shown in Table (6), as follows:

Table (6)

: Results of estimating the cost function for Diyala General Company

Dependent Variable: LNTC
Method: Least Squares
Date: 11/14/22 Time: 12:12
Sample: 2002 2021
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPV	0.567338	1.069682	0.530380	0.0035
LNW	0.581607	0.086937	6.690010	0.0000
LNM	0.405750	0.072360	5.607341	0.0001
LNS	0.124241	2.137537	0.058123	0.0008
LNIR	0.014788	1.014845	0.014571	0.0005
T	0.001983	0.006061	0.327170	0.0074
DV	-0.056427	0.037011	-1.524601	0.1533
C	0.174898	3.812079	0.045870	0.0083

R-squared	0.909592	Mean dependent var	17.47821
Adjusted R-squared	0.883542	S.D. dependent var	0.832490
S.E. of regression	0.066900	Akaike info criterion	-2.282057
Sum squared resid	0.053708	Schwarz criterion	-1.883765
Log likelihood	30.82057	Hannan-Quinn criter.	-2.204306
F-statistic	418.5861	Durbin-Watson stat	1.494428
Prob(F-statistic)	0.000000		

Source: Table prepared by researchers based on the results of the EViews 10 statistical program.

The results shown in Table (6) can be analyzed according to the following tests:

A- Statistical and analogical tests of the cost function:

- **T-Statistic:** To determine the significance of the parameters of the selected variables in estimating the cost function for the company under study, the results of the t-Statistic are found, and the results of the Prob-Value for this statistic are compared with the 5% level of significance, when the Prob-Value is less than At the level of significance, we reject the null hypothesis H0, which states that the estimated parameter is not significant, and we accept the alternative hypothesis, H1, which states that it is statistically significant. From the results shown above, we find that the estimated parameters are statistically significant, because the probability values of these parameters are less than 5%, so we accept the alternative hypothesis.
- **F-Statistic:** The test results for the F-Statistic show that the estimated function is statistically significant, that is, the significance of the function as a whole. When comparing the probability value of this statistic as stated in Table (6), the value of Prob(F-Statistic) reached 0.000000, which is less than the 5% level of significance. Therefore, we accept the alternative hypothesis H1, which states that the estimated function as a whole is significant, indicating that There is a significant effect of the independent variables on the dependent variable.
- **Coefficient of determination R^2**: The coefficient of determination R^2 indicates whether the estimated function is very statistically significant. The results of the ratio for this coefficient indicate the level of explanation of the independent variable for the changes that occur in the dependent variable. From the

above results, the corrected coefficient of determination* $\bar{R}^2$ indicates that the independent and selected variables explain 88.3% of the changes occurring in the total costs of the company under study, and the remaining 11.7% is explained by other variables that fall within the limit of random error.

- **Autocorrelation problem test:** It is one of the standard tests that diagnose the fact that the estimated function suffers from the problem of autocorrelation between the residuals, to show that the estimated function meets the necessary conditions in estimating the function, and this problem is diagnosed through the Darbin-Watson test D.W. The previously reported results showed that the calculated D.W value reached 1.494428, and this value is compared with the tabular value at a 5% significance level, where we find the tabular value to range between the lower limit DL = 0.784 and the upper limit DU = 2.144, at the number of observations of 20, The number of independent variables is K = 7, so the calculated value falls in the region where there is no autocorrelation problem (i.e. 2.144 < 1.494 < 1.856).

B -Economic analysis of the cost function:

The results of the estimated cost function appear in its non-linear form between the total costs (the dependent variable) borne by the Diyala Public Company and the selected independent variables, as these variables affect the dependent variable in different proportions within the logic of economic theory. When the value of production in its logarithmic form (LnPV) changes by 100%, the total costs (LnTC) are affected by 56.7%, assuming that other factors remain constant, as increasing production leads to an increase in the financial burdens borne by the Diyala General Company. This is consistent with economic theory. With regard to the impact of the prices of production factors represented by salaries, wages, benefits, and land rents, the relationship between these prices and total costs is a direct relationship according to the estimated cost function. This is consistent with the economic theory of increasing costs when the prices of production factors increase. When salaries and wages in their logarithmic form (LnW) increase by 100%, This leads to an increase in total costs (LnTC) by 58.1%, assuming that other factors are constant. As for the effect of the interest paid for the loans that the company under study borrows from banks and the Iraqi Ministry of Industry and Minerals, as well as other lending agencies, and what the company pays in terms of rents for the lands and buildings that the company rents for use in the production process, the effect of interest and land rents in their logarithmic form LnIR when changed by 100 % leads to an increase in total costs (LnTC) by 1.4% assuming that other factors remain the same. This weak effect is due to the fact that the company under study relies mostly on the financial subsidies provided to it by the Iraqi government, and because the company relies on self-financing that comes mostly from selling Electrical products from the company's laboratories.

