Journal of Economics and Administrative Sciences (JEAS)

Available online at http://jeasiq.uobaghdad.edu.iq

Industrial Sector and Development of Iraqi Economy by Kaldor's Approach For Years (2017-2030)

Adel Ghazi Khalil Jasim Al- Hayaly
Ministry of Industry and Minerals / General Directorate of Industrial Development / Baghdad / Iraq
Ahmedkazee1964@gmail.com

Received:20/10/2021 Accepted:2/11/2021 Published: June / 2022

Abstract

The study aims to clarify the impact of growth in the industrial sector on economic growth in the Iraqi economics according to the methodology of Kaldor for (2017-2030) , taking into consideration the effect of the accumulation of capital in the calculation of growth rates in the economy through productivity estimate of Total Factor Productivity (TFP) to growth in the economy, which is why the study assumes a formula to comply with the laws of Kaldor growth models developed requirements. This study is the most important to find out the development of the laws of Kaldor among Arabic studies, especially the first and third, so that the relationship between the growth of industrial production and economic growth as represented by the overall productivity of factors of production , while employment relationship is in the non-manufacturing sector with total production of inputs (TFI).

The study has concluded from the developed formulation to calculate degree of increasing in returning any production stage that the increasing degree of return comparable size when estimating the laws formats as there is a strong impact between the growth rates in industrial production and growth rates in gross domestic product .

Research paper
Keywords: **Industrial Sector , Kaldor's Approach , (TFP) , (TFI) , Iraqi Economy (2017-2030) .**

Introduction:

Economists place a high value on studies of economic growth because growth is a constant topic of discussion in economic analysis, particularly among Neoclassic economists. Some, like Robert Solow, believe that growth is determined by internal factors, while others, like P. Romer and Lucas, believe that growth is determined by external factors. There are also economists interested in analyzing the motives of growth, which means that growth is determined by how or how it is measured.

The research will focus on assumptions of Kaldor , who believes that the sectorial manufacturing structure of production is the one who explains the differences among the growth rates in different economies , and that growth is driven by sector, which has higher productivity (accelerated) to labor.

Although these assumptions are then formulated with developed countries directed towards the deepening of manufacturing production , it is still possible to verify the continuity of the sector due to the acquisition of technical progress requirements and therefore the higher productivity of the primary sector for different countries rates.

We can disseminate Kaldor's Hypothesis, which states that economic growth is impacted by sector growth, which influences worker productivity in the same industry. Knowing that rising demand for industrial products is driving rapid growth in this sector, there will be a favorable impact on productivity growth in this sector as well as the overall productivity of the economy, as measured by GDP growth rates.

The Aim: -

The study aims to understand and analyze the assumptions of Kaldor and ascertain the extent of the industrial sector and the growth of productivity growth in the compatibility of the Iraqi economy, and its detect many cases of the developments in the growth models , especially in the concepts of account for the total factors of productivity (TFP) and stage returns to scale , as well as the total factor inputs (TFI), because it cannot be ruled out new concepts for those models to influence the relationship between the sectorial growth and growth in output , especially if growth is occurring because of productivity growth that was the manufacturing sector or the economy as a whole with a reminder that Kaldor begins assumptions and ends its laws according to its dependence on the manufacturing sector is the motivation of growth.

Problem: -

The problem has determined in Kaldor's Law that is not always able to interpret the relationship between the rates of growth in gross domestic product and manufacturing sector in some countries, especially developing ones and this is what trailed by some studies, despite the launch of the principle that the sectorial structure that demonstrates the differences in growth rates . Therefore, it requires the integration of those laws with the requirements of the new growth models .

Hypothesis of this study :-

The new formulation of the Kaldor's Law through identifying growth relationship in the industrial sector with the total factor inputs (TFP) of the economics , and the total factor inputs (TFI) to the industrial sector will enable us to expand the capacity of the laws of Kaldor to emphasize the importance of the industrial sector being the motivation of growth in addition to the fact that the wording gives us a new possibility of determining the degree of increasing returns to scale.

I:- Theoretical reference.

1-1:- The Kaldor's Law and the relationship of productivity and economic growth.

The contributions of Kaldor in addition to the ongoing discussions concerning the Neoclassic Convergences growth between developed and poor countries, and discussions about the potential for growth of poor countries as well as studies on the growth gaps among those countries, there are a lot of growth models that have been to those convergences including model Solow- Swan (Solow1956 , Swan 1957), which they considered that the physical capital that accumulates by external factors have would achieve continuous growth rates in developed countries if the internal factors of production became not able to accomplish growth , because of the subordination of these factors to the law of diminishing marginal productivity in long range. If we know that the developed countries are subject to the state of constant return to scale of the factors of production or decreased return , especially for the size of capital , the poor countries have increasingly marginal productivity of capital and with this there is a paradox in growth rates that do not converge with the developed countries . From here, Solow and some Neoclassical are sacrificed that technological changes (external factor) is that explain these anomalies show the difference between those countries , especially from the standpoint of economic growth rates in the long range (McCombie 2006).

