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"The Role of Trade and Foreign Direct Investment in Improving Manufacturing Productivity: The Case of the Gulf Cooperation Council"

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The Role of Trade and Foreign Direct Investment in Improving Manufacturing Productivity: The Case of the Gulf Cooperation Council

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Abstract: *This paper aims to test the technical efficiency of the GCC manufacturing sectors as well as the role of trade and foreign direct investment in achieving diversification through technology transfers and embraced globalization. An analysis is conducted based on the theoretical implications of Solow growth model and is empirically evaluated through a stochastic frontier analysis measuring manufacturing technical efficiency, for the six GCC economies for the time-period 1980-2014. Results indicate a weak relationship between FDI levels and the manufacturing sector's productivity levels, but there exists a strong, positive relationship with trade. Labor and capital also exhibit positive relationships with productivity in line with the theoretical assumptions of a basic production function. Results also indicate a negative relationship between oil dependence and manufacturing productivity which supports the implications of the Dutch Disease. Finally, manufacturing technical efficiency levels are relatively high in the GCC region, with variances in each country.*

Keywords: Natural Resources, Openness, FDI, GCC, Manufacturing Productivity, Technical Efficiency
JEL Classification Codes: F15, F21, F23, O4, Q32

1. Introduction

The economies of the Gulf Cooperation Council (GCC) have been endowed with oil revenues which has allowed them to maintain budget surpluses, stable economic growth, and high levels of income per capita. However, when looking at the *productivity* growth patterns, the GCC economies have not been able to meet their growth frontiers. The hampering effects of the "resource curse" have been notably analyzed by Sachs and Warner (2005), whereby resource dependence induces a negative impact on the real GDP per capita growth rate (Figure 1)[1]. The percentage of oil rents to GDP in 2014 are estimated to be 15% for Bahrain, 53% for Kuwait, 27% for Oman, 19% for Qatar, 38% for Saudi Arabia, and 18% for the UAE (World Bank: World Development Indicators 2016). This negative relationship can be explained through the implications of the Dutch Disease in which resource abundance leads to the shifting of resources towards the booming oil sector, which in turn "crowds out" the tradeable sectors within the economy. These sectors, especially manufacturing, are crucial for achieving sustainable economic development levels, as they constitute technology

[1] All figures and charts are presented in Appendix A.

advancements, and "learning by doing" effects which transcend throughout other sectors in the economy, hence leading to an overall enhancement in the total factor productivity level.

Inefficient productivity especially in terms of low labor productivity levels and education outcomes in the GCC has been a persistent problem, hindering the region from realizing its full growth potential in a sustainable framework. Specifically, education systems are often deficient in equipping students with basic skills pertaining to science and technology, and the "productivity growth rate (defined as output per worker) of the Arab region over the period 1991-2010 was only 0.9 per cent, the lowest of the world's regions" (Arab Sustainability Report, 2015). Moreover, governments tend to devote little attention towards activities that promote research and development and focus more on capital spending and energy subsidies, especially within the GCC economies. Overcoming the resource curse will be contingent on the investment in science and technology, facilitating knowledge transfers, and improving the quality of the basic inputs, especially labor through human capital development.

For the case of this paper, trade and foreign direct investment are investigated as potential determinants of sustainable growth in the GCC economies. According to the Arab Sustainability report (2015), interregional and international trade is a probable engine towards achieving a higher comparative advantage level. The current trade patterns within the GCC demonstrate low levels of non-oil exports, and the region has had problems integrating holistically with the world market due to deficiencies in local absorptive capacities such as investment policies and institutional quality. These hindrances are preventing these economies from reaping the maximum benefits associated with international trade and foreign investment, especially pertaining to knowledge transfers. However, the region has been aiming to improve these deficiencies in an effort to improve international trade links, as well as to construct a more diversified source of income. Specifically, diversification strategies are aiming to develop less capital-intensive sectors such as real estate and services (Espinoza, Fayad & Prasad, 2013). Diversification is crucial especially in lieu of the recent plunge in oil prices coupled with excessive government spending constituting an average of 30-40% of GDP in the GCC economies (Figure 2).

The purpose of this paper is to present an investigation into the potentials of trade and FDI in serving as determinants of productivity improvements in the manufacturing sector, which is a topic the literature has not fully covered in the context of the resource-rich GCC economies. Furthermore,

the addition of the stochastic frontier analysis in evaluating technical efficiency levels in the GCC region is a critical contribution to the literature, as it clarifies whether the manufacturing sectors' performance is affected solely by external factors or if production efficiency must be taken into account. The data used consists of a panel dataset for the six GCC economies including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates for the time period between 1980 to 2014, constituting a total of 34 years. The empirical analysis is based on an OLS regression testing the determinants of manufacturing productivity, and an SFA approach to testing the technical efficiency levels using the premises of a Cobb-Douglas production function. Results for both the OLS and SFA model show significant, positive impacts of capital, labor, and trade on manufacturing productivity and a significant negative impact from oil rents on productivity indicating crowding out effects. Foreign direct investment exhibited insignificant results. Furthermore, the regional technical efficiency levels were high, with Bahrain having the highest level of manufacturing productivity and the UAE having the lowest levels.

