Exchange Rate and Trade Balance; J Curve Effect in Ethiopia

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Abstract

More recent studies have used bilateral data in testing the J curve   phenomenon. However, The paper has attempted to estimate the J-curve phenomenon for Ethiopia using a yearly data ,aggregate data over the period 1974-2010 in a multilateral trade model basis.

A recent   technique   in co integration, ARDL approach , more importantly the Hendry's general to specific approach has been employed, which allowed for a simultaneous short-run and long-run analysis of the trade balance model. Empirical results suggest there is strong evidence for the fulfillment of the Marshall-Lerner condition, as the trade balance improves in the long run in response to a currency devaluation, while giving rise to a J-curve effect in the short run.   Both Johansen's and autoregressive distributed   lag approach   are respectively   used.   Co integration test results showing   that LREERI ,LTB LRGDP and LIPI move all together in long run.   Corresponding   error- correction models as well as impulse response functions indicate that, following currency devaluation trade balance first deteriorates before it later improves, i.e. exhibiting the J-curve pattern. These results are relevant for policy making instruments in Ethiopia. It is likely that such policy may be able to produce the desired outcome—i.e., the trade balance could improve. The policy issue   that arises from   these observations is the usefulness of the real exchange rate as a tool for correcting trade imbalance.

The Granger Causality test suggests that REER, LRGDP, LIPI does Granger causes trade   balance. As the research works comprise two regimes, the stability analysis was checked.

Key words: Trade Balance, Real Exchange Rate, Autoregressive Distributed Lag (ARDL), Error Correction (ECM)

1. Introduction

The exchange rate is often discussed in macroeconomics because of its impact on the economy as a whole. Economists for a long period of time put emphasize on the relation between exchange rates and the trade balance. A theory that explains this relationship and makes it easier to predict the outcome   of devaluation or depreciation   of the exchange   rate for policymakers is the theory of the J-curve (Anderson and Sofia, 2010). In Ethiopia, the economic reasoning behind the devaluation of the birr as a means of improving a country's trade balance. The expected result in the trade balance depends, of course, on the exact amounts of imports and exports, their respected price elasticities and a number of other factors. Despite encouraging growth in export, the trade deficit of the country continued to remain wide .The export growth performance achieved in the past mainly from the agricultural sector. However, the country reported huge deficit even in agricultural sector where it has the potential to narrow the gap (Soya bean, wheat flour, grain sorghum, dried peas, shelled, durum wheat, spelt, common wheat and, Malt not roasted). The surprise devaluation of the birr on August 31, 2010 from 13.63 to 16.35 ,to boost export performance and bring about structural change in   the   economy (Bienen et.al, 2010).Given the awful past and current balance of payments of the country (both the current and capital), doubt on J curve in Ethiopia. In   the   context of   a   developing   country export and import elasticites are believed to be low(imports no domestic substitute and exports inelastic)Due to the nature of market structure, little benefit goes down to the Ethiopian producers(would limit the supply response) However, Others bring, the traditional theory of the J-curve to play. There is some support in theory for this pattern known as J curve but again it is up to empirical evidence and that is why the researcher is interested to support or reject theory in Ethiopia.

I.   MODEL TYPE

Data type, data description

Trade balance (TB)= ratio of import to export ,Real gross domestic product (RGDP)=for domestic income, Industrial production index (IPI)= proxy for foreign income and Real effective exchange rate (REER)= takes into account of 18 countries(see appendix part on last page)

The researcher have employed TB model by Rose and Yellen (1989),Bahmani-Oskooee (1991)and Petrovic and Gligoric (2009).

