

Spatial and Statistical Analysis of the Thermal Insulators Industry in Baghdad Governorate

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Abstract

Thermal insulators industry is one of the basic and vital chemical industries, because of its large and important role in the national economy and its enhancement of national income, as well as its importance in attracting large numbers of manpower, and its importance to other industries, as the products of this industry work to cover roofs and encapsulate buildings from the inside. And abroad and the protection of household appliances such as freezers, refrigerators and heaters, as well as the protection of pipes, as the importance of this industry lies, especially in the study area (Baghdad governorate) for the availability of most of its components, as Baghdad governorate constitutes an important geographical location in the center of Iraq. And the development of the thermal insulators industry, which created opportunities that help the emergence of spatial connections that can be invested in developing and developing future national trends for the thermal insulators industry. Because of this importance mentioned for the manufacture of insulators, we will address in this research several axes.

The first part: the manufacture of thermal insulators, their field of use, and their industrial classification

The second part: statistical analysis of the statistical data of large companies for the manufacture of thermal insulators in the province of Baghdad

The third part: SWAT analysis of the thermal insulation industry in Baghdad governorate

Research problem

1. Does Baghdad governorate have the geographical elements to establish this industry? What are the factors that affect the distribution geographical development?
2. What are the problems of the thermal insulators industry?

Research Hypothesis

- 1- 1 The study area possesses various natural, human and economic components that encourage the establishment of the thermal insulators industry. This made it one of the successful industries if the necessary capabilities and support were available.
- 2- It makes it able to solve its problems and plan for its future.

Research objective

- 1- Identifying the most important geographical factors that helped draw a picture of the geographical distribution of the sites of the insulator industry Thermal, and determine the future geographical vision of this industry and its development in the province of Baghdad.
- 2- The role of the public and private sector in establishing this industry and knowing the reasons for its concentration in certain areas of Baghdad.
- 3- The future view of the ways and methods of developing this industry.
- 4- Identify the most important problems facing the production processes of this industry within their locations, and indicate the harms and risks pollutants in the province of Baghdad, and ways to get rid of these pollutants.

Research limits

The limits of the research are the following dimensions:

- 1- The spatial dimension: the study area is represented within the administrative borders of the province of Baghdad, which has an area of (5105 km²), and includes (12 districts) as shown in map (1).
- 2- The temporal dimension: the temporal dimension is represented by studying the reality of the thermal insulators industry in the Baghdad governorate for the year (2022), and the statistical analysis for the period (2014-2021).

