STUDY OF THE EXPLANATORY FACTORS IMPACT OF THE TECHNICAL INEFFICIENCY OF THE NAFTAL FUEL DISTRIBUTION STATIONS PRODUCTION FUNCTION. SAIDA PROVINCE, (FROM 2015 TO 2018)

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ABSTRACT

Fuel distribution of NAFTAL Company has been done by thirty-five stations over six provinces (Wilayas) in the West, and in the South West. There are many factors make the way of managing these stations, complicated, and inefficient, for instance, the spacious area, and the geographical position.

Management complexion causes a real and logistic problem (Service, and Production Machines Number, Stock Capacity, and the Stations Location Importance). The frontier production function estimation, with the use of the stochastic Frontier Analysis method, has been shown, in recorded results, from 2015 to 2018, In addition, it has been demonstrated that, in accordance to Maximum Likelihood method, the frontier production has been applied, and related to the random model. The annual supplement of 10% to the allocated capital increases the annual turnover to 4.9%. The annual company turnover increase by 9.6% because of the annual supplement in the services, and productive workforce with 10%. The diversity of logistical factors and their impact have indicated a deficiency of that method in management. Finally, it is necessary for the company to think about an adaptive

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management to the west, and the western south areas, and their features. In this way, it gets the ability to enhance the productivity, the cost-effectiveness of production, and services, as a result, its annual turnover rises up.

KEY WORD

Logistical variants of NAFTAL satiations; The technical inefficiency; Frontier Production Functions; Stochastic Frontier Analysis; Maximum Likelihood method of estimation.

JEL CLASSIFICATION : C13; D24; D61; L71.

دراسة تأثير العوامل المفسرة لعدم الكفاءة الفنية في دالة الإنتاج لمحطات توزيع الوقود نفطال مقاطعة سعيدة للفترة 2015 – 2018

ملخص:

تعمل شركة نفطال على توزيع الوقود في مقاطعة سعيدة من خلال 35 محطة خدمات موزعة على ست ولايات في الغرب والجنوب الغربي، وبالنظر إلى بعض العوامل الداخلية والخارجية فإن إدارة هذه المحطات تبدو معقدة أو حتى غير فعالة نظرًا لشساعة المنطقة وموقعها الجغرافي، مما يشكل مشكلة لوجستية حقيقية (عدد آلات الإنتاج والخدمات ،قدرات التخزين وأهمية مواقع هذه المحطات)، وعليه من خلال تقدير دالة الإنتاج الحدودي باستعمال أسلوب التحليل الحدودي العشوائي تبين عدم كفاءتها من خلال النتائج المسجلة للفترة 2015-2018 والتي أظهرت أن تقييم دالة الإنتاج الحدودي حسب طريقه الإمكان الأعظم لتقدير قد تمت وفقا للنموذج العشوائي، حيث أن الرفع من رأس المال المخصص بنسبة 10٪ في السنة فقط تؤدي إلى زيادة 4.9٪ في رقم الأعمال السنوي، وكذلك الزيادة في قوة العمل الإنتاجية والخدمية بنسبة 10٪ كل عام تؤدي لزيادة سنوية بنسبة 9.6٪ في رقم الأعمال، كما تم إثبات عدم فعالية هذه الطريقة في التسيير بالنظر إلى التأثير المباشر والمتنوع للعوامل اللوجستية، في الختام يجب على

الشركة أن تفكر في طريقة إدارة تتكيف مع مناطق الغرب الجنوب الغربي وخصوصيتها، وهي وسيلة أساسية لتحسين الإنتاجية، تحسين المردودية للوسائل والخدمات المتاحة، وبالتالي الرفع من مستوى رقم الأعمال.

كلمات مفتاحية:

المتغيرات اللوجستية لمحطات نفطال، عدم الكفاءة الفنية؛ دوال الإنتاج الحدودي؛ أسلوب التحليل الحدودي العشوائي ؛ طريقه الإمكان الأعظم لتقدير.

تصنيف جال: C13; D24; D61; L71

ETUDE DE L'EFFET DES FACTEURS EXPLIQUANT L'INEFFICACITE TECHNIQUE DE LA FONCTION DE PRODUCTION DES STATIONS DES SERVICES DE CARBURANT DE NAFTAL : LA REGION DE SAIDA (2015/2018)

