Remittances and Dutch Disease in Pakistan- a Bayesian Approach

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Abstract

Pakistan has over the years been one of the major remittances receiving countries, getting as much as 10 per cent of its GDP as remittances. Remittances have regularly surpassed public and private foreign capital inflows. This has helped cover the country's chronic current account deficit and expanded the economy while at the same time, contributing to the revenues of the local households. However, theory suggests the potential deleterious effects of remittances in the form of the Dutch disease, which entails a substantial increase in capital inflows making an economy less competitive, characterized by the appreciation of the real exchange rate and the enlargement of non-tradable goods and services sector at the cost of the tradables sector. The question as to whether this has been the case with Pakistani economy has yet not been solved. This paper is an attempt in this regard. The paper studies the macroeconomic impact of worker remittances and official assistance over the real equilibrium exchange rate in Pakistan during the last thirty years. Considering the paucity of available data that makes the use of a standard econometric technique for a robust empirical analysis difficult, we employ a non-informative Bayesian analysis through the Markov Chain Monte Carlo method via the Gibbs algorithm simulation. The analysis helps us simulate the posterior distribution of the parameters given the observed data. This allows us to tackle the loss of digrees of freedom that an empirical analysis of a short time period suffers from besides encorporating our prior beliefs on the studied model. The paper finds that the remittances do cause an appreciation of the real exchange rate, hence making the country's exports less competitive while inflating the local non-tradables sector. Official development assistance, on the other hand, does not cause the Dutch disease. The findings suggest that reliance on the remittances for macroeconomic stability may not be a pertinent strategy in the long term, and the loss of competitivity of the economy requires a rethink of the economic policies to better absorb the high level of remittances inflows.

***Keywords**: Remittances; Real Exchange Rate; Dutch Disease; Bayesian Analysis; Gibbs Algorithm; Pakistan*

JEL Classification: F40, F41, O10

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1) Introduction

Remittances to Pakistan have seen a sharp and sustained rise in the recent years, increasing from under $1 billion in 1999 to over $7 billion today. This has not gone without leaving its macroeconomic impact. Anecdotal evidence points to links with rise with higher price levels, fewer productive investment opportunities for the local population and added reliance on imports besides growing lack of productivity of the export sector (State bank of Pakistan 2007). The launch of Pakistan Remittances Initiative (PRI) in 2009 for attracting more remittances in order to cover the chronic current account deficit can exasperate these adverse effects.

Countries tend to have different impact of remittances owing to their size of the economy, population, social habits and economic policies. These impacts, to certain extent, are contingent upon the developing country's exchange rate policy. Any study of the impact of worker remittances on a developing economy can thus not be complete without taking into consideration its monetary policy, and hence the role of the central bank.

Remittances are often an important source of foreign exchange for developing countries, often more than FDI and ODA. Their potential positive effects include lower poverty among the receiving households, higher consumption of consumer items and services and reduced dependence on other, potentially less reliable capital inflows. Workers tend to remit more to the home country in the time of economic distress to sustain their families, and thus preventing their basic consumption from falling. Yang (2004), for instance, finds an increase in remittance inflows to the Philippines during the 1997 Asian financial crisis.

Remittances can however make a developing economy less competitive, a phenomenon known as the Dutch disease characterized by substantial capital inflows (e.g. revenue from natural resources, remittances etc) leading to a progressive decrease in competitivity of the tradable sector at the cost of an expanding non-tradable one. (Singer 2008) shows that worker remittances contribute in the choice of exchange rate regime. Remittances to the developing countries may cause a decline in their competitivity. For example, in their study of 13 Latin American and Caribbean countries, Amuedo -Dorantes & Pozo (2004) find that a 100 percent rise of remittances cause the real exchange rate to appreciate by 22 percent. Similarly, Bourdet and Falck (2006), in their empirical analysis of the Cape Verdean economy, find evidence of negative effects of remittances and official development assistance on the country's competitivity. Acost et al (2008) examine a panel of 109 developing countries for the period of 1990 to 2003 and find that such capital flows from abroad help the exchange rate go up.

Remittances have also been associated with declining competitivity through a decrease in the labour supply in the remittance-receiving country (Kim, 2006, Maurizio and Denis, 2007, Rodriguez and Tiongson, 2001). However, there is no consensus on the deleterious effects of remittances. Mongardini and Rayner (2009) look for the impact of worker remittances in Sub-Saharan Africa, and find no link with rise in exchange rate. Grabel (2008) suggests that the impacts of remittances in the short term are similar to those of other financial inflows, with the differences mostly due to different economic policies.