Section 2 presents an overview of the literature pertaining to the growth potentials of trade and FDI in facilitating technology spillovers, the analysis of the Dutch Disease dynamics within the "rentier state" classification of the GCC economies, and the potential of developing the manufacturing sector as a mechanism to achieve diversification and avoiding the resource curse. Section 3 explains the methodology adopted based on the theoretical implications of the Solow growth model and specifically the Solow residual, as well as the stochastic frontier analytical framework of estimating technical efficiency. Section 4 describes the data sources and variables of choice. Section 5 presents the empirical analysis for the general manufacturing productivity model, an extension to the overall results by investigating the relationship between oil rents and FDI, and the SFA model results. Section 6 and 7 consists of concluding remarks and policy recommendations generated based on the results of the empirical model. Finally, Section 8 addresses prospective ideas for further research in this topic.

2. Literature Review

The growth potentials and trade and FDI are first exemplified through knowledge spillover effects are discussed, providing a general implication regarding the relevance of considering these variables as possible determinants of manufacturing productivity. Second, the phenomenon of the Dutch Disease is explained within the context of the GCC economies. Finally, an overview of the potentials of the manufacturing sector is presented, especially pertaining to a method of escaping

the resource curse and achieving diversification. These components highlight the importance of openness in improving manufacturing productivity for the resource-rich GCC economies.

2.1 The Growth Potentials of Trade and FDI: Technological Gaps and Knowledge Spillovers

The potentials of trade and FDI in contributing to economic growth has been discussed throughout the literature extensively. These impacts are recently gaining focus in technology or knowledge linkages, which can be illustrated through a simply endogenous growth model. Hence, trade and FDI not only contribute to capital inflows and increased investment, they also lead to indirect impacts through transferred knowledge to the economy welcoming these inflows. Specifically, the IMF (2013) emphasized that trade acts as a major factor allowing productivity changes to occur due to technical improvements and knowledge spillovers. Furthermore, additional trade benefits are observed through increase competition within local businesses with the introduction of imports (Choudhri & Hakura, 2000). These productivity linkages often create a desire to reduce protectionism, which brings forth the concept of liberalization.

Building on this notion of openness, liberalization and productivity, it is important to note that it is now more important than any other time to consider the potentials of trade, as the world is becoming more integrated, and globalized; this brings about new challenges to the changing roles of the government which need to accommodate to the newly developed global value chains (GVCs) in both trade and knowledge linkages (Abonyi & Slyke, 2010). Advocates of laissez-faire economic policies often note the benefits of orienting policies towards a free market framework. In the context of international trade, the literature has extensively noted the positive relationship between enhanced productivity and trade openness (Edwards, 1998), thus advocating liberalized trade policies aiming to integrate the economies together with the international market. Furthermore, based on a study by Li, Lui, & Parker (2001), productivity gains from international trade on domestic firms in China are amplified within market-oriented policies that facilitate competition with local firms. Chuang (1998) claims that openness is a prerequisite but not a *sufficient* condition for improved growth; productivity gains are contingent on the specified trading partners, that do or do not aid in contributing to technology spillovers. The maximum benefit of trade arises in improved trading networks with more technically advanced, developed countries.

Moreover, a study on the productivity of the Indian industrial sector revealed that efficiency levels improved after liberalization policies, especially in foreign owned firms; an interesting observation of this study indicates that the significant impact of liberalization only impacting "scientific" or technically oriented firms, and spillovers only significantly affected domestic firms that invest in research and development (Kathuria, 2002). This presents an important concept which is emphasized throughout this paper; the available stock of inputs and their *existing* productivity levels (commonly referred to as the "absorptive capacity") is essential in maximizing spillover benefits from trade and FDI. Another study on 16 industrial countries also emphasize the relationship between total factor productivity growth and openness but on the condition that openness is associated for foreign knowledge spillovers (Madsen, 2009), hence reiterating the point above regarding the importance of trading with advanced, developing countries that potentially offer more progressive technology.

Trade openness and liberalization has its benefits, but one must consider to case of FDIs separately, as the dynamics influencing inflows slightly differ than those pertaining to trade. Many studies have indicated the positive impact of FDI on improving the technical efficiency levels, total factor productivity and real GDP growth (Arazmuradov & Scotti, 2014). For instance, Hejaz & Safarian (1999) conclude in their study that technology spillovers are larger from FDI or multinational production than through international trade. Another study on US manufacturing firms between 1987 and 1996 indicates that FDI results in massive productivity gains for domestic firms, especially in high-tech sectors, and results were more significant for FDI in comparison to imports (Keller & Yeaple, 2009). Furthermore, a study on the Korean manufacturing sector over the period 1970 to 2000 reveal a significant impact of trade and FDI on domestic productivity (Singh, 2004). Also, specifically for the case of selected Arab countries, FDI spillover effects are truly realized with the presence of improved institutional factors (Al-Shammari & Al-Rashid, 2017). Thus, based on this overview, the gains from trade and more importantly FDI are massive and are mostly amplified within a liberalized policy framework and with interactions between more advanced economies, inducing greater competition and efficiency in domestic firms.

