Foreign Direct Investment and Financial Development: Evidence from Selected Arab League Countries

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ABSTRACT

This study **examined** the impact of foreign direct investment on financial development in selected Arab League countries (Algeria, Comoros, Egypt, Jordan, Kuwait, Lebanon, Mauritania, Oman, and Qatar) for the period from 2010 to 2021. The study used one explanatory variable — financial development — and one explained variable — foreign direct investment. To obtain reliable and valid results, **panel data** were analyzed, and various **tests** were carried out**, including the Chow test, Breusch-Pagan Lagrange multiplier test, Hausman test, Jarque-Bera normality test, Wooldridge test, generalized least squares, and ordinary least squares. The robust model of the study **revealed** a positive and significant relationship between foreign direct investment and the financial development index, human development index, and interest rate. Also, there is a negative and significant relationship between foreign direct investment and the consumer price index and domestic credit to private sector. Based on these **findings**, the study **recommends** that Arab League countries' policies and strategies should attract foreign investors to maintain and sustain economic developmental goals for healthy, literate, and wealthy lives.

Keywords: foreign direct investment; financial development index; panel data; Arab League countries; human development index; consumer price index; economic development; econometric models

Прямые иностранные инвестиции и финансовое развитие: результаты исследований отдельных стран Лиги арабских государств

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АННОТАЦИЯ

В данном исследовании **рассматривается** влияние прямых иностранных инвестиций на финансовое развитие отдельных стран Лиги арабских государств (Алжир, Египет, Иордания, Катар, Коморские Острова, Кувейт, Ливан, Мавритания и Оман) за период с 2010 по 2021 г. В исследовании использовались одна объясняющая переменная — финансовое развитие, а также одна объясняемая переменная — прямые иностранные инвестиции. Для получения надежных и достоверных результатов был проведен **анализ панельных данных** и различные тесты, включая тест Чоу, тест Бреуша-Пагана на основе критерия множителя Лагранжа, тест Хаусмана, тест на нормальность Харке-Бера, тест Вулдриджа, а также методы обобщенных наименьших квадратов и обычных наименьших квадратов. Робастная модель исследования позволила **выявить** положительную и значимую связь между прямыми иностранными инвестициями и индексом финансового развития, индексом человеческого развития и процентной ставкой. Кроме того, существует отрицательная и значимая связь между прямыми иностранными инвестициями и индексом потребитель-

ских цен, а также внутренним кредитом частному сектору. Исходя из результатов исследования, авторы **рекомендуют** странам Лиги арабских государств привлекать иностранных инвесторов для поддержания и реализации целей устойчивого экономического развития здорового, грамотного и обеспеченного населения.

Ключевые слова: прямые иностранные инвестиции; индекс финансового развития; панельные данные; страны Лиги арабских государств; индекс человеческого развития; индекс потребительских цен; экономическое развитие; эконометрические модели

1. Introduction

Foreign direct investment (FDInvestment) plays a crucial role in fostering an open and efficient international economic system, in contrast to economies that are characterized by restrictive laws and regulations. FDInvestment[1] refers to the act of a person or firm making a direct investment in another country, specifically in production or for business purposes. FDInvestment may be undertaken via many methods, such as establishing a subsidiary, purchasing an already established foreign enterprise, or engaging in a merger or joint venture with a foreign corporation [1]. Foreign direct investment evidence indicates that FDInvestment inflows boost economic development through knowledge transfer and spillover efficiency. However, such a beneficial effect does not occur automatically; rather, it depends on the receiving country's absorptive ability. Absorption capacity has been the subject of several studies, and the success of FDInvestment focuses only on human capital and trade regimes [2].

According to the World Economic Forum's 2011 Financial Development Report, financial development is the sum of all elements — policy, institutions, and others — that support efficient financial markets and intermediation, as well as the provision of universally available capital and financial services [3].

The factors often used to measure financial development include financial depth, bank ratio, and financial activity, which may be generally characterized [4]. The prosperity of every economy is contingent upon the presence of a competent and efficient financial system since a robust financial system is essential for establishing a solid economic foundation. An enhanced financial system facilitates the provision of superior financial services, thereby enabling an economy to increase its GDP growth [5].

Foreign direct investment is an important source of growth and development, while financial development is a crucial input in developing nations for economics growth and poverty alleviation. Financial development fosters economic expansion and increases a nation's resilience. It enhances resource allocation, promotes information sharing and financial stability, mobilizes savings, and facilitates risk management and diversification [6].

The present study uses a relatively new measure of financial development proposed by the International Monetary Fund (IMF) [7]. The financial development index[2] combines 20 indicators and includes both banking and nonbanking institutions, as well as markets. It assesses financial development across three dimensions: depth, access, and efficiency. In addition, the study offers important policy recommendations for the selected OIC member countries.

There are strong connections between foreign direct investment and financial development. To find out how important FDInvestment is for financial development, correlation and regression models were used to figure out the best way to attract FDInvestment to encourage economic development.

