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Exchange Rates and Trade Balances under the Dollar Standard

by

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1. Introduction

Some commentators in western financial press have suggested that East Asian economies, especially China, should pursue a different exchange rate policy (Lardy, 2003, 2005; Goldstein 2004; Roubini 2005). To reduce the trade surpluses, especially in bilateral trade with the US, these economies are advised to appreciate or freely float their currencies in the near future (Lardy 2005). Instead of addressing the external imbalances by increasing national savings (public and private), the US government willingly and conveniently adopted this simplistic view, and has exerted pressures on China and other East Asian trading partners to adjust their exchange rate policies. This paper shows that forcing creditor countries to appreciate would not alleviate the U.S. trade deficit.

When most economists who propose to adjust exchange rates to affect trade balances, they have the elasticities models in mind, which are based on insular economies from the past rather than open economies today. Unlike the industrial economies after the WWII, now countries are much more open with a greater trade component and impressive inflows and outflows of capital. Nonetheless, open economies react

[1] The author would like to grant all credits to the insightful and patient guidance of Prof. Ronald McKinnon throughout the research. All errors are mine. Contact information: hongqiao@stanford.edu and hongqiao@stanfordalumni.org.

differently to exchange rate changes than insular ones do. McKinnon (1990) and McKinnon and Ohno (1997) have shown already that in open economies, exchange rate changes may have unpredictable effects on trade balances. In other words, with the correct setup of models for an open economy, depreciation may not improve the trade balance and appreciation may not make it deteriorate.

This paper in particular considers the impact effects of discrete exchange changes on open economies when they have net foreign exchange debts and assets. It reveals that the wealth effect, investment effect, together with indirect investment effect (in the East Asian region) increase the complexity of forecasting current account movement accompanying any exchange rate change. Except for the case when a debtor economy depreciates its currency against the dollar and suffers a foreign exchange crisis that depresses the economy, it is impossible to judge what will be the net trade balance effect of a depreciation or appreciation. Hence, exchange rate cannot be used as an efficient tool to adjust trade balance in most cases.

2. Literature Review

Like many other subjects in economics, economists have yet to reach an agreement over whether equilibrium in the balance of payments can be reached by exchange rate changes. But unlike other projects that require economists and politicians to work together, in this case, the misconception of adjusting trade balances through exchange rate movements is largely attributed to economists, not politicians. Most of the economists who believe that relating exchange rate changes systematically affect trade balances acquired such thinking from the conventional elasticities model of the balance of trade, still taught in undergraduate economic courses today.

Created in the 1930s and still widely accepted, the elasticities approach is central to many Keynesian (James Meade, 1951) and monetarist models (Milton Friedman 1953; Harry Johnson 1958). According to these models, the exchange rate is assigned to address external balance while government expenditures are assigned to internal balance and full employment. However, this type of model is based on the assumption that exchange rate policies can be separated from monetary policies. In other words, it is assumed that when a discrete exchange rate change takes place, the domestic price level can remain undisturbed because the money supply is unaffected. In some circumstances, this may be true. For example, among the industrial countries after World War II, when capital movement was strictly limited and trade was less prevalent, this separability in policy was possible. Depreciation may lead to a reduction in trade deficit and appreciation an improvement in trade balance.

However, no one will deny that today industrial economies and emerging market economies are much more open. Without the insular assumption, elasticity-type models are no longer valid in predicting consequences of exchange rate changes (McKinnon 1990, 1997). Nonetheless, economic scholars have not yet updated their framework of thinking when they naturally associate currency depreciations with current account deficit reduction. For example, in a recent publication of the Institute for International Economics, Goldstein (2004) concluded that "To reduce the US current account deficit to, say, 2 to 2½ percent of GDP at reasonable cost, it would be helpful to have a real depreciation of the dollar of about 25 percent from its peak (in February 2002)." He explained this result thus "This uses the rule of thumb that each 1 percent fall in the real trade-weighted dollar improves the US current account position by roughly $10 billion."

