The Effect of Real Exchange Rate on Economic Growth: Evidence from Tunisia and Morocco

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Abstract: This article aims to determine the impact of Real Effective Exchange Rate (REER) on economic growth for Tunisia and Morocco during the period 1988-2019. The methodology adopted was based on the Auto Regressive Distributed Lag (ARDL) model. Our results indicated that an increase in the REER, equivalent to a real appreciation, reduces economic growth in the long term. This is explained by the fact that a real appreciation makes domestic products less competitive than foreign products, which deteriorates the trade balance and thus constitutes a brake on economic growth. While in the short run, the link between real exchange rate and economic growth is statistically insignificant.

Keywords: Real Effective Exchange Rate, Economic Growth, Panel ARDL, Tunisia, Morocco.

1. INTRODUCTION

Since the collapse of the Bretton-Woods system, most countries have adopted a floating exchange rate regime. However, the exchange rate movement can have adverse effects on economic activity. Thus, studying the impact of exchange rate on economic growth has always been a subject of lengthy debate.

By referring to the orthodox liberal theory, we can distinguish two significant effects of the depreciation of the national currency (we also use the term devaluation if we are under a fixed exchange rate regime). First, a competitive currency makes local products more competitive than foreign products, and therefore an increase in foreign demand for domestic products will occur, strengthening exports. Second, the depreciation of exchange rate causes consumers to turn to the national product.

This study is subdivided into four parts, after this introduction, the second section provides a review of the literature relating, on the one hand, to the historical evolution of the exchange rate regime adopted in the countries taken in the model, and on the other hand to the relationship between the evolution of the exchange rate and economic growth. The third section presents the model used and the long and short-term effects of Real Exchange Rate (RER) on economic growth for Tunisia and Morocco during the period 1988-2019. Finally, the conclusion will be presented in the fourth section.

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2. LITERATURE REVIEW

Before presenting the main works which have dealt with the effects of RER on economic growth, we will study the evolution of the exchange rate regime for Tunisia and Morocco.

2.1. Evolution of the Exchange Rate Regime for Tunisia and Morocco

The establishment of an optimal exchange rate regime is of crucial importance as it allows the achievement of economic policy objectives. There are two main categories of exchange rate regimes: the fixed exchange rate regime and the floating exchange rate regime.

A fixed exchange rate regime is the advantage of a certain rigidity in macroeconomic indicators such as inflation (Ghosh and al, 1997, 2003). Unfortunately, the exchange rate can deviate from its equilibrium level. On the other hand, the floating exchange rate regime allows an efficient allocation of resources (Ghosh and al, 1997, 2003). However, increased flexibility could have adverse effects on trade and financial exchanges. This is explained by "currency risk" as a factor affecting the behavior of economic agents.

A third hybrid form stands out, next to these two categories, namely: the intermediate exchange rate regime. In this case, the central bank allows a fluctuation margin around the fixed parity.

The exchange rate regime adopted before the failure of the Bretton Woods system in 1971 was the fixed exchange rate system. Subsequently, most countries chose to move towards flexible exchange systems.

2.1.1. Tunisia's Exchange Rate Policy

Tunisia has adopted different exchange rate regimes since its independence until now. So the value of the Tunisian Dinar (TD) is determined by opting for different forms of connection: a connection to a single foreign currency or a basket of currencies. In the early 1970s, the TD was attached to only one foreign currency, the French Franc. In the mid-1970s, Tunisia chose to anchor its currency to a basket of two currencies: the French Franc and the Deutsche-Mark. In 1978, the American dollar was included in the basket of currencies. The latter was extended in 1981 to form the Italian lira, the Belgian Franc, then the Florin Dutch and the Spanish Peseta.

Since the end of the 1980s, the exchange rate regime adopted by Tunisia has been classified under the "crawling peg" category according to the International Monetary Fund (IMF) classifications. In this case, the Central Bank of Tunisia (CBT) is responsible for stabilizing the REER to maintain a good level of competitiveness. From April 2012, the CBT changed its operational framework for exchange rate policy, the objective of which was greater flexibility of the exchange rate. From this date, the value of the national currency is determined on the interbank market instead of persistence for a basket of currency.