2. Literature review
2.1. Foreign direct investment

Foreign direct investment occurs when a company from one nation establishes a business operation in another nation, either by estab-

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[1] FDInvestment denotes Foreign direct investment.
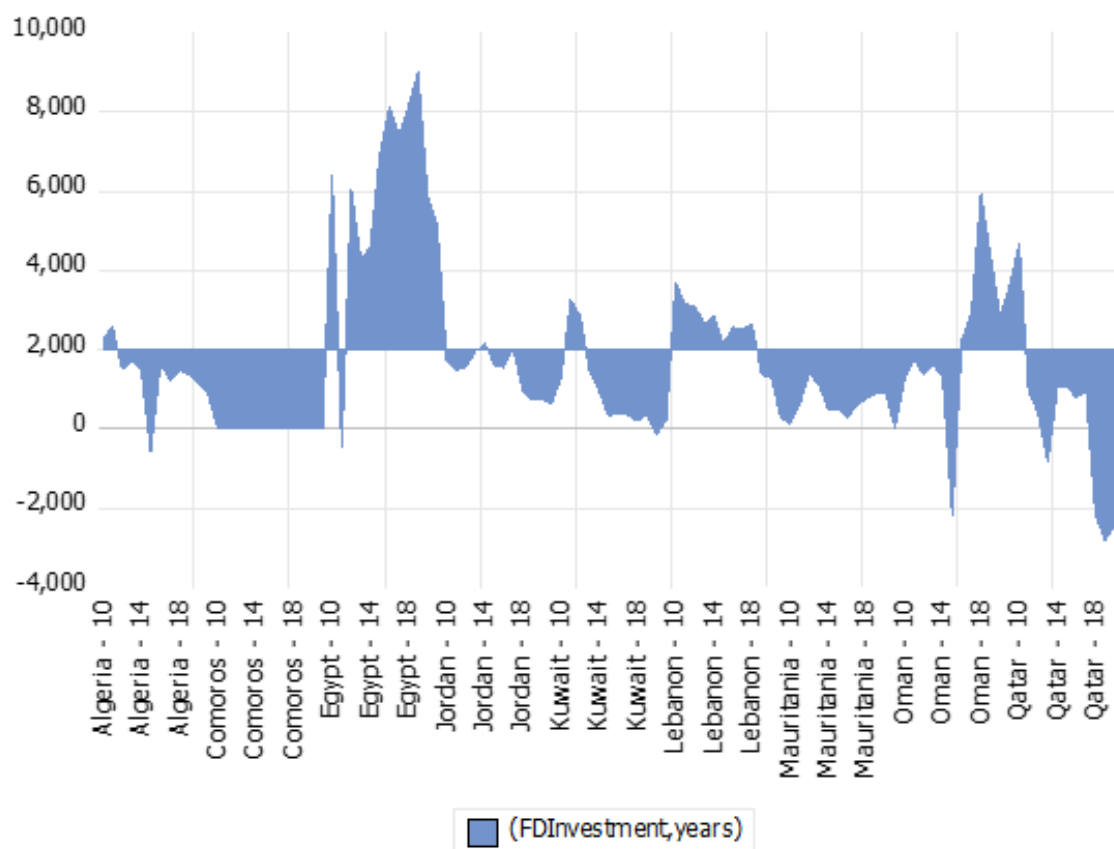
[2] FDI indicates financial development index.

Fig. 1. **Foreign direct investment of Arab League countries, millions of dollars**

Source: The Organisation of Islamic Cooperation (OIC) Countries. OIC Statistics Database (OICStat) — Query 2023. URL: https://www.sesric.org/query.php.

lishing a new wholly owned affiliate, acquiring a local company, or organizing a joint venture in the host economy [8]. The potential advantages of foreign direct investment for the host economy are considerable, including several aspects such as the transfer of technology skills, support for capital development, assistance in fostering a competitive business environment, and facilitation of international trade integration. These advantages can stimulate the main economic sectors, including petroleum, mining, manufacturing, agriculture, transportation, communication, construction, and others. Numerous nations consciously seek to attract foreign direct investment due to their belief that multinational firms would significantly contribute to economic development via the creation of new employment prospects, added capital accumulation, and enhanced total factor productivity. Without a doubt, an extensive database of empirical data proves the notion that foreign direct investment often provides overall benefits for both the countries of origin and recipient nations. These sectors are crucial for attaining substantial levels of employment and fostering economic growth and development. However, the advantages of foreign direct investment for nations may vary based on economic conditions and resource availability [1]. Economic factors, infrastructure, technology, institutional-political factors, specific risks, legal integration, space factors, entrepreneurial matters, cultural factors, and para-cultural factors are believed to influence the attraction of foreign direct investment. Most studies prioritize examining the economic variables that influence FDInvestment flows while largely disregarding or briefly mentioning other categories of factors. Scientists have studied a variety of economic factors in relation to FDInvestment, with varying degrees of success [9]. These factors include income, exchange rate, economic freedom, economic stability, liquidity, market size, market size growth, inflation, trade, capital availability, wages, agglomeration, capital formation, financial market, and debt.

The ups and downs of foreign direct investment for some selected Arab League countries (*Fig. 1*) during the last decade revealed that factors having a relation to or effect on foreign direct investment could make it possible to attract investment, and as a result, economic development can be provoked.

2.2. Financial development

The advancement of the financial industry is a crucial element that contributes significantly to gaining a competitive edge. A resilient financial system encourages multinational corporations to make investments in the countries where they are based [10]. Financial development refers to the enhancement of services offered by the financial system, including the allocation of capital to profitable investments, savings, risk diversification and monitoring, and risk management of these investments, as well as facilitating the exchange of goods and services. Financial development has the potential to decrease the imbalance of knowledge between parties, promote the distribution of risk, and mitigate limitations on financial activities. Financial development enhances the capacity of the financial system to withstand economic shocks, mitigates the exacerbation of negative effects caused by such shocks, and reduces macroeconomic instability and social disparities.

