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Modeling the Exports Diversification in the Oil Countries Growth: The Case of Gulf Cooperation Council Countries

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ABSTRACT

This paper aims at modeling and analyzing the short and long run effects of export diversification on economic growth using the countries Gulf Cooperation Council (GCC) panel data for the period 1992-2017. The paper introduces the panel auto regressive distributed lag/pooled mean group (ARDL/PMG) to reach its purpose. The export diversification measured by Theil index. The Pedroni panel cointegration test confirms that the variables are cointegrated, whereas PMG estimates indicate a positive significant long run relationship between export diversification and real gross domestic product (GDP) growth, no significant effect of export diversification in the short run. Results reveal a significant impact of trade openness growth on real GDP growth, which confirms the long-run as well as the short-run relationship between the growth of trade openness and economic growth for the GCC countries. It is worth to mention that the overall effort for GCC region on average had succeed in diversification, and the achieving of their plans goal is start to appear as a long run effect. But the study reveals that results may differ relatively in each country.

Keywords: Economic Growth, Economic Diversification, Oil Countries, Trade Openness, Structural Reform, Panel Auto Regressive Distributed Lag/Pooled Mean Group
JEL Classifications: C10, C33, F11, F14, F43, O11, O13

1. INTRODUCTION

The process of forming a sustainable economy and achieving a balanced economic development requires an efficient management of resources with the ability to introduce some new products, and achieving a larger volume of diversity in products and exports that can be respond to the local, regional and global economic and social changes under the economic openness that witnessed recently around the world. Therefore, to build a sustained production base and reduce the dependence on a specific resource to achieve sustainable development, factors of production such as land, capital, organized labor and technology, must be directed efficiently towards the achieving of economic growth.

The Gulf Cooperation Council (GCC) is one of the regional areas most affected by the decline in the world oil prices. Since the oil sector is the main source of income in these countries. According

to the bulletin of the ministry of economy and planning of Saudi Arabia, oil production controls about 80% of total government revenues and about 49% of the gross domestic product (GDP). Since the oil prices have fallen sharply in the summer of 2014, resulting in the loss of nearly 70% of their value. Several reports have indicated that the price of oil has reached its lowest level since 2009. This decline in oil prices is the result of many factors, some of which are related to supply and demand, and others to international policies and future prospects. Therefore, economic diversification is the main objective and a necessary condition for building a more sustainable modern economy.

In order to reducing the dependence on a specific resource to achieve sustainable development, and to avoid risks inherent in the unilateral and intensive dependence on the production and export of crude oil as a depleted resource of oil countries, In addition to the fact of oil expiration, and the growing pollution

that is taking wider place day by day, the repeated political, the economic problems in the oil market, the volatility in oil prices and the increasing unemployment make the need for diversification more urgent for GCC countries which have been implementing a plans and policies to support its economic diversification.

Therefore, this study aims to assess and examine the effect of economic diversification growth on economic growth in the GCC countries using export diversification index as an indicator for measuring the degree of economic diversification in these countries.

2. THE GCC ECONOMIC DIVERSIFICATION OVERVIEW AND LITERATURE REVIEW

Many oil-exporting countries rely on oil as the main source of export and fiscal revenues, they have been started an economic reform that includes diversifying their sources of income and reducing its dependence on oil revenues. Over the years, GCC governments have increased public sector employment and spending on infrastructure, health, and education. This has helped raise standards of living and support private sector activity, particularly in the non-tradable sectors. For this regards, the GCC countries have been implementing policies to support economic diversification, these policies have focused on providing a stable macroeconomic environment; strengthening the business environment; investing in infrastructure, education, and skills; targeting the development of specific sectors; and promoting entrepreneurship through small and medium-sized enterprises (SMEs) (Callen et al., 2014).

Therefore, In Saudi Arabia, the ambitious plan for 2030 vision reveals a wide-ranging targeting of economic diversification and reduced reliance on oil as the only resource. Recognizing this, the objective of economic diversification was the goal of successive development plans, which indicate the risks inherent in the unilateral and intensive dependence on the production and export of crude oil.

The United Arab of Emirates UAE witnessed a major change in the structure of economic life. As a result of the government efforts to move towards a knowledge-based economy by promoting innovation and strengthening the regulatory framework of key sectors. Several factors affect this effort, for example, the UAE strategic location, culture and labor diversity, government spending and state policies in economic diversification.

In Qatar, the most non-oil sectors that contributing to non-oil real growth are the financial services, construction, trade, hotels, and restaurants. The Economic Outlook Report of the state of Qatar (2016-2018) that issued by the ministry of development planning and statistics indicates that the construction activity increased by 19.7% year-on-year on the back of ongoing infrastructure projects. The rapid population growth (mainly due to the influx of foreign workers attracted by large-scale projects, especially after Qatar's bid to host the 2022 World Cup) increase the demand for services.

As a result, it has a strong growth in: (1) the financial services sector in the second quarter of 2015 compared to last year, (2) the trade, (3) restaurants and hotels sector by 12.5%, and (4) the government services sector by 6.3%.

Based on the Arab Monetary Fund, Bahrain is the least dependent on the oil sector. Which in turn accounts about a quarter of GDP. Because of the limited oil wealth, Bahrain has resorted to the option of economic diversification since the 1970s by investing in the industrial sector. The services sector accounts for 24% of Bahrain's GDP, the best in the Gulf. Bahrain's economy is characterized by the development of the financial services sector, including insurance, benefiting from the strengths of society, specifically, human resources.

Oman has established a national program for enhancing the economic diversification called "Tanfeedh" for the years from 2016 to 2020. The program aims mainly at diversifying the income resources in five priority sectors which are manufacturing, tourism, transport and logistics, and mining and fisheries. According to the National Centre for Statistics and Information, the GDP at current prices grew 8.7% in 2017 compared to 2016.

