Effects of Remittances on Inflation and Real Exchange Rate in South Asia

Mukti P. Upadhyay[17]

Eastern Illinois University

Kamal Upadhyaya[18]

University of New Haven

1. Introduction

Remittances received from workers working abroad have grown at a rapid pace over the last three decades in South Asia. In U.S. dollar terms, remittances as a percentage of GDP during the last ten years, for example, have risen in all countries but more dramatically in Nepal, Bangladesh and Pakistan. Phenomenal growth of remittances in Nepal during 2000s has raised their share in GDP to about 22 percent in 2010. Sri Lanka has always enjoyed relatively large remittances, as a proportion of GDP. Finally, India remains the largest recipient of remittances in the world in monetary terms, but because of its rapid growth in GDP, its remittances show only a modest rise relative to GDP.

Table 1: Selected Macroeconomic Indicators in South Asia, 2000-2010

Indicator	Bangladesh	India	Nepal	Pakistan	Sri Lanka
GDP grth (%)*	5.8	7.8	3.9	4.6	5.2
GDP pc grth (%)*	4.4	6.2	1.8	2.7	4.0
Remit/Pop ($)					
2000	15.2	12.7	4.6	7.4	62.2
2010	78.0	46.1	115.8	55.8	199.2
Remit/GDP (%)					
2000	4.3	2.8	2.1	1.5	7.1

[17] Corresponding author; Professor, Eastern Illinois University, 217-581-3812, mpupadhyay@eiu.edu

[18] Professor, University of New Haven.

2010	10.9	3.1	21.7	5.6	8.4
Ext.Dbt/GDP (%)					
2000	31.8	22.0	52.2	44.8	56.8
2009	24.0	18.2	28.7	31.3	41.5
Other Indicators:					
Inflation (%)	6.5	6.3	6.7	8.8	10.6
RER appr. (%)	1.0	3.5	1.8	-0.3	3.8

*: Total and per capita GDP measured in local currency.

Two interesting indicators in Table 1 that may have some relation with remittances are home inflation and the real exchange rate of the local currencies. Despite the fact that inflation in the global economy in general fell during 2000s, inflation in South Asian countries have remained moderately high in a sustained fashion and have not fallen much if at all from the preceding decade. One question we try to address in this paper is what role remittances play in inflation. A recent paper by Narayan et al. (2011) finds that remittances do generate inflation in their sample of 54 developing countries. The paper claims that the effect of remittances is even more pronounced in the long run.

The inflationary effect of remittances occurs through a change in both aggregate demand and aggregate supply. Larger remittances increase net foreign assets, monetary base, and money supply unless the central bank engages in a sterilization policy to offset monetary expansion. A rise in demand puts pressure on the prices of nontradables, and thereby on overall price level, causing the real exchange rate to appreciate. Under fixed exchange rates, prices go up as resources move from tradables to nontradables. A contraction in the country's tradables sector could cause the currency depreciation under flexible rates, but since the exchange rate does not move, the burden of adjustment to the shock is borne mainly by the price level.

If a country follows the flexible exchange system on the other hand, the increased supply of foreign currency reduces its value causing appreciation of the home currency. The exchange rate adjusts faster without an adequate initial adjustment in the domestic price level. The appreciation of the nominal exchange rate boosts demand which then raises the prices of nontradables to cause an appreciation of the real exchange rate.

It is thus apparent that remittances (and similarly other types of inflows of foreign money) will have an effect on both inflation and the real

exchange rate of the home currency. We explore these dual effects of remittances in South Asian economies.

2. The Model

2.1 Determinants of inflation:

Theoretical relationship of inflation with remittances may not run parallel to its relation with other types of receipts of foreign exchange. Exports result from higher levels of productive capacity and domestic employment while remittances resemble more as a "gift" from foreign countries. Remittances have a natural bias toward increased consumption or consumption smoothing and toward poverty alleviation rather than investment. This is one reason why the impact of remittances on economic growth has been hard to determine in the literature (Barajas et al., 2009). Thus a larger effect on aggregate demand without a concomitant increase in domestic production tends to raise price level.

