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Can Financial Development Mitigate the Impact of Remittances on Real Exchange Rate Appreciation?

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Abstract

Remittances have been blamed for causing real exchange rate appreciation by raising the relative prices of nontraded goods and services in the recipient countries. However, empirical studies seeking to support this claim are lacking in Asia, despite the huge amount of remittances received by the region. In view of that, this paper used a panel dataset from eighteen remittance-recipient Asian countries during the period of 1981 – 2010 and Pooled Mean Group (PMG) estimator to examine the effect of remittances and financial development on real exchange rate. The paper, specifically, questions if the real exchange rate appreciation caused by the inflow of remittances varies with the degree of financial development in these countries. The paper finds that inflow of remittances has significant long-run impact on the appreciation of the real exchange rates in the remittance-recipient Asian countries. However, such effect of appreciation declines in countries with enhanced financial development.

Keywords: remittances; financial development; real exchange rate; Asian countries.

JEL Classification: F14, F24, O16

Introduction

Asia has accounted for more than 63 per cent of all remittance flows to developing countries. The officially recorded remittances to the region were estimated to have reached $256 billion out of $483 billion received by developing countries in 2017 (IFAD[1] 2018). Remittance income has tripled official development assistance and exceeded foreign direct investment received by many labour-sending Asian countries. Countries such as India, China, the Philippines, Pakistan, Bangladesh and Vietnam, to name but a few, have appeared among the largest recipient of migrant remittances globally (Ngoma et al., 2018; Canuto and Ratha 2011).

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[1] IFAD means International Fund for Agricultural Development

The inflow of remittances has served as a vital source of foreign exchange earnings for these countries. However, a concern has been raised about their impact on macroeconomic instability. Specifically, the inflow of remittances has been blamed to cause real exchange rate appreciation by increasing the relative prices of nontraded goods and services in remittance-recipient countries (Hassan and Holmes 2013; Ball et al., 2012; Lartey et al., 2012). By appreciating the real exchange rate, remittances can undermine external price competitiveness, which can hamper export performance of the recipient countries. A classic example was the real appreciation of the Philippines' currency since 2005, and a subsequent reduction of its traditional export goods, caused by the persistent inflow of remittances into the country (BSP[2] Annual Reports 2005-2011). It has, therefore, become crucial to examine the impact of remittances on the appreciation of the real exchange rate in the recipient Asian countries.

Surprisingly, there are virtually no cross-country studies that examine the long-run effect of remittances on the real exchange rate in the Asian region. The only exceptions are works by Bakardzhieva et al., (2010) and Berajas, et al., (2011) who considered the region in their panel data studies for developing countries. However, the findings from these studies are inconsistent. The former found evidence of loss of external competitiveness through the appreciation of the real exchange rate caused by inflows of remittances in South and East Asia. Whereas the latter established that inflow of remittances results in real exchange rate depreciation in the Asian region. Given the small sample of Asian countries used in these studies and the conflicting results, it is difficult to draw a convincing conclusion on the impact of remittances on real exchange rates in the region.

In addition, the role of active financial sector has been stressed by the literature in mobilisation and allocation of remittance resources into productive investments (Jayaraman, et al., 2018; Brown and Carmignani 2015; Ramirez, 2013; Bettin and Zazzaro, 2011; Mundaca, 2009 and Freund and Spatafora, 2008). This can mitigate the real exchange rate appreciation that accompanies the use of remittances for consumption (instead of productive investment) in the receiving countries (Olaniyan 2019; Mundaca, 2009 and Acosta et al., 2009b). By raising the propensity of remittance investment, Acosta et al., (2009b) argued that financial development can reduce the appreciation of the real exchange rate associated with inflow of remittances. Given the role played by financial development in the

[2] Bangko Sentral NG Pilipinas Annual reports 2005-2011

Asian region, which has reduced business risks, transaction costs and increased desire to invest (Hsueh et al., 2013; Levine, 2005 and Lynch 1996) it is believed that financial development influences the use of remittances in these countries. However, none of these studies mentioned has considered its role in effectively easing the real exchange rate appreciation associated with the use of remittances in labour-sending Asian countries.

In this paper a panel dataset from eighteen remittance-recipient Asian countries during the period of 1981 – 2010 and Pooled Mean Group (PMG) estimator were used to examine the impact of remittances and financial development on real exchange rate appreciation. The paper, specifically, questions if the impact of remittances on the real exchange rate appreciation varies with the degree of financial development in these countries.

This paper contributes to the existing literature in the following ways. Unlike previous panel studies, (Hassan and Holmes 2013; Lartey et al., 2012; Combest et la., 2012; Lopez et al., 2007 and Amuedo-Dorantes and Pozo, 2004) that pooled heterogeneous developing countries across the world, this paper only focuses on remittance-recipient Asian countries. It provides evidence, which resolves the hitherto conflicting results, on the long-run effect of remittances on the real exchange rates in Asian countries. Contrary to the works of Berajas, et al., (2011) and Bakardzhieva et al., (2010), this paper examines the role of financial development in mitigating the real exchange rate appreciation brought about by inflows of remittances. Also, the impact of remittances on real exchange rate appreciation was evaluated at different degrees of financial development in the Asian countries.

According to the paper inflows of remittances have long-run significant impact on the appreciation of the real exchange rate in remittance-recipient Asian countries. However, the effect declines with the degree of financial development. Remittance-receiving countries with a higher level of financial development experienced lesser appreciation of real exchange rate than other recipient countries with lower levels of financial development.

The rest of the paper is organised as follows. Section 2 discusses the review of the literature on remittance and real exchange rate. The methodology of the analysis is explained in section 3. Presentation and interpretation of the results are given in section 4. Section 5 presents the conclusion.

Remittances and Real Exchange Rates

A number of studies have theoretically argued that persistent inflow of remittances leads to positive income effects in the recipient countries, which boost demand and spending on non-traded goods and services. The increase in the demand for non-traded goods and services could have a positive effect on their relative prices, thereby resulting in real exchange rate appreciation (Lopez et al., 2007; McCormick and Wahba 2000; Quibria, 1997 and Edwards 1989).

In addition, the increase in the relative prices of non-traded goods could further lead to the contraction of the traded goods sectors of the economy. This will, especially, occur if excess labour demand in the non-traded goods sectors are met with labour released from the traded goods sectors due to increase in wages. These adjustments ensure a positive shift in the relative prices and reallocations of resources that favours the non-traded goods sectors at the expense of the traded goods sectors, which appreciate the real exchange rate and negate export activities (Ball et al. 2012; Barajas et al. 2011; Acosta et al. 2009a; Fuentes and Herrera 2007).

