Journal of Development and Agricultural Economics Vol. 4(8), pp. 221-232, 12 May, 2012
Available online at http://www.academicjournals.org/JDAE
DOI: 10.5897/JDAE12.023
ISSN 2006- 9774 ©2012 Academic Journals

Review

The short-run and long-run trade balance response to exchange rate changes in Malawi

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Accepted 27 March, 2012

The objective of this paper has been to examine the short-run and long-run effects of real exchange rate changes on the trade balance in Malawi. The model was estimated using the multivariate cointegration framework proposed by Johansen (1988). The results from the study show that the impact of a real depreciation on the trade balance is not significant enough to change the trade pattern in the long-run. Further, while a J-curve pattern is observed in the short to medium term, the improvement that follows a deterioration is not significantly different from the old equilibrium levels. On the other hand, the trade balance seems to respond more positively to shocks in domestic income. These findings have important policy implications for policy-makers. The long-run insignificance of the real exchange rate movements on the trade balance and the importance of domestic income in determining trade patterns suggest that policies aimed at improving the country's trade competitiveness should first focus on internal supply-side policies that give a conducive environment for the production of exportables and import-substitutes. Focusing on the external approach (that is, currency devaluation) may not bring effective results as Malawi is mostly a price-taker on the international market, and would thus not be able to influence external demand for her exports through price incentives that arise from exchange rate changes.

Key words: J-curve, trade balance, exchange rate.

INTRODUCTION

Currency devaluation is one policy prescription that has featured highly in the literature and considerably used by policymakers in trying to improve a country's trade balance. Economic convention holds that, by making imports relatively more expensive and exports relatively cheaper, devaluations are expected to lead to expenditure switching by consumers, thereby leading to improvements in an economy's trade balance. In developing countries, this policy prescription has largely been associated with Structural Adjustment Programmes which were aimed at reducing large the external imbalances that developing countries had incurred in the late 1970's and early 1980's, correcting perceived overvaluations of the real exchange rate, increasing international competitiveness, and promoting export growth. While the long-run impact of a depreciation is expected to be an improvement in the trade balance, the short-run effect may be the worsening of the trade balance due to lags by both producers and consumers to adjust to the changed relative prices. This dynamic characteristic of the trade balance has been termed the J-curve hypothesis in literature. Whilst there are strong theoretical foundations on the J-curve hypothesis, its empirical validity remains inconclusive.

Since the early 1980's, Malawi has had its dose of structural adjustment reforms that have included exchange rate devaluations and changes in exchange rate regimes. For example, the Malawi kwacha exchange rate registered a number of devaluations between 1980 and its floatation in 1994. However, whether these reforms have had their intended effects on the economy remains a topic of intense debate among both

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policymakers and the academia. In particular, the economy has experienced growing and persistent trade deficits over the past two or so decades-the same period in which the Malawi Kwacha has undergone substantial devaluations/depreciations, bringing into question the role of exchange rate devaluations in determining trade balance behaviour in Malawi. On the other hand, improving the trade balance has featured highly on most of Malawi’s economic policy frameworks. For example, Malawi government’s current economic policy framework (the Malawi Growth and Development Strategy) has its overriding economic policy objective as turning the economy from “a predominantly consuming and importing nation to a predominantly producing and exporting nation.” This paper estimates the long-run and short-run responsiveness of Malawi’s merchandise trade balance to exchange rate changes. The importance of knowledge of this relationship for economic policy has been well documented by Stucka (2004).

Several empirical studies on how exchange rate changes affect trade balance, both developing and developed countries remain inconclusive (Bahmani-Oskooee and Ratha, 2004). Therefore, whether and how trade dynamics in a particular country respond to exchange rate changes, and how long an exchange rate shock takes to positively impact the trade balance remain empirical questions. Several scholars have attempted to study this relationship for Malawi. Using a small open economy IS-LM aggregate supply model of the Malawi economy, Musila and Newark (2003) explore the impact of nominal exchange rate depreciations on Malawi’s trade balance. However, their study largely focuses on the long-run relationship, and uses macro-simulation analysis to arrive at their conclusions. Further, the data used in their estimation is from 1969 to 1996, and thus, does not cover much of the period in which the current account and the Malawi kwacha exchange rate were liberalized. This study will complement the existing empirical literature by augmenting the study period to include the post-liberalization period and using more recent estimation techniques. Furthermore, in very recent times there has been heated debate between technocrat and the IMF on one hand and government on the other hand. The focus of the debate has been that Malawi has been maintaining a relatively overvalued currency, and for this reason the export sector and hence, economic growth have been hurt.