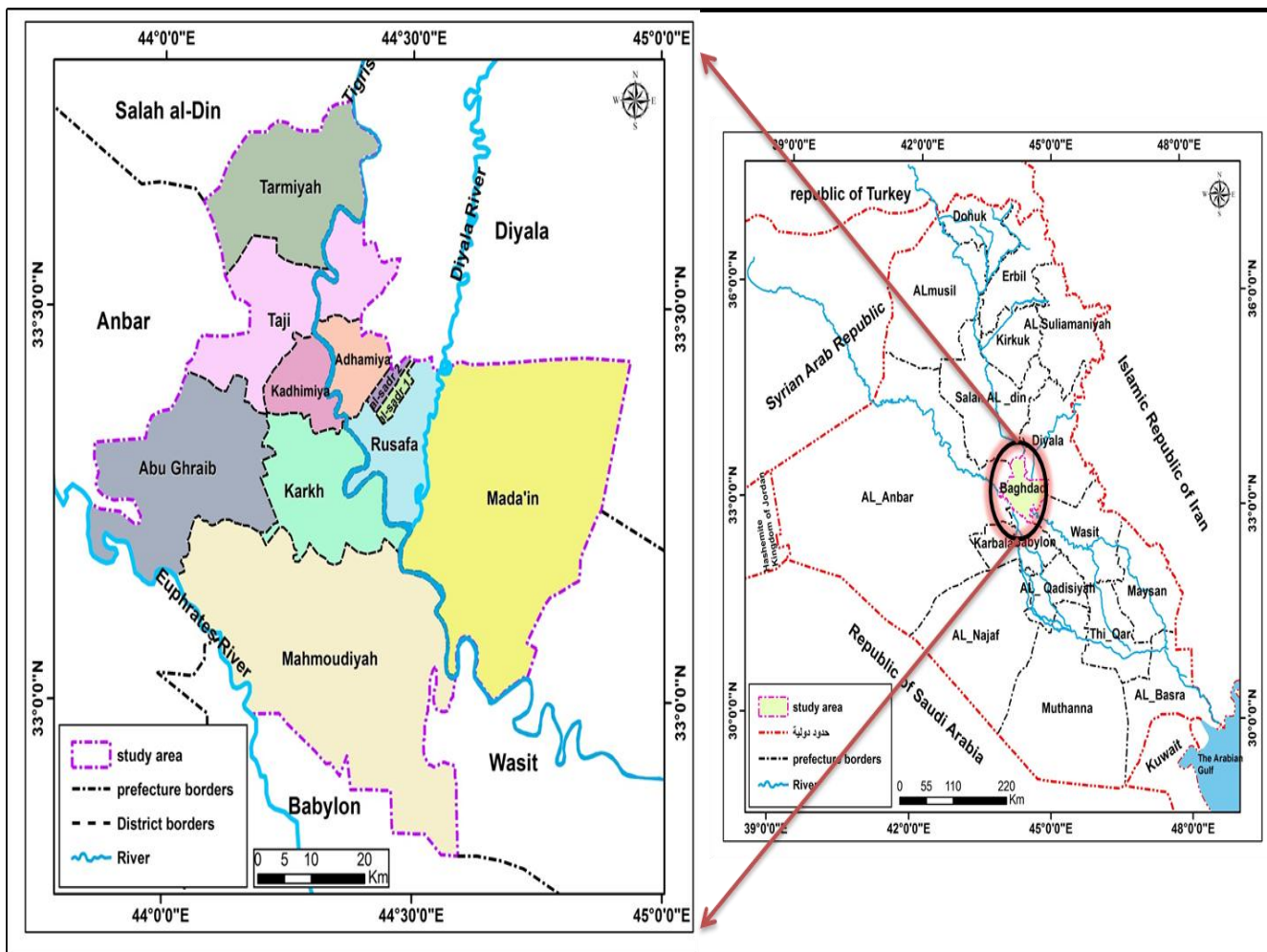
Research Methodology

For the purpose of achieving the objectives of the research, the study relied on that the branches of geography derive its methodology in the philosophy of geography based on the method of distribution and synthesis of the phenomena that share the place. It is one of the general geography approaches, as it works to show the factors of industrial settlement for the manufacture of thermal insulators in the province of Baghdad.

To achieve the research objectives, the following methods were used:

- 1- Descriptive method: describing the phenomenon as it actually is by drawing a clear picture of each aspect of the study.
- 2- The quantitative analytical method: This method is considered one of the general geographic methods for the purpose of analyzing the data in a scientific analysis expressing the truth, and then arriving at logical results imposed by the logic of analyzing the causes and linking them to the causes.

Map (1) The location of the study area (Baghdad Governorate) of Iraq for the year 2022



Thermal insulation industry

Thermal insulator industry is one of the important strategic industries in the countries of the world due to the many services provided by this industry and the many facilities it provides, due to its association

with several sectors, especially the agricultural sector. As for its connection with the construction sector, it is great, as the insulation industry provides many means of thermal insulation for buildings, especially heat and sound insulators, caravans, and secondary ceilings. And expensive items such as antiques, as well as the packaging of electrical appliances.

1 The use of thermal insulators in buildings, which takes several forms: (1)

It is used to insulate external walls and consists of several types

A This type is called by the name of a single wall built of red bricks or cement bricks, which contains within it

Parallelogram panels or strips of thermal insulation such as extruded or expanded polystyrene.

B - It is a single wall built of cement bricks with a single slice of extruded polystyrene or extended

This type contains thermal bridges formed as a result of the use of cement between the blocks during installation and thus

It is better than the previous type, and the percentage of heat leakage through it is (44%).

