“The effect of fixed capital formation rate on gross domestic product in Iraq”

AUTHORS	Sameer Siham Dawood Bilal Kadhim Haidar Mohammad Ghazi Nussaif Jasim

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Sameer Siham Dawood (Iraq), **Bilal Kadhim Haidar** (Iraq),
Mohammad Ghazi Nussaif Jasim (Iraq)

THE EFFECT OF FIXED CAPITAL FORMATION RATE ON GROSS DOMESTIC PRODUCT IN IRAQ

Abstract

The total fixed capital formation is one of the main and influential determinants of production function through its impact on production costs, competitiveness, and profits. The Iraqi gross domestic product depends on one sector (the oil sector) in financing the government budget, which may lead to crises in case of oil price collapse. Therefore, the study aims to clarify the imbalance in the production function and the real output of the Iraqi economy and to indicate the role of the total fixed capital formation in this imbalance. The econometric methods were used to measure the degree of influence of the total fixed capital formation (independent variable) on the gross domestic product (dependent variable) from 2004 to 2020. The results showed a robust relationship between fixed capital formation and gross domestic product, where the independent variable affects the dependent variable by 4.5%, while the oil sector dominated the total value added by its acquisition of the total fixed capital formation by 47.45%, and the productive sectors of agriculture and industry achieved value added of 3.8%. The study concluded that the distribution of total capital formation by sector has an impact on the gross domestic product. Therefore, it is necessary to distribute the total fixed capital formation to the productive and production-supporting sectors to achieve economic growth and diversify the structure of the gross domestic product.

Keywords government expenditure, production, economic growth, fixed investment, public sector accounting, macroeconomic impact

JEL Classification H50, O11, G31, F62

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Sameer Siham Dawood, Ph.D., Assistant Professor, Economic Department, College of Administration and Economics, University of Baghdad, Iraq. (Corresponding author)

Bilal Kadhim Haidar, Ph.D., Lecturer, Economic Department, College of Administration and Economics, University of Baghdad, Iraq.

Mohammad Ghazi Nussaif Jasim, Ph.D., Lecturer, Economic Department, College of Administration and Economics, University of Mustansiriyah, Iraq.

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INTRODUCTION

Aggregate investment in both government and private sectors is the engine of economic growth, which is one of the main objectives of all economies. Economies aim to increase and sustain economic growth to ensure a standard of living for society and the individual through the pursuit of macroeconomic policies that achieve stability in prices and the operation of economic resources and reduce unemployment rates to achieve sustainable economic growth.

It is challenging to provide a comprehensive explanation for the factors that most significantly affect economic growth. However, different macroeconomic factors can accelerate any country's economic growth in a proactive and dynamic way (Khan et al., 2022).

Therefore, aggregate investment is one of the determinants of gross domestic product (GDP) growth. It also affects the rate of fixed capital formation (FCF), which is the production base with the aim of stimulating economic growth and sustainability due to the investment multiplier. Fixed assets and advanced infrastructure (machines, buildings, bridges, hospitals, universities, schools, etc.) will stimulate economic growth and real production. The macroeconomic models have largely assumed that public and private capital is affected by the aggregate

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production function (An et al., 2019). A significant portion of overall aggregate demand is made up of fixed investment spending, which is connected to economic growth by its effects on social welfare and the productive stock of capital.

The Iraqi economy suffers from the low contribution of the productive sectors (with the exception of the oil extraction sector) to the composition of the gross domestic product. Despite the successive increase in the volume of the general investment tunnels, it is characterized by the weakness of the productive infrastructure, a real imbalance in the production function, and the rate of fixed capital formation of the government and private sector. These factors increased the impact of economic shocks, especially the volatility of oil prices in world markets, on the Iraqi economy and even enlarged the structural imbalances in the economy.

1. LITERATURE REVIEW

Soi et al. (2013) analyzed the Kenyan economic growth between 1960 and 2010 through multiple linear regression model, Barro growth model, and ordinary least squares method. They found a positive relation between the dependent variable (GDP) and the independent variable (fixed capital formation). Moreover, the results show the effect of openness, foreign direct investment, and gross capital creation in this relationship.

The relationship between government spending and economic growth in Jordan from 1980 to 2013 was collaborated by Al-Fawwaz (2016). The research variables were linked using a multiple linear regression model. The ordinary least squares model was used to analyze the model. The results showed that total government spending on total fixed capital has a positive impact on economic growth and can stimulate productive sectors.

