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Investigating the Impact of Oil Rents, Foreign Direct Investment and Exports on Productive Capacity: Concentrating on Spatial Analysis for the Gulf Cooperation Council Countries

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Abstract

Oil rents play a significant role for oil-abundant countries; therefore, most oil-abundant countries depend on oil sectors. However, if gains from oil rents are not invested in productive sectors, it may adversely affect long-term sustainable growth. As discussed in the relevant literature in the scope of the resource curse hypothesis or Dutch disease, dependence on natural resources may crowd out productive investment, resulting in decelerating economic growth (GDP). However, crucial policies emerge that suggest that oil rents contribute to or dampen productivity in oil-rich countries. It is observed that few studies have considered the role of oil rents in productive capacity, which is crucial for sustainable economic development. Therefore, the study attempts to research investigate the impacts of oil rents in productive capacity for a panel sample of the GCC countries from 2000 to 2021 by adopting spatial panel econometric techniques: the spatial autoregression (SAR) model, the spatial error model (SEM) and the spatial Durbin model (SDM).

The empirical findings point out that despite oil rents having a negative impact on productive capacity in the GCC countries, there is no spatial effect on productive capacity. This result indicates that change in oil rents in any member of the GCC does not spread to other members. Moreover, inward foreign direct investment has positive local and spatial impacts on productive capacity. Although merchandise exports have a positive spatial impact on productive capacity, there are no local effects. Finally, economic growth has negative local and spatial impacts on productive capacity. In line with empirical findings, some policy insights can be offered, namely that policymakers in the GCC countries should direct oil rents to productive investments to capture long-run sustainable development. Moreover, policymakers should encourage foreign direct investment in productive sectors.

Keywords: Oil rents, natural resources, economic growth, productive capacity, spatial econometrics, GCC countries

JEL Classification: O13, F21, F43, C21, Q33

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1. Introduction

In developing countries, researchers, scholars and policymakers have paid great attention to factors determining economic development. Therefore, there is an enormous body of literature concentrating on determinants of economic development. Among many factors, natural resources (NR) are of special interest to many developing countries because there are different ways to increase economic development. For example, NR include food, raw materials, required inputs and energy. Also, through exporting NR, countries can increase foreign revenue (Adabor *et al*., 2022). However, from the perspective of the resource curse hypothesis (RCH; Auty, 1993), it is pointed out that NR can dampen GDP. One of the main explanations of that hypothesis is that dependence on NR may crowd out non-resource investment, contributing to GDP. It causes reallocation of resources from the productive sector to primary production. Thus, it adversely affects both domestic sectors. Moreover, it causes an appreciation of the real exchange rate during the expansion of resources, resulting in reduced competitiveness (Yilanci *et al*., 2022; Badeeb *et al*., 2023; Kouas *et al*., 2024). However, the debate on the nexus between NR and GDP is still continuing and scholars are testing the RCH (Shahbaz *et al*., 2019). In the relevant literature, the empirical results are mixed. For instance, some studies (Asif *et al*., 2020; Rahim *et al*., 2021; Zheng *et al*., 2023) have verified the RCH; in contrast, some studies (Hannan and Mohsin, 2015; Bindi 2018; Shahbaz *et al*., 2018; Liang *et al*., 2023) have achieved results contrary to the RCH.

It is obvious that many studies have focused on the impact of NR on GDP. However, a limited number of studies have concentrated on the role of NR in productivity because a lack of productive capacity is one of the critical structural problems in most developing countries. Badeeb and Lean (2017) asserted that productivity is crucial for GDP. Explaining the difference between economic development and measuring productivity is not a new phenomenon. Since the pioneering studies of Solow (1956, 1957), researchers have centred upon measuring total factor productivity (TFP), which covers all factors used in production (Hamilton *et al*., 2019). In growth-accounting estimation, various factors affecting growth are considered to measure productivity (Shebeb, 2016). Thus, in oil-rich countries, measuring the effect of oil rents (OR) on productivity is crucial. There are different mechanisms behind the role of OR in productivity. Firstly, gains from oil exports can be invested in productive fields, including human capital, health, innovation, research and development (R&D) expenditures and renewable energy. Moreover, foreign exchange earnings flow to the financial sector, resulting in an increase in the allocation of funds to investors.

Another way in which OR affect productivity is through human capital. Industrial sectors with a highly skilled labour force may grow remarkably. Therefore, in NR-abundant

countries, NR alone do not enhance industrial development; it also depends on the level of human capital (Oyinlola *et al*., 2020). Venables (2016) argues that NR rents feed the development of the fiscal capacity of countries with a low capital level through enhancing human and physical capital.

In developing countries, the productivity can be directed from external factors including foreign direct investment (FDI). It is commonly recognized that FDI boost productivity by technology spillover and knowledge transfer. The spillover effect of FDI may increase capabilities of domestic firms (Demena and van Bergeijk, 2017). As recognized by several researchers, FDI has close ties with productivity. Along with the spillover effect, FDI promote scaling of production and incentivising competitiveness of domestic firms (Ali and Akhtar, 2024).

The GCC countries play a significant role in oil production and reserves. In 2022, a third of the world's oil was produced in the Middle East (ME) region, with the GCC countries leading the production. Saudi Arabia, the United Arab Emirates (UAE), Kuwait and Qatar are considered rentier states, as their primary income stems from fossil energy sources, particularly oil. However, the UAE has recently implemented a policy to reduce its dependency on oil by increasing investment in tourism and developing the financial system (Puri-Mirza, 2024). In most countries where NR are abundant, the primary problem is low productivity levels. As well-known from the Dutch disease mechanism, since the economy heavily depends on NR, the productivity gap arises between NR sectors and non-NR sectors. Thus, over-investment in NR sectors may ignore the productive sectors that are the driving force of long-run GDP (Aljarallah, 2020). Considering that the GCC countries' economies are mainly structured in the oil sector, a significant question arises as to whether oil rent feeds productivity. In other words, a research agenda on the nexus between *OR* and productivity becomes crucial in the GCC countries.

There are numerous studies on the nexus of NR and GDP (Maalel and Mahmood, 2018; Aljarallah, 2020; Ben Mim and Ben Ali, 2020; Hayat and Tahir, 2021) for the GCC countries; however, given that productivity is crucial for many developing countries, including the GCC countries, the role of OR in productivity comes to the fore. If the GCC countries do not improve their productive capacity through OR, they may face challenges in achieving sustainable development in the long run. Moreover, in the era of globalization, FDI and exports are crucial ways to enhance productivity for many developing countries by incentivizing technological spillover, attracting capital flow and contributing to human development. Therefore, the main motivation of the study is to determine whether OR spark productive capacity in the GCC countries. Based on this motivation, the present study aims to answer the following research questions:

- Do OR contribute to productive capacity in the GCC countries in terms of local and spatial dimensions?
- What is the role of inward FDI in productive capacity in the GCC countries regarding local and spatial dimensions?
- What is the role of exports in productive capacity in the GCC countries in terms of local and spatial dimensions?

In order to achieve these objectives, the present study examines whether OR, inward FDI and exports foster productive capacity in the GCC countries over the period 2000–2021. Overall, the empirical findings of the present study enrich the existing literature and provide significant practical policy implications for decisionmakers and stakeholders in terms of deepening the knowledge of the productivity effect of OR, inward FDI and exports in the GCC countries. Specifically, the present study makes three contributions to existing literature. Firstly, to the best of the authors' knowledge, this is the first study to examine the nexus between the productive capacity, OR, FDI and exports for the GCC countries. Secondly, studies on the determinants of productivity mainly focus on TFP. In the growth economics theory, TFP is seen as a contribution of used inputs to output growth and is solely related to economic factors.

However, in the complex and globalized world, the contents of productivity are changing, and it is important to investigate the role of qualitative factors. Thus, considering the comprehensive indicator may provide narrow results. Therefore, the overall PCI developed by UNCTAD (2024) is performed, covering eight sub-indicators, including natural capital, human capital, energy, transport, information and communication technology (ICT), institutions, structural change and the private sector instead of TFP. Thirdly, spatial econometric techniques are employed instead of traditional econometric methods. Most traditional econometric techniques ignore the spatial dimensions of economic activities. However, in the interconnected and counter-dependent world, the spatial effects of economic activities must be considered. As emphasized by scholars (Anselin, 1988; Mohammadi *et al*., 2023), disregarding the spatial dimensions leads to biased results.

Figure 1: Map of the GCC region

Source: MapChart (2024)

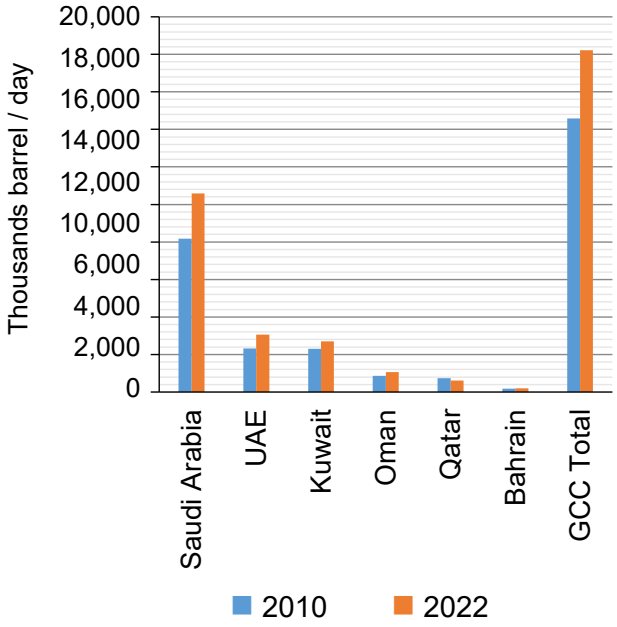
As depicted in Figure 1, it is obvious that the GCC countries have borders among themselves. Therefore, considering the spatial correlation among the GCC countries, it is crucial to implement the appropriate econometric technique.

