Investigating Nexus among Transportation, Financial Inclusion and Economic Growth in MENA Region

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Abstract

The paper studied nexus among transportation, financial inclusion, and economic growth in MENA region. The paper calculated three-dimensional index of financial inclusion (IFI) from 2000 till 2020 for 21 MENA countries. Also, three-dimensional index of transportation (ITR) calculated for 18 MENA countries from 2005 till 2019 including maritime, air and road transport. The analysis examined short and long run links between IFI, ITR and GDP, with further analysis of financial inclusion dimensions impact on transportation for 16 MENA countries from 2005 till 2019. The study employed Cross-Section Augmented Autoregressive Distributed Lag (CS-ARDL), and bias error correction half-panel Jackknife approaches, in addition to Dumitrescu and Hurlin (2012) causality test. The approaches employed, provide robust results under existence of Cross-Sectional Dependence CD, biasness and slope heterogeneity. The study results show bidirectional relationships between IFI ↔ITR, GDP ↔IFI, and ITR ↔GDP. Also, the analysis found positive significant impact of banking penetration and access to banking services on transportation, with weak impact of usage of banking services which need to be addressed in future financial policies. The study recommends strengthening financial inclusion and integration to promote transportation that stimulate economic growth in MENA region.

Keywords: CS-ARDL, Jackknife, Financial inclusion, transportation, MENA, GDP

1. Introduction

Based on literature, transportation and financial inclusion is very important to enhance economic growth. More developed and inclusive financial system has an important role in development of transportation, which enhance economic growth. Financial inclusion aims to include all excluded population into financial system, through well-developed accessible financial system which reduces transactions and information costs. Savings increases with higher accessibility to financial services, which increase liquidity that enable larger financial resources to productive investments which stimulate economic growth (FinTech, 2020).

There are very few literatures available study relationship between financial inclusion and transportation, which shows the importance of current study to fill this gap through analyzing the nexus between financial inclusion, transportation and economic growth with further investigation of financial inclusion dimensions impact on transportation.

Methodology of the current paper includes: first; calculation of financial inclusion and transportation indices. Second; uses a deductive approach to derive economic hypotheses using logical deduction. Main hypotheses are existence of short and long run relationship between financial inclusion, transportation and economic growth and positive impact of financial inclusion dimensions on transportation. Then empirically test the hypotheses using investigation of short and long run relationships among financial inclusion, transportation and economic growth for 16 countries in MENA region from 2005 till 2019 using advanced empirical approaches include CS-ARDL and half-panel Jackknife (JK) bias correction method. Third analysis of bi-variate causality using Dumitrescu and Hurlin causality test.

The rest of paper organized as follows: second section cover economic literature studying three strands of literature discussing the relationship among transport, economic growth and financial inclusion. Third section discusses briefly financial inclusion in MENA region. Fourth section includes calculation of index of financial inclusion and transportation. Fifth section covers empirical methodology used in analysis with discussing its results in sixth section. Finally, the paper is discussing conclusion and policy implications.

2. Literature Review

Financial inclusion is defined by World Bank as "individuals and businesses have access to useful and affordable financial products and services that meet their needs delivered in a responsible and sustainable way". Defined by Financial inclusion Committee as "process of ensuring access to financial services and timely adequate credit where needed by vulnerable groups".

The paper main objective is studying the relationship among financial inclusion and transportation with nexus to economic growth, through three strands of literature as follows:

2.1 Financial Inclusion and Transportation

Literature studied the relationship between financial inclusion and transportation is very few. Investments in transportation enhance productivity; facilitate international trade through better connectivity that promotes economy. Experiences of several countries show the difficulty of depending only on public finance for funding transportation projects, which led to the privatization concept (Pradhan, 2019). High quality transportation is important for “Sustainable Development Goals” as it enhances access and mobility to people and businesses. For developing transport infrastructure there is financial challenges which requires resource of long-term finance at acceptable cost. This shows the importance of financial sector as a step for raising financing ability for transportation (Think 20, 2019).

Financial inclusion promotes sharing of information through financial institutions networks and facilitates easier access to resources and sharing of earnings and risks. It helps in identifying different market opportunities in financing transportation investments, evaluating associated financial risks, and allocation of resources. Financial inclusion promotes linkages among financial institutions which is necessary for funding transportation projects. More collaboration among financing mechanisms facilitates better access to equity funds and international organizations (Jianqing, 2016).

Pradhan (2019) examined relationship among "transportation infrastructure, financial penetration, and economic growth", the study found long and short-run links among studied variables. Stating that financial institutions are playing important role in attracting larger investments for financing transport projects. Financial inclusion stimulates the linkages among transportation and economic growth, as financial inclusion facilitates generation of more financial funds for financing transportation projects (Pradhan, 2019).

2.2 Transportation and Economic Growth

As mentioned by Rostow (1960) "the introduction of railways was a factor in growth and development in the United States, France, Germany, Canada and Russia". Later during seventies, Arrow & Kurz studied transport infrastructure theoretically and included it in growth theories (Lenz *et al.*, 2018). As declared by Williamson (1974) and later O'Brien (1983) "forward linkages of transport infrastructure", reduce cost and raise access of more advanced and efficient transport that change marginal costs, households' mobility, as well as, demand of goods and services. Improvement of transport services expands markets locally and regionally which enhance international trade and overall productivity which goes with Adam smith (Lakshmanan, 2007).

Aschauer (1989) stated that investment in public transportation projects has positive affect on productivity. Same results also found by studies as Krugman (1991) argues that accessibility to transport boosts economic growth (Pradhan, 2019). Bougheas *et al.* (2000) similar to Romer (1987) growth model found that transportation improvements facilitate specialization that stimulates long-run growth, which reduce costs, raising efficiency of intermediate and final goods production.

As mentioned by Banister & Berechman (2000) economic theory states that availability of fast, reliable and affordable transport is an economic advantage of countries. Seetanah (2006) studied African countries found that transport has a positive impact on economic progress at the studied countries. As declared by Kim (2006) investment in transportation facilitates movement of goods; which raise living standards. According to "Schumpeterian dynamics" transportation facilitates higher firms' entry, and exit, which leads to higher expansion. Zhou *et al.* (2007) studying China found correlation among GDP and highway length (Akgũngōr *et al*., 2014).

Lakshmanan (2007) stated that more advanced transport will improve freight and other transport services which lower costs, save time and raise reliability, in turn will enhance international trade, expand production, and growth rates. Hong *et al.* (2011) found positive significant impact of transport on economic growth. Akgũngōr *et al*. (2014) stated that improvements of transportation reduce operation time and cost, increase organizations efficiency and mobility of goods which ease access to markets. As mentioned by Pradhan *et al*. (2015) transport facilities are one of the most vital infrastructures, which contribute massively to economic growth. Mohamed *et al.* (2017) declared uni-directional impact of economic growth on transportation at long run. Pradhan

(2019) found that financial penetration along with transportation enhance economic growth in long-run. Also, mentioned the three main ways link transportation to economic growth which are; first; transportation participation in production process as direct input, as well as a free production factor. Second, transport may transform inputs to more productive usages. Third, transport attract more financial resources that enhance economic growth.

2.3 Financial Inclusion and Economic Growth

Literature shows importance of finance to economic growth, goes back to (Smith ,1776; Hamilton, 1781; Bagehot, 1873; Schumpeter, 1912; Shaw & McKinnon, 1973) (Li & Angham, 2020). Hicks (1969) stated that financial market had an important role in England's industrial revolution as discussed later by Levine (1997). According to Hicks, financial liquidity ignited economic growth in 18th century in England. Savers hold financial assets as different types of financial tools which they can liquidate easily. Financial markets facilitate transformation of financial instruments into long term investments. Robinson (1952) stated that "where enterprise leads finance follows". King & Levine (1993) associate higher economic growth with more developed financial and banking sectors. Levine & Zervos (1996) stated that level of banking development predicts economic growth (Levine, 1997).