RÉSUMÉ

L'entreprise NAFTAL chargée de la distribution de carburant dans la région de Saida gère 35 stations-services réparties dans six (06) wilayas d'Ouest et Sud-Ouest. Compte tenu de certains facteurs endogènes et exogènes la gestion de ces stations-services s'est avérée complexe voire même inefficace vu l'étendue, la situation géographique et les lieux d'implantation de ces stations qui posent un véritable problème de logistique (nombre de machines de production et services, les capacités de stockage et l'importance de l'emplacement de ces stations). L'estimation de la fonction de production frontalière basée sur l'analyse stochastique frontalière a révélé son inefficacité. D'autant plus, que les résultats enregistrés durant la période 2015-2018 ont démontré que l'estimation de la fonction de production frontalière était réalisée selon un modèle de gestion aléatoire au point où une revalorisation du capital alloué de 10 % dans l'année entrainait uniquement une augmentation de 4,9 % du chiffre annuel, un renforcement des effectifs de production et services de 10 % chaque

année et une augmentation du chiffre d'affaire annuel de 9,6 %. Ce mode de gestion prouve son inefficacité compte tenu de l'impact direct et diversifié des facteurs logistiques. En conclusion, l'Entreprise se doit de réfléchir à un mode de gestion adapté aux régions du sud-Ouest et Ouest et à leur spécificité, moyen incontournable pour améliorer la productivité, rentabiliser l'outil de production et services et par voie de conséquences, améliorer son chiffre d'affaire.

MOTS CLÉS

Variables logistiques des stations NAFTAL, L'inefficacité technique; fonctions de production frontalière; Analyse des frontières stochastiques; Méthode du maximum de vraisemblance.

JEL CLASSIFICATION : C13; D24; D61; L71

INTRODUCTION

The international energy need is common, everyone agrees about over the world. It is expectedly that the international need of energy will rise 25% from 2014 to 2040. Providing energy, with increasing quantities, has been a worrying issue to many countries. It is an important element in the social and economic development journey. In developing countries, now, the need of affordable and reliable energy is more than in the past. Fighting poverty, making good life, establishing a strong economy, improving transportation, developing the trade exchange, the expanding industry, and the modern agricultural all rely on the affordable energy. The energetic security is related to the energy efficiency; and its supplies (Ozturk, 2013). The energy supplies efficiency saves money, ensures specialized, and technical effectiveness for the energy supplying mission responsible units, realizes the national policy about the energy supply without additional costs. Because of the competitive atmosphere of the energy supply industry, many modern ways have appeared which rely on the input, and output efficiency with giving importance to the technological advance in the production operations, and systems. Presenting a competitive product is

important, as well as, determining the product philosophy. This has been provided by the production systems that could perfectly utilize the given resources to increase the products (El-moussawi, 2009).

Production theory is the most used conceptual framework to study the lucrative and non lucrative institutions productivity. The theory's supposition is based on that the expected maximum productivity is a function of inputs and their prices. The relation is also reflected between the inputs and the outputs of the production function, which is known as the economic efficiency of the partial perspective. The dedicated efficiency, and the technical efficiency are the components of the economic efficiency, the realization of the first one, in an establishment, is done when the lower cost products are used to produce the same product. On the other hand, the technical efficiency realization occurs when the same inputs are exploited in the production of more inputs.

In accordance to the theories of the two last types of efficiency, the frontiers of efficiency are a group of the most effective points, and remoteness each observation on these frontiers the degree of inefficiency represents (Farrell, 1957).

Due to the measurement mistakes, and the external shocks over frontiers (Hadjar & Yassine, 2018), the remarks deviation can be found. For the possible maximum production, and the lowest costs estimation of the outputs, in the decision making units, as well as for designing a sample of relations and inefficiency in one phase an explanatory Stochastic Frontier Analysis method has largely been applied. In different life fields (Business management, economy, operational researches, general finance, education, agriculture, transportation, manufacturing, and the providing productive services unit - fuel distribution stations) (Titus & Kevin, 2016), SFA use is noticeable.

Fundamentally, the analysis composition is the division of the remaining value to random error, and non-negative inefficiency.

THE RESEARCH PROBLEMATIC

Like many countries, Algeria works hard and does all its efforts to develop its economy. Relying on hydrocarbon sector as a currency provider with 97% of the country's income. For this, NAFTAL is one of the most important companies of Algeria is the leader of the derives petroleum products and their stock, distribution, and transportation.

Its several types fuel distribution stations on the national territory with 42 fuel stock centers and 1800 stations; 400 of them are directly managed (NAFTAL, 2019). This type of stations is the most crucial one because of its provided service to the different transportation means. Fuel distribution stations must be well-located for rising up the spatial and operational efficiency.

In addition, Well-located stations are able to increase their turnover through the annual invested capital by the manager who has a set of logistical factors given by the central administration of each province. Our concentration is on Saida province that includes 35 distribution stations in six wilayas. The aim of this study is to the Stochastic Frontier production function estimation of NAFTAL fuel distribution stations in Saida province, with SFA usage, and to study the technical inefficiency impact on these stations in presence of additional factors; the internal logistical factors (machines number, storage capacity, station surface, station's location importance) for the period of 2015-2018.

Based on what has previously been mentioned, our research problematic is as following:

How much do the logistical factors affect the technical inefficiency of Saida province fuel distribution stations, from 2015 to 2018?