Empirically, a number of studies have examined the long-run relationship between the inflow of remittances and the movement of real exchange rates. Among the earlier works was Bourdet and Falck (2006) who used Cape Verdean data. They found that a 10 per cent rise in the inflow of remittances leads to a real appreciation of the Capverdean Escudo by 1.2 per cent. Similarly, using a Jordanian dataset, Saadi-Sadik and Petri (2006) showed that a percentage increase in inflow of remittance accounts for 0.4 per cent appreciation of the equilibrium real exchange in Jordan.

Furthermore, Bayangos and Jansen (2011) reported that real exchange rate appreciation of the peso against the US dollar caused by the inflow of remittances has undermined external price competitiveness and export performance in the Philippines. Also, a study by Chowdhury and Rabbi (2013) in Bangladesh, revealed that inflow of remittances has significantly appreciated the real exchange rates and reduced external trade performance of the country. Significant adverse effects of the inflow of remittances on the real exchange rates were also reported by Izquierdo and Montiel (2006) in the Dominican Republic, El Salvador, and Guatemala.

Contrary to the above findings, some studies have statistically found the impact of the inflow of remittances on the real exchange rates to be insignificant. For instance, in Honduras, Jamaica, and Nicaragua, Izquierdo and Montiel (2006) found no significant impact of inflow of remittances on the equilibrium real exchange rates, in spite of the fact

that these countries have experienced a large inflow of remittances. Likewise, a study by Ersoy (2013) in Turkey showed that the inflows of remittances did not significantly raise the real value of the country's exchange rates. A similar finding was also reported by Martins (2013) for the case of inflow of remittances to Ethiopia.

Other studies on this topic have considered panel data from many countries to assess whether the inflows of remittances can induce real exchange rate appreciation. For example, a study by Amuedo-Dorantes and Pozo (2004) used pooled data from 13 Latin America and Caribbean countries[3]. The authors confirmed that, on average, a doubling of the remittances received in these countries can lead to real exchange rate appreciation of about 23 per cent. Likewise, Ball et al., (2012) studied the effect of remittances in 21 emerging countries. The authors found that inflow of remittances was accompanied by an appreciation of the equilibrium real exchange rate regardless of exchange rate regimes in these countries. In a panel of 57 countries, Bakardzhieva et al., (2010) found that increase in remittance receipts results in appreciation of the equilibrium real exchange rate in countries of the Gulf Cooperation Countries, South and East Asia, and Africa.

However, a panel study by Lartey, et al., (2012) used data from 109 remittance-receiving developing and transition economies. The authors argued that, on average, a 1 percentage point increase in the remittances to income ratio, results in 20 – 40 percentage points increase in the real exchange rate appreciation. This result was earlier confirmed by Acosta et al., (2009b). Moreover, they argued that the effect decline with increase in the level of financial development in the remittance-receiving countries. Compared to other forms of private capital flows, a study by Combes J-L., et al., (2012) in 42 emerging and developing countries, showed that remittances have the least significant impact in raising real exchange rate appreciation. In the same way, Hassan and Holmes (2013), in a panel of 24 high remittance-recipient developing economies, further confirmed that remittances have a minor but significant impact on long-run appreciation of the real exchange rate. In a recent study, Kim (2019) argued that remittances caused nominal appreciation of exchange rate. But such appreciation falls with increase in openness. Similarly, Daway-Ducanes (2018) showed that a percentage point increase in remittances negates manufacturing growth by 0.07 percentage point in countries with high appreciation of real exchange rates.

[3] Namely; Argentina, Belize, Bolivia, Colombia, Dominican Republic, EL Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Peru, and Trinidad & Tobago.

Support for the adverse effect of inflow of remittances on the real exchange rate has not been unanimous. Some studies based on panel data have shown that inflow of remittances might not necessarily be associated with appreciation of the real exchange rate. Rajan and Subramanian (2005) for instance, used panel data for a number of remittance-receiving, developing countries. They demonstrated that remittances do not have a significant adverse effect on external competitiveness in these countries. Similarly, based on a region-specific analysis of 57 countries, Bakardzhieva et al., (2010) discovered that an increase in remittance receipts has no significant effect on changes in the real exchange rates in Latin America and Middle East and North Africa. Evidence of insignificant impact of inflow of remittances on the real exchange rate was also found by Mongardini and Rayner (2009) and more recently by Ojapinwa and Nwokoma (2018) in Sub-Saharan African countries.

In addition, other studies have also reported that inflow of remittances leads to real exchange rate depreciation (instead of appreciation) in the recipient countries. In a panel study of 79 remittance-recipient countries, Berajas, et al., (2011) found that inflow of remittances has long-run depreciating effect on the real exchange rates in Asia, Middle East and North African countries. Similarly, Bakardzhieva et al., (2010) reported that inflow of remittances has depreciated the equilibrium real exchange rates in Central and Eastern European Countries. Also, remittances lead to depreciation of the real exchange rates if they are used to finance consumption that is import oriented and investment activities that require unskilled labour (Rajan and Subramanian 2005).

Although a considerable number of studies have examined the effect of remittances on the real exchange rate, it is pertinent to note that most of these studies have focused on the contemporaneous impact of remittances on the real exchange rate appreciation. Therefore, it is possible that these studies captured only the transitory effects of remittances on the real exchange rate in their estimations while ignoring the long-run impact. Besides, there is virtually no consensus about the impact of inflow of remittances on the real exchange rate based on single-country and cross-country analyses. Inflows of remittances have been reported to be associated with not only appreciation but also the depreciation of the real exchange rates. In some cases, the flows have also been found to be insignificant in explaining the behaviour of real exchange rate. The conflicting findings informed the need to reexamine the issue, particularly at the regional level.

Furthermore, the long-run relationship between the inflow of remittances and the real exchange rate appreciation may vary with the degree of financial development in the recipient country and the type of expenditure that remittances finance. Remittances are likely to appreciate real exchange rate in the long-run if the recipient country exhibits a lower financial deepening (Berajas et al., 2011: Acosta et al., 2009b). Therefore, accounting for the effects of financial development extend the existing literature on the relationship between remittances and real exchange rate.