A pickup in an economy's growth rate will dampen inflationary trend holding any offsetting policy variables constant. We therefore control for the growth of real GDP. Another relevant variable in a study of inflation would be openness. Greater trade openness is likely to bring domestic inflation closer in line with foreign inflation (Romer, 1993). Such considerations may have less relevance for countries (such as Nepal) that depend for their trading relations considerably on large neighbors, particularly if inflation in these neighbors is misaligned from inflation in the world economy as a whole.

Fiscal theory of the price level holds that the real value of an unsustainable government debt will be forced down through inflation (Sims 1994, Woodford 2001). While this theory has been criticized (Buiter 2002, among others), a shorter maturity of rising government debt is more likely to be inflationary than the debt that will mature farther in future. We control for the size of external debt as a percentage of GDP to check if a rise in such a debt will cause inflation so that the government can reduce the burden of its internal debt. A large and rising current account deficit (as a percentage of GDP) that can be brought about by monetary expansion can also lead to higher inflation according to the monetary approach to the balance of payments.

Finally, empirical studies indicate that current inflation may depend on past inflation because of inertia. Recent experience with inflation can cause inflationary expectations for future under adaptive expectations.

This is also a likely scenario for South Asia where inflation rates have generally remained higher than the average inflation in the rest of the world.

The theoretical considerations made above lead to the following empirical model for inflation:

$$\pi_{i,t} = \beta_0 + \beta_1 remit_{i,t} + \beta_2 ygrth_{i,t} + \beta_3 \log e_{i,t} + \beta_4 trdgdp_{i,t} + \beta_5 dbtgdp_{i,t} + \beta_6 cagdp_{i,t} + \beta_7 \pi_{i,t-1} \quad (1)$$

where π = inflation, remit = worker's remittances, *grth* = annual growth of real GDP, *e* = nominal exchange rate (amount of foreign currency that a unit of local currency can purchase), *trdgdp* = trade to GDP percentage, *dbtgdp* = external debt to GDP percentage, *cagdp* = current account balance as a percentage of GDP, and the subscripts *i* and *t* stand for country and year.

2.2 Determinants of Real Exchange Rate

Relative to some high inflation economies around the developing world, countries in South Asia have experienced moderate inflation over the last two to three decades. A possibly more relevant candidate for the impact of remittances in these countries may be the real exchange rate. Real exchange rate is simply the nominal exchange rate adjusted for home to foreign price ratio. A significant appreciation of the real exchange rate makes the home goods more expensive relative to foreign goods, discourages foreign demand for home goods and encourages imports. This can lead to a significant deterioration in a country's current account balance and an undesirable rebalance of tradables-nontradables production. What role do remittances play in the evolution of the real exchange rate then becomes an empirical question.

Apart from remittances, several other factors can affect the real exchange rate. To begin with, it needs to be emphasized that if purchasing power parity (PPP) holds for a country, the real exchange rate will remain stable. But most empirical studies show that PPP is seldom true in the short to medium run and does not hold in many cases even in a longer run. This makes identification of factors that cause deviations of the real exchange rate from PPP an important task. Our main hypothesis is that a greater flow of remittances will make home currency stronger in real terms. To examine this claim, we must control for other factors that influence real exchange rates.

The Balassa-Samuelson model, for instance, states that if a country has higher productivity in its tradables sector than the productivity in its

trading partners, its wages will rise causing the prices of nontraded goods, and hence the overall price level, to go up. The real exchange rate will therefore appreciate. This is shown by the following equation:

$$\frac{\Delta q}{q} = s\left(\frac{\Delta A}{A} - \frac{\Delta A^*}{A^*}\right) \tag{2}$$

where q is the real exchange rate (price of home goods in terms of foreign), s is the share of nontraded production in the country's total output, A is the productivity of labor (or in general resources) productivity, and the asterisk shows the partner country numbers. Note that tradables prices are determined in the world markets, hence a higher wage in the country must raise the price of nontradables causing real exchange appreciation. Since the national productivity figures or even those by major sectors are not available for South Asian economies, we proxy this variable by real GDP per capita.

