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The Effect of Manufacturing Value Added on Economic Development: Empirical Evidence

Yousef M. Abdulrazzaq[1]

Abstract

Purpose: This study aims to discern the critical role of manufacturing value-added to the economic growth of the GCC countries. Similarly, gross fixed capital formation, total labor force, and technology with economic growth were also examined.

Data: This research evaluates the data of six GCC countries that includes Kuwait, Qatar, Oman, Saudi Arabia, United Arab Emirates, and Bahrain which started from 1980 to 2020 and used well know econometric panel framework.

Methods: The econometric methods included panel unit root testing based on Im-Pesaran-Shin and Fisher. The long-run association was extracted based on the fixed effect econometric model followed by residual diagnostic testing that include Pesaran test for cross sectional independence to validate outcomes.

Findings: The outcomes of panel unit roots suggest all variables are integrated at order and hence provide a platform to move on to check long run association between variable. The overall outcomes of this study revealed that manufacturing value-added, gross fixed capital formation, labor force, and technology are a positive and significant relationship with economic growth in the long run. The policymakers should concentrate on enhancing manufacturing growth by increasing its productivity and raising employment to boost healthy and sustainable economic development in the GCC countries.

Keywords: *Manufacturing Value-Added, Economic Growth, GCC, Fixed Effect, Labor Force.*

Introduction

The Gulf Cooperation Council (GCC) region has been trying to stimulate its non-oil GDP by enhancing economic growth. It has been witnessed that so far, such policies have a significant emphasis on the government to promote manufacturing to boost non-oil economic prosperity. Industrial growth produces employment and is subsequently linked with many macroeconomic indicators such as advanced research and technical skills. According to Awad (2010), the manufacturing sector's contribution is not much help boost the gross domestic product; however, playing a substantial role for boost non-oil GDP in the long run time. That is why the GCC countries should focus on developing the non-oil sector and rely more on it. Moreover, new exploration of an oil field in the rest of the world also put intense pressure on the GCC countries to do all possible plans to sustain their economies when the supply the oil would be ample.

Industrialization in GCC countries is considered the most vital engine for economic development. The distinct features ascribed to the manufacturing sector can be explained

[1] Assistant Professor, Department of Economics and Finance, Gulf University for Science and Technology, Kuwait

in several ways: economies of scale, rapid technology change, and enhanced global production associations (Szirmai 2012; Lavopa and Szirmai 2014). Moreover, several studies in this field empirically examined and endorsed that any transformation from the services and agriculture sector to manufacturing is a healthy process of economic prosperity (Chenery 1979 and Fuchs 1980, Naudé et al. 2016). Consequently, it was typically accepted that "since the industrial revolution, no country has become a major economy without becoming an industrial power" (Acharya 2007). National economies could harness their power and use their productivity and wealth to strengthen the manufacturing sector (Oyati, 2010, Khan et al. 2020). In this regard study of VU et al. 2020 also help to understand the activities of the manufacturing sector grow up in term of value added if the management role is more transparent.

Based on numerous empirical and theoretical studies, the level of technology, investment, manufacturing output, and labor are the crucial factors in explaining economic development in the long run. The neoclassical theory of growth (Solow, 1956) represents the significance of these factors to play a role in explaining economic development in the long run. This theory developed by American economist Robert Solow (1956) explained that technological advancement is the critical element for economic prosperity. He also focused on labor, capital formation, capital, and technology. The theory further suggests that these factors largely explain economic growth. Furthermore, this theory also describes total factor productivity (TFP), where augmenting in labor, change in technology, and per worker capital elaborate on the long-run economic growth of per worker. The Solow model is described as follows:

$$Y = TF(K, L)$$

Where,

K: Physical Capital

T: Technology

L: Amount of Worker

Y: Production (Gross Domestic Product − GDP)

It is well documented in the literature that economic growth is strongly associated with the growth in the manufacturing sector in any economy (Pacheco-Lopez et al., 2013). The study of Szirmai and Verspagen (2015) empirically examines the relationship between manufacturing value added (NVAG) and the gross domestic product in 92 economies from 1950 to 2005 and analyzed through panel estimation methods (Fixed Effect, Random Effect, and Hausman Test). Their findings suggest that the manufacturing sector role plays a vital role in developing low and middle-income economies. A similar study examines by Szirmai and Verspagen (2015), manufacturing output acts as an engine of economic growth. Furthermore, Fagerberg and Verspagen (1999) study suggest that manufacturing is a critical element of the economic development of East Asia's countries. Su and Yao (2017) examined the middle-income countries and applied various econometric such as panel regressions, cross-sectional regression analysis, and granger causality tests. Their findings illustrate that the growth of the manufacturing sector uplifts the growth of the services sector. According to Bell et al. (2019), the fixed and random effect model gives a more reliable outcome in larger data sets and even deals well with the possible misspecification.

