

Are Workers' Remittance Flows a Source of Economic Development in Sri Lanka?¹

*Harsha Eranda Paranavithana**

Abstract

Large workers' remittances inflows have been protuberant features of the Sri Lankan economy for many decades. Combining workers' remittances among other exogenous variables into a growth model, and engaging time series annual data over the 1977-2014 period, this paper examines the impact of workers' remittances on economic growth in Sri Lanka. The empirical evidences based on the VEC approach shows a positive direct as well as indirect relationship between workers' remittances and economic growth in the long-term. However, the Wald test results reveal that there is no short-run causality between workers' remittances and economic growth, either directly or indirectly.

Keywords: Economic growth; Labour migration; Workers' remittances

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* Senior Economist, Central Bank of Sri Lanka; University of Southampton, UK; e-mail: hp2313@gmail.com

Introduction

International migration can be considered one of the most significant factors affecting economic and socio-political relations between developing and developed countries in the 21st century. This could be due to the rapid increase in the volume of workers' remittances flow, and the resultant dependency on them by a number of economies to cushion external shocks, spur development, and reduce poverty levels. According to the World Bank (2010), remittances by migrant workers signify the second most significant source of external funding in developing countries. Labour migration of Sri Lankans has proved to be a significant feature in the socio-economic fabric of the country. It was only in the mid-1970s that Sri Lankans started migrating in large numbers for overseas employment. Prior to this, such migration was limited to several hundreds and was dominated by professional and technical personnel leaving for overseas destinations. After Sri Lanka launched its open market policies and due to the opening up of employment opportunities in the oil-rich Gulf States, Sri Lankan labour migration has increased rapidly and steadily, presently standing at an average of 260,000 workers migrating annually.

Sri Lanka is a comparatively small open market economy, with a large expatriate labour force that sends a substantial amount of workers' remittances to the country. In 2014, the Central Bank of Sri Lanka has pointed out that the inflow of workers' remittances through official channels amounted to US\$ 7,018 million, which is equivalent to 9.4 per cent of gross domestic product (GDP). Additionally, workers' remittances are Sri Lanka's second largest source of foreign exchange, next to total industrial exports. However, on a net basis, it is the largest source of foreign exchange, overtaking total industrial exports.

Labour migration has contributed to the economy in several ways. On one hand, it has helped to alleviate the unemployment problem to a certain extent and their departure for foreign employment may have cushioned to reducing the unemployment rate. On the other hand, when workers' remittances compared with other foreign exchange sources, such as foreign borrowings and foreign direct investment (FDI), they do not become a liability to the receiving country, because they are unrequited transfers from abroad. Hence, they do not involve any cost to the recipient country, as in the case of foreign borrowings. Such unconditional transfers have a profound effect on the economies, which are affected by internal conflicts or natural disasters (Cooray, 2012). In spite of the above positive attributes, there are concerns about certain adverse socioeconomic effects of migration. It is argued that the disintegration of migrant workers' families, particularly female workers, has had adverse repercussions, such as on children's well-being and the misuse of remittances by spouses (Gunatilleke, Colombage, and Perera, 2010).

However, there is a consensus among policymakers that migrants remit money and it contributes to the economic growth in terms of inflow of foreign exchange and through the multiplier effect, once such workers' remittances are utilized in the country. Therefore, it would be interesting to investigate whether the same conclusion could be obtained through the analysis of Sri Lankan data. Therefore, this empirical study has contributed to understanding of the impact between workers' remittances and economic growth in Sri Lanka in econometric analysis and it is helpful for policy makers in making necessary policy decisions regarding labour migration.

The study is structured as follows. The next section presents the theoretical perspective and the empirical literature of workers' remittances and economic growth. Methodology and empirical analysis using econometric techniques are explored in the third section and the final section presents the conclusions and policy implications.

Theoretical Perspective and Review of Empirical Literature

Theoretical Perspective: Workers' Remittances and Economic Growth

When considering the theoretical perspective of workers' remittances and economic growth, it can be identified that the former influences the latter through three different channels - capital accumulation, total factor productivity (TFP), and labour force growth.

Workers' remittances can affect the degree of capital accumulation in the remittances recipients' countries in three different ways and Chami, Hakura, and Montiel (2009) have initially pointed out this idea. Based on their idea, firstly, from a microeconomic perspective, workers' remittances can increase the rate of accumulation of both human and physical capital. Secondly, it leads to a decrease in the cost of capital in the workers' remittances recipient country. In this context, additional borrowing would permit the amount of new investment that can be financed in the presence of workers' remittances flow during any given period. Finally, workers' remittances inflow may influence domestic capital accumulation through their impact on domestic macroeconomic stability. As a result of that, remittance inflows make the domestic economy less volatile.

