




Impact of Information and Communication Technology (ICT) on Foreign Direct Investment (FDI) in the OIC countries

BOUKEZATA Salim 
s.boukezata@univ-boumerdes.dz
University of Boumerdes (Algeria)

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Abstract:

The main purpose of this article is to examine the effect of Information Communication Technology (ICT), market size and trade openness on Foreign Direct Investment (FDI) for the panel of 21 countries of the Organization of Islamic Cooperation (OIC), over the period 1998-2021, using the panel Vector Error Correction Models (panel VECM). overall, we find a strong evidence supporting the view that ICT, market size and trade openness effects FDI in OIC members countries in the long-term. however, in the short-term ICT, market size and trade openness haven't a significant effect on FDI inflows.

Keywords: ICT, FDI, VECM, trade openness, market size, OIC countries.

JEL Classification Codes: D83, F13,F14, F21, G11, P45.

1. Introduction

Despite some negative effects caused by foreign direct investment in many countries, which must be taken into account in the host countries and guided by policies that limit these negatives.

However, its gains and advantages are significant, and many researchers and studies agree that it is considered a driving force for developing economies.

This is due to its important role as a source of external financing and contribution to the international production process and technology transfer.

In recent decades, the intensity of competition between countries to attract foreign investments has increased, and great importance has been given to the determinants of attracting them.

Many of these determinants, such as labor costs, Market size, trade openness, abundance of natural resources, and ease of doing business, are all considered traditional determinants of Foreign Direct Investment.

The increasing technological change in the world is considered an opportunity to accelerate development and raise growth rates in various countries (Boukezata, 2023).

It can also be one of the factors attracting Foreign Direct Investment, which is supported by many studies that consider Information and Communication Technology as one of the new determinants of Foreign Direct Investment, aligning with the focus of our study on Our selected sample of countries.

The selected countries of this study include: Albania, Azerbaijan, Bahrain, Bangladesh, the United Arab Emirates (UAE), Algeria, Indonesia, Morocco, Ivory Coast, Iran, Cameroon, Kuwait, Lebanon, Malaysia, Egypt, Senegal, Saudi Arabia, Tunisia, Turkey, Oman and Jordan.

study problematic

through this study, we aim to address the question of whether information and communication technology has a positive effect on attracting more Foreign Direct investment flows in the selected countries during the period 1998-2021. This is grounded on indicators that can reflect the significance of ICT in the country, including the number of internet users and the number of fixed and mobile phone subscribers.

Study hypothesis

The study attempts to test the following hypothesis:

- There is positive and significant impact of ICT, market size and trade openness on FDI inflows in the long and short term.

The impact of market size and economic openness on FDI is also examined, where market size and economic openness are the control variables.

Structure of the study

- 1 Introduction;
2. Previous studies;
3. ICT and foreign direct investment inflows;
4. Data, methodology and Econometric model specifications;
5. Descriptive statistics;
6. Estimated model;
7. Conclusion.

2. Previous studies

- (Benlhadj & Hamdaoui, 2021) this study aimed to assess the impact of ICT as a criterion for FDI flows to the MENA region, Compared to some traditional and institutional determinants in the period 2008-2019, using pannel static data, the study concluded that ICT has a moral and adverse effect on FDI flows in MINA zone, where the FDI inflows in this region are carriers of ICT, and they are not searching for it.

- (Faton & Chaboussou, 2021) this study aimed to examine the sense of causality between ICT and FDI in Sub-saharan Africa, it adopted an estimated VAR panel approach with the method of Abrigo and Love, followed by a Hurlin causalite test, and it used data from wdi, uit and wgi between 1989-2018. The causality test shows that independent variable cause the dependent variable , and has a positive impact in SSA region..

- In the same context, the study by (Djihhan M,2021) aimed to measure the impact of the use of information and communication technology on export performance in the long and short-terms the study concluded that there is a positive effect for both fixed phone and internet users.

- The Study by (Basiouni A, 2023) examined the role of digitalization in developing the business environment and stimulating investment and investment obstacles, one of the results of this study is that digitalization helps improve the effeciency of the business environment and attract investment, this study also found that weak infrastructure hinders the process of transformation towards digitalization and reduces investment flows, the study recommended the need to increase Foreign Direct Investment through infrastructure development.