The growth models , which says the continued long-range growth caused by external factors called external growth models. And a continuation of those approaches (Romer1986 , 1990) and Lucas (Lucas1988) added new ideas into growth models , but they adopted the idea of the state of constant return to scale (Note that these assumptions according to the logic analysis marginal goes to the lack of growth rates because of factors of production then you will lose the ability to create additions new production). Therefore, Romer and Lucas confirmed that the total productivity growth is determined by internal factors , namely the incident because of the innovations and developments of knowledge.

From here, overturned growth models neoclassical from external growth models represented technical changes generated by the accumulation of generating capital because of external factors to be driven by internal factors , although associated with a physical or human capital , it reflected a new way to calculate the physical capital and human capital enhanced innovation and skills. Because the innovations and knowledge are ones of the factors of production and are not subject to the law of diminishing returns , and therefore not decreasing marginal productivity , and this provides a practical explanation for continued growth in the developed countries. Returning to Kaldor discussed the growth from the different points of view is that the sectorial structure of production causes the differences among the growth rates in different economies. Kaldor ((Kaldor, 1966)) when his

interpretation of the changes occurring in the overall productivity of factors of production was fired from that labor productivity in most sectors are driven by productivity growth. And he showed that labor productivity growing sectors make this motivation of economic growth, and in any economy, there must be a motivation of growth and the sector. Kaldor said that the industrial sector is the sector of the motivation of growth. Nicholas Kaldor takes it that economic growth happens through the process of absorption of the labor force from less productive sectors to the most productive sector of the economy . And it is the sector which contributes directly to GDP growth of a country .

Kaldor has introduced three reasons for the possibility that growth in the industrial sector explains the differences in growth rates when account the productivity of labor and capital in different economic sectors; it is the most important sector because of having the fastest rates of productivity. The reasons are : -

1. The industrial sector boosts growth in GDP.

2. Promoting growth in the productivity of the sector itself and thus increases the return degree dynamically .

3. Stimulating the transmission of preliminary work sectors (which are characterized by declining returns size) the industrial sector

Kaldor emphasized that the increased demand by increasing production capacity and encouraging investment leads to economic growth in the future. It can increase demand by economies of scale resulting from technological progress and technical progress and learning through experience (specialization) . He said that economies of scale are the factors of economic growth and specialization practiced a central role .

Kaldor quoted this concept of growth through the study of the (Verdoorn. 1949), Kaldor also concluded that the demand growth leads to increased productivity and that this increase creates competitiveness and therefore to increase the demand again . Kaldor coined concepts about the motivation of growth in three laws can be placed formats behavioral equations (functions) with the possibility of estimating its parameters and these laws are: -

First Law.

The growth rate of an economy is positively related to the growth rate of its industrial sector

This law is the most important law, which confirms that the growth in the productivity of the industrial sector was the biggest influential in economic growth, so the manufacturing is the motivation of economic growth. We can estimate the relationship assumed by the law in the following format: -

$$g_q = a + bg_m$$

Where: $(g_m \quad , g_q)$ **express their manufacturing and GDP growth rate respectively.**

Kaldor assumptions built for the industrial sector as the motivation of growth through his study of the path of growth of developed countries during the period 1953-1964 after World War II. This relationship is recognized when the industrial sector represents a fundamental component and the largest in the total output of the economy.

Here will be the value of the regression coefficient (b) **is positive and less than the one that is** $(1\rangle \quad b \quad \rangle 0)$ **.**

The value of regression coefficient $(b\rangle 0)$ indicates that the rate of growth in the economy depends on the existence of a positive difference between the rate of growth in the industrial sector output and the growth rate in the production of non- industrial sectors, especially agriculture (to be considered the primary sector). It is here also can develop a formula of the first law of Kaldor according to the following equation: -

$$g_q = c + d(g_m - g_{nm})$$

To ensure that manufacturing is the motivation of growth , Kaldor had another idea is that the growth in the production of non- industrial sectors (g_{nm}) is a positive function in the growth of the industrial sector output in accordance with the following formula: -

$$g_{nm} = u + vg_m$$

This addition paved the way for the drafting of the third law will come later.

The second law .

An increase in the rate of growth of industrial output leads to increases in labor productivity in that sector.

This law, known as the (Verdoorn's Law), confirms the existence of a positive relationship between labor productivity in manufacturing (P_m) and the growth of the industrial sector output growth. The formula adopted by Kaldor in this law, which are: -

$$P_m = a + Bg_m + \varepsilon$$

Where (P_m) represents a growth rate of labor productivity in the industrial sector. Also, (ε) is a normally distribution error term , so that :- $\varepsilon \sim N(0 - \sigma_e^2)$

Also, (P_m) is a difference between the rate of growth in the industrial sector production and the rate of growth in employment in this sector that is $(P_m = g_m - e_m)$, and this difference value is Kaldor additional to Verdoorn's law.

