Available online at https://www.asjp.cerist.dz/en/PresentationRevue/85

Economic Researcher Review

ISSN: 2335-1748, EISSN: 2588-235X VOL10,N^{O}02 (Year 2022.),PP44-53

The Impact of Manufacturing Industries on Sustainable Development in Saudi Arabia

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Received: 09 /23 /2022 ; **Accepted:**10 / 16/2022; **Published:**12/30 /2022

Abstract :

The manufacturing industries sector is extremely important, especially for oil countries, aiming at protecting their economy from the imbalances resulting from sharp fluctuations in oil prices and achieving economic stability. Therefore, the purpose of the study was to identify the experience of Saudi Arabia in developing the manufacturing sector, as well as trying to build a standard model of the impact of manufacturing industries on sustainable development. To achieve that purpose, we initially shed light on the manufacturing industries sector indicators, such as value added, exports, capital accumulation and employment in the sector.

Through the study, we reached a noticeable trend in the Saudi Arabia towards achieving economic diversification by developing the manufacturing sector. We also reached, through the standard model, the positive impact of the manufacturing industries on sustainable development in the country.

Keywords: oil, manufacturing industries, economic stability, sustainable development.
Jel Classification Codes: C51, D72, F43, O11, Q01.

How to cite this article by the APA method:
Nabila NOUI (2022), ***The Impact of Manufacturing Industries on Sustainable Development in Saudi Arabia,*** *Economic Researcher Review* ,Volume10(issue02), Algeria: University of skikda, pp44-53

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1. Introduction.

There is a lot of evidence for the fact that oil contributes to increasing the targeted economic growth rates in a number of oil countries, but in contrast there is no doubt that evidence as well, shows an important worsening economic situation due to oil in other countries. In fact, the problem does not appear in oil, since it is characterised by its instable prices since its discovery. The real problem lies in the efficient use of its revenues during the boom to protect the economy in light of the crisis.

In past years, many oil countries adopted an economic model aimed at increasing economic growth rates. However, these countries found that the adopted model resulted a major economic imbalance due to the domination of the rentier pattern that impeded the production of a real development model. In a later period, and with the recurring of oil crises, it is realized the need to search for a development model that does not achieves only positive growth rates, but also works to stabilize these countries, as they realized that this stability will not be achieved by relying on limited sectors dominated by oil and gas.

The Saudi Arabia model of an oil country that has discerned the negative effects of oil, and has worked to gradually disengage its economy from oil by diversifying the economic through the manufacturing sector, seeking to protect its economy and achieve economic stability and sustainable development.

- The study issue

Based on the foregoing, and based on the fact that the negative effects resulted from the rentier model on sustainable development, we may ask:

"Has manufacturing industries contributed to improving the indicators of sustainable development in the Saudi Arabia?

- The study hypothesis

The study is based on the main hypothesis that the trend towards developing the manufacturing manufacturing industries has contributed positively to improving the indicators of sustainable development in the Saudi Arabia.

- Objectives of the study

Through this study, weseek to:

- discover the fact of manufacturing industries in the Saudi Arabia;
- Shed the light on the importance of manufacturing industries in achieving sustainable development through the experience of the Saudi Arabia.

- The study approach

This study relied on the descriptive approach with analysis. Standard analysis methods we reused to choose variables, test and estimate methods, using statistical programming (Eviews 9) to build a model that explains the relationship between manufacturing industries and sustainable development.

- The study structure

The study was divided into three main axes:

The first axis: studies made in the relationship between manufacturing industries, diversification and sustainable development;

The second axis: the experience of Saudi Arabia in achieving diversification through the manufacturing sector;

The third axis: the standard study of the impact of manufacturing industries on sustainable development.

2. Studies in relationship between manufacturing industries, diversification and sustainable development

Although Ricardo has presented arguments and proofs about the benefits of specialization which has received great approval during the past decades, both the Cooper (1968) and Kemp (1973) studies have shown that specialization presents a risk to the economy. Indeed, countries that depend on natural resources face two types of challenges, Short-term and long-term challenges. As for the short-term challenges, they are represented by the intensity of fluctuations in the prices of raw materials at the global markets level, which makes achieving economic stability a difficult target to achieve. Concerning the long term one, the main challenge is the inability of these countries to achieve sustainable development (Cooper, 1968, p285).