The real interest rate differential is another variable with a potentially significant effect on the real exchange rate. A high domestic interest rate relative to foreign can attract foreign money and induce an appreciation of RER. Similarly, terms of trade shocks, such as a significant increase in the price of the country's major exports could drive the RER upward.

Another important determinant of RER could be fiscal policy. If a large budgetary expansion occurs to benefit the nontradables sector the most as is likely to be the case for countries in South Asia, it will raise the RER. Finally, depending on the way money received through foreign aid gets spent, the aid variable could also have an independent influence on RER. Thus we also control for foreign aid as a fraction of GDP in our model of RER.

The RER model can be represented in terms of equation (3) below:

$$q_{i,t} = \gamma_0 + \gamma_0 rmtpc_{i,t} + \gamma_0 prodif_{i,t} + \gamma_0 rdif_{i,t} + \gamma_0 terms_{i,t} + \gamma_0 g2y_{i,t} + \gamma_0 aid2y_{i,t} + \varepsilon_q \tag{3}$$

where q is the real exchange rate, $q=e\bullet P/P^*$, where e is the nominal exchange rate, i.e., the amount of foreign currency per unit of domestic currency, *rmtpc* = remittances per capita, *prodif* = productivity differential (home minus foreign), *rdif* = real interest rate differential (home minus foreign), *terms* = terms of trade (export prices over import prices), *g2y* = government expenditure as a percentage of GDP, and *aid2y* = foreign aid received as a percentage of GDP.

3. Results

Our dataset was compiled from the World Development Indicators, the International Financial Statistics, and some country sources. We estimate our model for Bangladesh, India, Pakistan and Sri Lanka. Nepal is dropped because of a small number of data points (16) for remittances. Our variables are measured either as growth rates or as logarithms of original values. The mean and median are close together and both skewness and kurtosis are close to their values for a normal distribution.

3.1 Inflation:

Our inflation model does not perform well when tested against the annual time series for each country separately. The growth of remittances has a positive sign but comes out statistically insignificant in all countries even at the 10 percent level. Real GDP growth also fails to have a significant influence on inflation. The external debt to GDP ratio and the trade share in GDP are also not significantly correlated with inflation. The only factor that shows significance for one country (Pakistan) is the current account balance whose coefficient is 0.0097 which implies that a one percentage point increase in the current account to GDP ratio is associated with about a one percentage point decrease in inflation.

It seems that there may be an omitted variable bias with respect to these results. The constant term is significant for all countries except Bangladesh. It is possible that inertial inflation while stronger in a monthly or quarterly model can be important in an annual model as well. So we include the one-year lagged inflation as an additional term in the last model. However, the results continue to show a similar pattern in terms of the direction of effects and statistical significance. Even worse is the adjusted R^2 which, except for Pakistan, is lower for all countries, and is negative for Sri Lanka. A rise in inflation in the last period raises Pakistan's inflation this period by about a quarter (27 percent). In addition, the current account balance for this country continues to have a negative sign (with a coefficient of −0.0077) with a high statistical significance.

It is possible that remittance growth by itself may not have as direct an effect on inflation as the growth of remittances relative to the size of the economy. If remittances rise faster than GDP, the excess aggregate demand could potentially pull inflation higher. We therefore replace the remittance growth with the growth of remittances as a percent of GDP. The new variable fails to be statistically different from zero nor does it make any important changes in the size or significance of other explanatory variables.

As mentioned earlier, the size of our sample stays within 30 observations per country. By pooling observations we can raise the sample to four times as much. Any bias resulting from country-specific features of data can be removed by using a fixed-effects model. An FE model directly controls for the characteristics unique to a country and prevents their effects on the included right hand side variables. On the other hand, if excluded country characteristics have a random element in them, the random-effects estimation becomes more appropriate for country intercepts.

The Hausman statistical test indicates that we cannot reject the null hypothesis that the difference between the two models is not systematic. This means we accept the random effects model for its efficiency. This conclusion remains valid whether or not we include the lagged inflation term in the regressions. Yet the model without the one year lag of inflation performs slightly better in other respects.