Kaldor also said that employment in the industrial sector (e_m) a positive function in the same sector output growth. That is $(e_m = a + Bg_m + \delta)$.

He also noted here that if the (B) is significantly different from the one at every 1 % increase in the industrial production, it will grow at a rate of less than 1% , which means that production will increase to increase production .

The third law .

The productivity in the non- industrial sector increases as the rate of growth of industrial output increases.

It is a complement to the first law, especially from the point of view of the employment relationship in the sectors of the economy with growth in the industrial production sector . It is a dialectical relationship underwent numerous discussions in exchange for a few applications. The third law of Kaldor suggests that the productivity of industrial sectors is a positive function in the industrial sector growth , a negative function in the growth in non- industrial sectors.

Thus, confirming that productivity in the non- industrial sectors will increase the rate of growth due to the increase in the growth rates of industrial production according to the following formula: - $(P_{nm} = a + Bg_m - \gamma e_{nm} + \delta)$ **.**

Where (e_{nm}) **the rate of growth in the employment of non- industrial sectors**

This law shows that productivity in the non- industrial sectors depends on the rate of growth in the industrial sector as the motivation of growth.

Most probably, the Kaldor adopted here on the Lewis model (Lewis 1954) explained the work of the primary sector movement (agriculture) to the capital sectors . As the (Thirlwall 1986) explained that the high-income primary sector will manufacturing the demand for industrial goods and thus accelerate growth in the industrial sector . This view turns the direction of impact the direction of the industrial sector.

(McCombie 1981) believes that the third law of Kaldor does not mean anything as if it was the productivity of the industrial sector level higher than the level in the agricultural sector; any transfer of resources from agriculture to manufacturing will lead to increased levels of productivity in various sectors . Others pointed out that the productivity of the industrial sector may not lead to increased productivity in the agricultural sector .

Kaldor 1966 through a standard regression model was conducted on data analysis of 12 developed countries for the period of time 1953-1964 test. As the others tested the Kaldor's hypothesis in many countries, including (Diaz: 2003) in Mexico, using the gross domestic product and production of industrial data for the period 1980 to 2000 the methodology of con-integration with Granger's methodology of causality and the application of the first law of Kaldor and concluded that there is a two-way causal relationship between two variables fully supports the Kaldor's hypothesis. And the study of ((Wells and Thirlwall 2003)) which supported the three laws of Kaldor in 45 African countries for the period 1980_1996. The study found that more than half the existing differences in growth rates for African countries dated back to the industrial production growth. Despite the support , the hypothesis of Kaldor in many countries in different time periods , has faced some criticism from the scientific and theoretical consideration , especially those referred to it by the (McCombie1983 and Thirlwall, 1983) on the second and third laws , where they found that the direction of these two laws was presumed by Kaldor in two opposite directions. In addition, there are many studies that have adopted the laws of Kaldor putting the original, and the other was based on the development of some of these laws to suit the requirements of modern growth models.

<u>1-2: - Analytical data</u>

In this study, we aim to understand the relationship between the productive sectors of the economy and economic growth in the Iraqi economy , with emphasis on the industrial sector production and according to the requirements of the Kaldor's laws. Beginning to be the most important review of quantitative data of the Iraqi economy and having to do research topic during the study period (2017-2030) .

This was for a long time but the style required by statistical analysis . We can note three periods, each of which represents a period of internal and external economic conditions as another advantage . And to review the most important economic indicators can look at the data in Table (1) :

Table (1) Some quantitative indicators of the Iraqi economy *

Period	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
GDP growth rate	%11.30	%20.21	%2.64	%-15.7	%-6.64
Population growth	%2.5	%2.58	%2.57	%2.55	%3.3
Oil production growth	%-0.223	%3.23	%-3.87	%-1.34	%2.1
Oil production from the productive sector rate	%23.7	%46.53	%8.2	%12.5	%40.3
Productive sectors percentage of GDP	%53.59	%56.32	%56.1	%46.4	%54.13
Distributive sectors percentage of GDP	%21.45	%20.19	%18.9	%21.2	%20.77
Service sectors percentage of GDP	%24.96	%23.49	%25	%32.4	%25.10

Source: calculated from data of the Ministry of Planning , the Republic of Iraq , the Central Bureau of Statistics for various years .
*** (Values and ratios of the average duration of data at constant prices 1988 = 100)**

Data from Table (1) clarified that the production sectors obsessed by oil production at high rates and that there is an imbalance in the relative importance , especially in the productive sectors , which includes the industrial sector of the main sectors . Table (2) and Table (3) show the expectations for the growth of the Iraqi economy until 2030.