The remainder of the study is structured as follows: Section 2 presents an overview of oil resources in the GCC countries. Section 3 provides an empirical literature review. Section 4 expresses the data, model and methodology. Section 5 reports empirical findings with a discussion, and the conclusion and policy recommendations are presented in Section 6.

2. Oil Resources in GCC Countries

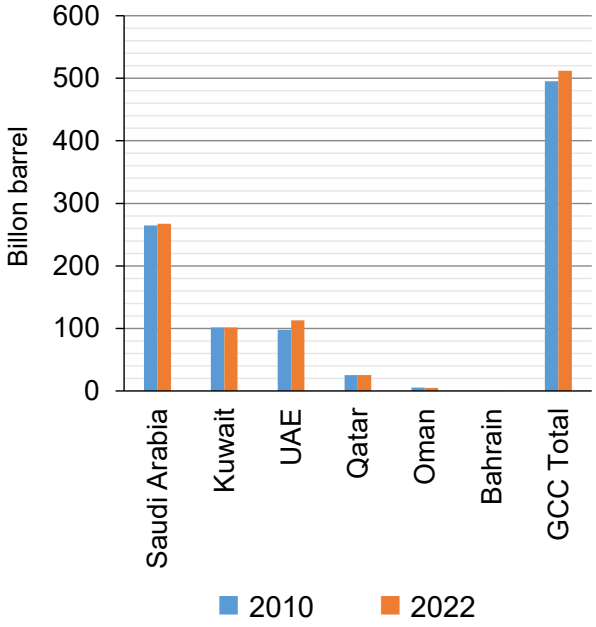
The GCC countries play a significant role in producing natural gas and oil (Ulussever *et al.*, 2024) and primarily rely on oil resources to compete in the global economy (Qudah *et al.*, 2016).

Figure 2: Crude oil production in GCC countries



Source: GCC-STAT (2024)

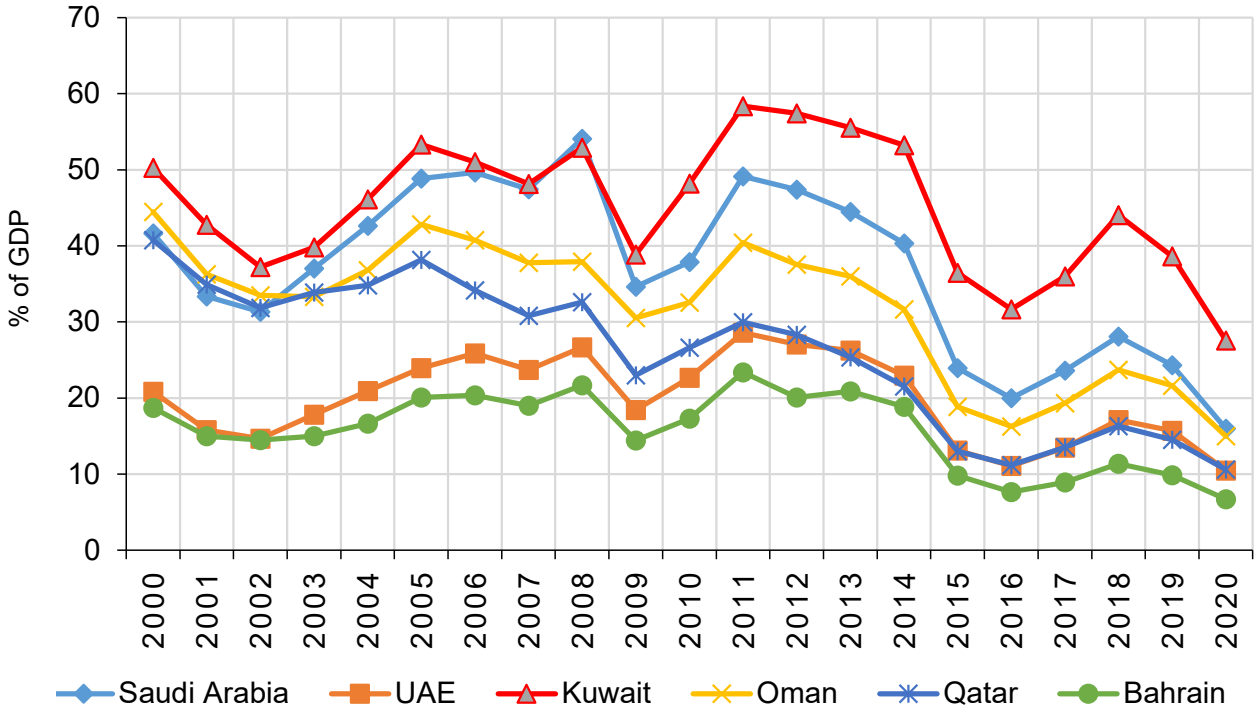
Figure 3: Crude oil reserves in GCC countries



Source: GCC-STAT (2024)

According to Figure 2, the GCC countries produced over 14.5 million barrels of crude oil per day in 2010; this production capacity increased to over 18.2 million barrels per day in 2022. In 2010, Saudi Arabia was the leading crude oil producer in the GCC countries, producing over 8 million barrels per day, which increased to around 10.5 million barrels per day in 2022. Following Saudi Arabia, the UAE produced 3.06 million barrels, Kuwait produced 2.7 million, Oman produced 1.06 million, Qatar produced 600 thousand and Bahrain produced 190 thousand barrels per day in 2022, respectively. In addition, the GCC countries have significant oil reserves. As depicted in Figure 3, the crude oil reserve was approximately 495.4 billion barrels in 2010 and rose to 512 billion barrels in 2022. Likewise to oil production, Saudi Arabia has the highest crude oil reserve among the GCC countries, with around 267.2 billion barrels in 2022. In contrast, Bahrain has the lowest crude oil reserve.

Figure 4: OR in GCC countries



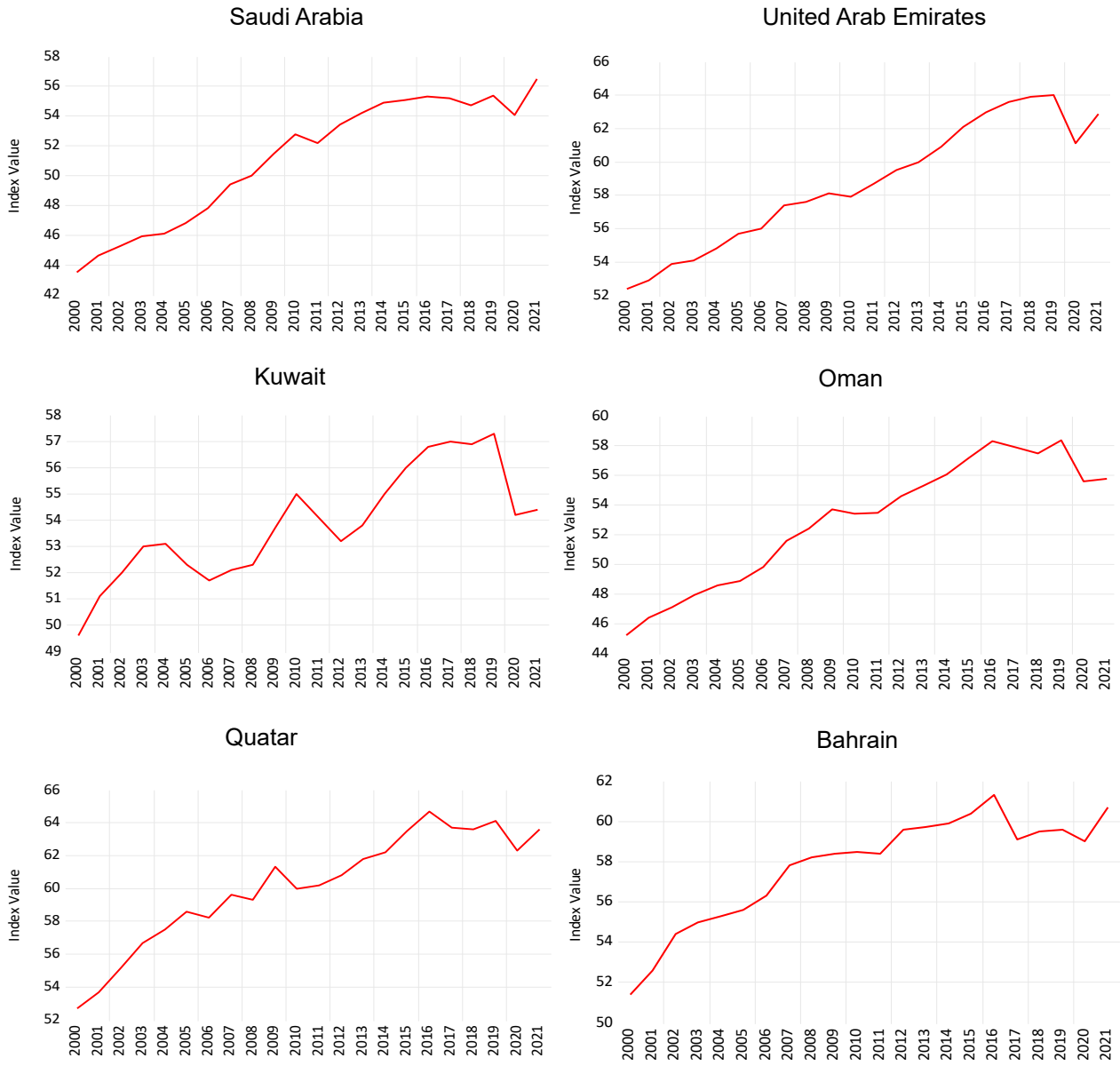
Source: WB (2024)