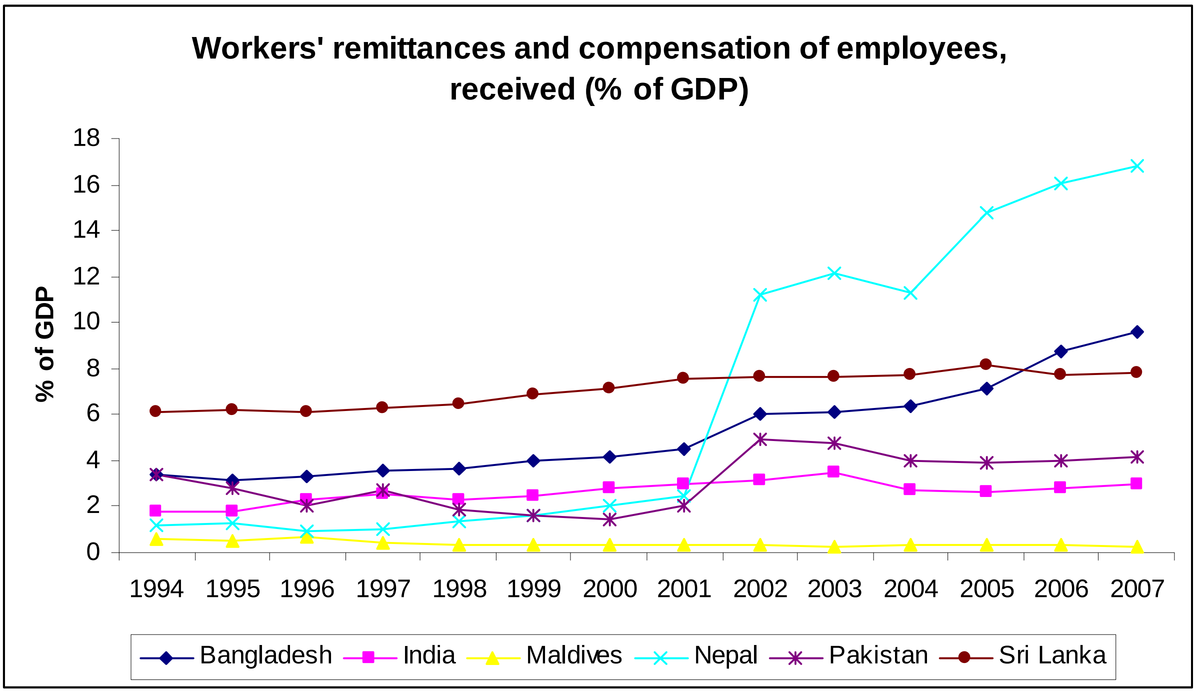
Due to these opposing interacting forces, the impact of remittances on growth is ambiguous. Stark and Lucas (1988), Faini (2002), and Garcia and Lynn Kennedy (2009) among others find a positive effect on growth, while on the other hand, Chami et al (2003) and Ramiez and Sharma (2006,2008) find a negative relationship between remittances and economic growth.

This paper attempts at studying the phenomenon in the context of Pakistan economy, looking for evidence of the Dutch disease. Did the rising stream of remittances make the Pakistani economy less competitive? Which have been the channels of macroeconomic interaction with remittances? To answer these questions, we examine the impact of worker remittances and ODA on the country's real exchange rate, from the 1970s, when Pakistan first began receiving remittances in a considerable amount till the 2000s, when in the aftermath of 9 11, tighter controls on money transfers led to a rapid growth in worker remittances sent through official channels. Given that the State Bank of Pakistan manages the official exchange rate, keeping the Rupee in a managed float, our study of remittances inflows must take into account the official exchange rate policy. Therefore, we employ non-informative Bayesian analysis to introduce this information. The rest of the paper is organized as follows: In section 2, we describe some salient features of the Pakistani economy during the period in study. Section 3 presents the model and describes the econometric technique used, followed by the results and their interpretation in section 4. Conclusions and policy recommendations follow.

2) Remittances and the Exchange rate of Pakistan: Some Stylized facts

Pakistan is one of the significant remittance receiving countries in Asia. An estimate of the number of overseas Pakistanis ranges from the official 4 million to the anecdotal 5 to 6 million to the more speculative 8 to 10 million. The major concentrations of the diaspora are found in Saudi Arabia (1.1 million), the United Kingdom (800,000), the United States (600,000), the United Arab Emirates (500,000) and Canada (250,000). Pakistanis resident in these five countries constitute more than 80 percent of the overseas Pakistani population Oda (2009). Historically, remittances sent by the overseas Pakistanis have ranged between 2% and 10% of the Pakistani GDP, which compares favourably with other foreign capital inflows, as well as with many developing countries. The following graph depicts remittances flows to Pakistan and other South Asian countries