Ali (2017) used annual time series data from 1981 to 2014 to examine the impact of total free cash flow on economic growth in Pakistan. The article used the Augmented Dickey-Fuller (ADF) unit root test to ensure the stationarity of the data before regression analysis. The study variables include Pakistan's GDP and total foreign direct investment (FCI). The study explained the impact of private investment, financial development, and exports in this relationship.

Das and Tulin (2017) explained the significant decline in total investment, particularly in fixed capital formation during 2000–2010 in India, through the analysis of company-level financial statements and other new data sets on corporate investment decisions. Firms were less inclined to undertake new investment projects, and financial competition and credit restrictions played a role in the slowdown.

Mukherjee and Ahuja (2017) studied the role of gross fixed capital formation (GFCF) in determining India's economic growth. Economic growth was expressed through gross domestic product (GDP) from 1970 to 2014 using regression analysis to measure the correlation coefficient. The outcomes confirmed an ideal positive correlation between gross fixed capital formation and gross domestic product (GDP).

Kozmenko and Korneyev (2017) studied how financial flows affect economic growth in the Central and Eastern European States by applying the ARDL model and the ECM model to joint integration analysis. Researchers have found a positive correlation between the short and long-term flow of financial resources, economic growth, and the role of economic openness in this relationship.

Bahal et al. (2018) used structural vector error correction models (SVECMs) to analyze total public and private investment in India during 1996–2015. The study showed the positive role of private and public investment in fixed capital formation; moreover, private investment in total investment has become increasingly important.

Berg et al. (2018) studied the overall effects of the efficiency of public investment on selected economies through the application of the ARDL and ECM models for the analysis of joint integration. The study has shown that increases in public investment spending in inefficient countries have

less impact on growth than in efficient countries. It follows that there may have been an inverse relationship between the scarcity of public capital and efficiency across national borders.

Lupu et al. (2018), who applied the Autoregressive Distributed Lag (ARDL) model using quarterly data for 1995–2015, demonstrated the significance of the relationship between the structure of public spending and GDP growth in selected Central and Eastern European countries. The results showed that while spending on social welfare, public services, defense, and economic affairs had negative effects on the economy, spending on health care and education had beneficial effects.

Adekunle (2019) analyzed annual time series data on GDP (dependent variable), gross fixed capital formation, gross national savings, and foreign direct investment (independent variables) to study the impact of capital formation on economic growth in Nigeria from 1988 to 2017. The results showed that while gross national savings significantly impacted GDP, gross fixed capital formation and foreign direct investment had no significant impact on the country's GDP.

Meyer and Sanusi (2019) used data from South Africa to demonstrate whether domestic investment, employment, and economic development are causally related. Johansen's co-integration domain and vector error correction models (VECM) were applied to quarterly data from the first quarter of 1995 to the fourth quarter of 2016. The empirical results showed a long-term relationship between employment, domestic investment, and economic growth; the causal relationship runs from investment to economic growth and not vice versa.

The composition of spending affects Afghanistan's economic growth, as explained by Barlas (2020), who analyzed data gathered between 2004 and 2019. The bound, Johansen co-integration, and unit root tests were examined. The results showed that the dependent and independent variables have a long-term association. Furthermore, there is a strong correlation between Afghanistan's economic growth and the previous and present infrastructure and education spending. Nonetheless, the growth rate and security expenditure are inversely correlated.

Alshammary et al. (2020) analyzed the impact of government spending on economic growth in 20 Middle East and North Africa (MENA) nations in 1990–2016. The study shows that the MENA region's economic growth underwent a dynamic shift from the short to the long term. Government spending generally has a crowding-in influence on growth rather than a crowding-out effect on the MENA region.

The effects of capital production on Nigeria's economic growth were discussed by Onwiodiokit and Otolorin (2021) using the multiple regression technique. They showed that free cash flow and exports are not positively related to GDP values in Nigeria in the short term due to the negative impact of imports on GDP and the importance of public investment spending in GDP in the long term.

However, Gbohoui (2021) explained how macroeconomic uncertainty affects the fiscal multiplier of public investment. The study indicates that unanticipated increases in public investment had larger and longer-lasting effects on output, investment, and employment during periods of high uncertainty, using disagreement over GDP projections as a proxy for uncertainty. Additionally, shocks to public investment improve private sector confidence in times of uncertainty and raise expectations for future economic growth.