2.2 The Dutch Disease and The Gulf Cooperation Council: The "Rentier State"

After acknowledging the potential gains from trade and FDI, it is important to implement these dynamics within the context of the GCC economies. This pertains to the classification of the rentier

state which these economies entail, emphasizing their dependency on oil as a major source of income. This characterization brings about crucial economic implications that can be observed through the effects of the Dutch Disease. This phenomenon is examined through its associated spending and resource movement effects which tend to arise by having an inflow of wealth through natural resources or foreign aid. The spending effect implies that the rise in domestic income from the natural resource sector leads to higher aggregate demand in both the tradeable and nontradable sectors, which leads to an increase in the prices of nontradable relative to tradeable, leading to a real appreciation of the local currency (Venables, 2016). This real appreciation makes the tradeable exports less competitive since the home currency where the natural resource is present has now appreciated against other currencies, thus leading to a spending effect. The resource movement effect implies that the higher demand in nontradable sector and booming oil sector, leads to a rise in prices in nontradable goods which causes resources such as labor to be shifted from the tradeable to the nontradable sector, driving average wages upward. As a result, the tradeable sector is crowded out or squeezed, and the economy's inputs are mostly directed to the nontradable sector.

Thus, the Dutch Disease leads to an underperforming tradeable sector and less competitive exports which induces the economy to increase imports to satisfy the shortages in the tradable sector (Van der Ploeg, 2011). The tradable sector mostly refers to the manufacturing sector, which tends to be under-performing with unmet growth potentials (Sachs & Warner, 2001). For the case of the GCC, the resource movement effect is most prominent and evident especially when looking at the underperforming non-oil sectors and lack of diversification. Furthermore, the underperformance is also observed throughout the economy, especially in the public sector as the "paradox of plenty" often associates resource dependence with the lack of political participation due to the generous government spending packages (Hertog, 2010). This also implies that the reliance on oil rents has removed the incentive to achieve greater development and progress, hence causing non-oil growth levels to be sluggish. Therefore, the classification of the rentier state not only leads to Dutch Disease symptoms, notably the resource movement effect, but is also associated with the lack of incentives leading to further technical deficiencies. This serves as an important factor in determining the optimal policy options, that should not only aim to diversify the sources of income, but to also search for determinants that might promote and encourage development and progress throughout the economy, such as competition and knowledge transfers induced by trade and FDI.

2.3 Overcoming the Resource Curse: Diversification and the Manufacturing Sector

As mentioned above, one way to tackle the detrimental effects of the resource curse is to focus on ways to develop the manufacturing sector, as it has great potential to diversify the economy and to serve as a source of *sustainable* economic development. This provides appropriate justifications for GCC economies to invest more in these sectors through subsidies, as capital-intensive economies tend to be more productive and achieve higher income levels (Espinoza, Fayad, & Prasad, 2013). This has already begun to take shape in the Dubai model which used oil income to create growth based on service provisions, which attracted FDI, achieved high value-added products and achieved diversification (Hvidt, 2009). This newly gained economic growth has enabled Dubai to promote development within local firms and business, and increased investment levels. The economic policies also tend to support liberalist, free-market policies promoting economic openness and embracing the benefits of globalization, which is something rare within the context of the GCC economies (Hvidt, 2011).

The success that Dubai has observed has encouraged neighboring Gulf states to embrace the proponents of the Dubai model, aiming to achieve diversification, growth, and globalized benefits, hence leading to re-envisioning the traditional rentier state classification (Hvidt, 2011). For the purpose of this paper, the emphasis lies in examining the role of trade and FDI to achieve this desired diversification in lieu of resource dependence. This might be difficult to achieve not only due to the GCC's un-liberalized policies, but also because of the heavy reliance on resource exports; this reliance may lead to the crowding out of non-oil exports that actually drive economic growth (Venables, 2016). Nonetheless, the benefits of trade and FDI inflows both in terms of promoting competition and in the manufacturing sector, but also pertaining to incoming knowledge spillovers, that together lead to enhanced total factor productivity levels and independence from the hampering effects of the resource curse.

