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Research Article

The Remittances-Output Nexus: Empirical Evidence from Egypt

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This paper examines the long-run causal link between remittances and output in Egypt for the period 1977–2012. The long-run causal link is examined using the autoregressive distributed lag (ARDL) bounds test for cointegration, along with a vector error-correction model to estimate the short- and long-run parameters of equilibrium dynamics. Results show that remittances and GDP are cointegrated, with a statistically significant, positive causality running from remittances to output, while output is found not to be a long-run forcing factor of remittances in Egypt. The findings of this paper shed light on the importance of remittances for promoting economic growth in Egypt. Governmental policies that attract more remittance inflows, along with their efficient use, could promote economic growth in Egypt.

1. Introduction

Migrant remittances are a major source of foreign exchange for many developing countries, which exports labour, and hence they play a prominent role in the development of their economies. (There are several definitions for remittances. In a broad definition, Carling [1] defines remittances as "transfers of value by emigrants or their descendants to their country of origin." This definition includes not only monetary transfers but also social transfers such as ideas and social capital in addition to in-kind transfers and informal transfers [2, 3]. In this paper, remittances are defined as personal monetary transfers that a migrant makes to the country of origin.) Official remittance inflows to developing countries have been progressively increasing and recent data released by the World Bank [4] show that these inflows have reached $401 billion in 2013, putting them as the second largest financial inflow after foreign direct investment (FDI). Statistics also show that remittance inflows are three times the size of official development assistance and are larger than private debt and portfolio equity flows to developing countries [4].

Worldwide, Egypt is the sixth largest recipient of remittances, and the biggest recipient in the Middle East and North Africa (MENA) region, with US $20 billion, representing 7.5% of the gross domestic product (GDP) in 2013.

The objective of this paper is to examine the causal link between remittances and output in Egypt using time series for the period 1977–2012. Short- and long-run relationships between remittances and output are estimated using autoregressive distributive lag (ARDL) bounds testing for cointegration and error-correction modeling introduced by Pesaran et al. [5].

The paper is organized as follows. Section 2 presents the theoretical background. Section 3 discusses the evolution and composition of remittance inflows to Egypt. The data and the empirical methods of the paper are presented in Section 4. Section 5 presents the results which are discussed in Section 6. The conclusions are summarized in Section 7.

2. The Link between Remittances and Output

Remittances can affect output through several direct and indirect channels. For example, remittance can stimulate output growth by reducing output volatility [6]; by promoting the development of financial sector activity [7]; by increasing investment and human capital accumulation, especially by stimulating household enterprises [8]; by stabilizing the source of foreign currencies via countercyclical inflows [9, 10]; by reducing poverty among remittance-receiving

households [11, 12]; and by decreasing the need for children to work and hence correspondingly increasing their education [12, 13].

Several studies have examined the causal relationship between remittances and output, but with mixed findings. While in some studies remittance has a positive effect on output [15, 16] in other studies a negative effect is found [17, 18] or the effect is not statistically significant [19]. In a panel study of 113 countries, Chami et al. [17] argue that remittances are compensatory in nature and thereby countercyclical and so do not serve as capital for economic development but rather as compensation for poor economic performance. According to this model, remittances negatively affect economic activity by inducing people to work less. The positive effect of remittances on economic growth found by Pradhan et al. [15] is based on a panel study of 39 developing countries. The International Monetary Fund [19] study covers 101 developing countries and finds no statistically significant effect of remittances on per capita output growth but a positive impact on poverty reduction. Siddique et al. [20] use Granger causality within a vector autoregression framework to examine the causal link between remittances and economic growth in Bangladesh, India, and Sri Lanka. Growth in remittances leads to economic growth in Bangladesh, while in India there is no causal relationship between growth in remittances and economic growth. In Sri Lanka, a two-way directional causality is found. Using panel data on Asian and Pacific countries, Jongwanich [21] finds that remittances have a small positive effect on economic growth and a significant impact on poverty reduction.

One negative indirect growth effect of remittances is their effect on real exchange rates and the allocation of resources between the tradable and nontradable sectors which is known as the "Dutch disease." Several studies find that large remittance inflows appreciate the real exchange rate, which has negative effects on the corresponding trade balance and hence on economic growth [22, 23]. In a panel study of 109 developing and transition countries during the period 1990–2003, Lartey et al. [23] find that increased remittance inflows lead to real exchange rate appreciation and resource movement effects that favor the nontradable sector at the expense of tradable goods production.