Using Slovenia as an example, Espinoza (2021) calculated sector-specific and overall fiscal multipliers for public investment and EU structural investment (ESI) grants. The study addressed the problem of heterogeneity across countries, and it discovered that multipliers were higher in a group of Central and Eastern European nations that are significant recipients of European funds and are distinguished by higher rate regimes.

Turan et al. (2021) described how the investments from the public and private sectors affect growth using data from a broad sample of nations. By applying the Autoregressive Distributed Lag model (ARDL) and ECM to analyze the co-integration, the study showed the positive relationship between public and private investment and economic growth in general and that public investment has a greater impact than private investment in some economies.

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Hua et al. (2022) compared recent investment dynamics with estimated benchmarks. The findings indicated that Greece had been suffering from a lack of investment since the Securities Deposit Agreement, with private investment lagging significantly. The estimated investment gap ranged between 1.6 and 8% of GDP in 2019. This is due to the structural obstacles facing corporate investment.

The relationship between Zimbabwe's economic expansion and gross capital formation was discussed by Maune and Matanda (2022) covering the years 1960–2020 using ARDL model. The results demonstrated unidirectional and bidirectional causal relationships between gross capital formation and economic growth during the three study periods.

Poku et al. (2022) discussed the relationship between government spending and Ghana's economic growth using data from 1970 to 2016. The empirical results show that, in the near term, government spending and economic growth are positively correlated. The findings also indicated that, both in the short and long terms, there is a considerable positive correlation between foreign direct investment, gross capital formation, and economic growth. Nonetheless, a clear inverse relationship exists between GDP growth and population increase.

The literature review showed the positive impact of fixed capital formation on economic growth, and there are many factors affecting the relationship, such as foreign direct investment, government spending, trade opening or trade liberalization policies, financial development, and total national savings.

This study aims to clarify the impact of imbalance in the distribution of the total sectoral fixed capital formation in Iraq on the gross domestic product. Despite the large volume of literature that studied the reality of the Iraqi economy, there is a small number of studies that clarify the real reason for the imbalance in the structure of the gross domestic product per each sector, which makes the research an addition of knowledge to the analysis of the reality of the Iraqi economy.

2. METHODS

This study employed an econometric approach to analyze the relationship between Gross Domestic Product (GDP) at current prices and fixed capital formation (FCF) in Iraq between 2004 and 2020. The methodology was designed to evaluate the impact of capital accumulation on GDP growth and to test the model's accuracy using various statistical and econometric tools.

The importance of the total FCF of fixed capital is shown through the production function, which is the calculation of the relationship between inputs and outputs, that is, the amount that can be produced from the number of inputs. It consists of two elements, namely labor and capital, as shown in equation (1):

$$Y = f\left(K, L\right), \tag{1}$$

where: K – capital, L – Labor.

The pillars of economic growth are investments in physical capital, human capital, and technology, all in an economic environment where companies and individuals can respond to the incentives provided by markets and government by creating the infrastructure to activate the interaction between the elements of the production function and thus reflected on productivity, production, and operation. Due to the investment multiplier, sustainable growth is achieved (Hyslop et al., 2003).

Total FCF is the total value of construction operations minus disposals or depreciation of fixed assets during a certain period (Ugochukwu & Chinyere, 2013), as shown in equations (2,3):

$$\begin{aligned} &Total\ net\ fixed\ capital\ formation \\ &= total\ fixed\ assets \\ &- accumulated\ depreciation\left(depreciation\right), \end{aligned} \tag{2}$$

where

$$\begin{aligned} &Total\ Fixed\ Assets \\ &= \begin{pmatrix} Total\ Purchase\ Price\ of\ Fixed\ Assets \\ + Capital\ Improvements \end{pmatrix} \\ &- \begin{pmatrix} Angulated\ Depreciation \\ + Fixed\ Asset\ Requirements \end{pmatrix}. \end{aligned} \tag{3}$$

Statistically, total FCF measures the value of acquisitions (construction) of new or existing fixed assets by businesses, governments, and households (excluding their individual institutions) minus the disposal of fixed assets. The total composition of net fixed capital is not a measure of the total investment because it only measures the value of net additions to fixed assets after excluding all types of financial assets such as stock of stocks and other operating costs.

In general, capital formation refers to additions to the stock of a state's non-financial assets resulting from investment activities. Therefore, the estimated FCF shows investment plans analytically and the degree to which they are serious about reaching goals, as the accumulation and diversification of productive assets lead to a rise in the level of productivity for all elements of production for that they are among the most significant economic indicators (An et al., 2019).

