Progressive Agriculture 29 (1): 33-44, 2018 ISSN: 1017 - 8139

Progressive Agriculture
Journal homepage:http://www.banglajol.info/index.php/PA

Impact of remittance on domestic labour productivity in Bangladesh

S Akter*

Department of Economics, Graduate School of Modern Society and Culture, Niigata University, Japan and Human Resources Department, Bangladesh Bank, Head Office, Dhaka, Bangladesh.

Abstract

The inflow of remittances is the largest source of foreign capital to the economy of Bangladesh, which has an important contribution to Gross Domestic Product (GDP) with broader socio-economic impact. It is important to investigate the labour productivity (LP) effects of international migration and subsequent remittances inflow because, economic growth in the long run is better reflected through LP growth. Remittances can have counteractive effects on LP of the receiving countries through its interaction with labour supply and capital accumulation. We investigated the relationship between remittances and domestic LP to ascertain long run growth impact of remittances under Solow-Swan growth model using production function approach. We performed Johansen co-integration tests using data over the 1976-2014 periods. The co-integrating equation estimates suggested a positive linear relationship between remittance and LP. The findings pointed out the direct effects of remittances on LP through physical capital accumulation. The findings of the study are a vital contribution to the empirical literatures of remittances and economic growth, which is important for policy options.

Key words: Remittance, labour productivity, production function, Bangladesh

***Corresponding Author:** shirin.ad.bb@gmail.com

Introduction

Labour productivity (LP) is the measure of the total amount of gross domestic product (GDP) produced by a labour hour. It evaluates the efficiency of labour and measures the economy's capability to channel the available human resources to generate output (Pilat, 1996).Contemporary literary works on economic growth highlighted productivity growth as the primary driving force to attain long-term per capita growth (Hall and Jones, 1999). Sustainable economic growth and higher living standards have a significant positive correlation with LP (Andersan and Spange, 2012).The ways to achieve LP growth is to increase the amount of physical and human capital available to the economy (Sharp, 2007).

Remittances are funds transferred by the expatriates' mainly overseas workers to the home country. It is creating an excellent financial market in which resources and funds are transferred from people with an excess of available to people who has a shortage (Mishkin, 2007). In 2017, developing countries received US$ 442 billion from international migrants, which accounted for about 75% of global remittances flow (World Bank, 2017a). For developing countries, one of the biggest challenges is to achieve and maintain growth in productivity (APO, 2016). Labour exporting developing economies are credit constrained and need lots of investment in the form of capital to facilitate LP growth (Stark and Bloom, 1985). Remittances available for investment can ease off constraints and drive LP growth through the optimization of the labour-capital ratio and help to achieve balanced growth in the long-run (Al-Mamun et al, 2015). Thus, migration facilitates productive assets accumulation (Chiodi et al, 2012).

Remittances from migrant workers' to their families have also counter effects on the supply of labour and productivity of the country of origin (Drinkwater et al, 2003). Under labour-leisure framework, a person's choice between labour and leisure due to an increase in non-labour income, results in choosing more relax instead of labour and supply of labour in the labour market decreases (Nicholson and Snyder, 2008; Borjas, 2016). Similarly, remittances raise the income of the unemployed family members, which increase dependency as well as unwillingness to work (Airola, 2008; Bussolo and Medvedev, 2007). It negatively affects the supply of labour particularly the labour force participation rate ((Amuedo-Dorantes and Pozo, 2004; Kim, 2007), which can be termed as a moral hazard problem (Chami et al, 2003). Therefore, there is a possibility of low domestic labour participation, high unemployment, and overall lower LP (Chami et al, 2005; Barajas et al, 2009; Ssozi and Asongu, 2016).