Most of the researchers have demonstrated that workers' remittances may influence the growth rate of TFP through the effects on the size of domestic productive sectors that generate dynamic production externalities as well as through effects on the efficiency of domestic investment. However, Barajas et al. (2009) point out that workers' remittances influence the efficiency of investments, depending on who is making the investment decision. If the recipient makes the decision on behalf of the remitter, it is likely that the decision is not as efficient as one made by a skilled domestic financial intermediary in the case of proper capital inflow.

Workers' remittances can have various effects on the labour market. On the one hand, regardless of their intended use, remittance transfers may be plagued by severe moral hazard problems (since remitter and recipients are generally separated by long distances), an idea that is highlighted by Barajas et al. (2009) and Naiditch and Vranceanu (2009). On the other hand, to the extent that remittances inflows are simple income transfers, recipient households may rationally substitute unearned remittances income for labour income. In general, most studies have identified that international labour migration and workers' remittances tend to reduce household labour supply² although these effects are sometimes influenced by gender.³

The above facts demonstrate that remittances have many positive impacts on economic growth, but these are typical of highly uncertain magnitude and conflicting directions. Therefore, the effects of remittances on economic growth of the recipient economies are theoretically ambiguous.

Review of Empirical Literature

From a macro perspective, the relationship between remittances and economic growth has come under renewed scrutiny. Because empirical evidence on the impact of remittances on economic growth appears to be ambiguous, their influence is still open for discussion. Remittances are used either for investment, consumption or both. Some elements of the literature point out that by easing liquidity constraints, workers' remittances can contribute to investment in human and physical capital and thereby affect the economic growth of the host country. Another strand of literature on workers' remittances proposes that using remittances for consumption does not make any substantive contribution to the economic growth of the host country.

Empirical Literature in the Global Context

When considering the empirical literature regarding the size of workers' remittances inflows and the importance of human and physical capital diffusion in economic growth, Chami et al. (2008) demonstrate that remittances can increase economic growth by increasing investments in human and physical capital by developing the financial system in the remittances' recipient country. Furthermore, as a significant portion of

2 Itzigsohn (1995), using the panel data of four Caribbean countries (Dominican Republic, Guatemala, Haiti, and Jamaica), highlights that workers' remittances inflows have a positive and significant effect on nonparticipation in the labour market of the other family members.

3 Using panel data from two large surveys in Nicaragua, Funkhouser (2006) has demonstrated that international migration does indeed tend to reduce labour force participation. In a similar study using panel data from El Salvador, Acosta (2006) has identified that the effects of workers' remittances on labour force participation differ by gender.

remittances is spent on education and nutrition, this results in a higher rate of human capital accumulation which leads to TFP and subsequent economic growth. Finally, they point out that by increasing the accumulation of human and physical capital, workers' remittances could have a positive impact on economic growth by affecting the recipient countries' financial system.⁴ In the context of workers' remittances cushioning the human and physical capital development of the remittances recipient country, Cox-Edwards and Ureta (2003), Kure and Nwosu (2008), Adams and Cuecuecha (2010), and Mim and Ali (2012) have identified positive and significant results. Additionally, Senbeta (2013) demonstrates that workers' remittances have a positive and significant impact on human and physical capital, while the impact on TFP growth is insignificant.

However, the impact of the workers' remittances on the economic growth determines the minimum threshold of human capital stock in the remittances receiving country (Garcia-Fuentes & Kennedy, 2009). Benhabib and Spiegel (1994) confirm this idea, following Nelson and Phelps' (1966) and Romer's (1990) formulated a model for TFP growth as a function of human capital and an interaction term between human capital and workers' remittances. They suggest that the economic growth rates may differ among countries because of differences in human capital stock levels. Other studies that find a positive and significant influence of the interaction between human capital and remittances on economic growth are by Li and Liu (2005), Eller, Haiss, and Steiner (2006) and Calero, Bedi, and Sparrow (2008). However, Balasubramanyam, Salisu, and Sapsford (1999), and Makki and Somwaru (2004) have identified a positive but insignificant effect on the interaction between human capital and remittances on economic growth.

There are empirical evidence that workers' remittances cushion economic growth, through their positive impact on savings or investments. In this context, Lucas (2005) demonstrates that workers' remittances positively influence accelerating investment in India, Morocco, and Pakistan. A similar conclusion is obtained by Glytsos (2002) using panel data of Mediterranean countries. Addressing the financial position development in the workers' remittances recipient country context, Burgess and Haksar (2005) and Giuliano and Ruiz-Arranz (2009) highlight that workers' remittances act as an important source of foreign capital, while its role as a significant component of the balance of payment serves as a boon to the economy. Furthermore, they confirm that workers' remittances cushion the reduction of the current account deficits in the balance of payments and thereby reduce dependence on foreign borrowings. Additionally, Sayan (2004) and Lopez-Cordova and Olmedo (2006) point out that at a macro perspective, the positive financial

4. *Workers' remittances can help develop the banking system of remittance recipient countries by increasing the demand for money. Additionally, it contributes to the financial development of the remittance recipient economies and subsequently causes higher economic growth (Chami et al., 2008).*

position created by workers' remittances, which are likely to be large, offer a firm source of foreign currency that can support the avoidance of a balance of payment crisis.

