

## Do Workers' Remittances Cushion Economic Growth in Sri Lanka?

Harsha Paranavithana<sup>1</sup>

School of Economics, University of Southampton  
Central Bank of Sri Lanka

### Abstract

*International migration and large workers' remittance inflows have been prominent features of the Sri Lankan economy for many decades. Incorporating workers' remittances among other variables into a growth model, and employing time series annual data over the 1977-2012 period, this study investigates the impact of workers' remittances on economic growth in Sri Lanka. The empirical evidences based on the vector error correction model indicate a positive direct as well as indirect relationship between workers' remittances and economic growth in the long-term. However, the Wald test results demonstrate that there is no short-run causality between workers' remittances and economic growth, either directly or indirectly.*

**Keywords:** Economic Growth, Labour Migration, Workers' Remittances

**JEL Classification:** O40, F22, F24

### 1. Introduction

International migration can be considered as one of the most significant factor affecting economic and socio-political development in the developing and developed countries in the 21<sup>st</sup> century. This could be due to the rapid increase in the volume of workers' remittances flows, 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 relatively small open market economy, with a large expatriate labour force that sends a substantial amount of remittances to the country. In 2012, the Central Bank of Sri Lanka has pointed out that the inflow of workers' remittances through official channels amounted to US\$ 5,985 million, which is approximately equivalent to 10 per cent of gross domestic product (GDP). Moreover, workers' remittances are Sri Lanka's second largest source of foreign exchange followed by total industrial exports. However, on a net basis, it is the largest source of foreign exchange which overtaking total industrial exports.

Labour migration has played a prominent role in the economy in several channels. On one hand, it helped to alleviate the unemployment problem to a certain extent and their departure for foreign employment may have cushioned to further reduce 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 (Cooray, 2012).

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In spite of the above positive attributes, there are concerns about certain adverse socio-economic 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 general 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 remittances are utilized in the country. Therefore, it would be interesting to investigate whether the same conclusion could be driven for Sri Lanka as well. In this context, this empirical study attempt to contribute to understand the relationship between workers' remittances and economic growth in Sri Lanka using econometric analysis which would helpful for policy makers in making necessary policy action on labour migration in the future period.

The study is structured as follows. The next section presents the theoretical perspective and the empirical literature on 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.

## ***2. Theoretical Perspective and Review of Empirical Literature***

### **2.1. 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 which have been initially pointed out by Chami, Hakura, and Montiel (2009). 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 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 flows during any given period. Finally, workers' remittances inflows may influence domestic capital accumulation through their impacts on domestic macroeconomic stability. As a result, of that, remittances inflows make the domestic economy less volatile.

Most of the researchers have demonstrated that workers' remittances may influence 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 one hand, regardless of their intended use, workers' remittances 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 workers' 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 supply<sup>2</sup>, although these effects are sometimes influenced by gender<sup>3</sup>.

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

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<sup>2</sup> 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.

<sup>3</sup> 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.

## 2.2. Review of Empirical Literature

From a macro perspective, the relationship between workers' remittances and economic growth has come under renewed scrutiny. Because empirical evidence on the impact of workers' remittances on economic growth appears to be ambiguous, their influence is still open for discussion. Workers' 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.

### 2.2.1. Empirical Literature in the Global Context

When considering the empirical literature regarding the size of workers' remittances inflow and the importance of human and physical capital diffusion in economic growth, Chami et al. (2008) demonstrate that workers' 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 significant portion of workers' remittances is spent on education and nutrition, this results to a higher rate of human capital accumulation which leads to high 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<sup>4</sup>. 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 Cuenca (2010), and Mim and Ali (2012) have identified a positive and significant results. Furthermore, 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 and Kennedy, 2009). Benhabib and Spiegel (1994) have confirmed this idea, following Nelson and Phelps' (1966) and Romer's (1990) formulated 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 influences of the interaction between human capital and workers' 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 of the interaction between human capital and workers' remittances on economic growth.

There are empirical evidences which highlights that workers' remittances cushion economic growth through their positive impact on savings or investment. 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 balance of payment (BOP) serves as a boon to the economy. Furthermore, they confirm that workers' remittances cushion the reduction of the current account deficits in the BOP 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 position created by workers' remittances, which are likely to be large, and offer a firm source of foreign currency that can support to avoid BOP crisis.