Guiso *et al.* (2002) stated that financial development enhances probabilities of people starting own business, increases competition, and promotes firms' growth which shows its importance of economic success. As mentioned by Levine (2003) countries with more developed financial sectors grow faster. Liang & Jian-Zhou (2006) found that higher economic growth leads to higher financial development. Pradhan *et al.* (2017) studied link between economic growth and finance in ASEAN countries from 1991 to 2011 found unidirectional and bidirectional causality among variables.

Studying financial inclusion by Bardhan & Sharma (2019) found that financial institutions raise available savings as financial services will be more attractive which raise available funds for investments, which stimulate economic growth. They found positive link among financial development and growth rate of GDDP "per capita gross district domestic product". Found impact of deposits is stronger than impact of credit on economic growth and discussed the important role of access to bank branches.

Financial inclusion promotes economic growth as providing financial services attract depositors raise financial resources for productive investments that stimulate economic growth. Providing people and businesses

with financial services access alone isn't enough for economic growth as without usage of banking services resources will not increase to finance investment and stimulate economic growth (FinTech, 2020).

This shows importance of all dimensions of financial inclusion of accessibility to banking services, banking usage and penetration which shows the importance of investigating different dimensions of financial inclusion as observed by Kempson *et al*. (2004) stated that large amount of people has bank accounts use little banking services which called "under or marginally banked" which require a measurement of banking services utilization to measure financial inclusive properly.

3. Financial Inclusion in MENA Region

In 2021, according to World Bank report "Global Findex 2021", bank accounts ownership raised globally by 50% within ten years, and increased in developing countries by 30%, from 42% in 2011 to 71% in 2021 (Demirgüç-Kunt *et al*., 2021).

Financial inclusion rate in MENA region was 20% in 2020 which is lower than global rate of 76%. The region experienced 36% rate of access to financial services which is lower than global rate of 51%, while access to credit was 9% lower than global rate by 2%, while 12% had access to savings in comparison to 27% global rate.

There are different levels of banking access at MENA region countries "United Arab Emirates" UAE is leading by 69% access to banking services, 19% accessible to credit, and 29% accessible to savings followed by Bahrain access rate 59%, 17% and 31% accessible to banking services, credit and savings respectively. "Kingdom of Saudi Arabia" KSA access rate of 54%, 11% and 14% accessible to credit and savings, Jordan access rate to banking 26%, 17% to credit and 10% to savings. Algeria accessibility of 24% to banking, 3% to credit and 11% to savings, Tunisia access rate 23%, 9% to credit and 18% to savings, Egypt access rate 18%, 6% to credit and 6% to savings, and finally Morocco access rate 16%, 3% credit and 6% to savings.

The main challenge facing the region is that despite of increasing rates of access to banking services there is no evidence of usage extent which is the main channel for raising financial liquidity that stimulate economic growth (FinTech, 2020), which shows the importance of further study of all financial inclusion dimensions.

4. Index of Financial Inclusion and Transportation

4.1 Index Calculation Method

The present study uses multi-dimensional index based on Sarma (2008) method for calculation of both IFI and ITR. The index includes three dimensions attaching equal weights to all dimensions, it starts by calculating an index of each variable in the dimension i^{th} calculated by formula (1) to ensure that the resulted d_i value will be in range of 0 to 1 the higher means higher dimension achievement.

$$d_i=(A_i-m_i)/(M_i-m_i) \quad (1)$$

A_i = "Actual value of dimension i"

M_i = "Maximum value of dimension i"

m_i = "Minimum value of dimension i"

The next step is calculating each dimension D_i over the studied period using the simple average of d_i for the available years using formula (2), where n is number of years

$$D_i = \sum d_i/n \quad (2)$$

Finally, the index, for each country, measured by formula (3) "the normalized inverse Euclidean distance" of the point D_i from ideal point. Second component's numerator is "Euclidean distance of D_i from ideal point". The inverse normalized distance is calculated then divided by √n and subtracting it from 1 to get values between 0 and 1, in which 0 is the minimum and 1 is the maximum.

$$IFI\ i = 1 - \sqrt{\frac{(1-d1)^2+(1-d2)^2+\cdots+(1-dn)^2}{\sqrt{n}}} \quad (3)$$

4.2 Index of Financial Inclusion (IFI)

Index of financial inclusion IFI calculated for the period from 2000 till 2020 for 21 MENA countries using three dimensions as shown from Figure (1) including the following indicators based on data retrieved from World Bank from 2000 to 2020 using equation (3).

First Dimension (Banking Penetration) (IFD1): shows the penetration of financial system among population, include number of borrowers, depositors, and bank accounts. If all people in the country have bank account the dimension should be equal to 1.

Second Dimension (Banking Availability) (IFD2): banking services should be easily accessible to all people in the economy. The dimension is including number of bank branches, and "Automated teller machines" ATMs.

Third Dimension (Banking services usage) (IFD3): Usage of banking include two main services considered in banking literature which are deposits and credits, accordingly, bank deposits and domestic credit included in dimension calculation.

4.3 Index of Transportation (ITR)

Index of Transportation ITR calculated using equation (3) for the period from 2005 till 2019 for 18 MENA countries as shown at figure (2) including the following indicators based on data retrieved from ESCWA.

The index calculated includes three transport modes as follows:

First Dimension (Air Transportation) (ITR1): air transportation dimension includes amount of air crafts, air passengers and air freight.

Second Dimension (Maritime Transportation) (ITR2): maritime dimension includes sea freight gross weight, and amount of sea vessels.

Third Dimension (Road Transportation) (ITR3): dimension of road transportation includes length of road network and amount of road accidents.

Table (1) Variables Included in Index of Financial inclusion IFI

Indicator	Source
First Dimension (Banking Penetration) (IFD1)	
Bank account per 1000 adults	IMF
Borrowers from commercial banks per 1,000 adults	WB
Depositors with commercial banks per 1,000 adults	WB
Second Dimension (Banking Availability) (IFD2)	
Commercial bank branches per 100,000 adults	WB
ATMs per 100,000 adults	WB
Third Dimension (Banking Usage) (IFD3)	
Bank deposits as % of GDP	WB
Domestic credit to private sector as % of GDP	WB

Source: Collected by Author

Note: WB = "World Bank"