3. Methodology

3.1 Estimating the Determinants of Manufacturing Productivity: A Linear OLS Approach

The theoretical basis of which the empirical analysis is based on relies on the concepts offered by the Solow growth model, specifically in its interpretation of the Solow residual. In this paper, the main aim is to measure how much growth in the manufacturing sector increases through various

determinants of production; this includes elements of the basic production function, capital and labor with the edition of the residual which measures the contribution of technical progress. Since the primary focus is on examining the role external trade towards developing the productivity of the manufacturing sector, the Solow residual will represent the technological progress brought about by the influx of foreign direct investment and trade. Starting off with the basic production function (1),

$$Y(t) = F(K(t)A(t)L(t)) \tag{1}$$

where $Y(t)$ (the output at time t) is a function of $K(t)$ (capital at time t), $L(t)$ (labor at time t) and $A(t)$ (technology or "knowledge" at time t). By examining the impacts of specific determinants of growth using growth accounting empirics, the production function takes the form (2),

$$\frac{\dot{Y(t)}}{Y(t)} = \alpha_k(t)\frac{\dot{K(t)}}{K(t)} + \alpha_L(t)\frac{\dot{L(t)}}{L(t)} + R(t) \tag{2}$$

where $\alpha_k(t)$ is the elasticity of output with respect to capital at time t, and $\alpha_L(t)$ is the elasticity of output with respect to labor at time t; $R(t)$ represents the Solow residual which illustrates the sources of growth other than the contribution of capital accumulation or labor (Romer, 2012). Hence, building on this theoretical framework, the empirical model will take the following form (3),

$$ManuVA = \alpha + Labor + Capital + OilRents + BoP + FDI + \varepsilon \tag{3}$$

The endogenous variable represents the productivity of the manufacturing sector, $ManuVA$, which is estimated by the manufacturing value added. The exogenous variables constitute $Labor$ estimated by the total labor force in thousands, capital $Capital$ estimated by the percentage of government expenditure towards gross fixed capital formation, $OilRents$ (oil rents) measured as a percentage of GDP, BoP measured by the balance of payments' net current account (US Dollars at current prices in millions), and FDI measured by foreign direct investment as a percentage of GDP. In this empirical application, the two variables, BoP and FDI aim to test whether exposure to international trade and foreign investment can serve as the Solow residual, improving productivity of the manufacturing sector from sources other than the contributions of labor and capital. The

inclusion of the oil rents variable is crucial as the analysis focuses on the largest group of oil exporters in the world; hence, in order to improve the total explained variations in the model, oil rents must be included especially in lieu of the implications of the Dutch Disease and resource curse indicated above. The model is tested based on a linear pooled OLS panel regression.

3.2 Estimating the Technical Efficiency of GCC Manufacturing Sectors: An SFA Approach

The second part of the empirical analysis will aim to test the specific levels of technical efficiencies in the GCC region's manufacturing sectors. Technical efficiency refers to maximizing output using minimum inputs, or improving the *productivity* of selected factors of production. For the case of this analysis, the technical efficiency of each of the six GCC economics is measured using a panel Cobb-Douglas stochastic frontier analysis approach used by Battese and Coelli (1988). The general production function including the deterministic component $x_i\beta$, the normally distributed, random error (noise) term v_i and the non-negative, random inefficiency term u_i takes the following form,

$$y_i = x_i\beta + v_i - u_i \tag{4}$$

Using this framework of including both the inefficiency terms as well as the error term, the stochastic approach is applied to measure the GCC growth frontiers augmented with trade, FDI, and oil rent components to minimize the error. Including the inefficiency term will clarify whether productivity levels are accounted for by external or environmental factors, or if they are determined by inefficient growth patterns. The SFA model will hence take the following form,

$$\begin{aligned}\ln(ManuVA) = {} & \beta_0 + \beta_1 \ln(Labor) + \beta_1 \ln(Capital) + \beta_1 \ln(BoP) + \beta_1 \ln(FDI) \\ & + \beta_1 \ln(OilRents) + v_i - u_i\end{aligned} \tag{5}$$

Since these growth models are assumed to not be necessarily dependent on time, as the time frame covering 34 years is not reflective of long-term trends, the SFA model will be estimated using a time-invariant inefficiency model. Using the methodology by Battese and Coelli (1988; 1995), the technical efficiency is calculated based on the following formula,

$$TE_i = \frac{\exp(x_i\beta + v_i - u_i)}{\exp(x_i\beta + v_i)} = \exp(-u_i) \tag{6}$$

Where TE_i is a value between 0 and 1, with 1 meaning that the productivity of each country is technically efficient. In other words, technically efficiency can be defined as the ratio of the observed output to the stochastic frontier output. Furthermore, under Cobb-Douglas assumptions, estimated parameters would be interpreted whereby the production elasticity for i^{th} input is $E_i = \beta_i$ and the scale elasticity would be $\varepsilon = E_1 + E_2$. For the case of this analysis, embedded commands within the STATA12 software will be used to estimate the stochastic frontier model for the panel dataset, and the technical efficiency and inefficiency terms for each GCC country.

4. Data Description

The dataset used in the empirical analysis consists of a panel data for the six GCC economies including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates for the time period between 1980 to 2014, constituting a total of 34 years. The data for the manufacturing value added, the total labor force, the expenditure towards gross fixed capital formation, and the balance of payments' current account is extracted from the United Nations Conference on Trade and Development database (UNCTADSTAT). Moreover, the data for oil rents, and foreign direct investment is extracted from the World Bank's World Development Indicators database (WDI). The variable for capital accumulation was originally the measure of gross fixed capital formation in absolute terms (in current US dollars) from the World Bank WDI database, however, due to missing data, the GDP expenditure towards gross fixed capital formation from UNCTADSTAT is used as a proxy for capital. Furthermore, trade openness was originally aimed to serve as the exogenous variable of choice through the World Bank's estimate of trade as a percentage of GDP; similarly, due to excessive missing values, a proxy for trade effectiveness was used through the balance of payment's current account valuation from UNCTADSTAT. These changes were necessary in order to produce the most robust results.