Conversely, some negative relationships of workers' remittances and economic growth have also been found in past studies. Confirming the above agreement, Chami, Fullenkamp, and Jahjah (2003) find a robust negative correlation between workers' remittances and economic growth. This specifies that such remittances may not be intended to serve as a source of capital for economic development. Additionally, they demonstrate that when workers' remittances are used by recipients to reduce their labour supply and labour market participation, then there is a potential for economic activity to be adversely affected. However, Rapoport and Docquier (2005) argue that Chami, Fullenkamp, and Jahjah (2003) ignore the possibility that workers' remittances could influence investment and human capital formation through the existence of liquidity constraints. Therefore, human capital, a significant factor that affects growth, was absent in their analysis. However, Barajas et al. (2009) have not identified a robust and significant positive effect of workers' remittances on long-run economic growth, and frequently find a negative relationship between workers' remittances and economic growth.⁵

Some literature on workers' remittances proposes that using remittances for consumption does not make any substantive contribution to the economic growth of the remittances recipient country. Böhning (1975), Rempel and Cobbell (1978), Stahl and Habib (1989), Sofranko and Idris (1999), and Rajan and Subramanian (2005) confirm this idea and demonstrate that workers' remittances are primarily used for consumption purpose and this resource would fail to create sufficient savings required for desired economic growth. Supporting the above arguments, Das and Serieux (2010) point out that 1 per cent increase in the rate of workers' remittances flows will increase the rate of consumption by around 0.8 per cent, and has no statistically discernible effect on the rate of investment.

Empirical Literature in the Sri Lankan Context

A number of studies have been conducted on the impact of workers' remittances and economic growth in Sri Lanka. Using quarterly data in Sri Lanka, Lueth and Ruiz-Arranz (2007) have investigated the response of workers' remittances to macroeconomic shocks. The results prove that workers' remittances are positively correlated with real GDP, undermining their usefulness as a shock-absorber using both descriptive evidence and econometric analysis. To identify the relationship between remittances and

5. To keep the reporting simple, Barajas et al. (2009) report results for two different sets of countries: all countries and emerging countries only. To the measurement of remittances, they use workers' remittances as a percentage of GDP.

economic growth in three South Asian countries, namely Bangladesh, India, and Sri Lanka, Siddique, Selvanathan, and Selvanathan (2010) have used annual time series data. They highlight a positive relationship between workers' remittances and economic growth in Bangladesh. In India, they identify no causal relationship between workers' remittances and economic growth. However, in Sri Lanka, a two-way directional causality is found. This means workers' remittances influence economic growth and vice-versa. Using an endogenous growth model, Cooray (2012) conducted a study to investigate the impact of workers' remittances and economic growth in six South Asian countries, including Sri Lanka. The results in the Sri Lankan context prove that workers' remittances have a significant positive effect on economic growth. A positive significant interactive effect of workers' remittances on economic growth is detected through the level of education and financial sector development. Also, Jawaid and Raza (2012) identify a positive significant long-run relationship between workers' remittances and economic growth in Bangladesh, India, Nepal, and Sri Lanka. However, results regarding Pakistan are negative and significant.⁶ In contrast, in the above context, Habib and Nourin (2006) demonstrate a negative relationship between workers' remittances and economic growth in India, Indonesia, Sri Lanka, and Thailand, whereas this relationship is positive in Bangladesh, Pakistan, and the Philippines.

Methodology and Empirical Analysis

Data Collection

The impact of workers' remittances and economic growth in Sri Lanka is examined using annual data covering the period from 1977 to 2014. This study presents an endogenous growth model based on growth-accounting techniques that will show the impact of growth rate of GDP (economic growth) and the growth rate of TFP, human capital, physical capital, labour force, and workers' remittances.⁷

6. In causality analysis, Jawaid and Raza (2012) have identified the bidirectional causality between workers' remittances and economic growth in Nepal and Sri Lanka and unidirectional causality between workers' remittances and economic growth in Bangladesh, India and Pakistan..

7 Data for GDP, workers' remittances, and physical capital (gross domestic capital formation) are from the Central Bank of Sri Lanka. The data for total labour force (population ages 15-64) is from the combination of Penn World Table Version 7.1 and the Central Bank of Sri Lanka. Finally, human capital (total number of secondary education pupils) data is from the World Development Indicators published by the World Bank.

