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Evidence of Exchange Rate Effect on the Trade Balance of 5 Countries: Cases of Multiple Devaluations

Abstract

Many countries face the challenge of how to improve balance of trade. One theory is that when exchange rate is defined as the domestic currency units per unit of the foreign currency, then increasing the exchange rate will lead to a higher cost of imports and lower cost of exports leading to a surplus in balance of trade. This paper will examine the effects of devaluating currency on the balance of trade of five African countries. Using a comparative analysis this paper finds that countries that devaluate their currency multiple times actually create a greater deficit in balance of trade. This brings about important policy implications to countries that face balance of trade deficits.

INTRODUCTION

The question on how to solve a country's balance of trade deficit has plagued policy makers for many years. One theory on how to improve the balance of trade of a country whose imports outnumber exports is to raise the exchange rate. When the exchange rate is raised, the domestic currency is devalued. When this happens prices of exports fall in foreign currency while the prices of imports in domestic currency increase. As this happens the demand for imports is expected to fall and the demand for exports is expected to rise creating a surplus balance of trade (Moosa 2005). In theory this argument for increasing the exchange rate makes sense. The Marshall-Lerner condition backed this theory up showing that in the short run the elasticity of demand for imports and exports are not large enough for there to be an increase in balance of trade, but in the long run elasticities will grow creating an increase in the balance of trade.

Numerous papers have been written on the topic of the Marshall-Lerner condition and the J curve that comes from it. These studies have conflicting results based on which countries were studied, what methods were used and the time period that was covered. This paper intends on showing that increasing the exchange rate multiple times will not lead to an increase in balance of trade because of the shifting J curve known as the Kulkarni Hypothesis. Creating multiple devaluations in order to increase balance of trade only creates more of a deficit. To show the effect of the

African countries for ten year data.

The next section will be a literature review of previous studies on the J curve hypothesis to give a foundation for the paper. Following the literature review will be an overview of the theory that was used to set up the analysis. Next will be a short description of the data. Finally there will be a discussion of the results for each of the five African countries followed by a short conclusion.

LITERATURE REVIEW

There have been many have been many papers written on whether the J curve exists or not. There are numerous studies that have written to show support for the J curve (Noland 1989, Bahhmani-Oskooee 1985, Brooks 1999, Onafowora 2003, Hacker and Hatemi-J 2003 and Kulkarni 2006) in some countries and not in other countries. Also, there are papers written that show there is no J curve (Rose and Yellen 1988). Even though there are papers that have been written against the J curve, the main consensus is that the J curve does exist in many countries given the correct economic conditions.

There have been studies that have shown that there is no evidence of the J curve existing in many countries. Rose and Yellen (1988) have found no evidence of the J curve for the United States using both bilateral data and aggregate data. Further they found no evidence that the balance of trade has a long term relationship with the exchange rate. While no relationship is found, they do bring up a key concern with the traditional theoretical argument, "The theoretical model excludes the possibility of 'third-country' effects".

For instance, in their equation, bilateral trade with Canada is seen as being dependent only on the Canada/US real exchange rate and not on, say, the Japan/U.S. real exchange rate as well. (page 63) Some previous studies could suffer from omitted variable bias without this effect accounted for.

Noland (1989) finds that there are significant effects between the exchange rate and the balance of trade. He found there are short run lags in all of the variables of less then one year, meaning a perverse reaction for the balance of trade. After the initial lags, a decrease in the balance of trade, an improvement was seen for Japan and a long run surplus in balance of trade was observed. While he finds significant J curve evidence, Noland warns that the while there could be improvements of the trade balance in the long run, there will be long periods of lags and perverse reactions with the trade balance. Governments should be aware of this and use a economic activity policy rather than an exchange rate policy (Noland 1989).