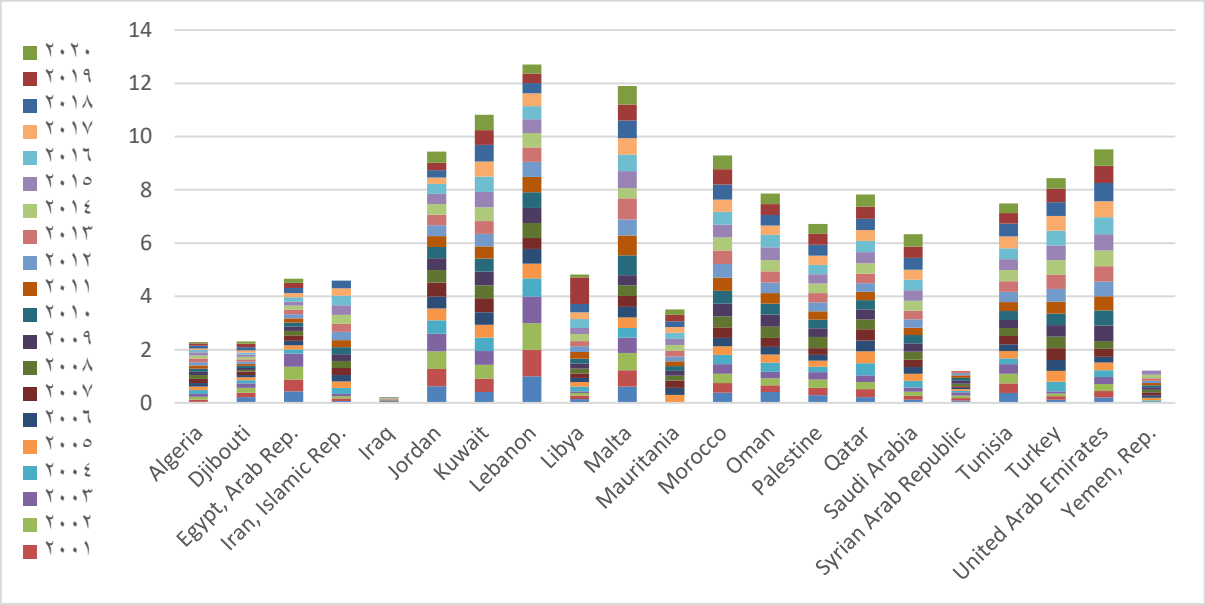

Figure (1) IFI from 2000- 2020 for 21 MENA Countries

Source: Calculated by Author

Table (2) Variables Included in Index of Transportation

Indicator	**Source**
First Dimension (Air Transportation) (ITR1)	
Number of Aircrafts "sum of arrivals and departures"	ESCWA
Number of air transport passengers	ESCWA
Air cargo and mail transported Goods Loaded & Unloaded	ESCWA
Second Dimension (Maritime Transportation) (ITR2)	
Gross weight of sea freight Goods Unloaded	ESCWA
Number of Sea Vessels "sum of arrivals and departures"	ESCWA
Gross weight of sea freight Goods Loaded	ESCWA
Third Dimension (Road Transportation) (ITR3)	
Road Network Length	ESCWA
Number of Road Accidents	ESCWA

Source: Collected by Author

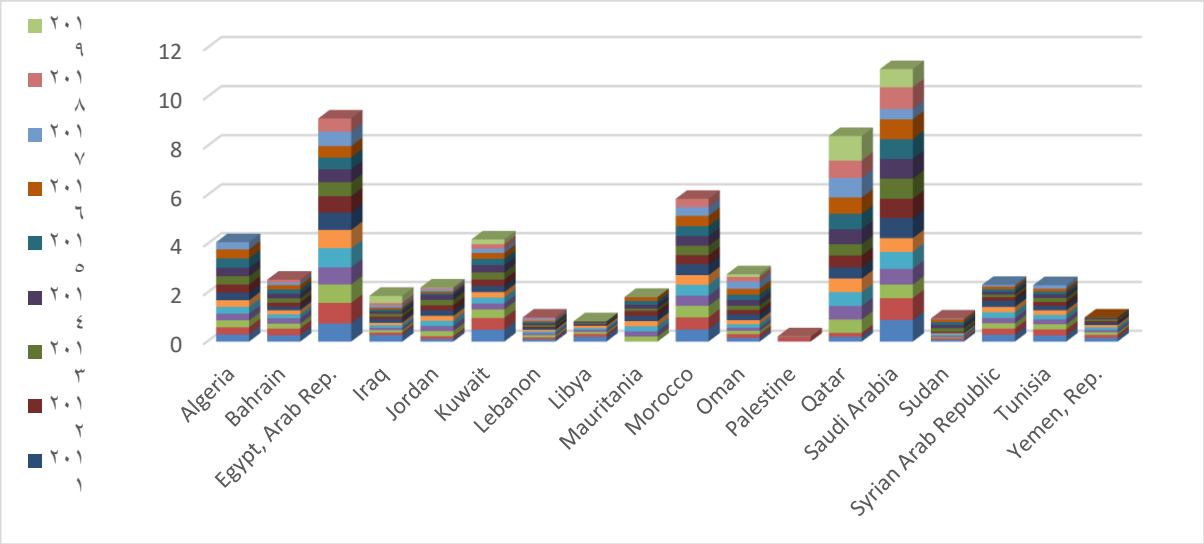

Figure (2) ITR from 2005- 2019 for 18 MENA Countries

Source: Calculated by Author

5. Empirical Analysis Methodology

To empirically investigate the nexus among financial inclusion, transportation and economic growth in MENA region, advanced econometric methods employed to estimate four models, according to the following steps:

5.1 Pre- Estimation Tests

Panel tested first for cross sectional dependence using Pesaran (2015) test of CD which is applicable on different variable lengths, testing of null hypothesis "errors are weakly cross-sectional dependent".

Second, data tested for biasness using bias adjusted LM test of Pesaran *et al.* (2008) employed as its valid if N>T or T>N.

Third, data tested for homogeneity using Pesaran & Yamagata (2008) slopes homogeneity test based on dispersion of "individual weighted slope" testing null hypothesis "slope coefficients are homogenous". As stated by Dahmani *et al*. (2021) "Monte-Carlo simulations show that the test is appropriate for small sample sizes and dynamic unbalanced panel data".

Fourth, based on CD test, in case of existence of CD then second-generation unit root test CIPS should be used, which consider CD that introduced by Pesaran (2007) combining ADF "Augmented Dickey Fuller" and IPS "Im and Pesaran and Shin".

Fifth, to check the possibility for testing long run equilibrium, panel should be tested for cointegration which examines linear combination among variables. In case of existence of CD, it's recommended to use four co-integration tests by Westerlund (2007) which based on ECM "error correction model" considering inter-individual dependence, also the study employed Pedroni (2004) co-integration test.

5.2 Model specification

Standard panel ARDL methods don’t account for CD and assume homogenous slopes which lead to false results in case of CD existence. Therefore, it's important to use CS-ARDL "Cross-Section Augmented Autoregressive Distributed Lag" approach in case of CD existence to investigate short and long run coefficients. CS-ARDL advantages that it provides robust results even if variables integrated of same or different levels and even if data series co-integrated or not (Okumus *et al.,* 2021). As stated by Chudik & Pesaran (2015), CS-ARDL is ARDL version considers CD.

Mean Group (MG) of CS-ARDL based on "augmentation of ARDL estimations of each cross-section with cross-sectional averages which are proxies of unobserved common factors and their lags. Then it allows mean group estimations while slope coefficients are heterogeneous. Augmenting the model with lagged cross-section averages mostly prevent endogeneity problem". ARDL estimation based on following equation

$$y_{it} = C^*_{yi} + \sum_{\ell=1}^{p_y} \varphi_{i\ell}\, y_{i,t-\ell} + \sum_{\ell=0}^{p_x} \beta'_{i\ell}\, X_{i,t-\ell} + \sum_{\ell=0}^{p_z} \psi'_{i\ell}\, \bar{Z}_{t-\ell} + e^*_{it} \quad (4)$$

$\bar{Z}_t = (\bar{y}_t, \bar{X}'_t)'$, p $\bar{z} = [T^{\frac{1}{3}}]$ there are two options considered for lag orders; "ARDL (2,1) specification, $p_y = 2$ and $p_z = 1$, and ARDL (1,0) specification, $p_y = 1$ and $p_z = 0$". CS-ARDL individual mean level coefficient estimation given by

$$\hat{\theta}_{CS-ARDL,i} = \frac{\sum_{\ell=1}^{p_x} \hat{\beta}_{i\ell}}{1 - \sum_{\ell=1}^{p_y} \hat{\varphi}_{i\ell}} \quad (5)$$

$(\hat{\varphi}_{i\ell}, \hat{\beta}_{i\ell})$ are short run coefficients estimates based on (4), long-run effects mean estimated as $N^{-1} \sum_{i=1}^{N} \hat{\theta}_{CS-ARDL,i}$, the inference based on "the usual non-parametric estimator of asymptotic variance of the MG estimator".