Table (2) some quantitative indicators of the Iraqi economy (2022-2026)

Period	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026
GDP growth rate	% -2.5	%1.23	%2.64	%-1.32	%-1.6
Population growth	%3.31	%3.321	%3.35	%3.39	%3.42
Oil production growth	% -0.2	%2.12	%1.26	%1.52	%3.33
Oil production from the productive sector rate	%38.2	%40.23	%41.25	%42.15	%49.27
Productive sectors percentage of GDP	%52.17	%53.32	%55.1	%56.4	%60
Distributive sectors percentage of GDP	%22.97	%22.19	%18.9	%192	%20
Service sectors percentage of GDP	%24.86	%24.49	%24	%24.4	%20

Source: calculated by the researcher.

Table (3) Some quantitative indicators of the Iraqi economy (2026-2030)

Period	2026-2027	2027-2028	2028-2029	2029-2030
GDP growth rate	%2.32	%2.21	%7.64	%6.23
Population growth	%3.52	%3.9	%4.1	%4.25
Oil production growth	%0.54	% -3.3	%3.35	%4.35
Oil production from the productive sector rate	%49.3	%41.53	%50	%53.4
Productive sectors percentage of GDP	%60.21	%55.32	%61.3	%62.2
Distributive sectors percentage of GDP	%19.09	%21.19	%18.9	%18.4
Service sectors percentage of GDP	%20.70	%23.49	%19.8	%19.4

Source: calculated by the researcher.

Table (4) Some indicators of growth in production and partial productivity in the Iraqi economy and some of its sectors

Index	Economy as a whole	Service sector	Agriculture sector	Manufacturing sector	Oil
The rate of growth in production during the period	%4.86	%4.62	%2.52	%1.43-	%12.06
The rate of growth in capital accumulation	%3.52	%4.69	%-0.267	%2.16	%6.37
The rate of growth in the labor force	%6.46	%6.29	%5.75	%0.545	%1.06
Average labor productivity during the period	6.21 one Thousand dinars per worker	4.35	2.74	7.73	323.3
Average productivity of capital accumulation	0.603	0.25	0.92	0.38	2.68
The rate of growth in labor productivity	%-1.63	%-1.46	%-3.29	%-1.865	%10.88
Growth in the productivity of capital	%1.30	%0.20	%2.75	%-3.34	%5.35

Source: - calculated by the researcher.

Table No. (4) contains economic indicators for the period (2017-2030), from which we find the growth rates of both total production and production sub-sectors of the Iraqi economy, which refers to the negative growth rate in labor productivity in the economy and its sectors except oil.

Also growth rates in the economy caused by certain oil sector to attest that the Iraqi economy is a rents economy depends on oil exports significantly. Regarding the growth rates that we use in the analytical framework contains part of the extension in the attached tables.

These data indicate that the industrial sector in accordance with the importance of its studies require assumptions search because it still has importance in the economy, although it records a negative growth rate during the study period, because the research method depends on the relationship of labor productivity in this sector in its productivity and its impact on growth in the overall economy. Here it must be pointed out that the data for analysis were used in the manner that is compatible with the requirements of growth models. And here we mean how to calculate both the capital as well as labor productivity and this requires to clarify the method of calculating the factors of production because the growth index requires estimation of capital accumulation and to be calculated in accordance with the depreciation rates and capital formation, as human capital is calculated according to the average years of schooling and return on investment.

1-2-1. Capital Accumulation.

To calculate capital accumulation, there is a perpetual inventory method , which depends on the basis of the compilation accumulations of fixed capital formation as annual additions that are added to the annual flow of capital stock according to the following equation: - $K_t = I_t + (1-\delta)K_{t-1}$**,**

where (K_{t-1}) **the rate of depreciation of capital assets in the productivity of the economy and** (I_t) **the initial capital stock and the annual additions to the capital (net annual capital formation).**

1-2-2. Humane Capital (H).

The purpose of compatibility with modern additions to the school internal growth and requirements of skills and training as well as to transform the work force to form human capital . The labor force (L) is another factor with the accompaniment of a (h_t) **, which represents the weighting value for each of the average years of schooling** (S_t)**, and the rate of return to schooling (r).**

This means that : - $H = L * h$ *then* $h_t = e^{r.S_t}$

Here we can modify the equation of Solow model to get the following formula: -

$$Y_t^* = A_t^* + aK_t^* + (1-a)H_t^*$$

$$\therefore A_t^* = Y_t^* - aK_t^* - (1-a)H_t^*$$

1-2-3. Account of production factors in the Iraqi economy .