On the other hand, government argues that the structure of the country's economy is in such a way that devaluation will only filter into high prices because the production and consumption behaviour of economic agents in Malawi are highly import dependent. This follows from the fact that the country has an inelastic demand for imports. To this extent, depreciation of the currency is not expected to improve the trade balance but effectively increase commodity prices. This paper will therefore assist in answering this puzzle.

LITERATURE REVIEW

The theoretical foundation of the relationship between the exchange rate and trade flows is rooted in the ‘elasticity’ approach to analysis of the ‘balance of payments’. The core of this view is the substitution effects in consumption (explicitly) and production (implicitly) induced by the relative price (domestic versus foreign) changes caused by a devaluation. Musila and Newark (2004) explore the impact of nominal exchange rate devaluation on the trade balance for Malawi. They estimate a small-open economy IS-LM aggregate supply model of Malawi using time series data covering the period of 1967 to 1996 is used in the simulation analysis. The results of the simulation experiment show that devaluation helps to improve export performance and to curtail the growth of imports in the long run, which lead to improvement in the trade balance position. The results provide evidence supporting the view that nominal devaluation can indeed be a quite powerful tool in minimizing the imbalances in Malawi's international trade. Kamoto (2006) investigates the effects of devaluation on the trade balance in Malawi and South Africa using a vector error correction model (VECM).

The generalized impulse response functions are used to trace the response of the trade balance to the shocks in the exchange rate. The vector error correction model suggests the existence of a long-run equilibrium relationship among the variables for both Malawi and South Africa. There is a positive relationship between the trade balance and the real effective exchange rate indicating that a real depreciation will improve the trade balance in the long run. The study finds evidence of the J-curve on the South African trade balance. This suggests that following a real depreciation, the South African trade balance will initially deteriorate but improve in the long run. However, Malawi does not exhibit a statistically significant J-curve phenomenon. Pentecost and Ahmad (2010) examine the impact of terms of trade shocks on output and price levels of 22 African countries which operate different de facto exchange rate regimes using a structural VAR with long-run restrictions over the period from 1980 to 2007. The empirical findings support the view that the exchange rate regime matters as to how countries respond to exogenous external shocks like terms of trade shocks, in that output variation is greater for countries with fixed regimes, while for flexible regime countries real exchange rate variation reduces the need for output variability. Munthali et al. (2010) analyze the impact of real exchange rate on savings rate and economic growth. They further explore the savings transmission mechanism through which such a link can take place in the country.

The results shows that real effective exchange rate (REER) volatility has adverse effects on economic performance. Contextually, an appreciated REER is significantly and positively correlated with economic growth, reflecting Malawi's net-importer position. On the otherhand, REER volatility is significantly and negatively correlated with growth, reflecting investors' preference for a stable exchange rate. The study also finds that devaluation of the REER has an insignificant effect on economic growth in the long-run. Various methodologies have been used by researchers to estimate the long-run and short-run relationships between exchange rate changes and the trade balance. Musila and Newark (2003) have summarised the various methodologies used into four categories, namely, the "before-after," the "control-group," the macro-simulation, and the time series econometric approaches.

Given the purpose of this paper that is, to estimate short-run and long-run responses to exchange rate changes and to identify the pattern of trade flows after an exchange rate shock, the time series econometric approach is the preferable methodology to be used in the paper.

THE MODEL AND ECONOMETRIC FRAMEWORK

Trade balance is usually measured as the difference between the value of total exports and total imports. Following a number of studies (Lal and Lowinger, 2001; Bahmani-Oskooee and Brooks, 1999; Gupta-Kapoor and Ramakrishnan, 1999), we measure trade balance as the ratio of exports (X/M). One reason for using this ratio rather than the absolute difference is that it is not sensitive to the unit of measurement and can be interpreted as nominal or real trade balance (Bahmani-Oskooee, 1991). Furthermore, as noted by Boyd et al. (2001), the ratio in a logarithmic model gives the Marshall-Lerner condition exactly rather than as an approximation. We specify the trade balance as a function of real domestic income, real foreign income and the real effective exchange rate. The reduced form of the equation is given as follows:

$$\text{Ln } (X/M)_t = a_0 + a_1 \ln Yt + a_2 \ln Y_t^* + a_3 \ln REER_t + \varepsilon_t \quad (1)$$

Where: *ln* is natural logarithm, Yt is real domestic income, Yt* is real foreign income, REERt is real effective exchange rate and ε_t is an error term. REERt is defined as REERt = (EP/P*), where E is the nominal effective exchange rate, P and P* and P are the domestic and foreign price levels, respectively, so that an increase in the index represents an appreciation and a decrease represents a depreciation.