Despite the significant role of the GCC in oil production and reserves, the OR[1] do not go hand in hand with oil capacity. Figure 4 shows that the OR in the GCC countries fluctuated in the last two decades. All the GCC members showed identical trends during that period. Periodically, there is an increasing and decreasing trend at different times. Different factors affect the fluctuation of OR. For example, in 2000–2009, the global financial crisis (GFC), the 2011–2014 Arab Spring in the ME region and in 2019–2020, the COVID-19 pandemic affected the oil price in the world. The Brent crude oil price declined approximately 70% from $150 per barrel to $40 from mid-2008 to 2009 (ECB, 2012). Moreover, global oil demand decreased during the COVID-19 pandemic and the recovery following the pandemic period was not strong. Even so, it is decreasing, thereby reducing oil prices. According to the IEA (2024) report, global oil demand growth decelerates. More importantly, the Brent oil price is trading around $70/bbl, indicating the lowest level since late 2021. In addition, the higher operating costs of oil production are another factor reducing OR in the GCC countries. As discussed by Vasquez *et al.* (2024), oil-producing countries generally have monopolistic oil market conditions, resulting in higher operating costs than private companies. This

1 According to the WB (2024) OR are the "*difference between the value of crude oil production at regional prices and total costs of production*".

is also true of the GCC countries. Although economies that are dependent on NR realize solid economic development, several factors, including political, geopolitical, natural and social, easily affect the prices of NR and may reduce competitive power in the long run. Thus, most oil-abundant countries may have difficulties enhancing sustainable development in the long run. As investigated and pointed out by several studies, reducing reliance on NR and establishing productive capacity is crucial. From a productivity point of view, countries with abundant NR must improve their productive capacity and allocate resources efficiently to sustain GDP.

Figure 5: Productive capacities index (*PCI*) in GCC countries



Source: Authors´ own elaboration based on UNCTAD (2024) data

In the relevant literature, one of the main criticisms against NR-abundant countries is that they are strongly reliant on NR, which dampens efficient use of economic factors and misallocates resources, reducing productivity. In the case of the GCC countries, it is demonstrated in Figure 5 that productive capacity of all the members increased during 2000–2021. Despite some slight fluctuations, there is an overall upward trend. The PCI rose from 43.5, 52.4, 49.6, 45.2, 52.7 and 51.4 respectively to 56.5, 62.9, 54.4, 55.8, 63.6 and 60.7 respectively over the 20 years. As discussed above, the mainstream studies have concentrated on the RCH in the case of resource-rich countries. However, in order to capture sustainable economic development, managing the factor endowments correctly plays a crucial role.

3. Literature Review

The relevant literature on the nexus between natural rents and productivity is mainly built on testing the RCH or Dutch disease, indicating a negative relationship between NR and economic development. For instance, Adabor et al. (2020) analysed the role of NR rents in GDP in Ghana by using data from 2007–2019. Their empirical results indicate that although OR influence GDP negatively, gas resource rents incentivize GDP. Qudah et al. (2016) studied the impact of the oil sector on global competitiveness for a panel sample of the GCC countries from 2006 to 2014. Their empirical findings show that the oil sector dampens competitiveness while the mining sector influences competitiveness positively. Itaman and Awopegba (2021) tested whether financial flows to the oil and gas sector accelerate deindustrialization in Nigeria using annual data from 1981–2018. They concluded that financial flows, such as domestic bank credit to the oil and gas sector, negatively affect the manufacturing sector. Likewise, Asif et al. (2020) scrutinized the relationship between financial development and NR in terms of the RCH for Pakistan from 1975 to 2017. Their empirical findings showed that coal rents, forest rents, natural gas rents and *OR* are negatively associated with financial development.

Kouas et al. (2024) attempted to shed light on the effect of OR on deindustrialization in China, covering the period 1990–2021. Their empirical outcomes documented the existence of the Dutch disease and indicated a negative association between OR and industrial value added. Taking into account data from 170 countries from 1991 to 2011, Hannan and Mohsin (2015) obtained empirical results that NR positively affect GDP in all regions except South Asia. Kim and Lin (2018) verified the RCH in developing countries using data covering 1990–2012.

Sha (2023) provided empirical results for the G-7 countries by employing data over 2000–2020, showing that NR rents negatively affect GDP, whereas globalization and tech-

nological improvement increase economic development. Satti *et al*. (2013) investigated the nexus between NR abundance and GDP in Venezuela, including the period 1971–2011, and concluded that NR dampened GDP.

In addition, some studies have explored the relationship between NR and productivity. For example, Ahumada and Villarreal (2022) investigated the association between OR, institutional quality and TFP for a panel sample of 15 petroleum exporting countries spanning the period 2008–2019. Their results show that human capital positively influences TFP, whereas OR decrease TFP. Moreover, the interaction of OR and institutional quality fosters TFP. Hamilton et al. (2019) covered a panel of 74 developing countries for the period 1996–2014 and studied the effect of NR on TFP. Their results show that NR contributes to TFP. Awoa and Ondoa (2023) investigated how NR rents influence TFP in 91 countries with annual data spanning the period 1980–2019. Their empirical findings highlighted that TFP growth is lower in resource-abundant countries.

Badeeb and Lean (2017) examined the role of NR in TFP in Yemen by considering data from 1980–2012. The authors documented that NR decrease TFP. However, increasing banking sector performance mitigates the negative effect of NR. Aljarallah (2021) investigated the effect of NR on GDP and TFP in Saudi Arabia with data spanning 1984–2014 and found that NR increase both GDP and TFP in the long run. Al Abri and Al Bulushi (2022) studied the effect of institutional quality on TFP for the GCC countries and pointed out that contract enforcement and property rights contribute to TFP, while regulatory quality affects it negatively.

Debonheur *et al*. (2024) analysed the role of NR rents in human development (HD) in 41 African countries spanning the time 1996–2019. They found that NR rents dampen HD. However, the individual effect of each rent varies. For instance, forestry and natural gas rents have incentives for HD, whereas oil and coal rents are negatively influenced. Farzanegan and Thum (2020) investigated the effect of *OR* on the quality of education for a panel sample of 70 countries from 1995–2015. They found that *OR* have a negative long-run impact on the quality of education.

With regard to FDI, there are several empirical studies investigating the relationship between FDI and productivity. Baltabaev (2014) investigated the effect of FDI on TFP for a panel sample of 49 countries using annual data from 1974–2008. Empirical outcomes indicate that FDI positively influences TFP. Abdullah and Chowdhury (2020) examined the association between FDI and TFP in 77 low- and middle-income countries over the period 1980–2008. Their results showed that FDI does not affect TFP. Tanna (2009) analysed the role of FDI in TFP in the banking sector for a panel sample of 75 countries from

2000–2004 and they found that FDI positively influences TFP in the long term. Liu *et al*. (2016) attempted to determine the association between FDI and TFP in China's electronic sector by using firm-level data covering the period 2003–2008. According to their results, foreign equity participation contributes to TFP. Another study, conducted by Senbeta (2009) for 22 sub-Saharan African countries over the 1970–2000, concluded that FDI improves TFP by increasing technological spillover. Ali and Akhtar (2024) examined the impact of FDI on TFP in Pakistan, considering the role of the effectiveness of exports, physical capital, R&D and human capital spanning the period 1991–2021. They found that FDI, physical capital and human capital increase TFP. Adnan *et al*. (2019) attempted to explore how FDI affected TFP in Bangladesh, Pakistan, India and Sri Lanka over the period 1975–2016. Their empirical outcomes verified the positive effect of FDI on TFP.

Mitze (2014) investigated regional spillovers among FDI, TFP and trade using West German state-level data over the period 1976–2008. According to their empirical results, outward FDI creates positive spatial spillover effects. Moreover, spatial characteristics of FDI inflow and outflow affect TFP in the short run. Malik *et al*. (2021) analysed the determinants of TFP in India by performing annual data covering 1980–2016 and pointed out that FDI does not affect TFP. Yasin and Sari (2022) evaluated the relationship between FDI, TFP, efficiency and technology intensity in Indonesia by using a firm-level dataset for 2007–2015. They documented that *FDI*, technology intensity and absorptive capacity improve TFP. Elheddad (2016) examined the relationship between OR and FDI in the GCC countries from 1980 to 2013 and revealed that OR negatively affect FDI. From another perspective, Mahmood (2023) studied the role of NR (oil and natural gas), trade, FDI and urbanization in carbon productivity in the GCC countries using spatial analysis techniques on data from 1980 to 2021. The author reported that OR negatively affect carbon productivity in domestic economies and GCC countries. In contrast, natural gas rent, trade and FDI were found to increase carbon productivity in neighbouring and GCC countries. Rasheed (2019) studied the macroeconomic determinants of FDI in 14 Asian countries using data from 2003 to 2017. The findings show that macroeconomic variables play a crucial role in half of those Asian countries.

A summary of studies related to NR, GDP and productivity is depicted in Table 1.

