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**Workers' Remittances and Economic Growth in China and Korea: An
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Abstract

This study investigates the relationship between workers' remittances and economic growth in China and Korea by employing time series data from period of 1980 to 2009. Cointegration results confirm that there exist significant positive long run relationship between remittances and economic growth in Korea, while, significant negative relationship exist between remittances and economic growth in China. Error correction model confirms the significant positive short run relationship of workers' remittances with economic growth in Korea while, the results of China were insignificant in short run. Causality analysis confirms unidirectional causality runs from workers' remittances to economic growth in both China and Korea. Sensitivity analysis confirms that the results are robust. It is suggested that Korea should form friendly policy to ensure the continuous inflows of workers' remittances and their efficient utilization to ensure economic growth. On the other hand, China should keep an eye to reduce voluntary unemployment leads to decrease in productivity and growth in the country.

Key words: Remittances, Open Economy, Economic Growth

JEL Classification: F24, F41, F43

1. Introduction

Workers' remittances played an important role to promote economic growth. As compare to other external capital inflows (Aids, Foreign Direct Investment and Foreign Loans) workers' remittances are consider more for rapid economic growth because of their stable nature. The flows of workers' remittances in developing and developed countries are growing rapidly in positive direction. The workers' remittances transfers through official channels have reach to \$

440 billion in 2009.¹ In many developing countries the flow of foreign direct investment have fall sharply because of economic recession whereas, positively increasing in flows of workers' remittances have been seen in last 5 years.

Shortages of foreign exchange reserves and import bills are the main problems for developing countries. The efficient amount in terms of foreign exchange reserves is necessary to pay import bills. Workers' remittances provide an opportunity to resolve the problems of shortages of foreign exchange reserves. Workers' remittances are found to be main reason for the rapid economic growth in many developing countries.² Increase in workers' remittances leads to increase in consumption and investment in recipient countries. The domestic production also increases because of increase in purchasing power. Increase in Investment, consumption and domestic production are all main determinants of rapid economic growth. Workers' remittances also help to reduce the poverty rate in developing countries.³

Conversely, some negative relationship of workers' remittances and economic growth is also found in past studies. Waheed and Aleem (2008) argue that workers' remittances are only beneficial in short run. For continuous long run economic growth, the focus should be on to increase the foreign exchange earnings through export earnings instead of workers' remittances. Sofranko and Idris (1999) argue that workers' remittances are mainly used for consumption purposes so the efficient savings required for economic growth will not be entertained. Ahorter and Adenutsi (2009) conclude that workers' remittances may create voluntary unemployment in recipient countries because of over dependency on external or workers' remittances income.

¹ Source: World Bank (World Development Indicators) 2010.

² Fayissa and Nsiah (2010), Faini (2006), Jongwanich (2007), Ahmed et al. (2011) and Azam and Khan (2011).

³ Imai *et al.* (2011), Jongwanich (2007).

After reviewing the previous empirical studies it is found that most of the studies are conducted on cross country⁴ but there are some time series studies⁵ are also found to investigate the impact of workers' remittances on economic growth. This study examines the relationship between workers' remittances and economic growth in China and Korea by using the long time series data from period of 1980 to 2009. China and Korea are two rapidly growing economies of East Asia and Pacific. In last 10 years, the average annual growth in real gross domestic production was 10.49 percent in China and 4.17 percent in Korea. China and Korea are relatively large open economies. This study thus provides some empirical evidence of whether workers' remittances have contributed significantly to large open economies.

2. Literature Review

Chami *et al.* (2003) use the panel data of 113 countries to empirically examine the role of remittance as a source of capital development on a period from 1970 to 2008. Negative and significant relationship is found between workers' remittances and economic growth in a long run. They concluded that workers' remittances do not act as source of capital for economic development and there are significant obstacles to transfer these resources into significant source of capital.

Jongwanich (2007) uses the generalized methods of movements (GMM) to empirically examine the relationship of workers' remittances with economic growth and poverty. Annual data of period from 1993 to 2003 of 17 developing Asia Pacific countries have been used. Results suggest the significant positive impact of workers' remittances on poverty reduction. On the other hand positive and significant relationship is also found between workers' remittances and economic growth.

⁴ Faini (2006), Fayissa and Nsiah (2010), Chami et al. (2003), Mohammed (2009).

⁵ Ahmed et al. (2011), Karagoz (2009), Azam and Khan (2011) and Waheed and Aleem (2008).

Waheed and Aleem (2008) analyzed the long time series data of Pakistan over the period of 1981 to 2006 to empirically investigate the relationship between workers' remittances and economic growth. Cointegration and error correction model have been used for long run and short run relationship respectively. Results suggest the significant positive impact of workers' remittances on economic growth in short run while, negative and significant relationship is found in long run.

