



## The Impact of Expatriate Remittances on Economic Growth In the Kingdom of Saudi Arabia

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### Abstract

*This study seeks to uncover the nature of the relationship that expatriate labor remittances have in the economic growth of Saudi Arabia. Autoregressive Distributed Lags (ARDL) and Non-Linear ARDL (NARDL) are used as a method to discover the influence and nature of the remittances on Saudi GDP growth. This method, NARDL, enables us to detect whether the relationship between the expatriate labor remittances and Economic growth is symmetric or asymmetric. This Study depending on data collected from the World Bank, Saudi Central Bank (SAMA), and the Saudi General Authority of Statistics to cover the period 1970-2016. The study concludes that the relationship between labor remittances and Saudi Arabian economic growth is asymmetrical; a one percent decrease in remittances increases GDP by 0.837 percent, while a one percent increase in remittances increases GDP by 0.291 percent.*

*This study recommends that the Kingdom of Saudi Arabia continue to maintain remittances at least their current level.*

**Keywords:** Expatriate Remittances; Economic Growth; Saudi Arabia; NARDL Method; Labor-exporting Countries.

*JEL:* E24, O4, O53

### Introduction

Due to the growing importance of expatriate labor remittances (ELR) to the total capital flows from developed countries to less developed countries (see Section 2 below), and because the relationship between ELR and economic performance has not been adequately studied, there are many questions in Saudi Arabia about the impact of ELR on the Saudi economy. In 2017, these remittances reached US\$36.12 billion (World Bank, 2018), or 4.14% of Saudi Arabia's GDP (Saudi Central Bank (SAMA), 2019). According to the World Bank (2018), the average yearly outflow of remittances from Saudi Arabia during the 1980-2017 period was US\$16.913 billion. It was the second-largest remittance source after the United States, which averaged US\$31.439 billion.

ELR can be regarded as financial losses and a depletion of the Saudi economy. They are considered significant financial debits in all economic indicators, especially national income, investment spending, and consumption. This is in addition to their impact on the labor market, especially unemployment rates, which are strongly influenced by the economic growth and investment spending rates in the economy.

ELR are considered an exchange for a large volume of goods and services in the Kingdom of Saudi Arabia (KSA), and are thus an important tool that plays a significant role in curbing inflation. This outflow from the Saudi economy clearly reduces the M2.

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This study uncovers the effect of these remittances on economic growth using the Non Linear Autoregressive Distributed Lags (NARDL) method. It is a modern econometrics methodology developed by Shin, Yu, and Greenwood-Nimmo (2014). Importantly, this method enables us to detect whether the relationship between two variables is symmetric or asymmetric.

This study is important because the Kingdom ranks second in the world, after the United States, in ELR. Its total ELR are equal to those from Germany, Spain, and Italy combined. The cumulative value of these remittances from the Kingdom during the 2001-2011 period was equivalent to SAR766 billion (Skeldon, 2014). This study is also important because it represents a scientific contribution at both the Arab and international level, due to the lack of research that addresses the impact of remittances on the exporting economies. The results of this study constitute an important data point supporting economic decisions in Saudi Arabia and other countries with similar economic conditions. By doing so, it may help economic decision-makers formulate investment, monetary, and labor market policies in line with the needs of their economies.

## Theory and Literature Review

Studies in the economic literature concerning the impact of foreign remittances of expatriate labor on economic growth in the countries receiving the labor (sending-remittances countries) are very few and insufficient, While most studies have focused on labor-sending countries (receiving-remittances countries). In general, these studies can be classified into two main types:

- a- Studies related to the impact of ELR on the economies of the countries that received the remittances, such as India, Turkey, Pakistan, and Egypt, of which there are too many.
- b- Research and studies related to the impact of these remittances on the economies of the countries receiving the labor, such as the Gulf Cooperation Council (GCC) countries, especially the KSA, which are rare.

Alkhathlan (2013) focused on determining the nature of the relationship between economic growth and ELR in the KSA during the 1970-2010 period using the ARDL method and an error correction model. The results of that study showed that there was a negative relationship between economic growth and ELR in the short and long term. Termos, Naufal, and Genc (2013) also focused on the impact of foreign labor remittances on the economies of labor-receiving countries, namely the GCC countries, during the 1972-2010 period. The value of these remittances in USD was studied as a percentage of GDP.