Bahmani-Oskooee (1985) shows that there is evidence of the J curve in many LDC's. This is done by examining the case of four countries, Greece, India, Korea and Thailand. To see if any of these countries exhibited the J curve phenomenon Bahmani-Oskooee used a technique that had never been done at the time. Instead of examining only exchange rate and balance of trade, many other factors were used to evaluate the J curve. In addition to balance of trade and exchange rate, GDP, real world income index, domestic and world high power money indexes were also used. The regression results found that in three of the four countries there was evidence of the J curve. The exchange rate coefficient was negative and the distribution lag coefficients were initially positive and then became negative, which follows the J curve path (Bahmani-Oskooee 1985). This paper explains the J curve differently than the traditional elasticity approach, rationalizing the movement of the trade balance, "it is quite possible that flows of goods respond only with time lags to changes in the exchange rate" (Bahmani-Oskooee, 502). Using a unique approach at the time Bahmani-Oskooee has shown that in some of the less developed countries there is evidence of a J curve.

Along with Brooks, Bahmani-Oskooee (1999) also found long run evidence of the J curve with the

United States and six of her largest trading partners. They employed the technique of disaggregating the data between the United States and Canada, France, Italy, Germany, Japan and the United Kingdom. When they used the disaggregated data it was found that in the short term there was no sign of the J curve, but in the long term the J curve did exist. Thus they conclude that a depreciation of the U.S. dollar can have favorable long run effects on balance of trade (Bahmani-Oskooee, Brooks).

Onafowora (2003) presents another case in which currency devaluation could lead to a favorable increase in Balance of trade. Onafowora studied Indonesia, Malaysia and Thailand to find the effects of the exchange rate and balance of trade. Using a cointigration analysis Onafowora foundthat there was a relationship between real exchange rate, real domestic income, real trade balance and real foreign income. Also the Marshall-Lerner condition held true in the long run (2003). This paper found short run J curve effects for bilateral trade with U.S. and Japan between Malaysia and Indonesia and between Thailand and the U.S. For Malaysia and Indonesia there was an initial decline in balance of trade but then over time balance of trade improved.

Another study that confirms the J curve hypothesis was written by Hacker and Hatemi (2003) when they studied north European countries. In this study they examined the monthly and quarterly trade statistics for Belgium, Denmark, Netherlands, Norway and Sweden. To analyze the effect of exchange rate onbalance of trade they used a export import ratio instead of the commonly used export minus import. Also, because of the other factors that influence trade balances, both domestic and foreign inputs such as GDP were used as variables in the regression as well. Using the trade ratio, Hatemi and Hacker found that these countries do exhibit the J curve phenomenon (2003). In nine of the ten cases that were studied a decline in the trade balance was found to happen after the initial devaluation of the currency. After the initial trade balance declined seven of the ten countries were found to have an increased trade balance in the long run (2003), which is not as convincing of an argument.

Kulkarni (2006) forms the basis of this paper. In the case of Ghana, he shows that there are several devaluations in the currency accompanied by a worsening balance of payment deficit. From this he concludes that, "a continuously devaluating currency may lead to further deficits in balance of trade" (49). Based on the case of Ghana, devaluating a currency multiple times creates shifts in the J curve and an ever increasing deficit in balance of trade.

This paper studies the effects of five African countries in a way that previous literature has not. We will look at the long run relationship of exchange rate and balance of trade in periods of multiple devaluations using comparative analysis. This paper examines the effects of multiple devaluations that are not seen before in previous papers besides Kulkarni (2006) and address the policy implications of such devaluations.

THEORY

1. J-Curve Hypothesis and Marshall-Lerner Condition

The J curve hypothesis explains the relationship between changes in exchange rates and balance of trade. Conventional arguments have shown that an increase in exchange rate, or depreciation of currency, leads to a reduction in imports and an increase in exports and a balance of trade surplus. The J curve hypothesis by Marshall and Lerner shows that the conventional argument might not be the case. Increasing the exchange rate would only lead to a surplus in balance of payments if the absolute value of demand elasticity of exports and imports is greater than or equal to one. This statement is proven by the derivation of the Marshall-Lerner condition. If the Marshall-Lerner condition is not satisfied, there is a perverse reaction, an increase in exchange rate will lead to a decrease in balance of trade.