RESEARCH HYPOTHESIS

In order to answer our research problematic, we suppose the following:

- The frontier production function of the Saida province fuel stations, following the random model.
- There's an irregular impact of the additional explanatory factors (machines number, fuel stock capacity, the geographical location importance) on the inefficiency of the fuel stations in Saida.

1- THE THEORETICAL CONCEPTS

1.1- The Benchmarking of the best performance

At the beginning of the eighties, the Benchmarking strategy appeared, in Rank Xerox establishment (the printing international pioneer), to improve the stock management function. The company compared its performance to another commercial company, specialized in sports products (Zairi, 2002).

Internationally, many institutions compete to enhance quality, and minimize the costs, in other words, observing the best practices from others in the same industry (competitives), then modify, adapt, and apply again. (Ugbuma, Ugboma & IBE, 2008). It is allowed, here, to define benchmarking as the ongoing observation of the leader institutions' attitudes. There are different concepts that concentrate on the benchmarking applications, and requirements, (Kamel, 2002):

- Benchmarking is a comparison to the pioneer companies; called "the referential unit ".
- It requires the accurate pointing out of the institutions' performance, especially, the weak sides to be compared to the referential unit.
- It is requested that there must be the best understanding of how the referential unit performs.
- Benchmarking contains inputs, outputs, and the administrative acts.
- It is an ongoing process, its successful implement leads to improve the company performance, the main rule is data gathering to succeed in benchmarking.

Benchmarking is one of the important ways to correct the performance, throughout the measurement .The performance correction is a part of the performance management. Most of the establishments coherently use this method to realize their strategy, with informal, and formal motivation, evaluation, and the performance rewarding (Hussein, 2015).

1.2- Efficiency concept:

In capitalism, efficiency has been related to the main economic problem that is how to use the limited resources for providing the repetitive and renewing people's needs. By another saying, it is doing the best throughout the available resources (Lockwood, 2018). Historically, the Italian economist "Vilfredo Pareto", (1848-1923), had developed the efficiency concept that became to him, as "Pareto optimality". According to Pareto, any resources apportionment is either efficient or inefficient; an inefficient allotment reflects inefficiency in case of produces the same outputs with lesser quantity of the inputs than another company uses (Lockwood, 2018). The first one is efficient in accordance to Pareto efficiency (Sengupta, 2018).

Stochastic Frontier Analysis is used to estimate the possible maximum production of outputs, the lowest costs used when producing the outputs, to measure the technical efficiency of the harmonic, making decision units, and to explain the reasons of inefficiency.

1.3- Stochastic Frontier Analysis to measure inefficiency:

SFA was suggested by Aigner, Lovell, & Schmidt, and Meeusen & Van den Broeck in 1977. It is one of the most important methods in terms of the production function, and measured the technical efficiency (Battese & Coelli, 1992). The production inefficiency is caused by two reasons (Farsi, 2007):

- Lack of technology use (technical inefficiency).
- The wrong dedication of resources (the allocative inefficiency).

The productive inefficiency is also due to the previous reasons, which can be measured by the inputs, and outputs measurements. In this case, Stochastic Frontier Analysis appears as a parametric method, uses the econometrics theory to estimate the production, and cost function (Farsi, 2007).

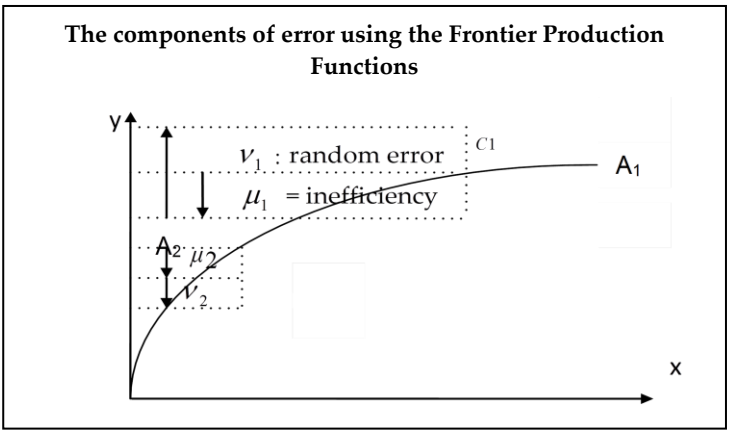
SFA, as a parametric model, takes into consideration the random error of the misestimation, and the error of the efficiency. Inefficiency calculated with the parametric methods is any deviation beyond the efficient limits in the error factor. In this way, results are less sensitive to the external factors, and to avoid the negative values a constant is added to the series. There are different functions used, in applied studies, to show the relation between the inputs and the outputs, for instance, the Cobb-Douglass function, the Quadratique function, or the Translog function (Borodak, 2007). The technical inefficiency (TE) is distinctive by the comparison of the real production to the ideal production, the equality between them means that there's efficiency, in contrast, any deviation reflects inefficiency. The difference between the two productions is the random disturbance threshold.

$$\varepsilon_i = v_i + \mu_i$$

It contains two elements; the generated errors of inefficiency μ_i, and the random errors of the deviation, and the external factors (El-naimi, & Zina, 2012). In n°1 form, factory $C_1$is inefficient, located above the SFA efficiency curve, μ_1 represents inefficiency.