2.1.2. Morocco's Exchange Rate Policy

Since 1973, the exchange rate regime adopted by Morocco has been a fixed exchange rate regime. The dirham has been anchored to the French Franc since its creation until 1996. Then, it was attached to a basket of 9 currencies (the American dollar and 8 European currencies). The creation of the euro in 1999 made it possible to replace the European currencies. Thus, the most important weight is given to the euro given the commercial exchanges characterizing the relationship between Morocco and Euro area.

During the last three decades, Morocco opted for the depreciation of the dirham and the liberalization of its economy. Thus, it adopted a structural adjustment program in 1983, followed by the partial convertibility of the dirham in 1993 and the creation of an interbank market in 1996.

In 2012, according to IMF classifications, Morocco opted for a conventional fixed exchange rate regime. However, the reforms implemented on January 15, 2018, constitute a break with the fixed regime adopted since independence. Since then, Morocco has moved towards a more flexible exchange rate regime by widening the fluctuation band from +/- 0.3 to +/- 2.5.

2.2. Real Exchange Rate and Economic Growth

The study of the effect of RER on economic growth has been the subject of several theoretical and empirical works. Among the first works dealing with the relationship between the two variables, we cite those of Edwards (1988), who underlined the importance of the stability of the RER as determinants of economic performance in the least developed countries.

Using a Vector Autoregressive (VAR) model, Kamin and Rogers (1997) found that an economic contraction follows the Peso's devaluation in Mexico. However, they also pointed out that a real appreciation has been associated with an expansion in economic activity.

Mishkin (1996) noted that the exchange rate is the tool through which monetary policy affects economic activity. A competitive currency tends to lower the price of domestic goods relative to foreign goods, allowing for increased net exports and, therefore, overall production.

Rodrik (2008) developed a small open economy model in which tradable and non-tradable sectors are "taxed". He found that when taxes in the exposed sector are higher than those in the protected sector, the production of tradable goods will be reduced, and the rate of GDP growth will be below its optimal level. The author confirmed the essential role of RER undervaluation in overcoming these problems.

Tarawalie (2010) used the Johansen co-integration technique to study the relationship between RER and economic growth in Sierra Leone for the period 1990Q1–2006Q4. He showed that the depreciation of the RER has a positive effect on production.

To study the economic and social effect of RER on economic growth, Ping (2011) used the Generalized Method of Moments (GMM) and data for a panel of 29 Chinese provinces covering the period 1987 - 2008. The author has shown that the appreciation of the RER negatively affects economic growth. Furthermore, he found that the effect is higher in coastal regions than inland provinces.

Di Nino and al (2011) studied the effect of exchange rate on economic growth for Italy during the period 1861-2011. They have shown that the undervaluation promotes growth by increasing exports, especially productivity.

Using a sample of 77 countries, Elbadawi and al (2012) showed that the real overvaluation negatively affects economic growth during the estimation period from 1970 to 2004.This study also showed that this effect is reinforced in countries that suffer from a less developed financial system.

A theoretical analysis by Razmi and al (2012) showed that the real undervaluation positively affects economic growth for two reasons. On the one hand, it shifts domestic consumption towards non-tradable goods. On the other hand, it increases profitability and investment in the tradable goods sector. The study proves that the RER affects economic growth through the sustainable accumulation of capital.

Gluzmann and al (2012) have shown that the depreciation of the national currency makes it possible to increase savings and investment, which positively affects economic growth.

Aman and al (2013) studied the link between exchange rate and economic growth for Pakistan. Using data covering the period 1976 - 2010 and the least-squares technique, the authors have shown that a depreciation of the national currency positively affects economic growth since depreciation encourages exports and imports of substitution.

Bernard and Odhiambo (2015), using a sample of 15 countries and data covering the period 1970 - 2010, showed that the real undervaluation boosts economic growth while the real overvaluation negatively affects it.