The Bangladesh economy has undergone through structural changes in the different development stage since its inception in 1971. Bangladesh economy gradually moved from an agricultural to a more industrialized and service-oriented economy (Raihan, 2016). After a slow start during the 1970s, the economy of Bangladesh is growing at a strong speed.Since 2010, Bangladesh has been maintaining average 6.2% growth rate which is higher than many developing countries in South East Asia (World Bank, 2017b). LP growth has contributed to this growth with available large labour force (World Bank, 2012). The economic potential of Bangladesh relies on the successful transformation of its labour into productive resources. However, limited job creation capacity makes it difficult to manage employment for the young age population. Under this circumstance, international migration from Bangladesh has reduced the quantity of unemployed labour. Bangladesh has sent estimated 10 million migrant workers globally and experienced a significant increase in remittances inflow from US$ 0.78 billion in 1990 to US$13.7 billion up to 2016 (BMET, 2017). Remittances inflow from migrants can accumulate capital, to resolve the capital-scarcity problem in Bangladesh and increase productivity. Remittances have an important share to GDP and gross savings with broader socio-economic impact, and the contribution of remittances is inevitable in the economic growth of developing countries including Bangladesh (Fayissa and Nsiah, 2010; Balde, 2011; Akter, 2016). But economic growth in the long-run is better reflected through LP growth and it is the ultimate target of any economic growth strategy. Nevertheless, the studies concerning remittances and LP relationship in Bangladesh is very few and the findings are ambiguous (Al-Mamun et al, 2015). Therefore, it is important to investigate the LP effects of international migration and subsequent remittances inflow.

The Solow-Swan model is a popular neo-classical economic growth model that helps to determine the relationship between LP, savings and population growth rate (Mankiew et al, 1992). Robert Solow got the noble prize for developing and implementation of this simplified model. This model is suitable with the international setting and able to explain differences in standard of living (Mankiew et al, 1992). Economists use this model to estimate the separate effects of capital, labour and technological progress on economic growth. This model is mathematically easy to apply because of its nonlinear system.

Despite the increasing importance of remittances in the capital flows of Bangladesh, the relationship between remittances and LP growth has not been studied adequately yet. Therefore, we have conducted the study to observe the long-term impact of remittances on LP in the presence of both physical and human capital of Bangladesh. This study has explored the impact of remittances on LP growth under 'the Solow-Swan growth model' using the data of a sample period of 1976–2014.

Materials and Methods

Empirical Framework

To fulfill the objective of the study, we applied the Solow-Swan growth model with exogenous savings rate and human capital as discussed in Barroand Sala-i-Martin (1999). This model is a supply-side economic growth model under neo-classical production function that can explain the relationship among productivity, factors of production and total factor productivity. Remittances are included in the model as the proxy of capital.

***Basic equation of the model*:** The model started with the following neoclassical production function with underlying assumptions of constant return to scale and positive but diminishing returns,

$$Y = F(K, L) \quad (1)$$

Where Y= Output, K = capital stock and L = Labour.

In its intensive form, to determine output per unit of labour i.e., productivity; the production function showed in Equation 1 could be written as;

$$y = f(k) \quad (2)$$

Where, $k = K/L$ (Capital per unit of labour) and $y = Y/L$ (Output per unit of labour).Similarly, following Equation 2, the Cobb-Douglas function ($Y = AK^{\alpha}L^{1-\alpha}$) could be written in intensive form as,

$$y = k^{\alpha} \quad (3)$$

The steady state level of capital k^* and outputy^* the Equation (2) could be rewritten as;

$$y^* = (k^*)^{\alpha} \quad (4)$$

For simplification, by taking natural log on both side of the equation we got,

$$\ln y^* = \alpha \ln k^* \quad (5)$$

***Construction of remittances induced model*:** In order to construct remittances induced model, we were required to show the change in capital stock with response to remittances inflow. Net increase of physical capital equals gross investment less depreciation and expressed as;

$$\dot{K} = I - \delta k = sF(K, L) - \delta K \quad (6)$$

Where, $I$is the investment, s is the fraction of output saved i.e., savings rate such that $0 \leq s \leq 1$.$\delta$is the rate of depreciation of capital, such that $\delta > 0$.

Then we assumed that remittances inflow R would increase investment into the productive sector, which would increase the stock of physical capital. Then the Equation 4 would take the following form;

$$\dot{K} = sF(K, L) - \delta K + sR \quad (7)$$

To determine Change in capital stock per unit of labour we divided both sides of the Equation 6 by L. Thus, we got,

$$\dot{K}/L = sf(k) - \delta k + sr \quad (8)$$

Where, $r = R/L$ is the remittance per unit of labour and $\dot{K}/L$ is the change in capital per labour input.