Figure1: Remittances to South Asian countries 1994-2007

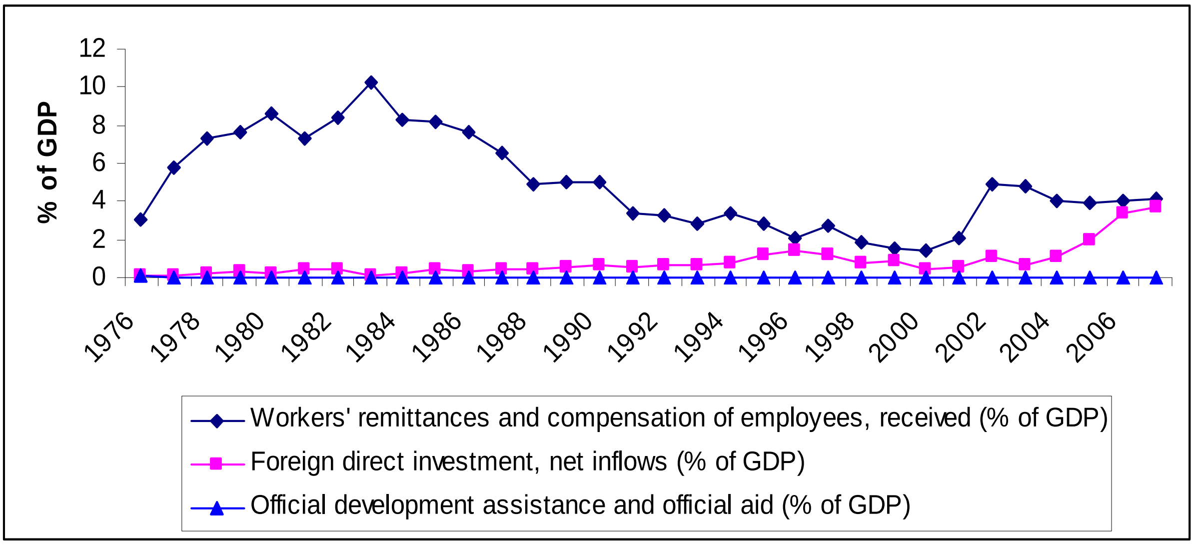


Source: WB Online 'World Development Indicators'

China and India are on top of the list of remittances receiving countries with 9% of the global share**.** For South Asian countries, the share of remittances in the GDP has evolved greatly in the last decade. It remained relatively stable between 1994 and 2001, when it began a rapid climb, particularly in case of Pakistan and Nepal. Beside the curbs on illegal money transfer mechanisms, called Hundi or Hawala, fears among the migrants in the Western countries, such as stricter scrutiny of their capital investments, risk to life or property etc convinced them to transfer their savings back home. Strengthening currencies, booming real estate sector and well performing stock markets, particularly in case of Pakistan and India also played their role. Pakistan’s official remittance receipts grew from under $1 billion in the year 2000 to over $7 billion in 2009. Though the receipts from all the destinations have been substantial, remittances from the United States have risen the most, from a mere $73.3 million in 2000 to over $1.7 billion.

This boom has taken the share of remittances in the Pakistani economy to the highest levels since the late 1970s and early 1980s, when high labour demand ensuing a construction boom in the Persian Gulf had led to a remittances bonanza, even surpassing the export receipts in 1983 (figure 2)

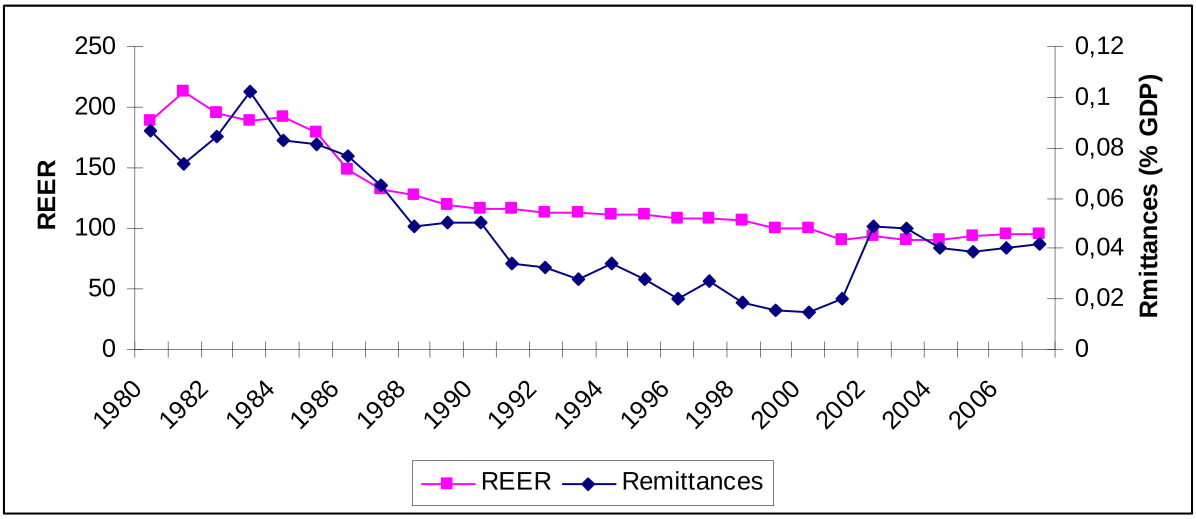
Figure2: Capital inflows to Pakistan



Source: WB Online ‘World Development Indicators’

Remittances, being such a substantial source of foreign capital must have some effect on Pakistan's exchange rate. This raises the possibility of the economy facing the Dutch disease. A cursory look at figure 3 shows a correlation between the remittance flows and the Real Effective Exchange Rate (REER) of Pakistani Rupee. This relationship is regardless of the fact that the central bank, the State Bank of Pakistan (SBP), follows a managed float policy, keeping the Rupee loosely associated with the US Dollar while keeping an eye on the currencies of other competitor economies such as India and Bangladesh. This involves loosening or tightening the monetary policy as required, through sterilization operations to mop up excess liquidity flowing in the Pakistani economy and the sale or purchase of treasury bills, thus treading cautiously, curbing abrupt appreciation of the Rupee while keeping the inflationary pressures in check. In spite of that, the money growth in the economy has remained somewhat high, consistently in the double digits during the current decade.[3]