The data used in this study spanned the period from 2004 to 2020 and were sourced from the Ministry of Planning, Central Bureau of Statistics, and other relevant government institutions.

3. RESULTS

To achieve the research goal, the GDP index was analyzed at current prices, the rate of fixed capital formation, and the extent of its impact on the structure of GDP. GDP is defined as the sum of the total values of the final goods and services produced in the economy during a given year. It is a measure of economic growth, employment, the flexibility of production structures, the diversity of economic sectors and activities, and finally, the level of community well-being (Central Bank of Iraq, 2018).

The Iraqi economy after 2003 witnessed political events represented by the lifting of economic sanctions, which lasted 13 years of international siege, and the resumption of the export of crude oil to foreign markets. It was accompanied by the rise in the prices of a barrel of crude oil in foreign markets and the increase in oil revenues. Moreover, a change in the philosophy of economic management represented the transition from the central economy to the market economy and economic openness to the world. Table 1 shows the development of gross domestic product at current prices in Iraq, and the total fixed capital formation for the period 2004–2020, one million Iraqi dinars.

Table 1. Development of gross domestic product at current prices in Iraq, and gross fixed capital formation for the period 2004–2020, one million Iraqi dinars

Source: Statistics provided by the Ministry of Planning, Central Bureau of Statistics for several years.

Year	GDP at current prices	Total FCF
2004	53,235.358	3,682.390
2005	73,533.598	11,788.961
2006	95,587.954	17,831.126
2007	111,455.813	7,530.404
2008	157,026.061	21,263.967
2009	130,643.200	12,418.985
2010	162,064.565	26,558.090
2011	217,327.107	27,379.586
2012	254,225.490	35,033.925
2013	273,587.529	55,036.676
2014	266,332.655	52,112.311
2015	194,680.971	45,528.386
2016	196,924.141	26,112.655
2017	221,665.709	32,004.040
2018	268,918.874	33,439.111
2019	277,884.869	51,340.132
2020	198,774.325	14,951.765

The relationship between economic variables must be described using the econometric method based on economic theory. Economic theory indicates that the relationship between GDP by current prices and capital accumulation is direct, so it can be verified using economic measurement methods of the nature and direction of the relationship between GDP at current prices GDP and capital accumulation K, as follows:

$$GDP = f\left(K\right), \tag{4}$$

$$GDP = a + bK + \mu, \tag{5}$$

where a represents the fixed limit in the equation, which point to the value of GDP in current prices in the absence of the effect of the formation of fixed capital; b, $b > 0$ represents the marginal tendency that reflects the amount of the marginal change in GDP as a result of capital accumulation changes; K represents capital accumulation; μ represents the random error limit that represents all other variables not included in the model.

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The results of descriptive statics of GDP and (*K*) are shown in Table 2 while the outputs of the linear regression of GDP and *K* are shown in Table 3.

Table 2. Relationship between GDP and capital accumulation (*K*)

Measurement method	GDP	K
Mean	1.86E+08	27012340
Median	1.97E+08	26558090
Maximum	2.78E+08	52112311
Minimum	53235359	3682391.
Std. dev	72967673	14795623
Skewness	–0.342842	0.205457
Kurtosis	1.916378	2.037672
Jarque-Bera	1.164782	0.775572
Probability	0.558561	0.678557
Sum	3.15E+09	4.59E+08
Sum Sq.Dev	8.52E+16	3.50E+15
Observations	17	17

Tables 2 and 3 show a direct relationship between GDP and fixed capital accumulation *K*, where GDP increases by USD 4.2 million when the volume of capital accumulation increases by USD 1 million. Changes in GDP are attributed to changes in capital accumulation *K* by 72% and the rest 28% of the changes in GDP are due to factors that were not included in the model. Statistical morale is less than 1% (0.0000) according to the test of the marginal tendency of changes in GDP to changes in capital accumulation, and this indicates the impact of capital accumulation in GDP. Statistical morality of the estimated model is less than 1% (0.000013) according to the *F* test, and this indicates the safety of the estimated statistical model.

Ramsy test is used to reveal the linear and nonlinear relationship between GDP and *K* and the results are shown in Table 4.