Later on, $\dot{K}/L$ was written as a function of k by using the following condition,

$$\dot{k} = \frac{d(K/L)}{dt} = \dot{K}/L - nk \quad (9)$$

Where,$n = \dot{L}/L$ is growth rate of population, given$n \geq 0$and $\dot{k}$=marginal increase of capital per labour input.

Then, substituting the value of $\dot{K}/L$ from equation (6) into equation (7), we got, the fundamental differential equation of the Solow-Swan growth model including remittance regarded as the proxy of capital.

$$\dot{k} = sf(k) - (n + \delta)k + sr \quad (10)$$

Finally, following Equation 4 the equation for long-term level of capital per labour input was written as,

$$\ln y^* = \alpha \ln k^*(s, n + \delta, r) \quad (11)$$

***Human capital added model*:** Recognizing the importance of human capital for economic growth as described under Solow, (1956) and Mankiw et al, (1992) we added human capital in our study to overcome misspecification problem. If there is an effect of human capital, omitting human capital term biases the co-efficient on savings rate and population growth rates. As a proxy for the level of human capital,this study added government expenditure for education per labour input denoted by h. Therefore, the equation after adding human capital accumulation took the following form;

$$ln\, y^* = \alpha\, ln\, k^*(s, +\delta, r, h) \quad (12)$$

From the relationship expressed in the above equation, we expected that savings rate (s) and human-capital accumulation (h) would affect output growth positively whereas population growth rate (n) and depreciation rate of capital (δ) would affect output growth negatively. Remittances inflows were assumed to augment the capital stock of the country. In addition, government investment into human capital was assumed to increase the efficiency of labour.

Model specification

Based on the conceptual framework, according to equation (12), the empirical model can be written as;

$$y = f(s, n+\delta, r, h) \quad (13)$$

In order to determine the long run impact of remittances on LP, this study added remittance square as an explanatory variable. This facilitated answering the question whether the marginal increase of remittance plays positively or negatively in the long run. The study estimatedassuming both linear and nonlinear relationship between remittance and LP once in the presence of human capital and then in absence of human capital. In order to find better estimation and consistent model, the following four equations have been estimated.

Model 1:

$$lny_t = \alpha_0 + \alpha_1 lns_t + \alpha_2 \ln{(n + \delta)_t} + \alpha_3 lnr_t + \varepsilon_t \quad (14)$$

Model 2:

$$lny_t = \alpha_0 + \alpha_1 lns_t + \alpha_2 \ln{(n + \delta)_t} + \alpha_3 lnr_t + \alpha_4 (lnr)_t^{\,2} + \varepsilon_t \quad (15)$$

Model 3:

$$lny_t = \alpha_0 + \alpha_1 lns_t + \alpha_2 \ln{(n + \delta)_t} + \alpha_3 lnr_t + \alpha_4 lnh_t + \varepsilon_t \quad (16)$$

Model 4:

$$lny_t = \alpha_0 + \alpha_1 lns_t + \alpha_2 \ln{(n + \delta)_t} + \alpha_3 lnr_t + \alpha_4 (lnr)_t^{\,2} + \alpha_5 lnh_t + \varepsilon_t \quad (17)$$

Where, $\alpha_0$is the constant, α_1,α_2,α_3, α_4 and α_5 are the coefficient of respective variables associated with and ε_t indicates error term.

Empirical test

***Unit Root Test*:** Before performing cointegration test for investigating long-term relationships among variables it is necessary to ensure that all the variables under consideration are stationary and integrated of the same order. The Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979) and Phillips-Perron (PP) Unit Root Tests (Philips and Perron, 1988) were estimated to ensure the stationarity of the variables.

***Cointegration test*:** This study applied Johansen's (Johansen, 1988) technique in order to establish how many cointegration equations exist between variables.

The Maximum Eigen value test and the Trace test. The Maximum Eigen value statistic tests the null hypothesis of cointegrating relations against the alternative of r+1 cointegrating relations for r = 0, 1, 2…n-1. This test statistics is computed as:

$$\mathrm{LR}_{max}(r\ /n+1) = -T \times \log(1-\lambda) \qquad (18)$$

Where, λ is the Maximum Eigen value and T is the sample size.