Owoundi (2015), in his study of Sub-Saharan African countries, used bayesian inference techniques to study the effect

of RER on economic growth. The author noted that the gain linked to the undervaluation is almost zero whatever the exchange rate regime adopted.

Missio and al (2015) investigated the relationship between RER and output growth rate. They used a sample of 63 developing countries and data from 1978 to 2007. Their results showed that the depreciation of the RER can positively affect long-term economic growth by increasing the income elasticity of demand for exports.

In his study of the Chinese economy, Tang (2015) did not found long-term dependency relationship between RER and economic growth.

Gabriel and al (2016) used a dynamic model explicitly integrating the effects of the North-South technological gap to study the link between RER and economic growth. Their results showed that the response of economic growth to the RER depends on two factors, namely: the size of the technological gap and the level of industry participation in the South's GDP.

Using a sample of 150 countries and data covering the period 1970-2010, Maurizio (2016) studied the impact of RER on per capita economic growth. The result obtained proves a statistically positive and significant effect of the real depreciation on economic growth per capita for an average period of five years. This is checked only for developing countries.

Using a sample of 150 countries and five-year data over the post-Bretton Woods period, Habib and al (2017) found that the real appreciation (depreciation) significantly reduces (increases) growth annual real GDP.

Using a dynamic panel model and the GMM method, Brain and Dev (2018) studied the relationship between undervaluation of the RER and sector growth in South Africa during the period 1984 - 2014. They found the existence of a negative link between the two variables.

Using a sample of 152 countries and annual data covering the period 1990 - 2014, Ulasan (2018) showed that the undervaluation of the RER positively affectsthe economic growth for developing countries. On the other hand, the author found that a prolonged real overvaluation can generate a decline in long-term growth since it shifts the allocation of resources from the tradable goods sector to the non-tradable goods sector.

Using annual data covering the period 1970 - 2014 and a set of emerging countries, Christian and al (2018) have shown that the impact of the undervaluation of the RER on economic growth is transmitted through the channel of foreign trade.

Amina and Ayoub (2020) studied the effect of exchange rate on economic growth for Morocco during the period 1988-2016. Using the ARDL (AutoRegressive Distributed Lag) method, the authors found that an appreciation of the RER negatively affectsthe economic growth in the short-term. At the same time, the long-term effect is statistically insignificant.

Using annual data for the period 1980-2018, Hniya and al (2021) studied the impact of RER on Foreign Direct Investment (FDI) for Tunisia, which is one of the engines of economic growth. Their results proves that an increase in the RER, equivalent to a real appreciation (quotation at certain), negatively affects FDI.

3. EMPIRICAL RESULTS

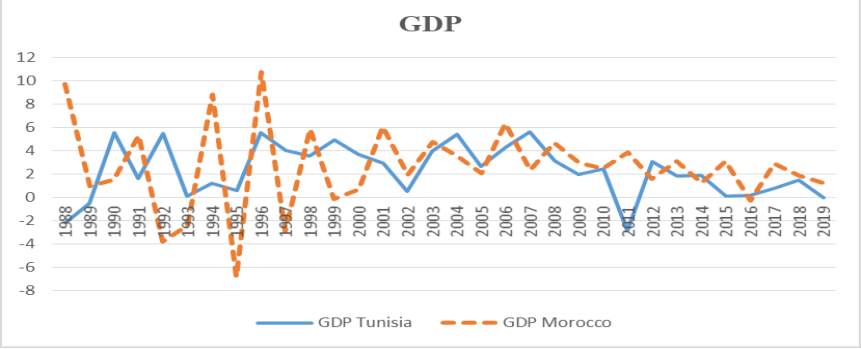
To study the impact of the RER on economic activity for Tunisia and Morocco during the period 1988-2019, we will build an economic growth model expressed by the following relation:

$$InGDP_t = b_0 + b_1 InOP_t + b_2 Inl_t + b_3 FDI_t + b_4 InREER_t + e_t \quad (1)$$

Where:

- b_0: Constant
- b_1, b_2, b_3, b_4 :The coefficients of the model
- GDP: Gross Domestic Product per capita growth (annual %)
- OP : The rate of openness of the economy: is expressed by the sum of exports and imports (% of GDP)
- I: Domestic Investment (Gross fixed capital formation (% of GDP))
- FDI: Foreign Direct Investment, net inflows (% of GDP)
- REER: Real Effective Exchange Rate
- e: Error term
- Ln: Natural logarithm
- t: Time index

In the following figure, we will present the evolutions of the variables.