Formulation of the Model

A Cobb-Douglas production function is used in this study to investigate the impact of workers' remittances on economic growth through the factors of TFP, human capital, physical capital, and labour force in Sri Lanka. Solow Growth model and Cobb-Douglas production function have been used in some previous studies to examine the impact of workers' remittances on economic growth [Garcia-Fuentes and Kennedy (2009), Jayaraman, Choong, and Kumar (2010), Coury and Lahouel (2011), and Uda (2011)]. In this study, the model starts with an augmented Cobb-Douglas production function⁸ in which GDP is the dependent variable and TFP, physical capital, and labour force are the independent variables as follows:

$$Y = AK^\alpha L^{1-\alpha} \quad 0 \leq \alpha \leq 1 \quad (1)$$

In equation (1), Y is GDP, A is TFP, K is physical capital and L is labour force. In this study, to capture GDP more precisely we have added human capital (H) as an additional independent variable to the equation (1) and it can be derived as follows:

$$Y = AK^\alpha L^{1-\alpha} H \quad (2)$$

Taking the log first difference of equation (2), we can formulate a growth-accounting equation as follows:

$$\Delta \ln(Y_t) = \Delta \ln(A_t) + \alpha \Delta \ln(K_t) + (1 - \alpha) \Delta \ln(L_t) + \Delta \ln(H_t) \quad (3)$$

In this study, TFP is considered as a function of human capital, which is the approach previously used by Nelson and Phelps (1966), Romer (1990a), Benhabib and Spiegel (1994), Garcia-Fuentes and Kennedy (2009), and Uda (2011). In Nelson and Phelps' (1966, p.73) description; $(\bar{A}/A) = c(H)[T(t) - A(t)]/A(t)$, the rate for closing the difference among an actual and theoretical level of knowledge depends on the level of human capital, which is highlighted as $c(H)$. Romer (1990a, p.83) highlights the growth of TFP as $\bar{A} = \delta H_A A$, where H_A is total human capital employed in the research and affects the growth of TFP. Benhabib and Spiegel (1994, p.161) describe the TFP as $[\ln A_t(H_t) - \ln A_0(H_t)]_i = c + gH_i + mH_i[(Y_{\max} - Y_i)/Y_i]$, which includes exogenous technological progress, endogenous

8. In the Cobb-Douglas production function, economic growth is expanded either through an increase in TFP, physical capital or labour force.

technological progress, and human capital represented as c , gH_i , and H_i respectively. Garcia-Fuentes and Kennedy (2009, p.11) demonstrate the TFP as,

$$\Delta \ln(A_{it}) = \gamma_{A0} + \gamma_{A1} \ln(h_{it}) + \gamma_{A2} (\ln h_{it}) * (\ln RE_{it}), \quad \text{which}$$

includes human capital stock as h . In addition, Uda (2011, p.305) define the TFP as $\ln A = \beta_0 + \alpha \ln Z + (\ln Z * \ln RE)$, which includes human capital to labour ratio as Z . Therefore, to capture TFP, in this study we use an interaction term between human capital and workers' remittances as follows:

$$\Delta \ln(A_t) = \beta_0 + \beta_1 (\Delta \ln H_t) * (\Delta \ln RE_t) \quad (4)$$

By substituting equation (4) with equation (3), the following equation can be derived.

$$\Delta \ln(Y_t) = \beta_0 + \beta_1 (\Delta \ln H_t) * (\Delta \ln RE_t) + \alpha \Delta \ln(K_t) + (1 - \alpha) \Delta \ln(L_t) + \Delta \ln(H_t) \quad (5)$$

The main objective in this study is to investigate the impact of workers' remittances on economic growth in Sri Lanka. In addition to the interaction term, log first differences of workers' remittances [$\Delta \ln(RE)$] add an additional independent variable to equation (5) and it can be rewritten as an econometric model as follows:

$$\Delta \ln(Y_t) = \beta_0 + \beta_1 (\Delta \ln H_t) * (\Delta \ln RE_t) + \alpha \Delta \ln(K_t) + (1 - \alpha) \Delta \ln(L_t) + \Delta \ln(H_t)$$

In equation (6), the economic growth is determined by the growth rates of TFP, physical capital, labour force, human capital, and workers' remittances.

Estimation of Unit Root Test and Cointegration Test

Macroeconomic variables have a tendency to move together in time series data. To avoid the problem of spurious regression, this study initially performs unit root test on the variables. Various alternative econometric tests are available to check whether a data series is stationary or not. When considering those tests, the Augmented Dickey-Fuller (ADF) and the Philips-Perron (PP) tests are the most popular. Based on the results depicted in Table 1, data series is found to be non-stationary in level, and stationary in first difference.