Kuwait's government also is aware of the heavy reliance on oil as the main sector that generates income. In Kuwait's vision 2035, the government concentrated on trade diversification besides other indicators in order to obtain a position within the strongest 35% of economies by 2035.

But yet, the experiences of other oil-exporting countries show that it is very difficult to diversify economies that rely on oil, particularly if the oil production horizon is long as its expected in the GCC countries (Callen et al., 2014). However, Hvidt (2013) questions the likelihood of diversification plans being translated into action. While the prospect of diversifying economies through politically difficult economic reforms has suffered a significant setback.

The diversification experience of the few successful oil exporters suggests that diversification usually associated with declining oil revenues, and requires long time of preparatory work to develop a non-oil tradable sector. Successful strategies have relied on a policy mix of promoting vertical diversification in "comparative advantage" sectors such as oil and gas and petrochemicals and goings-on into horizontal diversification beyond these sectors with an emphasis on technological upgrade and competition in international markets.

The literature does not come up with a consistent definition of export diversification. Conceptually, the definition is derived from the way diversification is measured, for example, Balavac (2012) used the concentration indices to measure the extent to which country's export is diversified. Indicating that concentration indices measure whether majority of country's export earnings comes from small range of export products (indication of export concentration) or the source of export earnings are more evenly spread across a given range of export goods (indication of export diversification). A diversified economy is an economy that has

a structural transformation and various revenue resources to enforce economies with the ability for sustainable growth and development. This diversification and expansion create more stability, security and reliability that developing countries which needed instead of the strong reliance on the production of primary goods that are often unstable and always fluctuating (Abu Wadi and Bashayreh, 2018).

Regards the impact of economic diversification on development and growth, a key priority for the GCC countries is to create a dynamic non-oil tradable sector to support sustainable growth. Cherif and Hasanov (2014) argue that the failure to diversify away from oil stems mainly from market failures rather than government failures. Whereas the government needs to change the incentive structure for workers and firms to tackle market failures. But Hvidt (2013) conclude that reform plans do not rule out a piecemeal and ad hoc implementation of the diversification strategies in the future. Keller and Nabli (2002) indicates that there is a limited effect of technology development on growth in gulf countries because they import technology and high quality workers besides the low expending on research and development.

Jednak et al. (2016), they investigate the impact of economic diversification on the development of Serbia over the period (2007-2012). They found that economic activities structure and diversification have a positive influence on economic growth and development. Esu and Udonwa (2015), examined the effect of diversifying the economy in Nigeria using time series data for the period (1980-2011). The results reveal that Nigeria could achieve sustained gains through diversifying the economy, encouraging large-scale industrialization of the non-oil sector of the economy, emphasizing deepening technology in every trade and investment discourse, sustaining the recent improvements in the agricultural sub-sector amongst other factors. Moreover, Ayeni (2013) investigates the role tourism would play if the Nigerian economy is diversified through tourism. He used a linear model through the multiple regressions analysis and concludes that tourism would be of immense benefit to the Nigerian economy.

Brown (2012), examined a time series of employment data for a single regional economy to ascertain whether changes in economic diversification over a 30-year period play a statistically significant role in explaining stability and rates of growth. Multiple regression analysis is used to determine the role of diversification and other factors. The results reveal that output volatility is negatively related with economic diversification, and that an increase in employment concentration was associated with an increase in the variance of growth rates. Further, the growth rate of employment is inversely related to diversification, and positively related to the growth rate of United States employment and the percentage of employment in resource-based industries.

Referring to the link between diversification and economic growth, there are two visions that illustrate it. First, the Ricardian comparative advantage which focuses on the role of specialization (low economic diversification) in economic growth (Dornbusch et al., 1977). Second, the empirical studies that show a negative relationship between economic concentration (less diversification)

and economic growth. Imbs and Wacziarg (2003) track the evolution of sectoral concentration in relation to the level of per capita income. They present different measures of sectoral concentration follow a U-shaped pattern across a wide variety of data sources: Countries first diversify, in the sense that economic activity is spread more equally across sectors, but there exists, relatively late in the development process, a point at which they start specializing again. They connected their finding with theories of trade and growth, which generally predict a monotonic relationship between income and diversification. Cadot et al. (2011) explores the evolution of export diversification patterns along the economic development path. Using a large database with 156 countries over 19 years at the HS6 level of disaggregation (4'991 product lines), they look for action at the "intensive" and "extensive" margins (diversification of export values among active product lines and by addition of new product lines respectively) using "Theil index" and various export concentration indices and the number of active export lines. They also look at new product introduction as an indicator of "export-entrepreneurship." The results reveal a hump-shaped pattern of export diversification similar to what Imbs and Wacziarg (2003) found for production and employment. The conclusion was diversification and subsequent re-concentration take place mostly along the extensive margin, although the intensive margin follows the same pattern.