Compatible with the purpose of capital stock account analytical framework (Capital Accumulation) , we estimate the rate of depreciation of capital in the Iraqi economy according to the approved financial standards, which states that the rate of depreciation of capital between (4% and 6% and 5%) for various sectors or the various assets capitalism. Depending on the weight of each sector of GDP in Iraq for years to study the depreciation rate of 5% per year to adopt a reasonable average asymptotic global rates also despite our conviction that many of the productive capital assets beyond its useful life, while the account (K_0) **through average accumulation account in the first four years of the study period after treatment by a factor of depreciation .**

And that was for the economy as a whole $(K_0 = 8772.49)$ **,and this will be the estimate of capital stock according to the following formula: -**

$K_t = 8772.49 + (1-\delta)K_{t-1}$

For the industrial sector and other sectors use the same method to get the accumulation of capital to those sectors values. The human capital transactions can calculate the average years of schooling (education) to calculate the rating labor force in the Iraqi economy according to their level of academic base and then taking the average study period . And total years of education up to bachelor's is in Iraq 16 years is added to the upper years of education certificates representing the upper limit . The minimum shall be zero and when taking the weighted distribution of the workforce and found that the closer the average duration of the study is up to (9.6%). For the average return on investment in education, there are a number of indicators that can be done calculating the average of which, including the United Nations studies in this regard, as demonstrated most recently and who is studying the relationship between education and the labor market. The measurement of investment returns in human capital was 15.5% for primary education, 11.2% secondary education and 10.6% for higher education. For this, the researcher when taking the weights for the distribution of the workforce according to the school level got an average of 8.5%. Note that there is a low average yield of the labor force below the level of primary education, which is to reduce the percentage (0.85); from here would be: - $K_t = 8772.49 + (1-\delta)K_{t-1}$**.**

2 : - Analytical perspective

2-1: - Analysis Methodology

When looking at the laws of Kaldor, we found that they are applied more on the developed countries where labor productivity is accelerating , particularly in the industrial sector and in the period after World War II , a period during which Kaldor tested especially in the United States and European countries , while industry accounted for the greatest increasing return to scale of its laws (McCombie & Roberts 2007).

Iraq's economy is not developed mainly produced primary pattern attribute. The agricultural activity (primary) has a greater importance of the industrial sector, and this is what the data indicate in the analytical study as stated above. It is certain we will see upheaval in the applicability of the laws of Kaldor as essential primary on the industrial sector as the motivation of growth. On the other hand, the growth rates in the overall productivity of factors of production in the long range is a function of the accumulation of the capital . The first and second laws of Kaldor become unable to explain the level of increase in the dividend scale correctly (McCombie2012), especially if we know that the capital stock are the most important variable in internal growth function , especially in the long range. This requires that growth (TFP) is a function in capital growth. From here, we have to make changes to the formats of the laws of Kaldor's functions in line with the requirements of modern growth models departing from the impact of the adoption of the accumulated capital in the production function and are as follows : - $Q = Ae^{\lambda} K^{a} L^{(1-a)}$**.**

We know that this cup Douglas production function and make a logarithmic transformation we get : - $q = \lambda + ak + (1-a)l$.....(1)

In this formula, the variables are logarithmic values and when to make some transfers (unscrewed by Taylor) function can be written in the following formats: -

$q^* = \lambda^* + ak^* + (1-a)l^*$.....(2)

And variables here are annual growth rates.

This formula in equation (2) is identical to the Solow-Swan equation accounting for growth ,and the interpretation of the Total Factor Productivity (TFP), as follows: -

$tfp = q^* - ak^* - (1-a)H^*$.....(3)

Note that physical capital is calculated in the accumulation of capital and the labor force was calculated on the basis of human capital. As we mentioned that according to the law of Kaldor the (λ) is an internal variable and represents technical progress, while in the point of view of Solow is an external variable represents here in the equation (3) the total factor productivity generated by the non-production inputs (capital and labor).

We can also use other formula ((McCombie, & Roberts 2007) include the presence coefficient represents the degree of increased return. (v = degree of increasing returns) , as follows: -

$q^* = \lambda^* + v[ak^* + (1-a)H^*]$.....(4)

And to compensate the equation (4) in equation (3) and make some transfers we get : -

$$tfp = \frac{\lambda^*}{v} + (1-\frac{1}{v})q^*$$.....(5)

Here can be generalized formula on the motivation of growth sectors , including the industrial sector as follows : - $tfi = \frac{\lambda^*}{v} + (1-\frac{1}{v})g_m$.....(6)

Where ((tfi)) the total factor inputs ,and (g_m) Growth of industrial output.

And if we know that :- $tfi = \lambda^* + ak^* + (1-a)H^*$.....(7)

This means that growth in total production (Millemaci, E. and Ofria 2014) is a function in the total productivity of inputs and are as follows: -

$q^* = \lambda^* + vtfi$.....(8)

These formulas arranged for us the possibility of taking into consideration the capital accumulation when estimating the growth rates in total output that the economy was on the level or at the level of economic sectors , especially in the long term.