Table 1: Unit Root Test Results

Variable	Level (with intercept)		1 st Difference with Intercept	
	ADF Statistic	PP Statistic	ADF Statistic	PP Statistic
ln Y	-0.622368	-2.051518	-6.451649	-13.06245
ln H * ln RE	-2.088960	-2.242490	-6.716776	-6.691147
ln K	-1.346772	-1.299470	-4.815206	-4.812062
ln L	-1.876534	-2.569723	-7.421078	-7.265905
ln H	-2.717037	-2.297214	-6.617070	-6.442565
ln RE	-2.540556	-2.723471	-5.769518	-7.826788
1 per cent critical val.	-3.646342	-3.632900	-3.646342	-3.639407
5 per cent critical val.	-2.954021	-2.948404	-2.954021	-2.951125

Source: Compiled by Authors based on selected variables

Based on the results in Table 2, the model has one cointegrated vector (error terms), which means there is a long-run relationship between the variables. Therefore, to investigate the relationship between workers' remittances and economic growth in Sri Lanka, we use VECM. This is due to the facts that (i) all the macroeconomic variables are endogenous, proposing a multi-equation estimation, (ii) all the variables are non-stationary, proposing an estimation in first (or higher) differences and (iii) there is a cointegrating relationship in this model, suggesting the inclusion of the cointegration relationship as an additional regressor (Engle & Granger, 1987).

Table 2: Johansen Cointegration Rank Test Results

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized				
No. of CE(s)	Eigenvalue	Trace Statistic	5 Per Cent Critical Value	Prob.**
None *	0.879870	146.2776	95.75366	0.0000
At most 1	0.580116	29.39888	29.79707	0.0555
At most 2	0.426069	44.72100	47.85613	0.0956
At most 3	0.307078	25.84265	29.79707	0.1335
At most 4	0.265859	13.37016	15.49471	0.1019
At most 5	0.080739	2.86230	3.841466	0.0907

Trace test indicates 1 cointegrating eqn(s) at the 5 per cent level

* denotes rejection of the hypothesis at the 5 per cent level

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

Source: Compiled by Authors based on selected variables

Empirical Long-Run and Short-Run Results

The VECM is a restricted VAR that has cointegration restrictions created into the specification. Therefore, it is formulated for use with non-stationary series that are known to be cointegrated. The cointegration term

is known as the error correction term since the deviation from the long-run equilibrium is regularly corrected through a series of partial short-run adjustments.

To run the model, we consider optimal lag length as two⁹ [Akaike Information Criterion (AIC) value of lag length one is -12.81, but AIC value of lag length two is -14.25]. In equation (7) and Table 3 show the long-run relationship between the economic growth and growth rates of TFP, physical capital, labour force, human capital and workers' remittances. The standard growth elements behave as follows:

Table 3: Empirical Long-Run Results

Vector Error Correction Estimates: T-statistics in []	
Cointegrating Eq:	Coint.Eq1
LN $Y(-1)$	1.000000
LNHRE (-1)	-0.617738 [-1.90913]
LNK (-1)	-0.531891 [-2.35932]
LN $L(-1)$	5.290330 [5.22930]
LNH (-1)	1.690946 [0.94194]
LNRE (-1)	-0.995236 [-4.31814]

Source: Compiled by Authors based on selected variables

$$\ln(Y) = 4.99 + 0.62 \ln(A) + 0.53 \ln(K) - 5.29 \ln(L) - 1.69 \ln(H) + 1.00 \ln(RE)$$

$$[-1.91] [-2.36] [5.23] [0.94] [-4.32]$$

$$\ln A = \ln(h) * \ln(RE)$$

9. A number of alternative ways are available for selecting optimal lag length for VECM. Among them, choosing the lowest AIC value is most common.

Table 4: Least Squares - Long-Run Causality with Economic Growth**Dependent Variable: D(LNY)**

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.964753	0.315204	-3.060721	0.0064
C(2)	0.328082	0.192600	1.358925	0.1901
C(3)	0.050736	0.192600	0.263424	0.7951
C(4)	-1.331661	1.778509	-0.748751	0.4632
C(5)	-1.891151	1.112509	-1.699897	0.1055
C(6)	-0.971331	0.783619	-1.239545	0.2302
C(7)	-1.193995	0.794801	-1.502256	0.1495
C(8)	-0.447744	6.865412	-0.065217	0.9487
C(9)	8.486697	6.983678	1.215219	0.2392
C(10)	4.790334	11.20706	0.427439	0.6739
C(11)	7.147546	6.265984	1.140690	0.2682
C(12)	0.922960	0.585549	1.576231	0.1315
C(13)	1.272574	0.487952	2.607990	0.0173
C(14)	0.163156	0.243340	0.670485	0.5106
R-squared	0.630301	Mean dependent var		0.08638
Adjusted R-squared	0.377349	S.D. dependent var		0.522561
S.E. of regression	0.412343	Akaike info criterion		1.362496
Log likelihood	-8.481186	Schwarz criterion		1.997378
F-statistic	2.491779	Hannan-Quinn criter.		1.576115
Prob(F-statistic)	0.034534	Durbin-Watson stat		1.658013