The theory suggests that the volume of exports (imports) to a foreign country (domestic country) ought to increase as the real income and purchasing power of the trading partner (domestic economy) rises and vice versa. So we expect $a_1 < 0$ and $a_2 > 0$. However, if the rise in real income is due to an increase in the production of import-substitute goods, imports may decline as income increases in which case $a_1 > 0$ and $a_2 < 0$. The impact of exchange rate changes on trade balance is ambiguous, that is, a_3 could be positive or negative. If there is a real depreciation or devaluation of the domestic currency, that is, REER decrease, then the increased competitiveness in prices for the domestic country should result in it exporting more and importing less (the "volume effect"). However, the lower REER also increases the value of each unit of import (the "import value effect") which would tend to diminish the trade balance. Krugman and Obstfeld (2001) argued that in the short run import value effects prevail, whereas the volume effects dominate in the longer run $a_3 > 0$ satisfies the Marshall-Lerner condition. The paper will use multivariate cointegration analysis developed by Johansen (1988, 1991).

Existence of a long-run equilibrium relationship between two or more variables has traditionally been examined by the cointegration techniques of Engle and Granger (1987) and Johansen (1991, 1995). If a series must be differenced *d* times before it becomes stationary, then it contains *d* unit roots and is said to be integrated of order *d*. For two or more non-stationary variables, if a linear combination of the variables is stationary, then the time series are said to be cointegrated. The economic interpretation of cointegration is that if two or more series are linked to form an equilibrium relationship spanning the long-run, then even though the series themselves may contain stochastic trends (that is, be non-stationary) they will nevertheless move closely together over time and the difference between them will be stationary. Further, according to the Granger representation theorem, if two or more series are cointegrated to form a long-run equilibrium relationship, then there exists an error correction model for the variables depicting their short-run dynamics. Equation 1 describes the long-run equilibrium relationship among the variables in the trade balance model whose empirical validity will be tested by the Johansen methodology.

If the results indicate the absence of cointegrating vectors between the variables, it means that there is no long-run stable relationship between them. If cointegration exists, then it can be presumed that a one-way or two-way Granger causality exists in at least the stationary series, and further more a dynamic specification of the error correction mechanism is appropriate (Engle and Granger, 1987). If the variables are found to cointegrate, then we estimate the cointegrating vector(s) by applying the method suggested by Johansen (1988) and Johansen and Juselius (1990). The procedure is implemented using the full information maximum likelihood estimation (FIML) of a system characterised by r cointegrating vectors (for r<n, where n is the number of endogenous variables in the system), using the following statistical model:

$$Z_t = \sum_{i}^{k} A_i Z_{t-i} + u + \psi D_t + \varepsilon_t \quad (2)$$

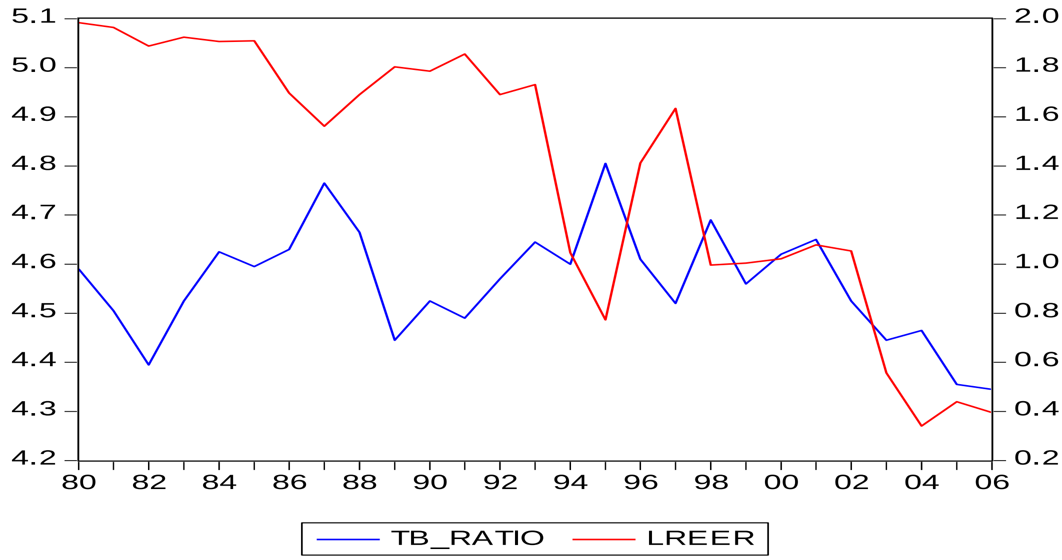

Figure 1. Graphical inspection of the data. Source: IMF, IFS and reserve bank of malawi financial and economic review.