Table 1: Literature summary

Study	Sample/period	Methodology	Findings
Gani and Al-Abri (2013)	GCC countries 2003–2010	FE	Political instability and the lack of democracy incentivise inward FDI.
Ashraf *et al.* (2016)	123 countries 2003–2011	AR, system GMM	FDI has no impact on TFP.
Matallah and Matallah (2016)	11 MENA oil exporters countries 1996–2014	Pooled OLS, FE, RE, GMM	OR have a positive effect on GDP.
Aimer (2018)	Oil exporting countries 1997–2015	FE, RE	OR foster GDP.
Majumder *et al.* (2019)	95 countries 1980–2017	PLS, FE, RE	OR reduce GDP. However, trade openness mitigates the negative effect of OR on GDP.
Mohamed (2020)	Sudan 1970–2015	Co-integration, VECM	Resource rents, human capital and financial development dampen GDP.
Liu *et al.* (2021)	China 2002–2013	DIDs technique	The marketization of the pricing of NR raises the TFP of firms.
Badeeb *et al.* (2021)	Malaysia 1970–2018	NARDL	Negative and positive shocks in OR have asymmetric effects on GDP.
Ofori and Grechyna (2021)	43 sub-Saharan African countries 1990–2017	Pooled OLS, FE, RE, GMM	Although forest rents increase GDP, oil and natural gas rents hinder GDP.
Mbingui *et al.* (2021)	Republic of the Congo 1987–2016	VECM	OR reduce GDP.
Saidi and Montasser (2022)	GCC countries 1990–2019	GMM Panel VAR	Two-way causality between FDI and financial development
Cieslik and Hamza (2023)	GCC countries 2009–2017	PPML	Inward FDI is related to horizontal market-seeking rather than vertical efficiency-seeking.
Liu *et al.* (2023)	149 countries 2001–2019	GMM	NR hampers green TFP.
Yang *et al.* (2024)	China 2010–2019	System GMM	NR declines green TFP.

Source: Authors' own elaboration

4. Data and Methods

4.1 Data and model

Our objective is to estimate the impact of *OR*, *FDI*, *EXP* and *GDP* on productive capacity for the GCC countries, covering Saudi Arabia, the UAE, Kuwait, Oman, Qatar and Bahrain, for the period 2000–2021[2]. The time frame of the study is 2000–2021 based on the data availability for the selected variables. For example, data on *OR* start from 2000 and end in 2021; moreover, the *PCI* data start from 2000. Table 2 lists the abbreviations, units of variables and data sources.

Table 2: Description of variables

Symbol	Variable name	Unit of measurement	Source
PCI	Productive capacities index	An overall index value of eight sub-indices covering natural capital, human capital, energy, transport, ICT, institutions, structural change and private sector	UNCTAD (2024)
OR	Oil rents	% of GDP	WB (2024)
FDI	Inward FDI flow	USD at current prices in millions	UNCTAD (2024)
EXP	Merchandise exports	USD at current prices in millions	UNCTAD (2024)
GDP	Economic growth	GDP per capita constant (2015 USD)	WB (2024)

Source: Author's own elaboration

The empirical model is constructed as follows:

$$PCI_{it} = f(OR_{it}, FDI_{it}, EXP_{it}, GDP_{it}) \quad (1)$$

The empirical model in Equation (1) is converted to natural logarithms. Thus, the functional form of the model is rewritten as a semi-logarithmic form and stated in Equation (2):

$$\ln PCI_{it} = \alpha_0 + \alpha_1 \ln OR_{it} + \alpha_2 FDI_{it} + \alpha_3 \ln EXP_{it} + \alpha_4 \ln GDP_{it} + \varepsilon_{it} \quad (2)$$

where α_1, α_2, α_3 and α_4 represent long-term coefficients for ln*OR*, *FDI*, ln*EXP* and ln*GDP*, respectively. Furthermore, *i* denotes cross-section, *t* refers to time and is ε_{it} the error term.

2 The data on *OR* for Kuwait in 2021 were lacking. Therefore, the average value of *OR* for this year was used to form a balanced panel.

4.2 Empirical methodology

We perform spatial econometrics to find out the relationship between variables and cross-sections.

4.2.1 Concept of spatial econometrics

The first law of geography, stated by Tobler (1979), is as follows: "*Everything is related to everything else, but close things are more related than distant things.*" In other words, the dependence and interaction between regions are the main issues of focus in spatial analysis. Therefore, development in any issue may affect the host country and its neighbours (Mohammadi *et al*., 2023).

Spatial econometrics is a subfield consisting of econometric methods that incorporate the spatial effect in cross-section or panel data (Paelinck and Klaassen, 1979; Anselin, 1988). A spatial weight matrix is usually defined to express spatial interdependence, i.e., neighbourhood. These weights represent a measure of interaction or spillover (Ord, 1975). The spatial weight matrix **W** is matrix of dimension $n \times n$ (Gumprecht, 2005), depending on the geographical arrangement or proximity of observations. Spatial econometrics was first proposed by Paelinck and developed by Anselin (1988) (Wang *et al*., 2020). There are different types of spatial analysis techniques. The present study utilizes the spatial autoregression (SAR) model, the spatial error model (SEM) and the spatial Durbin model (SDM). The SAR model covers a spatial lag of the response to induce spatial dependence among nearby regions (Tho *et al*., 2023). The SEM model takes into account the spatial interaction impact of error items and the SDM model includes spatial impact, mechanism, exogenous explanatory variables and spatial errors (Wang *et al*., 2020).

4.2.2 Contiguity weights

This approach assumes the existence of a map with recognizable boundaries (Anselin, 1988). A simple definition of neighbourhood depends on the proximity between two locations. Two locations are said to be neighbours if they share a common boundary. The elements of the two-valued weight matrix **W** are determined according to the following criterion (Arbia, 2006) so that all neighbours of location are represented in the set $N(i)$:

$$w_{ij} = \begin{cases} 1 & j \in N(i) \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

In some cases, the weight matrices are standardized on a row-by-row basis, such that the sum of each row is as follows (Arbia, 2006):

$$\sum_j w_{ij}^* = 1\,;\; w_{ij}^* = \left[w_{ij}\right] / \left[\sum_j w_{ij}\right] \tag{4}$$

4.2.3 Spatial Durbin model (SDM)

The spatial Durbin model follows from the AR(1) process in time series as follows (Mur and Angulo, 2005):

$$\left.\begin{array}{l} \boldsymbol{y} = \mathbf{x}\boldsymbol{\beta} + \boldsymbol{u} \\ \boldsymbol{u} = \rho\mathbf{W}\boldsymbol{u} + \varepsilon \end{array}\right\} \boldsymbol{y} = \rho\mathbf{W}\boldsymbol{y} + \mathbf{x}\boldsymbol{\beta}\theta + \varepsilon \tag{5}$$

W is the weighting matrix; $\boldsymbol{y}$, $\boldsymbol{u}$ and are vectors of order $R \times 1$; **x** is the Rxk matrix of observations of the explicative variables, $\boldsymbol{\beta}$ is a $(k \times 1)$ vector of parameters and ρ is the autoregressive parameter of the SAR (1) process that intervenes in the random term of [5]. The model [5] cannot be estimated by OLS since it causes a simultaneity problem between $\mathbf{W}\boldsymbol{y}$ and the error term ε (Mur and Angulo, 2005). It must hold the condition that $\theta = -\rho\beta$. If the k nonlinear constraints are not rejected in the unconstrained equation, the SAR(1) error term process is obtained. Consequently, the LRCOM Burridge (1981) test should be used. The model can be estimated using the maximum likelihood method.

$$\boldsymbol{y} = \rho\mathbf{W}\boldsymbol{y} + \mathbf{x}\boldsymbol{\beta} + \mathbf{W}\mathbf{x}\theta + \varepsilon, \qquad \varepsilon \sim N(0, \sigma^2 I) \tag{6}$$

$$\begin{aligned} &H_0: \rho\boldsymbol{\beta} + \theta = 0 \\ &H_1: \rho\boldsymbol{\beta} + \theta \neq 0 \end{aligned} \tag{7}$$

If the null hypothesis cannot be rejected, model (6) is induced to the SEM model as follows (Golgher and Voss, 2016):

$$\begin{aligned} &\boldsymbol{y} = \boldsymbol{x}\boldsymbol{\beta} + \boldsymbol{u} \\ &\boldsymbol{u} = \lambda\boldsymbol{W}\boldsymbol{u} + \varepsilon \end{aligned} \tag{8}$$

In the model (8), if $\theta = 0$, model (6) is induced to the SAR model as follows (Golgher and Voss, 2016):

$$\boldsymbol{y} = \rho\mathbf{W}\boldsymbol{y} + \mathbf{x}\boldsymbol{\beta} + \varepsilon \tag{9}$$

$$\boldsymbol{y} = (\mathrm{I} - \rho\mathbf{W})^{-1}\boldsymbol{x}\boldsymbol{\beta} + (\mathrm{I} - \rho\mathbf{W})^{-1}\varepsilon \tag{10}$$

The SAR model is a model that enables an empirical evaluation of the scope and importance of spillover effects. Rewriting the SAR model (9) into its simplified version (10) yields direct and spillover effects (Elhorst and Vega, 2013).

The matrix of partial derivatives of the $E(y)$, with respect to the k-th explanatory variable of **x** in unit 1 up to unit N, is shown below:

$$\left[\frac{\partial E(\mathrm{y})}{\partial \mathbf{x}_{1k}} \ldots . \frac{\partial E(\mathrm{y})}{\partial \mathbf{x}_{Nk}}\right] = (I - \rho\mathbf{W})^{-1}\boldsymbol{\beta}_k \tag{11}$$

$$(I - \rho\mathbf{W})^{-1} = I + \rho\mathrm{W} + \rho^2\mathbf{W}^2 + \rho^3\mathbf{W}^3 + \cdots \tag{12}$$

The global nature of the spillovers generated by these models is a crucial feature. The distinction is explained by Anselin (2003). Equation [12] states that a change in **X** at one place will be sent to all other locations by the matrix inverse, even if two locations are unconnected according to **W**. By contrast, local spillovers are those that take place at other sites without the use of an inverse matrix, that is, solely at those places that are connected by **W** (Elhorst and Vega, 2013). The SDM model includes both endogenous and exogenous interaction effects (LeSage and Pace, 2009; Elhorst, 2010).

