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Industrial Park Role as a Catalyst for Regional Development: Zooming on Middle East Countries

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Abstract: The development of the industrial park has been one of the priorities of the plans of different countries and has created a magnitude challenge concerning regional disparities. Globally, the Middle Eastern countries have demonstrated a more remarkable dedication to industrial park development, given its general importance since the 1970s. Due to this importance, this paper is divided into three sections due to the critical role of industrial park development in the case of Middle Eastern countries. First, this study highlighted the relevant literature using Scinotometric analysis. In the second step, following the investigation of the relationship between selected critical variables and the development of industrial parks towards regional development in the Middle Eastern countries from 2000 to 2018. In this regard, panel data were used to determine the association between the selected variables and industrial park performance. According to the findings, the author suggests policy implementation for industrial park development in three categories: economic growth, environmental issues, and reduction in regional disparities. Finally, this study can serve as a foundation for future research, such as comparing the first batch of industrial parks with their upgraded counterparts in the Middle East and studying the competitive advantages issues.

Keywords: industrial park; economic growth; regional disparities; regional development; middle east

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1. Introduction

1.1. Research Background

One of the most essential and fundamental regional development factors is the launch and expansion of industries which have played an influential role in economic and social development [1,2]. As one of the factors of industry, industrial parks play a decisive role in developing different areas, which can significantly help develop and raise the level of regions [3]. Since the opening of the first modern industrial parks in the 1960s, Industrial parks have evolved in a variety of ways, from early 'enclaves' to the contemporary 'economic zones', due to the increasing digital technologies being inextricably linked to urban growth [4–6]. The primary goals of establishing industrial parks are to immediately focus on macroeconomic concerns, particularly global interactions and disparities between developed and developing regions [7]. Economic growth has been predicted to lead to greater equality, eventually eliminating poverty [8,9]. On the other hand, in contrast to agriculture, industrial park development factors are more flexible and can adapt better to environmental, regional, and national conditions and circumstances [10]. As a result of this remarkable phenomenon, many countries and nations are concentrating their efforts on creating industrial parks as an economic engine [11]. In particular, since the 1970s, Asia's industrial parks have become a hot topic in the region's transformation plan. They have been able to help their growth and development by acquiring with industry and utilizing the experiences of other countries. Depending on the country's geography, politics, infrastructure, and objectives, numerous industrial parks have been established worldwide and given different names in different cultures [12,13]. Among them, China stands out as the most successful example of industrial park development in terms of local benefits identified as Economic Zones. In addition, India has the most large-scale industrial parks by naming EPZs after China's development plan step [14,15]. Further, many nations/regions, especially in the Middle East, have been influenced by this successful case, such as United Arab Emirates (Free zones) [16], Saudi Arabia (Economic zones) [17], Turkey (Free zones) [18], and others have developed their own similarly spatial organizations.

1.2. Aims And Questions

Following the significance and goals of developing industrial parks in the Middle East, the country quickly transitioned from an oil and agricultural economy to an industrial one [19]. One of its main challenges is rapid industrialization growth, especially in urban areas, which has created significant regional economic inequalities [20,21]. Economic inequality has always been a source of concern for developing countries. Refs. [22–24] mainly focus on the role of industrial parks in developing and eliminating regional disparities and propose alternatives. However, studies have been conducted to assess the impact of industrial parks on regional disparities. They have failed to provide these details for countries with similar conditions, such as the Middle East region. The latter's economies are primarily based on oil and agriculture and have only recently begun to transition to industrial economics. It is a novel topic that can be researched in industrial park performance in Middle Eastern countries. Thus, this approach is used in this study to answer the following two main questions: Is the construction of industrial parks impacting the economic growth of targeted areas and, if so, how much? Which macroeconomic variables have the most influence on specific countries? Thus, the goal of this research is to investigate methods for evaluating the regional development of Middle Eastern countries influenced by developing industrial parks. Furthermore, making recommendations for the development of a beneficial industrial park in the Middle East region. Based on panel data analysis and GIS technology, this study aims to evaluate and investigate the evolution of the Middle East region's industrial parks from 2000 to 2018. The study's findings are expected to have significant theoretical and practical implications for industrial park development toward regional development. This study is expected to serve as a model for panel data research in other similar regions. As a result, this work adds a three-dimensional to the literature. First, this study studies the macroeconomic criteria in the area and describes the selected factors. Second, a panel data model was employed in this study to assess the impact of industrial park expansion on economic growth, environmental pollution, and the rate of urbanization. Third, based on the model analysis results and the classification of countries depending on their development, this article will present policy implications for the plan. The following sections categorize the selected nations to provide an overview of the current stage of industrial park development. The remainder of this study is divided into four sections: the second introduces the relevant literature by utilizing scientometric analysis, the third section is adopted data sources and methodology; the fourth includes the result and the fifth is discussion; and the last section includes the theoretical conclusion.

2. Relevant Literature

This paper attempts to provide a comprehensive view of the evolution of the field of industrial park development based on literature published between 2010 and 2022 using bibliographic records from the Web of Science. It is a descriptive survey that uses Scientometric indicators by VOSviewer software. The findings revealed 618 articles out of 1290 articles in the field of industrial park development from 2010 to 2022 (Figure 1). From these articles, we have selected articles that deal with the role of industrial parks in the development and growth of the region, so they are divided into three categories: Geographical division, Chronological analysis, and future trends. Correspondingly, some papers have been selected for literature reviews, such as the boosting economy, environmental pollution, economic growth, and low carbon emissions, as shown in Table 1.

Table 1. Research fields (empirical analysis), dimensions, and methods from existing literature.