The J curve hypothesis incorporates the Marshall-Lerner condition and the time determinant of elasticity demand. As time progresses the elasticity demand of both imports and exports will increase. So, initially after the devaluation the elasticity demand of imports and exports should be relatively small. As time goes by the elasticity demand for imports and exports will increase and the Marshall-Lerner condition is met when the elasticity demand for imports plus exports will be greater than or equal to one.

$$\left(Nx + Nm > 1 \text{ for } \frac{\partial BOT}{\partial J} > 0\right)$$

Once the Marshall-Lerner condition is met, there will be a balance of payment surplus. When graphing balance of trade over time there will be a J shape to the curve that balance of trade takes.

There are three definitions that are required for the Marshall-Lerner Condition

i) $\left(real\ Exchange\ Range(J)\ \frac{\varepsilon p^*}{p}\right)$

Where

ε = Nominal Exchange rate

p^* = Foreign general price level

p = Domestic general price level

Elasticity Demand for imports with respect to real exchange rate (N_m)

$$\left(Nm = \frac{\Delta M}{\Delta J} \times \frac{J}{M}\right)$$

Elasticity Demand for imports with respect to real exchange rate (N_x)

$$\left(Nx = \frac{\Delta X}{\Delta J} \times \frac{J}{X}\right)$$

To derive the Marshall-Lerner Condition there are three assumptions that must be followed.

1. The supply elasticity's of exports and imports are infinite.

2. Balance of Payment is defined as balance by only balance of trade.

3. At the time of devaluation, the balance of trade is balanced.

a) $(BOT = x - JM = 0)$ so $x = JM$ or $M =$

b) Derive the BOT equation with respect to J

$$\frac{\partial BOT}{\partial J} = \frac{\partial x}{\partial J} - \frac{\partial x \cdot M}{\partial J} - \frac{\partial M \cdot J}{\partial J}$$

c) $\frac{\partial BOT}{\partial J} = \frac{\partial x}{\partial J} \times \frac{J}{x} \times \frac{X}{J} - \frac{X}{J} - \frac{\partial M}{\partial J} \times \frac{J}{M} \times M$

→ So $\partial BOT = M(Nx - 1 - Nm)$

For an increasing real exchange rate (J) to lead to a surplus in BOT, we must have absolute value of demand elasticity of X and M to be at least one. When Marshall-Lerner condition is not satisfied the devaluation of currency leads to a balance of payment deficit. To have a surplus in the BOT

after a devaluation $\frac{\partial BOT}{\partial J} > 0$

Because both X and M are positive by definition

$$\left(Nx + Nm > 1 \text{ for } \frac{\partial BOT}{\partial J} > 0\right)$$
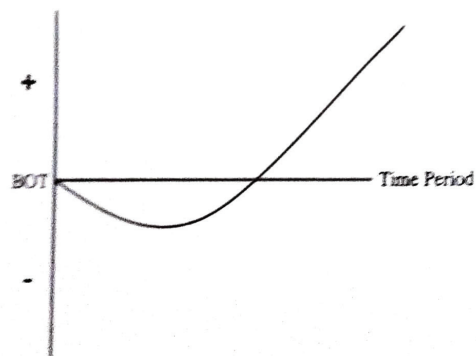