5. Empirical Results and Analysis

Building on the theoretical implications of the Solow growth model, the following subsections present the applied empirical models, aiming to investigate the potentials and trade and foreign direct investment in serving as the Solow residual, towards improving the productivity of the manufacturing sector in the GCC region. The first subsection presents the general growth model, and the second subsection presents a further analysis, based on the general model's results, illustrating the impact of oil rents on the volume of FDI as a percentage of GDP.

5.1 The Determinants of Manufacturing Productivity

The empirical results of the pooled OLS panel regression follow the theoretical implications of the basic production function by indicating a positive, significant relationship between the inputs (labor and capital) and the growth of the manufacturing value added[2]. Furthermore, the proxy for trade exhibits a positive, significant relationship with manufacturing productivity, which supports the hypothesis of this paper in presuming the role of trade in serving as the Solow residual. However, as shown in Table (1)[3], the level of FDI indicates an insignificant relationship to the endogenous variable, which is surprising, especially since FDIs serve as major contributors of technology spillovers.

An explanation for this insignificant relationship can be explained by looking at the significant, *negative* relationship between oil rents and manufacturing productivity. This observation clearly illustrates the implications of the Dutch Disease, whereby the dependence on oil revenues through the dynamics of the rentier state classification, imply that the tradable sectors are crowded out through the resource movement effect. Hence, the results indicate the potentials of trade towards developing the manufacturing sector, but it is not meeting its maximum benefit since FDIs are insignificantly affecting the productivity level, despite the evident technology and knowledge spillovers that FDIs offer host countries. Based on this result, it is possible to conclude that FDIs might be harmed because of the dependence on oil revenues for achieving desired growth levels. Building on this result, the following subsection presents an extension to this general model, aiming to investigate the relationship between FDI and oil rents.

5.2 Foreign Direct Investment and Oil Rents: A Crowding Out Effect

As can be seen in Table (2), capital accumulation is statistically significant and positively associated with FDI levels in the GCC economies. However, labor exhibits a surprising negative, slightly significant (based on a benchmark p-value of 5%) relationship with FDI. This can be explained by

[2] In order to avoid the problem of heteroscedasticity tested through the Breusch-Pagan test, the results are based on a robust standard error type model. Furthermore, no issues of multicollinearity existed based on the evaluation of the variance inflation factor values for each exogenous variable.

[3] All output tables are presented in Appendix B.

the deficiency of the labor force's ability to contribute to the economies' *absorptive capacity* due to the lack of technical skills, for instance. Moreover, when looking an oil rents, a significant, negative relationship is noted with FDI levels, which supports the conclusions made based on the results of the general model above.

Thus, heavy reliance on oil rents as a major source of income seems to be a main factor in deterring the potential benefits of knowledge and productivity spillovers in the manufacturing sector, of which diversification could be achieved. These empirical results evidently present the potential of greater integration within the globalized market through trade and FDI, however, the benefits yielded cannot be fully grasped within the rentier state classification. Hence, policy implications must be conducted in an effort to not only aim to embrace globalization, but also focus on internal economic structuring of which *oil dependency* is dampened, with a greater focus on other sources of economic growth, especially in a sustainable level.

5.3 A Stochastic Frontier Analysis of Manufacturing Productivity

Before interpreting the panel SFA model[4], it is important to test the significance of the technical inefficiency in the production function for the GCC economies by looking at the null hypothesis which is $H_0: \gamma = 0$ and indicates that if gamma γ is close to one then there is technical inefficiency present[5]. In the case of this paper's model, γ values to be 0.447 which means that 44% of the total variation in the manufacturing value added is accounted for by the inefficient term and 56% is accounted for by random errors (or noise). Based on this inference, it is possible to conclude that an OLS estimation of the impact of inputs and environmental factors (trade variables and oil rent) is an adequate representation of the data analysis, as the inefficient terms accounts for less than 50% of total variation in the dependent variable.

However, applying the log-likelihood test to test the goodness-of-fit of the OLS or SFA models, the value of the log likelihood of the model is -70.277 with a p-value of 0.000 which means that the null hypothesis (of using the OLS regression) is rejected, indicating that the inefficiency term is in fact

[4] The panel SFA model was estimated using the "xtfrontier" built-in command in STATA12.