While most studies find that causality runs from remittances to output, some studies find the other direction of causation. For example, Paul et al. [24] find a statistically significant positive causality running from output to remittances, while remittances were not found to be a long-run forcing factor of output in Bangladesh during the period from 1976 to 2010.

Theoretically, there are several potential effects of remittances on output of different magnitudes and some effects in the opposite direction. This is not surprising, since there are naturally institutional, economic, and political differences between countries. Thus, it is to be expected that, in practice, the remittance-output relationship should be country specific and should vary depending on the period under investigation. Indeed, a growing number of individual country studies have investigated the relationship between remittances and output or the determinants of output like investment, consumption, or the balance of trade (e.g., [25–29]). For example, Paul and Das [26] find a long-run positive relationship between remittances and output in Bangladesh from 1979 to 2009, while Hossain and Hasanuzzaman [29] find a similar long-run relationship running from remittances to investment in Bangladesh. On the other hand, Glytsos [30] finds that the impact of remittances on output varies over time and across countries.

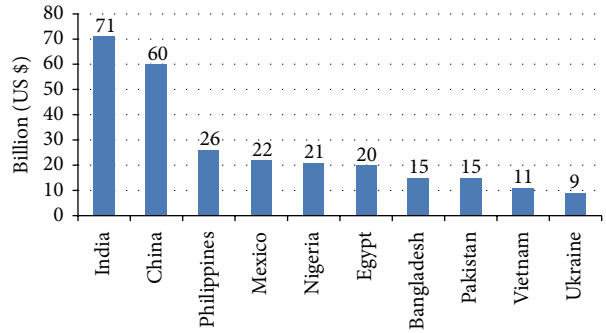

Figure 1: Top 10 recipients of remittances in 2013. Source: the World Bank [4].

This paper contributes to the growing number of individual country studies which investigate the macroeconomic impacts of remittances by focusing on the specific case of Egypt.

3. Remittance Inflows to Egypt

In 2013, official remittance inflows to Egypt reached an unprecedented level of US $20 billion, making Egypt the sixth largest recipient of remittances in the world and the first recipient in the Middle East and North Africa (MENA) region with about 40 percent of remittances sent to the MENA countries. Remittances are more than three times larger than revenues from the Suez Canal and are about 165 percent of Egypt's official reserves. As shown in Figure 1, Egypt is the sixth largest recipient of officially recorded remittances in the world in 2013 after India ($71 billion), China ($60 billion), the Philippines ($26 billion), Mexico ($22 billion), and Nigeria ($21 billion).

Figure 2 displays the evolution of Egyptian remittance inflows during the period 1977–2013. During 1977–2013, remittance inflows have increased substantially from US $2.6 billion in 1977 to US $20 billion in 2013. During the late 1970s and mid-1980s, remittance inflows increased steadily. This was driven by an increase in demand for Egyptian workers in the Gulf region which accompanied the increase in oil prices. In 1984, remittance inflows reached over US $7 billion and amounted to 13% of the Egyptian GDP.

Similar to other capital inflows, remittances to Egypt experienced some fluctuations following international political and economic conditions. Remittance inflows increased dramatically in 1992, after the first Gulf war, to over US $8.6 billion in real terms, representing the highest ever proportion of GDP of about 14.6%. After this peak, remittances declined for almost a decade. This fall was mainly due to

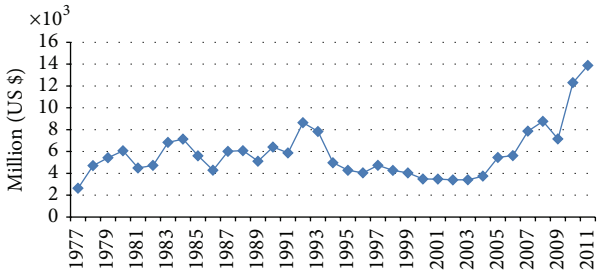

Figure 2: Remittance inflows to Egypt from 1977 to 2011 (constant 2009 US $, million). Source: World Bank [14], World Development Indicators.

