The Impact of Capital Formation on Economic Diversification in GCC Countries—Empirical Analysis Based on the PVAR Model

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Abstract: Economic diversification has been a cornerstone of the policy agenda of resource-rich countries, such as Gulf Cooperation Council (GCC) countries, seeking sustainable economic development to avoid reliance on hydrocarbon revenues that cause significant vulnerabilities and economic, social, and political instability in the long term. GCC governments invest the proceeds from rich hydrocarbon exports to build a diverse local economy. However, it is unclear whether increased capital formation through public investments helps these economies diversify away from hydrocarbons. The main objective of this study was to determine whether GCC countries’ capital formation has appreciable impulse effects on response-economic diversification in the short or long term. A panel vector autoregression method describing the cause and effect or the dynamic relation between capital formation and economic diversification was used to attest to the success of economic diversification policies in resource-rich countries. The results show that a shock to real gross capital formation has a limited impact on economic diversification (the non-resource rent share) in the GCC economies. This could be attributed to these countries’ oil/gas-focused fixed investment build-up. Furthermore, an evaluation of the recursive relationship shows that the impact of growing non-hydrocarbon sectors on gross capital formation is limited.

Keywords: economic diversification; sustainable economic development; gross fixed investments; resource-rich countries; GCC; panel vector autoregression

1. Introduction

The subject of economic diversification in countries with abundant natural resources is not new and has been the focus of numerous academic research studies as well as national and international organizations. However, the existing literature on the topic is often plagued by data scarcity and a lack of deeper quantitative analysis [1,2]. In addition, economic diversification visions, strategies, and studies vary across countries depending on the country’s unique conditions, i.e., the level of economic development, resource endowment, and demographic conditions, which makes the “one size fits all approach” a non-viable option [2].

About 35 countries worldwide depend heavily on hydrocarbons (oil and gas), while another 12 rely on minerals to a large extent [3]. Although achieving a sustainable economy through economic diversification has been a long-established goal for most mineral exporters (especially oil and gas), few have managed to diversify their economies away from the dominant resource, such as Norway [4] and Chile [5]. Globally, the diversification efforts of oil- and gas-exporting countries reveal mixed results, and many resource-rich countries have fallen victim to “the resource curse”, a phrase used to explain how nations with an abundance of mineral resources were unable to use that wealth to expand their economies and experienced slower growth than nations without such resources [6].

The Cooperation Council for the Arab States of the Gulf (GCC) is a regional, intergovernmental, political, and economic union made up of the Kingdom of Saudi Arabia, Qatar,
the United Arab Emirates, Kuwait, Bahrain, and Oman. The GCC economies emerged mainly due to the extraction of hydrocarbon reserves and are still highly concentrated around hydrocarbon-related sectors despite diversification efforts being on national agendas since the 1980s [1]. During the last few decades, the governments’ effort toward the diversification process in the GCC have been inversely correlated with the revenues generated from oil and gas. Oil price shocks are found to create volatility in non-hydrocarbon sectors of larger economies, and the volatility is larger if it is transmitted via current expenditures [7]. The low hydrocarbon prices resulted in the intensification of diversification focus in governments’ plans, whereas higher prices contributed to complacency and the continuation of the status quo. After the oil crash in 2014, which happened after years of all-time-high oil price levels, most GCC governments increased economic diversification efforts [8]. The initial diversification initiatives aided in the growth of additional energy-intensive sectors and downstream petroleum/gas industries such as petrochemicals. However, the real policy issue took precedence, and diversification to non-resource-related, knowledge-based, high-tech, and innovative sectors has not yet been realized. Examining countries’ dependence on resource extraction, according to the Extractives Dependence Index, showed that the GCC countries performed worse than other resource-rich countries that managed to diversify their economies [9]. A relatively poor performance of the GCC countries was also observed through the level of natural resource rents compared to the size of the economy, which was used as a proxy for economic diversification in this study.