Figure 1: Traditional J-Curve Hypothesis

2. Shifting J curve/ Kulkarni Hypothesis

The extended J curve Hypothesis put forward by Kulkarni addresses the issue of a country whose currency continuously devaluates. This theory states that when currencies are continuously devaluated, a continuous deficit in balance of trade can result (Kulkarni 2006). This happens because when there are multiple devaluations, there will be a shift of the J curve every time the currency devaluates. The series of rightward shifts will cause balance of trade to decrease and the effect will continue to be perverse.
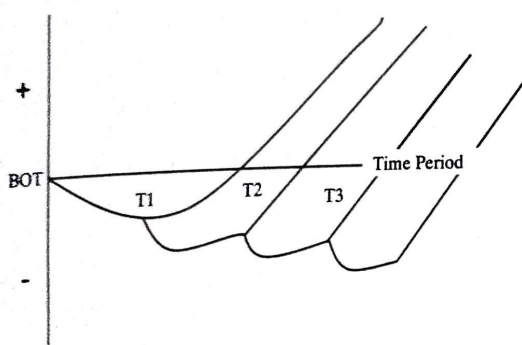
Figure 2: Multiple Devaluations and Shifts in J-Curve

In this paper we will use the extended J curve hypothesis to see if the constant devaluations of currencies in Africa lead to a drop in balance of trade and whether the path of balance of trade resembles the shifting J curve model seen in figure 2.

DATA

This study examined the effect of exchange rate on the balance of trade to find if there was evidence of the J curve and the extended J curve. To do this we examined five African countries, Kenya, Tanzania, Morocco, Mozambique and Uganda from 1994 to 2004. To find the existence of the extended J curve data were collected for both exchange rate and balance of trade. The exchange rate for all countries was in the form of domestic currency per US dollar, for example Kenyan shillings per 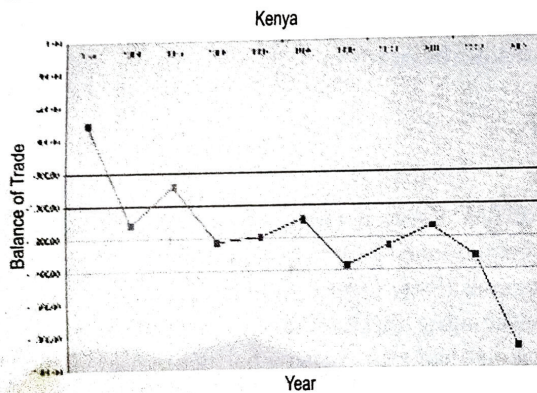US dollar. Balance of trade is computed by subtracting exports from imports. Balance of trade data were aggregate for each year's end starting in 1994 and ending in 2004. The figures for exchange rates for each country were also found at the year's end beginning in 1994 and ending in 2004. Figures on both exchange rate and balance of trade were collected from the International Financial Statistics Yearbook by the International Monetary Fund 2006.

RESULTS

This paper examined the possibility of the shifting J curve hypothesis put forward by Kulkarni. Using data collected from 1994 to 2004, we plotted the balance of trade across the time period. When doing this we found results that were consistent with many previous studies showing a J curve. But when we looked at multiple devaluations we found that four of the five countries studied showed evidence of shifting J curves. This is something that has not been shown before and has economic policy implications for countries to consider before devaluating their currency.