- (peizhi & Bangash, 2020) found that ICT infrastructure can significantly increase Foreign Direct Investment inflows, on the other hand exchange rate it has negative but significant effect on FDI inflows.

3. ICT and FDI inflows

ICT is one of the factors affecting Foreign Direct Investment. Many research studies have concluded that the attractiveness of Foreign Direct Investment can be influenced by the extent of ICT development in the country.

Furthermore, many of the largest companies in the world are looking to invest in countries that have achieved a high level of ICT infrastructure development. (Cheng, Shanshan, & Huijiang, 2022).

This relationship occurs through several channels, some of which have been given great importance by many theoretical studies and research.

One of the most important channels of influence is the ability of ICT to reduce investment costs.

Therefore, Foreign Direct Investors will generally prefer countries that offer lower costs and higher revenues. This includes costs related to obtaining information before or after the investment decision-making process (peizhi & Bangash, 2020).

by applying ICT to the public sector, countries can provide opportunities for access to public and private information, which can reduce uncertainty costs, opportunism, and information costs faced by foreign investors in their initial stages of investment (Belhasani, 2023).

Likewise, many studies conclude that ICT reduces transaction and production costs for foreign investors and improves their access to information on alternative investment opportunities (Belloumi & Touati, 2022).

ICT has other positive effects on Foreign Direct Investment, particularly in saving transportation costs. Additionally It is utilized in marketing activities and improving production (Belloumi & Touati, 2022).

Additionally, ICT can affect FDI indirectly through other determinants. Digital infrastructure, such as the spread of new communication tools, can improve transparency and reduce administrative corruption, These are necessary conditions for enhancing the business environment, which in turn is stimulates Foreign Direct Investment flows (Fakher, 2016).

4. Data, methodology and Econometric model specifications

4.1. Data and methodology

The main source of data used for this study is the world bank database, we also utilized Foreign Direct Investment as a dependent variable, expressed as net FDI flows, calculated as a percentage of GDP.

In terms of the independent variables utilized in this study, the primary focus was on one fundamental explanatory variable: ICT. It is widely regarded in numerous research studies as one of the new determinants explaining FDI flows. In our study, it is represented by three variables: the number of mobile and landline subscribers per 100 people, and the percentage of people using the Internet.

Two additional variables were included as control variables, representing traditional determinants of FDI: OTRPGDP represents trade openness, calculated as the ratio of exports to imports. while GDPPC17 represent market size, indicating GDP per capita in constant 2017 international \$. These variables are described in Table 1.

The indicators representing the ICT variable were selected based on data availability. Regarding the sample of selected countries in this study, it initially comprised 13 countries from the MINA region and later expended to include 21 member countries of the OIC. It is noteworthy that the countries selected from the MINA region are all members of this organization. They include Bahrain, United Arab Emirates (UAE), Algeria, Morocco, Iran, Kuwait, Lebanon, Egypt, Saudi Arabia, Tunisia, Turkey, Oman, Jordan, as well as Albania, Azerbaijan, Bangladesh, Indonesia, Ivory coast, Cameroon, Malaysia and Senegal. These specific countries were chosen based on the availability of data for all variables studied during the time frame of 1998-2021.

In this study, we will employ panel data analysis to assess the impact of ICT on foreign direct investment inflows in 21 OIC countries from 1998 to 2021, without including control variables

Table 1. variable definitions

Variable	Symbol	definition	Data base
"" dependent variable""			
FDI "Foreign Direct Investment"	"FDIINF"	Net inflows, percent of Gross DP	World DI
"" Interest variable""			
Representative variables of ICT	"MOBCE100P"	"" Mobile cellular subscriptions (per 100 people)""	WDI
	"INDUSINTP"	"" Individuals using the Internet (% of population)""	WDI
	"FIXT100P"	"" fixed telephone subscribers per 100 people	WDI
"" Independent Variable (control variable)""			
Market size	"GDPPC17"	GDP per capita, PPP (constant 2017 international \$)	WDI
Trade openness	"OTRPGDP"	Trade (% of GDP)	WDI

Source: Author -2024-

4.2. Model Specifications

The following model is selected by the guidance of literature.

$$FDI_{CN}=f (ICT, Market Size, Trade Openness)_{CN}..... Equation (1)$$

Where,

"N" represents the time period covered in this study, spanning from 1998 to 2021, while "C" is the sample of selected countries, totaling 21 countries from the Organization of Islamic Cooperation. FDI serves as the dependent variable, while ICT is expressed by the number of cellular and fixed telephone subscribers and internet users, selected based on data availability.