The role of investment in any economy is decisive since it appreciates growth and profit for any economy. The study of Dritsakis et al. (2006) examined the causal linkages between gross capital formation, economic growth, foreign direct investment (FDI), and exports for the case of Greece for 42 annual observations through the Vector Autoregressive Model (VAR). The outcome shows there exists a long-run relationship between the mentioned variables. In addition, unidirectional causality between export and

gross fixed capital formation and a unidirectional causality between GDP and FDI. The study of Kolmakov et al. (2015) also claimed that GDP and capital investment are closely linked in the US and Russia. Furthermore, physical and human capital investment also accelerate economic growth (Anwar and Waqar, 2015). Moreover, sustainable manufacturing mechanism also play a crucial role in the value added as it uplift the overall productivity (Muhardiet al. 2020).

Over the past many years, the association between economic growth and the labor force are studied mainly because of their importance in any economy. The research of Seyfried (2011) evaluated the linkages between economic growth and employment for a period that started from 1990-2003 for ten different biggest states. The outcomes show that economic development is grossly accelerating employment in most states. In the contemporary world, the dependency on technology is considered one of the significant input factors for the economic growth of any country. The research of Gani (2009) evaluated the relationship between economic growth and advancement in technologies and used panel data analysis for 45 countries. The results are potentially supporting the economic development positively in these countries.

Furthermore, Falk (2009) empirically reviewed the high-tech exports and their link with the economic development for 22 Organization for Economic Co-operation and Development (OECD) countries and applied the Generalized Method of Moment (GMM) panel framework. Their results show that high-tech exports are directly and significantly linked with the economic growth in these countries. Bujari and Matinez (2016) also reported similar findings.

Objectives

- The core purpose of this research is to examine the potential role of the manufacturing sector in the economic development of six GCC countries (Kuwait, Oman, Saudi Arabia, Bahrain, Qatar, and UAE).
- To empirically examine the role of the manufacturing sector in explaining the GDP. To evaluate how the investment is influencing GDP in the GCC states. To look at the impact of labor force and technology on the economic growth of the GCC countries.

Based on the extensive literature, it is noteworthy to examine whether the non-oil GDP of the GCC countries through the manufacturing value-added.

Methodology and Model Specification

The present research examines the role of manufacturing sectors on the economic development of GCC countries, and annual data started from 1980 to 2020 obtained from world development indicators of the World Bank. In order to avoid possible spread in the data, the data has been transformed into a natural logarithm. This research has used various variables such as gross domestic product (GDP), which is a proxy for the economic health of GCC economies, the total labor force (Swane and Vistrand, 2006), gross fixed capital formation as a proxy for investment (Oburot and Okoi, 2017), manufacturing value-added which is a proxy for manufacturing output (Szirmai and Verspagen, 2015) and in lastly exports for high-technology has taken as a proxy for technology (Srholec, 2007 and Fagerberg, and Verspagen, 2002).

Table 1: Definition of Variables and Source

Variable	Measurement	Sources	Abbreviation
GDP	Gross Domestic Product (Constant 2010 $)	WDI, World Bank	LnGDP

Technology	High-Technology Exports (Current $)	WDI, World Bank	lnTHE
Manufacturing Output	Manufacturing Value-Added (Constant 2010 $)	WDI, World Bank	lnMVAG
Labor Force	Total Labor Forces	WDI, World Bank	lnLF
Investment	Gross Fixed Capital Formation (% of GDP)	WDI, World Bank	lnGFCF

Source: Own Author Formation

Table 1 represents a detailed explanation of the variables, measurement, and the abbreviation used throughout this research.

As per the suggested theory, the following model has been empirically examined:

$$\ln GDP_{it} = \beta_1 + \beta_2 \ln MVAG_{it} + \beta_3 \ln THE_{it} + \beta_4 \ln LF_{it} + \beta_5 \ln GFCF_{it} + \mu_{it} \quad 1$$

Where,

$\ln GDP_{it}$: Gross Domestic Product of ith country in period t.

$\ln MVAG_{it}$: Manufacturing Value − Added of ith country in period t.

$\ln THE_{it}$: High − Technology Export of ith country in period t.

$\ln LF_{it}$: Total labor force of ith country in period t.

$\ln GFCF_{it}$: Gross Fixed Capital Formation of the ith country in period t.

$\ln \mu_{it}$: Residual Term

In order to analyze the above econometric model, this research has used various econometric methods and analyses of data started with the descriptive test such as mean, standard deviation, range, and graphical interpretation. In order to investigate the long-run association between variables under study, it is essential to examine the stationarity issue in the data. For this reason, this research has used various unit root methods, such as Im et al. (2003) that propose the t-bar statistics, which is standardized and based on the augmented dicky fuller method. On the other, hand the Fisher-Type method was used for robustness.