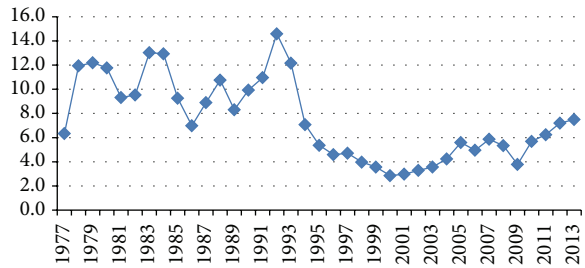

Figure 3: Remittance inflows as a % of GDP. Source: World Bank [14], World Development Indicators.

a corresponding fall in oil prices followed by the 1997 collapse of East Asian financial markets. Consequently, remittance inflows dropped to around 3.4 billion dollars during the period 2000–2003, representing around 3% of the GDP. After that, remittances started to recover and increased steadily reaching US $8.7 billion in 2008. In 2009, remittance inflows dropped to US $7.1 billion following the 2009 world financial crisis. Afterwards, remittance inflows to Egypt have nearly tripled reaching over US $20 billion or 7.5% of the GDP.

Figure 3 shows the proportion of migrant remittances to Egyptian GDP during the period from 1977 to 2013. During the first Gulf war, in 1992, remittances as a percentage of GDP have reached a peak of 14.6%. From 1977 to 2013, the ratio of remittances to GDP has been 7.5% on average.

A prominent characteristic of remittance inflows to Egypt is that they are concentrated in a few source countries with about two-thirds coming from U.S. and the Gulf countries. This makes remittance inflows highly sensitive to any political or economic shocks that may take place in these countries. As shown in Figure 4, the United States of America is the major source of remittances to Egypt with about 23% of the total remittance inflows in 2008, followed by Kuwait (15%), United Arab Emirates (14%), and Saudi Arabia (9%) while remittances from Europe are less than 10% of the total inflows.

4. Materials and Methods

Data on remittances (defined as personal remittances received in current US dollars) and GDP (in constant 2000 US dollars) are obtained from world development indicators (WDI) issued by the World Bank [14]. (Workers' remittances

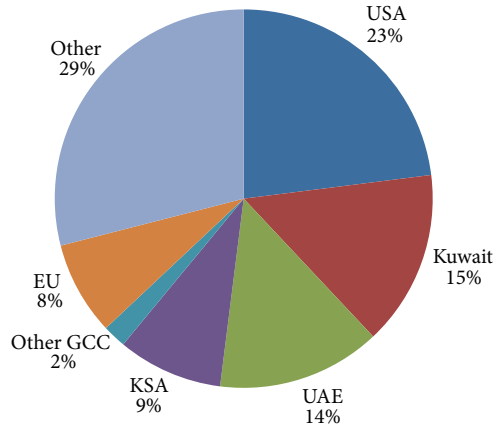

Figure 4: Remittance inflows to Egypt by destination in 2008. Source: adapted from Jureidini et al. [2]. Note: the figure for the EU includes only remittances from France, Germany, Italy, Netherlands, U.K., Greece, and Spain.

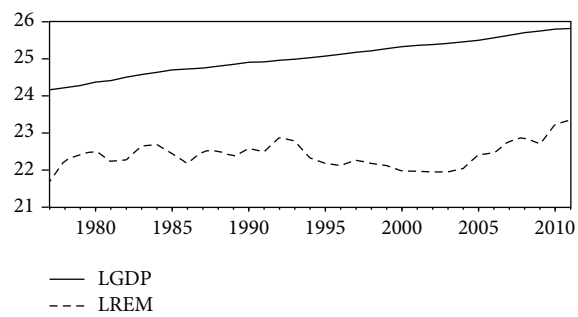

Figure 5: Log of remittances inflows and GDP in Egypt during 1977–2011. Source: World Bank [14], World Development Indicators.

include personal transfers, compensation of employees, and capital transfers. For more information about what constitutes remittances see the World Bank Balance of Payments Manual [31].) The analysis covers the period from 1977 to 2012 because the remittance series begins in 1977. Nominal remittance values are converted to real (2000) US dollar using the U.S. GDP deflator obtained from the US Bureau of Economic Analysis [32]. Figure 5 plots the log of the GDP and remittance series over the study period.