Clearly, he remains loyal to the elasticities model since he quotes "As James Meade (1951) emphasized more than 50 years ago, the classical remedy for an economy experiencing both domestic overheating and external surpluses is exchange rate appreciation, and neither reserve nor debt consideration appear to constrain such exchange rate action."

It perhaps will take years and hopefully not too many further mistakes for the elasticity school to realize that a discrete change in exchange rate does not necessarily lead to trade balance adjustment in a certain direction. In open economies today, capital markets are no longer tightly restricted and interest rates have to follow open interest parity internationally. As a result, exchange rate determination can no longer be isolated from monetary policies. According Frankel and Mussa (1980), in an open economy, the exchange rate is a forward-looking variable. They adopted an asset-market approach which implies that investors will base their portfolio decisions between claims denominated in local and foreign currencies on their expectations of future exchange rates. Then their investment decisions determine spot exchange rates.

How do people form their expectations on future exchange rates in the first place? They are ultimately derived from people's beliefs of the relative tightness of monetary policies in a country when compared to others. If they feel that future monetary policy will be tighter in one country than elsewhere and its price level will decrease, they will increase the demand for this currency and force an appreciation in the spot market, and vice versa. Hence in an open economy, exchange rates are endogenous to present and future monetary polices. Ignoring the monetary consequences from an exchange rate change (as people do in an elasticities model) seems rather simplistic.

McKinnon (1990) and McKinnon and Ohno (1997) have demonstrated how exchange rate changes may be followed by unpredictable movements of the balance of payments in open economies. As the dollar standard prevails with open international capital market behind global imbalances in the 21st century, how should exchange rate economics be updated for open economies with large dollar assets or debts? What are the distinctive features of economies in East Asia and how are they related to the East Asian financial crisis? This paper tends to address these questions by introducing a wealth effect, an investment effect and an indirect investment effect in macroeconomic models when discussing the impact effects of discrete exchange rate changes.

3 Theoretical Model

3.1 Insular versus Open Economies

Let's first review the difference between insular and open economies by analyzing the short-term and long-term effect after an exchange rate change.

3.1.1 Insular Economies

Defined in the same fashion as in McKinnon (1990) and McKinnon and Ohno (1997), an insular economy in the following model is represented largely by industrial countries in the 1930s to 1950s and some developing countries at a later time. Such an economy is featured with a tightly regulated capital market and domestically determined interest rates. The trade component in the economy is also limited so that exchange rate changes affect trade volume but not domestic price level.

The model of insular economies is borrowed from McKinnon (1997) with reference of Marston (1985).

$$Y = A + B \qquad \text{Domestic output} \qquad (1)$$

$$A = C(Y) + I(i - \dot{p}) + G \qquad \text{Domestic absorption} \qquad (2)$$
$$\quad -$$

$$B = B(A, e - p) \qquad \text{Trade balance} \qquad (3)$$
$$\quad - \quad +$$

$$m - p = L(Y, i, \dot{p}) \qquad \text{Money market} \qquad (4)$$
$$\quad + \; - \; -$$

$$\dot{p} = \alpha\left(Y - \bar{Y}\right), \ (\alpha>0) \qquad \text{Price equation} \qquad (5)$$

$$p = \bar{p} \qquad \text{Alternative price equation} \qquad (6)$$

where endogenous variables include: Y, A, B, p ($\dot{p}$), and i

exogenous variables: G, e, $\bar{Y}$, and m

In this standard macroeconomic model and its variations in the following part, variables are defined as the follows:

Y	= real GDP	$\bar{Y}$	= full-employment output
A	= domestic absorption	B	= trade balance (net)
i	= domestic interest rate	i^*	= foreign interest rate
p	= domestic price level	$\dot{p}$	= price level change
G	= government expenditure	e	= nominal exchange rate (domestic currency/foreign currency)
m	= domestic money supply		

Assume nominal exchange rate is exogenously set in an arrangement resembling the dollar pegs. The real exchange rate is equal to $e - p$ as foreign price p^* is assumed to be fixed.