Empirical Strategy

To examine the effect of inflow of remittances on real exchange rate appreciation and verify whether or not such appreciation declines with the degree of financial development, a Pooled Mean Group (PMG) estimator developed by Pesaran et al., (1999) was used on pooled cross country time series data for the period of 1980-2010. The sample size comprised eighteen remittance-recipient Asian countries[4]. The choice of PMG estimator was motivated by the fact that long-run movements of aggregate flows of remittances and other related macroeconomic fundamentals are expected to be the same across labour-exporting Asian countries. This is especially true given their level of income, common geographic location, migration history and economic and labour market integration. But short-run fluctuations are expected to reflect country–specific factors. The PMG estimator allows for this type of econometric specification by imposing weak homogeneity across countries (Pesaran et al., 1997, 1999). It allows the intercepts, short-run coefficients and error variances to differ freely across the countries but restricts the long-run coefficients to be identical across countries (Blackburne and Frank 2007 Pesaran et al., 1999).

PMG has been robustly suggested to be better than the Mean Group (MG) estimator (Pesaran and Smith 1995), which imposes heterogeneity across countries. Besides, unlike Generalised Method of Moments estimator (GMM), the estimator does not restrict all parameters to be the same across countries. This may likely lead to inconsistent and misleading long-run coefficients, particularly if the time dimension of a sample dataset is sufficiently very large (Pesaran et al., 1997, 1999; Im, et al., 2003). By relying on pooling and averaging of coefficients, PMG estimator has produced consistent estimates of long-run parameters in many empirical applications (among others,

[4] The list of remittance-recipient Asian countries used in this paper and their private capital flows as a percentage of GDP are given in Apendix A.4.

Combes et al., 2012; Martınez-Zarzoso and Bengochea-Morancho 2004; Bassanini and Scarpetta 2002).

Following the works of Combes et al., (2012) and Acosta et al., (2009b) and extending the model proposed by Hassan and Holmes (2013), the long-run specification of the effects of remittances and financial development on real exchange rate appreciation is given by equation (1). This specification is unique as compared to the ones used in the aforementioned studies. It captures the key fundamentals explained in the literature, which affect the long-run behaviour of the real exchange rates. More importantly, it measures not only the role of financial development in shaping long-run movements of the real exchange rates but its interactive effect with the inflow of remittances in the recipient countries.

$$REER_{it} = \alpha_{0i} + \alpha_{1i}REM_{it} + \alpha_{2i}PROD_{it} + \alpha_{3i}GS_{it} + \alpha_{4i}TOT_{it} + \alpha_{5i}WI_{it} + \alpha_{6i}FD_{it} + \alpha_{7i}REM_{it} * FD_{it} + \mu_{it} \quad (1)$$

$$i = 1, \rightleftarrows 2, \dots N, \quad t = 1,2, \dots T,$$

$REER_{it}$ is a consumer price index based real effective exchange rates, REM_{it} is the remittances, $PROD_{it}$ is the productivity level, WI_{it}, is the world interest rates, GS_{it} is the level of government spending, TOT_{it} is the terms of trade, and FD_{it} is financial development.

The interaction term between remittances and financial development in equation (1) is expected to explain whether or not the marginal effect of remittances on real exchange rate appreciation declines with the degree of financial development. At the margin, the effect of inflow of remittances at a given level of financial development can be calculated by examining the partial derivatives of real exchange rate with respect to remittance variable (Baltagi et al., 2009). Based on equation (2) for example;

$$\frac{\partial REER_{it}}{\partial REM_{it}} = \alpha_1 + \alpha_7 FD_{it} \rightleftarrows \quad (2)$$

When the derivatives are positive, an increase in either remittances or financial development would then lead to more real exchange rate appreciation. This will only occur if α_1, and α_7 are all positive. If, on the other hand, one of these parameters is negative, whereas the other is positive, as suggested by our argument, the derivatives would need to be examined within the sample, given that they change with the degree of financial development. It requires the derivative of real exchange rate with respect to financial development to be negative at a given level of remittance for the financial development to effectively mitigate real exchange rate appreciation caused by the inflows of remittances.

Definition of Variables

Real effective exchange rate ($REER_{it}$) is a consumer price index based real effective exchange rate. It is defined as the nominal effective exchange rate (a measure of the value of a country's currency against a weighted average of several foreign currencies) divided by a price index. The real effective exchange rate measures the evolution of the real value of a country's currency against the basket of currencies of its trading partners (Darvas 2012). Therefore, an increase in the index of the real effective exchange rate in the remittance-recipient country indicates appreciation[5].

Remittances (REM_{it}) refer to the official workers' remittances and compensation of employees received by migrants' source countries divided by the population in the migrants' origin country. The inflows of these unrequited private transfers have an important effect on the movement of the long-run real exchange rates in remittance-receiving developing countries (Ball et al. 2012; Barajas et al. 2011; McCormick and Wahba 2000; Quibria, 1997). Like other forms of private transfers, the inflows of remittances increase the amount of disposable income available in the recipient country, which generates excess aggregate demand for traded and non-traded goods in the receiving countries. To restore internal balance, the relative price of non-traded goods must rise and hence appreciating the real exchange rate (spending effect). Consequently, the increase in the relative prices of non-traded goods caused by the inflows of remittances will create further reallocation of resources from the traded to non-traded goods sectors of the economy, which will further accelerate the appreciation of the real exchange rates. Thus, inflow of remittances is assumed to have a positive effect on the real exchange rate appreciation.

Productivity ($PROD_{it}$) this variable capture the well-known Balassa-Samuelson effects: the tendency for countries with higher productivity in traded goods sectors than in non-traded goods sectors to have higher price levels (Obstfeld and Rogoff 1996). International productivity differences may have important implications for real exchange rate movements. According to Balassa (1964) and Samuelson (1964), productivity growth is higher in the traded goods sector than in the non-traded and faster productivity growth in the former sector push up the relative prices of non-traded goods upward over time by raising wages. This increase in the price of non-traded goods due to rise in wages corresponds to real exchange rate appreciation. In other words, a rise in the productivity level has a

[5] A comprehensive explanation of the methodology used to construct this CPI based real effective exchange rate is given in Darvas. (2012).

positive impact on income level. This increase in income can generate additional pressure on the demand for non-traded goods. The increase in the demand may result in higher relative prices of non-traded goods, thereby appreciating the real exchange rates.

However, data on productivity growth across sectors of the economy are difficult to obtain particularly for developing countries (Combes et al., 2012). Thus, following (Amuedo-Dorantes and Pozo 2004 and Combes et al., 2012) this paper used country's real GDP per capita as a measure of variations in productivity levels in relation to advanced countries.