Studies that focused on the impact of remittances on the economies of the labor-receiving countries verified that remittances reduced inflation in labor-receiving countries more than in remittance-recipient countries. They also verified that remittances played a contractionary role in labor-receiving countries, and played an important role in monetary policy for achieving monetary stability. Aggarwal, Demirgüç-Kunt, and Pería (2011) used data on ELR from approximately 109 countries ELR during the 1975-2007 period. Their study attempted to link those remittances to the level of banking sector deposits in these countries, and found a positive and strong relationship between those remittances and financial development in these countries. Ahamada and Coulibaly (2011) examined how changes in remittances affected GDP growth volatility. Their study relied on a sample of 87 remittance-receiving countries during the 1980-2008 period. Ahamada and Coulibaly (2011) was conducted using the PSTR method, which was recently developed by Gonzalez, Teräsvirta, Van Dijk, and Yang (2005). The findings of this study are evidence that the impact of remittances on GDP growth volatility is nonlinear, and that these changes, over time and across countries, are fundamentally linked to the nature and level of financial development. More precisely, the developed financial systems in the recipient countries prevented considerable volatility in GDP growth, so output growth and investment was more stable. Giuliano and Ruiz-Arranz (2009) focused on remittances from

developed to developing countries, and their impact on economic growth and financial development. Their study looked at data from 100 countries with the least-developed financial sectors during the 1975-2002 period and utilized the OLS method. They found that there was an important role for remittances in those countries, in particular in providing suitable investments. Their study stressed that the financial sector alone cannot drive financial development in those countries. It found that remittances were the second most important factor in driving economic growth.

Akkoyunlu and Kholodilin (2008) looked at cyclical interactions in the Turkish and German economies that emerged from remittances from Germany to Turkey. The study used official Turkish and German statistical data, and covered the 1962-2004 period. That study was selected on the basis that the two countries were an ideal model for inter-state cash transfers, as their remittances constituted a major and stable source of foreign currency build-up in Turkey. One of the most important findings of the study was that remittances tended to keep pace with the periodic trends of macroeconomic fluctuations in both countries, such as inflation, and that they contributed to instability.

Abdel-Rahman (2006) examined the determinants of remittances from Saudi Arabia to labor-exporting countries and divided them into three categories. These included economic determinants, such as variables for production and inflation, socio-economic variables, political variables that reflected the risks to the Saudi economy, and its impact on the remittances. The study concluded that the GDP and wages in the KSA had a proportional relationship to remittances abroad. As for the risk indicators, the study showed that there was a proportional and significant relationship between risk indicators and remittances, where increased risks to the Saudi economy lead to an increase in the remittances to workers abroad.

Ilahi and Shendy (2008) examined the relationship between economic performance in the GCC and other Middle-Eastern countries, and the impact of remittances from the GCC countries to those countries. The study was based on 35 years of panel data in six countries. It found that the real GDP growth rate, private consumption, and investment in those countries had a strong relationship with remittances, unlike in other developing and emerging countries. The study also stressed that growth in the GCC countries was not affected by growth in developed countries.

This study demonstrates the impact of remittances on remittance-sending countries, which has great value for research in addition to the information it will provide to macroeconomic policymakers in Saudi Arabia, the country in which the study model will be applied, using its data.

This study is different from prior ones. It monitors the impact of remittances using modern econometric methods to test the nature of changes in remittances on economic growth rates by utilizing the NARDL method.

## **Model, Data, and Methodology.**

### ***Empirical Model***

Two relatively recent methods of econometrics have been used to test the research hypothesis. The first method is the ARDL bound test for cointegration which assumes that the relationship between the dependent variable and the explanatory variable is linear. The second method is NARDL, developed by Shin et al. (2014), which attempts to capture the asymmetric relationship between variables.

Firstly, the ARDL bound test approach is used to reveal whether there is a cointegration relationship between the dependent variable and the explanatory variables, especially the transfers of expatriate workers. And also, a test of whether there is a relationship in the short term. Moving forward in applying this method requires identifying the statistical properties of time series, and in particular identifying the order of integration of each of them, i.e. run unit root tests.

Secondly, the study implements several diagnostic tests: the F Wald Test to test the long-run or cointegration in the model, the homoscedasticity test using the Breusch-Pagan-Godfrey test, the autocorrelation of the error term using the Lagrange multipliers (LM) test, and finally, the stability test of the model using the Ramsey Regression Equation Specification Error Test (RESET).

Using this method, the study model is stated in the following equation:

$$\begin{aligned} \Delta LGDP = & a + \lambda_0 LGDP_{t-1} + \lambda_1 LCPTL_{t-1} + \lambda_2 LPOPL_{t-1} + \lambda_3 Lgov_{t-1} + \lambda_4 LCPI_{t-1} + \lambda_5 Lopn_{t-1} \\ & + \lambda_6 LTR_{t-1} + \sum_{i=1}^{\rho_0} \varpi_{0i} \Delta LGDP_{t-i} + \sum_{i=0}^{\rho_1} \varpi_{1i} \Delta LCPTL_{t-i} \\ & + \sum_{i=0}^{\rho_2} \varpi_{2i} \Delta LPOPL_{t-i} + \sum_{i=0}^{\rho_3} \varpi_{3i} \Delta Lgov_{t-i} + \sum_{i=0}^{\rho_4} \varpi_{4i} \Delta LCPI_{t-i} \\ & + \sum_{i=0}^{\rho_5} \varpi_{5i} \Delta Lopn_{t-i} + \sum_{i=0}^{\rho_6} \varpi_{6i} \Delta LTR_{t-i} + v_t \end{aligned} \tag{2}$$

Where  $\lambda_0$  is the error correction term, assumed to be statistically significant with a negative sign, to reflect the existence of a cointegration relationship and the speed at which a dependent variable returns to equilibrium after a one shock in the explanatory variable.  $\lambda_1$  to  $\lambda_6$  refers to the long-term information that enables us to calculate the long-term parameters, according to the equation  $\beta_n = -\frac{\lambda_n}{\lambda_0}$ .  $\varpi_i$  refers to short-term parameters.  $v_t$  is the error term at time (t).