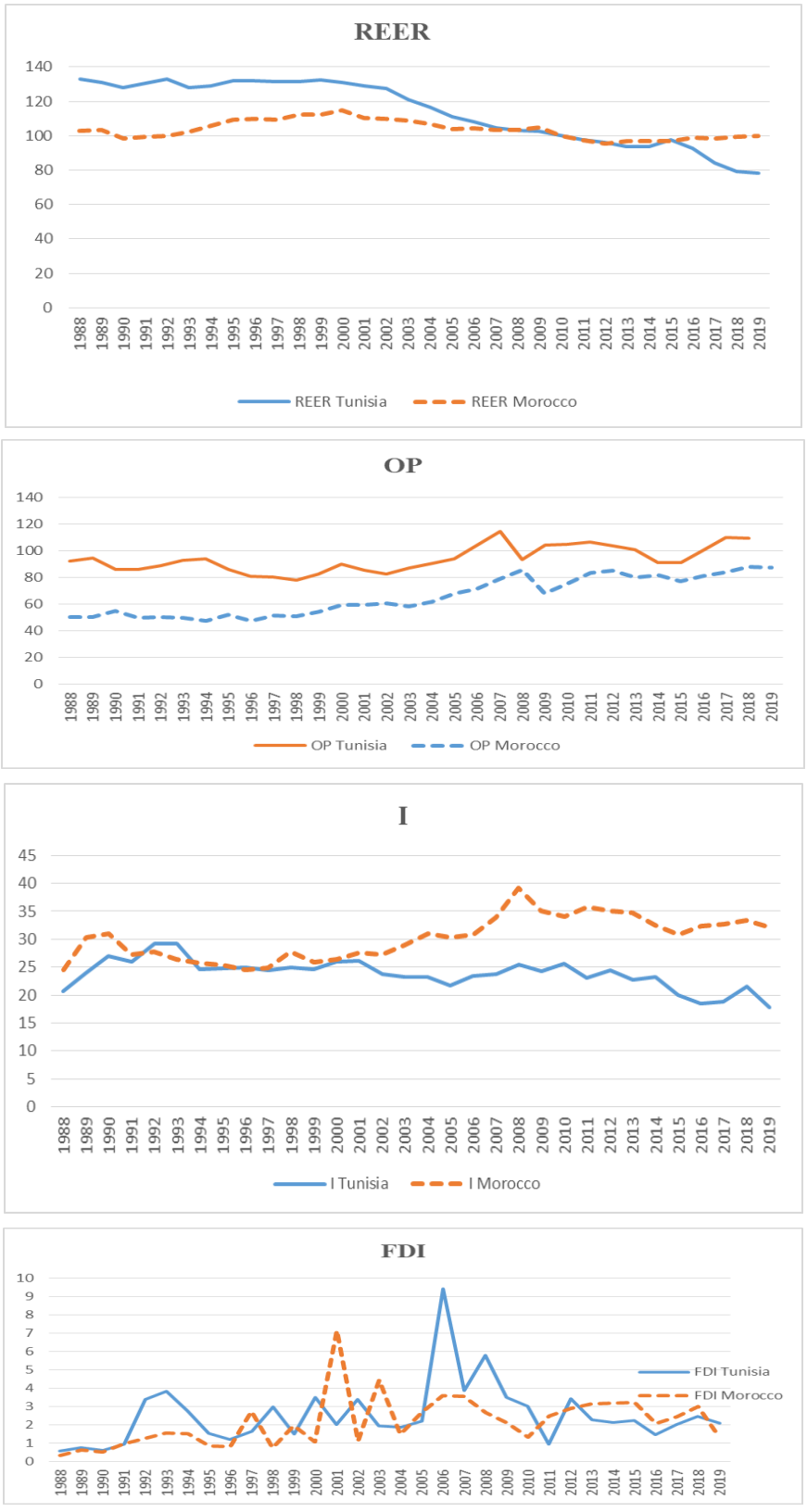


Fig. (1). Evolutions of the variables.

Before proceeding with the regression, a preliminary step involves studying the properties of the variables taken in the model. To do this, we will use unit root and co-integration tests.

3.1. Panel Unit Root Results

To check the level of stationarity of the series studied, the Fisher – ADF test, Levin test and Fisher PP test are used. The results of various tests, as presented in the Tables **1.1**,

1.2 and **1.3**, indicates that the variables REER, OP and I are non-stationary at level. By applying the first difference, they all become stationary. The GDP and FDI variables are stationary at level.

Table 1.1. Levin Test.

Variable	Stationarity	Statistic	Prob	Result
GDP	Level	-1.28454	0.0995	Stationary
FDI	Level	-1.82359	0.0341	Stationary
OP	Level	-1.18803	0.4254	Non stationary
	First difference	-5.63059	0.0000	Stationary
I	Level	1.00936	0.8436	Non stationary
	First difference	-3.80703	0.0001	Stationary
REER	Level	1.64230	0.9497	Non stationary
	First difference	-4.02242	0.0000	Stationary

Table 1.2. Fisher -ADF Test.

Variable	Stationarity	Statistic	Prob	Result
GDP	Level	24.9877	0.0001	Stationary
FDI	Level	9.49654	0.0498	Stationary
OP	Level	1.75215	0.7812	Non stationary
	First difference	29.9869	0.0000	Stationary
I	Level	1.35832	0.8514	Non stationary
	First difference	34.7807	0.0000	Stationary