There are two alternative equations for domestic price determination: (5) and (6). Equation 5 allows price to respond to a deviation of the full-employment output level and equation 6 fixes the price at the level of $\bar{p}$. In this insular economy, exchange rate changes cannot be passed through onto domestic prices through either of the two price equations. In addition, the exchange rate does not affect domestic absorption directly

because domestic investment is not influenced by the real exchange rate and the domestic interest rate is isolated from foreign ones. In the following part, we will adopt equation 5 for price determination in our model. However, if this price equation is replaced by equation 6, it should not affect our results in any significant way.

To determine the sign of the derivative of trade balance with respect to changes in the real exchange rate, we have to consider both the direct impact and the indirect effect from domestic absorption. Let us first examine the direct impact from an exchange rate change. Suppose the partial derivative of trade balance with respect to real exchange rate is positive, or, the well-known Marshall Lerner Condition is satisfied, i.e.

$$\frac{\partial B}{\partial(e-p)} > 0 .$$

That means ceteris paribus, exchange rate will affect trade balance in the fashion predicted by the conventional wisdom. A real deprecation of the local currency makes imports more expensive and exports cheaper, thus boosting exports and reducing imports, improving current account balance. Vice versa, an appreciation encourages imports and reduces export, and thus lowering current account surplus.

In this model of an insular economy, we now have to consider the domestic absorption effect from the impact of currency depreciation on domestic expenditure. Shortly after a depreciation and export expansion, domestic output increases, i.e. $\frac{dY}{de} > 0$, which also leads to a rise in imports. But such an increase of imports is smaller than that of exports. Therefore, trade balance still improves after considering domestic absorption effect, or

$$\frac{dB}{d(e-p)} > 0 .$$

In the long run, however, the price change induced by depreciation diminishes as prices remains at the higher level, $\dot{p} \to 0$ and $p \uparrow$. Such a price increase reduces the real money supply, inducing an increase in interest rate because of the money market equilibrium. This is easily seen from equation 4. As output falls back to the original level in the long run, the domestic interest rate is the only adjustable variable to accommodate the fall in the real money supply from the higher price levels. In other words, the interest rate has to rise. Such an increase reduces domestic investment (and domestic absorption) according to equation 2, improving the trade balance in both the short and the long run.

The following tableau summarizes the impact effects of an exchange rate change in an insular economy systematically:

Tableau 1 Insular Economy: Depreciation/Appreciation against Dollar

(No net foreign exchange indebtedness)

	Wealth Effect	Investment Effect	Domestic Absorption	Import	Export	Trade Balance
Depre-ciation	-	-	↑ (small and limited)	↓	↑	↑
Appre-ciation	-	-	↓ (small and limited)	↑	↓	↓

3.1.2 Open Economies

As the readers must have noticed, the insular features of the economy described in the previous session bear very few similarities with the ones prevailing today. Now, there is a much higher proportion of international trade, and rules against capital movement internationally nowadays are much less restrictive than fifty years ago. Now exchange rates can float more freely if the government chooses to let them. Almost all industrial countries after the 1960s, and many emerging market economies today, are better described by the following model for open economies.

$i = i^*$	Interest rate parity	(7)
$\dot{p} = \beta(e - p)$, where *(β>0)*	Price expectation	(8)
$Y = A + B$	Domestic output	(9)
$A = C(Y) + I(i - \dot{p}, e - p) + G$ $\quad\quad +\quad\quad -\quad\quad +$	Domestic absorption	(10)
$B = B(A, e - p)$ $\quad\quad -\quad +$	Trade balance	(11)
$m - p = L(Y, i, \dot{p})$ $\quad\quad\quad +\ -\ -$	Money market	(12)

Endogenous: Y, A, B, p ($\dot{p}$), m, and i

Exogenous: e, i^*, and G

In many ways, an open economy differs from an insular economy and this is reflected in the setup of the model. Equation 7 states that the domestic interest rate has to follow the international one. In this stationary model, risk adjustments are omitted. This is because in an open economy, financial openness requires the rate of return of domestic capital to converge to the international level. The price equation 8 shows that a change in real exchange rate will be directly reflected in the domestic price level. According to the asset-market approach of exchange rate determination by Frenkel and Mussa (1980, 1985), today's exchange rate changes can affect future domestic price levels through the expectation of future changes in monetary policies that are needed to validate any sustained changed in today's exchange rate.