An accepted, external factor $\mathcal{V}_1$is bigger than μ_1. On the other side, A_2 factory is under the SFA efficiency curve, μ_2 represent inefficiency, and $\mathcal{V}_2$ is not accepted, external factor (Filali, 2007).

Figure n°1. The components of error using the Frontier Production Functions



Source: (Filali, 2007, p10)

1.4- SFA description according to transcendental Logarithmic Function

SFA and Transcendental Logarithmic Function TL estimate technical Efficiency. There are two error thresholds, in the Stochastic Frontier production function, for a set of establishments $i = 1,\ldots, N$, and its formula, as following (Abu-Soleyman, 2019):

$$\ln y_i = \beta_0 \ln x_i + (v_i - \mu_i)$$

It is also possible to insert the time variant, as following:

$$\ln y_{it} = \beta_0 \ln x_{it} + (v_{it} - \mu_{it})$$

There are three types in the estimation process (Al-Naimai, & Zina 2012; Seya, 2020):

The 1st phase: The Ordinary Least Squares method is applied to get neutral linear parameters for the measurement conception, except the disconnected part of the upward axis that is biased.

The 2nd phase: Here, the Corrected Ordinary Least Squares method is relied on, for getting unbiased linear parameters

(β_0), and the Cobb Douglas production Frontiers function after the algorithm insertion, are included. It's as following:

$$\ln y_i = \beta_0 \ln x_i - \mu_i$$

Each element represents:

y_i: Outputs of the institution i

x_i: Vector ($k \times 1$) of the inputs used by the institution $i$ème

β_0: Vector (k×1) Parameters of the estimated conception.

μ_i: A random variant, related to the institution's technical inefficiency.

In this case, the Technical efficiency of $i$ème institution is acquired, as following (Kristek, 2019):

$$TE = \frac{y_i}{y_y^*} = \frac{\exp(\beta_0 x_i - \mu_i)}{\exp(\beta_0 x_i)} = \exp(-\mu_i)$$

Adding a random error v_i (the measurement error) to the random error μ_i representing inefficiency, make the random frontier production different from Cobb Douglas production frontiers function as following :

$$\ln y_i = \beta_0 \ln x_i + (v_i - \mu_i)$$

The 3rd phase: By using Maximum likelihood method, we get the maximum possible estimation of the random frontier production function (Kibala Kuma, 2001). According to Transcendent Logarithmic Function, that is the most used, and the most successful one notably with the existence of two factors of production. (Elisson Scott, 1993). It's an attractive function with linear, and squared variants, and arbitrary number of the production factors. It's also an exponential function of the production factory (Al-naimi & Zina, 2012). Then TL takes the following formula, with more than one output, for estimating the technical efficiency with the technical efficiency with the supposition of three inputs (Heyer, Florina & Arnaud, 2004):

$$\ln y_i = \beta_0 + \beta_1 \ln x_1 + \beta_2 \ln x_2 + \beta_3 \ln x_3 + \beta_4 (\ln x_1)^2 + \beta_5 (\ln x_2)^2 + \beta_6 (\ln x_3)^2 + \beta_7 \ln x_1 \ln x_2 \ln x_3 + \nu_i - \mu_i$$

1.5- The definition and the fuel distribution stations components

Energy supply has been a worrying issue for long time to many countries over the world, simultaneously, the necessity of different types of vehicles in daily life (Hiegel, 1999). Fuel distribution stations, is a vital sector because of their provided services and products to the drivers, and the motorbike riders. These stations are found in cities, villages, on highway. Any institution supplies liquid hydrocarbon with distribution appliances connects to buried tanks, to the vehicles, is called "liquid fuel station"(Ali Mohamed Al-kahtani, 2005).

Good location of the station in the first step to build a station. Its profitability depends on its location. Actually, there are criteria for the good position:

- Easily reachable
- Limited number of competitive.
- Clearly visible
- Full of cars movement, for example, on highway.
- The environment respect.

After choosing the righteous place, the investments (the costs) are to be provided, for instance, the human workforce, machines; equipments. And the products to re-sell. (Al-samarai, 2015). For attracting more clients, these stations have places for entertaining and relaxing. Texaco group empowered Mr. Walter Tig to develop its stations. In Switzerland, 69% of hydrocarbon sales were registered in stations with commercial shops, these types of stations, represent 35% of the fuel distribution stations network. (Baha & Abdellah, 2009)

2- PREVIOUS STUDIES

Bassel Ibrahim Wanous (2015): "The Impact of Organized and Infrastructure on The Efficiency of Containers Ports and

Terminals Applied Study on the Mediterranean Sea Container Ports and Terminals".