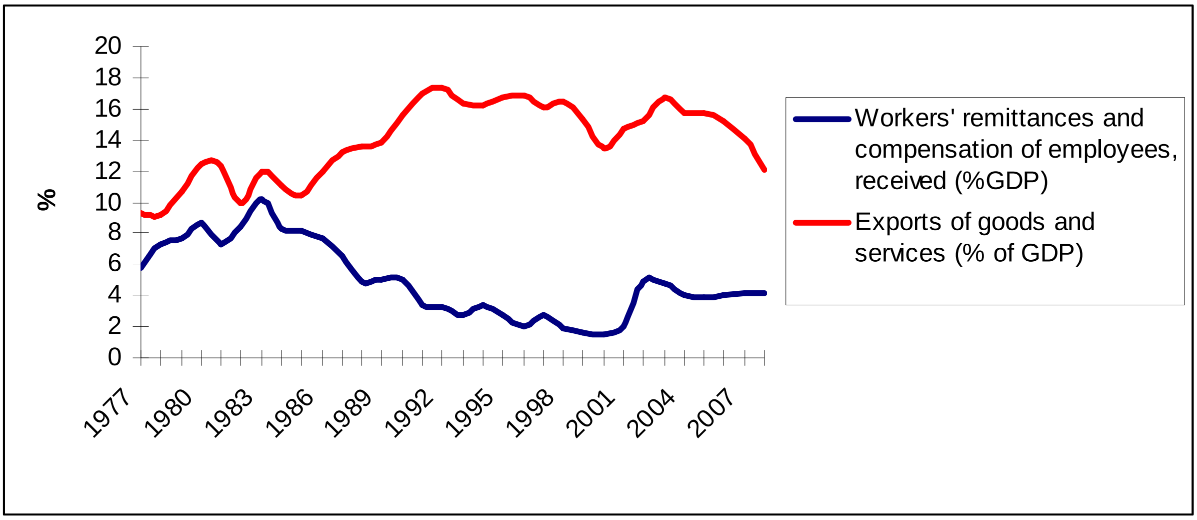
Figure 3 REER and Remittances to the GDP



Source: WB Online 'World Development Indicators', IFS and authors' calculations

Similarly, figure 4 shows a clear negative relationship between exports and remittances. We can observe a divergence between remittances and exports during the 1980s and 90s.

Figure4: Exports and remittances as share of the GDP



Source: WB Online 'World Development Indicators'

[3] The mass of money in circulation increased by 19.5 per cent in the year 2006-07 (SBP))

3) Empirical Analysis

3.1. Choice of variables

According to the model of Montiel (1999) and Edwards (1989), the Real Effective Exchange Rate (REER) can be considered as the ratio between the relative prices of the tradeables and non-tradeables, which is compatible with the twin objectives of internal and external equilibrium, taking account of the specific values of pertinent macroeconomic variables that could influence the internal or external equilibrium. Furthermore, the REER is driven by a set of fundamentals, real variables, both external as well as internal, due to which, REER can not be directly observed.

Therefore, different methods of calculating the exchange rate index have been employed in the literature according to the question under study. According to Edwards (1989), the selection of appropriate price index is important for calculating the real exchange rate, and has to reflect the specificities of the economy. For estimating the impact of productivity shocks on the exchange rate, the use of GDP is appropriate, while to analyze the effects of foreign capital inflows, such as competitivity, the consumer price index (CPI) seems to be more useful Maxwell (2004). We take inflation, government spending and terms of trade as explanatory variables in our model. In order to capture the effect of external shocks, we consider financial inflows (foreign direct investments, remittances and official development assistance) and openness to trade. Through these variables, we could take into consideration both the factors that act upon the REER in the short term as well as in the long term.

3.2. The model

The relationship between REER and the explanatory variables included in our model can be written as:

$$REER_t = \theta_0 + \theta_1 TOT_t + \theta_2 OPEN_t + \theta_3 CPI_t + \theta_4 GOV_t + \theta_5 GRO_t + \theta_6 FDI_t + \theta_7 REMIT_t + \theta_8 ODA_t + \xi_t \quad (1)$$

Where:

TOT: represents the terms of trade, Open stands for the trade openness as a share of GDP,

GOV represents the public expenditure to GDP, and GRO represents the GDP growth rate,

Summary statistics are shown in the Appendix (a). Data for the REER and the government expenditure has been taken from the IMF- IFS database. Other variables have been derived from the WB Online ‘World Development Indicators’.

In estimating this equation, the Ordinary Least Squares (OLS) methods show there limits for the following reasons:

1. Given the limited degrees of freedom in our case, with 28 observations and 8 parameters), the OLS estimator is biased.
2. Thee OLS estimation, called frequentist or objective estimation, does not allow taking into account the variability of results due to the intervention of SBP. The managed float can be better studied by introducing it as a prior in the Bayesian model.
3. Frequentist estimation does not consider the uncertainty and complexity of the impact of remittances on the REER, which requires a probabilistic analysis.