To test for the existence of a long-term relationship between remittances and GDP, this paper uses an autoregressive distributed lag (ARDL) bounds testing approach to cointegration developed by Pesaran et al. [5]. The use of the ARDL method is more appealing than other cointegration methods for the following reasons: (i) the ARDL method is relatively more robust in small samples consisting of 30 to 80 observations as in the current study; (ii) the method is not sensitive to orders of integration of the variables of interest, although the series must not be integrated of order two, $I(2)$; (iii) the ARDL approach is based on a single equation framework; (iv) it has been shown that the ARDL bound testing approach to cointegration yields efficient simultaneous estimation and separation of the short-

and long-run relationships between the variables of interest; and moreover (v) it yields unbiased estimates and valid t-statistics, even if some of the regressors are endogenous [24, 33, 34].

Although the ARDL cointegration method is not sensitive to the order of integration of the time series, nevertheless it is essential to conduct a unit root test to ensure that none of the variables are $I(2)$; otherwise the computed F-statistics, as produced by Pesaran et al. [5], can no longer be valid. Two unit root tests are used in this paper, the augmented Dickey-Fuller (ADF) test and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. Three versions of the Augmented Dickey-Fuller (ADF) are conducted. One version allows for an intercept, a second allows for an intercept and a deterministic trend, and a third version excludes the intercept and the deterministic trend. For the KPSS test, two versions are used; one version allows for an intercept, and a second allows for an intercept and a deterministic trend. (The KPSS is a test of the null hypothesis that the series is stationary around a deterministic trend. The series is expressed as the sum of a deterministic trend, a random walk, and a stationary error, and the test is the Lagrange multiplier test of the hypothesis that the random walk has zero variance [35].)

To examine the causal link between GDP and remittances, each of the two variables must be tested as the forcing variable to explain the other variable. The long-run relationship between GDP and remittances can be expressed as follows:

$$\begin{aligned} \text{Log GDP}_t &= \beta_0 + \beta_1 \text{Log rem}_t + u_{1,t}, \\ \text{Log rem}_t &= \alpha_0 + \alpha_1 \text{Log GDP}_t + u_{2,t}. \end{aligned} \tag{1}$$

According to Engle and Granger's [36] representation theorem, if both log GDP and log rem are integrated of order one, $I(1)$, but the residuals $u_{1,t}$ and $u_{2,t}$ are stationary at levels, $I(0)$, then the two variables are considered to be cointegrated; that is, a long-term relationship exists between them and can be modeled as an error-correction model (ECM) as in

$$\begin{aligned} \Delta\text{Log GDP}_t &= \gamma_1 + \sum_{i=1}^{p} \varphi_{1i} \Delta\text{Log GDP}_{t-i} \\ &\quad + \sum_{i=1}^{q} \theta_{1i} \Delta\text{Log rem}_{t-i} + \mu_1 u_{1,t-1} + e_{1,t}, \\ \Delta\text{Log rem}_t &= \gamma_2 + \sum_{i=1}^{p} \varphi_{2i} \Delta\text{Log rem}_{t-i} \\ &\quad + \sum_{i=1}^{q} \theta_{2i} \Delta\text{Log GDP}_{t-i} + \mu_2 u_{2,t-1} + e_{2,t}. \end{aligned} \tag{2}$$

Cointegration between GDP and rem is established if the coefficients μ_1 or μ_2 are each statistically significant with a negative sign. A standard method of parameter estimation in a cointegrated system is the Engle and Granger [36] two-step method. In the first step, the variables of interest, log GDP and Log rem, are checked as $I(1)$ and the cointegrating regressions, (1), are estimated using OLS. If the residuals, $u_{1,t}$ and $u_{2,t}$, are $I(0)$ then (2) are estimated. Pesaran et al. [5] combined the Engle and Granger [36] two-step procedure into one step by replacing $u_{1,t-1}$ and $u_{2,t-1}$ in (2) and by their equivalents from (1) to get (3) which is the ARDL- ECM model:

$$\begin{aligned} \Delta\text{Log GDP}_t &= \gamma_1 + \sum_{i=1}^{p} \varphi_{1i} \Delta\text{Log GDP}_{t-i} \\ &\quad + \sum_{i=1}^{q} \theta_{1i} \Delta\text{Log rem}_{t-i} + \tau_1 \log \text{GDP}_{t-1} \\ &\quad + \tau_2 \log \text{rem}_{t-1} + \varepsilon_{1,t}, \\ \Delta\text{Log rem}_t &= \gamma_2 + \sum_{i=1}^{p} \varphi_{2i} \Delta\text{Log rem}_{t-i} \\ &\quad + \sum_{i=1}^{q} \theta_{2i} \Delta\text{Log GDP}_{t-i} + \tau_1 \log \text{rem}_{t-1} \\ &\quad + \tau_2 \log \text{GDP}_{t-1} + \varepsilon_{2,t}. \end{aligned} \tag{3}$$

The bounds testing approach to cointegration is conducted in two steps. The first step involves testing the existence of a long-run relationship between remittances and GDP using two-test statistics: an F-test for the joint significance of the coefficients of the lagged level variables (H_0: $\tau_1 = \tau_2 = 0$) and a t-test for the statistical significance of the coefficient on the lagged level of the dependent variable (H_0: $\tau_1 = 0$). Pesaran et al. [5] considered that the F-statistic does not follow the standard F-distribution and hence they provided lower and upper bound critical values. The lower bound critical values assume that all variables are $I(0)$ while the upper bound values assume that they are $I(1)$. Similar to the F-statistic, the t-statistic does not follow the standard t-distribution and Pesaran et al. [5] also provided their lower and upper bound critical values. Cointegration between the variables of interest is established if the F- and t-statistics exceed the upper bound critical values. A note worth mentioning is that the F-statistic is affected by two factors, the lag length of the first-order differenced variables in (3) and the inclusion of a time trend. The decision about these two factors will be discussed in the next section. All tests and estimation are conducted using Microfit 5 [37].

5. Results

Results of the ADF and KPSS unit root tests for the variables in levels and in first differences are reported in Table 1. According to the ADF test, both the output and remittance series are $I(1)$ across all specifications of the test. According to the KPSS test, the remittance series is $I(0)$ while the output series is $I(0)$ in the specification, which includes an intercept and a trend, and is $I(1)$ across all test specifications. More importantly, both tests show that none of the remittances and GDP series is integrated of order two $I(2)$. This implies that it is plausible to use the ARDL cointegration bounds approach.

Table 1: Unit root tests of remittance and GDP.

	Stationarity tests in levels				Stationarity tests in first difference			
	Output		Remittances		Output		Remittances	
	ADF	KPSS	ADF	KPSS	ADF	KPSS	ADF	KPSS
Intercept	−1.80	0.70**	−1.74	0.15	−4.17***	0.23	−6.01***	0.18
Trend and intercept	−3.03	0.11	−1.80	0.11	−4.38***	0.11	−6.05***	0.17
No trend and intercept	14.57		1.15		−1.50*		−6.01***	

*,**,***indicate rejection of the null hypothesis at 10%, 5%, and 1% levels of significance, respectively. For the ADF test, the hypotheses of interest are H_0: series has a unit root versus H_1: series is stationary. The ADF augments the test using p lags of the dependent variable to ensure that the error terms of the test are not autocorrelated. The Schwarz Bayesian information criterion (SBIC) is used to determine the optimal lag length of the ADF test. For the KPSS test, the hypotheses of interest are H_0: series is stationary versus H_1: series has a unit root.

Table 2: Cointegration bounds test.

Dependent variable	Forcing variable	F statistic	95% critical bounds		t statistic	95% critical bounds		Cointegration
			$I(0)$	$I(1)$		$I(0)$	$I(1)$	
Δ log GDP	log rem	7.883	6.56	7.30	−3.865	−3.410	−3.690	Positive
Δ log rem	log GDP	0.802	6.56	7.30	−0.954	−3.410	−3.690	Absent

Δ denotes the first-order difference operator. The F-test examines the joint significance of the coefficients of the lagged level variables (H_0: $\tau_1 = \tau_2 = 0$) and the t-test examines the statistical significance of the coefficient on the lagged level of the dependent variable (H_0: $\tau_1 = 0$). The lower and upper bound critical values are obtained from Pesaran et al. [5].