Depending on the Stochastic Frontier Analysis to measure the explanatory factors impacts, infrastructure, and organization, on the Mediterranean ports, and container stations. The inputs of this study were: number of rigs, the containers stations surface, the pavements length whereas the outputs were the containers number .The additional explanatory variables were the infrastructure elements: the situation types, the roads network quality, the organizational elements, the administrative issues, the implement of communication and technology convention in the operating procedures. There was a positive relation between the infrastructure and organization elements, and the containers ports and stations. The needed time period of import, export operation had the greatest impact as a variable.

"Analytics for smart Energy Management "Seog-Chan Oh, Alfred J. Hildreth study (2016). This study was to analyse the energy performance in the cars industry. AS a big energy consumer tries to save energy, throughout the energy use efficiency program. To measure the efficiency of energy saving initiatives, Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA) were executed to determine the limits of the best attitudes to measure the technical improvement in accordance to the limits change by the time. By extrapolating the results of the LR value and the Spearman ranking factor tests to determine the significance of the SFA model and its consistency with the DEA model.

"The measures of efficiency of power generation plants in Sylhet of Bangladesh". Fredushi, K. F., Kmail, A.A. Ahmed, S. A., and Kawsar, L.A Study (2020). The purpose study was to measure the power generation plants performance in Sylhet region in Bangladesh with monthly data twenty-four months from 2013 to 2014. The electricity generation was an output in SFA, while fuel consumption, lubricant consumption, auxiliary consumption, cost, heat rate and operating hours were

considered as input variables. The results showed that the Translog function was the best method to work better than the Cobb-Douglas function. In addition, the average efficiency of the selected stations was more than 90%. And the results showed that some explanatory variables have a significant positive effect on power generation. On the other hand, some input variables such as operating hours and the interaction between cost and heat rate have a significant negative impact on power generation.

"Cost efficiency in the Swiss gas distribution sector". Farsi, M., Filippini, M., & Kuenzle, M. Study (2007). By adopting stochastic boundary analysis as a parameterized method, this study was conducted with the aim of studying the cost structure of gas distribution facilities in Switzerland. Three random boundary models were applied to cross-sectional data from 26 companies operating in gas distribution from 1996 to 2000. This study highlighted the importance of output characteristics such as customer density, network size, and a number of terminal blocks on inefficiency, and three inputs were used in this study: Capital, labor, the volume of gas purchased, and output represented by the total volume of natural gas sold to estimate the stochastic frontier function of a Cob-Douglas. The results showed that operating costs had an adverse effect on inefficiency, and that the size of the network did not affect the inefficiency of these facilities, while the size of the area had a positive effect. The results showed that gas distribution facilities in Switzerland could reduce their average costs by increasing production as long as they use the same network, but expanding networks does not lead to a transition to economies of scale.

"Assessment of the technical efficiency of thermal generation plants in Egypt using Stochastic Frontier Analysis". Muhammad Hamad Muhammad Abu Suleiman. Study (2019). The stochastic frontier analysis method was used to measure the levels of technical efficiency of the thermal generation plants in Egypt. Using one output of total electricity generated,

and three inputs for capital, labor, and the fuel used in generating electricity, as well as determining the degree of influence of the fuel consumption rate, load factor, capacity factor and plant type on the levels Inefficiency in these stations (25-32 stations during the study period) for the period from 08/2009 to 16/2017. The results showed the low level of technical efficiency of the electricity generating stations in Egypt. The study also shows the lower efficiency of small-sized plants (less than 500 MW) compared to large-scale power plants. The results of the study indicated an adverse effect for both the type of station and the plant capacity factor on the technical inefficiency of the power plants, while the rate of fuel consumption had a negative impact on the technical efficiency of the power plants in Egypt during the study period.

The current study: The research gap for the current study is that it estimated the parameters of the production function for 35 fuel distribution stations in Saida province within 4 years, as these stations are decision-making units that seek to maximize their technical efficiency by using inputs and outputs that are similar in the nature of their activities and in the type of inputs used in the decision-making units in previous studies, such as the study of Abu Suleiman (2019), and study of Farsi, M., Filippini, M., & Kuenzle, M. (2007).

Cross-sectional data were used in the presence of explanatory variables, which are among the most important assumptions of the special model (model2, Battese and Coelli 1995) has an impact on inefficiency (Battese, 1992). The confirmation of the chosen inputs impact on the stations turnover, to the actual explanation of the management of these stations, showing the explanatory variables (the logistical variables) influence on the technical inefficiency, and going an explanation to the station inefficiency are all considered as an addition in this study. From another side, the efficiency of Stochastic Frontier Analysis use has been confirmed by the collected results, in estimating the production function and the station inefficiency reasons study.