Regards the modeling of export diversification in economic growth, Sadorsky (2012) uses panel cointegration regression techniques to examine the relationship between capital, output, labor, energy and trade (exports and imports) in a sample of 7 South American countries covering the period 1980-2007. A panel VECM model is proposed and estimated. Panel cointegration tests show a long-run relationship between the variables. Short-run dynamics show a bi-directional feedback relationship between output and exports, output and imports. Al-Marhubi (2000) presents empirical evidence that export diversification promotes economic growth. This result is robust to different specifications of the growth equations and different measures of export diversification. Results reveal that in developing countries, export diversification is associated also with higher investment rates. Gozgor and Can (2016) tests the impacts of Theil index, the extensive margin, and the intensive margin on the real GDP per capita in 158 countries by applying the system-GMM estimations and reveals that the exports diversification affects the real GDP per capita positively in low-income countries. Mudenda et al. (2014) examined the role of export diversification on economic growth in South Africa using annual time series data for the period (1980-2010). The results show that export diversification and trade openness affect the economic growth positively. Further, Aditya and Acharyya (2013) investigates the export-growth relationship taking into account both the diversification and the nature of the export composition. They used a sample of sixty-five countries over the period (1965-2005), the dynamic panel estimation reveals that both diversification and composition of exports are important determinants of economic growth after controlling for the impacts of other variables like lagged income, investment, and infrastructure. Additionally, the economic growth across these countries increases with a diversification of export up to a critical level of export concentration which is then reversed with

increasing specialization leading to higher growth. Below this critical level, diversification of exports matters for GDP growth.

McIntyre et al. (2018) present notions of economic diversification with respect to exports for 34 small countries over the period of (1990-2015), the study found that the more diversified countries faced lower output fluctuations and higher average growth than most other small countries. These results are consistent with traditional economic theories with the fact that export diversification has a more significant effect on decreasing output volatility than enhancing long-run growth in small states. Whereas, Koren and Tenreyro (2007) found that poor countries have a high degree of economic concentration and weak efforts for diversification. Hesse (2009) in his study, concludes that export diversification can lead to higher growth that is potentially nonlinear with developing countries, and benefiting from diversifying their exports in contrast to the most advanced countries that perform better with export specialization.

On the other hand, Ramcharan (2006) studied the effect of economic diversification on financial development and reveals that there is a significant positive relationship. Also, the study noticed that economic concentration is accompanied by low economic and financial development in developing countries. Acemoglu and Zilibotti (1997) present a theoretical paradigm, which concludes that in countries with excessively concentrated production, promoters lack motives for innovation because it is risky and costly. Further, Klinger and Lederman (2011) suggest that the effort of economic diversification is influenced by market failures, which discourage investment in new economic activities.

Abu Wadi and Bashayreh (2018) conclude that diversification is very important to economic growth for the following reasons: (1) Increase the productivity of human capital and financial development. (2) Diversify investment opportunities and reduce the risks. (3) Expand and develop the production structure and reduce the harms of reliance on limited products. (4) Enhance trade and reduce the risks of exporting limited goods that are vulnerable to prices fluctuations. (5) Strength the relationships between the economy productive sectors and reduce the fluctuations in GDP levels year after year which increase the added value. (6) Create variety jobs and reduce unemployment. (7) Enhance sustainable economic growth and development.

Imbs and Wacziarg, (2003) introduce the theoretical reasons of economic diversification based on two types of arguments: First, the structural of preferences. Second, based on portfolio diversification and income sources. If the countries have non-homothetic preferences, their consumption pattern will response to income growing, implying an expanding diversity of the goods and services that have been produced and consumed, Since the production patterns respond to the demand structure changes. Therefore, preferences are sufficient to generate increasing sectoral diversification throughout economic development.

3. METHODOLOGY

3.1. Target Population and Sample Size
As a purposive sampling, the six GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) were selected. Accordingly, all GCC countries were included in this study using annual data for 26 years from 1992 to 2017. Where as this study utilizes a panel data analysis.

3.2. Data Collection with its Measurement
This study utilizes a panel data which was collected from the International Monetary Fund (IMF). The dependent variable is real GDP growth, and the explanatory variables are capital growth, labor growth, net energy growth, openness growth and Export Diversification growth. Table 1 shows the variables of the study with its corresponding measurements.

Table 1: Variables measurement

Models	Variables	Formula	Measures	Expected sign.
Dependent	GDPG	$GDPG_{it} = \dfrac{GDP_{it} - GDP_{it-1}}{GDP_{it-1}} \times 100$	Real GDP growth rate measured by US $ based on 2010 prices	
Independent	KG	$KG_{it} = \dfrac{K_{it} - K_{it-1}}{K_{it-1}} \times 100$	Growth rate of real capital value measured by gross fixed capital formation measured by US $ based on 2010 prices as a proxy	Positive
	LG	$LG_{it} = \dfrac{L_{it} - L_{it-1}}{L_{it-1}} \times 100$	Growth rate of total number of labor measured by total number of wage and salaried Workers as a proxy	Positive
	ENRG	$ENRG_{it} = \dfrac{ENR_{it} - ENR_{it-1}}{ENR_{it-1}} \times 100$	Growth rate of energy production after consumption measured by metric tons of Oil equivalent.	Positive
	OPNG	$OPNG_{it} = \dfrac{OPN_{it} - OPN_{it-1}}{OPN_{it-1}} \times 100$	Growth rate of trade openness in US $.	Positive
		Where: $OPN_{it} = \dfrac{EXPORTS_{it}}{GDP_{it}}$		
	EXDG	$EXDIG_{it} = \dfrac{EXDI_{it} - EXDI_{it-1}}{EXDI_{it-1}} \times 100$	Export diversification growth rate, this index developed by IMF based on Theil index	Negative

Sources: Prepared by the authors based on the IMF dataset and the world bank database

There are various indicators for diversification such as the GDP, exports, imports, actual revenues of the government, fixed capital formulation, labor force. This study will focus on the export diversification index to measure diversification degree as opposite index for concentration, which is considered as one of the most popular indicators (Balavac, 2012); (Cadot et al., 2011). Besides, the study uses the other diversification indicators (trade openness, fixed capital formulation, labor, and energy) as control variables.