These limits can be overcome using the Bayesian approach which we present in the following section

3.3. Bayesian Approach

The Bayesian method is a rational framework which models all the inputs, implying that the parameters are considered as variables. By taking the unobservable information into account in this way can improve the quality of the estimations and forecasts (Parent and Bernier, 2007). We estimate the parameters of equation (1), $\theta_j = (\theta_0,....,\theta_8,\Sigma)$ given X, such that X is the vector of explanatory variables ($TOT, OPEN, CPI, GOV, GRO, FDI, REMIT, ODA$).

In the Bayesian setting the parameter θ is unknown and we express our uncertainty about the prior by specifying it distribution. The prior density can be denoted as $\pi(\theta)$. The word "prior" is used to denote that it is the density before the data (X) is observed.

Using Bayes' theorem, the distribution of [θ / X] can be constructed, called the posterior distribution of θ, denoted by $\pi(\theta / X)$. It can be calculated as:

$$\pi(\theta \mid X) = \frac{\pi(\theta)L(X \mid \theta)}{\int_{-\infty}^{\infty} \pi(\theta)L(X \mid \theta)d\theta} \quad (2)$$

or

$$\pi(\theta \mid x) \propto \pi(\theta)L(\theta / X) \quad (3)$$

The objective here is to estimate $\widehat{\theta}_j$, for this, we use the generalized Bays' estimator of θ_j, equal to the mean of the posterior $\widehat{\theta}_j = E[\pi(\theta_j / Z)] \quad = \int \theta\pi(\theta / Z)d\theta \quad (4)$. Details are given in appendix (b).

Before calculating the posterior, we need to specify the prior distribution. There are many types of priors. Box and Tiao (1973) propose the noninformative prior (Jeffreys prior) for the case where limited information is available. A prior distribution is considered noninformative if its impact on the posterior distribution of θ is minimal.

To calculate the mean of the posterior, we apply the MCMC methods via the Gibbs algorithm.

The Gibbs sampler

The Gibbs sampler, applied to calculate $\pi(\theta / X)$, is generated by Markov Chain simulation. It can be used for a consistent estimation of the posteriors, such as moments and marginal densities Casella and George (1992). The method consists of finding an approximation for the posterior density which can not be solved directly. The idea is to generate a pseudo-random sample of observations equivalent to the posterior density. The empirical mean of the sample thus generated is equal to conditional expectation according to Law of large numbers details are given in appendix (c).

4. Results and discussion

The findings show that remittances parameter is positive at an average (Table 1). In other words, an increase in remittances leads to exchange rate appreciation. A look at the quintal graph (Table 2) confirms the consistent positive nature of the remittances posteriors. We can therefore deduce that remittances flows to Pakistan cause the Dutch disease. This is in spite of the fact that the State Bank regularly intervenes in the money market to sterilize excess liquidity, a factor our model took into consideration. This lends credence to the argument that remittances have, in the recent decades, led to a gradual erosion of productivity of Pakistan's export sector, and promoted consumption, thus reducing the capital available for investment. Anecdotal evidence of phenomenal rise in real-estate prices and stock markets, two important expenditures of the overseas Pakistanis, also points in the same direction.

Table : 1 Empirical mean and standard deviation for each variable, plus standard error of the mean:

	Mean	SD Naive	SE	Time-series SE
(Intercept)	2.98371	0.823052	8.231e-03	8.441e-03
TOT	0.05155	0.224659	2.247e-03	2.150e-03
OPEN	-0.47505	1.333065	1.333e-02	1.353e-02
CPI	-1.32776	0.283762	2.838e-03	2.986e-03
GOV	-0.08388	0.019407	1.941e-04	2.060e-04
GRO	0.12224	0.359986	3.600e-03	3.430e-03
FDI	0.20427	0.078852	7.885e-04	8.680e-04
REMIT	4.14620	1.965986	1.966e-02	2.037e-02
ODA	-5.85000	3.697902	3.698e-02	3.184e-02
sigma2	0.01620	0.005867	5.867e-05	8.012e-05

The Official Development Assistance on the contrary does not appear to have a detrimental impact on the country's exchange rate. This could be due to the fact that these inflows, being official transfers, are not spent in the same way as remittances. Our results provide evidence to the argument that despite wastage of development funds due to bureaucratic red-tape, corruption, and lack of spending capacity, ODA have, in sum, improved the national economy.

FDI shows signs of Dutch disease inducing effects, though they tend to be weaker than those for the remittances. The flow of FDI that accelerated in the 2000s has apparently not helped the economy much, and the purported benefits of FDIs have not materialized. This can also be gauged from the sectoral distribution of these inflows. Much of the FDI to Pakistan has been either in the form of acquisitions of private local concerns (e.g. banks, food and beverage companies) and nationalized corporations (sometimes at fire sale prices), or consumption-related non-manufacturing investments (e.g. telecommunication and furnace oil based power plants). This boost to consumption coming both from remittances and FDI has led to an increase in imports and higher inflation without a commensurate rise in productivity in the export sector.