[5] This methodology is based on Bettese & Coelli's (1995) paper as well the applications made by Hamidi (2016) which serves as the "landmark paper" for this quantitative SFA study, and Alsarhan, Al-Shammari, & Alenezi (2015).

valuable to this analysis. Hence, using the SFA regression is necessary to evaluate the performance of the GCC manufacturing sectors. Furthermore, testing the distribution of the inefficiency term, the value of μ is 0.371 with a p-value of 0.343 which means that the null hypothesis $H_0: \mu = 0$ is not rejected, and the inefficiency terms have a half-normal distribution (truncated at zero) as opposed to a truncated normal distribution. This also indicates that the manufacturing sectors are operating on the technical efficient frontier and that the random technical efficiency are zero.

After conducting the necessary hypothesis testing procedures, it is now appropriate to interpret the results of the SFA model. Based on the output table (Table 3) using a time-invariant efficiency model, a 1% change in labor and capital (the basic inputs in the typical production function) leads to a 54% and 60% change in the manufacturing value added for GCC countries respectively, based on the interpretation of the production elasticities of a Cobb-Douglas function. Furthermore, both inputs significantly affect the productivity of the manufacturing sector. Looking at the selected environmental factors, a 1% change in the current account, and oil rent leads to a 14% and -83% change in the productivity of the manufacturing value added, respectively. However, foreign direct investment exhibits an insignificant impact on the manufacturing sector's productivity which reiterate similar results as the basic OLS regression above.

Based on the results thus far, it seems that environmental or external factors seem to affect manufacturing productivity more than the inefficient aspect of country performances. To observe the magnitude of the technical efficiencies and inefficiencies for each country, the production elasticities were calculated in Tables (4) and (5) respectively[6]. The overall mean value of the technical efficiency elasticities for the GCC region is estimated to be 75% with a 15% standard deviation, in comparison to the technical inefficient elasticities estimated to be 31% with a 21% standard deviation. This shows that the overall ability of the GCC economies to utilize its inputs by maximizing output, considering the trade and oil rent factors, is relatively efficient. Table (6) displays the time-invariant production elasticities for each of the six GCC economies; results show that the lowest levels of technical efficiencies in the manufacturing sector are in Oman and the United Arab Emirates with 60% and 52% elasticities respectively. The highest level was found in Bahrain with a 93% technical efficiency value. The results may be surprising especially for a diverse, open, and growing economy such as the United Arab Emirates, however, the low levels of

[6] All estimates of production elasticities were calculated based on built-in STATA12 commands: "predict te" and "predict u" based on the methodology of Battese and Coelli (1988).

technical efficiency may be due to the fact that the UAE economy is geared towards its services sector relatively more than its manufacturing sector (especially as an international financial hub).

6. Conclusions

Based on the implications of the Dutch Disease and oil dependence, the inputs and resources within the GCC economies are presumed to have shifted mainly to the booming oil sector, leaving other sectors such as the manufacturing sector, unproductive and inefficient. This leads to unrealized growth potentials, offered by the potential of achieving diversification and technical efficiency. This paper investigates the role of trade and FDI as determinants of greater productivity in the manufacturing sectors. Results indicate that trade does positively impact the value added levels, supporting the advantages of embracing globalization, but FDI inflows insignificantly affected productivity levels, despite their potential spillover effects. The reasoning is based on the observed negative relationship between oil rents and manufacturing productivity, as well as between FDI levels in the extended regression output, emphasizing the crowding out effect generated by oil dependency. Hence, the benefits of openness are realized within the GCC economies, but are not fully absorbed because of the hindering effects of oil dependency, that squeeze out other potential sources of growth.

The stochastic frontier analysis presented a clear picture regarding the actual magnitude of technical efficiency in the GCC manufacturing sectors. Overall, it seems that the region has had efficient outcomes, however, certain countries have had lower efficiency that others mainly attributed to the skewedness of their resources to other respective sectors. It is important to note however, that even though in some GCC countries like Bahrain for example, had high technical efficiency levels, it still has not reached its frontier, which is where trade liberalization and economic integration comes into play. As shown in the basic linear regression, trade significantly affects productivity levels, and thus, orienting policies towards free trade can not only allow the GCC region to reach their productivity frontiers, but may also allow them to *expand* their growth potentials through the intellectual spillovers offered by trade and foreign direct investment.

Another important conclusion pertains to the different levels of technical efficiency within each GCC economy. Countries with lower manufacturing productivity levels such as the UAE and Oman may benefit more from greater economic integration, as it will allow them to catch-up through learning-

by-doing effects. However, it is important to note that growth in other sectors might be more efficient to orient inputs towards, as in the case of the UAE; as mentioned earlier, the UAE is building itself a reputation as a financial hub, thus directing its inputs towards its services sector. That might be more efficient that focusing on the manufacturing sector, given the greater rate of return of the services sector. Nonetheless, gains from trade especially pertaining to knowledge spillovers and technical know-how, is potentially beneficial across all sectors, as it will help boost local human capital levels and improve upon the existing level of technology.