To obtain direct and spillover effects, the SDM in a reduced form can be written as:

$$\boldsymbol{y} = (I - \rho\mathbf{W})^{-1}(\mathbf{x}\boldsymbol{\beta} + \mathbf{W}\mathbf{x}\vartheta) + (I - \rho\mathbf{W})^{-1}\varepsilon \tag{13}$$

The matrix of partial derivatives of the *E(y)*, with respect to the *k*-th explanatory variable of **x** in unit 1 up to unit *N* is shown below:

$$\left[\frac{\partial E(y)}{\partial \mathbf{x}_{1k}} \ldots . \frac{\partial E(y)}{\partial \mathbf{x}_{Nk}}\right] = (I - \rho\mathbf{W})^{-1}(I\boldsymbol{\beta}_k + \mathbf{W}\vartheta_k) \tag{14}$$

Based on explanations of the spatial models, the spatial models adopted for the variables can be expressed as follows:

SAR model:

$$\ln PCI_{it} = \alpha_0 + \rho\sum \mathbf{W}\ln PCI_{it} + \beta_1 \ln OR_{it} + \beta_2 FDI_{it} + \beta_3 \ln EXP_{it} + \beta_4 \ln GDP_{it} + \varepsilon_{it} \tag{15}$$

SEM model:

$$\ln PCI_{it} = \alpha_0 + \beta_1 \ln OR_{it} + \beta_2 FDI_{it} + \beta_3 \ln EXP_{it} + \beta_4 \ln GDP_{it} + \varepsilon_{it}; \varepsilon_{it} = \lambda W\varepsilon_{it} + \aleph_{it} \tag{16}$$

SDM model:

$$\ln PCI_{it} = \alpha_{0+} + \rho\sum \mathbf{W}\ln PCI_{it} + \beta_1 \ln OR_{it} + \beta_2 FDI_{it} + \beta_3 \ln EXP_{it} + \beta_4 \ln GDP_{it} + \theta_1\sum \mathbf{W}\ln OR_{it} + \theta_2\sum \mathbf{W}FDI_{it} + \theta_3\sum \mathbf{W}\ln EXP_{it} + \theta_4\sum \mathbf{W}\ln GDP_{it} + \varepsilon_{it} \tag{17}$$

5. Results and Discussion

5.1 Preliminary analysis results

To examine the general properties of the series, descriptive statistics are reported in Table 3.

Table 3: Descriptive statistics

	ln*PCI*	ln*OR*	*FDI*	ln*EXP*	ln*GDP*
Mean	4.017190	3.252108	3,238.386	10.94290	10.31129
Median	4.018183	3.290926	1,335.000	10.90718	10.10025
Maximum	4.169761	4.066784	23,112.00	12.96022	11.20495
Minimum	3.772761	1.901449	–2,813.000	8.626406	9.659614
Std. dev.	0.086891	0.496728	4,909.378	1.168092	0.463444
Skewness	–0.548060	–0.427956	2.088070	0.021474	0.491443
Kurtosis	3.049974	2.398152	7.428315	1.976185	1.771279
Jarque–Bera	6.621877	6.021433	203.7757	5.775235	13.61700
Probability	0.036482	0.049256	0.000000	0.055709	0.001104
Observations	132	132	132	132	132

Source: Authors´ own calculations

According to the logarithmic values, ln*EXP* has the highest standard deviation of 1.16, followed by ln*OR* with 0.49, ln*GDP* with 0.46 and ln*PCI* with 0.08. The median values for ln*PCI*, ln*OR*, *FDI*, ln*EXP* and ln*GDP* are 4.01, 3.29, 1335, 10.90 and 10.10 respectively.

Table 4: Correlation matrix

Variables	ln*PCI*	ln*OR*	*FDI*	ln*EXP*	ln*GDP*
ln*PCI*	1.0000	–	–	–	–
ln*OR*	–0.6288	1.0000	–	–	–
FDI	0.2104	–0.1235	1.0000	–	–
ln*EXP*	0.1737	0.1431	0.5741	1.0000	–
ln*GDP*	0.5147	–0.1433	0.0755	0.1624	1.0000

Source: Authors´ own calculations

Table 4 shows a positive relationship between *FDI* and ln*PCI*, ln*EXP* and ln*PCI*, ln*EXP* and ln*OR*, ln*EXP* and *FDI*, ln*GDP* and ln*PCI*, ln*GDP* and *FDI*, ln*GDP* and ln*EXP*; and a negative relationship between ln*OR* and ln*PCI*, *FDI* and ln*OR*, ln*GDP* and ln*OR*.

5.2 Empirical results

The spatial panel estimation techniques include the SAR, SEM and SDM models. The SDM holds a significant place in the field of spatial econometrics. In a more comprehensive model selection process, it can also be utilized as the nested model (Mur and Angulo, 2005). Endogenous and exogenous interaction effects are both included in the SDM, which has lately gained popularity in applied research (LeSage and Pace, 2009; Elhorst, 2010). With certain restrictions, this model can be reduced to particular SAR and SEM models. Therefore, whether the general model SDM may be reduced to specific models has been examined in this study. The results of estimators are documented in Table 5.

Table 5: Spatial panel model results

Variables	SAR estimation		SEM estimation		SDM estimation	
	FE	RE	FE	RE	FE	RE
ln*OR*	−0.0381169***	−0.0415687***	−0.070543***	−0.0684829***	−0.0705879***	−0.0615539***
FDI	0.000000749	0.000000827	0.000000770	0.000000741	0.00000101**	0.000000925*
ln*EXP*	0.0260309***	0.0290335***	−0.0099312	−0.0088911	−0.0020713	0.0061821
ln*GDP*	−0.0185148	−0.0199091	−0.0272736**	−0.0186557	−0.062779***	−0.0640541***
W ln*OR*	–	–	–	–	0.0085245*	0.0018655
W *FDI*	–	–	–	–	0.00000379	0.000000561**
W ln*EXP*	–	–	–	–	0.0144133***	0.0158777***
W ln*GDP*	–	–	–	–	−0.0262955**	−0.0458075***
ρ	0.1862875***	0.1724704***	–	–	0.1277023***	0.0739893***
λ	–	–	0.2635383***	0.2629229***	–	–
	Hausman test: 5.11 (0.4029) R^2: 0.8663 Log-likelihood = 277.8328		Hausman test: 30.76 (0.000) R^2: 0.1521 Log-likelihood = 297.6717		Hausman test: 5.55 (0.1354) R^2: 0.8885 Log-likelihood = 313.3490 Spatial lag (SAR) LR test: 155.98 (0.0000)*** Spatial error (SEM) LR test: 220.32 (0.0000)***	

Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Source: Authors´ own calculations

All the estimators have identical results for productive capacity. However, according to the spatial lag and spatial error tests, the SDM model is more appropriate than the SAR and SEM models. Furthermore, according to the Hausman test results, the RE model should be used for the analysis. According to the results, the spatial autocorrelation parameter (ρ) is statistically significant at the 1% level. It implies that an increase in neighbouring countries' productive capacity would increase the country's productive capacity (Mohammadi *et al*., 2023). The results of the SDM model are provided in the seventh column of Table 5. The results show that *OR* have a negative effect on productive capacity. An increase of 1% in *OR* reduces productive capacity by 0.061%. Moreover, *GDP* negatively influences productive capacity. An increase of 1% in *GDP* reduces productive capacity by 0.064%. In contrast, *FDI* positively influences productive capacity. An increase of 1% in *FDI* raised productive capacity by 0.0000925%. The low coefficient value of *FDI* on productive capacity can be explained from two perspectives. Firstly, the *FDI* inflow to the GCC countries may not cause spillover effects. As discussed above, the main potential contributing effect of *FDI* inflow is spillover technological improvement in host countries. In the case of the GCC countries, it is indicated that *FDI* inflow is not able to mitigate technological improvement that accelerates productivity. Thus, foreign investors may invest in the oil sector to obtain more rents instead of productive sectors. Secondly, as argued in the Emirates NBD report by Walters (2024), the greenfield *FDI*[3] has been at a lower level since the 2008 GFC and remained at those levels till the post-COVID era. Moreover, most of the greenfield *FDI* initiatives are realised by the UAE, not all the GCC members. *EXP* have no statistically significant effect on productive capacity.

In addition, the weighted coefficients of **W** ln*PCI*, **W** ln*OR*, **W** *FDI*, **W** ln*EXP* and **W** ln*GDP* indicate the spatial lag term of the dependent variable and the spatial interaction term of independent variables (spatial spillover effect). The weighted coefficient of the **W** ln*OR* variable is statistically insignificant. The weighted coefficients of **W** *FDI* and **W** ln*EXP* are statistically significant and positive. They indicate that an increase in inward *FDI* and *EXP* in any country of the GCC increases productive capacity in other members of the GCC. In addition, the weighted coefficient of **W** ln*GDP* is statistically significant and negative, indicating that a decrease in *GDP* per capita in any country of the GCC decreases productive capacity in other members of the GCC.

Besides, the regression coefficients of independent variables in the spatial panel model cannot capture the marginal impacts of dependent variables. A partial differential equation should be used to separate the spatial impacts into direct, indirect and total effects (Wang *et al*., 2020).