The governments of the GCC countries have come out with national visions and strategy documents to orchestrate the efforts targeting economic diversification. The objective of diversifying the economy is consistently cited in current development plans as a way to ensure the sustainability of high-income levels for future generations. The largest state of the UAE, Abu Dhabi, announced a long-term plan to transform the Emirate’s economy in 2008. The plan called for a gradual reduction in the Emirate’s reliance on the oil industry as a source of economic activity and a greater future emphasis on knowledge-based industries [10]. A competitive knowledge economy was mentioned as one of the pillars of the UAE Vision 2021, which was introduced in 2010 [11]. Qatar created its National Vision 2030 (QNV 2030) in 2008, intending to become a sustainably developed society that can support its growth and offer its citizens a high standard of living. Creating a competitive and diversified economy is one of the four main pillars of the National Vision 2030 [12]. Saudi Arabia unveiled its Vision 2030 transformation plan in 2016, which included measures to diversify the country’s economy and financial resources [13]. Unlike the early diversification efforts in the initial phase of economic development, the current diversification plans face some difficulties. Hvidt [14] noted several structural barriers to diversification plans, including overlapping economic activities among the GCC states, sizeable trade barriers between regions, and growth projections for the global economy. Therefore, achieving economic diversification remains a policy challenge for the GCC countries. Despite numerous studies that explain the link between government spending and economic development and growth, the literature lacks an analysis of the impact of government investment policies on economic diversification. Therefore, understanding the long-lasting implications of capital formation is critical for designing policies and strategies in resource-rich countries.

As an important economic agent, the governments drive the economy’s direction through their policy decisions, particularly fiscal policies. Infrastructure spending and the provision of fiscal incentives for business expansion appear to be the primary avenues through which fiscal policy influences diversification [15]. Indeed, hydrocarbon-based resource-rich economies are found to be strongly reliant on public investments to generate growth [16]. Over the past 20 years, the GCC countries have increased their budget spending, and during the same time a corresponding increase in nominal gross investment has also been noted. This observation resulted from the direct and indirect relationship between government spending and gross investments. The budget expenditures included public services, transportation, communication, economic affairs, housing and community amenities, public safety, environmental protection, defense, health, education, recreation,
culture and religion, and social security [17]. Therefore, part of gross investment is directly related to government spending on fixed assets. The increase in government expenditure is expected to have an induced impact on private investment and consumption. Increases in government economic spending, such as those on the forestry, fisheries, and wildlife industries, energy and oil, mining, manufacturing, and construction, as well as transportation and communications, are found to be impactful on domestic spending and private consumption [18].

Identifying the impact of capital formation, mainly driven by government spending, on economic diversification in the GCC countries, is the purpose of this paper. First, we identified the right measures for capital investments free from data shortcomings, such as the availability of data at the same level for all the countries. Then, we determined the extent of economic diversification performance as the non-resource rent share in the gross domestic product (GDP). Finally, we estimated the cross-country impact of gross fixed investment on economic diversification performance using panel vector autoregressions (VAR).

The contribution to the literature is to demonstrate the precise connections between gross capital formation and economic diversification and shed light on fiscal policy effectiveness through public investments using panel VAR. The results show that real gross fixed investments, which are assumed to be primarily driven by government spending, have a limited impact on improving the economy’s non-resource rent (share of non-hydrocarbon sectors). Furthermore, an evaluation of the recursive relationship shows that the impact of growing non-hydrocarbon sectors on gross capital formation is limited.

The following sections of the study are organized as follows: A literature review of the subject is presented in Section 2. The research methodology and data analysis are covered in Section 3. The empirical findings of the study are discussed in Section 4, and the study is concluded in Section 5 with a presentation and discussion of the findings, limitations, and future recommended work.

2. Literature Review

Government spending is a commonly used policy tool in response to market failures to ensure sustained economic growth. Keynesian economics argues that government spending effectively increases aggregate demand and leads to growth in national income through a fiscal multiplier effect [19]. Governments adjust government spending when markets are inefficient at achieving economic stability and accelerating economic recovery. Government spending on infrastructure such as roads, schools, hospitals, agriculture, transport, and electricity, as well as entrepreneurship support to small businesses, is the bedrock of economic growth, good economic performance, and higher productivity.