Table 2 presents the F- and t-test statistics of the cointegration bounds test, along with the 95% critical bounds, which are used to determine if there is a long-term relationship between remittances and output. Similar to previous related studies which used annual data, a lag length of three for the first-order differenced variables in (3) is used. Results were similar when the lag length of two is used. A time trend term is included in the GDP equation as Figure 5 shows an upward trend for GDP. The trend term was excluded from the remittance equation because it turned out to be statistically insignificant.

Results for the cointegration bounds test depicted in Table 2 show that a statistically significant positive long-run relationship exists between GDP and remittances with causality running from remittances to GDP. When remittances act as the forcing factor, both the F- and t-statistics exceed the upper bound of critical values at the 5% significance level. However, the causality running from GDP to remittances is not statistically significant; the F-statistic is less than the lower bound critical value at the 5% significance level.

Given the results of the cointegration bounds test, it is only the ARDL model with remittances being the forcing factor that is estimated. The optimal lag length of the ARDL model is determined based on the Schwarz-Bayes information criterion (SBIC). The SBIC selected an ARDL (1,0) model whose estimated long-run coefficients are presented in Table 3. All the long-run coefficients are statistically significant; indeed the intercept and trend are significant at the 1% level, while the coefficient on remittances is significant at the 10% level. The coefficient on the trend term is positive which is consistent with the increasing pattern of the GDP displayed in Figure 5.

Table 4 presents the error-correction representation for the ARDL (1,0) model. The coefficient of the error-correction term reflects the speed of adjustment of remittances and GDP to their long-run equilibrium, following any shock. This coefficient measures the proportion of the last period equilibrium error that is corrected for in the current period. As shown in Table 4, the short-run effect of the change in remittances on GDP growth is positive and statistically significant.

Of particular importance, the coefficient on the error-correction term is negative and statistically significant, implying convergence in the long-run dynamics of the variables of interest. In particular, 34% of last period's disequilibrium is corrected in the current period. This means that, following a shock, it takes around three years for GDP and remittances to restore their long-run equilibrium relationship.

Table 5 presents the estimated coefficients of the ARDL (1,0) model, along with a set of diagnostic tests. These include the Lagrange multiplier test of residual serial correlation, Ramsey's RESET test for specification error using the square of the fitted values, a normality test based on a test of skewness and kurtosis of residuals, and a heteroscedasticity test based on the regression of squared residuals on squared fitted values. For details about these diagnostic tests see B. Pesaran and M. H. Pesaran [38].

Results of the diagnostic tests show that the estimated ARDL model and the error-correction models do not have serial correlation, heteroscedasticity, specification error, and nonnormality at the 5% significance level. As is evident from Table 5, all the P values of the diagnostic tests are greater than 5%, implying that the null hypotheses of no serial correlation, homoscedasticity, normality, and specification error cannot be rejected at the 5% significance level.

6. Discussion

A full examination of the factors that drive the long-run relationship between remittance inflows and output is beyond

Table 3: Estimated long-run coefficients using the ARDL approach.

Information criterion	ARDL model	Regressors		
		Intercept	Trend	log rem
SBIC	ARDL(1,0)	23.284*** (0.547)	0.043***(0.001)	0.048*(0.024)

The dependent variable is log GDP. Asymptotic standard errors are in parentheses. The optimal lag length of the ARDL model is determined based on the Schwarz-Bayesian information criterion (SBIC).
***,* indicate statistical significance at the 1%, and 10% levels, respectively.

Table 4: Error correction representation for the selected ARDL model. ARDL(1,0) selected based on Schwarz Bayesian criterion. Dependent variable is Δ log GDP.