Literature stressed on possibility of existence of bias in "small sample time series in dynamic heterogeneous" which can be corrected by "Jackknife bias correction" JK first introduced by Quenouille (1949), with further study by Tukey (1958) this method has different forms. The current paper employs JK discussed by Dhaene & Jochmans (2012) and by Chudik & Pesaran (2015) which correct CCEMG "common correlated effects mean group" estimators which is a "simple average of individual CCE estimator". Constructed as:

$$\tilde{\pi}_{MG} = 2\, \hat{\pi}_{MG} - \tfrac{1}{2} (\hat{\pi}^a_{MG} + \hat{\pi}^b_{MG}) \quad (6)$$

As states by Chudik and Pesaran (2015) "$\hat{\pi}^a_{MG}$ denotes CCEMG estimator computed from the first half of the variable time period, namely over the period t= 1, 2, …, [T/2], where [T/2] denotes the integer part of T/2, and $\hat{\pi}^b_{MG}$ is the CCEMG estimators computed using the observations over the period t = [T/2] + 1, [T/2] +2, …, T". (Chudik and Pesaran, 2015)

The following four models will be estimated using the above econometric techniques.

***First Model*:** investigate the impact independent variables; GDP "growth domestic product" as proxy of economic growth retrieved from World Bank and financial inclusion (IFI), on transportation (ITR).

$$\text{LNITR}_{it} = C^*_{yi} + \sum_{\ell=1}^{p_y} \varphi_{i\ell}\ \text{LNITRI}_{i,t-\ell} + \sum_{\ell=0}^{p_x} \beta'_{i\ell}\ X_{i,t-\ell} + \sum_{\ell=0}^{p_z} \psi'_{i\ell}\ \bar{Z}_{t-\ell} + e^*_{it}\ (7)$$

With, $\bar{Z} = (\Delta\ \overline{LNITR}_t\ , \bar{X}'_t)'$ and $X_{it} = (LNIFI_{it}\ , LNGDP_{it}\ )'$

***Second Model*:** investigate the impact of independent variables; GDP and transportation (ITR) on financial inclusion (IFI).

$$\text{LNIFI}_{it} = C^*_{yi} + \sum_{\ell=1}^{p_y} \varphi_{i\ell}\ \text{LNIFI}_{i,t-\ell} + \sum_{\ell=0}^{p_x} \beta'_{i\ell}\ X_{i,t-\ell} + \sum_{\ell=0}^{p_z} \psi'_{i\ell}\ \bar{Z}_{t-\ell} + e^*_{it}\ (8)$$

With, $\bar{Z} = (\Delta\ \overline{LNIFI}_t\ , \bar{X}'_t)'$ and $X_{it} = (LNGDP_{it}\ , LNITR_{it})'$

***Third Model*:** investigate the impact of independent variables IFI and ITR on GDP.

$$\text{LNGDP}_{it} = C^*_{yi} + \sum_{\ell=1}^{p_y} \varphi_{i\ell}\ \text{LNGDP}_{i,t-\ell} + \sum_{\ell=0}^{p_x} \beta'_{i\ell}\ X_{i,t-\ell} + \sum_{\ell=0}^{p_z} \psi'_{i\ell}\ \bar{Z}_{t-\ell} + e^*_{it}\ (8)$$

With, $\bar{Z} = (\Delta\ \overline{LNGDP}_t\ , \bar{X}'_t)'$ and $X_{it} = (LNIFI_{it}\ , LNITR_{it})'$

***Fourth Model*:** further investigate the impact of IFI on transportation using index of transportation by investigating the impact of different IFI dimensions.

$$\text{LNITR}_{it} = C^*_{yi} + \sum_{\ell=1}^{p_y} \varphi_{i\ell}\ \text{LNITR}_{i,t-\ell} + \sum_{\ell=0}^{p_x} \beta'_{i\ell}\ X_{i,t-\ell} + \sum_{\ell=0}^{p_z} \psi'_{i\ell}\ \bar{Z}_{t-\ell} + e^*_{it}\ (8)$$

With, $\bar{Z} = (\Delta\ \overline{LNITR}_t\ , \bar{X}'_t)'$ and $X_{it} = (LNIFD1_{it}\ , LNIFD2_{it}, LNIFD3_{it})'$

5.3 Bi-Variate Causality

Bi-variate causality using Dumitrescu & Hurlin (2012) "Granger non-causality test" is appropriate as it takes account of country's heterogeneity not as the Granger causality test which assumes that all coefficients are similar for all the countries in the panel. As Stated by Dahmani *et al.* (2021) "The test estimates individual Granger causality for each cross section and calculates the average of the individual tests considering a statistical significance (*W* statistic) and a standardized statistic *W*, called the *Z* statistic".

6. Empirical Results

6.1 Pre- Estimation Tests Results

Results of Pesaran (2015) CD test of the four models as shown in table (3) reject null hypothesis showing the existence of strong cross section dependence CD between countries. This denotes that if country faced a shock, it will be transmitted to other countries. Also, CD test carried for all variables as shown in table (4) denoting the existence of CD for all variables. Since the literature stressed on the importance of checking for biasness in small time series data, the panels tested for biasness using bias adjusted LM test of Pesaran *et al.* (2008) results as shown in table (3) shows that panels have bias estimators which need to be considered by using bias correction technique.

Slope homogeneity Pesaran and Yamagata (2008) test results reject null hypothesis of slope coefficients homogeneity for all four models which shows the existence of heterogeneity in panel data which deduce that models' coefficients are heterogenous, and their slopes differs across countries which has to be considered by applying heterogenous panel methods.

Based on CD test results Pesaran (2007) second-generation unit root test CIPS that consider CD is employed, the results as shown in table (4) shows that LNGDP is stationary at level I(0), and the other variables are stationary at first difference I(1). Based on existence of CD among all variables in four models, the Westerlund (2007) co-integration test employed which consider heterogeneous slopes and CD. The results of both tests as shown at table (3) shows the rejection of "null hypothesis of non-cointegration", which shows long-run cointegration among variables in the four models. Also, Pedroni (2004) test used showing the rejection of null of hypothesis in four models. Therefore, long run equilibrium relationships need to be estimated among models' variables.

Table (3) Slope Homogeneity, CD Test, Co-integration Test

Test	Model 1		Model 2		Model 3		Model 4	
	Stat.	**P.**	**Stat.**	**P.**	**Stat.**	**P.**	**Stat.**	**P.**
LM_{adj}	12.39	0.000	21.51	0.000	12.74	0.000	4.38	0.000
Pesaran CD	12.204	0.000	2.157	0.031	18.166	0.000	5.047	0.000
Δ	10.652	0.000	7.798	0.000	13.300	0.000	8.561	0.000
Δ_{adj}	12.438	0.000	9.106	0.000	15.531	0.000	10.486	0.000
Pedroni Test for Co-Integration								
Modified PP "Phillips-Perron"	0.999		0.0060		0.0056		0.0261	
PP "Phillips-Perron"	0.0004		0.2397		0.0001		0.0002	
ADF "Unadjusted Dickey-Fuller"	0.0011		0.0000		0.0900		0.0000	
Westerlund ECM panel co-integration test								
Gt	0.000		0.000		0.000		0.000	
Ga	1		1		1		1	
Pt	0.000		0.000		0.000		0.0890	
Pa	0.001		0.000		0.322		0.869	

Source: Estimated by Author

Table (4) CIPS Unit Root Test and Pesaran (2015) CD test

Variable	CIPS		Result	CD
	level	1st diff		
LNGDP	-3.297		I(0)	0.000
LNITR	-2.268	-3.634	I(1)	0.000
LNIFI	-2.179	-3.511	I(1)	0.037
LNIFD1	-2.269	-3.327	I(1)	0.000
LNIFD2	-2.998	-3.694	I(1)	0.004
LNIFD3	-1.772	-3.765	I(1)	0.000

Note: "Ln" stands for logarithm

Source: Estimated by Author

6.2 Estimation Results

Preliminary analysis found CD at the four examined models and slope heterogeneity which shows that CS-ARDL is appropriate approach of the analysis due to its robustness under CD and different stationary orders. Also, preliminary analysis found biasness in panels which shows appropriateness of bias-corrected CS- ARDL and half -panel Jackknife (JK) method, which estimated for full set of countries to show country specific coefficients. Estimated models CD found to accept null hypothesis of weak cross section dependence at all models which solve CD problem.