Where Zt is the vector of endogenous variables, namely, (X/M, Y, Y*, RER), A_i is the matrix of coefficients for the variables, i is the lag order, k is the maximum number of the lag length, α is the vector of adjustment parameters, β is the vector of cointegrating relationships (the long run parameters), μ is the vector of constants, Dt is the vector of other deterministic (non-stochastic) components, and ε_t is the vector of independently distributed error terms with constant variance.

Then, if cointegration is established in Equation 2, in order to examine the pattern of dynamic adjustments that occur in the short-run to establish these long-run relations in response to various shocks to the system, the following vector error correction model (VECM) is estimated:

$$\Delta Zt = \Sigma\Gamma_i \Delta Z_{t-i} + \alpha\beta Z_{t-i} + \mu + \varepsilon_t \qquad (3)$$

Where α is the vector of adjustment parameters, β is the vector of cointegrating relationships (the long run parameters), and the rest of the variables are defined as mentioned earlier. We will use the VECM to generate the generalized impulse response functions and trace out the potential J-curve effects for Malawi.

For the econometric analysis, we use annual data from 1980 to 20010 drawn from the IMF, International Financial Statistics, RBM, Financial and Economic Review, and NSO, Quarterly Statistical Bulletin. The real effective exchange rate is computed by multiplying the nominal effective exchange rate by the ratio of the domestic consumer price index to a weighted basket of foreign consumer price indices. The real foreign income is calculated as the trade-weighted GDP of Malawi's major trading partners.

EMPIRICAL RESULTS

The trade balance ratio and the real effective exchange rate have been trending downwards over time. The trade balance has been deteriorating over time whilst the real effective exchange rate has also been depreciating over time. However, from the graphical inspection, the pattern in the trade balance seems to run in opposite direction with the pattern in the real effective exchange rate. The question still remains as to whether the real depreciation over time has been helpful in improving the trade balance which has been deterioration over time. Further, as the graph shows (Figure 1), the variability in the two variables has become more pronounced after 1994, probably reflecting the impact of the shift in the exchange rate regime from a fixed to a free floating/managed float regime and current account liberalisation. We therefore include a dummy variable reflecting this structural break. The graph (Figure 2) does not indicate any discernible co-movement between domestic income and the trade ratio.

Unit root and cointegration analysis using the Johansen approach

The Johansen (1988) procedure allows us to test for the number of cointegrating vector or long-run relationships. Given that Equation 2 has four endogenous variables, there can be up to three cointegrating relationships. However, it is necessary to note that, being a maximum likelihood procedure, the Johansen procedure requires longer samples than the one used in the present paper would carter for. The first step in implementing the

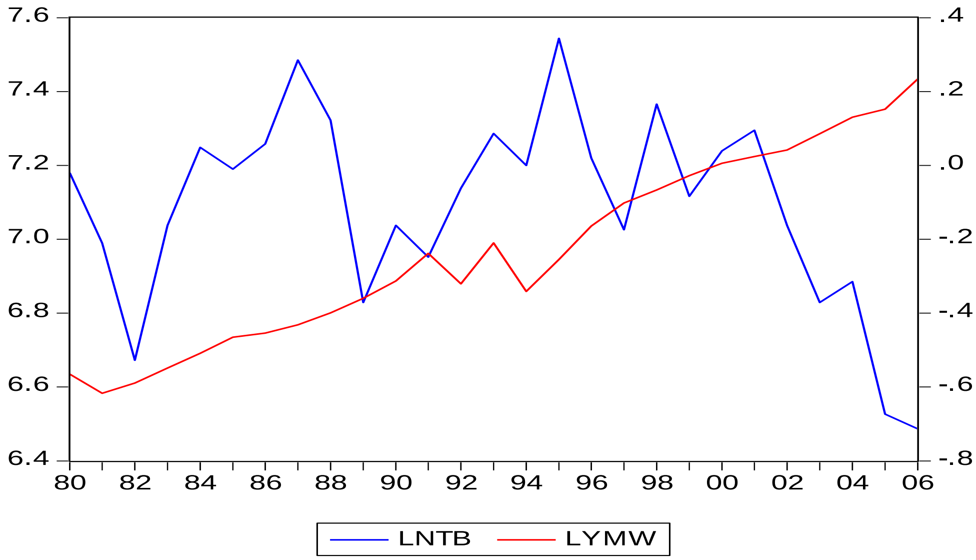

Figure 2. Graph on domestic income versus trade balance. Source: reserve bank of malawi financial and economic reviews.

Table 1. Johansen cointegration test.

Date: 10/29/10 Time: 11:20				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.814512	72.46208	63.87610	0.0080
At most 1	0.492853	30.34292	42.91525	0.4820
At most 2	0.304215	13.36905	25.87211	0.7090
At most 3	0.158061	4.301189	12.51798	0.6982
Unrestricted cointegration rank test (maximum eigenvalue)				

Trace test indicates 1 cointegrating equation(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values.