Government Spending, (GS_{it}) changes in government fiscal expenditures will have long-run effects on the movement of real exchange rate. For example, an increase in government spending on non-traded goods put upward pressure on their demand in the non-traded goods markets, leading to increase in their relative prices which culminate into an appreciation of the real exchange rate. In addition, if the rise in government spending was financed through public borrowing, the subsequent increase in taxes may reduce real income and lower demand for non-traded goods resulting in long-run real exchange rate depreciation (Edwards 1989). Therefore, the long-run impact of government expenditure may lead to either appreciation or depreciation of the real exchange rate, depending on the relative forces of substitution and income effects.

Terms of trade, (TOT_{it}) is the relative price of exports in terms of imports. An improvement in the terms of trade brought about by an increase in the price of a country's exports and consequently rising revenue and demand for non-traded goods, may result in real exchange rate appreciation. Similarly, a deterioration of the terms of trade brought about by an increase in the relative price of imports would lead to a rise in the demand for non-traded goods and consequently lead to an appreciation of the real exchange rate if the substitution effect dominates the income effect. Conversely, when the negative income effect dominates, a deterioration of the terms of trade may lower the demands for non-traded goods resulting in real exchange rate depreciation (Ostry, 1988).

World real interest rate, (WI_{it}) a rise in the world interest rate affects the price of non-traded goods if their production is labour intensive because a rise in world real interest rate increases the returns for capital and lowers the returns for labour. Given the fact that non-traded goods are labour intensive in developing countries, reduction in wages may lead to lower private consumption, thereby resulting in a decrease in the relative price of non-traded goods and real

exchange depreciation (Edwards 1989). On the other hand, a rise in the world real interest rate may also results in lower domestic capital stock, which may lead to a reduction in the level of production and output, thereby, exerting an appreciating effect on the real exchange rate (Gente and Leóne-Ledesma 2006).

Financial development (FD_{it}), inflows of remittances expand the level of deposits and credits intermediated by the banking sector (Aggarwal et al., 2011; Gheeraert et al., 2010). The ability of financial intermediaries to retain officially transmitted remittances as savings and converts them into formal investments and credits will mitigate the use of remittances for consumption by recipients, which generates excess demand for non-traded goods and consequent increases in their relative prices (Mundaca 2009). In other words, the real exchange rate appreciation that often accompanies the use of remittances in financing domestic consumption of non-traded goods can be attenuated by a developed financial sector in the recipient countries. This can be accomplished through improved mobilisation and allocation of remittances into productive sectors of the economy, which dampens their adverse effects on the real exchange rate appreciation (Acosta et al., 2009b; Bettin and Zazzaro 2011; Heng 2011).

Therefore, assuming that all the variables explained in the equation (1) are integrated process of order one for all individual countries, the error term is an *I*(0) process for all *i*. Taking the maximum lag equal to (11111111) based on Akaike Information Criterion, and assuming the ARDL equation can be given as shown below[6].

$$REER_{it} = a_i + \lambda_i REER_{it-1} + \beta_{10i} REM_{it} + \beta_{11i} REM_{it-1} + \beta_{20i} PROD_{it} + \beta_{21i} PROD_{it-1} + \beta_{30i} GS_{it} + \beta_{31i} GS_{it-1} + \beta_{40i} TOT_{it} + \beta_{41i} TOT_{it-1} + \beta_{50i} WI_{it} + \beta_{51i} WI_{it-1} + \beta_{60i} FD_{it} + \beta_{61i} FD_{it-1} + \beta_{70i} REM_{it} * FD_{it} + \beta_{71i} REM_{it-1} * FD_{it-1} + \mu_{it} \quad (5)$$

The error correction is given by

$$\Delta REER_{it} = \phi_i (REER_{it-1} - \alpha_{0i} - \alpha_{1i} REM_{it} - \alpha_{2i} PROD_{it} - \alpha_{3i} GS_{it} - \alpha_{4i} TOT_{it} - \alpha_{5i} WI_{it} + \alpha_{6i} FD_{it} - \alpha_{7i} REM_{it} * FD_{it}) + \beta_{10i} \Delta REM_{it} + \beta_{20i} \Delta PROD_{it} + \beta_{30i} \Delta GS_{it} + \beta_{40i} \Delta TOT_{it} + \beta_{50i} \Delta WI_{it} + \beta_{60i} \Delta FD_{it} + \beta_{70i} \Delta REM_{it} * \Delta FD_{it} + \mu_{it} \quad (6)$$

Where;

[6] The integration properties of these variables and their cointegration are examined and the results are included in Appendix: Table A.1 & A.2. All of the variables are integrated of order one; *I(1)*. However, Johansen Fisher Panel Cointegration test and Kao Residual Cointegration Test showed that these variables have a long-run cointegrating relationship.

$\varphi_i = -(1-\lambda); \alpha_{0i} = \frac{a}{(1-\lambda_i)}; \alpha_{1i} = \frac{\beta_{10i}+\beta_{11i}}{(1-\lambda_i)}; \alpha_{2i} = \frac{\beta_{10i}+\beta_{21i}}{(1-\lambda_i)}; \alpha_{3i} = \frac{\beta_{30i}+\beta_{31i}}{(1-\lambda_i)}; \alpha_{4i} = \frac{\beta_{40i}+\beta_{41i}}{(1-\lambda_i)}; \alpha_{5i} = \frac{\beta_{50i}+\beta_{51i}}{(1-\lambda_i)}; \alpha_{6i} = \frac{\beta_{60i}+\beta_{61i}}{(1-\lambda_i)}; \alpha_{7i} = \frac{\beta_{70i}+\beta_{71i}}{(1-\lambda_i)}.$ (7)

Data Sources

Data for the estimation of equation (1) above were sourced from the Bruegel database (http://www.bruegel.org/datasets/) and world development indicators (WDI) database World Bank (http://data.worldbank.org/data-catalog/world-development-indicators). The description, measurement and sources of data for each variable included in the estimation analysis is given in Table 1, below.

Table 1: Data Descriptions for Estimation of Effects of Remittances and Financial Development on Real Exchange Rates (Equation 1)

Variables	Descriptions	Measurements	Data Source
REER	Real effective exchange rate	CPI based real effective exchange rate	Bruegel database
TOT	Terms of trade	Net barter terms of trade index (2000=100)	WDI, World Bank
PROD	Productivity	GDP per capita (constant US$)	WDI, World Bank
WI	World interest rate	United States real interest rate	WDI, World Bank
GS	Government spending	Gross government final consumption expenditure (%GDP)	WDI, World Bank
REM	Remittances	Per capita Personal remittances received (current US$)	WDI, World Bank
FD	Financial development	Domestic credit to private sector (%GDP)	WDI, World Bank

Result and Discussion

The estimation analysis began with a preliminary examination of the dataset by presenting descriptive statistics, which displays the spread of the dataset. Moreover, correlation analysis and graphical plots of some of the key variables in the dataset were also made to identify any connections between the real exchange rate and remittances and financial development.