On the output side, both domestic absorption and trade balance are influenced by real exchange rate changes. In particular, investment grows in response to a real

devaluation and dips when currency appreciates (equation 10) because of the price effect. Hence, domestic absorption is influenced by the real exchange rate changes through domestic investment $\frac{\partial I}{\partial(e-p)} > 0$.

Suppose this exchange rate change is discrete and isolated from other major policy changes in government expenditure and money supply changes. Let us suppose there is an unexpected appreciation. In the short run, $\dot{p}$ becomes negative according to equation 8 but p initially remains at its original level. The appreciation in the exchange rate does not affect the domestic interest rate, which is aligned with the foreign rates. Therefore, we have:

$e - p \downarrow$, $i - \dot{p} \uparrow$ and $\dot{p} < 0$

Such real appreciation together with an increase of real interest rate slows down domestic investment as described in equation 10. Domestic absorption A and output Y both decrease, leaving the sign of trade balance $B = Y - A$ indeterminate as price deflation sets in.

Tableau 2 Open Economies: Initial Impact of a Discrete Exchange Rate Changes

	Wealth Effect	Investment Effect	Domestic Absorption	Import	Export	Trade Balance
Depre-ciation	-	↑	↑	↑	↑	?
Appre-ciation	-	↓	↓	↓	↓	?

If it still seems to be unconvincing why currency appreciation does not necessarily lead to a reduction in trade surplus, let us try to explain it without the help of equations. Suppose the Marshall-Lerner condition is still satisfied, i.e. the price effect from real appreciation will cause an increase in imports and a slump in exports,

deteriorating the overall trade surplus. On the other hand, this appreciation also makes the economy of interest a more expensive place to invest, and at the same time serves almost as a tight monetary policy because of deflationary pressure. Therefore, a slowdown in investment and output is inevitable, triggering a deceleration in domestic demand and imports. It is true that export slows down as a result of the appreciation, but the import also drops, making the net effect on trade balance uncertain. By the same token, currency depreciation in an open economy does not necessarily improve the trade balance.

The impact effects of discrete exchange rate changes in an open economy are listed below in Tableau 2. In contrast to the effects on an insular economy in Tableau 1, the net effect on trade balance is unpredictable. But, of course, in the long run, any discrete change in the nominal exchange rate eventually washes out as the domestic price level increases so as to restore the initial value of the real exchange rate.

3.2 Debtors versus Creditors under the Dollar Standard

The model in the previous section is a better depiction of the major economies in the 1970s and 1980s. The global capital market is more symmetrical because neither the U.S. nor Japan has accumulated large dollar debts or assets. Nonetheless, the world has changed tremendously on the rise of the dollar standard over the past 10 years. As introduced earlier, many economies have acquired significantly different position in foreign-currency denominated wealth. In the case of East Asia, a few countries have run chronic current account surpluses while others changed from net dollar debtors to creditors only recently. How does this difference in net wealth denominated in foreign currency alter the impact of an exchange rate change on the trade balance?

To incorporate the asymmetry created by the dollar standard into the model, we

expand the model into a two-country setup to include the economy with net foreign exchange assets – as denoted by F (denominated in dollars as in Chapter I) and the U.S. When $F < 0$, the economy is a net debtor. The rest of the world is treated as a sink so that the sum of world trade balances is zero.