Kenya : Kenya is a country which has had a short independence with many different exchange rate regimes (State Dept.). Kenya has had a policy of devaluating their currency multiple times, and has also had an increasing balance of trade deficit. After a devaluation in 1992 and 1993, there is evidence of the J curve by the increasing trade deficit for the year 1994 followed by a decrease in trade deficit for one year following. This is a perfect example of the J curve. But following other currency devaluations from 1996 to 2004 there are a number of other J curves taking place. The result of multiple currency devaluations is the shift of the J curve to the right when currencies devaluate. Because of this Kenya experienced a increasing trade deficit for all of the years the currency devaluated.
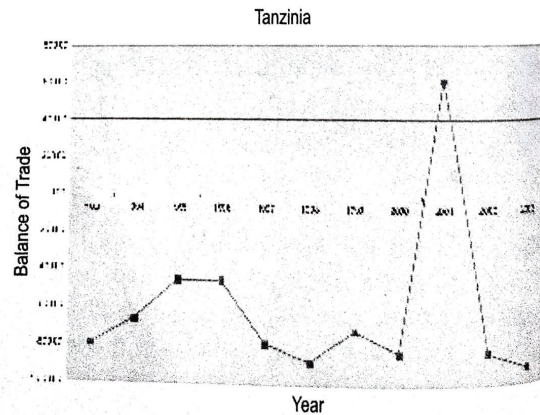
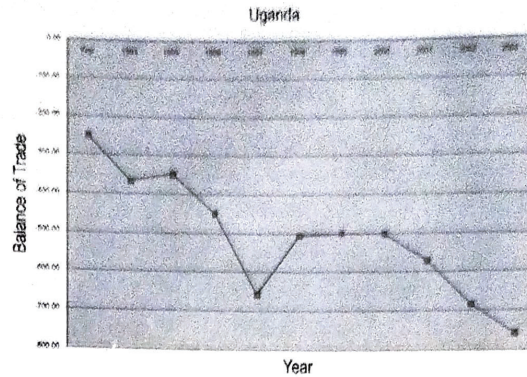| Year	Balance of Trade	Exchange Rate (Against US dollar)
1994	-504.00	56.05
1995	-1,112.00	51.43
1996	-881.00	57.11
1997	-1,225.00	58.73
1998	-1,189.00	60.37
1999	-1,085.00	70.33
2000	-1,371.00	76.18
2001	-1,248.00	78.56
2002	-1,129.00	78.75
2003	-1,314.00	75.94
2004	-1,869.00	79.17

Kenya

which was not expected. Following 1997 there was a sharp decline in the trade balance, a perverse reaction to the increase in exchange rate. Following the sharp decline there was a increase in balance of trade for one year, and then the deficit began to increase again. This is another perfect form of the J curve. The constant increase in exchange rate has again caused the balance of payment to decrease almost every year, brought about by the shifting of the J curve.

Year	Balance of Trade	Exchange Rate (Against US dollar)
1994	-789.90	523.45
1995	-657.50	550.36
1996	-449.00	595.64
1997	-449.10	624.57
1998	-775.90	681.00
1999	-872.10	797.33
2000	-704.30	803.26
2001	-819.60	916.30
2002	-614.90	976.30
2003	-823.70	1,063.62
2004	-906.00	1,042.96

Tanzania: Tanzania is a country who has had very few exports in the past decade due to the decline in clove production which is one of the countries few exports. The Tanzanian government has recently turned to a floating exchange rate which has created more foreign investment, but has created large increases in the exchange rate and a devaluating currency (State Dept.). During the time period we observed Tanzania's currency has devaluated every year in some instances by a large amount. From 1994 to 1997 the balance of trade actually increased,

Tanzinia

Uganda : Uganda is a country whose economy focuses around agriculture. Their main exports are coffee and fish products. Being focused on agricultural production and almost no manufacturing their exports are nearly half that of their imports, which are capital equipment, vehicles and petroleum (State Dept.). From the beginning time period of the study Uganda has had an increasing exchange rate every year. Because of this there is a sharp decline on balance of trade. This balance of trade decline can be seen to go along with the devaluation of their currency. There is about a one year period when the balance of trade actually increases, just as the J curve hypothesis would predict. But because of the shifting J curve the balance of trade continues to worsen.