According to Pesaran, Shin, and Smith (2001), time series are required to be integrated of different order, I(1) and or I(0), but not I(2). That is, “some time series in the model can be stationary in the level, while others can be stationary in the first difference. This distinguishes this model from the co-integration and error correction model, which requires that the series be stationary at the same level.” (Almosabbeh, 2020, p. 292)

This study employs the NARDL method to capture the existence of an (a)symmetric relationship between the expatriate remittances and economic growth in Saudi Arabia. This approach enables us to reveal what Granger and Yoon (2002) called the hidden co-integration. They argue that “the data series are not cointegrated in the conventional sense, it is still possible for them to have hidden cointegration, which would help better understand their dynamic relationships and produce improved forecasts.” (Granger & Yoon, 2002, p. 28). That means non-linear methods (such as NARDL) avoid eliminating intangible relationships between the phenomenon and its explanatory factors through the arbitrary assumption of a linear relationship between them.

To use the NARDL model, the independent variable X is divided into negative and positive values, so we have:

$$X_t = X_0 + X_t^+ + X_t^- \tag{3}$$

Thus, the co-integration function of the relationship between Y and X becomes:

$$Y_t = \alpha + \beta^+ X_t^+ + \beta^- X_t^- + u_t \tag{4}$$

where  $u_t$  represents the error term and  $\beta^-$  &  $\beta^+$  are the associated asymmetric long-run parameters.  $X_t^+$  &  $X_t^-$  are calculated with the following two equations:

$$X_t^+ = \sum_{j=1}^t \Delta X_j^+ = \sum_{j=1}^t \max(\Delta X_j, 0) \tag{5} \quad X_t^- = \sum_{j=1}^t \Delta X_j^- = \sum_{j=1}^t \min(\Delta X_j, 0) \tag{6}$$

Based on this division of the explanatory variable, introducing both variables  $X_t^+$  and  $X_t^-$ , instead of only  $X_t$  in the ARDL model, will produce our NARDL model, as follows:

$$\Delta y_t = \mu - \rho y_{t-1} + \theta^+ x_{t-1}^+ + \theta^- x_{t-1}^- + \sum_{j=1}^{\rho-1} a_j \Delta y_{(t-j)} + \sum_{j=0}^{q-1} (\pi_j^+ \Delta x_{t-j}^+ + \pi_j^- \Delta x_{t-j}^-) + \varepsilon_t \quad (7)$$

As in the previous model, shown in equation (2),  $\theta^+$  &  $\theta^-$  represent the asymmetric relationship in the model in the long term, and  $\pi_j^+$  &  $\pi_j^-$  represent the asymmetric parameters in the short term.

As in ARDL Method, the F Wald test is used to test the cointegration relationship in the model, as in equation (7).

$$\mu = \rho = \theta^+ = \theta^- = 0 \quad (8)$$

Also, the study is used the LM test, Breusch-Pagan-Godfrey test, RESET, CUSUM, and CUSUMQ, as A diagnostic test of the NARDL model.

The NARDL method is further characterized by a long-term symmetry test where the standard Wald test checks the following null hypothesis:

$$\left(\beta^+ = -\frac{\theta^+}{\rho}\right) = \left(\beta^- = -\frac{\theta^-}{\rho}\right) \quad (9)$$

Accepting the null hypothesis ( $\beta^+ = \beta^-$ ) means that the relationship between the two variables is symmetry. But rejecting the null hypothesis ( $\beta^+ \neq \beta^-$ ) means that the relationship is asymmetry.

In the short-term, the standard Wald test run as follows:

$$\sum_{j=0}^{q-1} \pi_j^+ = \sum_{j=0}^{q-1} \pi_j^- \quad (10)$$

An important test in the NARDL method is the asymmetric cumulative dynamic multiplier effect in the dependent variable caused by a change in the positive independent variable  $X^+$  and/or the negative independent variable  $X^-$ . The effects are calculated as follows:

$$m_h^+ = \sum_{j=h}^h \frac{\delta Y_{(t+1)}}{\delta X_t^+}, h = 0 \ 1 \ 2 \ \dots \quad (11)$$

$$m_h^- = \sum_{j=h}^h \frac{\delta Y_{(t+1)}}{\delta X_t^-}, h = 0 \ 1 \ 2 \ \dots \quad (12)$$

“Depicting and analyzing the paths of adjustment and/or the duration of the disequilibrium following initial positive or negative perturbations in  $[X]$ ,  $m^+$  and  $m^-$  adds useful information to the long and short-run patterns of asymmetry.” (Fousekis, Katrakilidis, & Trachanas, 2016, p. 501)<sup>h</sup>

**The Data**

Our dataset collected from the World Bank, SAMA and the Saudi General Authority of Statistics to cover the period 1970-2016.