MODEL ASSUMPTIONS

The model assumes that both exports and imports are imperfect substitutes for domestically produced

goods,inferior goods or domestic complements are excluded. This implies that domestic income and foreign income elasticity are assumed positive as well as the cross-price elasticities of demand. The own-price elasticities of demand are assumed to be negative

Benchmark of the model used

I.   Domestic Demand for import; domestic income, the domestic currency price paid by domestic importers and domestic price level,

II. Foreign demand for import :foreign income, exchange rate(price of foreign currency), foreign currency price paid by domestic importers, foreign general price level

III. Dividing all variables in demand function by their respective general price level; and after some simple manipulation.

$$TB=TB\ (Q,\ Y,Y^*)$$

Log TB=α+βLogYd+γLogYw+λLogREER+ε

The ratio measure of trade balance is convenient for several and important reasons.

The main reason to use logarithmic expression regardless of whether exports are less than import(especially good for Ethiopia)

In an effort to test the J-Curve phenomenon we must incorporate the short-run dynamics into the long-run model outlined below. (an error-correction modeling below) (Pesaran et. al.(2001)

ARDL representation

$$\Delta\ \text{Log}\ \text{TB}_t = \alpha + \sum_{k=1}^{K}\omega_k\Delta\ \text{Log}\ \text{TB}_{t-k} + \sum_{k=1}^{K}\beta_k\Delta\ \text{Log}\ Y_{d,t-k} + \sum_{k=1}^{K}\gamma_k\Delta\ \text{Log}\ Y_{w,t-k} +$$

$$\sum_{k=1}^{K}\lambda_k\Delta\ \text{Log}\ \text{REER}_{t-k}$$

$$+ \delta_1\text{Log}\ \text{TB}_{t-1} + \delta_2\text{Log}\ Y_{d,t-1} + \delta_3\ \text{Log}\ Y_{w,t-1} + \delta_4\ \text{Log}\ \text{REER}_{t-1} + u_t$$

if δ_1-δ_4 are jointly significant, variables are said to be cointegrated.

 The short-run effects of depreciation are inferred by the estimates of λ_K'.

Specifically, negative values for λ_K' at lower lags followed by positive values at higher lags consistent with the J-Curve hypothesis.

The long-run effects δ_4,normalized on δ_1.

III) MODEL RESULTS

TABLE I :*ARDL Model output A General To Specific (Hendry's,LSE,Gets) Procedure Model Estimates*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-16.29610	2.694536	-6.047833	0.0000
DLREER(-4)	-0.554034	0.201887	-2.744281	0.0122
DLREER(-5)	0.447362	0.203531	2.198000	0.0393
DLIPI(-1)	-1.677111	0.755221	-2.220688	0.0375
DLIPI(-3)	-2.039492	0.721019	-2.828623	0.0101
DLIPI(-4)	-2.181907	0.700804	-3.113435	0.0053

LTB(-1)	-0.563276	0.090995	-6.190150	0.0000
LREER(-1)	0.325760	0.117814	2.765027	0.0116
LIPI(-1)	1.090426	0.350139	3.114265	0.0052
LRGDP(-1)	0.918710	0.258908	3.548404	0.0019
R-squared	0.820723	Mean dependent var		0.048214
Durbin-Watson stat	1.941389	Prob(F-statistic)		0.05

The value of R-squared shows 82% variation in trade balance is explained by included main variables: IPI, RGDP and REER in the model. The regression model is not spurious as R-squared is less than DW statistic (0.820723<1.941389). We have a significant effect of the fourth and fifth lag of LREERI,, first ,third and fourth lag of LIPI on trade balance , implying that the current LREERI would still affect the trade balance in the next four and five year, the current LIPI would affect the trade balance for the coming year, in the next three and four years

TABLE II: Short Run and Long Run Elasticity of Trade Balance In Ethiopia

Variables	Short Run And Long Run Coefficients Before Normalization	Normalization Parameter	Normalized Coefficient
DLREER(-4)	-0.554034	0.563276	-0.98 [1]
DLREER(-5)	0.447362	0.563276	0.79
DLIPI(-1)	-1.677111	0.563276	-2.98
DLIPI(-3)	-2.039492	0.563276	-3.62
DLIPI(-4)	-2.181907	0.563276	-3.87
LREER(-1)	0.32576	0.563276	0.58 [2]
LIPI(-1)	1.090426	0.563276	1.94
LRGDP(-1)	0.91871	0.563276	1.63
C	-16.2961	0.563276	-28.93