Empirical research on the relationship between government spending and economic growth indicates that public expenditure on productive sectors (i.e., capital, education, health, transport, and communication) leads to higher economic growth [20]. In addition, an investment in education may increase the human capital of the labor force, which can subsequently improve labor productivity growth and result in higher levels of economic growth [21]. The World Economic Forum 2016 suggested three ways that education can support a country’s productivity. Firstly, it increases the ability of the aggregate workforce to carry out existing tasks efficiently. Secondly, secondary and tertiary education mainly facilitates the transfer of knowledge related to new information, products, and technologies created by others [22]. Lastly, increasing creativity boosts a country’s capacity to develop new understanding, innovation, products, and technologies. Furthermore, multiple empirical examples show that investing in education and skills contributes positively to economic diversification. Some notable examples include the growth of India’s software industry, the increased sophistication of China’s exports, and the rising export of business services from the Philippines [23].

A strong relationship between long-run economic growth and government spending is present if government expenditure is financed by increased non-tax revenues [24]. However, the impact of government spending on economic growth in the long term could be
counterproductive if it is financed by budgetary deficits and distortionary taxes. Thus, empirical evidence calls for an alignment of government expenditure to policy priorities to achieve long-run economic growth. Therefore, gross capital formation is expected to help countries achieve economic growth in the non-resource sectors; in other words, to diversify their economies.

Therefore, one link between government spending and economic growth is mediated by capital investments or, in other words, gross capital formation. Gross capital formation, in the form of produced resources, such as buildings, machinery, and equipment, significantly contributes to economic growth. For a nation to diversify its economy away from a resource-based sector to non-resource-based industries, both financial and non-financial capital accumulation is necessary. The linkage between capital formation and economic growth has been the subject of numerous theoretical and empirical studies. For instance, Solow used the growth theory to explain how physical capital accumulation contributes to long-term economic growth in his seminal work [25]. Numerous empirical studies have also examined how capital formation and economic growth are related. The accumulation of machinery, which is a key predictor of higher economic growth, was shown to be a factor in a nation’s productivity growth [26]. Gross capital formation could also be led by the private sector. The impact of government spending on private investment is widely studied and reported in the literature; however, the empirical findings lead to mixed and conflicting conclusions. Wang [27], Kim et al. [28], and Monadjemi [29] concluded that public spending on infrastructure and capital has a negative impact on private investment. Conversely, Erenburg et al. [30] demonstrated feedback effects between public and private investment using multivariate Granger causality testing, and Ashauer [31], Bairam et al. [32], and Ramirez [33] demonstrated a positive impact of an increase in government spending on private investments.

The impact of capital formation on economic growth is often examined in theoretical and empirical research. Economic diversification, by definition, is the ability of a resource-rich country to generate growth in non-resource sectors. Aside from our recent research, there has been little research on the impact of capital formation and economic diversification. In our recent empirical study, Jolo et al. [34], we found a statistically significant positive relationship between gross capital formation and economic diversification measured as the share of non-natural resource rent in GDP. It was found that, in line with the growth theory, an increase in gross capital formation will increase economic diversification. Revenues from natural resources would help the country to accumulate capital over time, which could then be utilized to finance the growth of non-resource sectors. Economic diversification is, therefore, expected to benefit over time if both financial and non-financial assets of the nation are nurtured to develop in a coordinated, progressive way.

3. Methodology and Data

We obtained data on gross fixed investment for the GCC countries from the Economist Intelligence Unit (EIU) database [35]. The EIU derives statistics from the International Monetary Fund (IMF) and national statistics authorities. We used real values rather than nominal ones to avoid the price effect over time and among countries. The EIU calculates real gross fixed investments ($rgfi$) by rebasing gross investment (fixed plus stock building) at market prices to 2010 constant prices and translating them into the United States dollar using the exchange rates in 2010. The dependent variable—economic diversification ($nrr$)—is proxied by deducting the GDP share of total natural resource rent from the total annual GDP. We gathered the GCC countries’ non-resource rent (share of GDP) from the World Development Indicators, WDI [36]. One of the drawbacks of studying developing economies is a lack of data. Because some countries had missing data, we put together yearly data for the six GCC countries between 2001 and 2019. The descriptive statistics of the data are presented in Table 1.
Table 1. Descriptive statistics.