Source: Compiled by Authors based on selected variables

The results regarding the long-run relationship between growth rate of TFP and economic growth are positive and significant at a level of 10 per cent. This means that for countries with low levels of human capital stock, workers' remittances have a negative impact on economic growth. This result is in line with previous results identified by Garcia-Fuentes and Kennedy (2009) and Udah (2011). The empirical results of this study show that growth rates of physical capital are positive and statistically significantly related to economic growth in the long-run. It means that physical capital positively influences domestic productive sectors that generate dynamic production externalities as well as the efficiency of domestic investment, and finally it facilitate to the economic growth of the country. The growth rates of workers' remittances are also positive and statistically significantly related to economic growth in the long-run. In this context, workers' remittances influence the rate of growth of productive capacity in the receiving countries through three different channels

including capital accumulation, labor force growth, and TFP growth. However, the long-run relationship between growth rate of labour force and economic growth is negative and statistically significant. Even though Romer (1990), Benhabib and Spiegel (1994), Garcia-Fuentes and Kennedy (2009) and Udah (2011) have identified a positive and statistically significant result regarding growth rate of human capital and economic growth, surprisingly, in this study, we identified a negative and insignificant relationship.

Based on the results shown in Table 4, the coefficient of the C(1) is negative (-0.96) and statistically significant, which indicates that there is a long-run relationship between the variables. According to the results shown in Table 5, the speed of adjustment is statistically significant, and it takes approximately one year (1/0.96) to adjust to the equilibrium level of economic growth

Table 5: Empirical Short-Run Results

Vector Error Correction Estimate: T-statistics in []

Error Correction	D(LNY)	D(LNHR)	D(LNK)	D(LNL)	D(LNH)	D(LNRE)
CointEq1	-0.964753 [-3.06072]	-0.501281 [-2.17840]	-0.223221 [-2.45417]	0.016090 [1.69697]	-0.047964 [-1.33420]	0.161252 [-2.37583]
D(LNY(-1))	0.328082 [1.35893]	0.305912 [1.73563]	0.161272 [2.31490]	-0.007546 [-1.03898]	0.032416 [1.17728]	0.108989 [2.09652]
D(LNY(-2))	0.050736 [0.26342]	0.103028 [0.73274]	0.115413 [2.07664]	-0.000165 [-0.02843]	0.007909 [0.36004]	0.011400 [0.27488]
D(LNHRE(-1))	-1.331661 [-0.74875]	-1.402555 [-1.08022]	-0.644047 [-1.25494]	0.085350 [1.59534]	-0.122611 [-0.60447]	-0.397082 [-1.03687]
D(LNHRE(-2))	-1.891151 [-1.69990]	-1.321239 [-1.62677]	-0.866481 [-2.69908]	0.014083 [0.42084]	-0.142781 [-1.12529]	-0.852937 [-3.56053]
D(LNK(-1))	-0.971331 [-1.23955]	-0.569660 [-0.99577]	-0.147801 [-0.65363]	-0.029991 [-1.27231]	-0.111543 [-1.24807]	0.260213 [1.54215]
D(LNK(-2))	-1.193995 [-1.50226]	-0.725756 [-1.25078]	-0.070939 [-0.30931]	-0.048852 [-2.04329]	-0.108946 [-1.20185]	0.005761 [0.03366]
D(LNL(-1))	-0.447744 [-0.06522]	5.944950 [1.18612]	-0.864985 [-0.43662]	-0.373693 [-1.80949]	1.140065 [1.45600]	-2.217717 [-1.50017]
D(LNL(-2))	8.486697 [1.21522]	10.48487 [2.05649]	-2.207060 [-1.09519]	-0.041928 [-0.19958]	1.554792 [1.95204]	1.141387 [0.75901]