Table 2 presents the descriptive statistics of all the series in the dataset that were used to measure the impact of inflow of remittances and financial development on real exchange rate appreciation. The series show considerable variations both between and within the countries included in our sample. These characteristics of the dataset can be best analysed by employing a dynamic heterogeneous panel data estimation technique which allows variations of the short-run

parameters across the countries in the sample but restricts their long-run coefficients.

Similarly, Table 3 presents a simple correlation analysis of the series included in the sample dataset. The correlation coefficients turned out to be within the plausible ranges except in a few cases. For instance, a higher correlation coefficient 0.95 was observed between remittances and the direct interaction term (REM×FD). This is, however, not surprising as the latter variable was constructed by taking the product of the former and financial development. It suggests that it will be difficult to estimate the impact of remittances on real exchange rate independently of the interaction term.

Moreover, a relatively moderate correlation coefficient of 0.021 was observed between the remittances and orthogonalised interaction term (ŘEM×ҒD). The correlation between remittances and other predictors of real exchange rates in the dataset range between -0.17 to 0.51. This suggests that the remittance is less correlated with other control variables in the dataset.

Table 2: Summary of Descriptive Statistics (Observations = 522)

Variables	Unit of measurement	Mean	Overall Std. Dev.	Between Std. Dev.	Within Std. Dev.	Minimum	Maximum
Real exchang rate (real effective exchange rat index)	Foreign currency	112.328	41.909	24.502	34.339	51.129	574.174
Remittances (per capita)	current US$	52.944	100.055	92.203	41.741	0.062	655.726
Productivity (GDP per cap	constant US$	3101.675	4747.5	4523.238	1654.678	235.993	22236.02
Government expenditure	% of GDP	14.583	7.903	7.541	2.787	4.136	45.187
Terms of trade index	%	84.668	32.254	26.179	19.482	0.383	247.859
World Interest rates (United states)	%	5.186	1.929	0.231	1.919	0.556	8.722
Financial development (credit to privc sector)	% of GDP	44.791	35.544	31.978	16.986	0.963	165.719

Source: own estimation

In addition, the average of the data for each country included in the sample dataset was taken. This was done in order to present a graphical relationship between the real exchange rates and the inflow of remittances and financial development. Figure 1 depicts the plot of real exchange rates against remittances. Contrary to the notion that inflow of remittances appreciates the real exchange

rates, Figure 1 displays a negative relationship between the variables. This may imply that remittances lead to depreciation (instead of appreciation) of the real exchange rates in the recipient countries. Similarly, In figure 2, the graphical plot of the real exchange rates against financial development is given. The graph shows that the real exchange rate depreciates with an increase in financial development in remittance-receiving Asian countries. However, given the descriptive nature of this analysis, at this stage, it would be inappropriate to draw any conclusion on the actual relationship among these variables.

Table 3: Correlation Statistics (Observations =522)

	Real exchange rates (multilateral index)	Remittances	Productivity	Government Expenditure	Terms of trade	World interest rate	Financial development	Direct interaction term (REM×FD)	Orthogonalised interaction term (REM×FD)
Real exchange rates (real effective exchange rate index)	1.000								
Remittances	-0.162	1.000							
Productivity	-0.211	0.509	1.000						
Government expenditure	0.192	0.235	0.454	1.000					
Terms of trade index	-0.182	0.022	0.358	0.504	1.000				
World interest rate	0.255	-0.173	-0.133	0.039	-0.052	1.000			
Financial development	-0.124	0.253	0.502	0.231	0.172	-0.126	1.000		
Direct interaction term (REM×FD)	-0.188	0.951	0.600	0.280	0.071	-0.207	0.467	1.000	
Orthogonalised interaction Term (R̃EM×ƒD)	-0.233	0.021	0.408	-0.013	-0.059	-0.152	0.062	0.6542	1.0000

Source: own estimation

In Table 4, results of regression analysis for the effect of remittances and financial development on real exchange rate are presented[7]. As highlighted earlier, real effective exchange rate index in foreign currency was used as a dependent variable to measure the real exchange rate movements in response to the inflow of remittances and financial development. Therefore, an increase in the real exchange rate represents an appreciation. Accordingly, a positive

[7] Although both MG and PMG estimators were used to estimate the results, for the purpose of simplicity and clarity only the results of PMG estimations are presented in the result and discussion section of the paper. For comparison, the results of both MG and PMG are included in Table A.4 in the appendix.

(negative) coefficient shows that an increase in the independent variable causes a real exchange rate appreciation (depreciation).

Figure 1: Real Exchange Rates and Inflow of Remittances

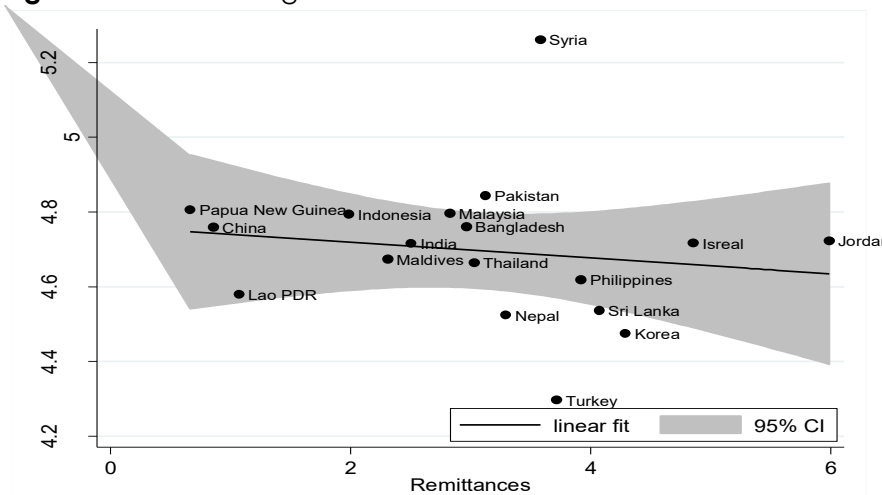
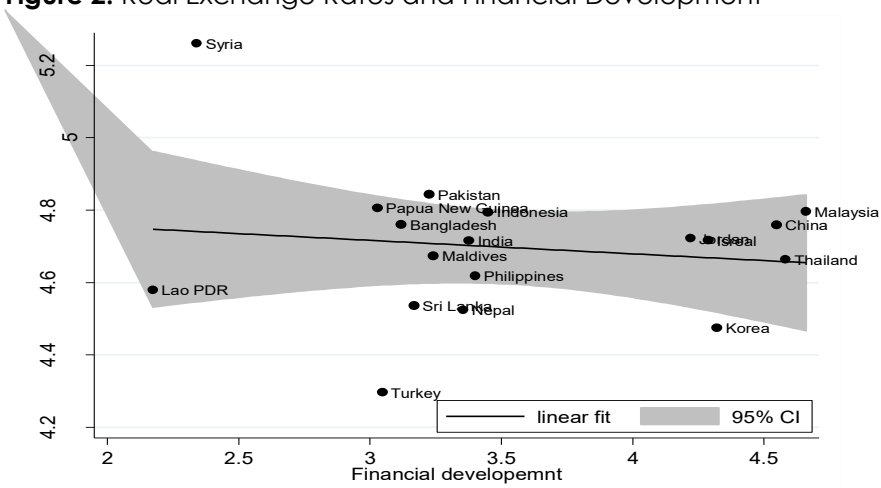