<table>
<thead>
<tr>
<th>Countries</th>
<th>Real Gross Fixed Investment (2010 Prices, USD)</th>
<th>Non-Resource Rent (% of GDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev</td>
</tr>
<tr>
<td>Bahrain</td>
<td>6.6</td>
<td>2.5</td>
</tr>
<tr>
<td>Kuwait</td>
<td>23.8</td>
<td>10.0</td>
</tr>
<tr>
<td>Oman</td>
<td>19.7</td>
<td>7.9</td>
</tr>
<tr>
<td>Qatar</td>
<td>37.7</td>
<td>22.7</td>
</tr>
<tr>
<td>KSA</td>
<td>140.1</td>
<td>54.3</td>
</tr>
<tr>
<td>UAE</td>
<td>76.0</td>
<td>25.7</td>
</tr>
</tbody>
</table>

Note: The statistics are calculated for the data between 2001 and 2019, with 19 observations for each country.

The contribution of this paper to the literature is in the use of panel VAR for the first time to assess the impact of investments—capital formation—on economic diversification. The vector autoregression method was used to determine the impact of shock across various indicators. The existence of dynamic heterogeneities across countries makes estimating average effects and cross-sectional differences more difficult, and also assessing the impact of previous trends on the current situation and understanding the impacts over time to derive policy conclusions. Panel VARs are particularly well suited to address issues that are currently at the forefront of academic and policy debates because they can (i) capture both static and dynamic interdependencies, (ii) treat the links across units in an unrestricted manner, (iii) easily incorporate time variations in the coefficients and variance of the shocks, and (iv) account for cross-sectional dynamic heterogeneities. Simply put, the ability to analyze interactions of multiple variables through impulse response analysis is an advantage of VAR models over single equation models. Panel VAR is widely used in academia and the policy arena because the method can capture both static and dynamic interdependencies, treat the links across units in an unrestricted manner, easily incorporate time variations in the coefficients and the variance of the shocks, and account for cross-sectional dynamic heterogeneities. Despite these advantages, panel VAR has dimensionality problems when evaluating the input–output links of a cluster, particularly when the time series is shorter. The study used the data between 2001 and 2019 with 19 observations for each of the six countries, and stable estimations, as shown in Table A1.

The estimation shows how an endogenous variable (economic diversification) responds to the changes in the exogenous variable (capital formation) and illustrates how the evolution of the variable changes over time after a shock occurs at a certain point in time. Using panel VAR, we monitored the results of a shock in one standard deviation with regard to innovation on the present and future values of the endogenous variable. Impulse-response functions of the estimated panel VAR were computed using the following equation:

\[ y_{it} = \mu_i + [Ay] (i(t-1)) + \epsilon_{it} \]

where \( y_{it} \) is the real gross capital formation, \( \mu_i \) is a country-specific intercept term demonstrating the fixed effect, \( A \) is a parameter matrix, and \( \epsilon_{it} \) is the residual term. Country and year are indicated by the subscripts \( i \) and \( t \), respectively. The information criteria criterion \((aic)\) is used to choose the VAR, which only contains first-order lags. A fixed-effect estimator may not be consistent in estimating dynamic models; therefore, to drop the fixed effect, we first used differencing and applied lagged values and obtained the first difference in total natural resource rent (share of GDP) \((dnrr)\) and the first difference in real gross fixed investments \((drgfi)\), respectively. We imposed a recursive structure to find the shocks, which made the variables’ order relevant. Although a delay was present, we anticipate changes in investment in the development of non-resource sectors to contribute to economic diversification. For this reason, we prioritized gross fixed investment over non-resource rent. However, we considered the VAR in the reverse recursive order as a robustness check. It turns out that, in this instance, the imposed order had little to no impact on the estimated long-run impulse responses.
4. Empirical Analysis