Further, we use the panel generalized least squares method that corrects for autocorrelation as well as the lesser problem in our data of heteroscedasticity. The results show that growth of remittances is positively correlated with inflation with the coefficient significant at the 5 percent level. However, the size of the effect is not very large. Even a doubling of remittances, holding other factors constant, is likely to lead to an increase in the mean inflation from 8.8 percent we observe in our sample to 11.5 percent. If remittances continue to grow by 14 percent a year which has been the rate of growth during our sample period, inflation rate rises by about 0.4 percentage point per year.

Furthermore, we do not find this result to be very robust. For instance, instead of the dollar growth of remittances, if we use the growth of remittances relative to GDP, the significance of its coefficient falls by a large amount with the *p* value now rising to 20%. Overall, remittances seem to correlate positively with inflation in South Asia although they do not provide a dominating influence on inflation in the region.

3.2 Real Exchange Rate:

We examine both the levels and the changes in RER. We find that remittances do not exert a statistically significant effect on the RER for any country other than Pakistan. The sign of the remittance coefficient is negative for Bangladesh and Sri Lanka and positive for India and Pakistan.

In the context of our relatively small samples, however, the real exchange rates do not seem to depend either way on remittances according to individual country data. Country-specific results also reveal that different factors are associated with currency appreciation. In Bangladesh,

for instance, coefficients for all the non-remittance variables are marginally significant between 10 and 15 percent levels. Results for India show that greater inflows of foreign aid significantly contribute to the RER appreciation whereas in Pakistan positive terms of trade shocks provide such an impact. These effects are as expected. However, Sri Lanka is different from other countries in that unlike our expectations the terms of trade shocks are inversely related and a rise in the foreign interest rates is positively associated with the real exchange value of its home currency.

The question of nonstationarity in the time series data can be important. But the rather small sample for each country in our data means that the unit root tests have low power. The conventional tests do indicate the presence or near presence of a unit root but a definitive answer is not available for our data. On the other hand, the series are clearly stationary in their first differences. Hence it is possible to perform a cointegration analysis to see dynamics of adjustment of the real exchange rates towards their long-run values.

Once again, however, the lack of certainty about the presence of nonstationarity leads us to favor instead the regression of a change in the real exchange rate on changes in our explanatory variables. Such an exercise exhibits some interesting results although remittances continue to fail the significance test at 10 percent or better. In all countries the domestic minus foreign productivity differential has a significantly positive relationship with the real exchange rate. A one percent advantage in home productivity leads to between 2 percent (Bangladesh) and 3 percent appreciation in the exchange rate. Government spending increases raise RER in India whereas home to foreign interest rate differential makes a significantly positive impact in Bangladesh. Other external variables, such as terms of trade shocks or aid to GDP ratio, fail to make any impact on RER in our model of first differences.

Panel data: To compensate for small sample from individual countries, we turn to a panel model for our four countries based on our annual time series. We control for the country-specific characteristics that may affect RER, but we let the data choose the fixed-effects or the random-effects model as a better representation of reality. The simple Hausman test shows that differences in the coefficients for the two models are not systematic which means we can opt for the random-effects model for its higher efficiency. A panel GLS estimation does not, however, produce results that are remarkably different from those of country-specific studies done separately. Remittances seem positively correlated to RER but their

coefficient fails the 10 percent significance test. And the variable that is most influential continues to be the real interest rate differences.

4. Conclusion

The basic conclusion that emerges from our study is that neither inflation nor remittances are significantly influenced by remittances received. Anecdotal evidence does suggest that in selected cities and villages the effects of remittances seem strong, particularly in the level of consumption and some aspects of human capital accumulation in the recipient households. However, without further analysis we are unable to verify undesirable outcomes for inflation or real exchange rate in South Asia.

This indicates that more econometric analysis may have some payoffs. For example, we could formulate a simple recursive structure for our model by determining inflation first which then will feed into the real exchange rate, since RER is nothing but the nominal rate adjusted for the price differences between a country and its trading partners.

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