The financial development index contains two sub-indices (the Financial Institution Index and the Financial Market Index). Each sub-index has its indicator in three (Depth, Access, and Efficiency) categories. Every category shows at least one indicator. The sum of the total indicator value is named the value of the financial development index. Financial development combines financial markets with financial institutions to extend the availability and access of debt or funds to clients or customers to maintain their organizational goals or profit. Financial markets are the channel through which FDInvestment may be beneficial for financial development and, most commonly, for growth. The theoretical model shows that improvements in financial markets increase output by increasing the marginal product of FDInvestment [7]. *Table 1* explains the indicators of the financial development index.

2.3. Correlation between FDInvestment and financial development index

Orji et al. (2021) utilized autoregressive distributed lag (ARDL) and ordinary least squares to analyze the impact of FDI on Nigeria's GDP growth. The findings indicate that both foreign direct investment and human capital training contribute positively and significantly to economic development in Nigeria. The exchange rate and inflation have a negative impact on Nigeria's economic growth, while trade openness has an opposite effect [11]. Gökmenoğlu et al. (2018) state that the impact of FDInvestment on the human development index (HDI) is a complex problem; thus, policymakers should be aware of and consider the pros and cons of FDInvestment inflows on all aspects of human development to achieve the best outcomes. The author's findings indicate that FDInvestment has a favorable impact on economic growth and educational advancement; therefore, they suggest that Nigerian policymakers should make attracting international investors a top priority. However, the dynamic ordinary least squares (DOLS) estimator shows that FDInvestment harms life expectancy in Nigeria due to FDInvestment-induced competition and insecurity [12].

In 2018, Saidi conducted an empirical study to examine the relationship between foreign direct investment, financial development, and economic growth in low-income countries. The study used data from 1990 to 2015. The findings of this study indicate that foreign direct investment operations can provide significant benefits for low-income countries in terms of technology acquisition, increased investment inflows, job generation, human capital development, and enhanced corporate growth. Moreover, the study revealed the presence of long-term cointegration and bidirectional causation between foreign direct investment and financial development in low-income nations [13].

According to Bayar and Gavriletea (2018), FDInvestment inflows do not significantly affect the level of financial development over the long and short terms. Nevertheless, it is evident that a one-way causal relationship exists between the growth of the financial sector and the influx of FDInvestment in the countries of the Central and Eastern European Union. Hence, based on theoretical analysis, no obvious influence, whether good or negative, can be identified [14].

Table 1
New broad-based index of financial development

Financial institution index	Financial markets index
Categories-based indicators of financial institution index	Categories-based indicators of financial markets index
Private-sector credit to GDP (Depth) Pension fund assets to GDP (Depth) Mutual fund assets to GDP (Depth) Insurance premiums, life, and non-life to GDP (Depth) Bank branches per 100000 adults (Access) ATMs per 100000 adults (Access) Net interest margin (Efficiency) Lending-deposits spread (Efficiency) Non-interest income to total income (Efficiency) Overhead costs to total assets (Efficiency) Return on assets (Efficiency) Return on equity (Efficiency)	Stock market capitalization to GDP (Depth) Stocks traded to GDP (Depth) International debt securities of government to GDP (Depth) Total debt securities of financial corporations to GDP (Depth) Total debt securities of nonfinancial corporations to GDP (Depth) Percent of market capitalization outside of the top 10 Largest Companies (Access) Total number of issuers of debt (domestic and external, nonfinancial, and financial corporations), (Access) Stock market turnover ratio (stocks traded to capitalization), (Efficiency)

Source: [7].

Majeed et al. (2021) analyzed 102 Belt and Road Initiative nations from Asia, Europe, Africa, and Latin America to determine the impact of foreign direct investment on financial development. They employed a suite of quantitative methods, including feasible generalized least squares and augmented mean group techniques, using data collected from 1990 to 2017. The results of the research indicate a statistically significant association between FDInvestment and trade openness, inflation, government consumption, and financial development. Asia, Europe, and Latin America experienced an increase in FDInvestment due to trade liberalization and government consumption, whereas Africa reported a reduction. Financial development is negatively impacted by inflation on every continent. Moreover, in Asia and Europe, the Dumitrescu–Harlin panel causality test validates a two-way causal link between FDInvestment, trade openness, and financial development. In contrast, FDInvestment and financial development in Latin America are interdependent in a unidirectional fashion. Due to high factor costs, low-income and middle-income countries attract more foreign direct investment than high-income countries, as indicated by income-based results [15].

Lestari et al. (2022) evaluated the impact of FDInvestment and corruption on financial development in developing nations. Furthermore, they examined the collective influence of financial development and corruption on FDInvestment. The study's findings indicated that financial development has a favorable and substantial influence on FDInvestment, but corruption does not exert a statistically noteworthy effect. This illustrates the significant role of financial development in fostering the expansion of foreign investment and serving as a crucial source of financing for emerging nations. Nevertheless, the correlation between financial development and corruption exerts an adverse impact on FDInvestment. Consequently, when FDInvestment experiences a decline due to an increase in corruption, these findings prompt policymakers to tackle concerns related to the combined influence of financial development and corruption on the inflow of foreign direct investment in developing nations [16].