7. Policy Recommendations

The key element to fully realizing the benefits of trade and FDI is to focus on economic restructuring within the GCC region. This entails focusing on achieving a greater degree of economic openness, improving local absorptive capacity levels, and investing in knowledge development as a prerequisite for diversification. As mentioned above, one of the main challenges facing the GCC economies in terms of achieving sustainable growth levels is the existing low productivity levels and education outcomes (Arab Sustainability Report, 2015). This is partially due to resource dependence and the outcomes of the "paradox of plenty", however, the issue also lies within local government policies that don't orient subsidies towards research and development, to promote knowledge creation and "learning by doing" effects. Public investments coupled with a greater degree of openness and liberalization support innovation and productivity, especially in the manufacturing sector (Abonyi & Slyke, 2010). Economic openness has been associated with faster productivity growth (Edwards, 1998), and hence is deserving of attention in terms of shaping public investments and policies. Such investments can be in the form of government initiatives involving training plans, skill development, and targeted SME-development policies (Abonyi & Slyke, 2010). This will not only achieve greater productivity, but will also serve as a source of improved absorptive capacity levels, attracting greater FDI levels and further improving efficiency gained from knowledge spillovers.

Specific policy options for creating a "knowledge economy" in the GCC region would be to orient subsidies as tools for industrial policies, contributing "to a broader plan to support businesses with a view to diversifying the economy and creating jobs" (Espinoza, Fayad & Prasad, 2013). Furthermore, oil wealth should be distributed through investments in particular elements of knowledge such as human capital and labor productivity, which would alleviate these deficiencies to achieve maximum growth potentials. The method of distributing oil wealth tests the implications

of public investments in promoting long-term growth in both the public and private sectors as suggested by Sachs (Soros, 2007). Building on that notion, investment orientations to enhance knowledge may revolve around certain determinants such as foreign direct investments (FDI), small and medium-sized enterprises (SMEs), and intra-sectoral spillovers within each GCC economy.

Furthermore, another crucial element to improving the absorptive capacity in the region pertains to the institutional quality level. Institutions in the Arab region are not properly handling important issues such as intellectual property rights, and environmental regulations (Arab Sustainability Report, 2015); these deficiencies are hampering the full potentials of trade, as it has prevented the region from fully integrating with the World Trade Organization (WTO). Moreover, institutional quality is especially important for the case of FDI inflows, even more so than trade, and assists in promoting economic integration with the rest of the world (Gopinath & Echeverria, 2004). Hence, all these policy options are interconnected whereby the absorptive capacity improved by policies oriented towards promoting productivity, would encourage greater openness, attracting greater FDIs, and thus amplifying productivity gains and knowledge creation.

8. Further Research

Further research can be made by analyzing individual GCC countries' determinants of manufacturing productivity using time series analysis. With this modeling approach, a *causal* relationship between manufacturing technical efficiency and various determinants of knowledge development including trade and FDI can be evaluated through the Granger-causal co-integration test. Furthermore, other determinants of productivity in the manufacturing sector should be analyzed at a both microeconomic and macroeconomic level. Microeconomic variables can include internal governance quality, the potentials of SMEs, and human capital indicators such as education outcomes. This can provide an in-depth analysis of the determinants of knowledge in the manufacturing sector, in order to build policy implications on how these factors can be developed or improved to achieve greater diversification within the GCC economies.

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Appendix A: Figures and Charts

Figure 1: The Resource Curse 1970-1989 (Sachs and Warner, 2005)