D(LNH(-1))	4.790334 [0.42744]	6.080468 [0.74318]	2.803555 [0.86692]	-0.532802 [-1.58045]	0.547584 [0.42841]	0.938618 [0.38895]
D(LNH(-2))	7.147546 [1.14069]	6.714634 [1.46785]	4.355836 [2.40904]	0.074810 [0.39690]	0.781732 [1.09388]	5.332916 [3.95254]
D(LNRE(-1))	0.922960 [1.57623]	0.350532 [0.82000]	-0.074383 [-0.44022]	-0.001955 [-0.11098]	0.064486 [0.96560]	-0.034613 [-0.27452]
D(LNRE(-2))	1.272574 [2.60799]	0.647098 [1.81652]	0.314188 [2.23138]	-0.002412 [-0.16432]	0.065626 [1.17923]	0.459675 [4.37497]
C	0.163156 [0.67048]	0.138539 [0.77984]	0.225258 [3.20795]	0.019567 [2.67305]	0.000198 [0.00713]	0.134729 [2.57128]
R-squared	0.630301	0.434778	0.496716	0.534639	0.385502	0.907384
Adj. R-squared	0.377349	0.048048	0.152363	0.216235	-0.034945	0.844015
Sum sq. resids	3.230516	1.721775	0.268999	0.002923	0.042022	0.149786
S.E. equation	0.412343	0.301031	0.118987	0.012404	0.047028	0.088789
F-statistic	2.491779	1.124241	1.442463	1.679120	0.916886	14.31906
Log likelihood	-8.481186	1.902035	32.53272	107.1462	63.16533	42.19349
Akaike AIC	1.362496	0.733210	-1.123195	-5.645224	-2.979717	-1.708696
Schwarz SC	1.997378	1.368092	-0.488313	-5.010342	-2.344835	-1.073814
Mean depend.	0.086381	0.208096	0.092061	0.013961	0.021004	0.139424
S.D. depend.	0.522561	0.308535	0.129239	0.014011	0.046228	0.224811
Log likelihood	325.1725		Determin. resid covariance (dof adj.)		3.05E-15	
Akaike information criterion	-14.25288		Determinant resid covariance		1.11E-16	
Schwarz criterion	-10.17149					

Source: Compiled by Authors based on selected variables

According to the Wald test results in Table 6, there is no short-run causality running from five independent variables (growth rates of TFP, physical capital, labour force, human capital and workers' remittances) to economic growth. All relationships' probability values of Chi-square represent more than 5 per cent.¹⁰ This means selected independent variables are not significant factors to changed economic growth in a short run.

¹⁰ All relationships' probability values of F-statistic also represent more than 5 per cent. This means that the null hypothesis should be accepted and concludes that there is no short-run causality running from those independent variables to economic growth.

Table 6: Wald Test - Short-Run Causality with Economic Growth**GDP and Interaction Term Between Human Capital and Workers' remittances**

Test Statistic	Value	df	Probability
F-statistic	1.489162	(2,19)	0.2507
Chi-square	2.978324	2	0.2256

GDP and Physical Capital

Test Statistic	Value	df	Probability
F-statistic	1.783480	(2,19)	0.1951
Chi-square	3.566960	2	0.1681

GDP and Labor Force

Test Statistic	Value	df	Probability
F-statistic	0.822867	(2,19)	0.4542
Chi-square	1.645734	2	0.4392

GDP and Human Capital

Test Statistic	Value	df	Probability
F-statistic	0.710072	(2,19)	0.5042
Chi-square	1.420145	2	0.4916

GDP and Workers' Workers' remittances

Test Statistic	Value	df	Probability
F-statistic	2.302706	(2,19)	0.0748
Chi-square	4.60541	2	0.0550

In evaluating the VECM and taking into consideration that there are two lags in each equation and the difficulty of forecasting each coefficient, especially since the coefficient signals alternate over time, it is necessary to examine the impulse response function (IRF) to confirm how the dependent variable responds to a positive shock (standard deviation) applied to one or more independent variables. The IRF allows the detection of how the model reacts over time to a positive shock applied to the model variables. In this study, the IRF is analysed over a period of ten years. Figure 1 shows the time behaviour of the economic growth in response to a positive shock applied to the other independent variables. In the first panel, we can see that the initial response of economic growth to it-self is positive in the first two and half years and after that, it has become negative. In the second panel, we can see that the response of economic growth to TFP is negative in the following three years and that after six years onwards it becomes positive. In the third panel, the response of economic growth to physical capital is negative in the first three years, and after that, it has become positive. Surprisingly, the response of economic growth to labour force is negative in the next ten years, which is shown in the fourth panel. In the fifth panel, we can see that response of