Qayyum *et al.* (2008) employ the ARDL approach to investigate the relationship of workers' remittances with economic growth and poverty in Pakistan. Annual time series data of period from 1973 to 2007 have been used. Results suggest that workers' remittance has positive and significant contribution in economic growth and poverty reduction. Karagoz (2009) uses the data of Turkey from the period 1970 to 2005 to empirically identify the relationship between workers' remittances and economic growth in long run by employing cointegration technique. Results suggest the negative and significant relationship between workers' remittances and economic growth.

Fayissa and Nsiah (2010) use the panel data from the period 1980 to 2005 of 18 Latin American Countries (LACs) to investigate the long run relationship between workers' remittances and economic growth.⁶ Regression results suggest positive and significant impact of workers' remittances on economic growth in long run. Das and Chowdhury (2011) use the data of top 11 remittances recipient developing countries to investigate the relationship between workers' remittances and economic growth.⁷ They used pooled mean group approach and panel

⁶ These countries were Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela RB.

⁷ These countries were Bangladesh, Dominican Republic, El Salvador, Gambia, Guatemala, Honduras, Jamaica, Lesotho, Philippines, Senegal and Sri Lanka.

cointegration on panel data from the period 1985 to 2009. Results indicate that workers' remittances have positive and significant impact on economic growth.

Ahmed *et al.* (2011) use bound testing approach and error correction model to investigate the impact of workers' remittances on economic growth in both long run and short run. Annual time series data from the period of 1976 to 2009 have been used. Results suggest that workers' remittances have significant positive impact on economic growth in both short run and long run.

Siddique *et al.* (2011) use the Granger causality test to identify the direction of relationship between workers' remittances and economic growth in South Asian countries.⁸ Annual time series data of period from 1976 to 2006 have been used. Results suggest the bidirectional causality between workers' remittances and economic growth in Sri Lanka, unidirectional causality is run from workers' remittances to economic growth in Bangladesh while, no causal relationship is found in between workers' remittances and economic growth in India.

Yasmeen *et al.* (2011) use the annual time series data of period from 1984 to 2009 of Pakistan to empirically identify the impact of workers' remittances on private investment and total consumption. Results suggest that workers' remittances have significant positive impact on total consumption and private investment. Azam and Khan (2011) use the annual time series data of Azerbaijan and Armenia from the period 1995 to 2010 to empirically identify the impact of workers' remittances on economic growth. Ordinary least square results indicate the significant positive impact of workers' remittances on economic growth.

⁸ These countries were India, Bangladesh and Sri Lanka.

3. Empirical Framework

After reviewing the theoretical and empirical work, the model to examine the impact of workers' remittances economic growth is derived using the production function framework. The production function in general form as follows:

$$Y = f(A, L, K) \quad (3.1)$$

Where Y is the real gross domestic production, L is the total labor force, K is the capital stock and A is the total factor productivity. It has been assumed that effect of workers' remittances on economic growth operates through A .⁹

$$A = g(R) \quad (3.2)$$

Substituting (3.2) in (3.1)

$$Y = f(L, K, R) \quad (3.3)$$

The empirical models for estimations are developed as follows:

$$Y_t = \beta_0 + \beta_1 L_t + \beta_2 K_t + \beta_3 R_t + \varepsilon_t \quad (3.4)$$

Whereas, ε_t is the error term. L is the total labor force and R represents the workers' remittances. Real gross fixed capital formation has been used as a proxy for capital stock because of unavailability of data of capital stock.¹⁰ The expected signs for labor and capital stock are positive while, the sign of R to be determined. Annual time series data of China and Korea have been used from 1980 to 2009. All data are gathered from World Bank's official database.

⁹ See, Kohpaiboon (2003), Waheed and Aleem (2008) and Jawaid and Waheed (2011).

¹⁰ See Wong (2004).

4. Results and Estimations

Stationary properties of time series variables are examined by Phillip Perron (PP) and Augmented Dickey Fuller (ADF) unit root tests. Results of unit root test are presented in table 4.1.

Insert table 4.1 here

Results of table 4.1 show that all the variables are stationary at first difference of both China and Korea. This confirms that the combination of one or more series may exhibit long run relationship.

Insert table 4.2 here

After removing autocorrelation results of table 4.2¹¹ show negative and significant relationship between workers' remittances and economic growth in China which leads to voluntary unemployment in the country.¹² The findings are consistent with Chami et al. (2003), Waheed and Aleem (2008) and Karagoz (2009). On the other hand results show significant positive impact of workers' remittances on economic growth is found in Korea. The findings are consistent with Qayyum et al. (2008), Azam and Khan (2011) and Das and Chowdhury (2011).