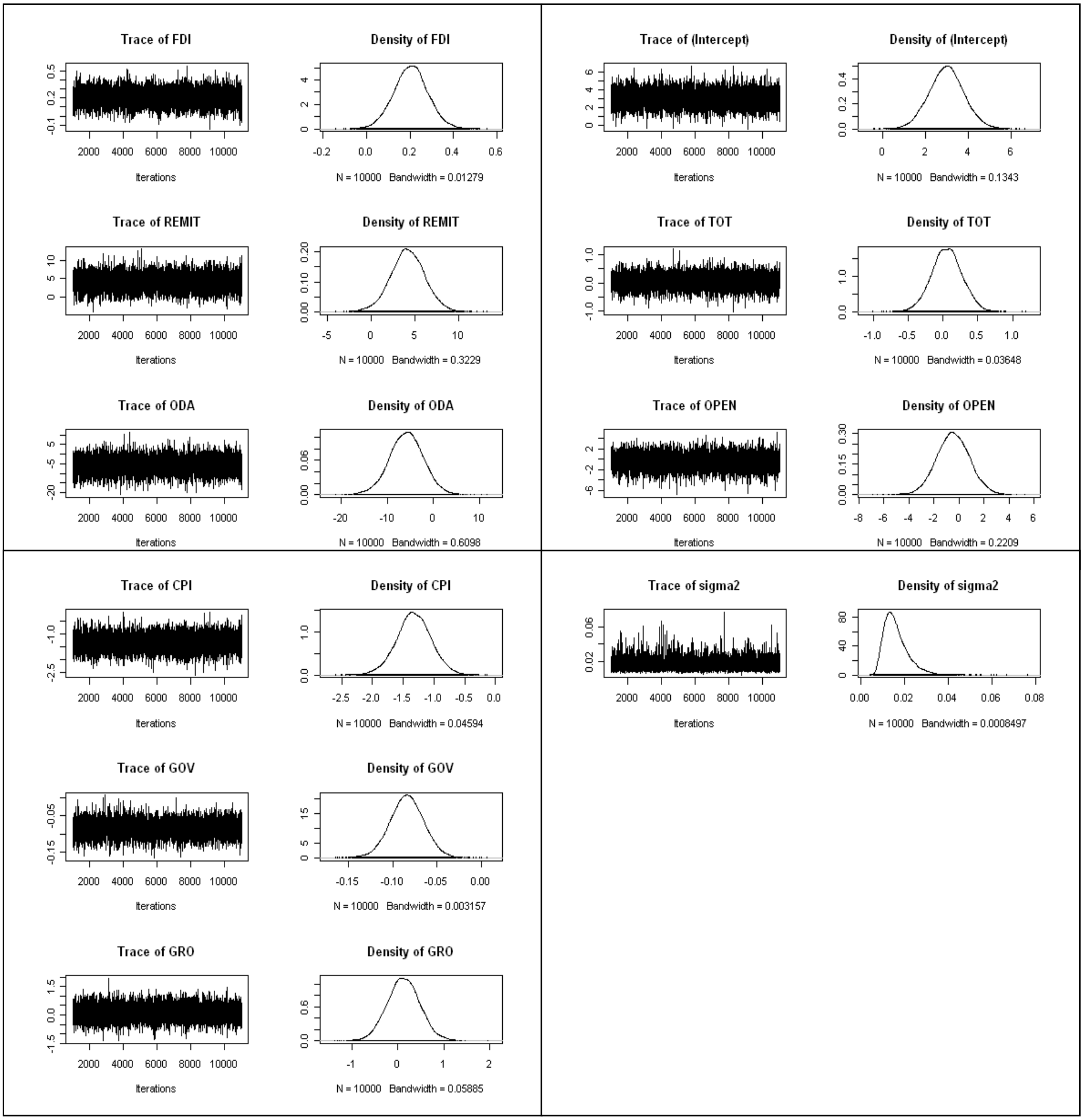
Table 2 : Quantiles for each variable:

	2.5%	25%	50%	75%	97.5%
(Intercept)	**1.393665**	**2.44687**	**2.98530**	**3.51775**	**4.62741**
TOT	**-0.392793**	**-0.09426**	**0.05078**	**0.19670**	**0.49087**
OPEN	**-3.100800**	**-1.35286**	**-0.48657**	**0.40875**	**2.16318**
CPI	**-1.903657**	**-1.50998**	**-1.32984**	**-1.14352**	**-0.77203**
GOV	**-0.122365**	**-0.09644**	**-0.08396**	**-0.07126**	**-0.04606**
GRO	**-0.575860**	**-0.11168**	**0.12069**	**0.35768**	**0.83813**
FDI	**0.049412**	**0.15282**	**0.20467**	**0.25481**	**0.36098**
REMIT	**0.194907**	**2.86728**	**4.13812**	**5.44308**	**8.03677**
ODA	**-13.333935**	**-8.27493**	**-5.80864**	**-3.41126**	**1.40786**
sigma2	**0.008397**	**0.01216**	**0.01502**	**0.01894**	**0.03041**

For certain determinants of REER, e.g. openness to International trade, the terms of trade and growth, we find conflicting arguments in the theory, and their impact could go in either direction depending on the hypothesis considered. Using the Bayesian approach, we could see the ambiguity inherent in these variables. The impact on REER varies between the negative and the positive territory, even though the overall effect is negative. This means that increased International trade and economic growth in Pakistan does not raise the REER.