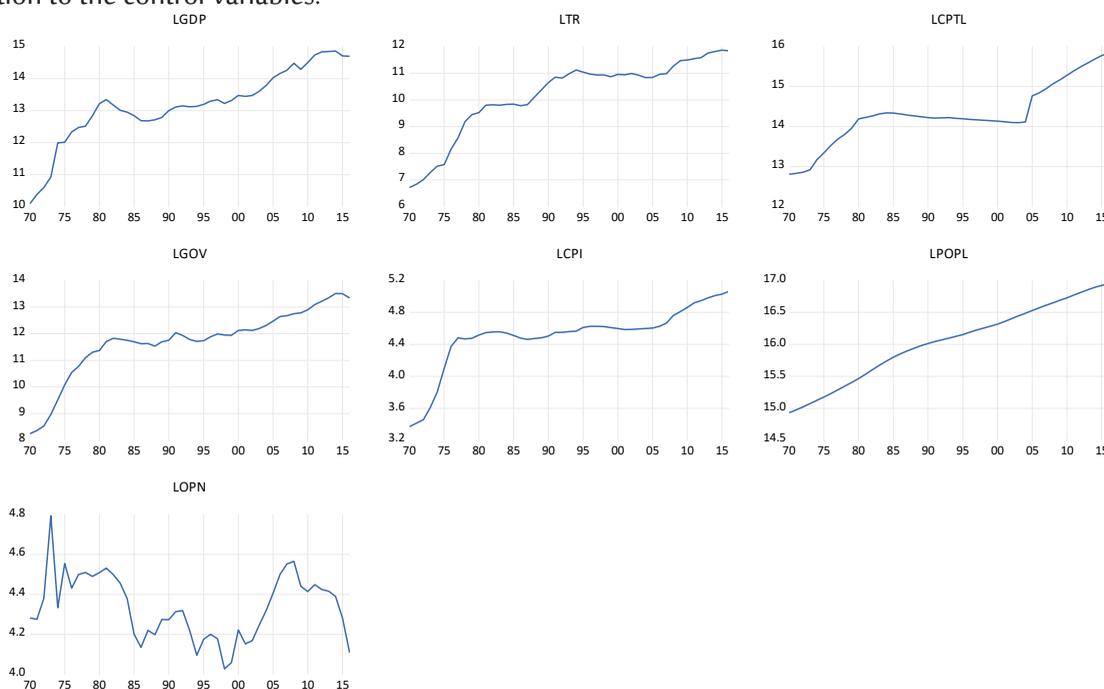
According to the data, remittances from foreign workers exceeded wages paid over the years. For example, according to SAMA data for the 2011-2012 period, the annual wages paid to expatriates amounted to approximately 78.9 billion Saudi Riyals in 2011, while remittances from foreign workers were approximately 110.4 billion Saudi Riyals. Thus, remittances were 40% greater than all the wages earned in 2011. During 2012, the difference increased to approximately 51%, with remittances reaching 125.2 billion Saudi Riyals while wages were only 83.0 billion Saudi Riyals (Saudi Central Bank (SAMA), 2019).

We used the natural logarithm of the data in order to take advantage of the statistical properties of logarithms and to get the flexibilities of the dependent variable for the independent variables. Table (1) reveals the statistical characteristics of the study's data.

**Table.1**  
**Descriptive Statistics.**

	LGDP	LTR	LCPTL	LGOV	LCPI	LPOPL	OPN
Mean	13.183	10.176	14.299	11.703	4.506	16.033	4.337
Std. Dev.	1.129	1.433	0.755	1.275	0.389	0.595	0.161
Observations	47	47	47	47	47	47	47

Figure (1) illustrates how the variables in the model evolved over the 1976-2016 timeframe, particularly real GDP (the dependent variable) and total foreign remittances (the main independent variable), in addition to the control variables.



**Figure 1. The Progress of the Study Variables during the 1970-2016 Period**

## Empirical Results

### Unit Root Test

Table (2) reports the results of the unit root analysis, using The Phillips-Perron (PP) test, for each variable. The tests reveal that some of variable are stationary at level, i.e. integrated of order 1 (I(0)), namely, LGDP, LTR, LGOV and LCPI. The other two variables, LCPTL and LOPN are stationary at the first difference, i.e. are integrated of order 1 (I(1)).