REER	Level	0.81216	0.9268	Non stationary
	First difference	16.0373	0.0030	Stationary

Table 1.3. Fisher PP Test.

Variable	Stationarity	Statistic	Prob	Result
GDP	Level	52.4177	0.0000	Stationary
FDI	Level	30.5440	0.0000	Stationary
OP	Level	2.14752	0.7086	Non stationary
	First difference	55.8684	0.0000	Stationary
I	Level	4 .17932	0.3823	Non stationary
	First difference	46.8819	55.8684	Stationary
REER	Level	0.87056	0.9287	Non stationary
	First difference	22.9244	0.0001	Stationary

3.2. Panel Co-integration Results

The level of co-integration between the variables taken in the model is detected by applying the tests of Pedroni, Kao and Fisher. According to the results shown in the tables **2.1**, **2.2** and **2.3**, the null hypothesis of absence of co-integration is rejected for all statistics, which implies the existence of a long-term relationship between the variable to be explained (GDP) and the explanatory variables (REER, OP, I and FDI).

Table 2.1. Pedroni Test.

	Statistic	Prob	Statistic	Prob
Panel v-Statistic	0.471838	0.3185	-0.882812	0.8113
Panel rho –Statistic	-4.263649	0.0000	-2.201848	0.0138
Panel PP- Statistic	-11.84500	0.0000	-5.901588	0.0000
Panel ADF-Statistic	-1.601659	0.0546	-3.893657	0.0000
Group rho –Statistic	-3.035356	0.0012		
Group PP- Statistic	-10.90630	0.0000		
Group Panel ADF-Statistic	-1.706452	0.0440		

Table 2.2. Kao Test.

	t-Statistic	Prob
ADF	-9.047516	0.0000

Table 2.3. Fisher Test.