From here, we can rewrite the laws of Kaldor and Verdoorn as follows:

$first \quad law.... \quad tfp = \frac{\lambda}{v} + (1-\frac{1}{v})g_m$.....(9)

$second \quad law..... \quad P_m = a + Bg_m$.....(10)

$third \quad law..... \quad P_{nm} = \delta + vtfi - \gamma e_{nm}$.....(11)

Where (B) Verdoorn's Coefficient , which ranges from value between zero and one.

(e_{nm}) The rate of growth in employment for the non-industrial sector.

(P_{nm}) The rate of growth in labor productivity in the non-industrial sector.

Here the value of $(\frac{1}{v})$ in the equation (9) is representing the degree of increasing returns to scale, while (v) is that this represents a degree of increasing return to scale in the equation (11).

2-2: - Econometrics Estimation

To estimate the total factor productivity (TFP) as in equation (3) requires the assumption that it restricted function (Cobb Douglas):-

$$tfp = q^* - ak^* - (1-a)l^*$$

And in which the degree of increasing return be equal to one. For this, we estimate the value of (TFP) of non-restricted function $Q = Ae^{\lambda}K^{a}L^{B}$, which is where for each share of labor and capital in the total production in the Iraqi economy. This estimate was cup Douglas function of the following formula:-

$$LnQ = \lambda + aLnK + BLnH$$

Through using the logarithmic values of work and head money in the overall economy, we got the following estimation : -

$$LnQ = 5.341 + 0.103LnK + 1.393LnH$$

This estimate parameters can be used to calculate values of (TFP) and are as follows:-

$$tfp = q^* - 0.103k^* - 1.393H^*$$

Among those calculated values of (tfp), we can estimate the value of (v) to level of the economy from the equation (8) and we have to estimate the following : -

$$\hat{q}^* = 0.064 + 0.614tfp$$

The return scale shows that the Iraqi economy is in a diminishing returns to scale , because $(v = 0.614)$,and this was less than one .

We can also use the calculated values (tfp) in the estimation of parameters for the first function of the Kaldor's Law ,equation (9)

In the same way are estimated values of the total productivity of inputs (tfi) in the industrial sector. When our estimation to unrestricted Cobb- Douglas production function in the manufacturing sector got the following rating : -

$$LnQ = 7.886 - 0.515LnK + 0.716LnH$$

A function (Total Productivity of Inputs) in the manufacturing is :-

$$tfi = q^* - (-0.515)k^* - 0.7161.393H^*$$

Here we can include the estimated values are calculated (tfi) for the period (2017-2030). We can also estimate the value of (v) for the manufacturing sector and that we benefit from this in checking (and ensuring) the convergence of values in the first and third laws of Kaldor. The more convergent values when estimating function parameters that represent those laws the closer the model that we have set to the accuracy and methodology of analysis and formulas that we have proposed in the search compatible with previous assumptions Kaldor .

When estimating (v) from the values of (tfi) as in equation (8) ….. $q^* = \lambda^* + v tfi$ **we get the following : -** $q^* = -0.881 + 0.926 tfi$

This means that the degree of return shows that the scale of the Iraqi manufacturing is in a state of diminishing returns , because $(v = 0.926)$**. But it was closer to the constant return to scale of the production and was the best of the situation of the Iraqi economy as a whole. Besides, we can use the calculated values (l) in the estimation of the equation (11) , which represents the Kaldor's third law .**

2-3 .Estimate Kaldor's laws : -

First law : - $tfp = \frac{\lambda}{v} + (1 - \frac{1}{v}) g_m$

When using the data growth rates in the production of the industrial sector and data on the overall productivity of (Total Factors Productivity) (tfp**), which were estimated we get the following estimates: -** $tfp = -0.038 + 0.004 g_m$

Results estimate the regression equation of the first Kaldor's law

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.038-	.041		-.912-	.368
	g_m	.004	.001	.481	3.100	.004***
a. Dependent Variable: TFP		$R^2 = 0.231$	$F = 9.609$	$Sig(F) = 0.004^{***}$		

Where:-

$$0.004 = 1 - \frac{1}{v}$$

$$\therefore \frac{1}{v} = 1 - 0.004 = 0.996$$

Here ($\frac{1}{v}$**) represents the degree of return to scale depending on how the function analysis is. It means that degree of increased return (0.996) is less than one case to show diminishing returns in which the industrial sector is going through and is also closer to the previous result (0.912) .**

The (λ)**, which represents the value of the level of technical progress coefficient ,according to Kaldor (which he said was an internal factor) can be estimated as follows : -**

$$-0.038 = \frac{\lambda}{v}$$

$$\lambda = (-0.038) v$$

$$\because \frac{1}{v} = 1 - 0.004 = 0.996$$

$$\therefore v = 1.004016$$

$$\lambda = -0.03815$$

The negative value ($\lambda = -0.03815$) for the coefficient of technical progress refers to the weakness of the use of technology in the industrial sector and this a logical conclusion with the nature and the low level of the development of the manufacturing in the Iraqi economy at the study time.