Source	Research Fields	Dimensions	Methods
Ye et al., 2021 [25]	Belt and Road Initiative (BRI), China (Thai-Chinese Rayong Industrial Zone and Tianjin Economic-Technological Development Area)	economic development mode	spatiotemporal evolution
Wang et al., 2021 [26]	Cambodia Sihanoukville Special Economic Zone (BRI)	Geo political, economic social and cultural	interviews and a case study
Liang et al., 2021 [27]	Malaysia-China Kuantan Industrial Park	policy transfer theory	Interview as data collection
Kang, 2021 [28]	Beijing–Tianjin–Hebei	urban agglomeration and supplements	Critical analysis
Shang and Li, 2021 [29]	an industrial Park	economic performance and the environmental performance	Eco- efficiency
Liu and Lei, 2013[30]	An Empirical Study in Xi'an of China industrial parks (environment, economic criteria)	the concept of ecological landscape	DEARA (Data Envelopment-Regression Analysis) model,
Fan et al., 2017 [31]	Huai'an economic and technological development area	Economic agglomerations	ecological network analysis
Zhao et al., 2020 [32]	Suzhou New District and Shanghai city in the building CE-oriented industrial park and CE city,	circular economy	a top-down approach
He et al., 2020 [33]	36 industrial parks Jiangxi Province of china	economic efficiency	DEA
Wu and Gao, 2022 [34]	264 prefecture-level cities in China	achieving green and sustainable development	difference-in-difference (DID) model and panel data
Yang et al., 2018 [35]	Beijing China	Economic returns	multi-stage operational process
Lin et al., 2019[36]	China's case study	Policy and economic inefficacy of industrial parks	multi-attribute decision- making model interview
Guo et al., 2018 [37]	greenhouse gas (GHG) emissions of 213 Chinese national-level industrial parks	Low carbon industrial park development	investigation and questionnaires;analysis by ArcGIS software
Zhang et al., 2020 [38]	Yongcheng Economic Technological Development Zone	Boosting economic and reducing carbon emissions	scenario ,Math analysis, IPCC guidelines as the main method
Gao et al., 2021 [39]	11 industrial parks located in Henan Province	CO, PM10, PM2.5, VOCs and NH3emissions from (which industry, and what kind of energy use) and economic ouput	bottom-up emission factor method and material balance method
Wang et al., 2019 [40]	Summary on China's industrial park project	green growth and sustainable development	Review theory
Yu et al., 2017 [41]	20 pilot industrial parks adopted by National Low Carbon Industrial Parks Pilot Programme (LCIPPP)	CO_2 emissions	STIRPAT (Stochastic Impacts by Regression on Population, Affluence and Technology) model

Geographic analysis revealed that the field had evolved significantly in China and BRI countries [25–27] investigated industrial parks development and economic growth between China and BRI countries. The aim of this investigation compares the performance of the industrial park between domestic and overseas projects.

Ref. [28] studied the urban agglomeration caused by the developing industrial parks in three mega cities in China. Furthermore, a chronological analysis revealed that scientific production in industrial park development on economic growth increased rapidly from 2011 to 2019. Refs. [29–31] devoted their study to China's economic performance and environmental issues by utilizing quantitative and qualitative analysis. Several of them [32–34] are concerned with the role of industrial parks in economic growth at China's regional level. Refs. [35–37] also study the economic efficiency of developing industrial parks. It should also be added that most studies are increasingly emphasizing economic equality among geographical locations.

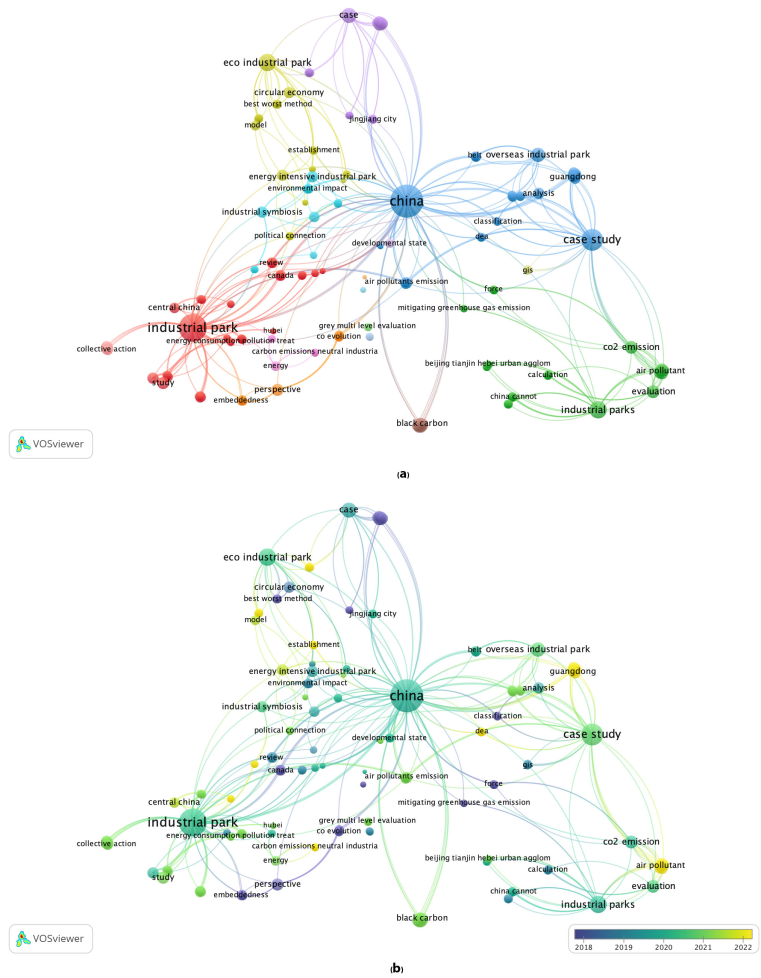

Figure 1. (**a**) Industrial Park development links co-occurrences, "China's case study", "circular economy", and "low carbon emission". (**b**) network analysis based on major discussion studies from 2010 to 2022 (Source: Web of Science).