Table 3. The estimated regression of GDP and K

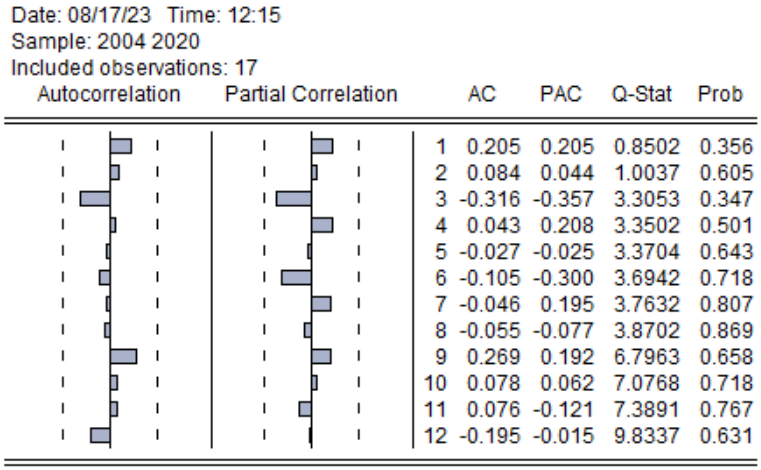
Dependent Variable: GDP
Method: Least Squares
Date 08/17/23 Time: 12:10
Sample: 2004 2020
Included observations: 17

Variable	Coefficient	Std. error	t-Statistic	Prob.
C	71,740,819	2E+07	3.541235	0.003
K	4.21218	0.66228	6.360096	0
R-squared	0.72949	Mean dependent variable		1.86E+08
Adjusted R-squared	0.711456	S.D.dependent variable		72967673
S.E. of regression	39195527	Akaike info criterion		37.91615
Sum squared residuals	2.30E+16	Schwarz criterion		38.01418
Log Likelihood	–320.2873	Hannan-Quinn criterion		37.92590
F-statistic	40.45082	Durbin-Watson statistic		1.361298
Prob. (F-statistic)	0.000013			

Table 4. Ramsy test

Dependent Variable: GDP
Method: Least Squares
Date 08/17/23 Time: 12:10
Sample: 2004 2020
Included observations: 17

Variable	Coefficient	Std. error	t-Statistic	Prob.
K	11.17868	3.98844	2.802767	0.0141
C	47772515	2.3E+07	2.049714	0.0596
FITTED^2	–4.31E-09	2.44E-09	–1.768151	0.0988
R-squared	0.778871	Mean dependent variable		1.86E+08
Adjusted R-squared	0.747281	S.D.dependent variable		72967673
S.E. of regression	36681713	Akaike info criterion		37.83224
Sum squared residuals	1.88E+16	Schwarz criterion		37.97928
Log Likelihood	–318.574	Hannan-Quinn criterion		37.84686
F-statistic	24.65569	Durbin-Watson statistic		1.589724
Prob. (F-statistic)	0.000026			



	AC	PAC	Q-Stat	Prob
1	0.205	0.205	0.8502	0.356
2	0.084	0.044	1.0037	0.605
3	-0.316	-0.357	3.3053	0.347
4	0.043	0.208	3.3502	0.501
5	-0.027	-0.025	3.3704	0.643
6	-0.105	-0.300	3.6942	0.718
7	-0.046	0.195	3.7632	0.807
8	-0.055	-0.077	3.8702	0.869
9	0.269	0.192	6.7963	0.658
10	0.078	0.062	7.0768	0.718
11	0.076	-0.121	7.3891	0.767
12	-0.195	-0.015	9.8337	0.631

Figure 1. Q-Stat statistics values for self-association and partial correlation of the residual

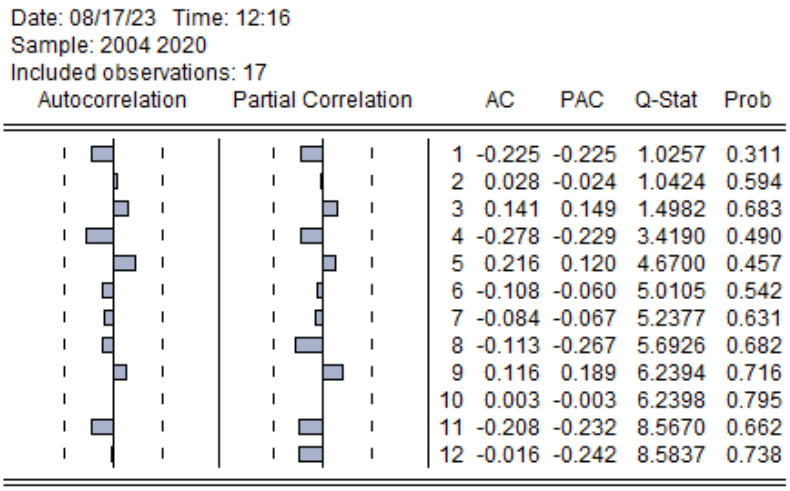
According to Table 4, the immateriality of the value of FITTED² is equal to (0.0988); it reaches a value of 5%, and this confirms the linear relationship between GDP and capital accumulation K, which ensures the affected relationship between GDP and *K*.