Koren study (2007) showed that economic performance, when associated with producing a particular product, the decrease in prices or the demand for that product for any reason necessarily exposes the productive structure of the economy to risks. In turn, economic diversification especially based on manufacturing industries will reduce the negative effects resulting from the excessive dependence of the economy on one product. In the same context, the study has demonstrated that the weak economic diversification resulting from the production concentration of one product or a limited number of products leads to a remarkable fluctuation in the levels of GDP, which is inversely related to the rate of economic growth. Hence, the increase of the economic diversification, in this sense, depends on reducing the fluctuation which will consequently lead to higher rates of economic growth for a long period that contributes to achieving sustainable development (Koren, 2007, p243).

Statistics has confirmed the validity of the results of these studies. Despite the fact that the oil-rich Middle East countries had enjoyed a stunning growth until the mid-seventies, they recorded during the eighties and the beginning of the nineties of the twentieth century a regression. However, in 2005, half of the OPEC countries were poorer than they were ethirty years ago. Economic growth in these countries has been closely linked to fluctuations in oil prices:

- During the oil shock of 1974, when oil revenues reached their highest levels, growth rates doubled.
- During1980-1986, the price of oil fell to its lowest levels, the fact that contributed to reducing the average per capita income in the Emirates, Saudi Arabia and Qatar to about 50%. (Ross, 2015, p. 17).

The International Monetary Fund indicates, in an evaluating study of the economic performance over 40 years for the countries of the Middle East and North Africa, which possess 55% of the world's oil and natural gas reserves, most of which specialize in oil and gas exports, that these countries have been able to achieve positive growth rates but characterized by strong fluctuation). The study concluded basically that specialization in the export of oil and natural gas is regarded as an obstacle to achieving sustainable development. (Arezki, 2012, p 8).

As for the Lederman, Maloney study (2007), it was concluded that economic diversification through the manufacturing industries leads to higher growth and sustainability. The study estimated as well that economic stability can mainly be achieved by the help of economic diversification in countries rich in natural resources. (Lederman, 2017, p 18).

Androw Rosser's study (2007) showed that countries that know a high diversification index have witnessed a considered growth in per capita GDP, for instance: China, Malaysia and Thailand while countries that know a high concentration index record weakness in per capita GDP which characterizes the countries of Africa (Rosser, 2007, p58).

As for the Dawe (1999) study, which examined the fluctuation of economic growth rates over time, and the inability of many countries to reach sustainable development. There are three main reasons behind this all linked to weak economic diversification (Dawe, 1999, p14):

- First: These countries specialize in production and export for a small number of products;

- Second: frequent and severe exposure to total shocks;
- Third: The strong fluctuations at the macroeconomic level due to the impact of the shocks on the specialized sectors.

Among the studies that dealt with the relationship between diversification and economic stability that of Thad Dunning (2005). The study showed that thereis a negative relationship between the abundance of natural resources and economic stability, as the dependence of these countries on natural resources leads to weak economic diversification, which makes their economie svulnerable to fluctuations in the price of these resources. Thus, sustainability and economic stability are far from being achieved (DUNNING, 2005, p482).

3. The experience of the Saudi Arabia in moving toward sustainable development

As of 2021, the Saudi Arabia is among the world's 10 largest oil producers and is a member of the Organization of the Petroleum Exporting Countries (OPEC) and the Gas Exporting Countries Forum (GECF).