Conversely, some negative relationships of workers' remittances and economic growth have also been found in the past literatures. Confirming the above argument, Chami, Fullenkamp, and Jahjah (2003) find a robust negative correlation between workers' remittances and economic growth<sup>5</sup>. This specifies that such remittances may not be intended to serve as a source of capital for economic development.

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<sup>4</sup> 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).

<sup>5</sup> The entire data set includes 113 countries for which worker remittances are reported over the 1970–1998 period.

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 affect of remittances on long-run economic growth, and frequently find a negative relationship between remittances and economic growth<sup>6</sup>.

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 Cobdell (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 therefore 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 increases in the rate of workers' remittances flows increases the rate of consumption by around 0.8 per cent and has no statistically discernible effect on the rate of investment.

### 2.2.2. Empirical Literature in the Sri Lankan Context

A number of studies have been conducted the impact of workers' remittances on 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 workers' remittances and 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 and significant 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 economic growth influences workers' remittances and vice-versa. Using an endogenous growth model, Cooray (2012) conduct 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 positive and significant effect on economic growth. The positive and significant interactive effect of remittances on economic growth is detected through the level of education and financial sector development. Also, Jawaid and Raza (2012) identify a positive and significant long-run relationship between workers' remittances and economic growth in Bangladesh, India, Nepal, and Sri Lanka. However, the results regarding Pakistan is negative and significant<sup>7</sup>. 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 Philippines economies.

## 3. Methodology and Empirical Analysis

### 3.1. Data Collection

The relationship between workers' remittances and economic growth in Sri Lanka is examined using annual time series data covering over the 1977-2012 period. This study presents an endogenous growth model based on growth-accounting techniques that will show the relationship between growth rate of GDP and the growth rate of TFP, human capital, physical capital, labour force, and workers' remittances<sup>8</sup>.

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<sup>6</sup> 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.

<sup>7</sup> 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.

<sup>8</sup> 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

### 3.2. 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 a number of 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 Udah (2011)]. In this study, the model starts with an augmented Cobb-Douglas production function<sup>9</sup> 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 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), Garcia-Fuentes and Kennedy (2009), and Udah (2011). In Nelson and Phelps' (1966, p.73) description;  $(A'/A) = c(H)[T(t) - A(t)]/A(t)$ , 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.S83) highlights the growth of TFP as  $A' = \delta H_A A$ , where  $H_A$  is total human capital employed in the research and affects the growth of TFP. Garcia-Fuentes and Kennedy (2009, p.11) demonstrate the TFP as  $\Delta \ln(A_{it}) = \gamma_{A0} + \gamma_{A1} \ln(h_{it}) + \gamma_{A2} (\ln h_{it}) * (\ln RE_{it})$ , which includes human capital stock as  $h$ . In addition, Udah (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:

$$\Delta \ln(Y_t) = \beta_0 + \beta_1 (\Delta \ln H_t) * (\Delta \ln RE_t) + \alpha \Delta \ln(K_t) + (1 - \alpha) \Delta \ln(L_t) + \Delta \ln(H_t) + \Delta \ln(RE_t) + \varepsilon_t \quad (6)$$

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

### 3.3. 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.

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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.

<sup>9</sup> In the Cobb-Douglas production function, economic growth is expanded either through an increase in TFP, physical capital or labour force.

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 are found to be non-stationary in level, and stationary in first difference.

**Table 1: Unit Root Test Results**

Variable	Level (with intercept)		1 <sup>st</sup> Difference (with intercept)	
	ADF Statistic	PP Statistic	ADF Statistic	PP Statistic
ln <i>Y</i>	-0.622368	-2.051518	-6.451649	-13.06245
ln <i>H</i> * ln <i>RE</i>	-2.088960	-2.242490	-6.716776	-6.691147
ln <i>K</i>	-1.346772	-1.299470	-4.815206	-4.812062
ln <i>L</i>	-1.876534	-2.569723	-7.421078	-7.265905
ln <i>H</i>	-2.717037	-2.297214	-6.617070	-6.442565
ln <i>RE</i>	-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

Based on the results in Table 2, the model has one cointegrated vector (error terms), which means there is a long-run relationship among the variables. Therefore, to investigate the relationship between workers' remittances and economic growth in Sri Lanka, we use vector error correction model (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 and 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	2.862303	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

### 3.4. 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 corrected regularly through a series of partial short-run adjustments.

To run the model, we consider optimal lag length as two<sup>10</sup> [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 in Appendix 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:

<sup>10</sup> A number of alternative ways are available for selecting optimal lag length for VECM. Among them, choosing the lowest AIC value is most common.