After converting data into log form. We obtain:

$$LOFDI_{CN}= a + b1 (LOMOBCE100P)_{CN} + b2 (LOINDUSINTP)_{CN} + b3 (LOFIXT100P)_{CN}+ b4(LOGDPPC17)_{CN}+b5 (LOOTRPGDP)_{CN}+h_{CN}.....eq 2$$

Were,

LOFDI =is the log of net FDI inflows %of Gross DP.

LOMOBCE100P= log of mobile cellular subscriptions per 100 people.

LOINDUSINTP= log of individuals using the internet% of population.

LOFIXT100P=log of number fixed phone subscribers per 100 people.

LOGDPPC17=log of market size.

LOOTRPGDP=log of trade openness.

“C” denotes the country and “N” the time period, “a” constant and “b” parameters.

“H_{cn}” = error terms.

5. Descriptive statistics

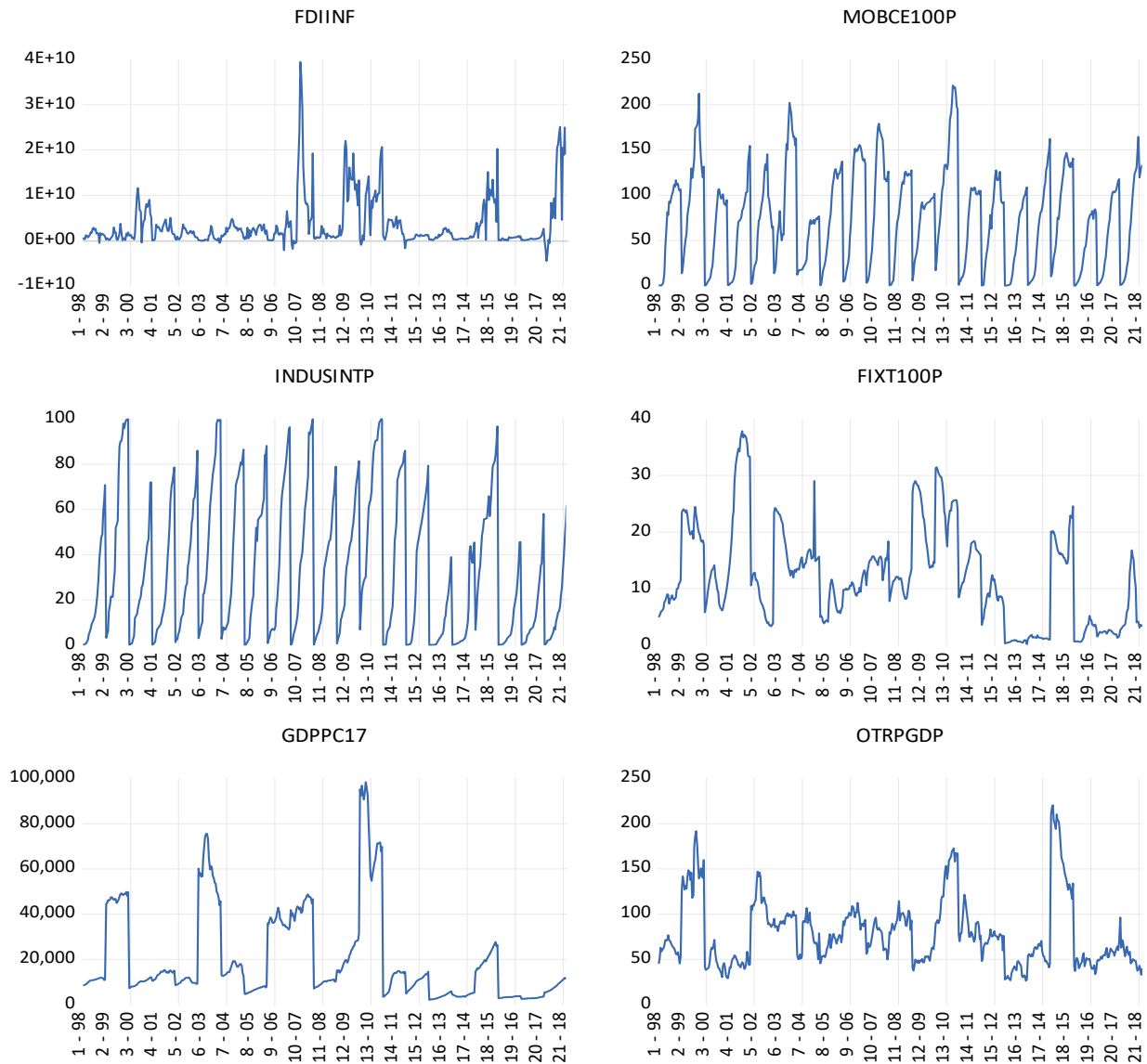
Table (2) summarizes descriptive statistics. The total number of observations is 504, It can be observed from the table that the average of FDI was approximately 3.45 with a standard deviation of about 5.51, FDI had the lowest value among the various variables.