As for the relationship between production requirements (goods and services) and costs, it is a direct relationship in accordance with economic theory. When the value of commodity production requirements in their logarithmic form (LnM) changes by 100%, it will lead to an increase in total costs (LnTC) by 40.5% assuming

that other factors do not change, to show the level of impact of these requirements on costs, as a result of most of the commodity requirements being imported from abroad, especially raw materials. When the value of service production inputs in their logarithmic form (LnS) changes by 100%, this leads to an increase in total costs (LnTC) by 12.4%, assuming other factors remain constant. The relative weakness of this effect is due to the fact that the company relies on the company's own means of transportation, and its weak spending on advertising. Its products are from the electrical industry.

Regarding the time parameter T (i.e. the value of B6), which shows the direction of technological change in the company under study, the estimated cost function shows its weakness, as the value of this parameter reached 0.001983, indicating the weak level of innovation of machines and machinery used in the production process within the company's factories. This matches the reality that most public companies are witnessing in the obsolescence of these machines and their lack of modernization.

As for the value of the dummy variable DV, it amounted to -0.056427, showing that this value, with its negative sign, means that there is an impact on the production process that the company under study faces from abnormal conditions, which is reflected in the company bearing additional costs that increase its financial burdens.

Conclusions and recommendations

First: Conclusions:

1- Diyala General Company faces a number of internal and external circumstances, such as the unstable conditions at the level of Diyala Governorate and Iraq, which affected the trends in production activity in the company's factories that produce a number of electrical industry products. The value of production fluctuated between (685 - 107,467) million dinars. During the period (2002 - 2021), the annual growth rates fluctuated, ranging between (82.1% - 329.2%).

2- Diyala General Company borne a number of expenses and financial expenditures necessary for the production process. These expenses were represented by the total costs and their items. The average total costs during the selected period amounted to 50,520,465 million dinars, distributed proportionally over a number of items of these costs with an average distribution ratio, which was: 49.3 % for salaries and wages, 43.2% for commodity supplies, 3.9% for depreciations, 2.4% for service supplies, 0.7% for other expenses, 0.4% for interest and land rents, and 0.04% for transfer expenses.

When estimating the cost function for Diyala Public Company, the best estimating formula for this function is the double logarithmic formula, based on the results obtained for the probability value of the t and F statistics, which were less than the 5% level of significance, and the quality of the function as a whole in terms of the explanatory power of the function, where it was The

3- corrected coefficient of determination $\bar{R}^2$ reached 88.3%, and the function exceeded the autocorrelation problem, as shown by the D.W test, whose value of 1.494428 fell in the region indicating that the function is free of the autocorrelation problem.

4- The results of estimating the total cost function were relatively distributed in the effect of the selected function variables during the study period. The effect of production value on costs reached 56.7%, the effect of salaries and wages on costs amounted to 58.1%, the effect of commodity supplies reached 40.5%, and 12.4% for The impact of service supplies on costs, and a 1.4% impact on interest and ground rent, excluding a number of items of financial expenses incurred by the company as a result of not exceeding statistical, measurement and economic tests.

5- The results of the time parameter T showed that the technological change within Diyala General Company has a weak effect, with a value of 0.001983, as a result of the obsolescence of machines and machines and their lack of updating over time.

6- The results of the negative algebraic sign of the dummy variable parameter DV showed the negative impact of the unstable conditions facing Diyala General Company, which negatively affect the company's production activity.

Second: Recommendations:

1- Providing a package of government subsidies to improve the production reality in Diyala General Company, reduce the financial burdens borne by the company, and direct these subsidies towards economically viable production lines in the company's factories.