First Model: Table (5) shows first model estimation results; "Error Correction Term" ECT of CS-ARDL and Jackknife are negative and significant at 1%, which shows long run causality running from IFI and GDP to ITR. Equilibrium will be restored in long run with adjustment rate of 127% according to CS-ARDL and 175% according to JK estimation.

At short run, GDP has positive significant impact on ITR at eight countries according to CS-ARDL and at 12 countries using Jackknife method. At long run, four countries is statistically positive significant using CS-ARDL while 10 countries significant using JK method, which shows that there is significant impact of GDP on transportation that goes with economic literature as Mohamed *et al.* (2016). Financial inclusion IFI has positive significant impact on ITR at short run at six countries using CS-ARDL and 10 countries according to JK estimation which is almost 63% of studied countries. At long run, IFI is statistically positive significant to ITR at four countries using CS-ARDL and at seven countries using JK which is almost 44% of countries. The Significant impact of financial inclusion on transportation goes with Pradhan (2019) stating that it creates financial resources to finance transport investment.

Second Model: Table (6) shows second model estimation results, ECT of CS-ARDL is negative and significant at 1%, and JK is negative and significant at 5%. That shows long run causality running from ITR and GDP to IFI. Equilibrium in long run will be restored at adjustment rate of 84% in one period according to CS-ARDL and 134% according to JK estimation.

At short run, transportation ITR has positive significant impact on IFI at five countries using CS-ARDL and at 15 countries using JK which is almost 94% of countries. At long run, ITR has positive significant impact on IFI at four countries using CS-ARDL and 13 countries using JK which is 81% of countries. This shows the significant impact at short and long run of transportation on financial inclusion which goes with Pradhan *et al*. (2019) that stated that better transportation infrastructure attracts financial resources from other regions. GDP has positive significant impact on financial inclusion according to CS-ARDL mean group at both short and long run at 10% level, and significant at four countries at short run and at three countries at long run. Using JK shows the impact at nine countries at both short and long run which is 56% of countries. Significant impact of economic growth on financial inclusion is consistent with Liang & Jian-Zhou (2006), and Pradhan *et al. (*2017).

Third Model Table (7) shows estimation results of third model of both methods, ECT of CS-ARDL and JK are negative and significant at 1% that shows long run causality running from IFI and ITR on GDP. Equilibrium in long run will be restored at adjustment rate of 84% according to CS-ARDL and 134% according to JK estimation.

Transportation ITR has positive significant impact on GDP at CS-ARDL mean group at short run at 1% and significant at eight countries while it's significant at five countries in long run. Also, significant at short run using JK method at 13 counties and 10 countries at long run which is 81% and 63% on studied countries. This shows significant impact of transportation on economic growth which is consistent with Rostow (1960), Bougheas *et al*. (2000), Seetanah (2006), Zhou *et al.* (2007), Hing *et al*. (2011) Pradhan *et al.* (2015), and Pradhan (2019). Financial inclusion IFI has positive significant impact on economic growth using GDP according to CS-ARDL mean group at 1% at both short run and at nine countries while it's significant at eight countries at long run. While using JK method IFI has positive significant impact on GDP at 15 countries at short run of almost 94% of countries. At long run, JK mean group is significant at 5% and at six countries. Financial importance to economic growth goes with Levine (1993), financial inclusion impact on economic growth consistent with Bardhan & Sharma (2019) stating the importance of bank access to economic growth and Pradhan (2019) showing the importance of banking penetration in facilitation of higher economic growth.

Fourth model: This model considers an addition to literature, investigated the impact of IFI dimensions on transportation. Table (8) shows estimation results of fourth model, ECT of CS-ARDL and Jackknife are negative and significant at 1% that shows long run causality running from IFI dimensions to ITR. Equilibrium in long run will be restored at adjustment rate of 97% according to CS-ARDL and 209% according to JK estimation.

Banking penetration (IFD1) has positive significant impact on transportation ITR according to CS-ARDL at short run at nine countries and five countries at long run. While using JK method IFD1 has significant impact on ITR at 15 countries in short run which is almost 94% of countries and at nine countries al long run.

Banking availability (IFD2) found to have positive significant impact on transportation ITR at short run using CS-ARDL at eight countries and four countries at long run, while using Jackknife it's significant at short run at 12 countries and 11 countries at long run which is 75% and 69% of countries respectively.

Banking usage (IFD3) found to have positive significant impact on transportation ITR using CS-ARDL at short run at only four countries and two countries at long run while using Jackknife found to be significant at nine countries at short run which is 56% and ten countries at long run of 63% of countries.

The result shows that banking usage impact is less significant than banking availability and penetration using both approaches which goes with literature that banking usage has to be addressed in policy, as providing financial services access isn’t enough for economic growth without the usage of banking services. This goes with findings of FinTech 2020 report that addressed that the main challenge facing MENA region is extent of usage of banking services which is the channel towards increasing financial resources that stimulate economic growth and also goes with Kempson *et al*. (2004) at large amount of people has bank accounts use little banking services.