Trace statistics investigate the null hypothesis of r cointegrating relations against the alternative of n cointegrating relations, where n is the number of variables in the system for r = 0, 1, 2…n-1. The equation is computed according to the following formula:

$$\mathrm{LR}_{tr}(r\ /n) = -T \times \sum_{i=0}^{n} \log(1-\lambda_{\mathrm{i}}) \qquad (19)$$

Definition of variables and collection of data

The study considered LP (y) expressed as the ratio of inflation-adjusted GDP and employed labour forces as the dependent variable. Remittances received internationally per employed labour (r), was the basic endogenous variable. Among other endogenous variables, gross fixed capital formation per employed labour (s) was a proxy for savings rate. Government expenditure for education per employed labour (h) was a proxy for human capital. The variable dataset ranged from 1976-2014. It is noteworthy to mention that all the variables were in domestic currency to remove exchange rate effect.

Table 1. Definition of variables used in the study

Sl. No.	Variable	Definition	Calculation
1.	y	Labour Productivity	$\frac{\text{Real GDP(Domestic Currency)}}{\text{Total Employment}}$
2.	s	Gross Fixed Capital Formation	$\frac{\text{GFCF(Domestic Currency)}}{\text{Total Employment}}$
3.	(n+δ)	Population growth rate and depreciation of capital	Population Growth + Depreciation Rate of Capital Stock
4.	r	Remittances	$\frac{\text{Remittance Inflow(Domestic Currency)}}{\text{Total Employment}}$
5.	h	Govt. Expenditure for Education	$\frac{\text{Total Govt. Exp. for education (Domestic Currency)}}{\text{Total Employment}}$

Data has been collected from different sources. Real GDP data, employment data, and GFCF data have been collected from APO (2017). Remittance inflow data has been collected from BMET (2017) and Govt. Expenditure for Education data collected from BER (2017). The data of population growth rate has been collected from WDI (2017). Depreciation estimates are important for productivity measures (Baldwin et al, 2005). We assumed a constant rate of 5% depreciation of capital as used in an example in Barro and Sala-i-Martin (1999).

Results and Discussion

We tested each of the variables to determine its order of integration. Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) unit root tests have been used to test the stationarity of the variables. Then after confirmation of stationarity of data, we performed Johansen cointegration test to identify long run relationship between remittances and LP, which included two tests: the Trace test and Maximum Eigenvalue test. All the testresults are discussed below in detailed.

Unit Root Test

The time series behavior of each of the series using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Unit Root Tests results indicated that most of the variables were non-stationary and exhibited unit roots at level but all the variables showed stationarity at first difference (Table 2 and Table 3). Thus, all of them were integrated of order one, I (1) and ready for the cointegration test.

Table 2. Augmented Dickey-Fuller Unit Root Tests showing stationarity of variables at first differences

Variable	At level				At first difference			
	Constant		Constant & Trend		Constant		Constant & Trend	
	t-stat	Prob.	t-stat	Prob.	t-stat	Prob.	t-stat	Prob.
ln(y)	2.55	1.00	-0.78	0.96	-4.99	0.00	-7.56***	0.00
ln(s)	-2.01	0.28	-3.43	0.06	-6.22***	0.00	-6.09***	0.00
$ln(n+\delta)$	-0.35	0.98	-2.63	0.27	-3.47***	0.02	-3.73***	0.03
ln(r)	-3.67***	0.01	-6.05***	0.00	-7.61***	0.00	-7.51***	0.00
$(lnr)^2$	-2.04	0.56	-1.16	0.68	-5.93***	0.00	-5.80***	0.00
ln(h)	-0.29	0.92	-2.84	0.19	-6.86***	0.00	-6.76***	0.00

Note: ***,** and * in superscript denotes significance of t-statistics at 1%, 5% band 10% level of significance respectively.

Cointegration test

After determining the order of integration, the study endeavoured to establish whether the non-stationary variables were co-integrated i.e., describing a particular kind of long-run equilibrium relationship among variables. This study used Akaike Information Criteria (AIC) to determine the appropriate lag length.

In identifying the number of cointegration equation(s) among variables, Trace test and Maximum Eigen Value test have been conducted (Table 4, 5, 6 and 7).