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

$$\begin{array}{cccccc} & [-1.91] & [-2.36] & [5.23] & [0.94] & [-4.32] \end{array}$$

$$\ln A = \ln(h) * \ln(RE) \quad (7)$$

The results regarding the long-run relationship between growth rate of TFP and economic growth indicate a positive and significant association at a level of 10 per cent. This means that for countries with low levels of human capital stock, remittances have a negative impact on economic growth. This result is in line with previous results identified by Garcia-Fuentes and Kennedy (2009) and Uda (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. This implies that physical capital positively influence the domestic productive sectors that generate dynamic production externalities as well as efficiency of domestic investment and thereby facilitates to economic growth of the country. The growth rates of workers' remittances are also indicate a positive and statistically significant to economic growth in the long-run. In this context, workers' remittances influence on 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 Uda (2011) have identified a positive and statistically significant result on 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 in Appendix, the coefficient of the C(1) is negative (-0.96) and statistically significant, which indicates that there is a long-run relationship among the variables. Moreover, based on the results shown in Table 5 in Appendix, 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.

According to the Wald test results (Table 6 in Appendix), 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 the economic growth. All relationships' probability values of Chi-square represent more than 5 per cent<sup>11</sup>. This means the selected independent variables are not significant factors to explain the changes in the economic growth in the short run.

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 positive shock applied to the model variables. In this study, the IRF is analysed over a period of ten years. Figure 1 in Appendix 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 after that it has become negative. In the second panel, we can see that response of economic growth to TFP is negative in the following three years, and it becomes positive after six years onwards. In the third panel, the response of economic growth to physical capital is negative in the first three years 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 fourth panel. In the fifth panel, we can see that response of economic growth to human capital is negative in the first nine years after that it appears to be died out shortly. Finally, the response of economic growth to workers' remittances is positive for the whole ten years<sup>12</sup>.

<sup>11</sup> 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.

<sup>12</sup> When considering general overview of our model, R<sup>2</sup> 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 in Appendix). 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 in Appendix).

#### 4. Conclusions and Policy Implications

The empirical literature on the impact of workers' remittances for economic growth has shown ambiguous results, where some studies highlights 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 in the literature and thereby fill the existing gap.

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 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 BOP support and as a means of consumption cushioning. Therefore, to maximize the benefits of the migration process, policy makers need to commit, as part of a national development plan for the future, to enhance the skills of migrant workers in order to facilitate skilled employment opportunities with better wages. Furthermore, 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 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 short-run and long-run.

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## Appendix

**Table 3: VECM Estimates – Long-Run**

Vector Error Correction Estimates: T-statistics in [ ]	
Cointegrating Eq:	Co-int.Eq1
LN <sub>Y</sub> (-1)	1.000000
LN <sub>HRE</sub> (-1)	-0.617738
	[-1.90913]
LN <sub>K</sub> (-1)	-0.531891
	[-2.35932]
LN <sub>L</sub> (-1)	5.290330
	[5.22930]
LN <sub>H</sub> (-1)	1.690946
	[0.94194]
LN <sub>NRE</sub> (-1)	-0.995236
	[-4.31814]
C	-4.992674

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		0.086381
Adjusted R-squared	0.377349	S.D. dependent var		0.522561
S.E. of regression	0.412343	Akaike info criterion		1.362496
F-statistic	2.491779	Hannan-Quinn criter.		1.576115
Prob(F-statistic)	0.034534	Durbin-Watson stat		1.658013