Table (5) First Model Estimation Results CS- ARDL & Jackknife

CS- ARDL		Short Run (1, 1,1)						Long Run			
		$LNITR_{t-1}$		LNIFI		LNGDP		LNIFI		LNGDP	
		Coef.	P	Coef.	P	Coef.	P	Coef.	P	Coef.	P
ECT		-1.275	0.000	CD	0.1654						
Mean Group		-.226	0.140	-.606	0.550	1.32	0.849	29.2	0.316	-1.736	0.795
1	Algeria	.493	0.268	2.81	0.000	77.9	0.000	445.6	0.001	79.18	0.000
2	Egypt	-.087	0.899	-.395	0.787	.345	0.957	.469	0.816	-1.169	0.603
3	Iraq	-.740	0.203	.237	0.005	2.36	0.009	.456	0.608	.059	0.578
4	Jordan	.764	0.460	10.18	0.002	69.71	0.000	39.6	0.004	20.31	0.005
5	Kuwait	.140	0.460	1.45	0.078	.066	0.950	.545	0.608	-1.102	0.434
6	Lebanon	-1.08	0.382	-.664	0.880	-4.55	0.470	.724	0.916	-.822	0.839
7	Libya	-.378	0.467	1.16	0.420	5.23	0.085	3.19	0.914	2.329	0.913
8	Mauritania	.556	0.002	-3.29	0.460	14.75	0.589	3.03	0.890	-2.69	0.708
9	Morocco	-.510	0.115	1.65	0.000	3.08	0.000	.6524	0.000	1.734	0.000
10	Oman	1.06	0.075	1.09	0.318	3.11	0.345	-62.4	0.460	-22.49	0.589
11	Palestine	-.765	0.357	10.6	0.682	-13.23	0.724	117.2	0.723	-59.96	0.770
12	Qatar	-.040	0.869	-1.34	0.462	-2.17	0.567	-.545	0.745	.485	0.458
13	Saudi	.872	0.051	-.489	0.713	13.18	0.007	.717	0.986	-1.704	0.986
14	Syria	.762	0.065	.134	0.000	1.05	0.000	.775	0.000	.279	0.000
15	Tunisia	-.339	0.675	-2.54	0.297	7.03	0.059	-3.07	0.689	-.431	0.821
16	Yemen	.057	0.880	-.671	0.768	1.50	0589	1.77	0.519	-.594	0.505
Half- Panel Jackknife		$LNITR_{t-1}$		LNIFI		LNGDP		LNIFI		LNGDP	
		Coef.	P	Coef.	P	Coef.	P	Coef.	P	Coef.	P
ECT		-1.753	0.000	CD	0.6285						
Mean Group		.661	0.512	-.500	0.794	6.12	0.497	-4.67	0.142	-5.96	0.238
1	Algeria	1.311	0.001	.914	0.010	7.98	0.025	-.277	0.638	13.14	0.000
2	Egypt	.9409	0.000	.4037	0.192	5.04	0.000	.797	0.007	.9081	0.727
3	Iraq	3.086	0.000	.538	0.000	134.4	0.000	.221	0.023	2.466	0.008
4	Jordan	13.43	0.000	23.2	0.000	.496	0.000	48.1	0.000	77.10	0.000
5	Kuwait	3.989	0.000	3.40	0.000	10.5	0.000	3.47	0.000	1.394	0.000
6	Lebanon	.8554	0.020	-.326	0.771	12.5	0.006	-.760	0.245	3.215	0.268
7	Libya	-.5082	0.137	10.00	0.000	3.30	0.000	.638	0.144	2.494	0.000
8	Mauritania	1.279	0.000	2.27	0.006	-22.5	0.187	.757	0.365	-.6336	0.161
9	Morocco	.4404	0.124	9.80	0.000	4.575	0.000	2.14	0.000	1.791	0.004
10	Oman	-.7742	0.116	.1881	0.860	-7.46	0.149	5.94	0.256	-14.065	0.646
11	Palestine	1.440	0.000	3.12	0.097	17.4	0.002	-1.14	0.426	10.16	0.001
12	Qatar	5.850	0.000	5.291	0.010	-.776	0.899	.518	0.212	2.057	0.142
13	Saudi	-.1151	0.752	7.92	0.000	15.7	0.000	2.29	0.000	7.696	0.000
14	Syria	.4424	0.036	1.16	0.000	.977	0.028	.297	0.000	.8419	0.000
15	Tunisia	.7431	0.001	5.04	0.019	12.1	0.000	-1.38	0.221	6.252	0.000
16	Yemen	1.521	0.002	1.93	0.039	.206	0.927	-.220	0.818	1.349	0.459

Source: Estimated by Author

Table (6) Second Model Estimation Results CS- ARDL & Jackknife

CS-ARDL		Short Run (1,1,0)						Long Run			
		$LNIFI_{t-1}$		LNITR		LNGDP		LNITR		LNGDP	
		Coef.	P	Coef.	P-	Coef.	P	Coef.	P	Coef.	P
ECT		-.8411	0.000	CD	0.924						
Mean Group		.1588	0.231	.1394	0.271	1.597	0.054	.206	0.435	1.034	0.065
1	Algeria	-1.344	0.132	1.234	0.380	-7.452	0.570	-.0771	0.934	2.308	0.924
2	Egypt	.5640	0.017	.7415	0.000	-1.961	0.357	.4062	0.409	-2.411	0.336
3	Iraq	.3404	0.133	1.285	0.002	6.061	0.083	3.828	0.000	-4.413	0.395
4	Jordan	.7202	0.023	.0840	0.001	-3.331	0.102	-.0902	0.497	4.789	0.002
5	Kuwait	-.5657	0.205	.1587	0.404	-.1532	0.795	-.1519	0.486	.0696	0.887
6	Lebanon	-.2511	0.521	.1080	0.769	.3006	0.877	.2286	0.702	1.787	0.063
7	Libya	.8421	0.026	.0250	0.931	1.086	0.022	.5275	0.862	-1.491	0.830
8	Mauritania	-.2229	0.565	-.1183	0.260	-2.488	0.497	-.0413	0.794	.0974	0.977
9	Morocco	-.2808	0.791	-.1901	0.369	.7778	0.790	.0921	0.748	.2741	0.829
10	Oman	.1093	0.831	-.3208	0.434	2.421	0.054	.3645	0.051	-.1030	0.965
11	Palestine	.4748	0.200	-.0239	0.445	-.0483	0.955	-.1889	0.247	-.6453	0.789
12	Qatar	.6974	0.000	.1585	0.002	2.369	0.000	.7846	0.006	2.941	0.001
13	Saudi	.0023	0.994	.2132	0.012	-.9723	0.108	.2588	0.057	.2607	0.638
14	Syria	-.0258	0.943	-.3750	0.238	-.0209	0.980	-1.136	0.137	-.5095	0.491
15	Tunisia	1.354	0.001	-.1307	0.227	-.2278	0.808	.0177	0.977	-4.867	0.155
16	Yemen	.1274	0.064	-.0248	0.938	.6515	0.440	-.2749	0.532	.8164	0.590
Half-Panel Jackknife		$LNIFI_{t-1}$		LNITR		LNGDP		LNITR		LNGDP	
		Coef.	P	Coef.	P	Coef.	P	Coef.	P	Coef.	P
ECT		-1.349	0.056	CD stat	0.6996						
Mean Group		1.450	0.153	1.654	0.018	-3.857	0.421	43.66	0.306	-135.5	0.320
1	Algeria	1.242	0.009	6.275	0.002	-67.32	0.125	-.5026	0.235	6.478	0.166
2	Egypt	6.379	0.000	-.4344	0.579	-2.853	0.622	-.0071	0.991	-2.109	0.260
3	Iraq	.7911	0.065	7.053	0.000	9.416	0.000	2.923	0.000	2.446	0.000
4	Jordan	1.328	0.000	.2630	0.000	18.98	0.000	.0418	0.000	3.062	0.000
5	Kuwait	14.93	0.000	.1183	0.013	1.757	0.000	1.031	0.000	.9108	0.000
6	Lebanon	-.4860	0.221	.0341	0.100	1.620	0.000	.2658	0.000	1.403	0.000
7	Libya	.8076	0.000	1.985	0.000	5.157	0.000	.6538	0.000	1.591	0.000
8	Mauritania	.1600	0.697	1.466	0.000	5.340	0.308	.7140	0.000	-.6588	0.633
9	Morocco	.0636	0.851	1.1034	0.002	5.285	0.386	.8285	0.060	-.0932	0.840
10	Oman	.2224	0.382	7.116	0.000	24.45	0.000	.3574	0.000	3.687	0.000
11	Palestine	2,644	0.000	1.117	0.000	2.741	0.000	.1117	0.001	2.236	0.000
12	Qatar	2.211	0.000	.3999	0.008	4.358	0.014	10.47	0.000	6.375	0.255
13	Saudi	.7781	0.050	.6765	0.000	6.870	0.000	684.04	0.000	2177.9	0.000
14	Syria	.2988	0.278	2.937	0.000	-.0576	0.958	3.830	0.000	2.522	0.011
15	Tunisia	-.3440	0.265	1.316	0.000	-2.727	0.415	4.909	0.052	3.778	0.871
16	Yemen	.1202	0.002	1.473	0.000	2.150	0.141	.3063	0.842	-.6399	0.794