Nguyen et al. (2023) examined the impact of the financial development index on the inflow of foreign direct investment in Vietnam between 1996 and 2021. The model used time series data to evaluate the impact of six factors representing financial development. Data on financial institu-

tion assessment, financial depth of institution, financial efficiency of the institution, financial assessment of the market, financial efficiency of the market, and domestic loans for the private sector were gathered from 1996 to 2021. The study reveals that a rise in financial institution assessment, financial efficiency of the institution, and financial efficiency of the market leads to a corresponding increase in Vietnam's FDInvestment inflow, whereas an increase in financial depth of the institution and financial assessment of the market, results in a fall in FDInvestment. The impact of domestic loans for the private sector is unreliable, and this study lacks any substantial correlation. This research all so reveals that the chosen financial development index has a substantial influence on attracting foreign direct investment to a country. Furthermore, the government and authorities must formulate suitable policies in the future [17].

3. Methodology

This section presents an overview of the study methods, econometric model, and tests employed to assess the research model results. Balanced panel data of selected countries (Algeria, Comoros, Egypt, Jordan, Kuwait, Lebanon, Mauritania, Oman, and Qatar) were collected from the website of the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC) of the Organization of Islamic Countries (OICStat) database. A set of panel data was used in this investigation through Stata 17 and EViews 13. Panel data are a combination of cross-sectional and time-series data. For better measurement of financial development, the most general proxy, the Financial Development Index, is considered in the study, which consists of two different indexes named the Financial Institutions Index and the Financial Markets Index. Dependent, independent, and controlled variables are explained; descriptive statistics, correlation matrix, common, fixed, random, and robust models of effect were employed on the mentioned variables. Several tests (the Chow test, the Lagrange multipliers test, and the Hausman test) were performed to find the best model of effect. Once the model was chosen, other tests (the Breusch-Pagan Lagrange multiplier test for independence, the heteroskedasticity white test, the Wooldridge

test for autocorrelation, and the Jarque-Bera normality test) were carried out to find the appropriate model.

4. Results and Findings
4.1. Definition of the variables

Definitions of the variables are presented in *Table 2*.

In order to investigate the association and regression between foreign direct investment and financial development, we first consider the descriptive statistics and correlation analysis of the variables. Subsequently, we use three different types of panel regression models to further analyze the previously discussed relationship, as shown in *Tables 3* and *4*.

According to descriptive statistics, we have the means, standard deviation, min, and max for all three categories of variables named as dependent, independent, and control variables.

Correlation matrix *Table 4* shows the type and degree of relationship between all three categories of variables (dependent, independent, and controlled variables).

4.2. Empirical models

This subsection covers the empirical models and techniques that provide the foundation for the subsequent estimation approach. These models and methods were used to estimate the impact of foreign direct investment on financial development of selected Arab League countries. The empirical model used to analyze the impacts of foreign direct investment of this type may be expressed in the following econometric equations:

$$FDInvestment =$$
$$= f\left(FDI, HDI, CPI, IR, TO, PCGDP, DCtPS - \%GDP\right), (1)$$

$$FDInvestment = \beta_0 + \beta_1 FDI_{it} + \beta_2 HDI_{it} + \beta_3 CPI_{it} +$$
$$+ \beta_4 IR_{it} + \beta_5 TO_{it} + \beta_6 PCGDP_{it} + \beta_7 DCtPS - \%GDP_{it} + U_{it}, (2)$$

where, Foreign Direct Investment is a dependent variable, FDI is the financial development index, HDI is the human development index, CPI is the consumer price index, IR is the interest rate, TO is the trade openness, PCGDP is the per capita gross domestic product, and DCtPS%GDP stands for domestic credit to the private sector (% GDP). And β_0 is the intercept, (β_1, ..., β_7) are the coefficients, and U_{it} is the error term of the model.

Table 2
Definition of the variables

Full Name	Variables Description	Source
Dependent Variable Foreign Direct Investment	The inflows of FDInvestment refer to transactions that raise the investment held by foreign investors in domestic firms, excluding transactions that reduce the investment of foreign investors in domestic companies, expressed in the current USD	UNCTADST Database
Independent Variable Financial Development Index (Index Value)	Evaluate the comparative placement of nations based on the extent, availability, and effectiveness of their financial institutions and financial markets. Combining the Financial Institutions Index and the Financial Markets Index yields the comprehensive financial development index	IMF
Control Variables Human Development Index (Rank Value)	The standard competition ranking, often known as the «1224» ranking, assigns the same ranking number to countries with equal Human Development Index scores, leaving a gap between the ranking numbers	OICStat
Trade Openness (Percent)	Trade balance, calculated as the ratio of the sum of exports and imports of goods and services to the gross domestic product (GDP), is represented as a percentage	WDI Database
Domestic Credit to the Private Sector (Percent),% GDP	The private sector's share of financial resources provided by financial businesses, which includes loans, non-equity securities purchases, trade credits, and other accounts receivable, in relation to the Gross Domestic Product (GDP)	IFS World
Interest Rate (percentage)	Annual bank rate that usually meets the short- and medium-term financing needs of the private sector, expressed as a percentage	OICStat
Consumer Price Index (percentage)	The final value of the consumer price index (CPI) at the end of a certain period. The Consumer Price Index (CPI) measures the fluctuations in the expenses associated with purchasing a standardized assortment of goods and services by the typical consumer	OICStat
Per Capita Gross Domestic Product	Per capita real GDP, denominated in USD	OICStat

Source: Developed by the authors based on OICStat Data Base.