Similarly, inflation and government expenditure do not seem to induce Dutch disease in Pakistan

Trace and density of the marginal posterior distribution



The graph shows, Markov Chains simulated by a Gibbs algorithm in the left column, and the posterior marginal parameters in the right

Conclusion and policy implications

The Pakistani economy exhibits symptoms of the Dutch disease as a result of the remittances inflows. Their impact on the country's export sector appears to be detrimental, even though many households benefit directly from them. Remittances have mostly been directed towards household consumption, and the part of this increase that has gone to the non tradable services has pushed up the prices of these services with respect to the tradable products and services. To that extent, the competitivity of the tradable sector has suffered due to a proportional rise in the real exchange rate. This fall in competitivity can be mitigated to certain extent through monetary measures. However, more attention is required towards channelling the remittances inflows in more productive directions. In the absence of adequate investment opportunities, much of the remittances are spent on conspicuous consumption. By providing investment schemes for overseas Pakistanis, and promoting small-scale enterprises, these remittances can be harnessed in a way that improves the country’s productivity. Development of the financial sector can also play a useful role in this regard.

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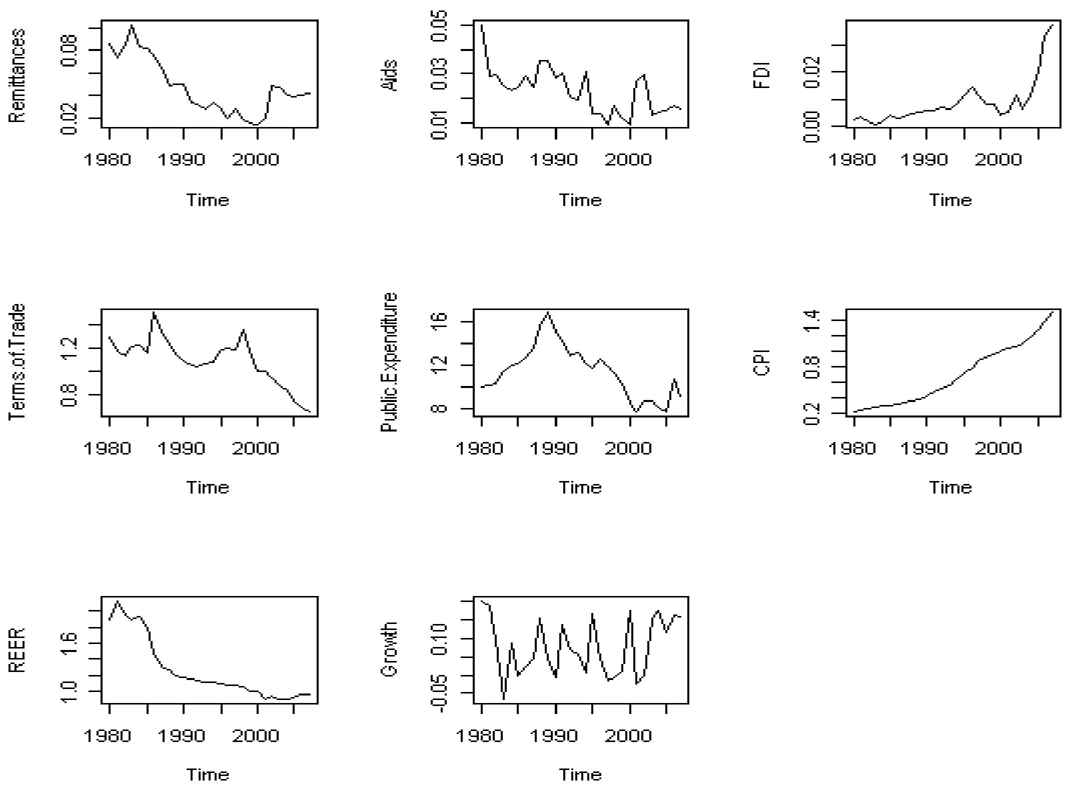
Appendix

A. summary



	REMIT		OPEN		GRO
Min.	:0.01454	Min.	:0.2800	Min.	:-0.066201
1st Qu.	:0.02820	1st Qu.	:0.3275	1st Qu.	: 0.006057
Median	:0.04112	Median	:0.3450	Median	: 0.064247
Mean	:0.04764	Mean	:0.3411	Mean	: 0.077327
3rd Qu.	:0.06744	3rd Qu.	:0.3600	3rd Qu.	: 0.155164
Max.	:0.10247	Max.	:0.3900	Max.	: 0.202036