3- TOOLS AND METHOD

3.1- The research field:

As a spatial phenomenon the fuel stations importance is due to the provided service to the different transportation means, for increasing their efficiency, they must be located after making good study and succeful planning. From this point, the current study aim appears, that is about the explanatory factor of the technical efficiency (machines number, stock capacity, the stations location importance) in the production function of the NAFTAL thirty-five fuel distribution stations in Saida province, in six Wilayas Saida, Mascara, El-baydh, Naama, Bechar and Tindouf, in the period from 2015 to 2018. With SFA use, our study also aims to estimate the production frontiers function.

3.1.2. The variables study:

Outputs y:

The outputs study are just one out that is the annual turnover, estimated in the Algerian Dinar, of each station.

Inputs x:

Our inputs studies are as following:

- The given capital in the Algerian Dinar by NAFTAL main directorate of Saida in province x_1;
- The workers number x_2.

The stations must be built in an attractive location for economic, and geographical reasons, equipped with fuel distribution machines the fuel tanks, the needed number of workers. The main directorate annually supplies each station with capital which must be invested for purchasing the different energetic substances those are again sold at pre-established price by the main directorate, or the state (Cherouati, 2009).

The costs, throughout managing the stations, are defrayed by the main directorate then the capital is the only input for increasing the stations turnover.

The influencer additional explanatory variables on the inefficiency variable Z_{it}:

These variables are the logistical factors, their impact on maxing the stations turnover in depending on the stations work mechanism. The NAFTAL directors, and some stations managers opinions are taken in consideration, whoo confirmed the suggested model accuracy. With its different variables to study. The additional variables are:

- The Fuel distribution machines number Z_{1t}: the different types the fuel distribution machines number.
- The fuel different stock capacity Z_{2t}: It is about the terrestrial tanks capacity, to stock fuel for selling.
- The geographical importance of location Z_{3t}: It is a crucial factor for increasing the station turnover. The answers of the stations managers have been recorded as data to this variable, by giving a weight to each importance. AS it is seen in the table 1.

Table 1. Weights of the geographical importance of stations

The geographical location importance	High	Medium	Low
The given weight	1	0.5	0

Source: Prepared by the researchers

3.2- Description the study variables

Depending on the real data in numbers, provided by NAFTAL in Saida, from 2015 to 2018 about all the variables, Table 02 summarizes the descriptive features of the research variables; inputs and outputs, and the additional variables of all the stations during the research period (140 observation). Throughout the table 02data, we notice the following:

- The lowest rate of turnover is zero because the Saida station No R2024 for the year 2017 was under reconstruction, whilst

the highest rate of turnover is 573560000, of Baba Ali station in Mascara.

- The given capital is between two rates one million DZD and seven millions DZD. The correlation coefficient between this variable and the output (turnover) is 0.66.
- The average of the machines was six machines per station; the correlation coefficient with the turnover was 0.251.
- The stock capacity is between 8000M^3 and 344000M^3, and the correlation coefficient is 0.75.
- The geographical location importance and the correlation coefficient with output is 0.60.
- The number of workers ranged between 5 and 31 workers, with the correlation coefficient with the turnover 0.66

Table 2. Description the study variables

Variables	number	Lowest rate	Highest rate	Average	Standard deviation
Turnover DZD	140	0	573560000	195894285,71	126344971,936
Capital DZD	140	1793279	7325941	4593543,46	1251326,550
Workers number	140	5	31	11.09	5.063
Machines number	140	3	10	5.85	1.666
Capacity of stock (M^3)	140	8000	344000	137875.14	79774.734
Location importance	140	1	3	2.26	0.843

Source: Prepared by researchers, based on spss records

3.3.-Determination the study model:

Relying on the Stochastic Frontier Analysis description, the model is determined, with the choice of the specific model (mode l2, Battese and Coelli 1995) that supposes, by the time, the existence of explanatory variables. The variable inefficiency μ_{it} is based on the Truncated normal distribution, it's defined as following:

$$\mu_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3$$

The frontiers production function estimation is done, in accordance to the specific model (Model2, Battese and Coelli

1995) with the application of the Maximum Likelihood method. The stochastic Frontiers Production function contains two limits of error of a group of institutions the linear formula is (Henningsen, 2009):

$$\ln y_{it} = \beta_0 + \sum_{n=1}^{i} \beta_n \ln x_{it} + (\nu_{it} - \mu_{it})$$

y_i: Outputs, the final distribution stations turnover.

x_i: Vector $(K \times 1)$ the used Inputs of the station *i*ème; the caital of each station.

β_0: Vector $(K \times 1)$ of the parameters estimated model, representing the elasticities of inputs x_i (Chaudhuri, 2016).

μ_{it}: It is a random variable, the technical efficiency of station, always-positive rate and follows a one-sided distribution, and as μ_{it} is the half-normal distribution with a mean of zero and the variance of σ_μ^2any $\left|N(0, \sigma_\mu^2)\right|$, or the truncated normal distribution with a mean m, and variance σ_μ^2 any $N(m, \sigma_\mu^2)$(Yang, Lin, Kennedy, & Ruth, 2011). The distribution hypothesis are necessarily important for the technical inefficiency μ_{it} and the Stochastic Frontiers Analysis (Otieno, Khin, Hanlong & Banounyong, 2011).