Hypothesized No. of CE(s)	Fisher Stat (from Trace Test)	Prob	Fisher Stat (from Max-Eigen Test)	Prob
None	47.42	0.0000	36.15	0.0000
At most 1	19.12	0.0007	19.03	0.0008
At most 2	5.029	0.2844	2.641	0.6196
At most 3	5.136	0.2736	3.604	0 .4622
At most 4	7.571	0.1086	7.571	0.1086

3.3. Auto-Regressive Distributed Lag Model

The unit root and co-integration tests indicated that the variables taken in the model are integrated of order I (0) and I (1) and that there is a long-term relationship between economic growth and its determinants, which therefore permits to proceed with the ARDL model, which is written as follows:

$$GDP_t = \alpha_0 \sum_{i=0}^{p} \alpha_1 \Delta GDP_{t-1} + \sum_{i=0}^{q} \alpha_2 \Delta OP_{t-1} + \sum_{i=0}^{q} \alpha_3 \Delta I_{t-1} + \sum_{i=0}^{q} \alpha_4 \Delta FDI_{t-1} + \sum_{i=0}^{q} \alpha_5 \Delta REER_{t-1} + \beta_1 GDP_{t-1} + \beta_2 OP_{t-1} + \beta_3 I_{t-1} + \beta_4 FDI_{t-1} + \beta_5 REER_{t-1} + e_t \quad (2)$$

Where:

- α_0: Constant
- $\alpha_1 \ldots \alpha_5$: Short run coefficients
- $\beta_1 \ldots \beta_5$: Long run coefficients
- e_t: Error term

3.3.1. Long Run Equation

The long-term coefficients, as presented in the table **3**, indicated that economic growth is negatively affected by trade

openness. Thus, a 1% increase in the degree of economic openness can lower economic growth by11%. Investment and FDI, considered two main drivers of economic activity, positively affect economic growth. Thus, a 1% increase in domestic investment can increase economic growth by17%. Following a 1% increase in FDI, economic growth may register a rise of1.2%. Regarding our key variable, the REER, it affects negatively the economic growth. Thus a 1% increase in the REER can reduce economic growth by 2.9%. This is in line with theoretical predictions since an increase in the REER, equivalent to a real appreciation, makes domestic products less competitive than foreign products, which deteriorates the trade balance and thus constitutes a brake on economic growth.

Table 3. Long Run Coefficients.

Variable	Coefficient	Std. Error	t-Statistic	Prob
OP	-11.07356	0.912495	-12.13548	0.0000
FDI	1.266194	0.118353	10.69844	0.0000
I	17.39198	1.403832	12.38893	0.0000
REER	-2.913280	0.319313	-9.123596	0.0000

Source: Authors' estimations using E views 12.

3.3.2. Short Run Equation

We see from the table 4 that economic growth is affected only by FDI. For investment and trade openness, their short-term effects are statistically insignificant. Although increased trade openness allows the import of intermediate goods necessary to carry out domestic investments, this requires a period, hence the negligible effect of these two variables on economic growth.

The short-term impact of the REER on economic activity, the variable that interests us, is statistically insignificant.

Table 4. Short Run Coefficients.

Variable	Coefficient	Std. Error	t-Statistic	Prob
D (GDP (-1))	0.219185	0.574689	0.381397	0.7069
D(OP)	6.664958	10.14854	0.656740	0.5188
D (OP (-1))	10.67629	25.23738	0.423035	0.6768
D(FDI)	-1.109832	1.150721	-0.964467	0.3463
D (FDI (-1))	0.266528	0.1077189	2.486514	0.0219
D(I)	-0.610220	8.695156	-0.070179	0.9447
D (I (-1))	-23.33461	17.04095	-1.369326	0.1861
D(REER)	-2.503451	25.25391	-0.099131	0.9220
D (REER (-1))	32.25755	51.00616	0.632425	0.534

Source: Authors' estimations using Eviews 12.

4. CONCLUSION

The study of the relationship between real exchange rate and economic growth has been the subject of many theoretical and empirical works. Thus, as an indicator of competitiveness, the real exchange rate affects economic activity. According to the existing literature, we found that the results obtained are mixed. Although the negative impact of an appreciation of RER has been proven by many studies, some works have proven that there is no link between the two variables . So the question is purely empirical.