Table 2. descriptive statistics

Variable	mean	max	min	Standard dev	Jarq--bera	obsrv
FDIINF	3.45E+09	3.95E+10	4.55E+09	5.51E+09	2422.306	504
MOBCE100P	76.55455	221.3088	0.034929	53.62478	16.39119	504
INDUSINTP	33.77725	100.0000	0.003685	30.84183	49.68164	504
FIXT100P	12.11731	37.83962	0.172086	8.666573	44.97329	504
GDPPC17	20223.81	98342.23	2137.150	20521.80	322.1981	504
OTRPGDP	79.35606	220.4068	26.27145	38.21981	178.3975	504

Source. Author-2024- based on Eviews 12.

Figure N.1. Descriptive statistics



Source. Author-2024- based on Eviews 12.

6. Estimated model

6.1. Panel Unit Root tests

At this stage, unit root tests are conducted using the software program EViews 12 to assess the stationarity of the series. The results are presented in table 3. It can be observed from the unit root test results that the stationarity condition for each variable was not met. However, after performing the first difference, it is noted that the various variables become stationary.

Table 3. Panel unit root test results

Variable	LLC		IPS		ADF Fisher		PP.Fisher	
	Level	First D	Level	First D	Level	First D	Level	First D
Individual Intercept								
FDIINF	2.846	-15.810***	0.599	16.486***	55.772	310.10***	53947	390.86***
MOBCE100P	-2.969	-7.025***	1.373	6.754***	29.710	121.03***	27.082	118.01***
INDUSINTP	9.321	-4.363***	15.170	4.507***	4.230	119.47***	5.518	130.63***
FIXT100P	-4.283	-7.308***	-3.037	8.763***	74.266	153.93***	46.525	344.04***
GDPPC17	3.946	-9.024***	3.625	9.442***	328111	173.65***	23.587	175.52***
OTRPGDP	-2.239	-15.683***	-1.335	14.985***	53.835	263.85***	55.483	543.50***
Individual Intercept and Trend								
FDIINF	1.787	-13.258***	0.227	14.432***	61.021	252.15***	59.757	581.29***
MOBCE100P	1.841	-6.581***	3.460	5.333***	21.153	98.98***	9.053	95.97***
INDUSINTP	3.708	-7.026***	5.231	7.831***	31.535	134.70***	16.668	241.12***
FIXT100P	0.453	-5.751***	0.337	6.216***	46.754	117.65***	39.588	378.91***
GDPPC17	-0.488	-8.310***	1.559	9.025***	41.212	152.39***	20.410	174.94***
OTRPGDP	-2.709	-11.826***	-1.708	12.207***	58.197	200.29***	302.940	563.98***
None								
FDIINF	0.985	-20.504***			35.675	413.19***	39.937	442.80***
MOBCE100P	2.143	-8.045***			11.361	146.41***	5.620	151.76***
INDUSINTP	15.710	-3.438***			2.133	84.10***	0.429	108.59***
FIXT100P	-1.980	-11.914***			44.503	236.64***	35.883	238.69***
GDPPC17	13.100	-7.312***			7.329	163.10***	8.633	192.75***

Note: *, **and *** represent, respectively, passing 10%, 5%, and 1% significance level test.