However, results of the trace test and the maximum eigen value test suggested the presence of co-integrating equation(s) between the selected variables at the significance level of 5 per cent. This implied a long-term relationship among the variables.

Next, the first normalized equation summary showed the long-term relationship LP and other explanatory variables (Table 8). The coefficient for gross fixed capital formation (y) and population growth rate with depreciation (n+δ) were positive and significant in all the cases. The coefficient of government expenditure for education (h) was negative and significant in Model 3 but significant and positive in Model 4. The co-efficient of remittance (r) showed positive and significant relation in Model 1 and Model 3, but the negative and significant relationship in Model 3 while insignificant positive relationship in Model 4. Remittance square showedthe positive relationship in both Model 2 and Model 4.

Table 3. Phillips-Perron (PP) Unit Root Tests showing stationarity of variables at first differences

Variable	At level				At first difference			
	Constant		Constant & Trend		Constant		Constant & Trend	
	t-stat.	Prob.	t-stat.	Prob.	t-stat	Prob.	t-stat	Prob.
ln(y)	3.72	1.00	-0.22	0.99	-5.15***	0.00	-7.98***	0.00
ln(s)	-0.17	0.42	-5.432***	0.00	-6.34***	0.00	-6.12***	0.00
ln(n+δ)	0.37	0.98	-3.09	0.12	-3.59***	0.01	-3.16***	0.10
ln(r)	-3.04**	0.04	-5.41***	0.00	-7.54***	0.00	-7.38***	0.00
$(lnr)^2$	-1.07	0.72	-2.32	0.41	-5.93***	0.00	-5.81***	0.00
ln(h)	-0.15	0.94	-2.85	0.19	-7.30***	0.00	-7.31***	0.00

Note:***, ** and * in superscript express the significance level value of t-statistics at 1%, 5% and 10% level.

Table 4. Trace Test Results for model without human capital

No. of Cointegrating Equation(s)	Model 1 Without Remittance Square[a]			Model 2 With Remittance square[a]		
	Eigen Value	Trace Statistic	0.05 Critical Value	Eigen value	Trace Statistic	0.05 Critical Value
None	0.732	86.178*	47.856	0.816	135.628*	69.819
At most 1	0.537	38.747*	29.797	0.726	74.656*	47.856
At most 2	0.262	11.043	15.495	0.412	28.105	29.797
At most 3	0.003	0.104	3.842	0.206	8.989	15.495
At most 4	-	-	-	0.018	0.666	3.841

Note:* in superscript indicates that the hypothesis at the 0.05 level is rejected. The result of the trace test confirms 2cointegrating equation(s).[a]denotes no. of appropriate lag length selection criteria equals 2.

Table 5. Maximum Eigen Value Test Results for model without human capital

Hypothesized No. of Cointegrating Equation(s)	Model 1 Without Remittance Square[a]			Model 2 With Remittance square[a]		
	Eigen Value	Max-Eigen Statistic	0.05 Critical Value	Eigen value	Max-Eigen Statistic	0.05 Critical Value
None	0.732	47.430*	27.584	0.816	60.971*	33.877
At most 1	0.537	27.704*	21.132	0.726	46.551*	27.584
At most 2	0.262	10.939	14.264	0.412	19.117	21.132
At most 3	0.003	0.104	3.841	0.206	8.323	14.264
At most 4	-	-	-	0.018	0.666	3.841

Note:* in superscript indicates that the hypothesis at the 0.05 level is rejected. The result of the trace test confirms 2cointegrating equation(s). [a]denotes no. of appropriate lag length selection criteria 2.

Table 6. Trace Test Results for model including human capital

Hypothesized No. of Cointegrating Equation (s)	Model 3 Without Remittance Square[a]			Model 4 With Remittance square[b]		
	Eigen Value	Trace Statistic	0.05 Critical Value	Eigen value	Trace Statistic	0.05 Critical Value
None	0.892	183.871*	59.819	0.828	164.699*	95.754
At most 1	0.851	110.319*	47.856	0.745	104.818*	69.819
At most 2	0.614	47.491*	29.797	0.511	58.336*	47.856
At most 3	0.378	16.095*	15.495	0.468	33.985*	29.797
At most 4	0.013	0.431	3.842	0.307	12.512	15.495
At most 5	-	-	-	0.000	0.000	3.841

Note: * in superscript indicates that the hypothesis at the 0.05 level is rejected. The result of the trace test confirms 2cointegrating equation(s). [a]and [b] denotes no. of appropriate lag length selection criteria of 2 and 1 respectively.