Figure 2: Real Exchange Rates and Financial Development



In Table 4, the imposed restriction of long-run homogeneity of all of the slope coefficients cannot be rejected at the conventional statistical level by the Hausman test statistics. In Column 1, the estimated result of the impact of remittances and financial development on real exchange rate was reported without including the interaction term using PMG estimator. Based on the result, inflow of remittances leads to the long-run appreciation of the real exchange rates in the recipient countries. However, the long-run real

exchange rate depreciates with an increase in financial development. In Table 4, Column 2, time dummies were included in the estimation to control for the 1997 Asian financial crisis and the 2008 global financial crisis. The result shows that a 1 percentage point increase in remittances, on average, causes the real exchange rates to appreciate in the long-run by 0.145 percentage points in remittance-receiving Asian countries. This result is statistically significant at a 1 per cent level.

Similarly, for a given amount of remittances, an increase in the level of financial development (measured by an increase in domestic credit to the private sector as a percentage of GDP) generates real exchange rate depreciation of -0.147 percentage point in the long run. This result is also significant at a 1 per cent level. This finding confirmed that the inflow of remittances is associated with real appreciation of the Asian countries' currencies in the long run. But the level of financial deepening in these countries leads to a depreciation of their real exchange rates in the long run.

Table 4: Result of the Effects of Remittance and Financial Development on Real Exchange Rate Appreciation

Long-run Coefficients	Column1	Column2	Column3	Column4	Column5
Remittances	0.151	0.145	0.068	0.090	0.094
	(0.028)***	(0.024)***	(0.020)***	(0.021)***	(0.021)***
Productivity	0.108	0.058	0.722	0.229	0.199
	(0.036)***	(0.015)***	(0.161)***	(0.106)**	(0.101)**
Government expenditure	-0.040	-0.010	0.537	1.160	1.124
	(0.098)	(0.059)	(0.132)***	(0.142)***	(0.140)***
Terms of trade index	-0.100	-0.305	0.094	0.209	0.217
	(0.049)**	(0.031)***	(0.025)***	(0.225)***	(0.022)***
World Interest rate	0.195	0.090	0.110	0.107	0.113
	(0.031)***	(0.021)***	(0.013)***	(0.012)***	(0.013)***
Financial development	-0.070	-0.147	-0.160	-0.146	-0.134
	(0.042)*	(0.024)***	(0.051)***	(0.039)***	(0.037)***
Remittance×Financial development			-0.022	-0.021	-0.022
			(0.007)***	(0.008)***	(0.008)***
Asian crisis (1997)		0.006	-0.077	0.016	0.016
		(0.028)	(0.051)	(0.027)	(0.027)
Global crisis (2008)		-0.013		-0.002	0.001
		(0.027)		(0.030)	(0.030)
Error correction adjustment	-0.148	-0.160	-0.172	-0.147	-0.148
	(0.033)***	(0.044)***	(0.054)***	(0.043)***	(0.043)***
Hausman test for long-run homogeneity	8.45	1.56	4.17	6.92	10.30
	[0.207]	[0.955]	[0.760]	[0.438]	[0.172]
Observations	522	522	522	522	522
Countries	18	18	18	18	18

Note: Time dummy was used for Asian and global financial crisis in the estimations. Values in parenthesis and square brackets are standard errors and p-values respectively. ***, **, * are levels of significance at 1%, 5% and 10% respectively. (Sample period 1981-2010).

In Table 4, Column 3, an interaction term[8] between remittances and financial development was introduced in order to examine whether the appreciation of the real exchange rate caused by the inflow of remittances decline with the degree of financial development in remittance-receiving Asian countries. In other words, the interaction term represents the long-run marginal effect of remittances on the real exchange rate given the degree of financial development in recipient Asian countries. Although, remittances have been found independently to generate real exchange rate appreciation in the long run, a priori, this paper has argued that such real appreciations can be mitigated in Asian countries with developed financial system. Estimating the econometric model, described in the equation (1), the long-run effect of remittances on real exchange rate appreciation was again found to be positive and statistically significant. However, the magnitude of the appreciation is lesser when compared with the estimated coefficient reported previously. A percentage point increase in per capita remittances now only results in real exchange rate appreciation of 0.068 percent in the long run. Also, the coefficient of the interaction term -0.160 turned out to be negatively significant at conventional levels. This suggests that countries with a certain degree of financial development offset long-run real exchange rate appreciation resulting from the inflow of remittances by funnelling remittance proceeds into the long-term productive investment.

In Table 4, Column 4, time dummies were used to control for the 1997 Asian financial crisis and the 2008 global financial crisis in the estimation analysis. The result of the estimation generally corroborates and confirms our previous findings. The magnitude of the impact of remittances on the real exchange rate appreciation now became even stronger. A percentage point increase in inflow of remittances appreciates the real exchange rate by 0.090 percent in the long run. In addition, the coefficient -0.146, which captures the marginal effect of remittances on the real exchange rate appreciation given the degree of financial development is still negative and statistically significant at conventional levels.

As earlier noted, the partial derivatives of the real exchange rate with respect to remittances can be examined using equation (2).