Insert table 4.3 here

Phillip Perron (PP) and Augmented Dickey Fuller (ADF) unit root tests are used to estimate the results of stationary of residuals. Results of table 4.3 represent the results of residuals stationary test. Results show that residuals of both countries namely; China and Korea stationary at level and variables at first difference. These results confirm the valid long run relationship between the considered variables.

¹¹ Initial Results show that autocorrelation exist in the model of China and Korea. Cochrane Orcutt (1949) iterative procedure has been used to remove autocorrelation in these models.

¹² Ahorster and Adenutsi (2009)

Insert table 4.4 here

Johansen and Juselius (1990) cointegration method is applied for estimating the long run relationship between considered variables. To test the cointegration test Trace statistics and Maximum Eigen value statistics have been used. Table 4.4 represents the calculated values of these two tests. Results indicate the rejection of null hypothesis of no cointegration for both Maximum Eigen value statistics and Trace statistics at significance level of 5 percent in both China and Korea in favor of alternative hypothesis that there is one or more cointegrating vectors. Residuals stationary test and cointegration test both suggest the long run relationship between considered variables.

To test the relationship in short run Hendry's (1980) general to specific modeling approach has been used. We use one lag of error correction term and one lag of considered variables in our error correction model. Results indicate that the coefficient of the error term for the estimated equation is both negative and significant that's confirms the valid short run relationship. Results show the significant positive short run relationship between workers' remittances and economic growth in Korea. We have also employed error correction model for China but the result were found insignificant.

5. Causality Analysis

The direction of causality between workers' remittances and economic growth is analyzed by using Granger (1969) causality test. Jones (1989) favors the ad hoc selection method for lag length in Granger causality test over some of other statistical methods to determine optimal lag.

Insert table 5.1 here

Results of causality test are reported in table 5.1. Results show the unidirectional causality exists, run from workers' remittances to economic growth in both China and Korea.

6. Sensitivity Analysis

The consistency of relationship between workers' remittances and economic growth is tested through sensitivity analysis by adding different additional variables in the basic model [Leven and Renelt (1992)]. If the coefficient of workers' remittances provides consistent sign and significance then they refer that the results are robust otherwise the results are refer to fragile. Barro (1996) consider primary school enrollment, inflation and fertility rate and Yanikkaya (2003) consider export as other determinants of economic growth. In this study primary school enrollment (*PSE*), inflation (*INF*), fertility rate (*FER*) and export as percentage of GDP (*EXP*) have been used as other determinants of economic growth. Results of sensitivity analysis are reported in table 6.1.

Insert table 6.1 here

Table 6.1 shows the results of sensitivity analysis comprises of 10 models. Results indicate the consistency of workers' remittances in both significance and sign in all 10 models which confirms the robustness of the results.

7. Conclusion and Policy Recommendations

This study investigates the relationship between workers' remittances and economic growth in China and Korea by employing time series data from period of 1980 to 2009. Cointegration results confirm that there exist significant positive long run relationship between remittances and economic growth in Korea while, significant negative relationship exist between remittances and economic growth in China. Error correction model confirms the significant positive short run relationship of workers' remittances with economic growth in Korea while, the

results of China were insignificant in short run. Causality analysis confirms unidirectional causality exists, run from workers' remittances to economic growth in both China and Korea. Sensitivity analysis confirms that the results are robust.

It is suggested that Korea should form friendly policy to ensure the continuous inflows of workers' remittances and their efficient utilization to ensure economic growth. On the other hand, China should keep an eye to reduce voluntary unemployment leads to decrease in productivity and growth in the country.

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Table 4.1: Stationary Test Results

Country	Variables	ADF test				PP test			
		I(0)		I(1)		I(0)		I(1)	
		C	C&T	C	C&T	C	C&T	C	C&T
China	Y	-0.65	-2.94	-4.17	-4.08	0.21	-2.43	-4.20	-4.14
	L	-2.59	-2.47	-3.78	-4.35	-1.79	-2.34	-4.01	-4.38
	K	0.52	-2.75	-4.11	-4.26	1.30	-2.57	-3.41	-4.02
	R	-2.22	-1.18	-3.14	-4.14	-2.15	-1.42	-3.83	-4.57
Korea	Y	-2.45	-1.42	-3.75	-4.77	-1.37	0.63	-3.74	-5.30
	L	-2.57	-0.32	-3.99	-4.79	-2.49	-0.37	-4.00	-4.82
	K	-0.99	-2.08	-4.40	-4.44	-1.01	-1.73	-4.06	-4.56
	R	-1.88	-1.87	-4.87	-5.10	-2.16	-1.41	-4.81	-5.07

Note: The critical values for ADF and PP tests with constant (c) and with constant & trend (C&T) 1%, 5% and 10% level of significance are -3.711, -2.981, -2.629 and -4.394, -6.612, -3.243 respectively.