Next, a set of diagnostic tests was performed to ensure the safety of the estimated model of important standard problems. Figure 1 shows the Q-Stat statistics values for self-association and partial correlation of the residual.

Figure 1 shows the Correlogram of Residuals test of the estimated model by observing the protrusions of self-linking and the partial correlation of the residual chain within the boundary. The stability of the Correlogram and the absence of the problem of variability of the error limit through the morality of the *Q*-Stat stat, as all were found to be higher than 5%. Figure 2 shows stat statistics values for self-association and squared correlation of the residual.

The squared Correlogram of Residuals test of the estimated model by observing the protrusions of self-linking and the partial correlation of the residual chain within the boundary. Also, Figure 2 shows the stability of the Correlogram and the absence of the problem of variability of the error limit through the morality of the Q-Stat stat, as all of them are higher than 5%.

The Jarque-Bera test checks the null hypothesis, which states that the horns are naturally distributed, against the alternative hypothesis that pro-



	AC	PAC	Q-Stat	Prob
1	-0.225	-0.225	1.0257	0.311
2	0.028	-0.024	1.0424	0.594
3	0.141	0.149	1.4982	0.683
4	-0.278	-0.229	3.4190	0.490
5	0.216	0.120	4.6700	0.457
6	-0.108	-0.060	5.0105	0.542
7	-0.084	-0.067	5.2377	0.631
8	-0.113	-0.267	5.6926	0.682
9	0.116	0.189	6.2394	0.716
10	0.003	-0.003	6.2398	0.795
11	-0.208	-0.232	8.5670	0.662
12	-0.016	-0.242	8.5837	0.738

Figure 2. Stat statistics values for self-association and squared correlation of the residual

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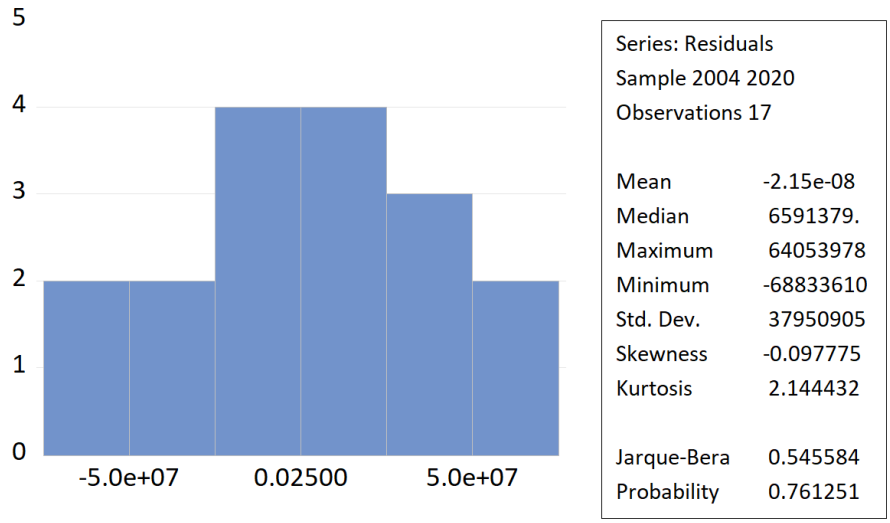

Figure 3. Normal distribution of the condom according to the Jarque-Bera test

vides for the abnormal distribution of the horns. The study accepts the null hypothesis if the probability value of the Jarque-Bera test is greater than 5%, where the value of the said test was 0.545584 with a probability greater than 5% (0.761251); the study accepts the alternative hypothesis if the probability value of the Jarque-Bera test is less than 5%. Figure 3 shows that the resting is distributed naturally, and this means the safety of the estimated model of random errors.

The serial correlation LM test was done to ensure that the estimated model does not still have the serial association problem. The Breusch-Godfrey test value can be used to determine whether the problem of the serial linking of the model protectors exists or not.