C – Two parallel walls are built by installing types of thermal insulation between the walls' space, as the insulating panels work

Completely separate the outer wall and the inner wall of the building

D - It is the type that is thermal insulation installed on the walls of buildings from the outside, as the wall is completely covered

Then he works on the installation of external shapes such as glass, or some stones, or materials from the outside

2 Use of thermal insulators for floors the insulation process is good for floors whose soil temperature reaches a depth

Three meters to 33 degrees, then the floor insulation reduces the temperature of the floors in air-conditioned buildings (2)

3- The use of thermal insulators in roofs: Insulators on roofs are divided into two parts: (3)

A - Thermal insulators system in the traditional roof:

In the old traditional system, the waterproofing layer is above the thermal insulation to protect the thermal insulation from water

B - Thermal insulators system for the inverted surface:

Which is placed over the waterproofing, which in turn works to protect the waterproofing from heat stress and exposure to ultraviolet rays, as well as mechanical stress during and after installation.

4- The use of thermal insulators in some electrical appliances: such as the manufacture of heaters, as the thermal insulation material is

The rock wool used is encasing the heater from the inside to reduce heat transfer from the inside to the outside.

5- Use of heat insulators in other industries: Some heat insulators are used in small industries

As the aluminum industry, the ester material, the SarayAlusain material. (4)

As well as using it in temporary housing as a caravan project and huge warehouses, as well as being used in the manufacture of some

Reservoirs that are used to store and cool the products to be stored, and is used in the construction of some fields and small facilities. (5)

The thermal insulation industry is classified according to the International Standard Industrial Classification (ISIC)

(International Standard Industrial Classification) under Section 23 Manufacture of metal products

Other nonmetals, branch (2391) Manufacture of refractory products, this branch includes making of tiles

Refractory and refractory concrete and manufacture of refractory ceramics, including: (6)

A- Heat-insulating ceramic goods made of silicon fossil powders.

B- Bricks, blocks and refractory tiles.

c Retorts, crucibles, silencers, exhaust nozzles, tubes and pipes. It also includes making items

Refractory materials containing magnesite, dolomite or chromite.

Statistical analysis of the thermal insulation industry in Baghdad governorate

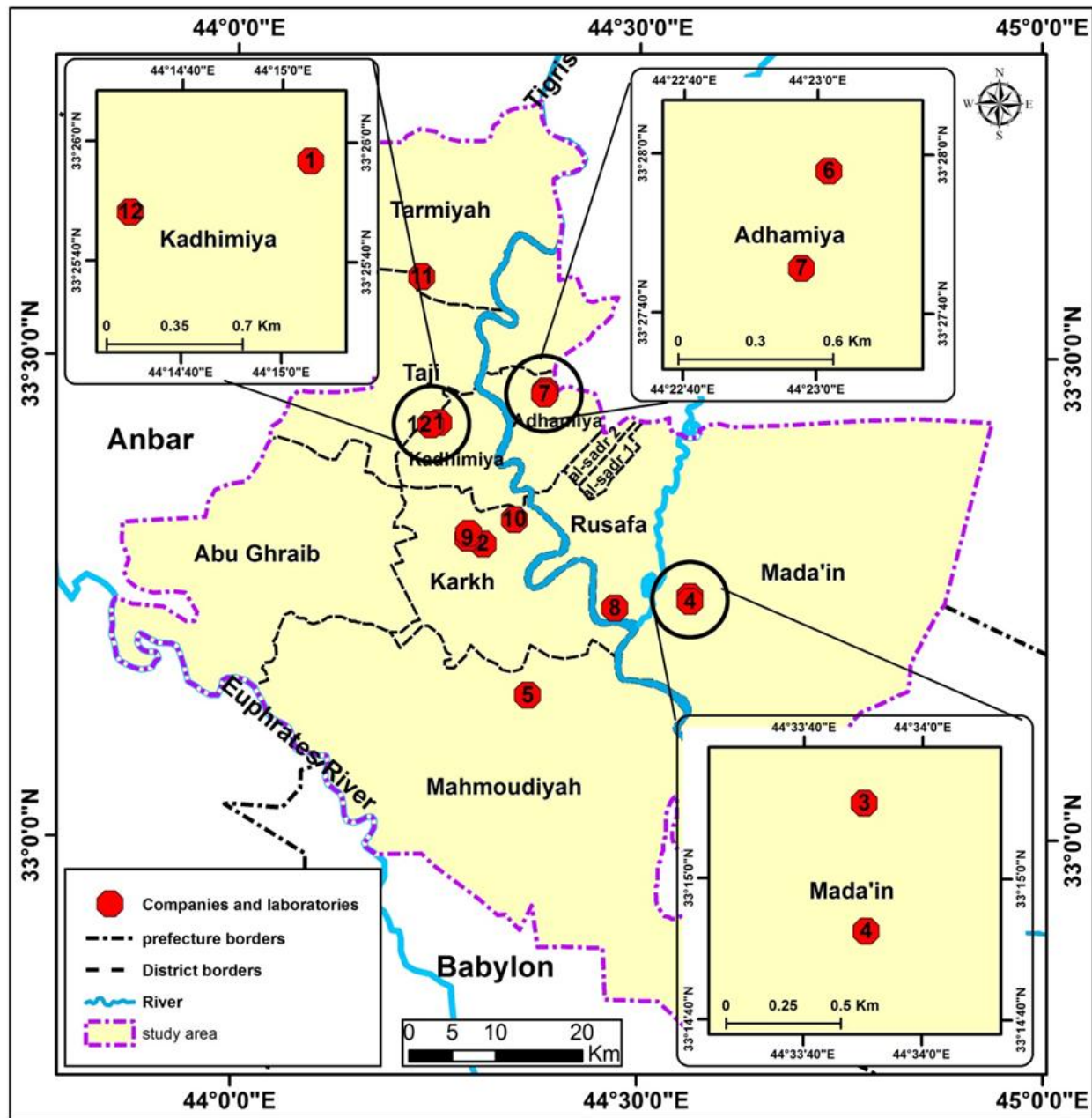
The study included the thermal insulation industry in Baghdad governorate by industrial sectors