Table 5: VECM Estimates – Short-Run

Vector Error Correction Estimate: T-statistics in [ ]						
Error Correction	D(LNY)	D(LNHRE)	D(LNK)	D(LNL)	D(LNH)	D(LNRE)
CointEq1	-0.964753	-0.501281	-0.223221	0.016090	-0.047964	-0.161252
D(LNY(-1))	[-3.06072]	[-2.17840]	[-2.45417]	[ 1.69697]	[-1.33420]	[-2.37583]
D(LNY(-2))	[ 1.35893]	[ 1.73563]	[ 2.31490]	[-1.03898]	[ 1.17728]	[ 2.09652]
D(LNHRE(-1))	0.050736	0.103028	0.115413	-0.000165	0.007909	0.011400
D(LNHRE(-2))	[ 0.26342]	[ 0.73274]	[ 2.07664]	[-0.02843]	[ 0.36004]	[ 0.27488]
D(LNK(-1))	-1.331661	-1.402555	-0.644047	0.085350	-0.122611	-0.397082
D(LNK(-2))	[-0.74875]	[-1.08022]	[-1.25494]	[ 1.59534]	[-0.60447]	[-1.03687]
D(LNL(-1))	-1.891151	-1.321239	-0.866481	0.014083	-0.142781	-0.852937
D(LNL(-2))	[-1.69990]	[-1.62677]	[-2.69908]	[ 0.42084]	[-1.12529]	[-3.56053]
D(LNH(-1))	-0.971331	-0.569660	-0.147801	-0.029991	-0.111543	0.260213
D(LNH(-2))	[-1.23955]	[-0.99577]	[-0.65363]	[-1.27231]	[-1.24807]	[ 1.54215]
D(LNRE(-1))	-1.193995	-0.725756	-0.070939	-0.048852	-0.108946	0.005761
D(LNRE(-2))	[-1.50226]	[-1.25078]	[-0.30931]	[-2.04329]	[-1.20185]	[ 0.03366]
D(LNH(-1))	-0.447744	5.944950	-0.864985	-0.373693	1.140065	-2.217717
D(LNH(-2))	[-0.06522]	[ 1.18612]	[-0.43662]	[-1.80949]	[ 1.45600]	[-1.50017]
D(LNRE(-1))	8.486697	10.48487	-2.207060	-0.041928	1.554792	1.141387
D(LNRE(-2))	[ 1.21522]	[ 2.05649]	[ 1.09519]	[-0.19958]	[-1.95204]	[ 0.75901]
D(LNH(-1))	4.790334	6.080468	2.803555	-0.532802	0.547584	0.938618
D(LNH(-2))	[ 0.42744]	[ 0.74318]	[ 0.86692]	[-1.58045]	[ 0.42841]	[ 0.38895]
D(LNRE(-1))	7.147546	6.714634	4.355836	0.074810	0.781732	5.332916
D(LNRE(-2))	[ 1.14069]	[ 1.46785]	[ 2.40904]	[ 0.39690]	[ 1.09388]	[ 3.95254]
D(LNRE(-1))	0.922960	0.350532	-0.074383	-0.001955	0.064486	-0.034613
D(LNRE(-2))	[ 1.57623]	[ 0.82000]	[-0.44022]	[-0.11098]	[ 0.96560]	[-0.27452]
D(LNRE(-2))	1.272574	0.647098	0.314188	-0.002412	0.065626	0.459675
C	[ 2.60799]	[ 1.81652]	[ 2.23138]	[-0.16432]	[ 1.17923]	[ 4.37497]
C	0.163156	0.138539	0.225258	0.019567	0.000198	0.134729
C	[ 0.67048]	[ 0.77984]	[ 3.20795]	[ 2.67305]	[ 0.00713]	[ 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. resid	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				

**Table 6: Wald Test - Short-Run Causality with Economic Growth**

<b>GDP and Interaction Term Between Human Capital and Remittances</b>			
Test Statistic	Value	df	Probability
F-statistic	1.489162	(2,19)	0.2507
Chi-square	2.978324	2	0.2256
<b>GDP and Physical Capital</b>			
Test Statistic	Value	df	Probability
F-statistic	1.783480	(2,19)	0.1951
Chi-square	3.566960	2	0.1681
<b>GDP and Labor Force</b>			
Test Statistic	Value	df	Probability
F-statistic	0.822867	(2,19)	0.4542
Chi-square	1.645734	2	0.4392
<b>GDP and Human Capital</b>			
Test Statistic	Value	df	Probability
F-statistic	0.710072	(2,19)	0.5042
Chi-square	1.420145	2	0.4916
<b>GDP and Workers' Remittances</b>			
Test Statistic	Value	df	Probability
F-statistic	2.302706	(2,19)	0.0748
Chi-square	4.605412	2	0.0550

**Table 7: Residual Tests Results of the Model**

<b>Heteroskedasticity Test: Breusch-Pagan-Godfrey</b>			
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
<b>Heteroskedasticity Test: ARCH</b>			
F-statistic	0.467812	Prob. F(2,28)	0.6312
Obs*R-squared	1.002375	Prob. Chi-Square(2)	0.6058
<b>Breusch-Godfrey Serial Correlation LM Test</b>			
F-statistic	1.779131	Prob. F(2,17)	0.1988
Obs*R-squared	5.711700	Prob. Chi-Square(2)	0.0575

**Figure 1: Response to Cholesky One SD Innovations**