Table 3
Descriptive statistics of variables

Variable	Obs	Mean	Std.Dev.	Min	Max
FDInvestment	108	1670.449	2181.461	-2812.640	9010
FDI	108	0.284	0.152	0.040	0.600
HDI	108	0.721	0.107	0.510	0.860
CPI	108	132.635	57.616	16.600	452.500
IR	108	8.402	4.342	0.790	18.320
TO	108	79.708	28.306	29.860	163.980
PCGDP	108	15057.205	20571.258	1284.400	80743.129
DCtPS-%GDP	108	51.312	35.710	−12.730	177.080

Source: Developed by the authors.

Table 4
Correlation matrix analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) FDInvestment	1.000							
(2) FDI	0.086	1.000						
(3) HDI	0.124	0.850	1.000					
(4) CPI	−0.407	−0.341	−0.244	1.000				
(5) IR	0.117	−0.590	−0.746	0.248	1.000			
(6) TO	−0.236	0.588	0.453	−0.010	−0.278	1.000		
(7) PCGDP	−0.232	0.720	0.645	−0.166	−0.496	0.430	1.000	
(8) DCtPS-%GDP	−0.177	0.669	0.605	0.030	−0.432	0.393	0.405	1.000

Source: Developed by the authors.

The general form of the panel data regression model is given by equation (3). The panel data regression model, which is briefly described in equations (4), (5), and (6), will be used in this study to estimate the impact of FDInvestment on financial development.

$$Y_t = \alpha_t + \sum_{j=1}^{k} \beta_{jit} X_{jit} + U_{it},$$ (3)

where: Y_t is response variable of the (i) individual and t time period, α_t is constant value/intercept of the (i) individual and t time period, β_{jit} ($\beta_{1it}, \beta_{2it}, ..., \beta_{kit}$) are coefficients of ($K$) independent variables, X_{jit} is the independent variables value of (i) individual and t time period, U_{it} is the error of (i) individual and t time period, and (i and t) are the number of individual (i; 1, 2, 3..., N) and time period (t;1,2,3..., T), respectively.

4.3. Estimation of the panel data regression model

For parameter estimation, the model depends on the intercept and slope coefficient assumptions. Using panel data permits unique intercept and slope coefficients for each individual and time period. The following three types of models are applicable to this concept: CEM (common effect model or pooled regression); FEM (fixed effects model); and REM (random effects models).

Common effect model. Pooled regression (CEM model) implies that the intercepts and slope coefficients for all individuals and time periods have the same value. This model does not consider both individual dimensions and time [18]. Equation (4) illustrates the CEM model:

$$Y_t = \alpha + \sum_{j=1}^{k} \beta_j X_{jit} + U_{it}.$$ (4)

A common effect model was employed using Stata 17 software. As a result, the financial development index, human development index and interest rate have a positive statistically significant relationship with foreign direct investment, whereas the consumer price index, trade openness, per capita gross domestic product and domestic credit to the private sector calculated as a percentage of GDP have a negative significant relationship with FDInvestment (*Table 5*).

Fixed effect model. This approach assumes that the intercepts represent the differences in individual characteristics. Thus, intercepts for each individual will vary, whereas slope coefficients will remain constant across all time intervals [18].

$$Y_t = \alpha_i + \sum_{j=1}^{k} \beta_j X_{Jit} + U_{it}.$$ (5)

In this method, we used a dummy variable to estimate the intercept for each individual; thus, this approach is called least square dummy variable (LSDV) model.

$$Y_t = \alpha + \sum_{i=1}^{n} \alpha_i D_i + \sum_{j=1}^{k} \beta_j x_{jit} + U_{it},$$ (6)

Table 5
Common effect

FD Investment	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
FDI	8828.658	2602.477	3.390	0.001	3665.417	13991.898	***
HDI	14652.036	3057.034	4.790	0.000	8586.968	20717.105	***
CPI	−8.956	2.964	−3.020	0.003	−14.837	−3.075	***
IR	247.306	49.264	5.020	0.000	149.568	345.043	***
TO	−28.142	6.345	−4.440	0.000	−40.731	−15.554	***
PCGDP	−0.065	0.010	−6.380	0.000	−0.085	−0.044	***
DCtPS-%GDP	−25.245	5.810	−4.350	0.000	−36.771	−13.718	***
Constant	−7785.323	2144.541	−3.630	0.000	−12040.032	−3530.613	***

Mean dependent var	1670.449		SD dependent var	2181.461
R-squared	0.597		Number of obs.	108
F-test	21.158		Prob > F	0.000
Akaike crit. (AIC)	1883.903		Bayesian crit. (BIC)	1905.360

Source: Developed by the authors.

Notes: *** *p*<0.01, ** *p*<0.05, * *p*<0.10.

where α_0 is the mean of the intercept from the error terms cross-section and time series; $u_{it} = \mu_i + \varepsilon_{it}$, where μ_i is the random error of the cross-sectional deviation, which explains the differences between individuals; and ε_{it} is the error term of the model.