**Table 2.**  
**Phillips-Perron (PP) Unit Root Tests.**

		At Level					
		LGDP	LTR	LCPTL	LGOV	LCPI	LOPN
With Constant	t-Statistic	-3.0017**	-3.1291**	-0.6548	-3.4091**	-3.0246**	-2.5086
	Prob.	0.0421	0.0313	0.8478	0.0156	0.04	0.12
With Constant & Trend	t-Statistic	-3.1577	-2.0531	-1.4846	-2.8562	-2.8498	-2.733
	Prob.	0.1057	0.5574	0.8206	0.1858	0.1879	0.2289

		At First Difference					
		d(LGDP)	d(LTR)	d(LCPTL)	d(LGOV)	d(LCPI)	d(LOPN)
With Constant	t-Statistic	-4.958***	-3.6233***	-4.9591***	-2.6981*	-2.3446	-8.9964***
	Prob.	0.0002	0.009	0.0002	0.0822	0.163	0
With Constant & Trend	t-Statistic	-5.2771***	-4.1918***	-4.9041***	-3.2226*	-2.609	-8.9717***
	Prob.	0.0005	0.0096	0.0013	0.093	0.2784	0

Notes: Using MacKinnon (1996) One-sided p-values: (\*) Significant at the 10% level; (\*\*) Significant at the 5% level; (\*\*\*) Significant at the 1% level; (n0) Not significant.

The Zivot and Andrews (1992) unit root test with structural break is used for the dependent variable. Their test, based on the ADF test, adds a dummy variable for each year that is likely to be a year of structural change in the concerned variable. That is, it enters a dummy variable for each year of the time series in turn, and the ADF unit root is tested. The year that corresponds to the smallest value of the statistic test ( $\tau$ ) is the year of the structural breakpoint of the variable under study. According to the Zivot and Andrews test, as shown in Table (3), the structural breakpoint for the economic growth rate occurred in 2010. Figure (2) presents the results of the Zivot and Andrews test, where the lowest critical value of the test was -4.9689 in the year 2010, which was greater than the critical value at the 0.05 level of significance.

This finding indicates that considering the unit root test is useful when estimating the study model. We did that by using a dummy variable that equaled zero from the beginning of the timeframe until 2010 and equaled one in later years.

Table 3.

Zivot and Andrews Unit Root Test for the Dependent Variable with one Structural Break

Break Date: 2010	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.968907	0.0363
Test critical values: 1 percent level	-5.347598	
5 percent level	-4.859812	

\*Using Vogelsang (1993) asymptotic one-sided p-values. Notes: The null hypothesis was that LGDP had a unit root; Trend Specification was Trend and intercept; Break Specification: Intercept only. Break Type was Innovational outlier; Break Selection was Minimize Dickey-Fuller t-statistic, and Lag Length was 3 (Automatic, based on F-statistic selection, lagpval=0.1, maxlag=9)

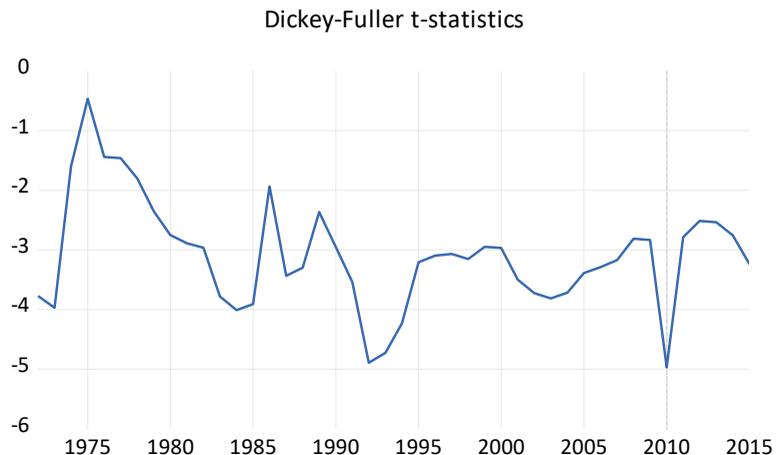


Figure 2. Results of the Zivot-Andrews Test

**Empirical Results**

Table (4) displays the results of the study model’s estimation. The first section of the Table shows the results of the model, which contain the long-term information, short-term parameters, and the error correction term.

In both models, we applied the Schwarz criterion to select the optimal number of lags for the dependent and independent variables, choosing the model with the smallest value on the test. The optimum lags are included in Table (4), panel 4.

As shown in Table (4), the NARDL method found a long-term relationship, with an error correction term that was significant at the 1% level, where the t-test value (-7.414) was greater than the upper critical values given in Pesaran et al. (2001) (see Table 5) On the other hand, we could not reject the null hypothesis that there is no co-integration relationship using the ARDL method, because the calculated t-test (-2.453)

was less than the lowest critical value given in Pesaran et al. (2001). The bound test was significant at the 1% level as well, where the F-bound test was greater than the critical value given in Pesaran et al. (2001) and (Narayan, 2005). In the NARDL model, the error correction term was approximately -0.7656; this meant that 76.6% of the shock in TR could be corrected in one year, meaning that the model corrected short-term errors in under 1.306 years.