The effect of MVAG on economic growth may vary from country to country, from time to time, and realistically based on the economic position of any economy. This method allows flexibility to control time variation within the countries. The RE model has also named a variance component method, and from a statistical point of view, the parameters of this model are random variables. In panel data analysis, the RE model is commonly used to get the long-run linkages of variables. This test is a standard test, and based on this, the Fixed Effect (FE) or Random Effect (RE) model is used to interpret long-run coefficients and policymaking. This method used chi-square estimation, and if the estimated value has less than the 5% probability value, the null hypothesis of the RE model would be rejected, and the FE model gives the appropriate outcome for long-run reporting.

Data Analysis

The analysis of data comprises on two main sections, (i) is informal that represent the essential nature of the data through descriptive analysis and a graphical representation, (ii) based on formal analysis that included unit root tests with the help of Im-Pesaran-Shin (IPS)F and Fisher-type method, panel cointegration through the fixed-effect model. At the end of this section, a residual diagnostic test was also applied to establish the efficacy of the estimated model.

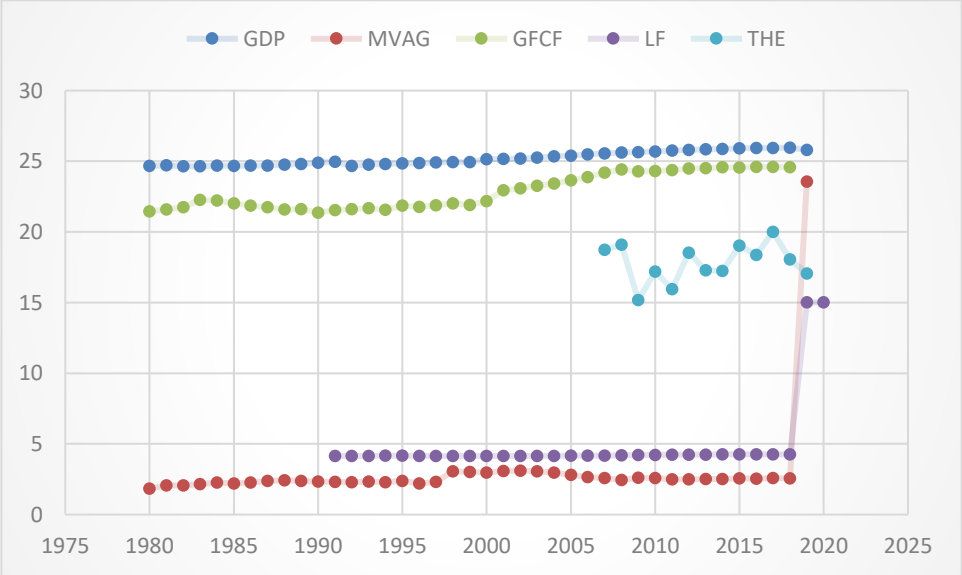
Informal Analysis

Table 2: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
lnGDP	25.26	2.24	21.64	28.60
lnMVAG	3.27	3.89	1.32	25.15
lnGFCF	22.94	2.63	19.41	27.31
lnLF	4.91	2.72	3.84	16.49
lnTHE	17.81	2.97	10.24	23.84

Table 2 shows the descriptive analysis and explained in detail the fundamental nature of the data through them. The highest average indicates by the lnGDP and lnMVAG has the lowest mean over the studied period, further followed by lnTHE and lnLF, respectively. In order to review the consistency of variables, the results of standard deviation (SD) indicate a moderate variation in the variables. The lnGDP is having the minimum SD representing the lowest variation for the studied period. However, lnMVAG accounts for the relatively higher value that illustrates a mild variation pattern in the data. Furthermore, the length of the data represents a moderate range between variables, the lnMVAG shows the minimum value, and lnGDP has the maximum value in the entire range calculation.

Figure 1: Movement of Variables



Source: Own Author Formation

Figure one shows the graphical illustration of all the variables in this study. The variable MVAG is performing consistently throughout the period; however, a slight upward movement cited in the year 1997 that further follows the previous trend. The total labor force is also representing a steady but moderate upward movement pattern. The GDP is also showing a consistent behavior over time; however, GFCF represents an upward move and follows GDP from 2008 and onward. In addition to this, the behavior of THE is having a slight variation for the given data.

Formal Analysis

A formal analysis of this research is established in the section that contains data stationery through various referenced methods, panel cointegration through fixed and random effect, and concludes on the diagnostic testing.