As a result of employing the fixed effect model, it was determined that the human development index, per capita gross domestic product and interest rate have a positive statistically significant relationship with foreign direct investment, whereas the consumer price index has a negative significant relationship with FDInvestment (*Table 6*).

Random effect model. Error terms in REM take into account the variations in individual characteristics. Error terms may correlate between individuals and between time periods [18]. We can formulate it as follows:

$$Y_t = \alpha + \sum_{j=1}^{k} \beta_j X_{jit} + \mu_{i+\varepsilon_i}, \qquad (7)$$

As a result of employing the random effect model, it was determined that the financial development index, human development index, and interest rate have a positive statistically significant relationship with foreign direct investment, whereas the consumer price index, trade openness, and domestic credit to private sector calculated as percentage of GDP have a negative significant relationship with FDInvestment (*Table 7*).

4.4. Selection of the panel data regression model
Multiple tests must be carried out to settle on the model that will be used to deal with panel data.

Table 6
Fixed effect

FD Investment	Coef.	St. Err.	t−value	p−value	[95% Conf	Interval]	Sig
FDI	8528.507	5191.465	1.640	0.104	−1782.189	18 839.204	
HDI	23 677.845	10402.984	2.280	0.025	3016.620	44339.070	**
CPI	−8.979	3.532	−2.540	0.013	−15.993	−1.965	**
IR	214.528	65.93	3.250	0.002	83.585	345.471	***
TO	−6.366	12.3	−0.520	0.606	−30.794	18.062	
PCGDP	0.124	0.067	1.860	0.066	−0.008	0.256	*
DCtPS−%GDP	−16.002	12.053	−1.330	0.188	−39.94	7.936	
Constant	−18 983.483	7835.655	−2.420	0.017	−34 545.770	−3421.197	**

Mean dependent var	1670.449		SD dependent var	2181.461
R-squared	0.351		Number of obs	108
F-test	7.096		Prob > F	0.000
Akaike crit. (AIC)	1831.444		Bayesian crit. (BIC)	1852.901

Source: Developed by the authors.

Notes: *** *p*<0.01, ** *p*<0.05, * *p*<0.10.

1. Chow Test. The Chow test is used to determine the most appropriate model for the study between the common effect and fixed effect models. Using this test, we test the null hypothesis (CEM is more appropriate than FEM). The hypothesis in the Chow test can be written as follows:

H0: Common Effect Model is more appropriate than Fixed Effect Model.

H1: Fixed Effect Model is more appropriate than Common Effect Model.

If the P-value is less than 0.05, then we can reject the H0 hypothesis. This means that the FEM is a better model than the CEM.

2. Lagrange multiplier (Bruch-Pegan) test. To decide whether the model, CEM or REM, is superior, researchers employ the Lagrange multiplier (Bruch-Pegan) test. The LM test hypothesis may be expressed as follows:

H0: The Common Effect Model is more appropriate than the Random Effect Model.

H1: The Random Effect Model is more appropriate than the Common Effect Model.

If the P-value is less than 0.05, then we can reject the H0 hypothesis. That means that the REM is a better model than the CEM.

3. Hausman Test. Finally, we performed the Hausman test to determine which of the two models (FEM or REM) would provide the most accurate results. In the Hausman test, one possible hypothesis states as follows:

H0: Random Effect Model is more appropriate than Fixed Effect Model.

H1: Fixed Effect Model is more appropriate than Random Effect Model.

If the P-value<0.05, then we can reject the null hypothesis, and conclude that FEM is a better model than REM. To select the best model from CEM, FEM and REM we will follow the diagram *Fig. 2*. As we can see, our base model is REM to finalize the most appropriate model.

Estimation of the parameter model in the CEM, FEM, and REM methodologies involves the use of ordinary least squares (OLS) and general least squares (GLS) methods. The classical assumption

Table 7
Random effect

FD Investment	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
FDI	12 389.857	4410.504	2.810	0.005	3745.428	21 034.285	***
HDI	11 211.597	6395.127	1.750	0.080	−1322.622	23 745.816	*
CPI	−9.238	3.394	−2.720	0.006	−15.889	−2.586	***
IR	280.303	57.825	4.850	0.000	166.969	393.637	***
TO	−22.100	9.871	−2.240	0.025	−41.447	−2.754	**
PCGDP	−0.037	0.031	−1.180	0.239	−0.097	0.024	
DCtPS-%GDP	−35.954	8.807	−4.080	0.000	−53.216	−18.693	***
Constant	−6907.591	4307.491	−1.600	0.109	−15 350.118	1534.937	

Mean dependent var	1670.449	SD dependent var		2181.461
Overall r-squared	0.493	Number of obs.		108
Chi-square	46.981	Prob > chi2		0.000
R-squared within	0.302	R-squared between		0.616

Source: Developed by the authors.

Notes: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

tests are conducted to obtain the optimal OLS or GLS estimator, often referred to as the best linear unbiased estimator (BLUE). Classical assumption tests include three specific tests: the Breusch-Pagan LM test of independence, the Modified Wald test for groupwise heteroskedasticity, and the Wooldridge test for autocorrelation. The Jarque-Bera normality test is a statistical test used to assess the normality of a given dataset. According to Gujarati (2022), in order to acquire the best estimator, it is necessary to meet the requirements of tests 2 and 3 among the four tests [20]. The results of the Breusch-Pagan LM test for independence, Heteroskedasticity White test, the Wooldridge test for autocorrelation, and the Jarque-Bera normality test are shown in the table below. These tests were conducted with random effect.