Technical efficiency is as following:

$$TE_{it} = \exp(-\mu_{it})$$

v_{it}The observation error, it always follows the normal distribution with a mean of zero and variance.σ_v^2, $N(m, \sigma_v^2)$ (Ferdushi, 2020). Whereas, also:

σ_μ^2 Variance of inefficiency

σ_v^2 Variance of the measured errors

σ^2 The total variance of the two error limits

$$\gamma = \frac{\sigma_\mu^2}{(\sigma_\mu^2 + \sigma_v^2)}$$

γ It represents "gamma". When γ gamma rate ends at "0", that means the deviation is due to the error measurement on

the other hand, when gamma rate reaches "1", it means that the technical efficiency is the deviation reason (Liu 2010).

4- RESULT AND DISCUSSION

The Frontiers Production function of NAFTAL fuel distribution stations has been done with the Stochastic Frontiers Analysis and the application of the Maximum likelihood Estimator method. Then, study the additional explanatory variables on the inefficiency of stations, by the Frontier program use, is the most used program because of being the easiest tool to estimate the random limits, with the cross-sectional data presence, in the production and costs function.

Frontier 4.1 electronic program for estimating the stochastic Frontiers model, throughout the estimation of the Stochastic Frontiers function parameters in applying Maximum likelihood Estimator method. The impact of the additional variables is on efficiency, is also estimated. Results are on the table 03.

Table 3. Estimation of the parameters for the stochastic frontier turnover function of fuels stations in the Saida province during the period 2015-2018

Variable	coefficient	standard-error	t-ratio
beta 0	-0.12	0.10	-0.12
beta 1	0.49	0.24	0.20
beta 2	0.96	0.10	0.96
Inefficiency Model			
delta 0	0.49	0.10	0.49
delta 1	0.48	0.10	0.48
delta 2	-0.23	0.10	-0.77
delta 3	-0.16	0.30	-0.16
Variance Parameters			
sigma-squared	0.72	0.10	0.72
γ	0.93	0.96	0.97
LR test rate			0.149
Likelihood Ratio			-0.27
Freedom degree			5

Source: Prepared by the researchers, depending on the outputs of the program FRAONTIER 4.1

Results of the station model parameter estimation of the Stochastic Frontiers turnover of the NAFTAL fuel station in Saida, from 2015 to 2018, with the use of Maximum likelihood method.

Depending on the results of the parameters model, we notice the following t-ratio of γ "gamma" reaches 97.15% that is bigger than tabular $t = 11.071$ at the level of the statically significance, freedom degree 5, and 97.15% of the deviation is due to inefficiency, and the modem is stochastic, and suitable to estimate inefficiency .

Test rate LR reaches 14.96, which is bigger than tabular $t = 11.071$ at the approved statically a significance 0.05, and freedom degree 5. So, the model is estimated by M.L.E of the positive error deviation, not by O.L.S, in this case it is acceptable to say that there is a relation of impact between the explanatory additional variables and the technical inefficiency of stations in Saida. The Stochastic Frontiers production function, as following:

$$\ln y_{it} = -0.12 + 0.49\,\chi_{1t} + 0.96\,\chi_{2t} + \nu_{it} - \mu_{it}$$

From the results of the estimated stochastic model of the stochastic frontiers production function, the independent variables are the capita and the workers number. t-Ratio rate consecutively reaches 20.48 and 96.68 those are bigger than the tabular $t = 11.071$ at the approved statically significance 0.05 at freedom degree 5. The null hypothesis $H_0: (\beta_1, \beta_2) = (0,0)$ is rejected, then the annual addition of 10% in the capital leads to an increase in the turnover with 4.9%, and the annual addition of 10% in workers number leads to an increase in the turnover with 9.6%.

It is also noticeable that the coefficients of the additional variables are successively $(\delta_1, \delta_2, \delta_3)(0.48, -0.23, -0.16)$, the negative sign indicates the reverse impact on inefficiency, then the relation between the additional variables and inefficiency, as following:

$$\mu = 0.50 + 0.48z_1 - 0.23z_2 - 0.16z_3$$

From the relation, we notice that There is a positive correlation between the machines, and the stations inefficiency in Saida, whereas the increasing in machines number, inefficiency increases. It means that three are inactive machines in the stations; this is due to the inadequate workers, especially in the important stations. The geographical importance must be taken in account, for making the decision of building stations in the future, to determine the machines number, and the workers number. Therefore, as long as the decreases geographical importance, the number of machines, and workers number decrease .and vice-versa.