(1) Domestic economy: debtor or creditor

$$i = i^* + \gamma \qquad \text{Interest rate parity} \qquad (13)$$

$$\dot{p} = \beta(e - p), \quad (\beta > 0) \qquad \text{Price expectation} \qquad (14)$$

$$Y = A + B \qquad \text{Domestic output} \qquad (15)$$

$$A = C(Y, e \cdot F) + I(i - \dot{p}, e - p) + G \qquad \text{Domestic absorption} \qquad (16)$$
$$\quad + \; + \; + \qquad - \qquad +$$

$$B = B(A, e - p, A^*) \qquad \text{Trade balance} \qquad (17)$$
$$\quad - \quad + \quad +$$

$$m - p = L(Y, i, \dot{p}) \qquad \text{Money market} \qquad (18)$$
$$\quad + \; - \; -$$

Endogenous: Y, A, B, p ($\dot{p}$), m, and i

Exogenous: e, i^*, G, γ, and F

It is notable that the major difference between this economy of interest and the open economy introduced in the previous section are: a wealth effect is included in domestic absorption (equation 16) and U.S. absorption A^* will also affect trade surplus (equation 17). The wealth effect has a positive impact on consumption, which implies that an appreciation decreases net wealth in domestic-currency terms and a depreciation increases net debt in domestic-currency terms. In both cases, people are conscious of such a change in their net value and reduce their consumption accordingly.

(2). The U.S. Economy

$$Y^* = A^* + B^*$$ Domestic output (19)

$$A^* = C(Y^*) + I(i^* - \dot{p}^*, e^* - p^*) + G^*$$ Domestic absorption (20)
$$\qquad\qquad\qquad\qquad\quad - \quad +$$

$$B^* = B(A^*, e^* - p^*, A)$$ Trade balance (21)
$$\quad - \quad + \quad +$$

$$m^* - p^* = L(Y^*, i^*, \dot{p}^*)$$ Money market (22)
$$\qquad\qquad + \quad - \quad -$$

$$\dot{p} = \alpha\left(Y^* - \bar{Y}^*\right), \ (\alpha>0)$$ Price equation (23)

Endogenous: Y^*, A^*, B^*, p^* ($\dot{p}^*$), and i^*

Exogenous: G^*, e^*, $\bar{Y}^*$, m^* and γ

The asymmetry of dollar standard is largely reflected in the fact that the U.S. economy bears more similarities with an insular economy defined in 3.1. than with the open economies. First, US interest rate i^* is determined domestically and there is no direct impact on domestic price level from an exchange rate change (equation 23). Second, domestic absorption is not influenced by the net foreign indebtedness of the U.S. (equation 20) because all foreign assets and debts are denominated in dollars.[2] We argue that such a setting can better describe the United States because of its central role in the world monetary system.

[2] This is a very strong assumption. However, relaxing it will not significantly change the implications from our model.

Studies have shown that a large proportion of U.S. foreign assets is in dollars. According to Gourinchas and Rey (2005), almost all US foreign liabilities are in dollars, but only about 70 percent of U.S. foreign assets are in foreign currencies, such as euro and sterling, instead of the currencies from major trading partners. Consequently, this asymmetry causes a valuation effect on U.S. trade balance – a depreciation in dollar should generate positive wealth transfers into the U.S. and therefore allow trade deficits to persist for longer without a crisis. Using data from 1952 to 2004, they estimate that a 10 percent fall in dollar transfers about 5 percent of US national income from the rest of the world to the U.S. This stabilizing valuation effect, which is independent of the exchange rate impact, is claimed to have contributed as much as 31% of the external adjustment.

Unlike interest rates in peripheral countries, the interest rate on dollar asset is determined in the US market. The price level in the center country is also less affected by exchange rate changes because the dollar has served as the major invoice currency in international trade. Therefore the price equation adopted (equation 23) is different from that of the peripheral economy (equation 14) or the zero-debt open economy (equation 11).