The LM test does not need to be performed if FEM is found to be the best in the Chow Test and Hausman Test. This test is only performed when the best model found in the Chow Test is FEM, whereas in the Hausman Test, the best model is REM. After selecting an appropriate model, we apply the robustness tests to determine the validity of the model.

When selecting a model for managing panel data, it is necessary to conduct various tests. These tests include the Chow test, which is employed to determine the superior model between CEM and FEM [19]. In addition, the Breusch-Pagan Lagrange multiplier test was used to select a better model between CEM and REM, while the Hausman test was employed to choose the preferred model between FEM and REM.

The results of the Chow test, Breusch-Pagan Lagrange multiplier test and Hausman tests are illustrated in *Table 8*.

We used the Chow test, the Breusch, and Pagan Lagrange multiplier test, and the Hausman test to determine which model most accurately reflected the data. The Chow test was used to check whether the intercept in each regression model showed any differences across the various countries. According to the Chow test, the regression reliability was 95% accurate, with a p-value of 0.000 ≤ 0.05. As a result, the random effect model is the correct choice and accepts the null hypothesis H0.

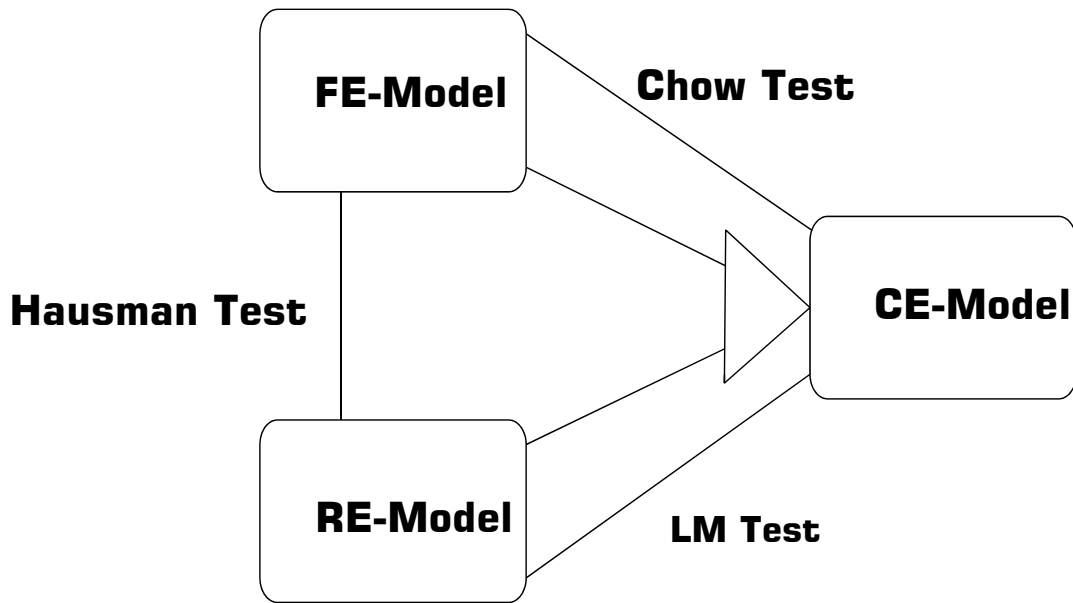*Fig. 2.* **Diagram of selecting appropriate models of effects**

Source: Developed by the authors.

Table 8

Selecting the appropriate model for parameter estimation

Test name	Null hypothesis	P-value	Result
Chow Test	H0: CEM is more appropriate than FEM	0.000	Rejected
Breusch-Pagan Lagrange Multiplier Test	H0: CEM is more appropriate than REM	0.000	Rejected
Hausman Test	H0: REM is more appropriate than FEM	0.1780	Accepted

Source: Developed by the authors.

Note: common effect model (CEM); fixed effect model (FEM); random effect model (REM).

Hence, the appropriate model for this scenario is REM. The use of the Chow and Hausman tests suggests that REM is suitable for this analysis. After REM is selected as the panel data regression model, classical assumption tests are performed to obtain the best OLS estimator, known as the best linear unbiased estimator (BLUE).

Estimation of the parameter model in the CEM, FEM, and REM methodologies uses OLS and GLS methods. The classical assumption tests are conducted to get the optimal OLS or GLS estimator, often referred to as the BLUE. The classical assumption tests include three specific tests: the Breusch-Pagan LM test of independence, the Modified Wald test for groupwise heteroskedas-

ticity, and the Wooldridge test for autocorrelation. The Jarque-Bera normality test is a statistical test used to assess the normality of a given dataset. According to Gujarati (2022), to acquire the best estimator, it is necessary to meet the requirements of tests 2 and 3 among the four tests [20]. The results of the Breusch-Pagan LM test for independence, the Heteroskedasticity White test, the Wooldridge test for autocorrelation, and the Jarque-Bera normality test are shown in *Table 9*. These tests were conducted with a random effect.