The last batch is followed by the future trend and essential factors for developing industrial parks in various geographical locations. It is critical to simultaneously consider economic growth and environmental pollution reduction at the regional level. Many researchers, including [38,39] , have focused on pollutants effusion and the rate of energy consumption by selected industries in industrial parks. Finally, Refs. [40,41] and others integrated environmental issues with economic growth influenced by the development of industrial parks across regions. According to the studies conducted, it can be concluded that the importance of industrial park development should be due to environmental issues and regional equality for the future plan.

3. Materials and Methods

3.1. Research Steps

In this paper, we introduced a Flowchart diagram of the research process. The study is divided into five sections: Part I adopts the main research question; Part II contains relevant literature based on the main research question; Part III contains the Method; Part IV contains the results and discussion based on the model analysis; and Part V contains the findings and policy implementation. The first section adopted the main research questions regarding the effect of industrial park development on regional development. The second part is the entire research background based on Scientometrics analysis of Web of Science results from 2010 to 2022. The third section describes the research method. Following the selected case study prompts three steps to answer the main research question: data selection, model specification, and model validation (part-III). The fourth section focuses solely on the outcomes of model analysis across the study areas. This section contains empirical data from the eight case studies. Part V concludes by synthesizing the findings from each case and discussing the implications for theory, practice, and policy. A flowchart diagram is constructed in Figure 2 to visually represent the research steps of this study.

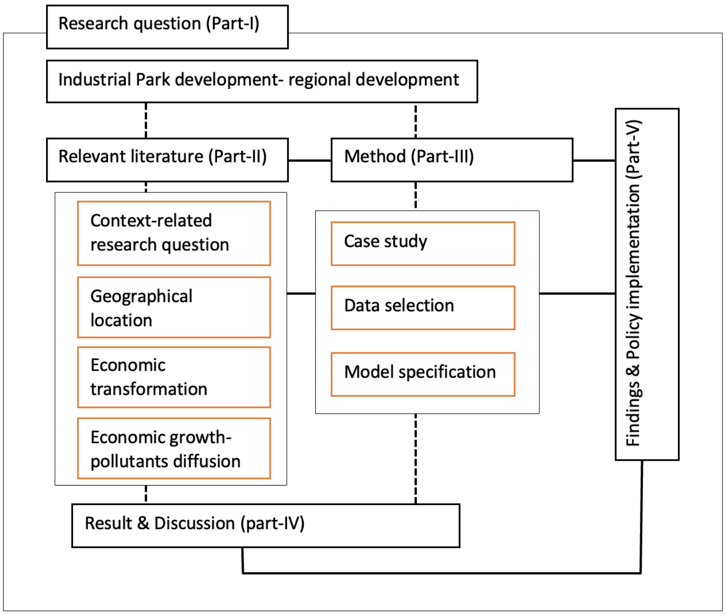

Figure 2. Research steps.

3.2. Study Area

The research in specific Middle Eastern countries is essential since the region has long been a center of attention due to its strategic location and vast oil and gas deposits (Figure 3) [42,43]. Studying the consequences of industrial park development in the Middle East has also resulted in the progressive development of its countries in terms of economy and urbanization. The significance of this research is that the countries in the Middle East are examples of emerging economies that have encountered inside and outside pressure, throughout history [44].

Figure 3. Study area.

Furthermore, they can get around this problem by establishing a variety of types of industries. As a result, examining such countries is necessary to determine how to improve their economies by establishing industrial parks and non-oil industries. Additionally, these countries must advance while aiding the economy of the rest of the world. Over the previous two centuries, the Middle East, like many other parts of the world, has gone through a period of deindustrialization followed by re-industrialization. Following WWII, another transformation occurred: the development of modern industrial parks began in the 1960s and accelerated in the 1980s and 1990s [45]. Following that, the Middle Eastern countries were contained by the construction of various industrial parks with the purpose of enhancing regional development. The first industrial parks were developed in cities like Amman in Jordan and Cairo and Alexandria in Egypt [46,47]. Following them, Turkey was one of the countries that led the way for industrial park development in the 1980s. The function of industrial park development is attributed to establishing the Turkish region's remarkable economic and development achievements [48]. As of today, Turkey has the most industrial parks in the Middle East [49,50]. Among them, 19 free zones are essential to Turkey's economy due to its strategic location as a gateway to Europe, Africa, and Asia [51].

The United Arab Emirates (UAE) also represents a notable successful instance from the 1990s [52]. The UAE has mainly focused on developing industrial parks to boost foreign direct investment (FDI) and trade markets [53,54]. UAE's strategy is to achieve economic diversification and sustainable development and lessen the reliance on the oil industry [55]. The UAE plans to redirect energy into long-term competitive industries and services by leveraging the creation of new vital sectors [56]. In 1985, Dubai established the UAE's first industrial park. Its success in attracting foreign investment, introducing technology and increasing exports as a significant source of revenue, job creation, and economic development [57].

Furthermore, this critical role of the industrial park has inspired other emirates to construct similar industrial parks to attract local and foreign investment and create jobs. As a result of this accomplishment, other Middle Eastern countries, such as Oman, Bahrain and Saudi Arabia, have paid attention to environmental issues and regional development simultaneously. Finally, when it comes to the problematic country of Iran, the fluctuations that occurred since the Islamic Revolution, including a lack of investment and struggling with the conflict, have complicated the industrial park development plan [58]. Despite these challenges, Iran established its first five-year economic plan in the 1990s, which focused on developing industrial parks [59,60]. As shown in Figure 4, the year of the establishment of industrial parks and the aim of development in selected Middle Eastern countries.