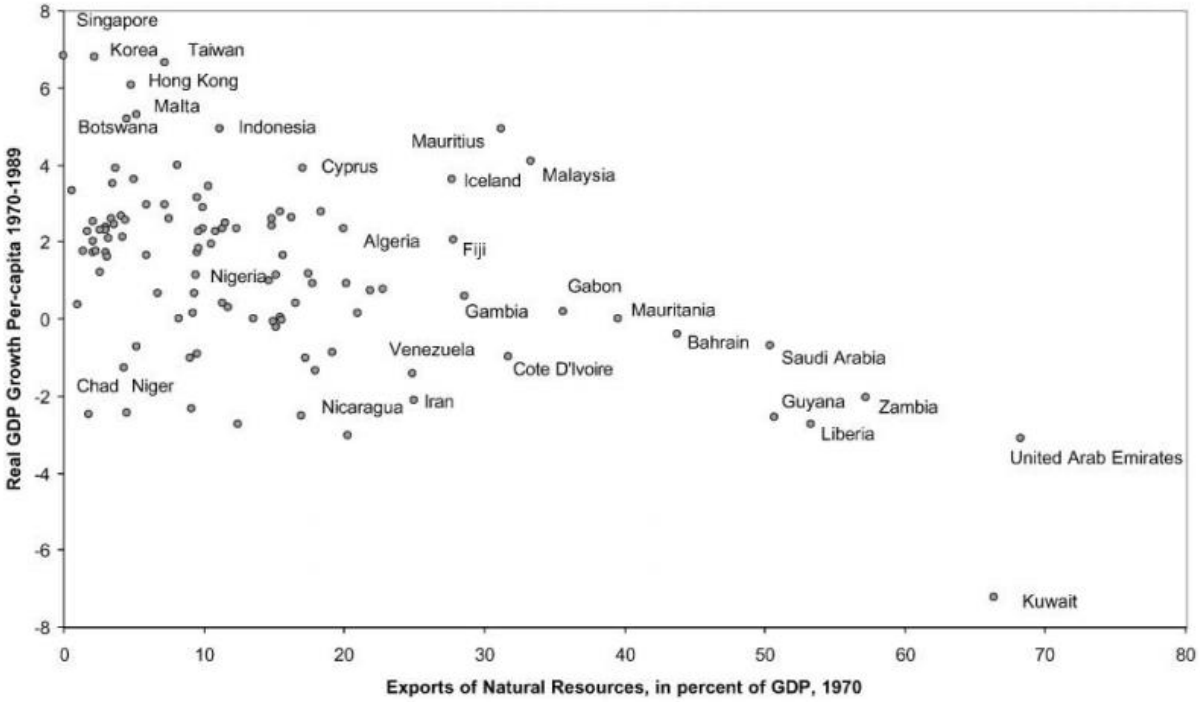

Figure 2: Government Expenditure % of GDP in the GCC 2013-2017

Country	2013	2014	2015	2016	2017	Estimates Start After
Bahrain	30.042	31.077	34.828	36.143	34.658	2015
Kuwait	38.146	44.281	56.335	56.371	51.722	2014
Oman	45.2	46.939	55.033	51.511	49.134	2015
Qatar	27.85	32.781	40.955	42.693	40.474	2015
Saudi Arabia	35.637	40.346	41.342	36.179	33.095	2015
United Arab Emirates	30.445	32.334	30.584	30.036	28.321	2014

Source: IMF World Economic Outlook Database, October 2016

Appendix B: Empirical Output Tables

Table 1: The Determinants of Manufacturing Productivity*

Dependent Variable: ManuVA	Coefficients	Robust Standard Error	t-Statsitic	P>t	Standardized Beta Coefficient
Labor	1.333781	0.1689988	7.890	0.000	0.2400341
Capital	0.2937386	0.0299521	9.810	0.000	0.6888157
Oil Rents	-57.51985	17.12314	3.360	0.001	-0.0587701
BoP	0.0563784	0.0181801	3.100	0.002	0.1204125
FDI	-31.33319	37.01457	0.850	0.398	-0.0088706
Intercept (β_0)	1174.533	596.447	1.970	0.050	

*The estimated model's R-squared value = 97.8%

Table 2: The Relationship between Oil Rents and FDI**

Dependent Variable: FDI	Coefficients	Standard Error	t-Statistic	P>t	Standardized Beta Coefficient
Labor	-0.0002468	0.0001335	1.85	0.066	-0.1569068
Capital	0.0000303	0.0000103	2.94	0.004	0.251195
Oil Rents	-0.0637108	0.0226924	2.81	0.005	-0.2299345
Intercept (β_0)	3.835797	0.9257666	4.14	0.000	

**The estimated model's R-squared value = 7.1%; the low R-squared value is due to the lack of additional variables explaining the intensity of FDI in the GCC economies. Despite this deficiency, the purpose of this supplementary model is to further emphasize the negative impact of oil dependency on productivity in the manufacturing sector *through* its negative impact on FDI levels.

Table 3: Stochastic Frontier Analysis of Manufacturing Productivity

Dependent Variable: ln(ManuVA)	Coefficient	Standard Error	z-Statistic	P>z	95% Confidence Interval	
ln(Labor)	0.543	0.125	4.360	0.000	0.299	0.787
ln(Capital)	0.604	0.086	7.040	0.000	0.436	0.772
ln(BoP)	0.144	0.038	3.830	0.000	0.070	0.218
ln(FDI)	-0.030	0.021	-1.460	0.145	-0.070	0.010
ln(Oil Rents)	-0.826	0.140	-5.890	0.000	-1.100	-0.551
Intercept (β_0)	1.001	0.685	1.460	0.144	-0.341	2.342
/mu	0.371	0.392	0.950	0.343	-0.396	1.139
/lnsigma2	-1.314	0.512	-2.570	0.010	-2.317	-0.311
/ilgtgamma	-0.212	1.148	-0.180	0.854	-2.462	2.039

sigma2	0.269	0.138			0.099	0.733
gamma	0.447	0.284			0.079	0.885
sigma_u2	0.120	0.137			-0.148	0.388
sigma_v2	0.149	0.019			0.112	0.185

Table 4: Regional Technical Efficiency

Variable	Observations	Mean	Standard Deviation	Min	Max
Technical Efficiency	211	0.752	0.149	0.515	0.930

Table 5: Regional Technical Inefficiency

Variable	Observations	Mean	Standard Deviation	Min	Max
Technical Inefficiency	211	0.308	0.213	0.074	0.665

Table 6: Country-Specific Manufacturing Production Elasticities

Country	Technical Efficiency	Technical Inefficiency
Bahrain	0.930	0.074
Kuwait	0.892	0.116
Oman	0.598	0.516
Qatar	0.788	0.240
Saudi Arabia	0.789	0.239
United Arab Emirates	0.515	0.665