Table 7. Maximum Eigen Value Test Results for model including human capital

Hypothesized No. of Cointegrating Equation (s)	Model 3 Without Remittance Square[a]			Model 4 With Remittance square[b]		
	Eigen Value	Max-Eigen Statistic	0.05 Critical Value	Eigen value	Max-Eigen Statistic	0.05 Critical Value
None	0.892	73.551*	33.877	0.828	59.881	40.078
At most 1	0.851	62.828*	27.584	0.745	46.481*	33.877
At most 2	0.614	31.396*	21.132	0.511	24.351*	27.584
At most 3	0.378	15.664*	14.264	0.468	21.472*	21.131
At most 4	0.013	0.431	3.841	0.307	12.512	14.264
At most 5	-	-	-	0.000	0.000	3.841

Note: * in superscript indicates that the hypothesis at the 0.05 level is rejected. The result of the trace test confirms 4cointegrating equation(s).[a]and [b] denotes no. of appropriate lag length selection criteria of 2 and 1 respectively.

Table 8. First normalized long- run cointegration equation: dependent variable labour productivity

1Cointegrating equations (s)	Human capital excluded		Human Capital included	
	Model 1 Without Remittance square	Model 2 With Remittance square	Model 3 Without Remittance square	Model 4 With Remittance square
ln(s)	0.175** (0.087)	1.108*** (0.138)	0.759*** (0.189)	0.369** (0.243)
ln(n+δ)	1.464*** (0.256)	1.250** (0.581)	2.246*** (0.394)	4.042*** (0.553)
ln (r)	0.419*** (0.073)	-3.221*** (0.390)	1.210*** (0.120)	0.179 (0.478)
$(lnr)^2$	-	0.170*** (0.025)	-	0.041* (0.030)
ln(h)	-	-	-1.704*** (0.204)	0.113 (0.299)
Log likelihood	343.16	354.79	388.80	358.04

Note: *, ** and *** in superscript denotes significance of t-statistics at 1%, 5% band 10% level respectively and standard error within parenthesis.

The positive co-efficient of gross fixed capital formation was found as expected but the co-efficient for human capital was negative which is not expected and cannot be accepted. The positive relationship between LP (Table 8) implies that additional capital stock increases LP. The population growth rate along with depreciation rate showed the positive relationship with LP. Although there are both positive and negative view regarding the relationship of population growth rate with GDP growth (Coale and Hoover, 2015), population growth can bring positive growth to GDP for developing countries (Dao, 2012) like Bangladesh with 1.08 % population growth rate, 29% young dependency ratio and only 5% old dependency ratio.

In the final attempt, to choose the appropriate model, we investigated whether the marginal effect of $\ln r_t$ on $\ln y_t$ is positive or not. We computed the marginal increase in $\ln y_t$ by increasing $\ln r_t$ as follows:

$$\frac{\partial \ln y_t}{\partial \ln r_t} = \alpha_3 + 2\alpha_4 \ln r_t$$

The sufficient condition of positive (negative) effect is $\alpha_3 > 0$ ($\alpha_3 < 0$). If this condition is satisfied, marginal increase of $\ln y_t$ is positive (negative) even in case of $\ln r_t = 0$. In addition, under the condition of $\alpha_4 > 0$, the larger the $\ln r_t$ is, the larger the marginal effect of remittance is. Under this condition, the model satisfying $\alpha_3 = 0$ and $\alpha_4 \neq 0$ is inappropriate and therefore Model 2 and Model 4 are not correct. Therefore, to explain the effect of remittance on LP, we chose Model 1 and Model 3 under consideration. However, because in Model 3 the coefficient of human capital is negative, Model 3 is inappropriate. Finally, Model-1 in the absence of remittance square and human capital is the appropriate model to express the long run impact of remittances on growth.