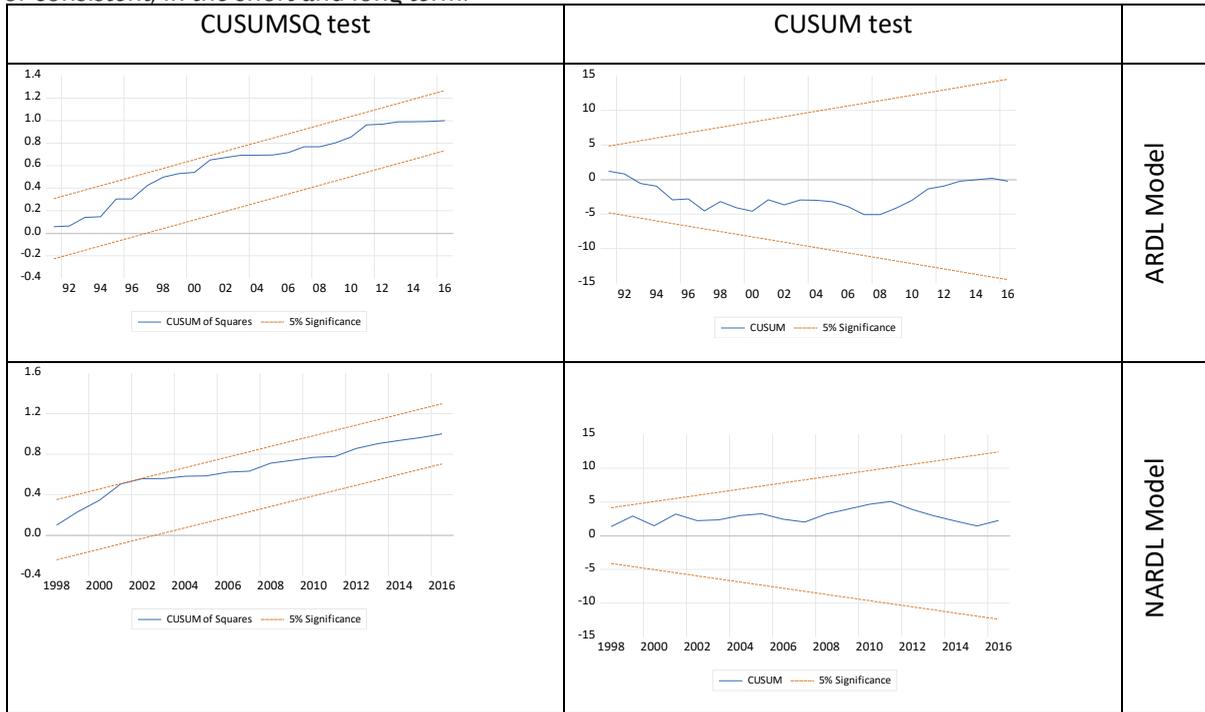
**Table 4.**  
**Estimating the NARDL model with Dependent Variable LGDP**

Variable	ARDL	NARDL	Variable	ARDL	NARDL
C	5.328 [0.0024]	5.372 [0.0003]	<b>Panel B: Estimated Long-run Elasticities</b>		
LGDP(-1)	-0.373 [0.0215]	-0.766 [0.0000]	TR	0.54 [0.0324]	
LTR(-1)	0.201 [0.0107]		LTR_POS		0.291 [0.0003]
LTR_POS(-1)		0.223 [0.0005]	LTR_NEG		-0.837 [0.0014]
LTR_NEG(-1)		-0.641 [0.0051]	LGOV	-0.313 [0.6031]	0.267 [0.074]
LGOV(-1)	-0.117 [0.5324]	0.205 [0.079]	LOPN	-0.514 [0.5279]	0.590[0.0079]
LOPN(-1)	-0.192 [0.4982]	0.452 [0.0218]	LCPTL	-0.055 [0.8866]	-0.061 [0.8029]
LCPTL(-1)	-0.02 [0.887]	-0.047 [0.642]	C	14.282 [0.0486]	7.016 [0.000]
D(LTR)	-0.244 [0.0962]		<b>Panel C: Model Diagnosis</b>		
D(LTR_POS)		0.168 [0.135]	F-Bounds Test		
D(LTR_POS(-1))		-0.223 [0.0413]	F-statistic	7.293538	11.8812
D(LTR_POS(-2))		-0.022 [0.855]	k	4	5
D(LTR_POS(-3))		0.384 [0.0012]	Adjusted R-squared	0.7604	0.7469
D(LTR_NEG)		-0.184 [0.7588]	Asymptotic critical value		
D(LTR_NEG(-1))		0.485 [0.4298]	bounds of the F-statistic	4.37	4.15
D(LTR_NEG(-2))		0.383 [0.5751]	Included observations:	43	42
D(LGOV)	0.221 [0.4493]		Selected Model:	ARDL(1, 1, 2, 4, 4)	ARDL(1, 4, 3, 0, 0, 4)
D(LGOV(-1))	-0.352 [0.0666]		Breusch-Godfrey Serial Correlation LM Test:		
D(LOPN)	0.223 [0.4417]		F-statistic	0.00191	0.029
D(LOPN(-1))	1.146 [0.0005]		Prob. F(1,25)	0.9655	0.8661
D(LOPN(-2))	0.39 [0.0696]		Heteroscedasticity Test: Breusch-Pagan-Godfrey		
D(LOPN(-3))	0.188 [0.2694]		F-statistic	0.467439	1.3363
D(LCPTL)	0.574 [0.0043]	0.362 [0.0239]	Prob. F(17,26)	0.9457	0.2532
D(LCPTL(-1))	0.507 [0.0195]	0.294 [0.1142]	Wald Test for long-run Asymmetric Test		
D(LCPTL(-2))	0.395 [0.0565]	0.266 [0.0644]	F-statistic (1, 23)		22.8141
D(LCPTL(-3))	0.628 [0.0041]	0.371 [0.0132]	Probability		0.0000
@AFTER("2010")	0.449 [0.0007]	0.241 [0.003]	Wald Test for short-run Asymmetric Test		
			F-statistic (1, 23)		0.0893
			Probability		0.7678