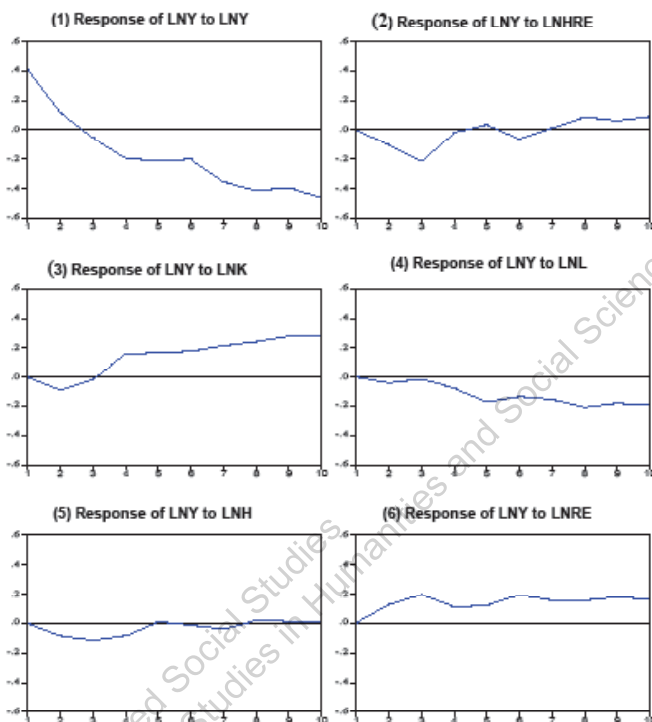
economic growth to human capital is negative in the first nine years and after that it appears to die out shortly. Finally, the response of economic growth to workers' remittances is positive for the whole ten years.¹¹

Table 7: Residual Tests Results of the Model

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.948227	Prob. F(18,14)	0.5498
Obs*R-squared	18.12944	Prob. Chi-Square(18)	0.4472
Scaled explain. SS	5.485817	Prob. Chi-Square(18)	0.9979
Heteroskedasticity Test: ARCH			
F-statistic	0.467812	Prob. F(2,28)	0.6312
Obs*R-squared	1.002375	Prob. Chi-Square(2)	0.6058
Breusch-Godfrey Serial Correlation LM Test			
F-statistic	1.779131	Prob. F(2,17)	0.1988
Obs*R-squared	5.711700	Prob. Chi-Square(2)	0.0575

Source: Author's calculation

¹¹ When considering general overview of our model, R² value of this model is 0.63, and probability value of F-statistic is less than 5 per cent. It means that all the independent variables jointly influence dependent variable (results are shown in Table 4). To test the residual of the model, we initially use Breusch-Pagan-Godfrey Test. Based on the probability value of the test; we cannot reject the null hypothesis. It means model residual is homoskedasticity. Additionally, ARCH Test also shows that there is no ARCH effect in this model. Breusch-Godfrey Serial Correlation LM Test shows that there is no serial correlation problem in this model (all the residual testing results are shown in Table 7).

Figure 1: Response to Cholesky One S D Innovations

Conclusion and Policy Implications

The empirical literature on the impact of workers' remittances on economic growth has shown ambiguous results, with some studies showing a positive impact and others a negative impact on economic growth. This could be partly due to the complex paths through which workers' remittances can affect economic growth and the various problems in constructing an appropriate empirical model to capture these complex relationships. By employing a VECM, this study attempts to overcome the weaknesses in dealing with the issue of endogeneity in previous empirical studies.

The VECM is expected to capture the long-run impact of workers' remittances on economic growth, allowing policy makers to derive important observations. Based on the results of the VECM, there is a long-run positive and statistically significant direct relationship between workers' remittances and economic growth. However, the indirect long-run impact of workers' remittances on economic growth through human capital is positive but significant at a level of 10 per cent. The Wald test results conclude that

there is no short-run causality running between economic growth and other independent variables. Our long-run and short-run results are in line with results identified by Das and Chowdhury (2011). Using panel cointegration and pooled mean group approaches in 11 developing countries (including Sri Lanka), Das and Chowdhury (2011) have identified a positive long-run relationship between workers' remittances and economic growth. However, as far as short-run dynamics are concerned, they have not identified a significant relationship. Therefore, the impact of workers' remittances on economic growth in Sri Lanka remains inconclusive. The IRF enables detection of how the model responds over time to a positive shock applied to the model variables and concludes that the response of economic growth to workers' remittances is positive for the next ten years.

Policy makers have identified workers' remittances in Sri Lanka as a valuable means of the balance of payment support, and as a means of consumption cushioning. Therefore, to maximize the benefits of the migration process, policy makers must be committed, as part of a national development plan for the future, to enhance the skills of migrant workers to facilitate skilled employment opportunities with better wages. Additionally, financial education and the necessary laws to protect migrant workers are other important areas in which the impact of workers' remittances could be magnified to benefit the Sri Lankan economy. Financial education would enable migrants and their dependents to manage workers' remittances flow in a way that provides greater benefits. From the perspective of protecting migrant workers, the Sri Lankan Government should sign bilateral agreements and a memorandum of understandings on migration with foreign countries, with the objective of ensuring the protection of migrant workers and obtaining better quality jobs. Finally, to improve methods of remitting the funds through formal financial channels, policy makers, in consultation with banks and other financial institutions, should restructure the fees and other charges levied on inward workers' remittances. Therefore, through the implementation of such prudent migration policies, workers' remittances can be permanently turned into one of the main factors of Sri Lankan economic growth, in both the short-run and long-run.

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