[1] *Figure -0.98 and 0.75 confirm the j curve phenomenon*

[2] *0.58,1.94,1.63 are Consistent with theoretical predictions*

The long run trade balance equation obtained by normalization principle is

LTB=-28.93+0.58LREER +1.63LRGDP+1.94LIPI

A positive REER coefficient imply an appreciation of domestic currency birr against major trade partner's currency deteriorate trade balance[1] however, an improvement in the other way round. Devaluation improves trade balance in long run. An increase in domestic income   induces   increase   in imports   and   causes deterioration   in the trade   balance. Contrary to theoretical prediction , the foreign income (IPI) has a negative impact on trade balance long run An increase in IPI deteriorates trade balance in long run.

 By implication, domestic income and trade balance has no effect on the   trade   balance   in short run. The finding of negative coefficients for lower lags and positive ones for higher lags was argued to support the J-Curve phenomenon.   Thus the short run coefficient of LREER confirms J curve in Ethiopia. A negative coefficient at fewer lag at four imply; an appreciation of domestic currency improve the trade balance, while devaluation force trade balance to move in other way round, deteriorate in short run suggesting the price effect dominates volume effect. Whereas at lag five, the positive coefficient shows a devaluation to improve trade balance .Regarding with elasticity interpretation, 1 % devaluation in birr against major trade partner's currency, leads to an increase in trade balance by 0.58% in long run.

Table III) Error Correction Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLTB(-1)	0.333634	0.112034	2.977962	0.0072
DLTB(-2)	0.278899	0.114972	2.425806	0.0244
DLTB(-3)	0.656628	0.134779	4.871893	0.0001
DLTB(-4)	0.661906	0.126679	5.225065	0.0000
DLTB(-5)	0.216545	0.111071	1.949599	0.0647
DLREER(-4)	-0.923413	0.188261	-4.904957	0.0001
DLIPI(-2)	-2.248201	0.795019	-2.827860	0.0101
DLIPI(-5)	1.759120	0.739167	2.379868	0.0269
DLRGDP(-3)	-1.565445	0.505023	-3.099750	0.0054
ECM_1	-0.807823	0.133098	-6.069385	0.0000

The error correction estimate on lagged DLREERI at four with negative sign show the immediate impact of currency devaluation is to worsen trade balance. Based on the Estimates above About 80% of the Disequilibrium in trade balance is "Corrected" each year.

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[1] an increase in REER is appreciation of domestic currency

IMPULSE RESPONSE FUNCTIONS(IRFs)

Fig 1. Impulse response function (IRFs) based on VAR , but almost similar figure based on VECM[1]

The fig 1. show that trade balance in Ethiopia after real depreciation of currency follows J-curve patter .More importantly the obtained estimates suggest that upon real depreciation in the first three years trade balance deteriorates ('short run') and subsequently improves.

TABLE IV: The Forecast Error Variance Decompositions (VDCs) based on VAR

Period	S.E.	LTB	LREERI	LIPI	LRGDP
1	0.271474	**100.0000**	0.000000	0.000000	0.000000
2	0.360347	**98.22696**	**1.405375**	0.359119	0.008545
3	0.402118	**97.68773**	**1.279362**	0.501879	0.531026
4	0.422675	**96.23515**	1.301527	0.639477	**1.823846**
5	0.436771	**93.68372**	1.980525	0.905778	**3.429980**
6	0.449469	**90.60999**	3.033224	1.504482	**4.852300**
7	0.462338	**87.39825**	4.073119	2.634023	**5.894605**
8	0.476037	**84.13818**	4.916067	4.359847	**6.585907**
9	0.490759	**80.83307**	5.547042	6.587947	**7.031942**
10	0.506372	**77.50547**	6.017836	**9.143025**	7.333670