The Wald test indicated that there was a long-term relationship in the model. The results from the ARDL model indicated that the statistical value of the test ( $F = 7.29$ ) was greater than the critical value given in the tables from Pesaran et al. (2001), with 5 independent variables at the 1% level of significance ( $F_{tab k=5} = 4.15$ ). Similarly, for the NARDL model bound test, the results showed that there was a long-term relationship, as  $F = 3.37$ , which was greater than the critical value at the 1% level of significance ( $F_{tab k=6} = 3.99$ ).

The diagnostic tests for both models indicated that they did not have serial autocorrelation. In the LM test, the calculated value of the F test statistic was equal to 0.002 and 0.029 for the ARDL and NARDL models, respectively. These were smaller than the corresponding tabular value, and the p-values for both were significant at a level greater than 10%. Therefore, we did not reject the null hypothesis that the two models were not autocorrelated.

This study utilized the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) as its stability tests. According to Turner (2010), the first test is more efficient at testing structural changes that impact the regression equation constant, while the second test detects the effect of changes in slope coefficients. The results from Figure (3) show that all the curves representing the two tests were within the critical bounds of significance at the 5% level. This means that the ARDL and NARDL models are both stable or consistent, in the short and long term.



**Figure 3 . Plots of the Cumulative Sum and Cumulative Sum of Squares**

The results of the ARDL model indicated that the remittances of foreign workers in the Saudi economy had a direct, proportional impact on the real growth rate of Saudi GDP. A 1% increase in remittances increased growth by 0.54%. This result is significant at the 5% level ( $p\text{-value} = 0.0324$ ).

The results shown in Table (4) for testing the symmetric relationship between foreign workers' remittances from Saudi Arabia and real Saudi GDP signify that the value of the Wald test ( $F = 22.81$ ) was statistically significant at the 1% level. This means that we rejected the null hypothesis, and accepted the alternative hypothesis that the relationship between remittances and economic growth was asymmetric.

This means that, in the long-term, the effect of remittances on economic growth in Saudi Arabia takes the form of a non-linear relationship. Thus, the effect of negative values of remittances on real GDP differed from the effect of positive values. The results also indicate that both effects are statistically significant at better than a 1% level. We can say that an increase of foreign labor remittances from Saudi Arabia by 1% led to a 0.29% increase in real GDP, while a decrease in remittances by 1% led to an increase in GDP of 0.837%. More specifically, reductions in remittances led to increases in Saudi Arabia's GDP with a relatively high elasticity coefficient when compared to the effects of increases in remittances. The difference was 0.54%, in favor of the impact of reducing remittances from the Saudi economy. In other words, increasing remittances put brakes on growth.

In an attempt to explain these results, it can be said that the phenomenon of labor remittances of their wages abroad is not an absolute monetary phenomenon, as there is an important aspect of this phenomenon that belongs to the real economy on the supply side. Economic growth, according to all economic theories, is determined by a set of variables, including the labor force (growth in the labor force), and it is

certain that more foreign workers in the Saudi economy are offset by more incomes and thus more foreign workers' remittances abroad. It seems to us that the variable of labor remittances abroad largely reflects the size of the foreign workforce in the economy and with a high correlation coefficient. On the basis of that, the relationship between remittances and economic growth can be expressed as a result of the interaction between the monetary side of the relationship and the real side, that is, between remittances as an outflow of cash (leakage) and the amount of work involved in creating economic growth in Saudi Arabia. It seems to us that the variable of labor remittances abroad largely reflects the size of the foreign workforce in the economy and with a high correlation coefficient. On the basis of that, the relationship between remittances and economic growth can be expressed as a result of the interaction between the monetary side of the relationship and the real side, that is, between remittances as an outflow of cash (leakage) and the amount of work involved in creating economic growth in Saudi Arabia.

On the one hand, the increase in cash flows, in particular, reflects an increase in the number of workers in the Saudi economy, where increasing their numbers plays a vital role in enhancing the economic growth. Outside cash flows (remittances) also play an opposite role, inhibiting economic growth. The results tell us that the result of this interaction represents a decrease in the rate of economic growth, not its transfer from the direct relationship to the inverse relationship. In other words, the interaction between the monetary aspects and the real aspects of the relationship between remittances and growth in the event of increased remittances led to the inhibition of economic growth in Saudi Arabia.