Export diversification index is developed by the IMF based on the Theil index. The overall Theil index is the sum of the intensive (within sectors) and extensive (across sectors) components. The extensive Theil index is calculated for each country/year pair as:

$$T_B = \sum_k \left(\frac{N_k}{N}\right)\left(\frac{\mu_k}{\mu}\right) ln\left(\frac{\mu_k}{\mu}\right) \tag{1}$$

Where k represents each group (traditional, new, and non-traded), N_k is the total number of products exported in each group, and μ_k/μ is the relative mean of exports in each group. The intensive Theil index for each country/year pair is:

$$T_w = \sum_k \left(\frac{N_k}{N}\right)\left(\frac{\mu_k}{\mu}\right)\left\{\left(\frac{1}{N_k}\right)\sum_{i \in Ik}\left(\frac{X_i}{\mu_k}\right)ln\left(\frac{X_i}{\mu_k}\right)\right\} \tag{2}$$

Where X represents export value.

The index "Theil" is inversely related to the degree of diversification[1], it is zero if exports are equally distributed among (n) export lines (i.e., perfect diversification), and it achieves its maximum value if all exports is concentrated in one export line, while the export in other lines is equal to 0 (i.e., perfect concentration). Moreover, Export can grow at the intensive (the growth in the value of existing products) and extensive margin (the increase in the number of export lines). Accordingly, export diversification can be captured along the margins: A more evenly spread of the export basket is an indication of diversification at the intensive margin, while the greater number of export lines indicate diversification at the extensive margin (Cadot et al., 2011).

3.3. Model Specifications
After investigation of the related work, this study presupposed that the main forces of economic growth were trade activities in line with the main factors of production (Capital, Labor and Energy), so we defined trade activities as an export diversification and trade openness in relation to economic growth.

This study will use the expanded neoclassical production function (Knight et al., 1993)[2]; (Barro and Sala-i-Martin, 2004); to study the effect of diversification indicators on economic growth. Through

literature review and following the works of Sadorsky (2012), the study constructs an empirical multiple regression model below:

$$GDPG_{it} = \alpha_0 + \sum_{j=1}^{k} B_j X_{it} + \varepsilon_{it} \tag{3}$$

Where *GDPG* is real GDP growth rate, X_{it} contains the independent variables. The subscripts i and t represent country ($i=1...6$) and time period ($t=1992...2017$) respectively. α_0 is the constant parameter, β is the coefficient of j independent variables, and ε_{it} is the error term. $\varepsilon_{it}=\mu_i+v_{it}$, while $\mu_i \approx E(0, \sigma^2\mu)$ and $v_{it} \approx E(0, \sigma^2 v)$ are independent of each other and among themselves. μ_i and v_{it} denote country-specific fixed effects and time variant effects respectively. It is expected that the growth in capital, labor, energy and trade openness will positively affect the economic growth, while the decrease in export diversification index (more diversification) will increase the economic growth.

The use of panel data has many advantages and disadvantages. The most common advantages that it allows examining a large number of observations with heterogeneous information, and produces less data multi-collinearity among the explanatory variables. Moreover, it allows using more data and can keep track of each unit of observation. It has also disadvantages as the data become more complex and heterogeneity appears and is not properly treated. If the properties of the country are not observable, then the residuals will be correlated with the observations, and the OLS estimators are inconsistent (Baltagi, 1995). As discussed in Pesaran et al. (1999), the traditional pooled estimators such as fixed and random effect estimators are extreme, where the intercepts are allowed to differ across groups while all other parameters are constrained to be the same. Further, Pesaran and Smith (1995) indicate that the traditional procedures for estimation of pooled model can produce inconsistent and potentially very misleading estimates of the average values of the parameters in the dynamic panel data models unless the slope coefficients are in fact identical.

Following Pesaran et al. (1999), this study employs the pooled mean group (PMG) estimator (PMG) technique, which is expected to provide us the most consistent and efficient estimates for our panel of GCC countries. The justification for employing this technique is that we expect economic growth in GCC countries to be affected by the long-run homogeneous conditions and for the short-run adjustment to depend on country-specific characteristics such as vulnerability to domestic and external shocks. Pesaran et al. (1999), Pesaran and Smith (1995), Pesaran and Shin (1998) show that PMG can render consistent and efficient estimates of the parameters in a long-run relationship even in case of mixed order of integration of variables. The PMG estimators obtained are consequently consistent and asymptotically distributed normally according to Pesaran et al. (1999). Moreover, they are intermediate estimators involving both pooling and averaging. Whereas the PMG takes the cointegration form of the simple auto regressive distributed lag (ARDL) model and adapts it for a panel setting by allowing the intercepts, short-run coefficients and cointegrating terms to differ across cross-sections.

In as much as the PMG approach allows short-term dynamic specifications which differ from country to country while long-

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1   - Higher values for Theil indices indicate lower diversification, see IMF data Mapper at: https://www.imf.org/external/datamapper/datasets/SPRLU

2   - This paper employs a technique for using a panel of both cross-section and time-series data for 98 industrial and developing countries over 1960-1985 to determine the quantitative importance for economic growth of both country-specific and time-varying factors such as human capital, public investment, and outward-oriented trade policies. The empirical results provide support for the view that these factors exert a positive and significant influence on economic growth.

term coefficients are constrained to be the same, it has some advantages compared to the dynamic OLS (DOLS) and fully modified OLS (FMOLS) methods (Pesaran et al., 1999).