A member of OPEC, the Saudi Arabia is currently the second -largest petroleum and other liquids producer in the world. Based on a seven-month total of revenues collected through July 2022, hydrocarbon export revenues are projected to account for $172 billion in 2021, about 51% of all export revenue. (SaudiA, 2022)

The Saudi Arabia produced 13 million barrels per day (b/d) of petroleum and other liquids in 2021 (condensate, natural gas plant liquids, and refinery processing gain). The Saudi Arabia was the first-largest petroleum producer in OPEC in 2021. (OPEC, 2022)

Exports

The Saudi Arabia is both a major exporter of petroleum liquids. According to Clipper Data, the Saudi Arabia exported more than 6 million b/d in 2021. (OPEC, 2022)

3.1. Diversification of the local product for sustainable development

Although the Saudi Arabia is still largely dependent on oil income, it has the largest diversified economy in the Gulf Cooperation Council region. This is evidenced by the decreased contribution of the oil sector and the increased contribution of the non-oil sectors to the local product. It is estimated an increase from 11% in 2000 to more than 27% in 2021. This indicates the decline in the role of the oil sector in the volume of GDP and the success of the state'spolicy in diversifying economic activities. The manufacturing sectoris regarded as the most important sectors to achieve the diversification objective. Its real growth rate reached annually about 78% from 2000 to 2021. The five-year plans for economic and social development in Saudi Arabia gave attention to the industrial sector with the aim of increasing its share of investment and its contribution to employment. As a result, the GDP growth of the industrial sector in general and the output of manufacturing industries in particular increased significantly. In the same context, the construction and building sector, as well, achieved growth rate of 11.4% during the same period. wherethe state witnessed a greaturban development for instance, the reconstruction of facilities, the new roads and cities in the country, as well as the transportation and communications sector, which achieved a growth rate of 7.3% (during the same period). (SaudiA, 2022)

3.2. Exports diversification for sustainable development

The Saudi Arabia recorded a positive development in diversifying exports without oil, as Non-Oil Exports in Saudi Arabia increased to 23800 Million SAR in May from 23249 Million SAR in April of 2022.

Figure 1. Value of non-oil exports from the Saudi Arabia

Source: Central Department of Statistics & Information, Saudi Arabia

3.3. Diversification of the government revenues for sustainable development

The contribution of oil revenues to total revenues decreased from 70% in 2000 to 40% in 2021, while the contribution of other sectors to the country's national income increased. The reason is that in recent years, the state has re-pumped part of the oil revenues into local investments in sectors rather than the manufacturing sector, energy sector, most notably the services sector, in order to diversify the state's revenues, which have been distributed over a wide range of activities. (SaudiA, 2022)

4. The standard study of the impact of manufacturing on sustainable development in Saudi Arabia during the period (2000-2021)

4.1. Model variables

The dependent variable: is a sustainable economic growth denoted by the symbol SD. This indicator was used to measure sustainable development in many studies of the International Monetary Fund, due to the ease of calculation and the availability of data for a specific long time. Data of the index values were obtained during the study period from World Bank data.
The explanatory variables: are indicators of manufacturing industries diversification: exports, government revenue, fixed capital, and employment.

4.2. The Model

The mathematical form of the model has been determined and the form of the function is as follows:

$$SD = f (ME, MR, MC, ML)$$

A multiple linear regression model is used as follows:

$$SD = B0 + B (1) ME + B (2) MR + B (3) MC + B (4) ML + u (i)$$

Whereas:
ui: represents the error term.
SD: represents sustainable development index.
ME: represents the Export Diversification in the manufacturing sector.
MR: represents the Government Revenue Diversification in the manufacturing sector.
MC: Gross fixed capital Diversification Index represents diversification of fixed capital formation in the manufacturing sector.

ML: labor diversification index represents the employment diversification in the manufacturing sector.

4.3. Stationarity tests

To test the stationarity of model variables, it is required Unit Root Test, of Dickey and Fuller (DF), and Augmented Dickey-Fuller test (ADF). These tests, in deed, prove the nature and characteristics of stationarity of variables that are understudy. Beforeapplying the Dicky Fuller test, it is necessary to find the degree of delay for the stationarity, in order to determine the type of test that is used in detecting its mono root. The following table shows the results of the test for study variables, by applying the extende Dicky Fuller test (ADF) to the stationarity being studied.