Source. Author -2024- based on Eviews 12.

6.2. panel cointegration test

This test involves only variables that are non-stationary in both level and first differences, whether they are dependent or independent variables.

It is evident from Table (4) that there is a cointegration relationship between the dependent variable FDI and the independent variable ICT. This suggests a long-term relationship between them.

Table 4. Panel cointegration test results

Kao Residual Cointegration Test
Series: FDIINF MOBCE100P INDUSINTP FIXT100P GDPPC17 OTRPGDP
Date: 03/01/24 Time: 11:18
Sample: 1998 2021
Included observations: 504
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 5
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-3.766569	0.0001
Residual variance	6.94E+18	
HAC variance	5.96E+18	

Note: *, **and *** represent, respectively, passing 10%, 5%, and 1% significance level test.

Source. Author -2024- based on Eviews 12.

6.3. Lag selection optimal results

In this step, it is necessary to determine the optimal lag length, it can be chosen by applying and comparing various lag length selection criteria, the results showed in the table 5. found all off the criteria suggest lag 2.

Table.5 Lag selection optimal results

VAR Lag Order Selection Criteria
Endogenous variables: FDIINF MOBCE100P INDUSINTP FIXT100P GDPPC17 OTRPGDP
Exogenous variables: C
Date: 03/01/24 Time: 11:23
Sample: 1998 2021
Included observations: 378

Lag	FPE	AIC	SC	HQ
0	2.87e+38	105.5809	105.6434	105.6057
1	3.31e+30	87.30115	87.73836	87.47467
2	2.00e+30*	86.79680*	87.60876*	87.11905*
3	2.03e+30	86.81136	87.99807	87.28234
4	2.24e+30	86.91006	88.47153	87.52979
5	2.21e+30	86.89674	88.83296	87.66520
6	2.30e+30	86.93511	89.24608	87.85230

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

6.4. Panel VECM model

$$\begin{aligned}
 D(\text{FDIINF}) = & C(1) * (\text{FDIINF}(-1) + 911053112.951 * \text{MOBCE100P}(-1) - \\
 & 492593768.874 * \text{INDUSINTP}(-1) + 727546653.669 * \text{FIXT100P}(-1) - \\
 & 1211142.05616 * \text{GDPPC17}(-1) + 180292169.196 * \text{OTRPGDP}(-1) - 59275482259.5) + \\
 & C(2) * D(\text{FDIINF}(-1)) + C(3) * D(\text{FDIINF}(-2)) + C(4) * D(\text{MOBCE100P}(-1)) + \\
 & C(5) * D(\text{MOBCE100P}(-2)) + C(6) * D(\text{INDUSINTP}(-1)) + C(7) * D(\text{INDUSINTP}(-2)) + \\
 & C(8) * D(\text{FIXT100P}(-1)) + C(9) * D(\text{FIXT100P}(-2)) + C(10) * D(\text{GDPPC17}(-1)) + \\
 & C(11) * D(\text{GDPPC17}(-2)) + C(12) * D(\text{OTRPGDP}(-1)) + C(13) * D(\text{OTRPGDP}(-2)) + C(14).
 \end{aligned}$$

The results of panel VECM indicate that the error correction term CointEq1 is significantly negative. (Table.6). This implies a long-term relationship between FDI inflows and information and communication technology (ICT), represented by Mobile cellular subscriptions (MOBCE100P), Individuals using the Internet (INDUSINTP) and Fixed telephone subscriptions (FIXT100P) in selected OIC countries.