Throughout this study, we have proceeded to determine the impact of real exchange rate on economic growth for Tunisia and Morocco. The study period is from 1988 to 2019. We moved with the ARDL model to detect the short and long-term effects.

The results obtained showed that the GDP is positively affected by domestic investment and FDI in the long term. At the same time, the impact of trade opening is negative. Therefore, we found that economic growth is affected only by FDI for the short-term relationship. Regarding the variable that interests us, the REER, our results indicated that it negatively affects economic growth. This is in line with theoretical predictions since an increase in the REER, equivalent to a real appreciation, makes domestic products less competitive than foreign products, which deteriorates the trade balance and thus acts as a brake on economic growth. At the same time, its short-term impact on economic activity is statistically insignificant.

APPENDIX 1: PANEL CO-INTEGRATION TEST

1.1. Pedroni Test

Pedroni Residual Cointegration Test
Series: GDP OP FDI I REER
Date: 10/14/21 Time: 00:15
Sample: 1988 2019
Included observations: 64
Cross-sections included: 2
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 6
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	0.471838	0.3185	-0.882812	0.8113
Panel rho-Statistic	-4.263649	0.0000	-2.201848	0.0138
Panel PP-Statistic	-11.84500	0.0000	-5.901588	0.0000
Panel ADF-Statistic	-1.601659	0.0546	-3.893657	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	-3.035256	0.0012
Group PP-Statistic	-10.90630	0.0000
Group ADF-Statistic	-1.706452	0.0440

Cross section specific results

Phillips-Peron results (non-parametric)

Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
1	0.008	3.365930	2.626437	5.00	31
2	-0.597	6.607457	7.517732	3.00	31

Augmented Dickey-Fuller results (parametric)

Cross ID	AR(1)	Variance	Lag	Max lag	Obs
1	0.008	3.365930	0	6	31
2	-0.146	5.603446	3	6	28

1.2. Fisher Panel Cointegration Test

Johansen Fisher Panel Cointegration Test
Series: GDP OP FDI I REER
Date: 10/14/21 Time: 00:19
Sample: 1988 2019
Included observations: 64
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 1

Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	47.42	0.0000	36.15	0.0000
At most 1	19.12	0.0007	19.03	0.0008
At most 2	5.029	0.2844	2.641	0.6196
At most 3	5.136	0.2736	3.604	0.4622
At most 4	7.571	0.1086	7.571	0.1086

* Probabilities are computed using asymptotic Chi-square distribution.

Individual cross section results

Cross Section	Trace Test Statistics	Prob.**	Max-Eign Test Statistics	Prob.**
Hypothesis of no cointegration				
1	118.0081	0.0000	51.2660	0.0002
2	94.1667	0.0002	53.6912	0.0001
Hypothesis of at most 1 cointegration relationship				
1	66.7421	0.0003	44.2763	0.0002
2	40.4754	0.2059	18.4315	0.4596
Hypothesis of at most 2 cointegration relationship				
1	22.4658	0.2733	11.2713	0.6202
2	22.0440	0.2961	13.2393	0.4305
Hypothesis of at most 3 cointegration relationship				
1	11.1946	0.1998	6.8662	0.5051
2	8.8047	0.3838	8.5381	0.3266
Hypothesis of at most 4 cointegration relationship				
1	4.3284	0.0375	4.3284	0.0375
2	0.2666	0.6056	0.2666	0.6056

**MacKinnon-Haug-Michelis (1999) p-values

1.3. Kao Test

Kao Residual Cointegration Test
Series: GDP OP FDI I REER
Date: 10/14/21 Time: 00:17
Sample: 1988 2019
Included observations: 64
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 8
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-9.047516	0.0000
Residual variance	22.26574	
HAC variance	5.307573	

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Received: Oct 09, 2022 Revised: Nov 05, 2022 Accepted: Dec 30, 2022