2- Providing customs protection for Diyala General Company's products for a specific period of time (for example, three years) in order to improve the environment surrounding the company and reduce the foreign competition that the company's products face. In addition to providing facilities for importing raw materials involved in the company's production process.

3- Urging the submission of more studies to examine the production reality of the Iraqi industrial sector in general, and the reality of public companies in particular, and to discuss ways to mitigate the costs borne by the sector and the company.

4- Implementing a package of financial policies, especially on the tax side, to reduce the financial burdens borne by public and private industrial companies.

5- Restructuring the Diyala General Company and rehabilitating some of its dilapidated factories in terms of machinery and machinery, training the company's employees to increase their productivity, and educating them on the importance of reducing cost burdens to improve its production path.

Sources and references

First: Arabic sources:

1- Irinam, Asad Chea. (1979). Modern Keynesianism: The Development of Keynesianism and the New Classical Synthesis, Translated by: Arif Dalila, Al-Tali'ah Printing and Publishing House

2- Bakhit, Hussein Ali, and Fathallah, Sahar. (2009). Econometrics, Al-Yazouri Scientific Publishing and Distribution House, Jordan.

3- Gujarati, Damodar. (2015). Econometrics, Part 1, Translated by: Hind Abdel Ghaffar Odeh, Mars Publishing House, Saudi Arabia.

4- Dagher, Mahmoud Muhammad Mahmoud. (2008). Microeconomics, 1st edition. Al-Zahf Al-Akhdar Library, Libya.

5- Rajab, Mai Thamer. (2020). Electrical industries and ways to develop them in Diyala Governorate: Diyala General Electrical Industries Company as a model, Journal of the College of Education, University of Wasit, Volume 2, Issue 38.

6- Diyala General Company, final accounts for the period (2005 – 2021).

7- Diyala General Company, General Administration Report for the year 2021.

8- Diyala General Company, production and sales summary report for the year 2021.

9- Abdel Rahim, Ali, Al-Adly, Youssef, and Al-Azma, Muhammad. (1990). Fundamentals of cost and management accounting. That Al Salasil Printing, Publishing and Distribution, Kuwait.

10- Abdullah, Wathiq Abdul Qahar, Khairi, Amna Muhammad, Mutlaq, Qusay Naziyah, and Muhammad, Majeed Hamid. (2016). Estimating the cost function for the rice crop in Najaf Governorate, Iraqi Agriculture Journal, Agricultural Research Department / Ministry of Agriculture, Volume 21, Issue 2.

11- Fawzi, Ahmed. (2005). Microeconomics, 1st edition. Bustan Al-Maarifa Library for Printing, Publishing and Distribution of Books, Egypt.

12- Musa, Abdul Sattar Abdul Jabbar. (2016). Microeconomic Analysis: Theory and Practice, 1st edition, Dar Amjad for Publishing and Distribution, Jordan.

13- Diyala General Company website:

https://www.dialacompany.com/acontact.htm

14- Al-Nuaimi, Salem Younis, Al-Sayegh, Bassam Yahya. (2003). Estimating cost functions and their economic derivatives for wheat and barley crops in the area with almost guaranteed rain in Nineveh Governorate for the season (2000 - 2001), Iraqi Mesopotamian Agriculture Journal, College of Agriculture and Forestry / University of Mosul, Volume 4, Issue 4.

15- Iraqi Ministry of Planning, Annual Guide to Public Companies that Meet the Conditions for Promoting the National Product, Third Edition, Part One: Public Sector, 2021.

Second: Foreign sources:

1- Doll, John P. (1978). Production Economics-Theory with Application, Grid, Inc.

2- Drury, Colin. (2004). Management and Cost Accounting, 6th Edition, Thomson Learning, USA.

3- Mankiw, N.Gregory. (2001). Principles of Microeconomics, 2nd Edition, Harcourt College Pub, USA.

4- Nicholson, Walter. (1994). Intermediate Microeconomics and Its Application, 6th Edition. International Edition, The Dryden Press, USA.

5- Prajneshu, Chandran. (2005). Computation of Compound Growth Rates in Agriculture: Revisited, Agricultural Economics Research Review, Vol. 18.