The PMG method also allows the speed of convergence to the steady state to vary, which was deemed appropriate, as the short run adjustment depends on country-specific characteristics. In order to act in accordance with the requirements for standard estimation and inference, the growth regression equation (equation [3]) was incorporated into an ARDL-PMG (p, q) model as follows (Pesaran et al., 1999):

$$\Delta GDPG_{it} = \sum_{j=1}^{p-1} Y_{ij} \Delta GDPG_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta X_{i,t-j}$$
$$+ \varphi_i \left[GDPG_{i,t-1} - \beta_{i1} X_{i,t-1} \right] + \varepsilon_{it} \qquad (4)$$

where, $GDPG_{i,t-j}$ and $GDPG_{i,t-1}$ represent short-run and long-run values of real GDP growth, respectively; while Y_{ij} and δ_{ij} are short-run coefficients; φ_i is the error correction term (ECT); $X_{i,t-j}$ and $X_{i,t-1}$ are the short-run and long-run values of the independent variables, respectively; β_{i1} are the long-run coefficients; and $\varepsilon it = \mu i + v it$ where μi and $v it$ denote country-specific fixed effects and time variant effects, respectively. Accordingly, our model estimation proceeded as follows:

i.   Panel unit root tests was conducted to assess the stationarity of the data
ii.   The spearman rank-order and variance inflation factors (VIF) were conducted to test multi-collinearity between the explanatory variables, and assessing how well the relationship between variables can be described using a monotonic function
iii. The presence of unit root required the conducting cointegration test to verify the cointegration among the variables
iv.   Having confirmed the presence of a cointegrating association, the ARDL/PMG regression method was used to estimate the short - and long-run relationship among the variables, along with the estimation of an error correction term ECT (the speed of adjustment) to investigate the long-run equilibrium conditions and short-run adjustment mechanisms
v.   The Granger causality test was conducted to assess causality and endogeniety
vi.   Finally, the lagged dependent variable in the regression model was conducted to check for the robustness of the obtained long-run coefficients from PMG estimates by employing the generalized methods of moments (GMM) for dynamic panel analysis.

4. DATA TESTS AND EMPIRICAL RESULTS

4.1. Unit Root Tests
Since the appearance of the papers by Levin and Lin (1992, 1993); Levin et al. (2002), the use of panel data unit root tests has become very popular among empirical researchers with access to a panel data set. It is by now a generally accepted argument that the commonly used unit root tests like the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests is one way of increasing the power of unit root tests (Maddala and Wu, 1999). Unit root test is applied to check the order of integration of the variables (Dickey and Fuller, 1979). In this study, three of unit root tests (ADF, PP, and LLC) are applied, the null hypothesis (H_0) for these tests indicates for existence of unit root (Non-stationary) in the variables. Noting that the LCC test assumes common unit root process where it considers an appropriate test in a small sample, and both tests ADF and PP assumes individual unit root process (Dimitrios and Hall, 2007). The results of the panel unit root tests are given in Table 2.

According to probability of Chi-square and t-statistic values of the unit root tests, the results show that all variables are stationary, while LG and ENRG may integrated variable, whereas all variables are stationary at first difference (d[1]). Accordingly, this study may find at least one cointegration relationship between the tested variables in long run. So that, we could be applying the dynamic panel model. This finding is realized from the conclusions drawn from the majority of panel unit root tests.

4.2. Multi-collinearity Test
The study employed the spearman rank-order to test multi-collinearity between the explanatory variables. It assesses how well the relationship between two variables can be described using a monotonic function. The spearman correlation between two variables will be high when observations have a similar rank, and low when observations have a dissimilar rank between the two variables. The null hypothesis (H_0) for Spearman test indicates for existence of no association between ranks when (Prob. <0.05), which means there is multi-collinearity between variables. The results are presented in Table 3.

Correlation coefficients and its probability in Table 3 reveal all the independent variables are correlated with the dependent variable (GDPG), meaning that these variables may impact on the growth of real GDP. Accordingly, the correlation coefficients in Table 3 indicate that no correlation problem between the independent variables.

Table 2: Panel unit root results: series in level

Variables	Series in level (d[0])						Series in first difference (d[1])					
	ADF		PP		LLC		ADF		PP		LLC	
	Chi-square	Prob.	Chi-square	Prob.	t-statistic	Prob.	Chi-square	Prob.	Chi-square	Prob.	t-statistic	Prob.
GDPG	88.01	0.00	86.38	0.00	−11.88	0.00	135.42	0.00	159.09	0.00	−10.88	0.00
KG	81.38	0.00	77.68	0.00	−8.99	0.00	126.12	0.00	145.84	0.00	−14.22	0.00
LG	21.91	0.03	11.05	0.52	−1.87	0.03	52.45	0.00	53.79	0.00	−4.54	0.00
ENRG	73.19	0.00	102.10	0.00	−0.37	0.35	193.24	0.00	124.10	0.00	−18.57	0.00
OPNG	84.46	0.00	91.63	0.00	−12.07	0.00	138.69	0.00	160.92	0.00	−11.71	0.00
EXDIG	106.02	0.00	136.35	0.00	−11.44	0.00	123.37	0.00	127.42	0.00	−8.10	0.00

All variables are stationary with individual effects

Moreover, this study applied variance inflation factors (VIF) as another diagnostic test that reveals the multi-collinearity. According to Robert (2007) and a rule of thumb is that the variance inflation factor (VIF) above 5 or the tolerance value (1/VIF) below 0.2 is an indication that there is a problem of multi-collinearity among the variables. The results are presented in Table 4.

Results show that there is no VIF >5 and 1/VIF below 0.2; in turn reveals any of the independent variable included in this study is not explained by the other. Hence all variables can be retained in the model of this study.

4.3. Cointegration Test

Pedroni (1999) suggests several panel cointegration test statistics. These statistics are grouped into two dimensions: the panel cointegration statistics (within dimension), and grouped mean panel cointegration statistics (between dimension). The alternative hypotheses for both dimensions were tested against the same

null hypothesis. However, this test was modified to minimize the possible bias created by the potential endogenous series in the panel data model (Sun et al., 2019). The results of the Pedroni cointegration test are given in Table 5.