	REER		ODA		TOT		CPI
Min.	:0.9007	Min.	:0.00947	Min.	:0.6554	Min.	:0.2117
1st Qu.	:0.9858	1st Qu.	:0.01478	1st Qu.	:0.9996	1st Qu.	:0.3202
Median	:1.1183	Median	:0.02391	Median	:1.1353	Median	:0.5926
Mean	:1.2624	Mean	:0.02289	Mean	:1.0950	Mean	:0.6874
3rd Qu.	:1.3573	3rd Qu.	:0.02929	3rd Qu.	:1.2019	3rd Qu.	:1.0079
Max.	:2.1252	Max.	:0.04985	Max.	:1.5000	Max.	:1.4920

	GOV		FDI
Min.	: 7.781	Min.	:0.001027
1st Qu.	: 9.808	1st Qu.	:0.004093
Median	:11.581	Median	:0.006272
Mean	:11.434	Mean	:0.008954
3rd Qu.	:12.798	3rd Qu.	:0.011389
Max.	:16.785	Max.	:0.037322

B. Model

Our model takes the following form
$Y_t = X_t\theta + \varepsilon_t \qquad \varepsilon_t \sim \text{N}(0, \sigma^2)$

And $\theta \sim \text{N}(\bar{\theta}, \Sigma^{-1})$

$\sigma^{-2} \sim \text{Gamma(c0/2, d0/2)}$

Where

$\bar{\theta}$: The prior mean of *theta*

Σ^{-1} : The prior precision of *theta*

c0 : *c0/2* is the shape parameter for the inverse Gamma prior on *sigma^2* (the variance of the disturbances). The amount of information in the inverse Gamma prior is something like that from *c0* pseudo-observations

d0 : *d0/2* is the scale parameter for the inverse Gamma prior on *sigma^2* (the variance of the disturbances). In constructing the inverse Gamma prior, *d0* acts like the sum of squared errors from the *c0* pseudo-observations.

And *theta* and *sigma^(-2)* are assumed *a priori* independent. Note that only starting values for *theta* are allowed because simulation is done using Gibbs sampling with the conditional error variance as the first block in the sampler.

The posterior can be calculate with the following formula

$$f(\theta / Y, X, \sigma) = \frac{f(Y/\theta, \sigma, X) f(\theta/\sigma, X)}{f(Y)} \quad \propto \quad f(Y/\theta, \sigma, X) f(\theta/\sigma, X)$$

C. Gibbs sampling

The MCMC method simulates the posterior distribution using standard Gibbs sampling as follows:

1) Generate $\hat{\theta}$ from $p(\hat{\theta}/\sigma^2, X, Y)$

2) Generate $\hat{\sigma}^2$ from $p(\hat{\sigma}^2 / \hat{\theta}, X, Y)$

The Gibbs sampler applied to $\pi(\theta / X)$ produce, by simulation Markov Chain $\{\theta^n\}_{n=1}^{N}$ of draws with equilibrium distribution $\pi(\theta / X)$. The can be used to consistently estimate the characteristics of interest of the posterior such as moments and marginal densities Casella and George (1992). Popular approximate integration techniques used in Bayesian statistics involve: Gaussian integration, Laplace approximation, and numerical integration based on stochastic approaches (Gibbs sampling, Markov Chain Monte Carlo).
In order to integrate equation 4, we use the MCMC method. One computational technique in common use is the Gibbs sampler. We know that $\pi(\theta / X = x) \propto \pi(\theta) L(\theta / x)$, but we have no practical method of computing the normalising constant needed to make this into a proper density function. So instead of doing that we try to generate a pseudorandom sample of observation, from $\pi(\theta / x)$, sampling from distribution of θ, holding x fixed.

Start off with an arbitrary initial vector, say $\theta^{(0)} = (\theta_1^0, \ldots\ldots, \theta_8^0)$
Step1 Holding $\theta_2^0, \ldots\ldots, \theta_8^0$ *fixed generte a new value of* θ_1 *conditional on* $\theta_2 = \theta_2^0, \ldots., \theta_8 = \theta_8^0$ *and of course X=x to obtain a new value of* θ_1^1
Step 2 Generate a new variable θ_2 *conditional on* $\theta_1 = \theta_1^1, \theta_3 = \theta_3^0, \ldots., \theta_8 = \theta_8^0$, *X=x , to obtain a new value* θ_2^1
…..
Step 8 Generate a new value θ_8 *conditional on* $\theta_1 = \theta_1^1, \theta_3 = \theta_3^0, \ldots., \theta_7 = \theta_7^0$, *X=x to obtain a new value* θ_8^1

This completes one iteration of the Gibbs sampler, and generates a new θ^1. Notice that at each step we only have to simulate from a one-dimensional (conditional) distribution. We then repeat this process to get θ^2, θ^3 and so on. After much such iteration (usually several hundred or even several thousand are required) the sampling distribution of θ will approximate the posterior distribution we are trying to calculate, and the Monte Carlo sample can then be used directly to approximate the probabilities of interest.
The Gibbs sampler is an example of a Markov chain Monte Carlo (MCMC) method. The iterative procedure is simulating a Markov chain which, under suitable regularity conditions, has equilibrium distribution the posterior distribution $\pi(\theta / x)$.