[8] The addition of direct interaction term (i.e. the product of workers' remittance and real exchange rate) in the estimated real exchange rate regression have led to the problem of multicolinearity as the interaction term was strongly correlated with the original variables used to construct it (see Table 3, for correlation statistics and Table A.3 in appendix A, for result of multicolinearity test). To solve the problem, the interaction term was orthogonolised as follows. Firstly, the direct interaction term REM×FD was formed by taking the product of workers' remittances (REM) and financial development (FD) and was regressed on the REM and FD variables. Secondly, residuals from this regression were obtained and used to represent the interaction term in the estimation (This technique was described by Burill 2007 and was also employed in Azman-Saini et al., 2010).

Specifically, the equation is evaluated using the estimated coefficients of these variables in Table 4, column 4, and a measure of financial development (domestic credit to private sector) at mean, minimum and maximum levels, obtained from the descriptive statistics given in Table 2. This was carried out in order to assess the merit of this paper's argument, that real exchange rate appreciation associated with the inflow of remittances depends on the degree of financial development in the recipient country.

The derivative of the real exchange rate with respect to remittances calculated at the mean level of financial development is -0.851, (0.090 – 0.021*44.791). The derivative of the real exchange rate with respect to remittances becomes -3.390 when calculated at a maximum level of financial development. This suggests that the capacity of financial development to mitigate real exchange rate appreciation increases with an improvement in the level of the financial system in remittance-recipient Asian countries. This is particularly, confirmed by the positive value 0.070 of the derivative of the real exchange rate with respect to remittances when evaluated at the minimum level of financial development. It implies that countries with a shallow level of financial development may not have the ability to offset or diminish real exchange rate appreciation resulting from the inflow of remittances.

Other covariates in the estimation result presented in Table 4, Column 4, also produced significant coefficients. A change in terms of trade was found to have positive long-run impact on real exchange rate appreciation. This implies that an improvement of the terms of trade brought about by either increase in the price of exports or decrease in the price of imported goods have appreciating effect on long-run real exchange rates. Similarly, an increase in productivity differentials generates long-run real exchange rate appreciation.

In line with the theoretical suggestions, we also found government consumption expenditure to have a positive impact on real exchange rate appreciation. This suggests that fiscal expenditure in remittance-receiving Asian countries are more geared toward non-traded than traded goods which consequently drives-up the relative prices of the former. Lastly, a rise in world interest rates was found to appreciate the average real currency of these remittance-receiving Asian countries in the long run. This is expected to occur if higher returns on investment abroad diminish domestic capital stock in these countries, thereby leading to a reduction in output and a rise in the price level which appreciates the real exchange rate.

Finally, the robustness of the hypothesis that financial development has the ability to reduce long-run real exchange rate appreciation caused by the inflow of remittances was re-examined. In Table 4, Column 5, an alternative measure of financial development (domestic credit to the private sector by banks as a percentage of GDP) was also considered in the estimation analysis. In the same way, the estimation results revealed that an increase in remittances triggered real exchange rate appreciation in the long run. However, the coefficient of the interaction term, which represents the marginal effect of remittances on the real exchange rate appreciation declines with the degree of financial development. This result further confirmed that the strength of the financial sector in directing remittances into productive investments in remittance-receiving Asian countries counteract their effect on real exchange rate appreciation in the long run.

Overall, the results support the hypothesis that inflow of remittances can generate long-term real exchange rate appreciation. But improved financial development can mitigate such real exchange rate appreciation and promote trade competitiveness in the remittance-receiving Asian countries. This finding is consistent with the results reported by Acosta et al., (2009b) who examined the short-term effects of remittances and financial development on real exchange rate. This paper extends their findings, by providing evidence of long-run significant effects of remittances and financial development on the real exchange rate appreciation in Asian countries.

Conclusion

Despite the growth of remittance flows into Asian countries, which placed the region at the top list of recipients in the world, there is limited empirical studies conducted on their effect on real exchange rates in the region. In this view, this paper examined the impact of remittances and financial development on real exchange rates in remittance-recipient Asian countries. The paper, specifically, questions whether the impact of remittances on real exchange rate appreciation varies with the level of financial development in these countries.

Based on a panel dataset for the period of 1981 – 2010 and pooled mean group (PMG) estimator, the estimated result shows that a percentage point increase in inflow of remittances appreciates the real exchange rate by 0.090 per cent in the long run. This means that inflow of remittances has long-run appreciating effect on the real exchange rate in these Asian countries. However, the impact is lesser in countries with better financial development as evidenced by the

negative and significant coefficient of the interaction term -0.146, which measures the interactive effects of remittances and financial development on the real exchange rates. This result is found to be robust when alternative measure of financial development is used in the estimation. In addition, the calculated derivatives of the real exchange rate with respect to remittances at the minimum, mean and maximum levels of financial development are 0.070, -0.851 and -3.390 respectively. This, also, confirmed that the effect of inflow of remittances on the real exchange rates depends on the degree of financial development. Therefore, countries with higher level of financial development can easily offset real exchange rate appreciation spawned by inflows of remittances.

From the policy viewpoint, the paper suggests that improving financial development can diminish or even offset real currency appreciation that accompanies inflow of remittances and enhance trade competitiveness in the remittance-recipient Asian countries.

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APPENDIX

Table A.1 Panel Unit Root Result of Workers' Remittances and Real Exchange Rate in Labour-Sending Asian Countries, 1981 – 2010.

Level	Levin, Lin & Chu	Im, Pesaran and Shin	PP - Fisher Chi-square
$REER_{it}$	0.300	1.226	24.122
REM_{it}	-0.870	0.678	26.956
$PROD_{it}$	14.589	1.343	291.400
GS_{it}	-0.299	0.147	30.292***
TOT_{it}	-2.441***	-1.273	48.817*
WI_{it}	-9.785***	-8.359***	11.022
FD_{it}	-0.686	-1.732	22.526
Diference	Levin, Lin & Chu	Im, Pesaran and Shin	PP - Fisher Chi-square
$\Delta REER_{it}$	-7.596***	-8.753***	501.603***
ΔREM_{it}	-5.543***	-8.870***	306.431***
$\Delta PROD_{it}$	38.511***	-7.138***	235.827***
ΔGS_{it}	-7.685***	-8.468***	277.079***
ΔTOT_{it}	-8.528***	-10.315***	953.585***
ΔWI_{it}	-11.474***	-7.812***	142.976***
ΔFD_{it}	-5.557***	-6.047***	167.693***

Note: Automatic lag length selection is used based on Newey-West automatic bandwidth selection and Bartlett kernel. Values reported are t-statistic and null hypothesis is nonstationarity. ** and *** indicates significance at 1% and 5% levels.