Table 5 presents the calculated values of the Pedroni Residual Cointegration Test statistics. The results reveal four (Panel PP, Panel ADF, Group PP, Group ADF) out of seven test statistics are greater than the critical values, indicating rejection of the null hypothesis of no cointegration. All these four statistics have acceptable values with associated probabilities <0.05. Thus, this study can be concluding that there is a long-run cointegrating relationship between the variables.

4.4. PMG Regression

After the Pedroni cointegration test confirmed a cointegrating relationship between the variables, our study applied the PMG method, which allows short run adjustments (depending on country-specific characteristics such as vulnerability to domestic and external shocks) to vary across countries to account for cross-country heterogeneity. It further imposes cross-country homogeneity restrictions only on the long run coefficients. The justification for common long-run coefficients across GCC countries was that they have access to common technologies as oil countries and have intensive intra trade and common consumption patterns. Moreover, they have been started an economic reform that includes diversifying their sources of income and reducing their dependence on oil revenues. Results from PMG estimates are reported in Table 6.

The findings indicate that there is a positive significant relationship from each of KG, LG, ENRG and OPNG, to real GDP growth in GCC countries in the long run. While export diversification index growth EXDIG has a negative effect (higher index less diversification) on GDP growth, meaning export diversification affect positively on economic growth in the long run. One significant relationship is observed between OPNG and GDPG in the short run, while the other variables have no significant association with GDPG. However, in the short run, the effect of LG and ENRG to real GDP growth is still positive while that of KG, OPNG and EXDIG is inversed. Our justification about these inversed relationships in the short run is that as Keller and Nabli (2002) indicate, the GCC countries import technology and high quality workers besides the low expending on research and development. So on, the importing and operating some new technologies may be being costly, and the productivity of imported technologies in

Table 3: Spearman rank-order test

	GDPG	KG	LG	ENRG	OPNG	EXDG
GDPG	1					
	--					
	--					
KG	0.265	1				
	[3.300]	--				
	(0.001)	--				
LG	0.301	0.087	1			
	[3.787]	[1.054]	--			
	(0.000)	(0.293)	--			
ENRG	0.675	0.076	0.089	1		
	[11.007]	[0.919]	[1.080]	--		
	(0.000)	(0.359)	(0.281)	--		
OPNG	0.306	-0.000	0.011	0.149	1	
	[3.864]	[-0.003]	[0.133]	[1.815]	--	
	(0.000)	(0.997)	(0.894)	(0.071)	--	
EXDIG	0.158	0.105	0.120	-0.091	0.124	1
	[1.924]	[1.276]	[1.460]	[-1.096]	[1.495]	--
	(0.050)	(0.203)	(0.146)	(0.274)	(0.137)	--

[ ] and ( ) denote for t-statistics and t-probability respectively

Table 4: Testing variance inflation factors

Variable	VIF	1/VIF
KG	1.035	0.966
LG	1.064	0.939
ENRG	1.049	0.953
OPNG	1.109	0.901
EXDIG	1.092	0.915
Mean VIF	1.069	

Table 5: Pedroni residual cointegration test

Alternative hypothesis: common AR coefs. (within-dimension)	Statistic	Prob.	Weighted statistic	Prob.
Panel v-Statistic	−0.621	0.732	−2.082	0.981
Panel rho-Statistic	−0.875	0.190	−0.201	0.420
Panel PP-Statistic	−6.133	0.000*	−5.228	0.000*
Panel ADF-Statistic	−5.593	0.000*	−4.371	0.000*
Alternative hypothesis: individual AR coefs. (between-dimension)	**Statistic**	**Prob.**		
Group rho-Statistic	0.071	0.528		
Group PP-Statistic	−6.440	0.000*		
Group ADF-Statistic	−5.166	0.000*		

The null hypothesis is that the variables are not cointegrated. * indicates statistical significance at the 1% significance level

Table 6: Results of PMG estimation

Dependent variable: Real GDP growth			
	Coefficient	t-statistic	P-value
Long run variables			
KG	0.07	3.57	0.00*
LG	0.32	5.47	0.00*
ENRG	0.44	6.28	0.00*
OPNG	0.06	2.06	0.04**
EXDIG	−0.09	−2.04	0.04**
Error correction term	−0.79	−6.57	0.00*
Short run variables			
ΔKG	−0.02	−1.37	0.17
ΔLG	0.05	0.41	0.68
ΔENRG	0.07	0.67	0.50
ΔOPNG	−0.03	−2.11	0.03**
ΔEXDIG	0.03	0.66	0.51

*, **, indicates significance level 1% and 5% respectively

the short run may declines especially when the workers are not familiar with these technologies. But over time these technologies will enhancing the economic growth. On other hand, Imbs and Wazziarg (2003) indicated that Countries at first diversify and then specialize as they move to higher levels of income. Where exporting requires output diversification before specialization and concentration. Lederman and Maloney (2003) found that countries which have a lot of natural resources grow more slowly because of export concentration rather than dependence on natural resources per se. Moreover, most of exporting contracts consider as long terms contracts, which take time to contribute in economic growth. That is why the export openness and export diversification have inverse effect in the short run.

In the long run, the results show that a growth of capital, labor, energy and trade openness by 1% is likely to cause a 0.07%, 0.32%, 0.44% and 0.06% increase in real GDP growth respectively. This finding in line with the economic theory in sense that the factors of production affect positively on the output level. Further, the econometric investigation revealed that export diversification positively affects economic growth in the long run, as a decline of diversification index growth (more diversification and less concentration) by 1% is likely to cause a 0.09% increase in real GDP growth. This result is consistent with the results from (Gozgor and Can, 2016; Mudenda et al., 2014; Hesse, 2009; Ramcharan, 2006).