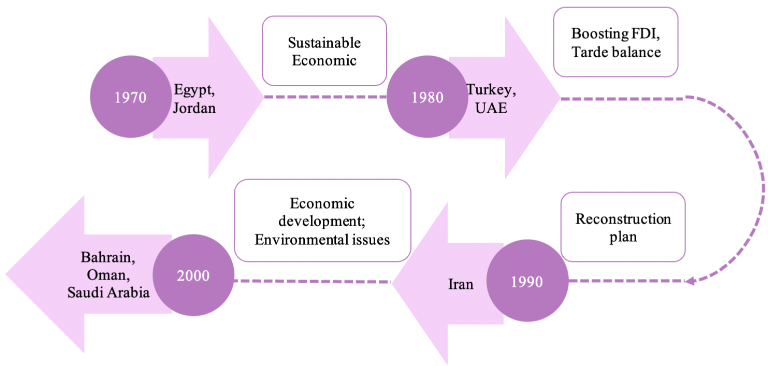

Figure 4. "The history of establishment of industrial park" on time line graph.

Following the development of industrial parks, this study intends to collect macroeconomic and urbanization data to characterize the growth of industrial parks in selected Middle Eastern countries and investigate regional economic differences in this part of the world. It also compares economic growth and regional development levels. Figure 5 illustrates the second analysis of the significance of selected factors based on key relevant literature in Middle Eastern countries.

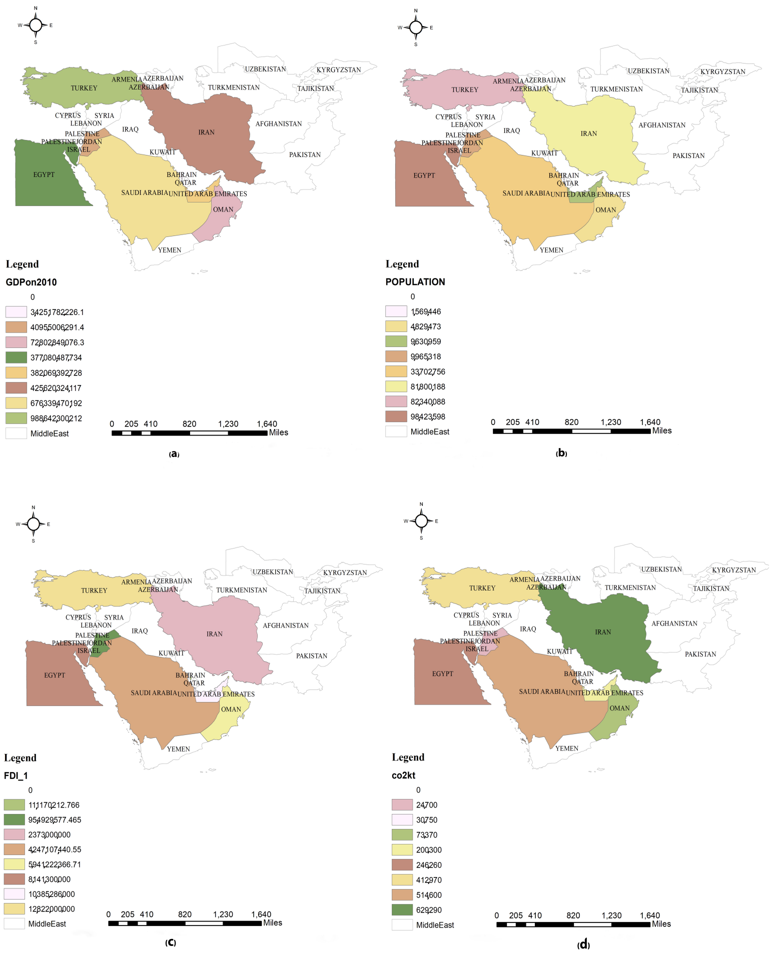

Figure 5. *Cont.*

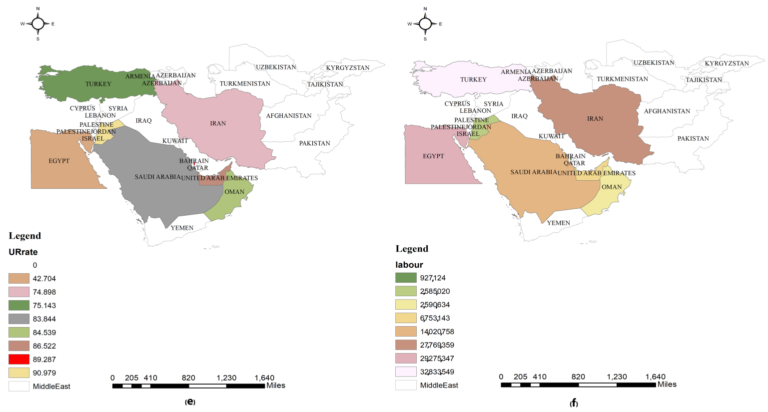

Figure 5. The share of distribution (**a**) "GDP constant on 2010 US, (**b**) Population growth, (**c**) FDI inflow based on US, (**d**) CO_2 diffusion by Kt, (**e**) urbanization rate, and (**f**) labor force growth rate in the selected study areas from 2000 to 2018 (Analysis by: ArcGIS).