Changes in its own shock, LTB is the predominant source of variation in the logarithm of trade balance. The researcher also observed that own series shock of LTB explain most of the forecast error variance of the series in a VAR. The change in the LREER represents the second source of variation in LTB with a percentage of 1.4%, and 1.28% in the second and third year forecast horizons respectively. Finally, the results also prove the relative ineffectiveness of the industrial production index in affecting trade balance in Ethiopia since LIPI accounts on average for a small percentage of the variation in the LTB sequence.

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[1] **(I will include it later on when it is accepted)**

IV . CONCLUSION

Agricultural sector even is contributing for ever-increasing trade deficit in Ethiopia. In Long run the result favor of the Marshall-Lerner condition in Ethiopia, the standard J-curve hypothesis is validated for Ethiopia. Based on the result found Ethiopian government should give due attention not only on manufacturing sector but also the agricultural sector .capital inflows – mainly foreign aid and remittances tend to cause the REER to appreciate. Therefore the government should has been able to effectively manage large capital inflows; aid target to at alleviating supply-side constraints .private sector can contribute to narrowing the trade deficit through investing in import substituting projects and export products.

Based on the conclusion we had above real devaluation (exchange rate policy is good as a remedy for serious trade imbalance in Ethiopia.

Devaluation Policy base: an assumption that: "nominal devaluation leads to Real devaluation". Thus the government based on result found should, either further devaluation or and has to control the rising domestic price level or even Just a combination of two to apply. Further reform in trade liberalization and exchange market (contribute for devaluation of REER) in Ethiopia. Thus the government should come up with better trade liberalization policy and policy regarding with foreign exchange market.

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Appendix

Methodology for REER in Ethiopia

If the interest is on the competitive position of the country with its major trading partners, a trade weighted or multilateral real exchange rate will be of relevance. Suppose the birr has depreciated against the US dollar, in other words, the price of dollars has risen. Does it mean that the international value of the birr has fallen? Or would it be accurate to say that the international value of the dollar has risen? From a purely bilateral view, the two amount to the same thing. However, a bilateral perspective is, for many purposes, far too narrow or inadequate The effective or trade weighted exchange rate measures changes in the price of foreign currencies in general by looking at an index of a currency's international value. Weighted multilateral exchange rate indices have been devised to measure, for each country, the average change in the value of its currency in relation to all other currencies, but usually those of its major trading partners. As country's currency can be compared with any other currency and a given country's currency can be expected to appreciate compared some currencies while expected to depreciate against some other currency. But can we generalize, whether a given country currency is expected to appreciate or depreciate? This can be done so by comparing the currency value of any country with the currency value of its major trading partners. Since countries trade with many other countries, to determine the relative purchasing power of a given currency, it needs to be evaluated against all other currency values so that the currency's true value can be identified. In other words, whether a currency is "over valued" or "under valued" compared to its major trading partners needs to be determined. This is done by calculating exchange rate indices. These indices are calculated by trade weighing bilateral exchange rates between the currency and its trading partners.The REERI is calculated as

$$\sum^{18}\{(Ei \times P)/P*\}Wi$$

Where Ei is the bilateral exchange rate (currency per birr) of trading partner countries[1]

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[1] The bilateral exchange rate are available except data for turkey,sudan and isreal

P is the domestic price of Ethiopia

P* foreign price   Wi is tarde partners' tarde weight

The REERI calculation thus takes 18 countries in to account of . Below shows these countries

S. No	Country Name
1	Belgium
2	France
3	Italy
4	Germany
5	Netherlands
6	Sweden
7	Switzerland
8	Turkey
9	UK
10	US
11	China
12	India
13	Japan
14	Korea
15	Israel
16	Saudi Arabia
17	Egypt
18	Sudan

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