The ECT coefficient shows the speed of the adjustment of the variables to long-run equilibrium and should be significant with the negative sign. In our investigation, the coefficient of the error correction term is −0.79, which is statistically significant at the 1% level of significance with a negative sign. This result implies the deviation from the long-run equilibrium is corrected by 79% each year, and a full convergence process is expected to take around 3 years to reach the stable path of equilibrium. It further implies the speed of the adjustment process is reasonable for any shock to real GDP growth in the GCC countries. Results ensure once more that stable long-run relationships among variables in the economic growth model exist in all of the considered countries.

However, the GCC countries mainly depend on crude oil production to support their economic activity but for sure the Oil production is

not the only source of economic growth for those countries. This study ensures that economic diversification across sectors (vertical diversity[3]), and diversification within sectors (horizontal diversity[4]) measured by Theil index[5] (what you export) has a significant impact on economic growth proxied by real GDP growth. These results may emphasis that the oil producing countries have the ability to introduce subsidies to goods and services sector which support the diversity of production and exports to enhance the economic diversification to establish a more sustainable modern economy.

4.5. Granger Causality Test
This study employs the traditional pairwise granger causality test that proposed by Granger (1969). The idea behind Granger causality is that the variable X_{it} granger causes Y_{it}, if past information in X_{it} (i.e., $X_{i(t-1)}$, $X_{i(t-2)}$...) uniquely contributes and has predictive power to future information in Y_{it}. The null hypothesis H_0 is a test that X_{it} does not Granger-cause Y_{it}. Similarly, is a test that Y_{it} does not granger cause X_{it}. In each case, a rejection of the null hypothesis implies there must be either bi-directional or unidirectional Granger causality between the variables. The case of bi-directional causality indicates the existence of endogeneity problem between X and Y. but unidirectional causality is not. Results from Granger causality are reported in Table 7.

Pairwise granger causality analysis reveals the appearance of unidirectional causality from (GDPG → LG); (KG → GDPG); (ENRG → LG); and (EXDIG → OPNG) in the second, sixth, eighteenth, and thirty models respectively. The causality models do not have any bi-directional causality. Thus, the study's variables do not have endogeneity problem.

The GDPG and ENRG cause the LG, as Keller and Nabli (2002) indicated, the GCC countries have import technology and high quality workers. While they have been implementing many policies to support economic reform, including diversifying their activities and sources of income and reducing their dependence on oil revenues. Economic reform purposed to strengthen the business environment, develop infrastructure, support the SMEs), and improve educational outcomes. For this regards, GCC governments have increased public and private sectors employment and spending on infrastructure, health, and education. This may impact on the number of employees, support the agility with which an economy adopts existing technologies to enhance the productivity of its industries and activities (Callen et al., 2014).

The KG causes GDPG whereas economic growth and development requires the availability of superior capital and resources, especially the GCC countries consider as wealthy and able to attract the superior capital. that meet the economic theory perspective and a-priori expectations as an increase in assets investment and capital formation is expected to result in higher national output (Romer, 2012).

EXDIG causes OPNG whereas Makhlouf et al. (2015) show that openness can be positively associated with both specialization and

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3   - Vertical diversity meaning new export products or new export destinations.
4   - Horizontal diversity meaning a larger volume of exports of old products.
5   - IMF, Datasets, Export diversification index.

Table 7: Results of pairwise granger causality tests

Null hypothesis: H_0	F-statistic	P-value	Decision	Causality
GDPG does not granger cause KG	0.870	0.458	Do not reject H_0	No causality
GDPG does not granger cause LG	2.692	0.049	Reject H_0	Unidirectional
GDPG does not granger cause ENRG	1.437	0.235	Do not reject H_0	No causality
GDPG does not granger cause OPNG	0.722	0.540	Do not reject H_0	No causality
GDPG does not granger cause EXDIG	0.593	0.620	Do not reject H_0	No causality
KG does not granger cause GDPG	3.559	0.016	Reject H_0	Unidirectional
KG does not granger cause LG	1.311	0.273	Do not reject H_0	No causality
KG does not granger cause ENRG	1.818	0.471	Do not reject H_0	No causality
KG does not granger cause OPNG	1.129	0.339	Do not reject H_0	No causality
KG does not granger cause EXDIG	1.840	0.143	Do not reject H_0	No causality
LG does not granger cause GDPG	2.002	0.116	Do not reject H_0	No causality
LG does not granger cause KG	2.292	0.081	Do not reject H_0	No causality
LG does not granger cause ENRG	1.255	0.292	Do not reject H_0	No causality
LG does not granger cause OPNG	0.654	0.581	Do not reject H_0	No causality
LG does not granger cause EXDIG	1.347	0.262	Do not reject H_0	No causality
ENRG does not granger cause GDPG	1.576	0.198	Do not reject H_0	No causality
ENRG does not granger cause KG	0.140	0.935	Do not reject H_0	No causality
ENRG does not granger cause LG	4.544	0.004	Reject H_0	Unidirectional
ENRG does not granger cause OPNG	0.416	0.741	Do not reject H_0	No causality
ENRG does not granger cause EXDIG	0.269	0.847	Do not reject H_0	No causality
OPNG does not granger cause GDPG	0.522	0.667	Do not reject H_0	No causality
OPNG does not granger cause KG	0.928	0.428	Do not reject H_0	No causality
OPNG does not granger cause LG	1.396	0.246	Do not reject H_0	No causality
OPNG does not granger cause ENRGG	0.581	0.628	Do not reject H_0	No causality
OPNG does not granger cause EXDIG	1.655	0.180	Do not reject H_0	No causality
EXDIG does not granger cause GDPG	0.484	0.694	Do not reject H_0	No causality
EXDIG does not granger cause KG	0.681	0.565	Do not reject H_0	No causality
EXDIG does not granger cause LG	0.742	0.528	Do not reject H_0	No causality
EXDIG does not granger cause ENRGG	1.349	0.261	Do not reject H_0	No causality
EXDIG does not granger cause OPNG	7.481	0.000	Reject H_0	Unidirectional