A negative correlation between the fuel capacity and the fuel stations inefficiency in Saida province. Whereas, the fuel capacity increasing leads to the inefficiency decreasing. The additional capacity of fuel stock, in the stations, ensures a safe stock during the high demand periods; religious occasions, holidays, and the oscillation periods of the fuel supply from the source. 70% of NAFTAL fuel distribution stations have the total capacity of stock more than 80000m3, its influence is obvious on the inefficiency decreasing. NAFATAL has adopted procedures related to the national market, one of the objectives, has been realized in 217, supervising the distribution, stock infrastructure development in 2030, and modernizing the petroleum products demand from 2017 to 2030 (Autorité de regulation des Hydrocarbures, 2018).

There is a negative correlation between the geographical importance, and inefficiency. Whereas the geographical importance increases, inefficiency decreases, as long as 75% of the Saida stations have medium, or high importance of the geographical location. This is due to the fact that NAFTAL was the only supplier of fuel to the national market, before the emergence of the private stations, then had the priority to be well located.

CONCLUSION

Stochastic Frontier Analysis method is considered among the modern parametric quantitative methods for estimating the random frontier production functions for a group of decision-making units, as it is known the presence of cross-sectional data, that distinguishes between the random error resulting from the miscalculation, and the error generated by the inefficiency, which is considered new within the framework of this analysis, and by applying this method to the fuel distribution stations of the NAFTAL Corporation in Saida Province, which includes 35 distribution stations during the period 2015-2018, it was found that the estimation of the random border production function model is a random estimate by the gamma insubstantial value, meaning that 97.15% of the deviations are due to non-Efficiency, as well as the results showed that there is an effect of the additional explanatory factors represented in the logistical factors (the number of fuel dispensing machines, the capacity of storing fuel, the geographical importance of the site) on the inefficiency of these stations, as the results of applying this method showed the following:

- Addition to the allocated capital each year with 10%, the turnover of the fuel stations of the Saida province Naftal institution, increases by 4.9%.
- Whenever the number of workers increases by 10% every year, the number of jobs increases by 9.6%.
- Increasing the fuel storage capacity leads to decreasing inefficiency of these stations.
- The geographical importance of the station's location is a reason of less inefficiency.
- Big number of the fuel distribution machine achieves more inefficiency.

Based on these results we propose the following recommendations to lessen the inefficiency of fuel distribution stations in Saida Provence.

- We suggest Saida Naftal establishment to locate in points of geographical importance, taking into account the new expansion of the New national roads, before the private sector is involved in these important points. This is due to the big Wilayas it manages in the west and the southwest.
- Because of the aggressive competition of the private sector, we suggest to Saida Naftal administration to improve and diversify the services provided, and make these stations multi-service, by marketing of fuel and other accompanying products, vehicle maintenance, places for entertainment and shopping ... etc, in order to make it the first choice for refueling and other services and thus will increase its business number.
- We suggest to a strategic direction that all its stations operate within the framework of the environmental quality management system ISO 14000 and 14001, and that it be within its culture, which will allow to enhance consumer confidence in the services of Naftal stations.
- The old stations, especially those of great geographical importance should be configured.
- For expanding its activities, the allocated capital should annually be raised, it makes the stations managers to create more chances to increase the annual turnover.

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Annexes

	Statistiques descriptive				
	N	Minimum	Maximum	Moyenne	Ecart type
turnover	140	0	573560000	195894285,71	126344971,936
capital	140	1793279	7325941	4593543,46	1251326,550
workers	140	5	31	11,09	5,063
machines	140	3	10	5,85	1,666
capacity	140	8000	344000	137857,14	79774,734
geographical importance	140	1	3	2,26	,843
N valide (liste)	140				

Corrélations							
		turnover	capital	workers	machines	capacity	geographical importance
رقم_الأعمال	Corrélation de Pearson	1	,662**	,603**	,251**	,754**	,597**
	Sig. (bilatérale)		,000	,000	,003	,000	,000
	N	140	140	140	140	140	140
رأس_المال	Corrélation de Pearson	,662**	1	,438**	,435**	,665**	,558**
	Sig. (bilatérale)	,000		,000	,000	,000	,000
	N	140	140	140	140	140	140
عدد_العمال	Corrélation de Pearson	,603**	,438**	1	,506**	,633**	,532**
	Sig. (bilatérale)	,000	,000		,000	,000	,000
	N	140	140	140	140	140	140
عدد_الآلات	Corrélation de Pearson	,251**	,435**	,506**	1	,366**	,361**
	Sig. (bilatérale)	,003	,000	,000		,000	,000
	N	140	140	140	140	140	140
طاقة_الاستيعاب	Corrélation de Pearson	,754**	,665**	,633**	,366**	1	,565**
	Sig. (bilatérale)	,000	,000	,000	,000		,000
	N	140	140	140	140	140	140
أهمية_الموقع	Corrélation de Pearson	,597**	,558**	,532**	,361**	,565**	1
	Sig. (bilatérale)	,000	,000	,000	,000	,000	
	N	140	140	140	140	140	140

** La corrélation est significative au niveau 0.01 (bilatéral).