Table 3: Panel Unit Root Tests

Variables	IPS		Fisher-Type	
	Level	1st Difference	Level	1st Difference
lnGDP	3.49	-6.07***	0.61	-8.15***
	(0.99)	(0.00)	(0.73)	(0.000)
lnMVAG	1.485	6.31***	1.59	9.10***
	(0.12)	(0.00)	(0.15)	(0.000)
lnGFCF	1.7288	-4.09***	1.60	-5.17***
	(0.96)	(0.00)	(0.94)	(0.000)
lnLF	0.79	-2.38***	4.17	3.03***
	(0.99)	(0.008)	(0.98)	(0.001)
lnTEH	-1.25	3.25***	-0.22	-5.59***
	(0.99)	(0.00)	(0.41)	(0.00)

Level of significance: *, p-value < 0.1; **, p-value < 0.05; ***, p-value < 0.001

IPS: H0: Unit Root, H1: Stationary and Fisher-Type: H0: Unit Root, H1: Stationary.

The outcomes of the long-run linkages are explained in table 4, and before presenting them, it is highly imperative to check the stationary of the variable; for this reason, the IPS method has been used, and for robustness purposes, an econometric technique used that is Fisher-type. The outcomes of panel unit root tests are explained in table 3, and that shows all the variables are non-stationarity at a level in both approaches; however, they converted into stationary after taking the first difference. These outcomes provide a base to evaluate of long-run association between variables, and in this regard, FE and RE approach was used, and subsequently, the FE model opted based on the Hausman specification test.

Table 4: Fixed Effect Results

Variables	Coefficient	SE	t-stat	P-Value
DV: lnGDP				
lnMVAG	0.105*	0.57	1.84	0.08
lnGFCF	0.152**	0.71	2.14	0.04
lnLF	1.976***	0.31	6.30	0.00
lnTHE	0.030***	0.006	4.50	0.00
Constant	13.422***	1.065	12.60	0.00
F-Statistics = 69.53				
P-Value = 0.000				

Level of significance: *, p-value < 0.1; **, p-value < 0.05; ***, p-value < 0.001

Table 4 represents the outcomes of the FE model for the long-run association between variables. The results show a positive and significant long-run association between lnMVAG, lnGFCF, lnLF, and lnTHE with the lnGDP. These outcomes display that by increasing manufacturing value-added, the gross domestic product will increase in the long run, and it is a good sign for the GCC countries to concentrate on this factor. These findings are consistent with many types of research where MVAG is a crucial player in explaining the GDP for developing and developed countries (Coad and Vezzani, 2017 and Szirmai, 2012). Similarly, by increasing investment, labor force, and an increase in technology export, the GDP of GCC reacts positively in the long term. The F statistics show that the overall FE model represents significant results. These findings are similar to many types of research (Dinh et al. 2019: Vo et al., 2019; Kargi, 2014; Koojaroenprasit, 2012 and Shahbaz and Rahman, 2010).

Table 5: Hausman Specification Test

Variables	RE	FE
DV: lnGDP	(b)	(B)
lnMVAG	-0.0878	0.105
lnGFCF	1.007	0.151
lnLF	0.153	1.976
lnTHE	0.004	0.030
Chi-Square Test = 259.22		
Prob > Chi = 0.000		

H0: Random Effect Model is Appropriate, H1: Fixed Effect Model is Appropriate

The outcomes of the Hausman specification test are presented in table 5, and as per the chi-square test, we reject the null hypothesis of the RE model and hence used the FE model for the long-run explanation of studied variables. Also, to check the efficacy of the estimated FE model, the residual test for serial correlation was applied.

Table 6: Residual Test for Serial Correlation

Test	Results
Pesaran's Test of Cross-Sectional Independence	Test Value = 0.295 P-Value = 0.752

H0: There is no Serial Correlation in FE Model, H1: There is a Serial Correlation in FE Model

Table 6 represents Pesaran's test for cross-sectional independence, and results show that we cannot reject the null hypothesis of no serial correlation in the FE model.

Conclusion

This study aims to examine the role of manufacturing value-added to the economic development of GCC countries. A panel of data for all six GCC countries (Kuwait, UAE, Oman, Saudi Arabia, Bahrain, and Qatar) has been collected from world development indicators of the World Bank. In order to analyze data, an informal and formal approach was adopted. The descriptive statistics and graphical illustration presented in the first section and various econometric methods used informal approaches such as IPS and Fisher type methods for the unit root analysis. In order to understand the long-run relationship between variables, a Fixed Effect approach was selected based on the Hausman specification test. In the end, Pesaran's serial correlation test was applied to

check the efficacy of the estimated model. This research shows that manufacturing value-added plays a positive and significant role in the economic development of the GCC countries.

Similarly, the gross fixed capital formation, labor force, and high technology exports are also positive and significant with the economic growth. In this regard, governments should decrease the unemployment rate and increase job opportunities by reducing prices, reducing tax rates, and increasing salaries. These outcomes are significant for the relevant government to focus on such factors since they are a vital player in their economy.

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