1- Public sector industry: represented by the Steel Industries Company and the Mining Industries Company.

2- Mixed sector industries: represented by the Light Industries Company.

3- Private sector industries: - Many industrial companies, including medium and small ones, were studied According to the number of manpower, medium companies were represented by (Al-Khaleej, Dima Steel, Baghdad, Essaouira, Al-Rafidain), As for the small companies in terms of the number of manpower, they were represented by (Tigris, Al-Jazira, Asia) and as shown in the map (2)

Map (2) Geographical distribution of thermal insulation companies in Baghdad governorate for the year 2022



Source: The researcher worked based on the data of the 2-Sentinel satellite for the year 2020, with an accuracy of 5 meters, and the outputs of the Arc map 10.8 program, at a scale of 1:1000 for the year 2022.

Despite the work of large, medium and small industrial companies, but it was not possible to obtain digital data from them, with the exception of the public and mixed sector companies represented by (Steel Industries Company, Mining Industries Company, Light Industries Company), and we obtained a time series for the period (2014-2021).

The statistical analysis of one of these companies is as follows:

First - the descriptive analysis of the productive variables for each company and for all the production variables that we obtained from the field study, as these variables were represented by (number of years, number of workers, wages of workers, quantity of production, value of production). As for the type of descriptive analysis, it was represented in the following form

A descriptive analysis of the data of the General Company for Steel Industries as shown in Table (1)

Table (1) The results of the descriptive analysis of the General Company for Steel Industries for the period (2014-2021)

Metadata	Number of the years	Descriptive analysis of the number of employees	Descriptive analysis For workers' wages/ dinars	Descriptive analysis of production Quantity / Ton	Descriptive analysis of production value/ dinars
Arithmetic mean	8	10.38	87150	901.25	1891139500
Mean	8	10.50	88200	837.50	1616910000
Median	8	^a 6	^a 50400	^a 94	^a 188000000
Std.Deviation	8	3.249	27288459	722.761	1625239943
Variance	8	10.554	74466000000	522383.071	2641404874333428700
Range	8	9	75600	1904	4207600
Minimum	8	6	50400	94	188000000
Maximum	8	15	126000000	1998	4395600
Sum	8	83	697200	7210	15129116000

Source: the researcher's work based on the spss program

B- Descriptive analysis of the data of the General Company for Mining Industries, as shown in Table (2)

Table (2) The results of the descriptive analysis of the General Company for Mining Industries for the period (2014-2021)