Decision indicates reject H_0 if $P < 0.05$

diversification, depending on the measure used. Further, Balavac and Pugh (2016) find that differences between diversification at the export margins are not just conceptual, but also substantive where the effect of openness is conditional on export diversification at the intensive margin but not at the extensive margin.

5. ROBUSTNESS CHECK

To check the robustness of the results, this study introduces the lagged dependent variable in the regression model by employing the generalized methods of moments (GMM) for Dynamic Panel analysis instead of ARDL/PMG model. The panel GMM estimator allows to control for heterogeneity of countries and overcome the endogeneity of the explanatory variables that may arise in the economic growth estimation by using some instrumental variables, and therefore yields consistent estimates. The reliability of the GMM method depends critically on the validity of the instruments, which can be evaluated with Hansen's test of over-identifying restrictions that produces *J-statistic*, and asymptotically distributed as Chi-square in the number of restrictions. A rejection of the null hypothesis that instruments are orthogonal to the errors would indicate that the estimates are not consistent (Baum et al., 2010). Therefore, If the J-statistic less than the critical value, or the probability of J-statistic exceeds 5%, then we fail to reject the null[6], and conclude that the instruments are exogenous. Table 8 presents the GMM estimator analysis.

6 - the hypothesis that instrumental variables are not correlated with the set of residuals.

Table 8: Generalized methods of moments regression results

Variables	Coefficient	t-statistic	P-value
GDPG(−1)	0.148	0.571	0.058
KG	0.054	4.090	0.000*
LG	0.459	7.823	0.001*
ENRG	0.466	7.169	0.000*
OPNG	0.049	2.864	0.004*
EXDIG	−0.192	−2.057	0.042**
AR (1) P value	0.038	S.E. of regression	0.024
AR (2) P value	0.149	Hansen P value	0.251

*, **, indicates significance level 1% and 5% respectively. Instruments are the lagged independent variables

The results of the GMM regression analysis reveal that all the independent variables (KG, LG, ENRG, OPNG, and EXDIG) were significant and have its same direction, which indicates that the results are invariant with earlier results (PMG model). The Hansen J-test with associated P-value, is proved as valid instruments for all tested equations. Therefore, the results from GMM estimator have proved the null hypothesis. As result, Hansen P-value test fail to reject the null hypothesis. In addition, the study present Arrelano–Bond test statistics for the first and second order serial correlations (AR[1] and AR[2]). It can be observed from Table 8 that AR(1) and AR(2) tests shows that at the 5% significance level our instruments are appropriately orthogonal to the error and no second order serial correlation is detected. This result is consistent with Baum et al. (2010) as mentioned in a dynamic panel data context, second order serial correlation should not be present if the instruments are appropriately uncorrelated with the errors.

However, the results of the GMM estimator remains robust in terms of directions and significance levels. Whereas they keep the same sign, the same order of magnitude, they remain significant as they were so in the ARDL/PMG model, and the standard error of regression model 2.4% is relatively low. As can be observed, the GMM model confirms the robustness of our findings.

6. CONCLUSION

Recently the economic diversification began to take more and more attention by GCC countries. It is noticed clearly that every economic plan, strategy or even future vision must include policies regarding economic diversification. GCC realized that the heavy reliance on oil must change into diversified exports and concentrate more on industrial exports rather than raw materials to maximize the gains from trade and maintain sustainable economic growth and development. For this purpose, the study modeled and analyzed the short and long run effects of export diversification on economic growth using the countries GCC panel data for the period (1992-2017). It employs the panel ARDL/PMG using the export diversification index as an indicator for measuring the degree of economic diversification in these countries besides other diversification indicators (trade openness, fixed capital formulation, labor, and Energy) as control variables and as an indicator for measuring the degree of economic diversification in GCC countries.

The Pedroni panel cointegration test confirms that the variables are cointegrated. Although PMG estimates indicate a positive significant long run relationship between export diversification and real GDP growth, no significant effect of export diversification in the short run which is consistent with the previous studies. Results reveal a significant impact of trade openness growth on real GDP growth, which confirms the long-run as well as the short-run relationship between the growth of trade openness and economic growth for the GCC countries. Moreover, the results confirm the existing of significant positive long-run effect of capital growth, labor growth, and energy growth on economic growth but again not in the short-run.

One may find controversial results comparing to most of the previous studies which showed that the GCC countries mainly depend on crude oil production to support their economic activity, but for sure the oil production is not the only source of economic growth for those countries. This study ensures that the vertical and horizontal diversification has a significant impact on economic growth proxied by real GDP. Besides, it is worth to mention that the overall effort for GCC region on average had succeed in diversification, and their plans are beginning in achieving some of its goals over time. But the study reveals that results may differ relatively in each country.

The current development plans of GCC countries point unanimously to diversification as the means to secure the stability and the sustainability of income levels in the future. Even though the states continue to depend on oil production as the main source of income, economic and export diversification entails a reinvigoration of the private sector and as such necessitates the implementation of broader and structural reforms beside the oil production. Which may accelerate the economic reform and creating a supportive investment environment for the private and public sectors.

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