3 Greenfield *FDI* is new investment that creates new capital and production capacity (Ashraf *et al*., 2016).

Table 6: Direct, indirect and total effects of SDM model

Direct effects			
Variable	**Coefficient**	**Standard error**	**Probability**
ln*OR*	−0.0620926	0.0125156	0.000***
FDI	0.00000108	0.000000522	0.038**
ln*EXP*	0.0105174	0.0053042	0.047**
ln*GDP*	−0.0789679	0.0220433	0.000***
Indirect effects			
Variable	**Coefficient**	**Standard error**	**Probability**
ln*OR*	−0.0095965	0.0139425	0.491
FDI	0.00000238	0.000001	0.017**
ln*EXP*	0.0603303	0.0057744	0.000***
ln*GDP*	−0.1954005	0.0545098	0.000***
Total effects			
Variable	**Coefficient**	**Standard error**	**Probability**
ln*OR*	−0.0716891	0.0086567	0.000***
FDI	0.00000347	0.0000012	0.004***
ln*EXP*	0.0708477	0.0044404	0.000***
ln*GDP*	−0.2743684	0.0718203	0.000***

Note: ***, **, and * denote statistical significance levels at the 1%, 5%, and 10% levels, respectively.
Source: Authors´ own calculations

Table 6 provides the direct, indirect and total effects of the SDM model. Direct effects mean the effects of change in independent variables on the local country's dependent variable. Indirect effects denote the effects of change in independent variables on neighbouring (adjacent) countries (Shao *et al*., 2020). The total effect is the influence of the independent variables on the dependent variable in all the countries (Gan *et al*., 2021).

The sign of the coefficients of direct, indirect and total effects is consistent with the results in Table 5. However, ln*OR* is statistically insignificant in the indirect effects. It shows us that *OR* have a potentially decreasing effect on productive capacity at the country level.

5.3 Discussion

However, it does not spread the negative effect on the productive capacity to neighbouring regions or countries. In other words, changing OR in any member of the GCC does not spread to neighbouring countries of the GCC. One possible explanation for these results is that increased economic, political and geopolitical risks increase the importance of NR. Therefore, each member of the GCC tends to adopt individual policies instead of collective action. The empirical results for the adverse effects of OR on productive capacity are in line with Badeeb and Lean (2017), Ahumada and Villarreal (2022), Liu *et al*. (2023), Awoa and Ondoa (2023) and Yang *et al*. (2024). Moreover, GDP affects productive capacity negatively and is statistically significant in the direct, indirect and total effects. Thus, it can be interpreted that negative effects of GDP on productive capacity do not affect only the given country but also other neighbouring countries in the region. Moreover, it indicates that an increase in income from GDP does not flow to productive sectors. The concept of the PCI used in the study consists mainly of quality aspects of the economy, including natural capital, human capital, energy, transport, ICT, institutions, structural change and the private sector. The results give remarkable clues that despite the GCC countries earning incomes from OR, they are not able to use the resources in the fields that contribute to productive capacity effectively.

The direct, indirect and total effects reveal that FDI has a positive impact on productive capacity. This indicates that inward FDI contributes to host economies' productive capacity and that this positive influence spills over to neighbouring countries in the GCC. The empirical findings align with the research of Tanna (2009), Senbeta (2009), Baltabaev (2014), Liu *et al*. (2016), Adnan *et al*. (2019), Yasin and Sari (2022) and Ali and Akhtar (2024). It is widely recognized that inward FDI promotes and attracts technology transfer, imitation of technology, advanced managerial skills and competition among multinational corporations (MNCs), which encourages domestic firms to utilize resources more effectively. All of these factors contribute to increased productive capacity (Baltabaev, 2014).

Finally, the direct, indirect and total effects of EXP are positive and statistically significant. The results are consistent with those of De Loecker (2007), Máñez *et al*. (2015), Newman *et al*. (2017) and Esaku (2019), who found that exports are positively associated with firms' productivity. The positive effects of exports on productivity may occur mainly in two ways: firstly, introducing to the export market and becoming more competitive requires increasing productivity and scale of production (Ciarli *et al*., 2023). Secondly, in terms of the learning-by-exporting approach, it is argued that since firms enter the export market, it is possible to learn knowledge and expertise, which contributes to productivity (De Loecker, 2007).

6. Conclusion and Policy Recommendations

OR are an important source and are accepted as a driver of GDP for oil-rich countries. However, researchers and scholars have long discussed the sustainability of OR for GDP. Thus, regarding the RCH, it is well documented that in oil-rich countries, economic structure may crowd out productive investment at the expense of increased OR. The most crucial problem arises that if OR do not incentivize productivity, it may be hard to sustain GDP in the long run. This study analysed the effects of OR, FDI, EXP and GDP in the GCC countries, namely Saudi Arabia, the UAE, Kuwait, Oman, Qatar and Bahrain, by performing spatial panel models with annual data spanning the period 2000–2021. According to the results, OR and GDP have a negative effect on productive capacity in the GCC countries. Moreover, FDI affects productive capacity positively. However, EXP have no significant effect.

Besides, the spatial analysis results indicate that a change in OR in any member of the GCC does not spread to neighbouring countries. However, an increase in inward FDI and EXP in neighbouring countries increases inward FDI and EXP in the local country's productive sectors. In addition, a decrease in GDP per capita in neighbouring countries decreases GDP per capita in the local country. The results regarding the direct, indirect and total effects of the SDM model also support these findings.

In line with empirical findings, some practical suggestions can be offered for decision-makers. Firstly, the policymakers of the GCC should consider the negative impact of OR on productive capacity. Therefore, they can redistribute resources to productive sectors rather than non-productive sectors. It is crucial to nourish the productive sectors to strengthen the domestic economy in the GCC countries. For instance, tax incentives and attainable credits can be provided for firms to invest in the productive sector. Secondly, structural change is critical for the GCC countries' policymakers to accelerate structural changes towards more productive sectors. Thus, the economic structure should be strengthened with investments covering different spheres of the economy such as human capital, renewable energy, private investments and ICT. Thirdly, it was demonstrated that inward FDI and EXP stimulate productive capacity. This means that integration into the world economy brings positive spillovers to the economy. However, the coefficient of inward FDI on productive capacity is low. It indicates that the spillover effect of FDI on host countries does not emerge at the targeted level. In that case, policymakers should adopt policies to direct foreign investors to productive sectors. Moreover, greenfield FDI should be a form of incentive through government policies instead of mergers and acquisitions. For this purpose, policymakers of the GCC countries can provide subsidies and financial opportunities to invest in productive sectors. Thus, the leading sectors should be determined and firms which prefer to invest in those sectors

should be supported. Fourthly, since EXP stimulate productive capacity, the export basket should be diversified and the dependence on exports of special commodities should be reduced. As the export basket becomes narrow, the fluctuation of the price of commodities may adversely affect and reduce competitive power in the global economy. In particular, exports of high technology should become a priority of policymakers and, along with domestic firms, inward FDI to technological sectors should be empowered. Thus, policymakers should strengthen cooperation between national firms and MNCs to increase productive capacity.

Finally, given the negative effect of GDP on productive capacity, it can be suggested that gains from GDP be allocated to the productive sector, which promotes efficiency. Besides, the GCC countries should focus on inclusive growth rather than considering only increasing output levels.

The present study provides remarkable empirical findings. However, there are also some limitations of the study. Firstly, due to a lack of data, inclusive growth data could not be added to the model. Secondly, variables for technological development, such as research and development expenditures and patent applications, are not available for the GCC members. Future studies may consider the effect of these factors on productive capacity if the data become available.

List of acronyms

AR: Autoregressive
BBL: Barrel of crude oil
DIDs: Difference-in-differences
ECB: European Central Bank
EXP: Merchandise exports
FDI: Foreign direct investment
FE: Fixed effects
GCC: Gulf Cooperation Council
GDP: Gross domestic product
GFC: Global financial crisis
G-7: Group of seven
GMM: Generalized method of moments
HD: Human development
ICT: Information and communication technology
IEA: International Energy Agency

LRCOM: Likelihood ratio common factors

ME: Middle East

MNCs: Multinational corporations

NARDL: Nonlinear autoregressive distributed lag

NR: Natural resources

OLS: Ordinary least squares

OR: Oil rents

PCI: Productive capacities index

PLS: Pooled least square

PPML: Poisson pseudo maximum likelihood

RCH: Resource curse hypothesis

RE: Random effects

R&D: Research and development

SAR: Spatial autoregression

SDM: Spatial Durbin model

SEM: Spatial error model

TFP: Total factor productivity

UAE: United Arab Emirates

UNCTAD: United Nations Conference on Trade and Development

VECM: Vector error correction model

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References

Abdullah, M., Chowdhury, M. (2020). Foreign direct investment and total factor productivity: any nexus? *Margin – The Journal of Applied Economic Research*, 14(2), 164–190. https://doi.org/10.1177/0973801020904473

Adabor, O., Buabeng, E., Annobil-Yawson, G. (2020). The impact of natural resource rent on economic growth of Ghana. *Asian Journal of Economics, Business and Accounting*, 19(1), 1–17. https://doi.org/10.9734/AJEBA/2020/v19i130293

Adabor, O., Buabeng, E., Dunyo, J. F. (2022). The causative relationship between natural resource rent and economic growth: evidence from Ghana's crude oil resource extraction. *International Journal of Energy Sector Management*, 16(5), 899–923. https://doi.org/10.1108/IJESM-06-2021-0007

Adnan, Z., Chowdhury, M., Mallik, G. (2019). Foreign direct investment and total factor productivity in South Asia. *Theoretical and Applied Economics*, 26(2),105–120.