As a result, GDP, FDI, and the labor force have the most for Turkey and the lowest rate for Bahrain. Turkey, with its significant growth of GDP 9.887USFDI, and a total labor force of 32,833,549 by 2018, was able to achieve the highest and fastest growth rate. Moreover, for an overview of the urbanization rate, it should be concluded that Jordan has reached the highest rate of about 90.979% and the lowest rate followed in Egypt of 42.704% in 2018. In the case of CO_2 emissions, Jordan has experienced the lowest emissions, and the highest rate emission is backed to Iran by 340,750 and 629,290 from 2000 to 2018. Finally, the rapid population growth followed in Egypt with 98,423,598, and Bahrain had the lowest population rate with 1,569,446 in 2018. Finally, it should be mentioned that there are some limitations in selecting these Middle Eastern countries. For instance, some countries are in conflict (Syria, Yemen, Palestine, and Iraq), resulting in a lack of reliable statistics on certain aspects. Furthermore, due to inadequate or missing data during the investigation, several countries were eliminated (Qatar, Israel, Lebanon, and Kuwait).

3.3. Data Source

The data for this research study were obtained from several credible sources. Specifically, the founding dates and locations of selected countries were collected from the organization and Institute of Industries and Industrial Parks Organization of each selected country. Since industrial parks are not the only factor influencing regional development, numerous factors are analyzed to account for the unique features of each country. Furthermore, annual statistical yearbook updated statistics data from 2000 to 2018 were used to obtain statistical data such as GDP per capita, foreign direct investment (FDI), urbanization rate (UR), labor force, CO_2 emissions, and total population. The core explanatory variable is a dummy variable equal to 1 after the establishment of industrial parks and 0 otherwise. The descriptive statistics for all variables are shown in Table 2.

Table 2. Descriptive data analysis.

Variables	Unit	Min	Max	Mean	SD
No. Industrial parks	-	0	4	0.447	0.796
labor force	person	305,457	32,833,549	11,738,565	10,968,542
Urbanization rate	percent	42.704	90.979	74.701	13.960
CO_2	kt	15,880	629,290	204993.289	183430.365
GDP	US	15,447,922,938	988,642,300,212	272,997,718,273	232,898,089,116
FDI	US	2,172,431,730	39,455,863,929	5,301,513,483	6,816,401,775
Population	NO	664,611	98,423,598	34,122,892	33,672,860

3.4. Model Specification

This section discusses the integration of time series and cross-sectional data. Combining data creates a more diverse source of variation and provides a more effective parameter estimate. Moreover, additional data with more information allow for the generation of more credible estimations and the examination of a more complex behavior patterns under less restricted assumptions. Panel datasets are also capable of controlling section heterogeneity. Inadequate management of these cross-sectional (individual) impacts results in biased estimates. Additionally, the panel dataset can detect and estimate impacts that are difficult to track in simply cross-sectional or time-series data. The panel dataset, in particular, better addresses the complicated challenges of dynamic behaviors. Pooled data refer to a set of data based upon which observations are examined by a large number of cross-sectional (N) variables that are often randomly selected over a specified time period (T). The models used in combined data include a fixed effect and a random-effects model. Like the time series model, the panel data regression model is as follows [61,62]:

$$y_{it} = a + X_{it}\beta + u_{it} \tag{1}$$

$$i = 1, 2, \ldots, n; t = 1, 2, \ldots, T. \tag{2}$$

The subscript i represents the time-lapse view (e.g., for households, individuals, firms, and countries), and t represents time. a is a scalar, β is the vector $k1$ and k is an explanatory variable. The specification of the error elements is as follows:

$$u_{it} = u_i + v_{it}, \tag{3}$$

where u_i represents the effect of the time interval and v_{it} represents the remainder of the component effect [63]. A fixed effects model where u_i is fixed parameters, the following equation will be selected as a fixed effect regression:

$$y_{it} = a + X_{it}\beta + \sum_{i=1}^{n} uiDi + vit, \tag{4}$$

in which D_I is a virtual variable for i. v_{it} is an ordinary class random distributed independently and identically,

$$IID(0, \sigma 2V). \tag{5}$$

- **Random effects model:**

If the variables are randomly selected and there is no correlation between explanatory variables and errors, then a random effects method can be used to achieve efficient and consistent estimates. In this method, using the generalized least squares (GLS) method, the model is estimated as follows:

$$y_{it} - \theta\hat{Y} = \beta_0(1-\theta) + \beta_1(x_{it} - \theta\hat{X}) + [(1-\theta)\alpha_i + (\epsilon it - \theta\hat{\epsilon}_i] \tag{6}$$

$$\theta = 1 - \sqrt{\frac{(\delta_\epsilon)^2}{T(\delta_\alpha)^2 + (R_\epsilon)^2}}. \tag{7}$$

In the equations above, if $\theta = 1$, then the model estimation with the random effect method is converted to the estimate with the fixed effects method, and if $\theta = 0$, then the model estimation with the random effects method changes into the model estimation as a combination of the total data, and with the usual least squares method, will be:

$$y_{it} = \alpha + \beta_1 X_{it} + \beta_2 Z_{it} + e_{it} + u_{it}. \tag{8}$$

In the above relation, $e_i t$ is the error of each observation, and $u_i t$ is the random effect of each section. $e_i t + u_i t$ is the total error with the condition $\mathrm{cov}(e_i t, u_i t) = 0$ for all$i$ and

t. In randomized models, generalized least squares estimators provide the best linear estimates without bias.

Diagnostic tests

Various tests are used to determine the type of optimal model used in the pooled data. The most commonly used ones are Hausman's test for using the fixed effects model against the random-effects model, the Chow test for using the fixed effects model against the estimated model of the pooled data, and the Lagrange Multiplier test for using the randomized model of the data model combined. Since fixed effects and Hausman tests were used in this study, these two tests will be elaborated.