The second law : As we have said previously that Kaldor – Verdoorn's law :

$P_m = a + Bg_m$

When using growth rates in labor productivity values and the values of growth rates in the output of the industrial sector got the following rating : -

$\hat{P}_m = -0.728 + 0.912 g_m$

Results estimate the regression equation of the second law (Kaldor -Verdoon's law).						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.728-	2.338		-.311-	.758
	g_m	.912	.078	.898	11.742	.000***
a. Dependent Variable: P_m $R^2 = 0.807$ $F = 137.881$ $Sig(F) = 0.000^{***}$						

Here the value of coefficient ($\hat{B} = 0.912$) appeared less than one-compatible with the presumption of Verdoorn , as we know that (B) is (Verdoorn's Coefficient) as we indicated. The value of this parameter confirms that if the rate of growth in the industrial sector increased by one unit , the productivity of the labor will grow at a rate of 0.912 % of this unit , at a rate less than the rate of output growth .

The third law : -

When using the data on all of the growth in labor productivity in the non-industrial sector (agriculture) (P_{nm}) and growth rates in employment for the sector (e_{nm}) , with data to (tfi) the overall productivity of the inputs for the industrial sector , we get the following estimate : -

$\hat{P}_{nm} = -2.094 + 0.974 tfi - 0.011 e_{nm}$

Results estimate the regression equation for the third law						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.094-	1.486		-1.409-	.168
	Tfi	.974	.048	.965	20.287	.000***
	e-nm	-.011-	.075	-.007-	-.146-	.885
a. Dependent Variable: Pnm …… $R^2 = 0.930$ $F = 211.254$ $Sig(F) = 0.000^{***}$						

Here the values of $(v = 0.974)$ **appeared, which converged with those of the first law or in equation (8) and which show that the total productivity of inputs , in diminishing returns in all cases phase . Note that this parameter is the only one that showed a significant statistically significant at a confidence level of 1% .**

Results showed that the estimated parameters agree with the format for the third function of the law , with the emergence of non- statistically significant factor in the growth rate of employment for non-industrial sector .

Conclusions

The researcher has analyzed the relation between the growth in the production of the industrial sector and overall economy in Iraqi economy , for the period (2017-2030).

The study used a methodology Kaldor's Hypothesis, but a new format , that enabled us to integrate modern growth models , which link between growth in the economy and the accumulation of capital, for this it has been put laws of Kaldor in a new function especially the first and third law .

The new versions of those laws enable us to calculate the degree of increase in return in the economy or in the industrial sector. The results reached by the study can be summarized thus : -

1. Although the industrial sector is characterized by decline in growth rates , but growth in that sector supports growth in the gross domestic product.

2. The degree of increase in the yield appeared worth less than one , and this shows that the industrial sector as well as the Iraqi economy each subject to the law of diminishing returns .

3. The Verdoorn's coefficient was less than the one, which is compatible with the assumption that all of Kaldor and Verdoorn .

References :-

1-Diaz, Alfjandro .P,(2003)," Mexico`s Industrial Motivationof Growth: Cointegration and Causality", Momento Economico.No,126 April.

2- Felipe,J.& McCombie,J.(2012)," Agglomeration Economies, Regional Growth, and the Aggregate Production Function: A Caveat Emptor For Regional Scientists .Spatial Economic Analysiss, Vol.7,No.4.

3- Kaldor ,Nicholas, (1966), "Causes of the Slow rate of Economic Growth of the United Kingdom" an Inaugural Lecture. Cambridge: Cambridge University Press.

4- Lucas ,Robert (1988). "On the Mechanics of Economic Development". Journal of Monetary Economics. No 22.

5- McCombie, J.S.L.,(1981) What Still Remains of Caldor's Laws?", Economic Journal No(91).

6- McCombie, John S.L. (1983), Kaldor`s Laws in Retrospect", Journal of Post Keynesian Economic , 5(3) Spring.

7- McCombie, J.S.L.(2006),"The nature of Economic Growth and the neoclassical Approach: More Questions than answer? In :Arestis, P. UK.Edward Elgar.

8- McCombie, J.S.L., & M. Roberts (2007) Returns to Scale and Regional Growth: The Static Dynamic Verdoorn Law Paradox Revisited, Journal of Regional Science, 47(2).