Before we estimated panel VAR, we tested for the unit root to check each variable in the time-series VAR for stationarity. The unit root test is relevant in linear dynamic panel model estimation using the generalized method of moments (GMM)—a generic method for estimating parameters in statistical models. If the variable is close to the unit root, the GMM estimators experience a weak instrument problem, and GMM inferences are misleading [39]. The Im–Pesaran–Shin unit-root test was applied to the variables, and the null hypothesis that there were unit roots was not rejected. After taking the first difference, the first difference of \( rrr \) and \( rghi \), namely \( dnrr \) and \( drgfi \), became stationary with and without a trend. We also identified the appropriate lag order using the lag selection criterion (Appendix A, Table A1). The appropriate lag order within a panel VAR was the one with the smallest statistic values for the MBIC, MAIC, and MQIC [40,41]. In our estimations, the MBIC, MAIC, and MQIC were smaller at lag order 1. As a robustness check, we checked the eigenvalue stability condition. All the eigenvalues were inside the unit circle, confirming that the estimated panel VAR was stable (Appendix A, Figure A1).

Figure 1a–d shows the impulse–response functions obtained from the estimated panel VAR shown in Equation (1). The grid shows the impact of one variable over another for ten years after a positive shock. Real gross capital formation and the non-resource rent were transformed using differencing. This would help stabilize the mean of the time series data as the trend and seasonality components are eliminated by removing level changes [42]. The expected level of the shock in a given period, encompassed by a 95% confidence interval, is one of the primary outputs of impulse–response functions. The impulse–response function (irf) confidence intervals were generated using 200 Monte Carlo simulations from the estimated panel VAR [43]. For the sake of space, the standard errors and confidence intervals for the forecast error variance decomposition (FEVD) estimates are not included.

![Impulse-response functions](image)

**Figure 1.** Impulse–response functions on the difference. Note: \( dnrr \): non-resource rent (difference), \( drgfi \): real gross fixed investment (difference).

Figure 1 shows that the effects of shocks for both capital formation and economic diversification are not permanent, as the impacts fade away within a couple of years. In Figure 1, it is possible to observe that all the variables return to zero, after a shock, in a maximum of five years. Figure 1c shows the impact of change in economic diversification after a one-standard-deviation shock to change in real gross fixed investment (capital forma-
A positive shock to capital formation, the major source of domestic investment, had a slightly positive impact on economic diversification. In other words, as the fixed asset investments increased, we expected a slight improvement in the share of non-resource rent sectors in the economy. The results imply that governments’ efforts to build investment capabilities through fixed capital investments do not strongly support economic diversification. This observation requires further investigation into the government investments undertaken during this period. One explanation could be related to the type of investments. Many capital formations, through new investments, are associated with expanding the hydrocarbon sector, increasing the size of this sector in the economy while reducing the share of non-hydrocarbon sectors or non-resource rent share. A closer look into the development of the GCC economies reveals that the GCC countries continued to expand oil and gas investments during the studied period. Qatar, Kuwait, and the UAE expanded their oil and gas production capabilities in the last 20 years [44–46]. It was found that increasing the gross capital investments helped the hydrocarbon economy more than the non-resource rent sectors.

Figure 1b shows the impact on capital formation after a shock to non-resource rent. A slight negative impact on capital formation lasted only a year. This demonstrates the limited spillover effect of developing non-hydrocarbon sectors on overall investments. This finding requires further investigation into the sources of non-resource sector growth. The causal relationship between gross capital formation and economic development has been studied in the literature. In MENA countries, economic growth strongly predicts investment, rather than the other way around. In other words, increased investment results from higher economic growth [47]. Other empirical studies for different regions have presented the bi-directional causal relationship between economic growth and capital formation [48,49]. The results of the panel VAR suggest that increasing the share of non-hydrocarbon sectors would not automatically improve capital formation. In other words, non-hydrocarbon sector development would be enhanced by increased total factor productivity.

When we used level values of the variables rather than differences, we obtained the same results. Figure 2 displays the estimated PVAR’s impulse response functions based on the level values of the variable rather than the differences. The direction of the impacts of shocks on variables remained the same.

Figure 2. Impulse-response functions for the level. Note: nrr: non-resource rent (level), rgfi: real gross fixed investment (level).
Figure 3 depicts the cumulative impulse response functions for recursive and reverse recursive panel VAR specifications. These plots demonstrate the effect on levels rather than the differences in non-resource rent and real gross fixed investment by accumulating the impact over time. For example, the first graph shows that, with a given shock in real gross fixed investment, economic diversification improved for a couple of years and the impact stabilized. Similarly, a shock to non-resource rent negatively impacted capital formation, but the cumulative effect stabilized.