The US has a colossal amount of foreign debt, but primarily denominated in dollars. We acknowledge that some of the US foreign claims are in other currencies, such as the euro, but the size of the claims is much smaller than dollar debts. Hence exchange rate changes may influence investment decisions in the U.S. because of the price effect, but because of the absence of the wealth effect, not the consumption decision.

(3). The rest of the world

$B_r + B + B^* = 0$ World trade balance (24)

3.2.1 Debtor country's depreciation against the dollar

Debtor Economy:

Consider an economy with net foreign debts, largely denominated in dollars. Such debts have been accumulated from past current account deficits. Suppose an unexpected event (such as an administration committed to more extensive monetary expansion takes over) takes place, leading to currency depreciation. Such depreciation will be sustained to the future if the monetary authority increases the money supply as per initial expectations.

In the short run, noticeably, a discrete depreciation sets off inflationary expectations and price change increases in the debtor economy (equation 14). In response, domestic investment increases because of the drop in real interest rate and currency

undervaluation (equation 16). Even though this leads to a rise in output, the net worth decreases sharply because the domestic cost of dollar debts increases as a result of currency deprecation. Domestic consumption ultimately drops (equation 16), causing a slump in domestic absorption. As a result, trade surpluses increase in the short run.

The trade balance improvement can also be seen from the fact that after currency deprecation, exports grow and imports drop due to the price effect. The negative wealth effect then dominates the positive investment effect, setting a brake on domestic absorption. Domestic demand for imports slows down because people restrain their consumption after finding out their net worth (in foreign exchange) decreases (by an increase in debt or a decrease in the value of assets). Therefore, both the price effect and the wealth effect dominate the investment effect and imports decrease, improving the trade balance.

In the long run, when the real exchange rate and PPP is restored, however, such depreciation leaves output, domestic absorption and the trade balance unchanged. Prices will remain at a higher level (as price changes diminish). The money supply also increases as a result of the accommodating monetary policies.

$$\frac{dY}{de} = 0\,,\ \frac{dA}{de} = 0\,,\ \frac{dB}{de} = 0\,,\ \text{and}\ \frac{dp}{de} = \frac{dm}{de} = 1$$

These short-to-mid term dynamics can be summarized as the follows:

Tableau 3 Debtor's Depreciation against Dollar:

	Wealth Effect	Investment Effect	Domestic Absorption	Import	Export	Trade Balance
Debtor	↓↓	↑	↓	↓	↑	↑
US	-	↓	↓	↓	↓	?
RoW						↓

Empirical results also support these theoretical predictions. Milesi-Ferretti and Razin (1999) recorded episodes of trade balance improvement following depreciations in Latin America and East Asia in the 1980s and 1990s. Noticeably, Columbia in 1982, Korea in 1984 – 1986, Malaysia in 1986 and Thailand in 1984 – 1986 were featured with policy shifts that drove down exchange rates. Without any exception, these debtor economies all improved their trade balances with stronger saving and domestic investments as a result.

Reduction in trade deficits is also evident during crisis periods – for debtor economies. Chile in 1983 and Mexico in 1982 and 1995 were known for sharp contractions of output and substantial exchange rate depreciations. At the same time, investment fell because of the failing financial sector. Furthermore, domestic absorption declined in these debtor economies, making room for trade balance improvements following currency depreciations. These economies are not alone. During the 1997 – 1998 East Asian financial crisis, the 5 crisis economies (Korea, Malaysia, Indonesia, Thailand and Philippines) all experienced trade balance improvement after their sharp depreciations. Figure 3, Figure 4, Figure 5, Figure 6, and Figure 7 illustrates their trade balances and exchange rates of between 1978 and 2005. The figures reveal that after considerable depreciation in exchange rates, these economies all suffered from significant supply-side contractions, leading to a large fall in domestic absorption. Very much like Noland et al (1998) stated, ‘net exports increase primarily through a compression of imports and only secondarily through an expansion of exports’. These five crisis countries therefore had substantial improvements in their trade balances.