Source: Estimated by Author

Table (7) Third Model Estimation Results CS- ARDL & Jackknife

CS-ARDL		Short Run (1,1,1)						Long Run			
		$LNGDP_{t-1}$		LNITR		LNIFI		LNITR		LNIFI	
		Coef.	P	Coef.	P-	Coef.	P	Coef.	P	Coef.	P
ECT		-.5549	0.007	CD	0.1461						
Mean Group		.445	0.030	.080	0.014	.048	0.010	-2.84	0.354	-4.88	0.347
1	Algeria	1.14	0.000	.072	0.000	.062	0.000	-.097	0.181	.483	0.000
2	Egypt	.754	0.066	.114	0.196	.129	0.071	.409	0.491	.356	0.618
3	Iraq	.845	0.016	.005	0.978	.072	0.091	1.93	0277	-.235	0.555
4	Jordan	1.57	0.000	-.004	0.589	.278	0.000	-.031	0.042	.684	0.001
5	Kuwait	.243	0.796	.029	0.935	.054	0.979	.381	0.781	-.379	0.884
6	Lebanon	.175	0.472	.094	0.018	.186	0.004	.149	0.109	.4806	0.007
7	Libya	-1.38	0.480	.467	0.459	-.529	0.472	.335	0.969	-.504	0.696
8	Mauritania	.903	0.000	.034	0.048	.010	0.534	1.12	0.006	1.54	0.022
9	Morocco	.876	0.000	.038	0.004	.398	0.000	1.42	0.000	3.21	0.000
10	Oman	.634	0.553	.026	0.932	-.126	0.747	-.016	0.971	-.158	0.914
11	Palestine	-.150	0.609	.043	0.011	.168	0.134	.049	0.236	.609	0.012
12	Qatar	6015	0.000	.021	0.300	.343	0.000	.131	0.429	-.026	0.886
13	Saudi	.992	0.019	.230	0.006	.326	0.060	48.8	0.012	82.7	0.001
14	Syria	1.38	0.000	1.84	0.000	.151	0.000	1.47	0.017	.439	0.016
15	Tunisia	.785	0.712	.120	0.489	.297	0.730	1.02	0.589	-.379	0.889
16	Yemen	.520	0.702	-.146	0.747	-.598	0.393	.218	0.868	-.213	0.817
Half-Panel Jackknife		$LNGDP_{t-1}$		LNITR		LNIFI		LNITR		LNIFI	
		Coef.	P.	Coef.	P	Coef.	P	Coef.	P	Coef.	P
ECT		-2.131	0.001	CD	0.5925						
Mean Group		-4.649	0.219	1.81	0.433	-.955	0.300	.255	0.036	.219	0.150
1	Algeria	.114	0.000	.112	0.000	.066	0.000	.086	0.000	-.008	0.534
2	Egypt	11.00	0.000	11.0	0.000	9.92	0.000	.979	0.002	1.04	0.040
3	Iraq	.106	0.021	.106	0.021	.080	0.008	.942	0.000	0.15	0.000
4	Jordan	.270	0.000	.270	0.000	.767	0.000	-.131	0.220	0.53	0.887
5	Kuwait	1.16	0.000	1.16	0.000	4.37	0.000	.793	0.000	0.040	0.005
6	Lebanon	1.04	0.000	1.04	0.000	.589	0.000	.176	0.190	0.000	0.555
7	Libya	.150	0.205	-.150	0.205	.927	0.000	.397	0.157	0.887	0.222
8	Mauritania	34.6	0.000	34.6	0.000	.172	0.000	-.038	0.102	0.005	0.835
9	Morocco	.230	0.001	.230	0.001	2.39	0.000	.062	0.070	0.555	0.180
10	Oman	.273	0.000	.273	0.000	.385	0.000	.001	0.991	0.222	0.115
11	Palestine	.598	0.000	.598	0.000	.735	0.000	.044	0.000	0.835	0.011
12	Qatar	.030	0.451	0.030	0.154	.331	0.000	.192	0.000	0.180	0.000
13	Saudi	.160	0.000	.160	0.000	-.029	0.861	.116	0.001	0.115	0.247
14	Syria	.014	0.948	-.014	0.948	1.16	0.000	1.26	0.040	0.011	0.244
15	Tunisia	3.08	0.000	3.08	0.000	8.74	0.000	-.505	0.146	0.000	0.561
16	Yemen	.275	0.000	.575	0.000	3.91	0.000	.188	0.023	0.247	0.005

Source: Estimated by Author

Table (8) Fourth Model Estimation Results CS- ARDL &Jackknife

CS-ARDL		Short Run (1,1,0,0)								Long Run					
		$LNITR_{t-1}$		LNIFD1		LNIFD2		LNIFD3		LNIFD1		LNIFD2		LNIFD3	
		Coef.	P	Coef.	P	Coef.	P	Coef.	P	Coef.	P	Coef.	P	Coef.	P
	ECT	-.972	0.000	CD	0.3278										
	Mean Group	.027	0.826	-.182	0.479	-.292	0.534	.149	0.739	-.944	0.174	-.988	0.354	-.025	0.965
1	Algeria	-.177	0.707	.351	0.005	.413	0.000	.427	0.016	.551	0.015	.560	0.161	-.366	0.304
2	Egypt	.688	0.069	.616	0.124	.493	0.075	.057	0.859	-.840	0.439	-1.29	0.331	.531	0.562
3	Iraq	-.677	0.385	.428	0.060	.106	0.655	.242	0.267	-.061	0.781	.083	0.784	.124	0.842
4	Jordan	.014	0.968	-.549	0.754	2.47	0.006	1.89	0.155	-.021	0.993	5.44	0.004	-.988	0.351
5	Kuwait	.459	0.658	.974	0.776	-1.16	0.721	-.735	0.616	-.159	0.982	.208	0.959	-1.93	0.471
6	Lebanon	.716	0.218	-1.19	0.454	-2.91	0.181	-.483	0.311	8.97	0.070	-17.1	0.231	-1.28	0.625
7	Libya	.654	0.016	.533	0.057	-.241	0.723	1.09	0.360	.936	0.319	-.254	0.751	-.068	0.975
8	Mauritania	-.094	0.837	-.329	0.749	-2.99	0.042	-.329	0.475	.740	0.415	-2.05	0.256	-.747	0.504
9	Morocco	.813	0.000	.356	0.012	.792	0.001	.523	0.000	-.085	0.426	.191	0.648	-.362	0.387
10	Oman	.397	0.001	.298	0.000	.572	0.000	1.65	0.000	.235	0.002	.35	0.014	1.59	0.000
11	Palestine	.318	0.540	-1.13	0.482	2.24	0.616	-1.24	0.619	-1.50	0.771	-.062	0.995	.550	0.815
12	Qatar	.245	0.422	2.67	0.013	4.73	0.000	6.05	0.000	6.08	0.002	6.71	0.000	8.56	0.000
13	Saudi	-.312	0.777	-.503	0.280	.472	0.910	-.857	0.775	-1.03	0.582	.338	0.948	-.836	0.861
14	Syria	.165	0.379	1.552	0.052	.358	0.032	-.595	0.203	1.92	0.202	.702	0.028	-.525	0.538
15	Tunisia	.449	0.438	.963	0.016	.388	0.740	.154	0.729	1.53	0.059	2.38	0.608	-.816	0.611
16	Yemen	.507	0.294	.329	0.095	.047	0.983	-.201	0.288	.805	0.159	-1.61	0.668	-.652	0.064
Half-Panel Jackknife		$LNITR_{t-1}$		LNIFD1		LNIFD2		LNIFD3		LNIFD1		LNIFD2		LNIFD3	
		Coef.	P	Coef.	P	Coef.	P	Coef.	P	Coef.	P	Coef.	P	Coef.	P
	ECT	-2.09	0.000	CD	0.8951										
	Mean Group	-.384	0.374	-266	0.317	.283	0.975	.096	0.880	-.070	0.885	.694	0.401	-.598	0.254
1	Algeria	.506	0.061	.536	0.000	.422	0.231	.125	0.418	.820	0.002	1.07	0.014	1.23	0.000
2	Egypt	1.32	0.000	.412	0.030	.895	0.000	.343	0.023	.410	0.487	3.51	0.005	.770	0.028
3	Iraq	.114	0.760	1.13	0.000	.017	0.902	-.063	0.843	-.028	0.725	.127	0.000	.111	0.306
4	Jordan	-.578	0.239	.942	0.571	.810	0.802	4.63	0.000	-1.89	0.153	4.37	0.000	.909	0.136
5	Kuwait	1.79	0.000	2.03	0.062	6.63	0.000	1.04	0.000	.026	0.990	1.19	0.388	5.81	0.000
6	Lebanon	2.52	0.000	1.96	0.000	1.53	0.87	-.004	0.970	2.86	0.000	3.66	0.000	.748	0.000
7	Libya	.149	0.394	1.82	0.000	.906	0.004	-1.48	0.562	1.04	0.000	.149	0.421	.974	0.204
8	Mauritania	4.31	0.000	64.1	0.000	105.3	0.000	-.008	0.993	.329	0.657	-1.31	0.416	-.275	0.703
9	Morocco	2.26	0.000	-1.19	0.000	2.86	0.000	.581	0.000	-.044	0.257	.455	0.001	.502	0.000
10	Oman	1.73	0.000	2.42	0.000	.570	0.001	.761	0.003	.347	0.000	1.12	0.000	1.94	0.000
11	Palestine	-.358	0.348	2.68	0.000	9.76	0.000	6.22	0.000	1.02	0.000	4.77	0.000	2.40	0.000
12	Qatar	1.87	0.000	6.87	0.000	.706	0.026	4.35	0.000	.191	0.222	2.89	0.000	2.74	0.000
13	Saudi	-1.96	0.000	-2.03	0.088	-3.61	0.051	1.15	0.311	1.27	0.002	.117	0.899	-.128	0.832
14	Syria	.512	0.304	-426	0.000	90.4	0.000	2.72	0.008	4.96	0.000	-.254	0.012	-2.81	0.000
15	Tunisia	-.582	0.208	3.73	0.000	6.26	0.000	2.17	0.000	-3.63	0.000	8.40	0.000	-1.80	0.000
16	Yemen	.713	0.065	-1.22	0.000	9.37	0.000	.137	0.128	1.50	0.017	4.38	0.395	-2.22	0.000