By observing the value of the probability of two vectors (Chi-Square and *F*), one can decide if the null hypothesis is accepted or rejected, i.e., there is or there is no sequential correlation between the random resting. The null hypothesis is accepted if the value is more than 5%. Table 5 shows the results.

It appears from Table 5 that the Brueusch-Godfrey test's probability value is higher than 5% (0.4915), which leads to accepting the null hypothesis. The integrity of the derived model from random errors is indicated when there is no sequential association between random resting.

The heteroskedasticity test is used to identify variance instability problems. By looking at the results of the Breusch-Pagan-Godfrey test, it can be determined whether variance instability problems exist or not by looking at the probability value *F* and the Chi-Square probability value. The results of the test are shown in Table 6.

The probability value of the Breusch-Pagan-Godfrey test is greater than 5% (0.3077), which means it accepts the hypothesis of nothingness where there is no problem of variance instability, and this means the safety of the estimated model from the problem of variance lessness. If the value is greater than 5% in this way, it rejects the alternative hypothesis, which states that there is a problem of variance lessness.

Table 5. Serial correlation LM test

Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial Correlation at up to 2 lags			
F-statistic	0.592664	Prob. F(2,13)	0.5671
Obs*R-squared	1.420523	Prob. Chi-Square(2)	0.4915

Table 6. Heteroskedasticity test

Heteroskedasticity Test: ARCH			
F-statistic	0.973732	Prob. F(1,14)	0.3405
Obs*R-squared	1.040469	Prob. Chi-Square(1)	0.3077

The standard analysis showed a direct relationship between the accumulation of fixed capital formation (FCF) and GDP. This confirms prior findings of Soi et al. (2013), Ali (2017), Mukherjee and Ahuja (2017), Adekunle (2019), Onwiodiokit and Otolorin (2021), and Espinoza (2021), where the standard analysis showed that if the size of capital accumulation increases by 1 million Iraqi dinars, the GDP will increase by 4.2 million Iraqi dinars. The standard analysis also showed that 72% of the changes in GDP are due to the accumulation of FCF, and 28% of the changes in the GDP are due to other factors.

The standard tests also showed that the statistical significance of the standard model is less than 1%, i.e., 0.0000 according to the marginal slope test. The changes in GDP are due to changes in capital accumulation, which indicates the impact of capital accumulation on GDP. The *F* test also showed that the statistical significance of the estimated model is less than 1%, i.e., 0.000013, which indicates the validity of the estimated statistical model.

However, these results contradict the structure of Iraq's GDP. Despite the positive relationship between free cash flow and GDP shown by the tests, there is a defect in the contribution of sectors to GDP. This outcome contradicts Al-Fawwaz (2016), Berg et al. (2018), and Lupu et al. (2018), as there is a defect in the percentage of contribution of economic sectors to GDP, as shown in Table 7.

The imbalance in the GDP is due to the imbalance in the distribution of the total FCF. Table 8 stresses that the oil sector accounts for the majority of the total FCF. In comparison, agriculture, industry, electricity, transportation and communications sectors account for a small percentage. This creates a problem of improving the production and employment function and increasing the impact of the total free cash flow toward the sectors not affected by the production function, according to Barlas (2020).

As shown in Table 9, the imbalance in the total FCF affected the added value achieved in the economic sectors.

Table 9. The percentage of added value achieved in the economic sectors in Iraq for the period 2017–2020

Source: Statistics provided by the Ministry of Planning, Central Bureau of Statistics for several years.

A sector of the economy	2017	2018	2019	2020
Oil sector	44.4	50.4	47.8	47.2
Agriculture	2.9	2.5	3.3	4.7
Industry	2.6	1.9	2	–
Building	6.2	5.7	4.3	–
Transfer and storage	10.5	9.8	9.8	–
Other activities	33.4	29.7	32.8	–

Table 9 shows that the oil sector dominates in achieving added value due to the concentration of free cash flows and the use of international oil companies in preparing and modernizing this sector's infrastructure. In addition, there has been a decline in the industrial and agricultural sectors, which has led to the failure of investment plans to create a production base supporting the non-oil production sectors.

The study's findings indicate a clear positive relationship between GDP at current prices and fixed capital formation (FCF) in Iraq. This relationship is statistically significant, with 72% of the variations in GDP being attributable to changes in

Table 7. The average percentage of the contribution of the sectors in the gross domestic product for the period 2003–2020

Source: Statistics provided by the Ministry of Planning, Central Bureau of Statistics for several years.