Overall speaking, the existing literature that studies the exchange rate impact for

trade balance have largely concentrated on debtor economies depreciating against the U.S. dollar.[3] Many more examples can be found where debtor country reduces its trade deficits by depreciating its currency either voluntarily or involuntarily in a crisis. Because of these apparently significant improvements in trade balances in these countries, researchers tend to conclude that a shift in exchange rate certainly should be followed by a trade balance correction. Hence they deduce that if depreciation improves the trade balance, the converse should be true too. Enhanced by predictions of elasticity models for debtor economies, currency appreciations are widely (but incorrectly as I shall show) believed to reduce trade surpluses.

However, we will attest below that this is not necessarily the case. As we will show in the following part, even though currency depreciation followed by trade balance improvement has been commonplace, an appreciation will not necessarily induce a reduction in a creditor country's trade surplus.

The U.S.:

Due to the asymmetry of the dollar standard, we cannot simply flip the signs and call them the impact effects on the U.S.. First, exchange rate depreciation of a debtor country often does not have any major impacts on US price level or even price changes, because the latter is determined by the U.S. output level (equation 23). Second, there is no wealth effect from currency revaluation that will change overall consumption (equation 20).

Consequently, even if the debtor country is a major trading partner of the US,

[3] An exception is Kraay and Ventural (1997), who argued that current account balances in debtor and creditor countries respond asymmetrically to income shocks. However, their model heavily relies on the underlying assumption that every country needs to attain its optimal portfolio balance. Unlike the conflicted virtue context in this dissertation, they also assume countries are free to choose the proportion of foreign versus domestic assets in the face of an income shock. As we have explained earlier, these ideal situations are inappropriate for our modeling purpose here for East Asian economies.

what we observe in the U.S. after depreciation (or dollar appreciation) is mainly reflected in domestic investment instead of a price level or consumption shift. Since the dollar is more expensive now relative to the debtor economy's currency, it is more economic to invest in the debtor economy than in the U.S.. Domestic investment in the U.S. drops and domestic absorption also decreases (equation 20). At the same time, the overall output growth slows down as a result of dollar appreciation, leaving the trade balance with an indeterminate sign.

This is equivalent to saying even though the US exports may slow down, its imports can be set back as well. Therefore, the effect of a debtor's currency depreciation has ambiguous effect on US trade balance in the short run. In the long run, output, domestic absorption, trade balance, price and money in the US is not affected by this change at all.

3.2.2 Creditor country's appreciation against the dollar

Creditor economy:

As mentioned in the introduction section, Japan remains to be the largest lender in the world and has run current account surpluses since the 1970s. After the end of the Asian Financial Crisis in 1998, most East Asian economies have switched from trade deficits to trade surpluses. As they paid off the foreign debts incurred previously, some of them also emerged as net creditor economies. Because of their trade surpluses, these economies are often under pressure to appreciate their currencies no matter whether they maintain a free-float or dollar peg (soft or hard) as their exchange rate policy. However, does currency appreciation necessarily help them reduce trade surpluses and the US trade deficits? The following analysis gives a negative answer.

Suppose in a creditor economy, a discrete appreciation of its exchange rate takes place. In the short run, domestic prices begin to fall (equation 14). Output also slows down because of currency appreciation ($e\downarrow$) and the monetary tightening effect following such appreciation. Consumption is cut back because of the output slowdown and the negative wealth effect: foreign wealth, denominated in dollars, also falls (equation 16). Appreciation also increases the real interest rate ($i - \dot{p}$)↑ and makes investment goods more expensive. Hence domestic investment is also set back (equation 16), reinforcing a decrease of overall domestic absorption ($C + I + G$). In the end, since both output and domestic absorption decrease, the impact on the trade balance is uncertain.

This result can be easily verified by the Japanese experience since the 1980s. As Japan was arm-twisted to appreciate yen from 360 in 1971 to below 100 in 1995, the Japanese trade surplus to the U.S. did not abate at all. Even in the short run, Japanese imports did not respond to yen appreciation as predicted by the elasticities models. (See Figure 1.)