Johansen procedure was to carry out specification and misspecification tests which included selection of the optimal lag length to be used in the estimated VAR, and normality and autocorrelation tests for the OLS residuals in the unrestricted model of Equation 1. Given that we are using annual data, and given the size of our sample, we selected up to three lags. As shown in the Tables 1 to 3 in the appendix (Tables 1 to 5), all the Schwartz information criterion criteria favours the use of one lag in the VAR, VAR (1), with intercept and trend. The residual tests for normality and autocorrelation also confirm that the VAR (1) is correctly specified. Using this specification, running the cointegration Equation 3 yields results reported in the Table 1. Both the maximal eigenvalues and the trace statistic indicate one cointegrating vector among the variables. We can therefore conclude that there is a long-run relationship between the variables in Equation 2.

We report the long-run cointegrating equation for the trade balance obtained under the Johansen procedure as follows:

$$\text{Ln } (X/M)_t = 246.8334 + 30.85 \text{ lnYt} + 2.47 \text{ lnY}_t^* + 5.93 \text{ lnREER}_t - 1.06 \text{ Trend} + \varepsilon_t \quad (4)$$

The sign of the exchange rate elasticity is inconsistent with the theoretical expectation that devaluation will improve the trade balance in the long-run due to increased competitiveness in domestic prices. Thus, the empirical evidence for Malawi is that a real devaluation in fact worsens the trade balance. This seems to suggest that the import value effect still dominates the export volume effect even in the long-run, perhaps because most of our imports are not domestically substitutable.

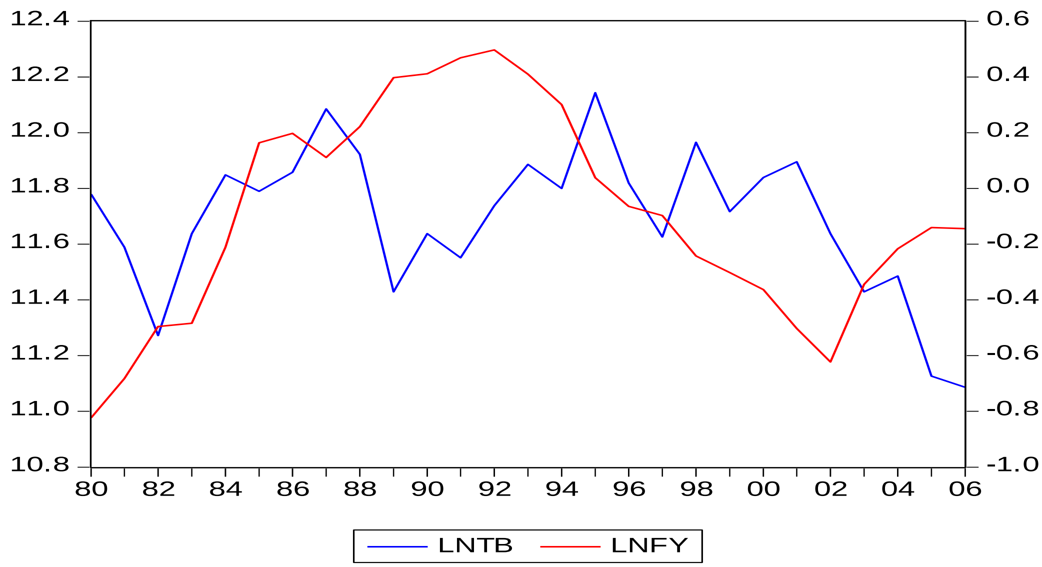

Figure 3. Graph on foreign income and the trade balance. Source: Reserve Bank of Malawi Financial and Economic Reviews.

The sign of the domestic income elasticity is positive, suggesting that, contrary to theoretical expectations of the elasticity approach, an increase in real domestic income leads to an improvement in the trade balance. This can probably be explained from two points of view. First, Malawi being a small agro-based economy with most of its exports being primary agricultural products, an increase in real income necessarily implies an increase in products available for export. Further, Malawi may not be very much constrained by the availability of international markets for its exports. As such, the effect of the increase of domestic income on export volumes may well outweigh the resultant increase in imports.

The foreign income elasticity has the expected sign and is also statistically significant. Having established that the variables cointegrate, we proceed to examine the dynamic responses in more detail by generating generalized impulse response functions showing the response of the trade balance to a one-standard error depreciation in the real effective exchange rate and trace out possible J-curve effects. The graph (Figure 3) indicate the pattern of movement over time of the trade balance in response to shocks on the other variables. According to the impulse response graph for the real effective exchange rate, a one-standard error permanent deviation in the real effective exchange rate leads to an initial deterioration of the trade ratio by about 3% in the first year, but the ratio starts picking up in the second year up to the fourth year, before deteriorating again and then settles at a new long-run equilibrium level just close to the old equilibrium. Overall, Malawi's trade ratio reacts positively to exchange rate changes in the long run, though the impact is not significant enough to adequately propel the trade balance. This pattern of movement seems to suggest that, while a J-curve pattern in Malawi may exist, the long-run impact of a real depreciation is not significant enough to change the pattern of the trade balance.