According to classical assumptions test, when residuals are not normally distributed and have dependency between cross sections, the model parameters (coefficient) will not be BLUE. In this

Table 9
Testing the validity of the selected model

Test Name	Null Hypothesis	Prob	Results
Breusch-Pagan LM test of independence	H0: There is no dependency between cross sections/individuals	0.000	Rejected
Heteroskedasticity White test	H0: The residuals are homoscedastic	0.002	Accepted
Wooldridge test for autocorrelation	H0: There is no autocorrelation between residuals	0.229	Accepted
Jarque-Bera normality test	H0: Residuals are normally distributed	0.000	Rejected

Source: Developed by the authors.

Table 10
Randon effect model robust SE regression

FD Investment	Coef.	St. Err.	t-value	p-value	[95% Conf	[Interval]	Sig
FDI	12 389.857	7034.772	1.760	.078	−1398.043	26 177.756	*
HDI	11 211.597	6028.547	1.860	.063	−604.138	23 027.332	*
CPI	−9.238	2.915	−3.170	.002	−14.951	−3.524	***
IR	280.303	110.393	2.540	.011	63.938	496.668	**
TO	−22.100	13.864	−1.590	.111	−49.274	5.073	
PCGDP	−0.037	0.037	−0.990	.324	−0.109	0.036	
DCtPS-%GDP	−35.954	9.192	−3.910	0.000	−53.970	−17.939	***
Constant	−6907.591	4130.732	−1.670	0.094	−15 003.677	1188.496	*

Mean dependent var	1670.449		SD dependent var		2181.461
Overall r-squared	0.493		Number of obs		108
Chi-square	512.249		Prob > chi2		0.000
R-squared within	0.302		R-squared between		0.616

Source: Developed by the authors.

Notes: *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

case, we can use robust standard error to correct the standard error of the model. The final model for this research. To test the validity of the model results, we use the following robustness (classical assumptions) tests. After correcting the standard error of the model, the effect regression model will be Randon Effect Model Robust SE Regression as shown in *Table 10*.

The results could be concluded as follows:

1. Foreign direct investment has a positive and significant effect (p-value < 0.10) on the financial development index in selected Arab League countries; this means a 1% increase in financial development will increase foreign direct investment by about 12,389 million USD.

2. Foreign direct investment has a positive and significant effect (p-value < 0.10) on the human development index in some selected Arab League countries; this means an increase in each percent of human development will increase foreign direct investment by about 11,211 million USD.

3. Foreign direct investment has a positive and significant relation to the interest rate, whereas the consumer price index and domestic credit to the private sector have a negative and significant impact on financial development. Overall, the model is significant at 95 percent, with a confidence level F (8, 92) = 7.19 and p-value = 0.000 < 0.05, which clarifies that the null hypothesis (H0: the predictor variable simultaneously does not affect the response variable) is rejected. As a result, the predictor variable simultaneously affects the response variable. The value of $R^2 = 0.615$ shows that the independent variable (financial development index) and controlled variables (human development index, consumer price index, interest rate, and domestic credit to private sector as percentage of GDP) can affect the outcome variable (foreign direct investment) in the Arab League countries by 61.5 percent while assuming the other effecting factors are constant.

5. Discussion and conclusions

The paper explores the relationship between foreign direct investment and the financial development index. This relationship has been investigated using an econometric model with one independent, one dependent and six controlled variables. Panel data were analyzed using Stata 17 and EViews 13. Results indicate that there has been a positive and statistically significant rela-

tionship between foreign direct investment and the financial development index, human development index, and interest rates, whereas a negative relationship exists between foreign direct investment and the consumer price index and domestic credit to the private sector as percentage of GDP. In recent years, some studies have shown that foreign direct investment has an impact on financial development and vice versa, but only a few studies have identified that there is no effect between foreign direct investment and financial development. While our research has established a positive influence of FDInvestment on financial and human developments, this result agrees with the studies [14–17].

Furthermore, the results of the study indicate that the contribution of domestic investment is essential and more significant than the foreign investment of every country, especially in Organisation of Islamic Cooperation (OIC) member countries, such as Malaysia, where a 1% increase in foreign direct investment contributes 0.02% to GDP, while local investment contributes up to 0.025%. For greater efficiency and contribution to GDP regarding foreign investment, certain economic, political, and cultural structures must be changed according to the national strategies of countries. The selected OIC member countries should pay attention to monetary policy based on interest rates, domestic credit to the private sector and inflation, where the interest rate positively affects foreign direct investment. In contrast, inflation and domestic credit to the private sector negatively affect foreign direct investment. The limitation of this study was the focus on foreign direct investment instead of considering other types of investment, such as portfolio investment or financial assets. A further constraint of this analysis was the use of aggregate foreign direct investment instead of sector-specific foreign direct investment. The authors suggest that the future investigation maintain the controlled variables of the study as main variables in the context of OIC member countries and could compare one or a group of the member countries to the rest of the countries to find a solution to the problem. Several factors, including initial income, human capital, population growth, government consumption, black market premium, institutional quality, rate of inflation, and trade volume, may influence the

effectiveness of FDInvestment. In future research, these variables could be considered as moderated variables between foreign direct investment and financial development in the context of different continents. The study also recommended that the

government and policymakers implement financial system quality standards, and that country authorities should also aim to boost the banking sector and financial markets by enacting market-friendly policies.

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