The oil sector	Development social services	Money, insurance, and real estate services	Building and construction sector	The agricultural and industrial sector
55.64%	10.98%	6.95%	4.84%	21.54%

Table 8. The development of the fixed capital formation structure according to the economic sectors, the average for the period 2004–2020

Source: Statistics provided by the Ministry of Planning, Central Bureau of Statistics for several years.

Agriculture	Industry	Oil	Electricity and water	Construction	Transportation	Other sectors
1.6 %	5.38%	20.68%	17.21%	1.38%	7.56%	46.19%

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capital accumulation, while the remaining 28% is explained by other external factors. These results align with previous research by Boamah et al. (2018), Ntamwiza and Masengesho (2022), whom observed similar positive impacts of capital formation on GDP growth.

The positive correlation between FCF and GDP supports the conventional economic theory that investment in capital stock leads to increased production capacity and economic growth. This can be attributed to the resumption of crude oil exports and the post-2003 transition of Iraq's economy from central planning to a market-driven model, which stimulated economic openness and investment. The rise in oil revenues also played a crucial role in boosting the country's capital accumulation during this period.

However, the study also reveals a significant structural imbalance within Iraq's GDP composition. Although the FCF positively influences GDP, the distribution of capital investment is heavily skewed toward the oil sector, which accounts for over 55% of Iraq's GDP. Meanwhile, other sectors like agriculture, industry, and construction contribute marginally, a problem exacerbated by their limited share of FCF. This over-reliance on oil contradicts findings by Luciani and Moerenhout (2021), who emphasize the need for more diversified sectoral contributions to achieve sustainable economic growth.

CONCLUSION

The purpose of this study was to clarify the imbalance in the production function and the real output of the Iraqi economy and to indicate the role of the total fixed capital formation in this imbalance.

The purpose of this study was to clarify the imbalance in the production function and the real output of the Iraqi economy and to indicate the role of the total fixed capital formation in this imbalance. The data analysis of total fixed capital formation showed that the acquisition of the oil sector reached 20.68% of the total fixed capital formation; construction, wholesale and singular trade, restaurants, hotels, banks, insurance, and social services showed 46.19%, which are sectors that do not achieve direct support for real production and achieve the goal of diversifying the economy. The percentage (33.13%) of the total fixed capital is directed toward the agricultural, industrial, electricity, transport, and communications sectors, which is a small percentage.

Thus, the oil sector dominated the total value added by its acquisition of the total fixed capital formation, which reached 47.45%. In contrast, the real productive sectors of agriculture and industry achieved only 3.8%. The statistical analysis and standard tests showed a direct relationship between the total fixed capital formation and the gross domestic product. Moreover, the study confirmed its impact rate on the Iraqi economy (4.2%). Despite this correlation, the study revealed an imbalance in Iraq's economic structure. The oil sector disproportionately contributes to GDP and receives the majority of capital investment, whereas critical sectors like agriculture and industry receive minimal support. This skewed distribution of fixed capital formation has limited the development of a diversified economy, constraining the potential for sustainable growth in non-oil sectors.

The study suggests that government policies should redirect total fixed capital formation to productive sectors such as agriculture and industry and sectors supporting production such as electricity, transportation, and communications.

AUTHOR CONTRIBUTIONS

Conceptualization: Bilal Kadhim Haidar, Mohammad Ghazi Nussaif Jasim.
Data curation: Bilal Kadhim Haidar.
Formal analysis: Sameer Siham Dawood, Mohammad Ghazi Nussaif Jasim.

Funding acquisition: Sameer Siham Dawood.
Investigation: Sameer Siham Dawood.
Methodology: Bilal Kadhim Haidar, Mohammad Ghazi Nussaif Jasim.
Project administration: Sameer Siham Dawood.
Resources: Bilal Kadhim Haidar, Mohammad Ghazi Nussaif Jasim.
Software: Bilal Kadhim Haidar.
Supervision: Sameer Siham Dawood.
Validation: Sameer Siham Dawood.
Visualization: Sameer Siham Dawood, Mohammad Ghazi Nussaif Jasim.
Writing – original draft: Sameer Siham Dawood.
Writing – review & editing: Sameer Siham Dawood, Bilal Kadhim Haidar, Mohammad Ghazi Nussaif Jasim.

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