The implication of this finding is that remittance positively affects LP; new inflows of remittances accelerate LP, evidence of a linear relationship. This can be an outcome of savings by the remittance for household and investment in productive sectors for capital accumulation. Therefore, our findings are against the hypothesis of Chami et al, (2005) and Barajas et al, (2009) who suspected the role of remittances for capital accumulation. However, this study attempted to investigate the non-linear behavior of remittances but did not find enough evidence to conclude such inference as explained by Al-Mamun et al, (2015). This difference might be due to choice of different growth model. Moreover, the human capital added growth model did not show expected result. We found that investment effects of remittances in capital deficient economy of Bangladesh, is strong as supported and explained by Stark and Bloom, (1985) for developing countries in general. So, our findings differs significantly with the findings of Chami et al, (2003) which supported the view of moral hazard problem of remittances as they found negative effect of remittances on growth. In addition, our study verified the findings of Al-Mamun et al, (2015) that found inconclusive results for Bangladesh on the growth impact of remittances in the long-run.

Conclusion

This paper observed the long-run impact of remittances on LP of Bangladesh. The study has found a significant positive effect of remittances to increase domestic LP but no significant positive relationship of government expenditure for education on LP. However, the positive and significant parameter of remittances implies that remittances contribute positively to domestic LP. The result showed the direct relationship between remittances and LP through physical capital accumulation. The result supported the view that migrant household saves a portion of remittances inflows to raise investment that facilitates productive assets accumulation (Adams, 1998; Chiodi et al, 2012). Therefore, to increase the positive effect of remittances on LP, efforts should be undertaken to increase remittances flows and channeled them to productive sectors. Furthermore, the government should explore more international markets for keeping the growth of migration. Further research is required to find an appropriate model for investigating human capital augemented growth model for remittances.

Acknowledgements

This research was supported by a scholarship from Rotary Yoneyama Memorial Foundation, Japan. The author is grateful to Professor Nakahigashi Masaki, Ishikawa Kozo, Ph.D. and Muto Shutaro, Ph.D. Faculty of Economics, Niigata University, Japan for valuable guidance and suggestions in concept development, statistical analysis and development of the manuscript.

References

Adams RH (1998). Remittances, investment, and rural asset accumulation in Pakistan. Econ.Dev. & Cult. Change, 47(1):155-173.

Airola J (2008). Labor supply in response to remittance income: the case of Mexico. The J. of Developing Areas, 41(2): 69-78.

Akter S (2016). Remittance inflows and its contribution to the economic growth of Bangladesh.J Modern Soc. Cult. Res., Niigata University Graduate School of Contemporary Social Culture, 62: 215-245

Al-Mamun M, Sohag K, Uddin GS, Shahbaz M (2015). Remittance and domestic labor productivity: Evidence from remittance recipient countries. Economic Modeling, 47: 207-218.

Amuedo-Dorantes C, Pozo S (2004). Workers' remittances and the real exchange rate: a paradox of gifts. World Development, 32(8): 1407-1417.

Amuedo-Dorantes C, Pozo S (2014). Remittance income uncertainty and asset accumulation. IZA J. Labor & Dev. 3(1): 1-24.

Andersen A, Spange, M (2012). Productivity Growth in Denmark. Monetary Review, 1st Quarter 2012 –Part 2. (https:www.nationalbanken.dk/en/public cations/Documents/2012/05/MON1Q_P2_2012_ Productivity %20 Growth %20 in %20 Denmark.pdf).

APO (Asian Productivity Organization) (2017). Productivity Measurement: APO Productivity

Database, 2016 Version 1. (http://www.apo-tokyo.org/wedo/measurement).

Balde Y (2011). The impact of remittances and foreign aid on savings/investment in Sub Saharan Africa. African Development Review, 23(2): 247-262.

Barajas A, Chami R, Fullenkamp C, Gapen M, Montiel PJ (2009). Do workers' remittances promote economic growth? IMF Working Paper No. 09/153: 1-22.

Barro RJ, Sala-i-Martin X (1999). Growth models with exogenous savings rates (The Solow-Swan model). In Economic Growth (pp.15-58). London. The MIT Press.

BMET (Bureau of Manpower Employment and Training) (2017). Statistical Reports: Overseas Employment and Remittances From 1976-2016. (http://www.bmet.gov.bd/BMET/stattisticalData Action).