Uganda

Mozambique : Mozambique is known as one of the poorest countries in the world with a GDP per capita of around $320 US dollars in 2006. This however is an improvement from the 1980's where it was around $120. Their main exports are agricultural and natural gas (State Dept.). Mozambique's exchange rate with the US dollar has increased substantially over the period 1994-2004, an amazing 2700%. This constant devaluation has almost cut balance of trade deficit in half over ten years. There can be two J curves observed during this time period, but they do not show the shifting J curve hypothesis, rather they show the perverse reaction and then the increase in balance of trade.

| Year	Balance of Trade	Exchange Rate (Against US dollar)
1994	-251.20	926.80
1995	-366.50	1009.5
1996	-347.60	1029.6
1997	-449.90	1,140.10
1998	-656.10	1,362.70
1999	-505.60	1,506.00
2000	-499.80	1,766.70
2001	-499.90	1,727.70
2002	-571.30	1,852.60
2003	-681.90	1,935.30
2004	-757.30	1,738.60

Year	Balance of Trade	Exchange Rate (Against US dollar)
1994	-767.20	6,651.00
1995	-536.30	10890.00
1996	-478.30	11377.00
1997	-454.00	11,543.00
1998	-491.00	12,366.00
1999	-806.20	13,300.00
2000	-682.00	17,140.50
2001	-271.30	23,320.40

2002	-666.60	23,854.30
2003	-604.20	23,856.70
2004	-345.80	188,899.30

Mozambique
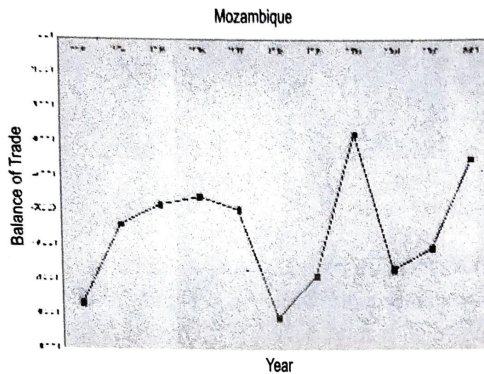
1999	-2,448.00	10.09
2000	-3,235.00	10.62
2001	-3,022.00	11.56
2002	-3,061.00	10.17
2003	-4,345.00	8.75
2004	-6,487.00	8.22
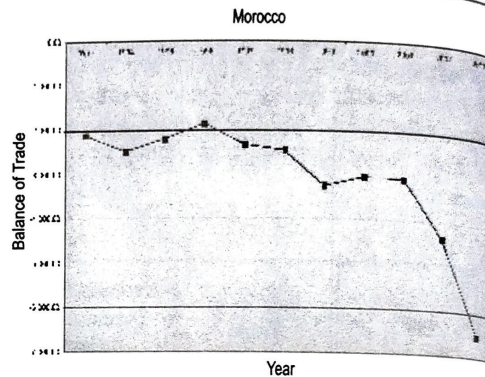
Morocco

Morocco : Morocco has seen a time period of low inflation and slow economic growth over the past decade. Morocco is extremely dependent upon agriculture for their economic growth, which has slowed dramatically. Morocco has had several exchange rate increases during the ten years of interest. Along with the exchange rate increases the balance of trade continued to worsen. Morocco shows several J curves following the devaluations occurring in 1994, 1996 and 1991-2001. Following these devaluations are decreases in balance of trade, and a small increase in afterward. But, these small increases last only for one year because of the constant devaluations and the shifting J curve effect.

Year	Balance of Trade	Exchange Rate (Against US dollar)
1994	-2,107.00	8.69
1995	-2,482.00	8.469
1996	-2,193.00	8.8
1997	-1,864.00	9.71
1998	-2,319.00	9.25

CONCLUSION

After analyzing five African countries, Kenya, Tanzania, Morocco, Mozambique and Uganda it is clear that the extended J curve hypothesis holds true. When a country is experiencing a balance of trade deficit and devaluates their currency multiple times the extended J curve takes effect. When there is devaluation there is a perverse reaction until demand elasticity's grow for imports and exports and the Marshall-Lerner condition is satisfied. When this happens there is an increase in balance of trade. But when there are multiple devaluations the J curve shifts to the right with the devaluations and balance of payment can never increase. When a country is experiencing a balance of trade deficit, it must realize that increasing the exchange rate may not be the answer. Devaluating the currency many times will actually make the problem worse and should not be considered an economic policy for improving balance of trade.

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