Fixed effects test

By doing the F test, the common sense of the virtual, i.e., $H; \mu_1 = \mu_2 = \ldots = \mu_{N-1} = 0$ can be tested. The restricted residual sum of squares ($RRSS$) is obtained by applying OLS over the combined pattern and the unrestricted residual sum of squares ($URSS$) by the LSDV regression. If lN is large, it can be converted into an intragroup. The unresolved residual squares sum is denoted by $URSS$. The statistics are as follows:

$$F = \frac{(RRSS - URSS)/(N-1)}{URSS/(NT - N - K)} \tag{9}$$

$$H_{F_{N-1.N(T-1)-K}}. \tag{10}$$

Hausman Test

The most common test for determining the type of data model is the Hausman test. If, after hypothesis F, hypothesis H_0 is rejected against hypothesis H_1, this test can be used to choose between a fixed and a random method. Hausman's test is based on the existence or non-existence of a correlation between estimated regression errors and independent variables. If there is such a relationship, the model has a fixed effect, and if this relationship is not present, the random-effects model will be used. Hypothesis H_0 indicates the lack of correlation between independent variables and the estimation error, and hypothesis H_1 indicates that there is a relationship. Since it is impossible to decide on the choice of a fixed-effects model or a random effects model, Hausman's test is used with the following assumptions:

$$H_0 : E(U_{it}|X_{it}) = 0. \tag{11}$$

The interpretation of this assumption is that (u_i) is independent of U_{it}. If the model does not have a random effect, then:

$$H_1 : E(U_{it}|X_{it}) \neq 0. \tag{12}$$

The Hausman test statistic is as follows:

$$m = q'[var(q)]q \tag{13}$$

$$\hat{q} = \hat{\beta}_{GLS} - \widetilde{\beta}_{whitin}. \tag{14}$$

This statistic under the zero assumption has an asymptotic distribution with k, which is the vector of coefficients β, and $\hat{\beta}_{GLS}$, fixed effect estimators and $\widetilde{\beta}_{whith}$ in showing random effects estimators.

4. Results

This section validates and tests the model. Due to the time-series structure of the data, it is important to evaluate the variables' significance prior to estimating the model. A variable is considered to be constant whether its mean, variance, and auto-correlation coefficients remain constant over time [64]. The Levin, Lin, and Chu unit root test was utilized to diagnose meaning in this investigation. The findings are summarized in Table 3.

Table 3. The unit root test.

Variables	T-Statistic	Prob	Degree
No. Industrial parks	−5.40679	0.0000	I(0)
labor force	−7.11154	0.0000	I(0)
Urbanization rate	−1.82847	0.0337	I(0)
CO emission	−2.46149	0.0069	
FDI	−2.39850	0.0082	I(0)
Population	−1.99382	0.0231	I(0)
GDP	−0.98403	0.1626	I(1)

The independent variables are all stable at zero, whereas the dependent variable is stable at one. Considering that the independent variables in this study are stationary, and the dependent variables of GDP at constant prices of 2010 are non stationary (I (1)), the reliability of the error component was examined to avoid making incorrect regression estimates. The regression's residuals are stationary I (0). Classic regression procedures, such as the t and F tests, can be used to examine the data. As a result, it avoids experiencing inaccurate or incorrect regression. Thus, Engel and Granger (1987) concluded that if the Dickey–Fuller test is performed on the model residues and the residual time series are stationary, co-accumulation is confirmed. Since the model is a panel data model, it is necessary to determine whether it contains fixed effects, random effects, or integrated data models. The fixed effect model assumes that each country has different intercepts and coefficients. The model with random effects assumes that country differences are random and represent a random variable. It is worth noting that countries do not exhibit particular characteristics in the model with integrated data. Now, a decision must be made to select a model. To this end, the model is first estimated with fixed effects and the coexistence of zero with all coefficients associated with the difference in intercepts across countries is checked. If the null hypothesis that all country impact coefficients are equal to zero is rejected, it can be found that at least one country has a different intercept from the others. As a consequence, the constant effect model is preferred to the combined data (F-Limer test). If fixed and random effects were found to be preferable to the combined model in the preceding test, we now employ the Hausman test to decide between the two methods. The establishment of classical hypotheses is one of the conditions for the correct estimation of regression and its coefficients. Since the intercepts are placed in the leading model, the first classical assumption that the mean of the error is zero is not rejected. Moreover, since explanatory (independent) variables are generally exogenous and non-random, they usually do not correlate with the model error statement. Therefore, the classical assumption of no correlation between independent variables and error sentences is not rejected and does not need to be tested. Due to the fact that other classical hypotheses are established in this study, and the sample size is large (more than 30 samples), the distribution of samples is close to the normal distribution (Figure 6). According to Jarkobra statistics, it can be stated that, except for the error, the bell-shape is normal. Therefore, the regression results can be trusted, and there is a slight possibility of deviation from the predicted results.

In this case, even if the perturbation samples are not normal, the model coefficients have a low variance. They are effective, and these two characteristics are sufficient to determine the tested hypotheses using model coefficients. Combining time-series and cross-sectional data eliminates variance heterogeneity and serial autocorrelation across model components. There is no need to study or resolve the issues mentioned earlier.