Table 1.Unit Root Test results for the study variables
(Unit Root Tests- Log)

First difference				Level				Variables
ADF				ADF				
Result	**With constant and trend**	**With constant**	**Delayed value**	**Result**	**With constant and for trend**	**With constant**	**Delayed value**	
Stationarity	-8.111	-8.142	P=0	**Non-stationary**	-2.4918	-2.111	P=1	SD
Stationarity	-4.324	-4.223	P=2	**Non-stationary**	-3.107	-2.529	P=3	MR
Stationarity	-8.162	-8.315	P=0	**Non-stationary**	-3.371	-2.368	P=1	ML
Stationarity	-9.492	9.668-	P=0	**Non-stationary**	3.093-	2.294-	P=1	ME
Stationarity	-4.866	5.008-	P=1	**Non-stationary**	3.629-	2.846-	P=2	MC

Source: Based on Outputs of (E-views.9)

- T.statistic, at (1%, 5%, 10%) level, with constant, is consecutively : -2.47, -3.11, -2.68.
- T.statistic, at (1%, 5%, 10%) level, with constant and for trend, is consecutively : -3.18, -4.17, -3.26.

From Table No. (1), it is clear that the result of stationarity test indicates that all variables are non stationary at level while after taking first difference, all these variables are stationary,at1%, 5% and also10% at significance level. Thus, time series are integrated at order one which indicates that there is a possibility of cointegration between the different variables.

4.4. Cointegration test to Johansen's method

When highlighting the stationary test, it is clear that each variable is cointegrated at first step which means variables are non-stationary at their level but stationary in the first difference. To find out whether there is/not the cointegration, we consuct the cointegration common test.

$$i\ /\ H_0 : r = 0\ /\ H_1 : r > 0$$
$$ii\ /\ H_0 : r = 1\ /\ H_1 : r > 1$$
$$iii\ /\ H_0 : r = 2\ /\ H_0 : r > 2$$
$$iiii\ /\ H_0 : r = 3\ /\ H_0 : r > 3$$
$$iiiii\ /\ H_0 : r = 4\ /\ H_0 : r > 4$$
$$iiiiii\ /\ H_0 : r = 5\ /\ H_0 : r > 5$$

Table 2. Results of the Cointegration Common Test

Series: SD MR ML ME MC
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.826175	121.6533	58.64534	0.0000
At most 1 *	0.801543	46.32736	44.95343	0.0142
At most 2	0.729876	24.37265	26.74654	0.0713
At most 3	0.426764	8.846565	12.87654	0.4746
At most 4	0.176548	2.953441	2.753443	0.0620

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.826175	52.64544	29.64553	0.0000
At most 1	0.801543	13.74654	22.74656	0.0711
At most 2	0.729876	10.84766	19.63554	0.1627
At most 3	0.426764	5.84765	12.74665	0.5654
At most 4	0.176548	3.43552	3.64553	0.0652

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Based on Outputs of (E-views.9)

The results of this test shown in Table (2) lead us to reject the null hypothesis and accept the alternative one because the calculated value of the Trace Statistic is greater than the value scheduled for that at the significance level of 5%.

The results of the Max-Eigen Statistic are also supported by the results of the trace test, which means rejecting the null hypothesis and accepting the alternative one (there is a common integration relationship r + 1 and the number of one cointegrating joint vectors is 1 vector).

This result confirms the existence of a long-term balance relationship between these variables, which means that they do not differ a lot from each other so they exhibit similar behavior.

4.5. Estimation of the standard model

After checking the Stationarity of time series and the existence of long-term cointegration relationships between the variables of the model of study, we will now estimate the standard model, where a preliminary evaluation of the standard model was made by entering all the independent variables in the model, in order to obtain elasticities for the independent variables and their effect on the dependent variable.

With the use of the economical standard program (Eviews-9), and the use of the method of least squares and its tests, the results were as shown in Table No. (3).