Metadata	Number of the years	descriptive analysis for the number of employees	descriptive analysis for workers' wages/ dinars	descriptive analysis for production Quantity / Ton	descriptive analysis for production value/ dinars
arithmetic mean	8	54.25	8252727	6474	2658327
Mean	8	62.50	9507750	1018	93459
Median	8	68	10344432	0	0
Std.Deviation	8	17.136	2606798.467	8418.123	3617459.867
Variance	8	293	6795398247	70864802	13086015888
Range	8	40	6084960	17294	7026972
Minimum	8	29	4411596	0	0
Maxmum	8	69	10496556	17294	7026972
Sum	8	434	66021816	51799	21266622

Source: the researcher's work based on the spss program

C- Descriptive analysis of the data of the General Company for Light Industries as shown in Table (3)

Table (3) Results of the descriptive analysis of forecast data in the State Company for Light Industries for the period (2014-2021)

Metadata	Number of the years	descriptive analysis for the number of employees	descriptive analysis for workers' wages/ dinars	descriptive analysis for production Quantity / Ton	descriptive analysis for production value/ dinars
arithmetic mean	8	94.75	673402	7795	6719740
Mean	8	95.00	676988.00	7962.50	6223138

Median	8	^a 95	^a 676988	^a 6240	^a 5400000
Std.Deviation	8	3.059	15035.626	979.445	1453651
Variance	8	9.357	226070052	959312	2113101726131
Range	8	9	44110	2631	3917797
Minimum	8	90	648000	6240	5400000
Maximum	8	99	692110	8871	9317797
Sum	8	758	5387220	62360	53757922

Source: the researcher's work based on the spss program

Second - the statistical analysis of the dependent variable and the independent variables. The (production value) was chosen as the dependent variable. As for the independent variables, the (number of workers, wages of workers, production quantity) were chosen as independent variables in this type of statistical analysis and also for the companies themselves on which the analysis was conducted. descriptive and for the same time period (2014-2021) and the results of this analysis were to extract the following results

A - Correlation matrix: through which we can find out the highest correlation coefficient between the dependent variable (production value)

And the independent variables (number of workers, wages of workers, quantity of production), as the correlation coefficient reached the highest between the value of production

The number of workers is 914. It is a strong direct correlation in terms of 001, and the correlation coefficient between the value of production and the wages of workers

914. It is a strong direct correlation in terms of 001, and the correlation coefficient between the value of production and the quantity of production is 995. It is Direct correlation with a statistical significance of zero, as shown in Table (4) for the Steel Industries Company.

Table (4) Correlation ratio between the dependent variable and the independent variables in the State Company for Steel Industries

Correlations

		production value Dinar	Number of employee s	workers wages Dinar	production quantity ton
Pearson Correlation	Production value/ dinars	1.000	.914	.914	.995
	Number of employees	.914	1.000	1.000	.939
	Workers' wages/ dinars	.914	1.000	1.000	.939
	Production quantity/ton	.995	.939	.939	1.000
Sig. (1- tailed)	Production value / dinars	0	001,	001,	000
	Number of employees	001,	0	000	000
	Workers' wages/ dinars	001,	000	0	000
	Production Quantity / Ton	000	000	000	0
N	Production value/ dinars	8	8	8	8
	Number of employees	8	8	8	8
	Workers' wages/ dinars	8	8	8	8
	Production Quantity / Ton	8	8	8	8

Source: the researcher's work based on the spss program

B - Pearson correlation coefficient: The correlation coefficient reached .997, which is a strong correlation with the value of the determination coefficient of 993, and the value of the adjusted coefficient of determination is 991, and thus this figure indicates the percentage of change that occurs in the value of the production of the Steel Industries Company by 0.991% due to the effect of Independent variables (number of employees, wages of employees, value of production) as shown in Table (5)

Table (5) Pearson's correlation between the dependent variable and the independent variables in the State Company for Steel Industries

Model Summary ^b				
Model	R	R Square	Adjusted R	Std. Error of the

			Square	Estimate
1	.997 ^a	.993	.991	156187219.3
a. Predictors: (Constant), Production quantity, workers wages				
b. Dependent Variable: Production value of the steel industries company				

Source: the researcher's work based on the spss program

C - ANOVA test: The statistical results of the ANOVA test for the Steel Industries Company clarified the regression rate and the residuals, as well as the value of F, which is the variance, as its value reached 376,476 and the significance value is zero. in table (6)