- **Estimation of the model with fixed effects:**

First, we estimate the model with fixed effects Table 4. This model assumes that each country has certain intercepts. Suppose this assumption is rejected, instead of the model with fixed effects. In that case, we should consider the model with integrated data because the unique hypothesis and the specificity of the intercepts are rejected. Table 5 of the F test indicates that at least one of the intercepts of the sources is significantly different from zero. Since the p-value of the test is less than 5%, it can be said that the null hypothesis suggesting that all virtual variables related to countries are ineffective is rejected, and at least one of them is significant. Therefore, the model with fixed effects is preferable to the one with integrated data.

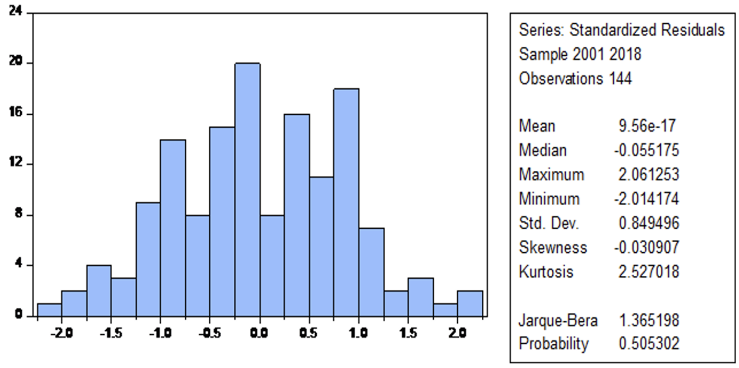

Figure 6. The normality tests.

Table 4. Redundant Fixed Effects Tests.

Equation: EQ01 Test cross-section fixed effects			
Effects Test	**Statistic**	**d.f.**	**Prob**
Cross-section F	362.673267	(7.130)	0.0000

Accordingly, Table 6 presents the model estimation with fixed effects. The GLS weighting model and cross-section SUR were utilized to account for the possibility of two problems with variance inequality and serial autocorrelation in the model's disturbance components. As it is evident in Table 5, except for the urbanization rate (which is significant at the level of 5%), all variables are significant at the level of 1%. Furthermore, according to the obtained results, when carbon dioxide emissions are increased by one unit, the interruption of GDP at a given price as a measure of economic growth rises to 434,439.9 units. By increasing the foreign investment by one unit, countries' economic growth will increase by 0.753961 units. By increasing the rate of urban development by one unit, economic growth will be increased by 3.79 units. Increases in the labor force and the number of industrial parks developed will boost the economic growth of 28,072.47 and 2.27 units, respectively. Economic growth in the surveyed countries has also been slowed by population growth.

Table 5. Estimate the first model with fixed effects.

Variables	Coefficient	Std.Error	t-Statistic	Prob
C	-9.14×10^{10}	6.14×10^{9}	−14.89862	0.0000
Co2Kt	434439.9	33209.84	13.08166	0.0000
FDI	0.753961	0.153564	4.909754	0.0000
URrate	3.79×10^{8}	1.85×10^{8}	2.051503	0.0422
Labor	28072.47	1468.923	19.11091	0.0000
Population	−2892.254	680.5519	−4.249866	0.0000
Industrial park	2.27×10^{9}	8.07×10^{8}	2.809662	0.0057

Table 6. Cross-section fixed (dummy variables).

		Weighted Statistics	
R-squared	0.997091	Mean dependent var	11.27881
Adjusted R-squared	0.996800	S.D. dependent var	23.58215
R-squared	0.997091	Mean dependent var	11.27881
S.E. of regression	0.890959	Sum squared resid	0.999807
F-statistic	3427.734	Durbin-Watson stat	103.1950
Prob(F-statistic)	0.000000		
		Unweighted Statistics	
R-squared	0.983306	Mean dependent var	2.67×10^{11}
Sum squared resid	1.22×10^{23}	Durbin-Watson stat	0.313567

In this estimate, it is assumed that the differences in intercepts across the countries are randomly distributed. In the previous section, it was seen that fixed effects are preferred over the integrated model. Now, the issue is whether fixed effects are preferable to random effects. To answer this question, we employ the Hausman test to distinguish between fixed-effects and random-effects models. To understand the logic of this test, we assume that the random component introduced to the model to account for individual effects is uncorrelated with the other independent variables in the model with random effects. If this component is connected with the independent variables, the model will be incompatible with random effects, and fixed effects regression should be utilized. The model might include random effects if this component is unrelated to the independent variables. While regression with fixed effects is still consistent in this case, it is less efficient than regression with random effects since it requires the estimation of additional parameters. Now, if an independent variable has a random component, the coefficients in the two models must be considerably different from the fixed and variable effects. The Hausmann test compares the coefficients of these two regressions. The Hausman test result for a model with random effects rather than fixed effects is shown in Table 7.

Table 7. Correlated Random Effects - Hausman Test.

Equation: EQ01 Test cross-section random effects			
Test Summary	Chi-Sq Statistic	Chi-Sq.d.f.	Prob
Cross-section random	313.897100	6	0.0000

Since the test statistic is less than 1%, we can conclude that the null hypothesis of no systematic difference in coefficients is rejected. Hence, the model with fixed effects is more efficient than the one with random effects. We adopt the same fixed effects as in the preceding section. Since establishing the presence of fixed effects in the model and taking into account that the dependent variable was GDP at constant prices in 2010, fixed values for various nations were calculated. According to Table 8, countries with positive fixed values have performed better on average in recent years in terms of GDP. The table below shows that Saudi Arabia, the United Arab Emirates, and Oman have the highest average GDP at constant prices in the calculated regression. Thus, the presence of independent variables in the model has a substantial effect on GDP in these three countries. In other words, independent variables such as the number of industrial parks established in these countries influenced economic growth the most. Finally, Iran also benefited from the slightest influence of the industrial park development on economic growth among the ME countries.

Table 8. Fixed effects between sections (countries).