Table A.2 Cointegration Test Results of Workers' Remittances and Real Exchange Rate in Labour-Sending Asian Countries

Johansen Fisher Panel Cointegration Test (1981-2010)				
Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	719.4	0.000	459.0	0.000
At most 1	454.8	0.000	216.4	0.000
At most 2	312.6	0.000	172.2	0.000
At most 3	242.3	0.000	140.6	0.000
At most 4	137.1	0.000	101.8	0.000
At most 5	67.69	0.001	61.70	0.005
At most 6	46.38	0.115	46.38	0.115
Note: the test includes intercept and trend. The optimal lags interval (in first differences) is 11				
Kao residual cointegrtion test		**t-statistics**	**-2.286****	

Null Hypothesis: No cointegration. Trend assumption: No deterministic trend. Lag length: 1

Table A.3 Multicolinearity Test (Observations = 522)

Variable	VIF	1/VIF
Direct interaction term (REM×FD)	25.81	0.038744
Remittances	22.48	0.044478
Financial development	2.69	0.372420
Orthogonalised interaction term(ŘEM×ƑD)	2.50	0.399878
Productivity	2.29	0.436856
Government expenditure	1.71	0.584655
Terms of trade index	1.47	0.682533
World interest rate	1.08	0.928732
Mean VIF		7.50

Table A.4 List of Remittance-Recipient Asian Countries Used in the Estimation Analysis and their Private Capital Flows in 2010

S/N	Country	Workers' Remittances (% of GDP)	Foreign Direct Investment (% of GDP)	Net Official Development Assistance (% of GNI)
1	Bangladesh	10.81	0.91	1.29
2	China	0.89	3.12	0.01
3	India	3.21	1.43	0.17
4	Indonesia	0.98	1.94	0.20
5	Israel	0.65	2.37	-----
6	Jordan	13.31	6.25	3.64
7	Korea, Rep.	0.86	-0.01	-----
8	Lao PDR	0.57	3.88	6.16
9	Lebanon	19.38	10.97	1.16
10	Malaysia	0.55	3.86	0.0009
11	Nepal	21.66	0.55	5.07
12	Pakistan	5.48	1.14	1.64
13	Papua New Guinea	0.16	0.31	5.52
14	Philippines	10.73	0.65	0.27
15	Sri Lanka	8.38	0.96	1.18
16	Syria	2.78	2.48	0.24
17	Turkey	0.12	1.24	0.14
18	Thailand	0.55	3.04	-0.004

Source: World Development Indicators.

Table A.5. Pooled Mean Group Estimations Result of the Impact of Workers' Remittance on Real Exchange Rate (Complete Results**)**

Long-run Coefficients	PMG1	MG1	PMG2	MG2	PMG3	MG3
REM_{it}	0.151 (0.028)***	0.142 (0.138)	0.145 (0.024)***	0.216 (0.212)	0.068 (0.020)***	0.271 (0.507)
$PROD_{it}$	0.108 (0.036)***	-0.168 (0.419)	0.058 (0.015)***	-0.169 (0.652)	0.722 (0.161)***	0.092 (0.478)
GS_{it}	-0.040 (0.098)	0.718 (0.266)***	-0.010 (0.059)	0.379 (0.201)*	0.537 (0.132)***	0.530 (0.458)
TOT_{it}	-0.100 (0.049)**	-0.319 (0.129)**	-0.305 (0.031)***	-0.240 (0.151)	0.094 (0.025)***	-0.289 (0.246)
WI_{it}	0.195 (0.031)***	0.128 (0.029)***	0.090 (0.021)***	0.111 (0.034)***	0.110 (0.013)***	0.227 (0.068)***
FD_{it}	-0.070 (0.042)*	-0.145 (0.079)*	-0.147 (0.024)***	-0.235 (0.158)	-0.160 (0.051)***	-0.026 (0.179)
$REM*FD_{it}$ (Orthogonalised)					-0.022 (0.007)***	-0.026 (0.163)
Asian crisis (1997)			0.006 (0.028)	0.019 (0.015)	-0.077 (0.051)	-0.099 (0.515)*
Global crisis (2008)			-0.013 (0.027)	-0.012 (0.028)		
Error correction adjustment	-0.148 (0.033)***	-0.474 (0.054)***	-0.160 (0.044)***	-0.463 (0.069)***	-0.172 (0.054)***	-0.612 (0.103)***
Hausman test for long-run homogeneity	8.45 [0.207]		1.56 [0.955]		4.17 [0.760]	
Observations	522		522		522	
Countries	18		18		18	

Note: Time dummy were used for Asian and global financial crisis in the estimations. Values in parenthesis and square brackets are standard errors and p-values respectively. ***, **, * are significance levels at 1%, 5% and 10% respectively. (Sample period 1981-2010).

Table A.5. Continued.

Long-run Coefficients	PMG4	MG4	PMG5	MG5
REM_{it}	0.090 (0.021)***	0.679 (0.418)	0.094 (0.021)***	0.793 (0.496)
$PROD_{it}$	0.229 (0.106)**	-0.353 (0.568)	0.199 (0.101)**	-0.477 (0.535)
GS_{it}	1.160 (0.142)***	-0.322 (0.601)	1.124 (0.140)***	-0.922 (1.048)
TOT_{it}	0.209 (0.225)***	-0.122 (0.227)	0.217 (0.022)***	-0.071 (0.205)
WI_{it}	0.107 (0.012)***	0.120 (0.119)	0.113 (0.013)***	0.077 (0.129)
FD_{it}	-0.146 (0.039)***	-0.251 (0.542)	-0.134 (0.037)***	-0.215 (0.268)
$REM*FD_{it}$ (Orthogonalised)	-0.021 (0.008)***	-0.200 (0.114)*	-0.022 (0.008)***	-0.263 (0.179)
Asian crisis (1997)	0.016 (0.027)	0.020 (0.025)	0.016 (0.027)	0.014 (0.018)
Global crisis (2008)	-0.002 (0.030)	-0.008 (0.018)	0.001 (0.030)	-0.062 (0.059)
Error correction adjustment	-0.147 (0.043)***	-0.428 (0.201)**	-0.148 (0.043)***	-0.483 (0.163)***
Hausman test for long-run homogeneity	6.92 [0.438]		10.30 [0.172]	
Observations	522		522	
Countries	18		18	

Note: Time dummy were used for Asian and global financial crisis in the estimations. Values in parenthesis and square brackets are standard errors and p-values respectively. ***, **, * are significance levels at 1%, 5% and 10% respectively. (Sample period 1981-2010).