Ahumada, V. M. C., Villarreal, C. C. (2022). Oil rents, institutional development, and total factor productivity. *Investigación Económica*, 81(322), 52–72. https://doi.org/10.22201/fe.01851667p.2022.322.82218

Aimer, N. M. (2018). Estimating the impact of oil rents on the economic growth of the OPEC countries. *European Journal of Management and Marketing Studies*, 3(1), 110–122. https://doi.org/10.5281/zenodo.1237965

Al Abri, I., Al Bulushi, A. (2022). The role of institutional quality in economic efficiency in the GCC countries. *Theoretical Economics Letters*, 12, 1591–1607. https://doi.org/10.4236/tel.2022.126088

Ali, L., Akhtar, N. (2024). The effectiveness of export, FDI, human capital, and R&D on total factor productivity growth: the case of Pakistan. *Journal of the Knowledge Economy*, 15, 3085–3099. https://doi.org/10.1007/s13132-023-01364-z

Aljarallah, R. A. (2020). The economic impacts of natural resource dependency in Gulf countries. *International Journal of Energy Economics and Policy*, 10(6), 36–52. https://doi.org/10.32479/ijeep.9836

Aljarallah, R. A. (2021). An assessment of the economic impact of natural resource rents in kingdom of Saudi Arabia. *Resources Policy*, 72, 102070. https://doi.org/10.1016/j.resourpol.2021.102070

Anselin, L. (1988). *Spatial Econometrics Methods and Models.* Dordrecht: Springer. ISBN 978-94-015-7799-1.

Anselin, L. (2003). Spatial Externalities, spatial multipliers, and spatial econometrics. *International Regional Science Review*, 26(2), 153–166. https://doi.org/10.1177/0160017602250972

Arbia, G. (2006). *Spatial Econometrics: Statistical Foundations and Applications to Regional Convergence.* Berlin: Springer-Verlag. ISBN 978-3-540-32305-1.

Asif, M., Khan, K. B., Anser, M. K., et al. (2020). Dynamic interaction between financial development and natural resources: evaluating the 'resource curse' hypothesis. *Resources Policy*, 65, 101566. https://doi.org/10.1016/j.resourpol.2019.101566

Ashraf, A., Herzer, D., Nunnenkamp, P. (2016). The effects of Greenfield FDI and cross-border M&As on total factor productivity. *The World Economy*, 39(11), 1728–1755. https://doi.org/10.1111/twec.12321

Auty, R. M. (1993). *Sustaining Development in Mineral Economies: The Resource Curse Thesis.* Routledge: London.

Awoa, P. A., Ondoa, H. A. (2023). Natural resources and productivity growth in developing countries. *The Journal of International Trade & Economic Development*, 32(8), 1271–1290. https://doi.org/10.1080/09638199.2023.2255685

Badeeb, R. A., Lean, H. H. (2017). Natural resources and productivity: can banking development mitigate the curse? *Economies*, 5, 11. https://doi.org/10.3390/economies5020011

Badeeb, R. A., Clark, J., Philip, A. P. (2023). Modeling the time-varying effects of oil rent on manufacturing: implications from structural changes using Markov-switching model. *Environmental Science and Pollution Research*, 30, 39012–39028. https://doi.org/10.1007/s11356-022-25045-7

Badeeb, R. A., Szulczyk, K. R., Lean, H. H. (2021). Asymmetries in the effect of oil rent shocks on economic growth: a sectoral analysis from the perspective of the oil curse. *Resources Policy*, 74, 102326. https://doi.org/10.1016/j.resourpol.2021.102326

Baltabaev, B. (2014). Foreign direct investment and total factor productivity growth: new macro-evidence. *The World Economy*, 37(2), 311–334. https://doi.org/10.1111/twec.12115

Ben Mim, S., Ben Ali, M. S. (2020). Natural resources curse and economic diversification in GCC countries. In: Miniaoui, H. *Economic development in the Gulf Cooperation Council Countries*. Singapore: Springer. https://doi.org/10.1007/978-981-15-6058-3_1

Bindi, G. (2018). *The resource curse hypothesis: an empirical investigation*. Master's Thesis. Lund: Lund University, School of Economics and Management.

Burridge, P. (1981). Testing for a common factor in a spatial autoregression model. *Environment and Planning A*, 13, 795–800. https://doi.org/10.1068/a130795

Ciarli, T., Coad, A., Moneta, A. (2023). Does exporting cause productivity growth? Evidence from Chilean firms. *Structural Change and Economic Dynamics*, 66, 228–239. https://doi.org/10.1016/j.strueco.2023.04.015

Cieślik, A., Hamza, S. (2023). Institutional quality and inward FDI: empirical evidence from GCC economies. *Middle East Development Journal*, 15(2), 261–290. https://doi.org/10.1080/17938120.2023.2254188

De Loecker, J. (2007). Do exports generate higher productivity? Evidence from Slovenia. *Journal of International Economics*, 73, 69–98. https://doi.org/10.1016/j.jinteco.2007.03.003

Debonheur, K. D., Avom, D., Ouedraogo, I. (2024). The effect of natural resources rents on human development in selected African countries. *Natural Resources Forum*, 48, 803–837. https://doi.org/10.1111/1477-8947.12341

Demena, B. A., Van Bergeijk, P. A. G. (2017). A meta-analysis of FDI and productivity spillovers in developing countries. *Journal of Economic Surveys*, 31(2), 546–571. https://doi.org/10.1111/joes.12146

ECB (2012). The development of prices and costs during the 2008–09 recession. *Monthly Bulletin*, 71–85.

Elheddad, M. (2016). Natural resources and FDI in GCC countries. *International Journal of Business and Social Research*, 6(7), 12–22.

Elhorst, J. P. (2010). Applied spatial econometrics: raising the bar. *Spatial Economic Analysis*, 5(1), 9–28. https://doi.org/10.1080/17421770903541772

Elhorst J. P., Vega, S. H. (2013, August 27–31). *On spatial econometric models, spillover effects, and W*. 53rd Congress of the European Regional Science Association: "Regional Integration: Europe, *the* Mediterranean and the World Economy", Palermo, Italy.

Esaku, S. (2019). Export markets and firm productivity in sub-Saharan Africa. *Journal of African Business*, 22(2), 254–273. https://doi.org/10.1080/15228916.2019.1695190

Farzanegan, M. R., Thum, M. (2020). Does oil rents dependency reduce the quality of education? *Empirical Economics*, 58, 1863–1911. https://doi.org/10.1007/s00181-018-1548-y

Gan, T., Yang, H., Liang, W., et al. (2021). Do economic development and population agglomeration inevitably aggravate haze pollution in China? New evidence from spatial econometric analysis. *Environmental Science and Pollution Research*, 28, 5063–5079. https://doi.org/10.1007/s11356-020-10847-4

Gani, A., Al-Abri, A. S. (2013). Indicators of business environment, institutional quality and foreign direct investment in Gulf Cooperation Council (GCC) countries. *International Review of Applied Economics*, 27(4), 515–530. https://doi.org/10.1080/02692171.2012.760066

GCC-STAT (2024). *Statistics*. [Retrieved 2024-10-01] Available at: https://gccstat.org/en/

Golgher, A. B., Voss, P. R. (2016). How to interpret the coefficients of spatial models: spillovers, direct and indirect effects. *Spatial Demography*, 4, 175–205. https://doi.org/10.1007/s40980-015-0016-y

Gumprecht, D. (2005). Spatial methods in econometrics: an application to R&D spillovers. *WU Vienna University of Economics and Business. Research Report Series/Department of Statistics and Mathematics No. 26*, 1–16. https://doi.org/10.57938/39f720e6-61c9-40fda88b-ec1a3a83fe12

Hamilton, K., Naikal, E., Lange, G. M. (2019). *Natural resources and total factor productivity growth in developing countries: testing a new methodology*. World Bank Policy Research Working Paper 8704. https://doi.org/10.57938/39f720e6-61c9-40fd-a88b-ec1a3a83fe12

Hannan, A., Mohsin, H. M. (2015). Regional analysis of resource curse hypothesis: evidence from panel data. *Pakistan Journal of Applied Economics*, 25(1), 45–66.

Hayat, A., Tahir, M. (2021). Natural resources volatility and economic growth: evidence from the resource-rich region. *Journal of Risk and Financial Management*, 14, 84. https://doi.org/10.3390/jrfm14020084

IEA (2024). *Oil Market Report – September 2024*. Paris: International Energy Agency. [Retrieved 2024-10-02] Available at: https://www.iea.org/reports/oil-market-report-september-2024

Itaman, R. E., Awopegba, O. E. (2021). Finance, oil rent and premature deindustrialisation in Nigeria. *Structural Change and Economic Dynamics*, 59, 149–161. https://doi.org/10.1016/j.strueco.2021.06.006

Kim, D. H., Lin, S. C. (2018). The Resource curse hypothesis: dynamic heterogeneous approach. *Emerging Markets Finance and Trade*, 54(12), 2698–2717. https://doi.org/10.1080/1540496X.2017.1372281

Kouas, M., Kalai, M., Helali, K. (2024). Dutch disease and deindustrialization: symmetrical and asymmetrical impact of oil rent on value-added industry in China. *Journal of the Knowledge Economy*, 15, 18202–18222. https://doi.org/10.1007/s13132-024-01866-4

LeSage, J. P., Pace, R. K. (2009). *Introduction to spatial econometrics*. Boca Raton: Taylor & Francis CRC Press.

Liang, H., Shi, C., Abid, N., et al. (2023). Are digitalization and human development discarding the resource curse in emerging economies? *Resources Policy*, 85, 103844. https://doi.org/10.1016/j.resourpol.2023.103844

Liu, S., Yin, S., Yin, C., et al. (2021). Does the price of natural resources affect firms' total factor productivity? Evidence from a natural experiment in China. *Economic Analysis and Policy*, 70, 37–50. https://doi.org/10.1016/j.eap.2021.01.017

Liu, W. S., Agbola, F. W., Dzator, J. A. (2016). The impact of FDI spillover effects on total factor productivity in the Chinese electronic industry: a panel data analysis. *Journal of the Asia Pacific Economy*, 21(2), 217–234. http://dx.doi.org/10.1080/13547860.2015.1137473

Liu, Y., Wang, J., Dong, K., et al. (2023). How does natural resource abundance affect green total factor productivity in the era of green finance? Global evidence. *Resources Policy*, 81, 103315. https://doi.org/10.1016/j.resourpol.2023.103315

Maalel, N., Mahmood, H. (2018). Oil-abundance and macroeconomic performance in the GCC countries. *International Journal of Energy Economics and Policy*, 8(2), 182–187.