Suffice to note that the impulse responses of the trade ratio to shocks in domestic income levels are more effective than REER impulse responses (Figure 4).

SUMMARY AND CONCLUSION

The objective of this paper has been to examine the short-run and long-run effects of real exchange rate changes on the trade balance in Malawi. The model was estimated using the multivariate cointegration framework proposed by Johansen (1988). The results from the study show that the impact of a real depreciation on the trade balance is not significant enough to change the trade pattern in the long-run. Further, while a J-curve pattern is observed in the short to medium term, the improvement that follows a deterioration is not significantly different from the old equilibrium levels. On the other hand, the trade balance seems to respond more positively to shocks in domestic income. These preliminary findings have important policy implications for policy-makers. The long-run insignificance of the real exchange rate movements on the trade balance and the importance of domestic income in determining trade patterns suggest that policies aimed at improving the country's trade competitiveness should first focus on internal supply-side policies that gives a conducive environment for the production of exportables and import-substitutes.

Focusing on the external approach (that is, currency devaluation) may not bring effective results as Malawi is

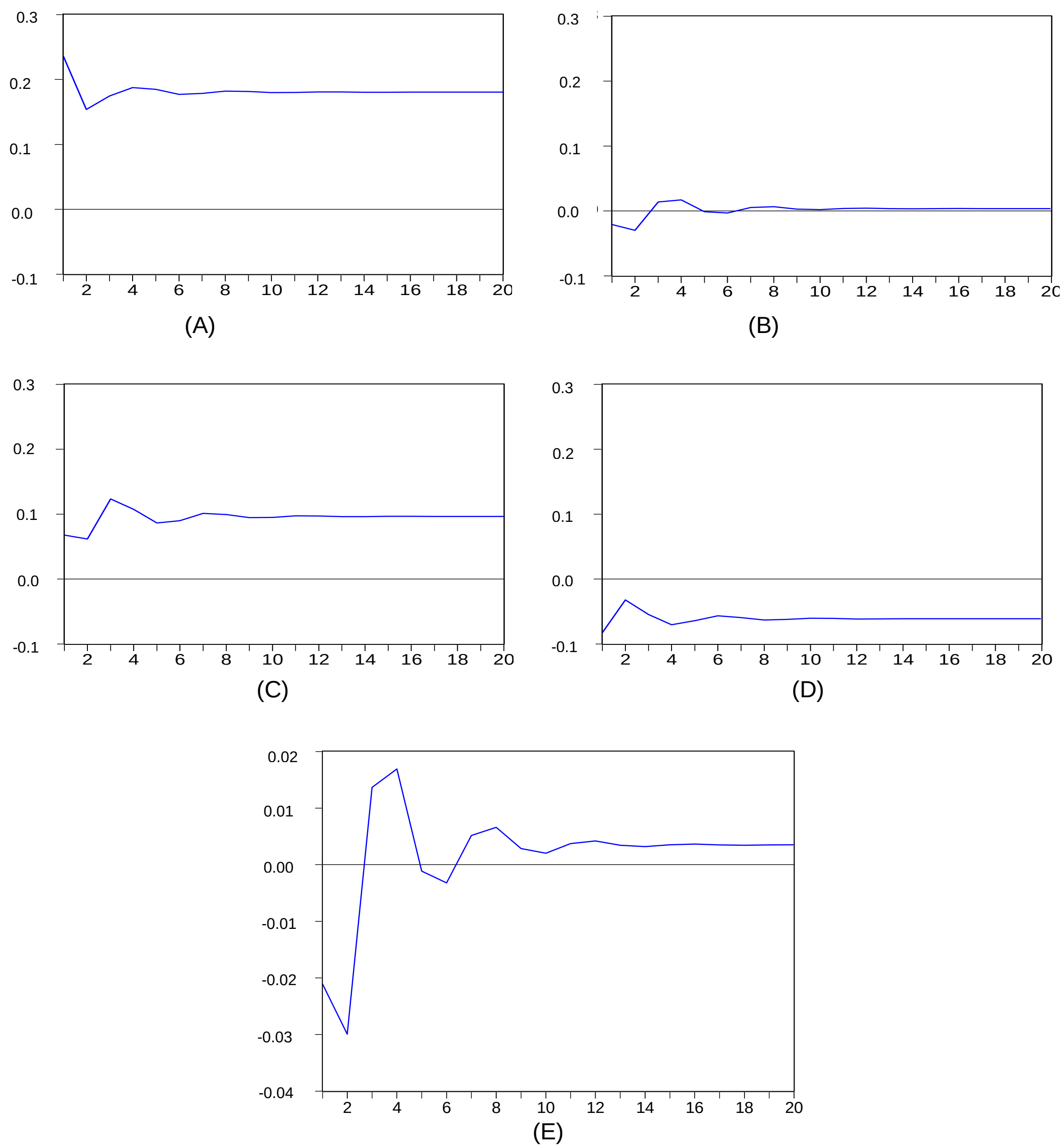

Figure 4. Response to generalised one S.D. innovations. Responses to LNTB to LNTB (A), LNTB to LREER (B), LNTB to LYMW (C), and LNTB to LNFY (D). Response of LNTB to generalised one S.D. LREER innovation (E).

mostly a price-taker on the international market, and would thus not be able to influence external demand for her exports through price incentives that arise from exchange rate changes. This to a large extent substantiate the country's persistence to maintaining a stable exchange rate.

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APPENDIX

Table 1. VAR lag structure selection for the Johansen procedure.

VAR Lag order selection criteria
Endogenous variables: LNTB LREER LYMW LNFY
Exogenous variables: C LIB94
Date: 10/29/10 Time: 10:43
Sample: 1980 2009
Included observations: 24

Lag	LogL	LR	FPE	AIC	SC	HQ
0	34.39242	NA	1.30e-06	-2.199369	-1.806684	-2.095189
1	102.3108	101.8775*	1.80e-08	-6.525899	-5.347845*	-6.213361
2	121.3360	22.19613	1.66e-08	-6.778004	-4.814581	-6.257107
3	147.0001	21.38675	1.17e-08*	-7.583345*	-4.834553	-6.854090*

* indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Table 2. Normality test for residuals in a VAR (1).

Component	Jarque-Bera	df	Prob.
1	3.379370	2	0.1846
2	2.279091	2	0.3200
3	1.924881	2	0.3820
4	1.952418	2	0.3767
Joint	9.535760	8	0.2991

We fail to reject the null hypothesis that the residual are normally distributed.

Table 3. Auto correlation test of the VAR (1) residuals.

VAR residual serial correlation LM tests
Null hypothesis: no serial correlation at lag order h
Date: 10/29/10 Time: 11:04
Sample: 1980 2009
Included observations: 26

Lags	LM-Stat	Prob
1	25.04039	0.0691
2	17.94784	0.3270
3	17.10596	0.3788
4	12.10520	0.7367
5	10.70165	0.8275

Probs. from chi-square with 16 df.

Table 4. Preferred VAR model for the Johansen test.

Date: 10/27/10 Time: 14:17
Sample: 1980 2009
Included observations: 25
Series: LNTB LREER LYMW LNFY
Exogenous series: LIB94
Warning: Rank test critical values derived assuming no exogenous series
Lags interval: 1 to 1

Selected (0.05 level*) number of cointegrating relations by model					
Data trend:	**None**	**None**	**Linear**	**Linear**	**Quadratic**
Test type	**No Intercept**	**Intercept**	**Intercept**	**Intercept**	**Intercept**
	No Trend	**No Trend**	**No Trend**	**Trend**	**Trend**
Trace	0	1	1	1	1
Max-Eig	0	1	1	1	1

Information criteria by rank and model					
Data Trend:	**None**	**None**	**Linear**	**Linear**	**Quadratic**
Rank or	**No Intercept**	**Intercept**	**Intercept**	**Intercept**	**Intercept**
No. of CEs	**No Trend**	**No Trend**	**No Trend**	**Trend**	**Trend**
	Log likelihood by rank (rows) and model (columns)				
0	88.27515	88.27515	94.27137	94.27137	95.04772
1	95.02071	106.2670	112.2167	115.3309	115.6703
2	101.6195	112.8668	117.7695	123.8179	124.1497
3	106.7360	117.9870	120.4673	128.3518	128.6007
4	107.6793	120.5353	120.5353	130.5024	130.5024
	Akaike information criteria by rank (rows) and model (columns)				
0	-5.782012	-5.782012	-5.941710	-5.941710	-5.683817
1	-5.681657	-6.501361	-6.737336	-6.906476*	-6.693622
2	-5.569560	-6.309342	-6.541559	-6.865431	-6.731973
3	-5.338876	-5.998959	-6.117384	-6.508145	-6.448059
4	-4.774347	-5.482822	-5.482822	-5.960193	-5.960193
	Schwarz criteria by rank (rows) and model (columns)				
0	-5.001932	-5.001932	-4.966609	-4.966609	-4.513696
1	-4.511536	-5.282485	-5.372195	-5.492580*	-5.133461
2	-4.009399	-4.651671	-4.786378	-5.012740	-4.781772
3	-3.388675	-3.902492	-3.972163	-4.216659	-4.107817
4	-2.434105	-2.947560	-2.947560	-3.229911	-3.229911

*Critical values based on MacKinnon-Haug-Michelis (1999).