Table (6) ANOVA test for the dependent and independent variables in the State Company for Steel Industries

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F variance	Sig. indicati on
1	Regression	837E+19 ,1	2	184E+18,9	376.476	b,000
	Residual	220E+17,1	5	439E+16,2		
	Total	849E+19,1	7			
a. Dependent Variable: Production value of the steel industries company						
b. Predictors: (Constant), Production quantity, workers wages						

Source: the researcher's work based on the spss program

D - Coefficients: Show the non-standard B, the standard error, the standard Beta, the value of T and its significance value. As for (e) the tolerance coefficient and the coefficient of variation inflation illustrate the problem of linear multiplicity. It was found that the value of the inflation factors (VIF) amounted to 8,479, which is less than 10. There is no problem of linear multiplicity among the variables adopted in the statistical analysis, as shown in Table (7).

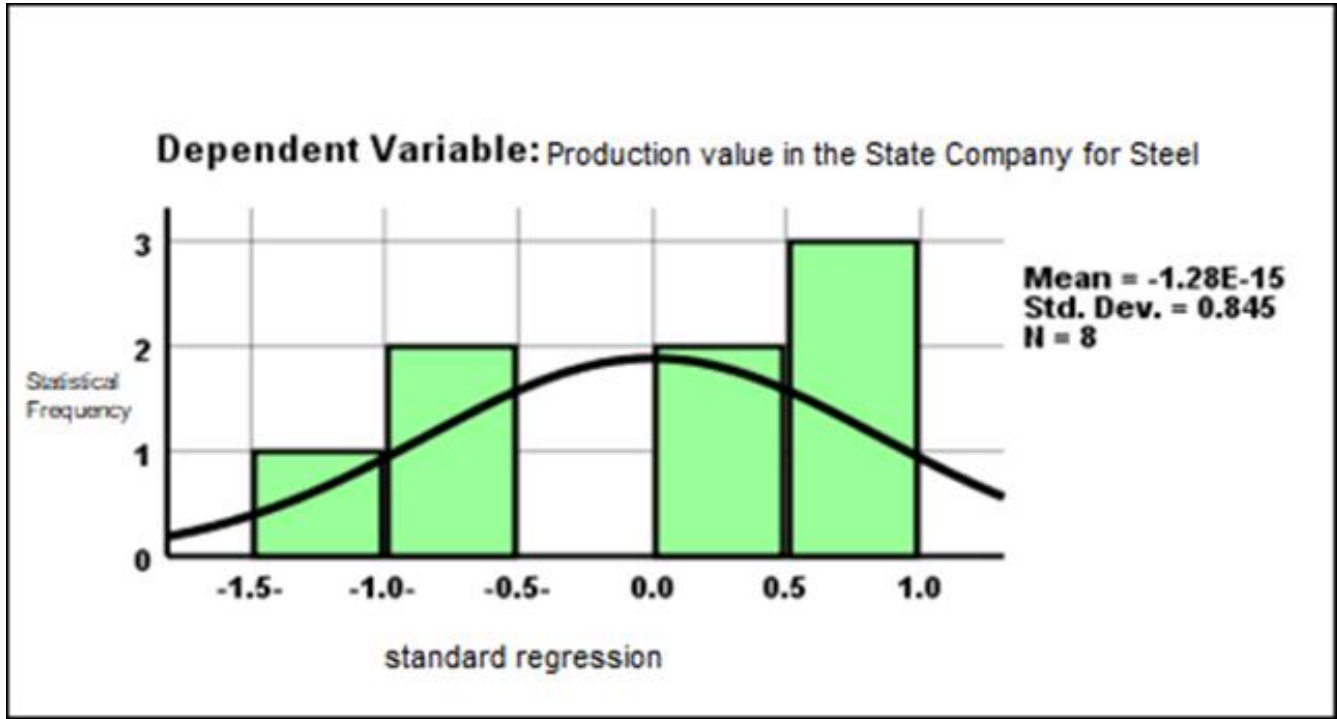
Table (7) Inflation coefficients for the dependent and independent variables in the State Company for Steel Industries