On the other side, the reduction of remittances of foreign workers to abroad reflects a decrease in the numbers of foreign workers in the Saudi economy, which leads to pressure on the rate of economic growth down according to the operative part of economic theory, while a decrease in these remittances as a monetary phenomenon promotes growth Economic. As a result of this interaction between the real monetary and economic aspects of the decrease in remittances abroad, it appears to us that the effects of the monetary side of the phenomenon are stronger than those of the real side of the phenomenon. As the decrease in labor remittances increased economic growth.

The panoramic reading of the results gives us an accurate understanding of the outcome of the interaction of the monetary and the real side of foreign labor remittances outside of Saudi Arabia so that it can be said that the increase in these remittances inhibits economic growth while reducing of them promote economic growth in Saudi Economy.

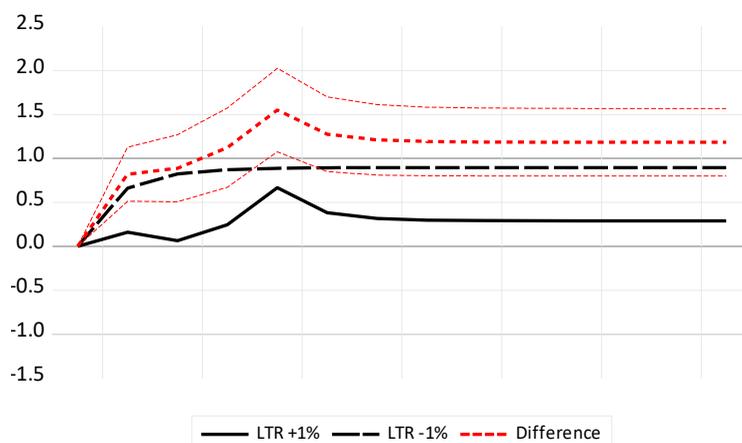
The results in Table (5) also indicate that the short-term relationship between labor remittances and GDP was symmetric. The short-term test's value was  $F = 0.0893$ , which was much smaller than any critical value for significance. This supports the fact that the probability value of this test was equal to 0.7678.

This means that the relationship between the two variables (labor remittances and GDP) was linear in the short term.

**Table 5**  
Critical Values of t-Bound Test, with the Null Hypothesis that No Long-Run Relationship Exists

	10 percent		5 percent		2.5 percent		1 percent	
k	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
4	-2.57	-3.66	-2.86	-3.99	-3.13	-4.26	-3.43	-4.6
5	-1.62	-3.49	-1.95	-3.83	-2.24	-4.12	-2.58	-4.44

Source: Pesaran et al. (2001, p. 304)



**Figure 4. Cumulative Dynamic Multiplier of Remittances**

Figure (4) gives the cumulative dynamic multiplier test for positive (LTR-POS) and negative values (LTR-NEG) of foreign labor remittances in Saudi real GDP.

It is clear that the cumulative negative changes in foreign labor remittances increased GDP more significantly than positive changes in those remittances. Reducing remittances by 1% increased GDP by 0.64% in the first year and stabilized in a maximum of 3 years, with a cumulative effect of 0.85%. Increasing remittances, on the other hand, increased real GDP with a relatively low elasticity rate of 0.16% during the first year. It then fluctuated up and down, only stabilizing 7 years after the positive shock, with a cumulative effect of 0.31%.

## Findings and Recommendations

This study investigated the impact of foreign labor remittances in Saudi Arabia using data from the 1970-2016 period.

- In order to test the effect of foreign labor remittances on Saudi Arabian economic growth, we began by identifying the statistical characteristics of the variables, especially the stationarity of the time series. It emerged that most of the variables were stationary at the first difference, meaning that they had a unit root. The results of unit root tests with a structural breakpoint for GY revealed that 2010 saw a structural shift in the path of real GDP.
- Since the time series were difference stationary processes, we employed the ARDL method to capture the co-integration relationship between LGDP and LTR. We utilized NARDL to capture the impact of positive and negative changes in LTR on real GDP in Saudi Arabia.

One of our most important results is that there is a statistically significant relationship between changes in foreign labor remittances and economic growth in Saudi Arabia, but with different effects in the cases of positive and negative shocks to labor remittances. Increasing remittances by 1% increased the growth rate in real GDP by 0.29%, while reducing remittances by 1% increased the growth rate by 0.837%. In addition, the result of Wald symmetry tests promoted the hypothesis that the relationship between real GDP and LTR was asymmetric.

Diagnostic tests on the two estimated models showed that they had characteristics suitable for reflecting the nature of the relationships between the variables under study, which will help enable economic policymakers to make appropriate economic decisions.

This study recommends that the Kingdom of Saudi Arabia continue to maintain remittances at least their current level, depending on the role the Kingdom wishes to play in contributing to international economic stability. In particular, the Kingdom should consider that most of the remittances go to countries with surpluses of employment, such as Egypt, India, Bangladesh, and Pakistan. However, in the long run, it must follow a gradual policy to reduce the number of foreign workers, with the aim of improving its economic growth rate, especially as it has begun to pursue a policy of diversifying its sources of income, and dependence more on sectors other than oil to create its economic growth.

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