![Cumulative impulse–response functions](image)

**Figure 3.** Cumulative impulse–response functions.

5. Conclusions

The GCC economies have been working to improve the structure of their economies and diversify them away from industries related to hydrocarbons. However, the current diversification plans have encountered some challenges, and the GCC countries continue to face a policy challenge in achieving economic diversification. Because government investments are one of the key policy tools for achieving economic targets, it is critical to identify whether government investment is impactful regarding economic diversification. Despite the attempts to explain the connection between government spending and economic growth, there has been no analysis of the impact of government investment policies on economic diversification in the literature. This study demonstrates that real gross fixed investments are one of the key policy tools for achieving economic targets, it is critical to identify whether government investment is impactful regarding economic diversification. Despite the attempts to explain the connection between government spending and economic growth, there has been no analysis of the impact of government investment policies on economic diversification in the literature. This study demonstrates that real gross fixed investments, which are assumed to be primarily driven by government spending, have a slightly positive effect on improving the non-resource rent (share of non-hydrocarbon sectors) in the economy. Additionally, the analysis of the recursive relation revealed that there was little effect from expanding non-hydrocarbon sectors on gross capital formation. GCC governments have been relying on natural resource revenues to finance the growth of non-resource sectors. The findings of this study suggest that there is a slight positive impact of capital formation on economic diversification. Therefore, together with capital investments, governments should develop strategies to improve productive non-hydrocarbon capabilities by investing in both financial and non-financial assets, i.e., machinery, equipment, production capacity, human capital, education, entrepreneurship, research, and innovation. GCC economies’ high-quality technological innovation can significantly reduce the negative impact of resource dependence on economic growth [34,50]. However, according to the IMF, the correlation between real GDP growth and investment is weaker in Arab nations compared to other regions of the world. Despite significant investment efforts, particularly in GCC nations, total factor productivity (TFP) contributes relatively less to potential growth [51]. Indeed, low TFP growth has long been a barrier to growth in
the region due to structural issues, including market interventions and a significant portion of the public sector in the economy [52]. Therefore, the GCC countries should focus on TFP and efficiently allocate capital away from hydrocarbon-intensive industries and toward industries that support sustainable growth and job creation. Economic diversification is, therefore, expected to benefit over time if both financial and non-financial assets of the nation are nurtured to develop in a coordinated, progressive way.

Regarding the limitations and recommended future work, the panel VAR method was used to compute impulse response functions and assess the impact of investments or capital formation on economic diversification. The method is useful in decomposing dynamic relationships between variables; however, it does not provide information on the economic channels through which capital formation and economic diversification interact. Future research could include multiple variables to investigate the structural channels between these two variables and their impact on economic diversification. Further analysis could also explore the sources of gross capital formation, including private and public investments.

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### Appendix A

Table A1. PVAR estimation stability.

<table>
<thead>
<tr>
<th>Pvarsoc Rgfi Nrr, Maxlag (3) Pvaropts (Instl(1/4))</th>
<th>Sample: 2005–2018</th>
<th>Number of Observations: 84</th>
<th>Number of Panels = 6</th>
<th>Ave. No. of T = 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lag</td>
<td>CD</td>
<td>J</td>
<td>J-p Value</td>
<td>MBIC</td>
</tr>
<tr>
<td>1</td>
<td>0.996874</td>
<td>12.27916</td>
<td>0.423529</td>
<td>−40.8907</td>
</tr>
<tr>
<td>2</td>
<td>0.996827</td>
<td>3.974785</td>
<td>0.859391</td>
<td>−31.4718</td>
</tr>
<tr>
<td>3</td>
<td>0.997365</td>
<td>3.682505</td>
<td>0.450676</td>
<td>−14.0408</td>
</tr>
</tbody>
</table>

All the eigenvalues lie inside the unit circle. pVAR satisfies stability condition.

**Figure A1.** Eigenvalue stability condition.
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