6- The National Institute on Drug Abuse (NIDA). (2001). Overview of Costs, Cost-Effectiveness and Cost-Benefit. Website: https://nida.nih.gov

7- Wasserstein, Ronald L., & Lazar, Nicole. (2016). The ASA's Statement on P-Values: Context, Process, and Purpose, The American Statistician, Vol. 2, No. 70.

Appendix (1) The selected study variables and their symbols used in the cost function for Diyala Public Company during the period (2005 – 2021)

Items / Years	Total Costs (Million Dinars)	salaries and wages (Million Dinars)	commodity supplies (Million Dinars)	service supplies (Million Dinars)	interests and land rents (Million Dinars)	Expirations (Million Dinars)	Transfer expenses (Million Dinars)	Other expenses (Million Dinars)	production value (Million Dinars)	time*	dummy variable*
	TC	W	M	S	IR	(Excluded from function)	(Excluded from function)	(Excluded from function)	PV	T	DV
2005	17882958	10052965	7032842	450339	64608	273723	2055	6426	14952	1	1
2006	21759632	11545935	8556720	679721	631936	335581	0	9739	16273	2	1
2007	14463491	9247356	4256547	458746	181367	312381	0	7094	11173	3	1
2008	32616999	20939926	9995762	847169	373361	451199	600	8982	21002	4	0
2009	42482761	28476418	12262161	928996	129441	630494	5251	50000	28984	5	0
2010	63352638	27620469	25907659	952835	75012	975452	0	78212	53157	6	0
2011	77376987	29295980	44890193	1419700	257896	1487967	7088	18163	89354	7	0
2012	87644532	33732959	49708800	1569671	34084	2344012	191652	63355	101433	8	0
2013	94596483	33457542	55977061	1754468	0	3302460	22365	82587	107467	9	0
2014	88673041	33582238	49138997	2092808	0	3808999	46657	3343	99123	10	1
2015	92496440	29419448	57511657	1547041	0	3976757	17459	24079	39099	11	1
2016	37157650	28010438	3942657	1079787	0	4070338	5959	48472	6985	12	1
2017	49667822	27349669	16088749	1329854	605152	4268057	20796	5546	29977	13	0
2018	60456223	26581171	27915968	1655548	0	4286151	15529	1856	33380	14	0
2019	81307280	27330851	47945148	1642930	113833	4176373	48738	49407	65230	15	1
2020	51870698	24739656	21643072	1106634	10000	4345496	9773	16068	29643	16	1
2021	68033494	24576036	37871157	1393091	25000	4025210	98460	44540	46422	17	1
المتوسط (%)	50520465	22083906	24603209	1088326	129341	2177527	24917	413239	.	.	.

Source: Diyala General Company, final accounts for the period (2005 – 2021) .

*The number of time observations and the values of the dummy variable were prepared by the researchers.

Appendix (2) The natural logarithm of some selected variables used in the cost function for Diyala General Company

LnPV	LnIR	LnS	LnM	LnW	LnTC
9.6126	11.07609	13.01776	15.76610	16.12338	16.69936
9.697263	13.35654	13.42944	15.96223	16.26184	16.89557
9.321255	12.10828	13.03625	15.26397	16.03985	16.48714
9.952373	12.83030	13.64966	16.11767	16.85717	17.30034
10.2745	11.77098	13.74186	16.32203	17.16459	17.56461
10.88101	11.22540	13.76720	17.07005	17.13407	17.96423
11.40036	12.46031	14.16596	17.61973	17.19296	18.1642
11.52715	10.43658	14.26638	17.72169	17.33399	18.2888
11.58494	0.00000	14.37768	17.84045	17.32579	18.36513
11.50412	0.00000	14.55402	17.71016	17.32951	18.30047
10.57385	0.00000	14.25185	17.86750	17.19717	18.34268
8.85152	0.00000	13.89227	15.18737	17.14809	17.43068
10.30819	13.31324	14.10058	16.59363	17.12421	17.72087
10.41571	0.00000	14.31964	17.14471	17.09571	17.91743
11.08567	11.64249	14.31199	17.68557	17.12353	18.21375
10.29698	9.21034	13.91683	16.89020	17.02392	17.76426
10.74553	10.12663	14.14704	17.44970	17.01728	18.03551

The natural logarithm was extracted by the researchers based on the data contained in Appendix (1).