Borjas G (2016). Labor Economics (6th edn.).McGraw-Hill publications, New York, pp. 35

Bussolo M, Medvedev D (2007). Do remittances have a flip side? A general equilibrium analysis of remittances, labor supply responses, and policy options for Jamaica. Journal of Economic Integration 23(3), 734-764

Chami R, Fullenkamp C, Jahjah S (2003). Are immigrant Remittances flows a source of capital for development? IMF Working Paper 03/189. IMF, Washington.DC

Chami R, Fullenkamp C, Jahjah S (2005). Are immigrant remittance flows a source of capital for development? IMF Econ. Rev. 52(1): 55-81. (https://doi.org/10.2307/30035948)

Chiodi V, Jaimovich E, Montes-Rojas G (2012). Migration, remittances and capital accumulation: Evidence from rural Mexico. Journal of Development Studies, 48(8): 1139-1155.

Coale AJ, Hoover EM (2015). Population growth and economic development: A case study of India's prospects.Princeton University Press. USA. pp. 9-17.

Dao MQ (2012). Population and economic growth in developing countries. Int. J. of Academic Res in Bus & Socl Sci, 2(1): 6-16.

Dickey DA, Fuller WA (1979). Distribution of the estimators for autoregressive time series with a unit root. J American Stat. Assoc. 74(366a): 427-431.

Drinkwater S, Levine P, Lotti E (2003).The labour market effects of remittances. Flowenla Discussion Paper 6: 1-43.

Fayissa B, Nsiah C (2010). The impact of remittances on economic growth and development in Africa. The American Economist, 55(2): 92-103.

Hall RE, Jones CI (1999). Why do some countries produce so much more output per worker than others? The Quarterly J. Econ, 114(1): 83-116.

Johansen S (1988). Statistical analysis of cointegration vectors. J. of economic dynamics and control, 12(2-3): 231-254.

Kim N (2007). The impact of remittances on labor supply: The case of Jamaica (Vol. 4120).World Bank Publications.

Mankiw NG, Romer D, Weil DN (1992). A contribution to the empirics of economic growth. The Quarterly J. Econ., 107(2), 407-437.

Mishkin FS (2007).The economics of money, banking, and financial markets.11th edn. The Pearson series in economics.8th Addison-Wesley Boston, Mass.

Nicholson W, Snyder C (2008). Microeconomic Theory Basic Principles and Extensions (10th edn.) South-Western College Pub., USA, pp. 573.

Philips PCB, Perron P (1988) Testing for a unit root in time series regression. Biomet 75(2): 335-346. (https://doi:10.1093/biomet/75.2.335)

Pilat D (1996). Labour productivity levels in OECD countries. OECD Economics Department Working Papers No. 169. http://dx.doi.org/10. 1787/18151973.

Raihan S (2016). Structural Change and Dynamics of Labor Markets in Bangladesh Studies on Labor and Employment, South Asian Network on

Economic Modeling. Dhaka, SANEM Publications.
Sharp A (2007). Three Policies to Improve Productivity Growth in Canada. In Leonard J, C. Ragan C, St-Hilaire F (eds.), A Canadian Priorities Agenda: Policy Choices to Improve Economic and Social Well-Being, (Montreal: Institute for Research on Public Policy), November 2007, pp. 353-388.
Solow RM (1956). A contribution to the theory of economic growth. The quarterly J Econ., 70(1): 65-94.
Ssozi J, Asongu SA (2016). The Effects of Remittances on Output per Worker in Sub Saharan Africa: A Production Function Approach. South African J. Econ., 84(3): 400-421.
Stark O, Bloom DE (1985). The new economics of labor migration. The Am. Econ.Rev, 75(2): 173-178.
WB (World Bank) (2017b). Bangladesh development update: towards more, better and inclusive jobs. The World Bank Office, Dhaka.
WB (World Bank) (2017a). Migration and Development Brief 27. Migration and Remittance Flows: Recent Trends and Outlook, 2017, World Bank Group.
WB (World Bank) (2012). Bangladesh: Towards Accelerated, Inclusive and Sustainable Growth-Opportunities and Challenges. Bangladesh Development Series, Volume 1,2.
WDI (World Development Indicator) (2017).World Development Indicator dataset. The World Bank. (http://data.wo rldbank.org/indicator/).