	Regressors		
	Trend	Δ log rem	ECM_{t-1}
Coefficient	0.0148	0.0164	−0.341
Standard error	0.005	0.009	0.114
P value	0.007	0.084	0.00

ECM = log GDP − 0.048044 ∗ log rem − 23.2843 ∗ Intercept −0.043389 ∗ trend.

the scope of this study, but the relationship can be explained through a number of channels that have been documented in the literature. For example, remittances affect several determinants of output, such as consumption, investment, both physical and human, and exports. Several studies find that remittance inflows finance investment and human capital accumulation [8, 25, 29]. Using data on Egypt along with other MENA countries, Kandil and Mirzaie [39] find that large remittance inflows play a significant role in financing domestic investment and consumption and reduce pressure on the current account. The authors also find that remittances increase export growth in some of the studied countries. In another study, Hossain and Hasanuzzaman [29] find a long-run positive causal relationship running from remittances to investment in Bangladesh. Zarate-Hoyos [25] finds that Mexican remittance-receiving households invest a significant part of their remittance income on productive activities which increase national output as multiplier effects work through labor and goods markets across the economy. Using an empirical survey of 200 remittance-receiving households in Egypt, Jureidini et al. [2] find that remittances contribute to up to 40 per cent of the income of Egyptian remittance-receiving households. The authors find that remittance inflows are completely used to finance housing and consumption expenditure and that a proportion of it, though small, is channeled to productive investment.

Remittances could also affect output indirectly by allowing households to increase investment in their children's human capital through education which will increase labor productivity in the long term and hence have a positive impact on national output. By relaxing household resource constraints, remittances could stimulate investment in household enterprise, increase children schooling, smooth household consumption levels, all of which reinforce the growth potential of that country's output level [8]. Using data from Ecuador, Calero et al. [8] find that remittances increase school enrollment and decrease the incidence of child work and that remittances are used to finance education when households are faced with economic shocks. In an Egyptian study, Elbadawy and Roushdy [13] find that remittances enhance school attendance among Egyptian university-aged boys. In another study, Elbadawy and Assaad [40] find that remittances to Egypt significantly reduce market work for boys aged 6–14 and enhance school attendance among university-aged boys aged 19 to 21 of migrant households. They also find a positive impact of remittances on the probability of girls ever enrolling in school and on school retention rates for 15- to 17-year-old girls.

One limitation of the current study that warrants mentioning is that, since there are no data available on remittance inflows through unofficial channels, the estimated output effect of remittances could be potentially understated.

A key policy implication of the current study is that governmental policies that attract more remittance inflows along with their efficient use could have positive macroeconomic effects in Egypt. In addition to the efficient use of remittance inflows, government could also play a role in facilitating and lowering the cost of transferring remittances, around 9%, through official channels which could be used for development purpose.

7. Conclusion

Using the ARDL bounds testing approach to cointegration, along with a vector error-correction model, this paper has examined the long-run causal relationship between remittances and output in Egypt during the period from 1977 to 2012. Results of the cointegration bounds test show a statistically significant positive, long-run relationship between GDP and remittances with causality running from remittances to GDP. Moreover, output is not found to be a long-run forcing factor of remittances in Egypt. Results of the error-correction model show that it takes around three years for GDP and remittance to restore their long-run relationship following any shock. The findings of this paper add to the existing evidence on the macroeconomic effects of remittance inflows and are in line with household-level studies which find that remittances improve the welfare of their recipients.

Conflict of Interests

The author declares that there is no conflict of interests regarding the publication of this paper.

Table 5: Autoregressive distributed lag estimates. ARDL(1,0) selected based on Schwarz Bayesian criterion.

	Regressors			
	Intercept	Trend	log rem	$\log \mathrm{GDP}_{t-1}$
Coefficient	7.949	0.0148	0.016	0.658
Standard error	2.69	0.005	0.009	0.114
P value	0.007	0.007	0.084	0.00
Diagnostic tests				
Test statistics	LM version	*F* version		
A: serial correlation	$\chi^2(1) = 2.718$ *P* value (0.10)	$F(1,26) = 2.50$ *P* value (0.126)		
B: functional form	$\chi^2(1) = 0.728$ *P* value (0.39)	$F(1,26) = 0.625$ *P* value (0.436)		
C: normality	$\chi^2(2) = 1.373$ *P* value (0.50)	Not applicable		
D: heteroscedasticity	$\chi^2(1) = 1.54$ *P* value (0.21)	$F(1,29) = 1.52$ *P* value (0.227)		

A: Lagrange multiplier test of residual serial correlation.
B: Ramsey's RESET test using the square of the fitted values.
C: based on a test of skewness and kurtosis of residuals.
D: based on the regression of squared residuals on squared fitted values.

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