Table 3. Results of estimating the impact of manufacturing industries on sustainable development in Saudi Arabia

Dependent Variable: SD
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MR	2.542243	2.467386	2.645561	0.1165
ML	18.39513	4.847636	3.941522	0.0003
ME	12.95351	4.746637	3.746664	0.0018
MC	1.007188	7.773543	0.052278	0.7423
C	-14.45321	1.922654	-8.164553	0.0000

R-squared	0.948123	Mean dependent var	2. 354425
Adjusted R-squared	0.954753	S.D. dependent var	2.853442
S.E. of regression	0.562254	Akaike info criterion	1.534453
Sum squared resid	3.854438	Schwarz criterion	1.736525
Log likelihood	-9.546377	Hannan-Quinn criter.	2.635542
F-statistic	145.8362	Durbin-Watson stat	3.635442
Prob(F-statistic)	0.000000		

Source: Based on Outputs of (E-views.9)

According to the table, the results of estimating the linear model were as follows:

$$\boldsymbol{SD} = -14.45321 + 12.95351\text{ME} + +2.542243\text{MR} + 1.007188\text{MC} + 18.39513\text{ML} + \text{u}_i$$

4.6. Testing the model

It is concluded from the estimation results of the estimated coefficient values, that:

- The value of the estimated coefficient for the constant limit indicates that when the values of the independent variables are null, the fluctuation of economic growth is at the limits (-14.45321), and it is significant (at the level of 5%) because (P <0.05).
- The coefficient of the ML and ME variables have statistically significant, according to the t-test at the level of significance (p≤ 0.05).

5. Results and discution

Through the model above, we notice the following:

- As for the manufacturing industries exports coefficient (B (1)), we notice its positive sign, that is, the positive correlation relationship between the dependent variable (fluctuation in economic growth), and the explained variable, the Herfendal Hirschmann coefficient for export manufacturing industries. In another word, the higher the Herfendal Hirschmann export diversification coefficient increased by (1%) (In the sense of increasing the concentration of exports), the rate of fluctuation of economic growth will increase by (12.95351%), and thisis consistent with expectations and the logic of economic theory, if the coefficient (B (5)) has an economic significance.
- One of the main challenges facing the Saudi Arabia economy is the high rate of employment in the services sector and a low one in the productive sectors, which negatively affects production.
- We have mentioned previously that the state provide sincentives for the transfer of workers to the productive sectors and the private sector, and yet, this challenge remains highly presented.

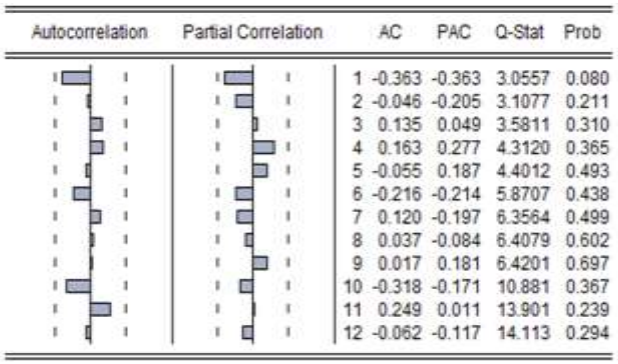
5.1. Testing for signification

The value of the coefficient of determination R2 = 0.948, as this ratio reflects the explanatory power of the model, and shows the effect of the independent variables and their contribution to identifying and explaining the changes occurring in the dependent variable, which means that this model has the ability to explain 94.8% due to the independent variables, and the rest 5.2%. is due to

other factors or other variables that were not included in the model and are due to the random variable (ui) as well.

It is observed through the analysis of the autocorrelation function, which shows that all the values of the autocorrelation function are within the confidence interval and (P> 0.05), which indicates the absence of the autocorrelation problem.