Source: Estimated by Author

6.3 Bi-Variate Causality Results

Table (9) shows results of Dumitrescu and Hurlin (2012) Granger non-causality test, in comparison to number of countries with significant impact at short and long run using both CS-ARDL and Jackknife summarized from estimation results.

Causality results show existence of three Bi-directional relationships between IFI ↔ITR, GDP ↔IFI, ITR ↔GDP, and three unidirectional relationships between IFI dimensions and transportation, IFID1 →ITR, IFID2 →ITR, IFID3 → ITR, this goes with estimation results.

These bi-directional relationships shows that financial inclusion is important for further transportation development as it facilitate easier access to financial resources and also, transportation is important to raise financial inclusion which shows the importance of better transportation means and road networks for easier access to financial services which raise financial penetration and usage.

Also, the results show the bi-directional impact between transportation and GDP which shows that further economic growth facilitate more resources and put higher importance for developing transportation and also, higher transportation enhance further economic growth. These results also shown by causality of each financial dimension on transportation showing that higher financial access, usage and penetration facilitate better transportation.

Table (9) Bi-Variate Causality Results

Relationship	Z bar	P-value	CS-ARDL		Jackknife	
			SR	LR	SR	LR
LNIFI →LNITR	3.7245	0.0002	6	4	10	7
LNITR → LNIFI	8.9401	0.0000	5	4	15	13
LNGDP →LNIFI	13.370	0.0000	4	3	9	9
LNIFI →LNGDP	3.9128	0.0001	9	8	15	6
LNITR →LNGDP	36.339	0.0000	8	5	13	10
LNGDP →LNITR	6.8140	0.0000	8	4	12	10
LNIFD1 →LNITR	8.9827	0.0000	9	5	15	9
LNIFD2 →LNITR	7.3666	0.0000	8	4	12	11
LNIFD3 →LNITR	7.4398	0.0000	4	2	9	10

Source: Estimated by Author **-** note: SR= Short run LR= Long Run

7. Conclusion and Policy Implications

The present study main objective is to examine the nexus among transportation, financial inclusion and economic growth simultaneously. Four models estimated using CS-ARDL and bias correction half-panel Jackknife, the results shows that Jackknife results are more robust. The analysis found three main results which provide policy implications:

First: Financial inclusion and transportation are important for economic growth at both short and long run, recommending that MENA countries should focus on development of financial and transportation sectors. According to results of models' estimation, transportation has positive significant impact on economic growth which is consistent with literature as Rostow (1960), Bougheas *et al.* (2000), Seetanah (2006), Zhou *et al.* (2007), Hing *et al.* (2011), Pradhan *et al.* (2015), and Pradhan (2019). Also, results found that financial inclusion has positive significant impact on economic growth which is consistent with literature as Levine (1993), Bardhan & Sharma (2019) and Pradhan (2019) showing the importance of banking inclusion in facilitation of higher economic growth.

Second: Estimation results found evidence of bi-directional relationship between transportation and financial inclusion. Estimation results found positive significant impact of transportation on financial inclusion at short and long run which shows that more developed transportation modes attract financial resources that finance transport projects which improve transportation infrastructure.

Third: Further analysis of financial inclusion role on transportation found that banking penetration and access has significant impact on transportation more than usage of banking services. Policies should be designed for promoting usage of banking services through offering attractive services. Raising awareness should be addressed in policies as providing financial services access isn't enough without its usage, for raising financial resources that is important to raise economic growth rates.

Financial inclusion has a key role in transportation which in turn stimulates economic growth. The overall results recommend that financial policies should be addressed to enhance transportation which positively affect economic growth, through designing consistent development policies and promoting financial integration and inclusion in MENA countries

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دراسة العلاقة بين النقل والشمول المالي والنمو الاقتصادي في منطقة الشرق الأوسط وشمال إفريقيا

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الملخص

درست الورقة الصلة بين النقل والشمول المالي والنمو الاقتصادي في دول الشرق الأوسط وشمال إفريقيا باستخدام البيانات السنوية من ٢٠٠٥ إلى ٢٠١٩. حسبت الورقة المؤشر ثلاثي الأبعاد للشمول المالي IFI من عام ٢٠٠٠ حتى عام ٢٠٢٠ لـ ٢١ دولة. أيضًا، تم حساب المؤشر ثلاثي الأبعاد للنقل ITR لـ ١٨ دولة من ٢٠٠٥ حتى ٢٠١٩ يتضمن النقل البحري والجوي والبري. فحص التحليل العلاقة طويلة والقصيرة المدى بين IFI وITR والناتج المحلي الإجمالي كمؤشر للنمو الاقتصادي، مع مزيد من الدراسة لتأثير أبعاد الشمول المالي على النقل باستخدام اسلوب CS-ARDL ونهج Jackknife لتصحيح التحيز التي توفر نتائج قوية في ظل وجود الانحياز وعدم التجانس، ودرس أيضا العلاقة السببية بين المتغيرات. وكانت أقوى نتائج الدراسة هي أن الشمول المالي والنقل يحفزان النمو الاقتصادي على المدى القصير والطويل.

الكلمات المفتاحية: النقل، الشمول المالي، النمو الاقتصادي، مؤشر، الاجل القصير، الاجل الطويل