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	450479837.1	3596414.463		253.1	266.		
	independent variables							
	workers wages	428.110	299.6	-175.-	-655.1	159.	118.	479.8
	production quantity	2606931836	237834332	159.1	10961	000.	118.	479.8
a. Dependent Variable: Production value								

Source: the researcher's work based on the spss program

All the results of the spss program that were clarified in the previous tables can be summed up in the following figure

Multiple regression of the dependent variable and the independent variables in the State Company for Steel Industries



Source: the researcher's work based on the spss program

Quadruple analysis (SWOT) for the thermal insulators industry (large, medium, small) in Baghdad governorate

Every industrial project seeks to develop a strategy for its development, so the factors that affect its success or failure should be studied. The most common strategic method is a SWOT analysis that represents strengths (S), weaknesses (W), opportunities (O), and threats (T). In order to achieve success for industrial projects, it must take advantage of strengths and opportunities and focus on weaknesses to fix them and avoid threats. SWOT analysis has been used to reach a successful approach to decision-making as it has been applied in the field of education by Dyson, and has applied for its use in health care institutions And in decisions related to sustainable investment, and it was recommended to use it when studying the relationship between countries. (7) Therefore, its application was approved in the field of thermal insulators industry, as it was found through the field study that the industrial facilities for thermal insulators in Baghdad governorate all (large, medium, small) have Many strengths and

weaknesses are offset by many indicators that represent positive opportunities for the thermal insulators industry and many threats that have a negative impact on this industry. It was found through the following study

1: Strengths of thermal insulation companies in Baghdad province

It is noted through the field study that the strengths of large industries of thermal insulators are clearly rising, but the most important strengths are the great diversity in the products of large industrial facilities, because each company includes a number of laboratories. Light, as it is concerned with the manufacture of refrigerators, freezers and heaters, it begins with the manufacture of the external structure according to certain sizes and then the insulating material is injected, and then the structures of the refrigerators and freezers are pressed into heavy iron presses for the purpose of giving time for the insulating material to harden and take the mold of the external structure of the refrigerator and freezer

2: Weaknesses of thermal insulation companies in Baghdad province

The weaknesses are clearly rising among the large thermal insulators manufacturers as well, the most important of which are the dependence of large companies on old and heavy production lines, and this made their production slow and not possessing the character of modernity.

3: Possible opportunities for thermal insulators manufacturing companies in Baghdad Governorate

It is noted that the number of possible opportunities for the manufacture of thermal insulators among medium industrial companies is high, the most important of which is the possibility of importing modern production lines, as they are characterized by high-quality production specifications and this is what achieves distinguished production

4: Potential threats to thermal insulation manufacturers in Baghdad province

It is noted that the number of points increased for large industrial companies, which is a clear and influential threat, and the most important of them was

The increase in population numbers in the province of Baghdad, and this may cause in the future a continuous population crawl towards areas of endemic industrial activity, especially the outskirts of the province due to the large area and the low price.

CONCLUSIONS

- 1- Baghdad Governorate possesses many of the ingredients that helped establish this industry, in addition to its location as the capital of Iraq and its high population growth, which contributes to the high demand for the products of the thermal insulation industry.
- 2- This industry is distributed in the province of Baghdad. For the public sector, on the Karkh side, there are two large facilities and one facility on the Rusafa side. As for the private sector, this industry was concentrated in both sides of the province.
- 3- After conducting a spatial analysis using the SPSS program, as well as a SWOT analysis and by reviewing the strengths, weaknesses, opportunities and threats.
- 4- It was found that there are strong positive direct statistical correlations between some of the approved variables (the quantity of production, the value of production with the independent variables represented by the numbers of labor force, and the wages of the labor force,) using the (SPSS) program.

Suggestions

- 1- Activating the laws that provide for the protection of the local product in a way that facilitates the marketing of the local product through a precise mechanism
- 2- Controlling the imported products in terms of quantity and quality, as the import percentage should be complementary to the local production
- 3- Addressing the phenomenon of surplus labor by establishing a department at the center of the ministry to handle the redistribution of these workers.
- 4- Facilitating the procedures for partnership contracts with international and Arab companies due to their importance in achieving the requirements of the industrial sector for the companies of the Ministry of Industry and Minerals through their contribution to the transfer of modern technology to Iraqi companies

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