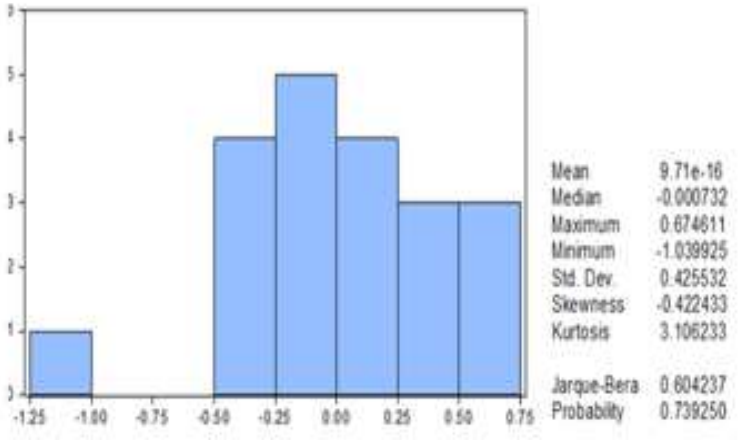
Table 4. The autocorrelation function



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.363	-0.363	3.0557	0.080
		2	-0.046	-0.205	3.1077	0.211
		3	0.135	0.049	3.5811	0.310
		4	0.163	0.277	4.3120	0.365
		5	-0.055	0.187	4.4012	0.493
		6	-0.216	-0.214	5.8707	0.438
		7	0.120	-0.197	6.3564	0.499
		8	0.037	-0.084	6.4079	0.602
		9	0.017	0.181	6.4201	0.697
		10	-0.318	-0.171	10.881	0.367
		11	0.249	0.011	13.901	0.239
		12	-0.062	-0.117	14.113	0.294

Source: Based on Outputs of (E-views.9)

Figure 2. Residual tests- normality test



Source: Based on Outputs of (E-views.9)

To confirm the presence or absence of a self-correlation problem, the BG-LM Test and ARCH-LM Test will be used.

Table 5. BG-LM Test, Test ARCH-LM for the model

	Obs*R-squared	**Probability**
Breussch- Godfrey Serial Correlation LM Test	**4.243**	**0.834**
Heteroskedasticity ARCH Test	**0.220**	**0.911**

Source: Based on Outputs of (E-views.9)

- The BG-LM test is used in order to test the serial correlation problem, that is: 22X0.192 = 4.243 = LM = nxR2, where n: the number of observations used in the model, and comparing it with the X2K tabular statistic with a degree of freedom of K = 1 and the level of significance of 5%, equal to 3.81 of which we have:

4.12 <4.243, and thus makes us accepting the null hypothesis that the model does not have a self-correlation problem.
- Test ARCH-LM, which aims at finding out if there is a correlation between the squares of the residues, which is based on the Lagrangian multiplier nxR2 = 20X0.009 = 0.18 LM =, and comparing it with the tabular X2K statistic with a degree of freedom of K = 1 and a level of significance of 5%, which equals 3.81. : 3.81 <0.18, thus we accept the null hypothesis that the variance is constant for the randomerror limit (residues).

6. Conclusion

The objective of this study is to examine the long run relationship between manufacturing industries and sustainable development in Saudi Arabia using annual data collected from the World Bank , and UNCTAD of 21 years from 2000-2021. Econometric methodology like Co-integration and Granger Causality test was also employed. At first, the stationary properties of the data to verify the existence of spurious relation among the series data and, order of integration were tested using the Augmented Dickey-Fuller (ADF) test.

Based on the finding of this study, the following policy recommendations are forwarded:

Concentration of exports has a positive effect on the volatility of economic growth, which means the inability to achieve sustainable development. Al though the Saudi Arabia has made a great effort to diversify exports outside oil, the achieved results are not sufficient to ensure the stability and sustainability of growth. The state should make efforts to increase diversification of its exports in manufacturing sector. Oil derivatives, re-exports and processed food stuffs, for instance, may play an important role in diversifying exports and achieving sustainable development.

In the same context, the concentration of employment in the services sector has a significant positive impact on the volatility and instability of growth. A greater distribution of labor in the productive sectors, especially agriculture and industry should been sured. The concentration of employment in the unstable financial sector should also be reduced, which may pose a greatest threat to the economy and the sustainability of development in the country.

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