Source: Author's estimations.

Table 4.2: Long Term Determinants of Economic Growth

Variables	China			Korea		
	Coeff.	t-stats	Prob.	Coeff.	t-stats	Prob.
C	1.993	10.843	0.000	2.433	7.602	0.000
L	2.238	5.865	0.000	1.620	4.299	0.000
K	0.630	15.254	0.000	0.003	4.432	0.000
R	-0.043	-2.476	0.020	0.080	2.415	0.024
Adj. R ²	0.995			0.935		
D.W stats	1.348			1.635		
F-stats (prob.)	1768.464(0.000)			114.308(0.000)		

Source: Authors' estimation.

Table 4.3: Unit root test for Residuals

Country	Test	Without Trend	With Trend
China	ADF Test	-3.917	-3.961
	PP Test	-3.737	-4.127
Korea	ADF Test	-4.452	-4.729
	PP Test	-4.452	-4.747

Note: The critical values for ADF and PP tests with constant (c) and with constant & trend (C&T) 1%, 5% and 10% level of significance are -3.711, -2.981, -2.629 and -4.394, -6.612, -3.243 respectively.

Source: Authors' estimation.

Table 4.4: Cointegration test results

Country	Null Hypothesis No. of CS(s)	Trace Statistics	5% critical values	Max. Eigen Value Statistics	5% critical values
China	None	88.673	47.856	51.011	27.584
	At most 1	37.662	29.797	25.917	21.132
	At most 2	11.745	15.495	11.617	14.265
	At most 3	0.128	3.841	0.128	3.841
Korea	None	61.438	54.079	31.635	28.588
	At most 1	29.803	35.193	16.747	22.300
	At most 2	13.056	20.262	10.328	15.892

Source: Authors' estimation.

Table 5.1 Results of Granger Causality Test

Country	Variables	F-Statistic	Probability
China	REM does not Granger Cause RGDP	6.612	0.016
	RGDP does not Granger Cause REM	1.143	0.295
Korea	REM does not Granger Cause RGDP	2.859	0.056
	RGDP does not Granger Cause REM	0.745	0.574

Note: The lag length of all focus variables is 1.

Source: Authors' estimations.

Table 6.1: Results of Sensitivity Analysis

Models	China					Korea				
	Coeff. of R	t-stats. (prob.)	R ²	D.W	F-stats. (prob.)	Coeff. of R	t-stats. (prob.)	R ²	D.W	F-stats. (prob.)
Basic Model	-0.042	-2.476 (0.020)	0.995	1.348	1768.46 (0.000)	0.080	2.415 (0.024)	0.935	1.635	114.300 (0.000)
EXP	-0.046	-3.337 (0.003)	0.997	1.527	2126.73 (0.000)	0.062	2.268 (0.033)	0.959	1.827	134.383 (0.000)
FER	-0.049	-2.761 (0.011)	0.996	1.368	1361.18 (0.000)	0.050	1.760 (0.092)	0.958	1.464	132.300 (0.000)
INF	-0.034	-2.390 (0.025)	0.997	1.366	2052.02 (0.000)	0.041	2.024 (0.055)	0.979	1.820	263.200 (0.000)
PSE	-0.060	-3.289 (0.004)	0.996	1.368	1235.31 (0.000)	0.075	2.121 (0.045)	0.935	1.618	83.350 (0.000)
EXP, FER	-0.051	-3.614 (0.002)	0.997	1.597	1753.06 (0.000)	0.046	1.719 (0.099)	0.965	1.595	122.924 (0.000)
EXP, PSE	-0.055	-3.858 (0.000)	0.997	1.790	1615.91 (0.000)	0.063	2.179 (0.040)	0.959	1.834	102.911 (0.000)
INF, PSE	-0.059	-3.199 (0.005)	0.997	1.380	955.65 (0.000)	0.037	1.759 (0.093)	0.979	1.822	205.059 (0.000)
FER, INF	-0.045	-2.659 (0.014)	0.996	1.316	1212.70 (0.000)	0.035	1.779 (0.089)	0.981	1.922	231.389 (0.000)
EXP, FER, PSE	-0.050	-3.686 (0.002)	0.998	1.808	1556.43 (0.000)	0.050	1.867 (0.076)	0.967	1.608	104.007 (0.000)
PSE, INF, EXP	-0.046	-3.843 (0.000)	0.998	1.818	2012.59 (0.000)	0.039	1.821 (0.083)	0.979	1.855	169.912 (0.000)

Source: Authors' estimation.