9- Millemaci, E. and Ofria, F. (2014) Kaldor-Verdoorn's Law and Increasing Returns to Scale: a comparison across developed countries. Journal of Economic Studies, Vol. 41 No. 1.
10- Romer P.M. (1986). "Increasing returns and long-run growth". Journal of Political Economy, Vol 94.
11- Romer, P. M. (1990)."Endogenous Technological Change". Journal of Political Economy, Vol 98(5).
12- Solow ,R.M.(1956."A Contribution of the Theory of Economic Growth". Quarterly Journal of Economics. Vol 70 No1.
13- Swan, T.W.(1956). "Economic Growth and Capital Accumulation" . Economic Record, Vo 32.
14- Thirlwsll, Anthony P. (1983), "A Plain Man`s Guode to Kaldor`s Growth Laws" , Journal of Post Keynesian Economic ,5(3), Spring.
15- Wells, H. and Thirlwall, A. P.(2003) "Testing Kaldor's Growth Laws Across the Countries of Africa." African Development Review, 15,.

Supplements

Growth rates in the Iraqi economy and some sectors indicators for the period (2017-2030)

Oil sector			Agriculture sector			Manufacturing sector			Overall economy			
H	K_t	product	H	K_t	Product	H	K_t	product	H	K_t	product	years
3.86	3.79	17.84	0.28	2.21	2.91	3.01	6.11	5.54	3.15	8.42	-2.11	2017
-2.63	49.96	-69.36	-0.08	52.2	1.91	-2.87	57.44	5.86	-2.38	39.30	-0.73	2018
0.81	28.1	-21.81	0.14	33.52	10.87	6.63	36	1.22	25.83	5.96	-0.52	2019
-0.68	14.3	-11.74	0.47	17.37	-3.84	-9.27	16.39	0.89	2.88	-21.24	-9.62	2020
25.15	51.99	13.91	-1.56	12.55	10.97	-15.77	3.68	-1.16	7.05	-25.18	-1.49	2021
3	18.77	28.4	1.05	8.73	15.72	5.83	-5	11.64	7.16	-10.57	1.45	2022
3.44	9.89	19.51	3	4.4	-4.3	3.7	0.87	-1.07	5.66	-39.73	4.65	2023
3.26	5.8	97.53	2.41	2.17	-8.34	3.23	-1.29	36.36	-8.48	20.93	9.31	2024
3.15	7.31	-1.32	2.68	3.47	7.69	3.27	-1.62	-22.34	4.84	11.21	-0.02	2025
3.28	6.44	-29.53	2.4	3.15	9.72	3.22	14.69	0.9	11.29	32.84	-3.12	2026
-35.01	1.26	789.14	-17.22	-0.39	10.87	-3.54	7.9	-46.92	-2.75	-36.65	-13.03	2027
-5.24	-3.74	-83.73	0.14	-4.06	-16.55	-0.58	-4.36	-61.93	-4.21	-83.85	-56.42	2028
-3.02	-1.82	59.34	1.22	-2.61	22.75	2.02	-3.2	2.14	-0.95	0.13	25.64	2029
1.56	-1.74	-18.11	1.07	-2.54	-1.12	1.33	-1.4	140.58	-5.97	21.72	48.58	2030

القطاع الصناعي وتطور الاقتصاد العراقي بمقاربة كالدور لسنوات (2017-2030)

الباحث/ عادل غازي خليل جاسم الحيالي
وزارة الصناعة والمعادن / المديرية العامة للتنمية الصناعية / بغداد / العراق
Ahmedkazee1964@gmail.com

Received:20/10/2021 Accepted:2/11/2021 Published: June / 2022

مستخلص البحث:

تهدف هذه الدراسة الى توضيح اثر النمو في القطاع الصناعي على النمو الاقتصادي في الاقتصاد العراقي وفق منهجية كالدور للمدة (2017-2030) , مع الاخذ بنظر الاعتبار اثر تراكم رأس المال في حساب معدلات النمو في الاقتصاد من خلال تقدير الانتاجية الكلية لعوامل الانتاج (TFP) بالنسبة للنمو في الاقتصاد .لهذا تم افتراض صيغة لقوانين كالدور تتوافق مع متطلبات نماذج النمو المطورة وهي اول دراسة عربية تتعرض لتطوير قوانين كالدور خاصة الاول والثالث بحيث تكون العلاقة بين نمو الانتاج الصناعي والنمو الاقتصادي ممثلا في الانتاجية الكلية لعوامل الانتاج. بينما تتمثل علاقة الاستخدام في القطاع غير الصناعي مع الانتاجية الكلية للمدخلات (TFI) ونخلص من هذه الصياغة المطورة الى حساب درجة تزايد العائد أي مرحلة الانتاج. انتهت الدراسة الى ان درجة تزايد عائد الحجم متقاربة عند تقدير صيغ القوانين كما أن هناك اثر قوي بين معدلات النمو في الانتاج الصناعي ومعدلات النمو في الناتج المحلي.

نوع البحث: ورقة بحثية
المصطلحات الرئيسة للبحث: القطاع الصناعي ، نهج كالدور ، TFP، TFI، الاقتصاد العراقي (2017-2030).