Table 5. The Johansen cointegration test.

Date: 10/29/10 Time: 11:20
Sample (adjusted): 1982 2009
Included observations: 25 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: LNTB LREER LYMW LNFY
Exogenous series: LIB94
Warning: Critical values assume no exogenous series
Lags interval (in first differences): 1 to 1

Unrestricted cointegration rank test (trace)

Hypothesized No. of CE(s)	**Eigen value**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.814512	72.46208	63.87610	0.0080
At most 1	0.492853	30.34292	42.91525	0.4820
At most 2	0.304215	13.36905	25.87211	0.7090
At most 3	0.158061	4.301189	12.51798	0.6982

Unrestricted cointegration rank test (maximum eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.814512	42.11916	32.11832	0.0022
At most 1	0.492853	16.97388	25.82321	0.4599
At most 2	0.304215	9.067859	19.38704	0.7175
At most 3	0.158061	4.301189	12.51798	0.6982

Unrestricted cointegrating coefficients (normalized by b'*S11*b = I):

LNTB	LREER	LYMW	LNFY	@TREND(71)
0.767654	-4.551158	-23.68398	-1.895074	0.813477
3.310185	-10.60107	38.33634	2.551623	-1.593950
-0.660990	0.936583	-27.27160	1.755283	0.962756
-5.329952	-6.410334	12.12298	1.681727	-0.797126

Unrestricted adjustment coefficients (alpha)

D (LNTB)	-0.094144	-0.082425	0.032285	0.057392
D (LREER)	0.095439	0.033766	0.018833	0.011732
D (LYMW)	0.029712	-0.009815	0.012410	-0.001607
D (LNFY)	0.056602	-0.029347	-0.047076	-0.017266
1 cointegrating equation(s)		Log likelihood	115.3309	

Normalized cointegrating coefficients (standard error in parentheses)

LNTB	LREER	LYMW	LNFY	@TREND(71)
1.000000	-5.928658	-30.85242	-2.468656	1.059692
	(1.94462)	(8.11144)	(0.58597)	(0.32209)

Adjustment coefficients (standard error in parentheses)

D (LNTB)	-0.072270 (0.03622)
D (LREER)	0.073264 (0.01450)

Table 5. cont.

D (LYMW)	0.022809 (0.00549)			
D (LNFY)	0.043451 (0.01953)			
2 cointegrating equation(s)		Log likelihood	123.8179	
Normalized cointegrating coefficients (standard error in parentheses)				
LNTB	LREER	LYMW	LNFY	@TREND(71)
1.000000	0.000000	61.43158 (10.6541)	4.576531 (0.78540)	-2.292123 (0.38138)
0.000000	1.000000	15.56575 (2.73967)	1.188327 (0.20196)	-0.565358 (0.09807)
Adjustment coefficients (standard error in parentheses)				
D (LNTB)	-0.345111 (0.14610)	1.302254 (0.49602)		
D (LREER)	0.185035 (0.05822)	-0.792313 (0.19767)		
D (LYMW)	-0.009681 (0.02297)	-0.031175 (0.07800)		
D (LNFY)	-0.053695 (0.08318)	0.053511 (0.28241)		
3 cointegrating equation(s)		Log likelihood	128.3518	
Normalized cointegrating coefficients (standard error in parentheses)				
LNTB	LREER	LYMW	LNFY	@TREND(71)
1.000000	0.000000	0.000000	185.5951 (56.9540)	-3.417921 (5.34933)
0.000000	1.000000	0.000000	47.05544 (14.4278)	-0.850617 (1.35512)
0.000000	0.000000	1.000000	-2.946669 (0.92386)	0.018326 (0.08677)
Adjustment coefficients (standard error in parentheses)				
D (LNTB)	-0.366451 (0.14649)	1.332491 (0.48980)	-1.810606 (2.22888)	
D (LREER)	0.172587 (0.05729)	-0.774675 (0.19155)	-1.479519 (0.87166)	
D (LYMW)	-0.017884 (0.02110)	-0.019552 (0.07055)	-1.418403 (0.32105)	
D (LNFY)	-0.022578 (0.07554)	0.009420 (0.25257)	-1.181802 (1.14933)	

Trace test indicates 1 cointegrating equation(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values, Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values.