Ranks	Countries	Average Value of GDP at Constant Price (Intercept)
1	Saudi Arabia	172,000,000,000
2	UAE	146,000,000,000
3	Oman	59,700,000,000
4	Bahrain	55,500,000,000
5	Jordan	47,300,000,000
6	Turkey	42,500,000,000
7	Egypt	− 245,000,000,000
8	Iran	−277,000,000,000

5. Discussion

There have been few studies that use data panel analysis to examine the role of industrial parks in regional development in the Middle East. This study integrates a data panel method for the first time, integrating geographic detectors and macroeconomic factors, which makes industrial parks and provides new research methods and understanding for industrial park development in a new research area.

The development of industrial parks played an important role in regional development. Regional areas benefit economically from the development of industrial parks. The findings of this study could be useful for developing the industrial park and improving regional development factors. In this regard, some studies, such as [65–67], used data panel analysis within Chinese regions to assess the economic performance and environmental impacts of industrial park development. They focused on macroeconomic and pollutant criteria among Chinese municipal areas. The results show that establishing environmentally friendly industrial parks has significantly reduced industrial pollution and increased the sustainable economic situation. As a result, establishing industrial parks will have an immediate and consequential impact on economic development and environmental pollution, despite the fact that corresponding research is rare in various geographical locations. As a result, based on panel data, the impact of the industrial park on FDI, labor force, and GDP is significant and positive. It demonstrates that pursuing industrial park development can improve FDI, which is consistent with our expectations as well as the findings of De Simone & D'Uva [68], Pan & Wang [69], and Li & Wang; Peng et al. [70,71]. To successfully overcome the green barrier and enter a larger international market, Saudi Arabia enterprises, such as the UAE, continue to engage in multi-directional innovation in areas such as strategy, management, and technology, which has had a significant positive impact on regional development factors. The data panel result for the rate of urbanization and population, on the other hand, is significantly positive. This is in agreement with Tian et al. [72], Cavallo et al. [73], and Davis and Kingsley [74]. The establishment of industrial parks as a result of regional development can result in rapid urbanization, which can exacerbate the negative effects of pollution. and the disparity between rural and urban areas. At this stage of rapid urbanization in Iran and Jordan, national urbanization has increased from 75.94 and 92 percent in 2021 respectively, while global urbanization has increased from 56.2 percent to 70 percent over the same period (Report by World Bank, 2021).

6. Conclusions

Industrial park developments have been increasingly important in developing regions during the last two decades. In this regard, This study aimed to ascertain the regional development viability of industrial parks in terms of GDP, labor force, population, urbanization, CO_2 emission and FDI from 2000 to 2018. Thus, the investigation of the effect of industrial parks on regional development criteria, the data panel analysis is used. The main conclusions of this study have been outlined as follows:

Industrial parks have enhanced regional development, demonstrating the necessity and significance of establishing industrial parks. The time series model could reveal the effects of industrial parks on regional development with accuracy. Thus, the advantage of the data panel model over the time series model in policy evaluation has been proved. This study supports the effects of industrial parks on regional development. In particular, the effects of industrial park development on economic growth in Iran and Egypt are weaker than in Saudi Arabia and the United Arab Emirates. Furthermore, the effects of industrial parks at different regional levels have differed significantly, emphasizing the importance and necessity of classified management.

Further research in the following areas is possible. Due to the obvious distinct advantages of data panel analysis, it is ideal for large-scale research. As a result, national- and even global-scale data panel evaluations are possible. Analyses based on the coupling of data panel and regional development factors can be carried out to determine the relationship between the industrial park and regional development, which will improve suggestions for developing industrial parks towards regional development, particularly in the process of urbanization.

For more efficient development of industrial parks, there are some suggestions from the urban planner's perspective, which can be divided into three aspects of economic growth, environmental issues, and a reduction in regional disparities, as described in the following; First of all, the selected countries are divided into two groups. The first group includes Saudi Arabia, UAE, Oman, and Bahrain, and the second group includes Jordan, Egypt, Turkey, and Iran. The main difference between the first and second groups is the average GDP growth level (Table 8). Accordingly, considering the situation of the second group, these countries should rethink their policy development and pay more attention to the economic growth rate, especially in Iran and Egypt. Furthermore, the second group has, in terms of specialist labor force training, another significant difference compared to the first group. The proposed solution to improve the quality of these countries is to enhance human development and the training of skilled labor, as well as technology, which leads to increased income and economic development. Finally, regarding the economic development sector, the economic growth of all countries that have survived, such as Iran, Egypt, and Turkey, depends on variables such as the development of technology, capital decentralization, human capital development, and working environment improvement, and macroeconomic stability. Secondly, for industrial park development, governments should stress green growth. Environmental issues are the primary step of the development plan in developed and developing countries. Thus, the traditional model of the industrial parks should be upgraded towards a green development plan. According to this plan, the situation will be improved by increasing the economic growth rate and reducing the environmental pollution as far as possible. A green environment includes the use of renewable energy, the design and implementation of green space in industrial parks, and the use of up-to-date materials in the construction of industrial parks. Iran and Saudi Arabia should consider this issue in proportion to the rest of the countries. In particular, Iran has the highest rate of CO_2 emission growth among the studied countries and, consequently, a high rank regarding the CO_2 emissions of big cities in the world. The third and last essential challenge review of developing industrial parks is regional disparities among the selected countries. Due to this issue, the government should consider, instead of increasing the number of industrial parks in the mega-cities, developing industrial parks in the rural and less developed regions based on the upgraded industrial park development. Therefore, countries with the same situation can simultaneously achieve the lofty goal of developing industrial parks considering sustainability economic, social and environment approaches.

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