Mahmood, H. (2023). Spatial effects of trade, foreign direct investment (FDI), and natural resource rents on carbon productivity in the GCC region. *PeerJ*, 11, e16281. https://doi.org/10.7717/peerj.16281

Majumder, M. K., Raghavan, M., Vespignani, J. (2019). *Oil curse, economic growth and trade openness*. CAMA Working Paper 78/2019.

Malik, M. A., Masood, T., Sheikh, M. A. (2021). Econometric analysis of total factor productivity in India. *The Indian Economic Journal,* 69(1), 88–104. https://doi.org/10.1177/0019466220988066

Máñez, J. A., Rochina-Barrachina, M. E., Sanchis-Llopis, J. A. (2015). The dynamic linkages among exports, R&D and productivity. *The World Economy*, 38(4), 583–612. https://doi.org/10.1111/twec.12160

MapChart (2024). *MapChart*. [Retrieved 2024-10-01] Available at: https://www.mapchart.net/index.html

Matallah, S., Matallah, A. (2016). Oil rents and economic growth in oil-abundant MENA countries: governance is the trump card to escape the resource trap. *Topics in Middle Eastern and North African Economies*, 18(2), 87–116.

Mbingui, C., Owonda, F., Diakabana, M. N. (2021). Effects of oil rent on economic development in the Republic of Congo. *Theoretical Economics Letters*, 11, 587–602. https://doi.org/10.4236/tel.2021.113039

Mitze, T. (2014). Measuring regional spillovers in long-and short-run models of total factor productivity, trade, and FDI. *International Regional Science Review*, 37(3), 365–388. https://doi.org/10.1177/0160017612438716

Mohamed, E. S. E. (2020). Resource rents, human development and economic growth in Sudan. *Economies*, 8, 99. https://doi.org/10.3390/economies8040099

Mohammadi, H., Shayanmehr, S., Borrero, J. D. (2023). Does freedom matter for sustainable economic development? New evidence from spatial econometric analysis. *Mathematics*, 11, 145. https://doi.org/10.3390/math11010145

Mur, J., Angulo, A. (2005). *A closer look at the spatial Durbin model*. 45th Congress of European Regional Science Association, Amsterdam.

Newman, C., Rand, J., Tarp, F., et al. (2017). Exporting and productivity: learning from Vietnam. *Journal of African Economies*, 26(1), 67–92. https://doi.org/10.1093/jae/ejw021

Ofori, P. E., Grechyna, D. (2021). Remittances, natural resource rent and economic growth in sub-Saharan Africa. *Cogent Economics & Finance*, 9(1), 1979305. https://doi.org/10.1080/23322039.2021.1979305

Ord, J. K. (1975). Estimation methods for models of spatial interaction. *Journal of the American Statistical Association*, 70, 120–126.

Oyinlola, M. A., Adedeji, A. A., Bolarinwa, M. O. (2020). Exploring the nexus among natural resource rents, human capital and industrial development in the SSA region. *Economic Change and Restructuring*, 53, 87–111. https://doi.org/10.1007/s10644-018-09243-3

Paelinck, J., Klaassen, L. (1979). *Spatial econometrics*. Farnborough: Saxon House.

Puri-Mirza, A. (2024). *Crude oil industry in the GCC – Statistics & Facts*. [Retrieved 2024-09-01] Available at: https://www.statista.com/topics/4546/gcc-crude-oil-industry/#topicOverview

Qudah, A. A., Badawi, A., AboElsoud, M. E. (2016). The impact of oil sector on the global competitiveness of GCC Countries: panel data approach. *Research Journal of Finance and Accounting*, 7(20), 32–39.

Rahim, S., Murshed, M., Umarbeyli, S., et al. (2021). Do natural resources abundance and human capital development promote economic growth? A study on the resource curse hypothesis in Next Eleven countries. *Resources, Environment and Sustainability*, 4, 100018. https://doi.org/10.1016/j.resenv.2021.100018

Rasheed, Q. (2019). Macroeconomic factors of FDI inflows in Asian economies: a study of 14 Asian countries. *International Journal of Advanced Research*, 7(2), 289–300. https://dx.doi.org/10.21474/IJAR01/8487

Saidi, H., Montasser, G. E., Doytch, N. (2022). The interplay between financial development, electricity consumption and foreign direct investment in the GCC countries: new insights from GMM panel VAR. *Energy Sources, Part B: Economics, Planning, and Policy*, 17(1), 2136875. https://doi.org/10.1080/15567249.2022.2136875

Satti, S. L., Farooq, A., Shahbaz, M. (2013). *Empirical evidence on the resource curse hypothesis in oil abundant economy*. MPRA Paper No. 50150.

Senbeta, S. R. (2009). *The nexus between FDI and total factor productivity growth in sub Saharan Africa*. MPRA Paper No. 31067.

Sha, Z. (2023). The effect of globalisation, foreign direct investment, and natural resource rent on economic recovery: evidence from G7 economies. *Resources Policy*, 82, 103474. https://doi.org/10.1016/j.resourpol.2023.103474

Shahbaz, M., Ahmed, K., Tiwari, A. K., et al. (2019). Resource curse hypothesis and role of oil prices in USA. *Resources Policy*, 64, 101514. https://doi.org/10.1016/j.resourpol.2019.101514

Shahbaz, M., Naeem, M., Ahad, M., et al. (2018). Is natural resource abundance a stimulus for financial development in the USA? *Resources Policy*, 55, 223–232. https://doi.org/10.1016/j.resourpol.2017.12.006

Shao, S., Zhang, Y., Tian, Z., et al. (2020). The regional Dutch disease effect within China: a spatial econometric investigation. *Energy Economics*, 88, 104766. https://doi.org/10.1016/j.eneco.2020.104766

Shebeb, B. (2016). Adjusted-productivity growth for resource rent: Kuwait oil industry. *Applied Economics and Finance*, 3(2), 128–135. https://doi.org/10.11114/aef.v3i2.1386

Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, 70(1), 65–94. https://doi.org/10.2307/1884513

Solow, R. M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics*, 39(3), 312–320. https://doi.org/10.2307/1926047

Tanna, S. (2009). The impact of foreign direct investment on total factor productivity growth: international evidence from the Banking industry. *Managerial Finance*, 35(3), 297–311. https://doi.org/10.1108/03074350910931799

Tho, Z. Y., Ding, D., Hui, F. K. C., et al. (2023). On the robust estimation of spatial autoregressive models. *Econometrics and Statistics*. https://doi.org/10.1016/j.ecosta.2023.01.004

Tobler, W. R. (1979). Cellular geography. In: Gale, S., Olsson, G. *Philosophy in geography: theory and decision library*, pp. 379–386. Dordrecht: Springer:.

Ulussever, T., Kartal, M. T., Pata, U. K. (2024). Environmental role of technology, income, globalization, and political stability: testing the LCC hypothesis for the GCC countries. *Journal of Cleaner Production*, 451, 142056. https://doi.org/10.1016/j.jclepro.2024.142056

UNCTAD (2024). *Statistics.* [Retrieved 2024-10-03] Available at: https://unctad.org/

Vasquez, C., Carpenter, N., Blessing, C. (2024). Rentier states and the transition away from oil: Oman, Kuwait, and Saudi Arabia. *The Macalester Street Journal*, 1(2), 117–151. https://doi.org/10.62543/msj.v1i2.18

Venables, A. J. (2016). Using natural resources for development: why has it proven so difficult? *Journal of Economic Perspectives*, 30(1), 161–184. https://doi.org/10.1257/jep.30.1.161

Walters, J. (2024). *GCC: trends in foreign direct investment*. [Retrieved 2024-10-01] Available at: https://www.emiratesnbdresearch.com/en/articles/gcc-trends-in-foreign-direct-investment

Wang, S. L., Chen, F. W., Liao, B., et al. (2020). Foreign trade, FDI and the upgrading of regional industrial structure in China: based on spatial econometric model. *Sustainability*, 12, 815. https://doi.org/10.3390/su12030815

WB (2024). *World Development Indicator*. [Retrieved 2024-10-03] Available at: https://data.worldbank.org/

Yang, S., Jahanger, A., Usman, M. (2024). Natural resource endowment and urban green total factor productivity: "resource gospel" or "resource curse"? *Natural Resources Forum*, 49(3), 3225-3247. https://doi.org/10.1111/1477-8947.12529

Yasin, M. Z., Sari, D. W. (2022). Foreign direct investment, efficiency, and total factor productivity: does technology intensity classification matter? *Economic Journal of Emerging Markets*, 14(1), 41–54. https://doi.org/10.20885/ejem.vol14.iss1.art4

Yilanci, V., Turkmen, N. C., Shah, M. I. (2022). An empirical investigation of resource curse hypothesis for cobalt. *Resources Policy*, 78, 102843. https://doi.org/10.1016/j.resourpol.2022.102843

Zheng, S., Liu, H., Hafeez, M., et al. (2023). Testing the resource curse hypothesis: the dynamic roles of institutional quality, inflation and growth for Dragon. *Resources Policy*, 85, 103840. https://doi.org/10.1016/j.resourpol.2023.103840