Table .6 Estimated Panel VECM coefficients

Dependent Variable: D(FDIINF)
Method: Panel Least Squares
Date: 03/27/24 Time: 13:43
Sample (adjusted): 2001 2021
Periods included: 21
Cross-sections included: 21
Total panel (balanced) observations: 441

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.008470	0.004064	-2.084039	0.0378
C(2)	-0.026687	0.052757	-0.505845	0.6132
C(3)	-0.040233	0.053738	-0.748699	0.4545
C(4)	4033599.	15005858	0.268802	0.7882
C(5)	10946798	15390510	0.711269	0.4773
C(6)	6571996.	38117209	0.172415	0.8632
C(7)	-30692123	38779596	-0.791450	0.4291
C(8)	1.58E+08	98875835	1.593674	0.1117
C(9)	43624566	99072422	0.440330	0.6599
C(10)	23869.70	107571.6	0.221896	0.8245
C(11)	-27439.11	108430.1	-0.253058	0.8003
C(12)	1659174.	19235004	0.086258	0.9313
C(13)	-1123372.	19155729	-0.058644	0.9533
C(14)	2.61E+08	2.23E+08	1.170929	0.2423
Root MSE	2.78E+09/	R-squared		0.026547/
Mean Dependent var	2.58E+08/	Adj R-squared		-0.003089/
S.D. Dependent Var	2.82E+09/	S.E. of Regression		2.83E+09
A I CRITERION	46.39308/	S s Resid		3.41E+21/
Schz Criterion	46.52289/	Log likelihood		-10215.67
Hannan-Quinn criter.	46.44428	F-statistic		0.895754
Durbin-Watson stat	1.946005	Prob(F-statistic)		0.557687

Source. Author 2024- based on Eviews 12.

As for the short-term relationship, The results indicate the absence of a significant causal relationship at a significance level of 5% between foreign direct investment inflows with a lag of one period (FDIINF(-1)) and each of the independent variables with their one-period lag, namely Mobile cellular subscriptions MOBCE100P(-1), Individuals using the Internet INDUSINTP(-1), Fixed telephone subscriptions FIXT100P(-1) (representing ICT), market size GDPPC17(-1) and trade openness OTRPGDP(-1). Whether in the period (lag -1) or the period (lag -2).

Table .7 Wald test results

Wald test

System : % system

Test statistic	Value	DF	Probability
Chi-Square	4.422561/	10/	0.9263/

Null hypothesis: C(4)= C(5)= C(6)= C(7)= C(8)= C(9)= C(10)=C(11)= C(12)=C(13) =0

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(4)	4033599.	15005858
C(5)	10946798	15390510
C(6)	6571996.	38117209
C(7)	-30692123	38779596
C(8)	1.58E+08	98875835
C(9)	43624567	99072422
C(10)	23869.70	107571.6
C(11)	-27439.11	108430.1
C(12)	1659174.	19235004
C(13)	-1123372.	19155729

Restrictions are linear in coefficients.

Source. Author -2024- based on Eviews 12.

Furthermore, the results of the Wald test, shown in table (7), with a p-value greater than 0.05 (0.9263), confirms that there is no significant short-run effect of ICT on FDI at a 5% level in the sample countries during the period 1998-2021.

7. Conclusion

Our study began with the hypothesis that “ there is a positive and significant effect of information and communication technology (ICT), expressed by the number of mobile cellular and fixed phone subscribers, as well as the percentage of individuals using the internet, on Foreign Direct Investment inflows in selected countries during the period from 1998 to 2021”.

To test this hypothesis, panel data from the period of 1998-2021 was utilized, the countries included in this study are Albania, Azerbaijan, Bahrain, Bangladesh, the United Arab Emirates (UAE), Algeria, ,Indonesia, Morocco, Ivory Coast, Iran, Cameroon, Kuwait, Lebanon, Malaysia, Egypt, Senegal, Saudi Arabia, Tunisia, Turkey, Oman and Jordan, all of which are members of the OIC. Consequently, panel unit root tests and Vector Error Correction Model analysis were employed to examine the long- and short-run relationships from ICT to FDI during the period 1998-2021.

The study concluded that it supports the prevailing trend indicating a positive effect from ICT to FDI inflows. Additionally, the study found that this relationship exists in the long term but not in the short term during the sample period.

This suggests the importance of focusing on developing and strengthening capacities in ICT to position countries among the most attractive destinations for FDI inflows.

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