Tableau 4 Creditor's Appreciation against Dollar:

	Wealth Effect	Investment Effect	Domestic Absorption	Import	Export	Trade Balance
Creditor	↓	↓	↓	↓	↓	?
US	-	↑	↑	↑	↑	?
RoW						?

Empirically, we can hardly obtain any determinant results in this category. First, let's take a look of Japan. Figure 1 illustrates the trade balance, imports, exports and yen-dollar exchange rate on a bi-axis chart. During the period succeeding the Plaza Accord period, Japanese yen appreciated from 250 yen to a dollar in 1985 to 130 yen to a dollar

in 1989. However, the Japanese trade surplus continued to grow. Ever since the 1970s, Yen appreciations have never been able to "correct" the Japan-US trade imbalance and Japan has kept posting large trade surplus versus the U.S. In Figure 2, for China, RMB appreciated against the dollar from 8.62 yuan per dollar to 8.31 yuan per dollar between 1994 and 1996, while the Sino-US trade surplus more than doubled.

The U.S.:

Due to the asymmetry, we should also examine the impact effects on the US. The dollar depreciates against the creditor economy's currency, but price change in the U.S. is minimal. Output increases as a result of undervaluation. Domestic absorption also grows because the U.S. becomes a relatively cheaper place to invest. Consequently, the U.S. current account deficit may increase or decrease in the short run. In the long run, this dollar depreciation will not change output, domestic absorption, trade surplus or price level.

3.3 Special Analysis on East Asia

With the asymmetry brought by dollar standard taken into consideration, our analysis on open economies implies that the impact effects on trade balance brought by exchange rate changes are more complicated. In most of the cases, we still cannot predict how the balance of trade will move, except for debtor country after depreciation. However, this only predictable case creates little excitement because of the harmful consequences on growth and the financial sector. In particular, we would like to further analyze this exceptional case, especially in the regional context and during the East Asian Financial Crisis.

3.3.1 Impact of fluctuations in the Yen-Dollar rate on a smaller Asian country pegged to the dollar

We have explained the consequences of exchange rate changes in economies that are involved. In East Asia in particular, a third country may also be affected when the yen-dollar rate fluctuates. According to McKinnon (Chapter 2, 2005), East Asian economies have synchronized business cycles that are related to fluctuations of yen against the dollar. When yen is high, East Asian economies other than Japan enjoy high investment and consumption; when yen is low, these other economies have slower pace in business.

This is because most of these economies are soft dollar peggers. When yen appreciates against the dollar, it also appreciates against other major East Asian currencies. A higher yen implies it is more expensive to invest in Japan domestically and therefore Japanese outward FDI (foreign direct investment) increases, much of it going to other East Asian countries. Therefore, economies such as Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand all enjoy a stimulant during yen appreciations but suffer from a slowdown during yen depreciations. During good times, both imports and exports grow rapidly while the net trade effect is ambivalent.

Tableau 5 The Impact of Fluctuations in the Yen-Dollar Rate on a Smaller Asian Country Pegged to Dollar:

	Wealth Effect	Investment Effect	Indirect Investment	Domestic Absorption	Import	Export	Trade Balance
Yen Appreciates	-	-	↑	↑	↑	↑	?
Yen Depreciates	-	-	↓	↓	↓	↓	?

3.3.2 Crisis: an Asian debtor economy depreciates against the dollar reinforced by a depreciation of the Yen

During the East Asian financial crisis, most of the crisis economies were dollar

debtors at that time. They suffered from direct impacts of currency depreciations against the dollar as well as indirectly from yen depreciation against the dollar.

The destructive impact of this crisis can be seen from the follows: even though export goods appeared to be cheaper and export may have grown faster than before, the significant reduction in domestic absorption and output were catastrophic. First, domestic investment may not increase. During the crisis, the financial sector was in a shambles, largely tempering the direct and indirect investment effect. Due to fears of the collapse of the economy, investors may choose not to further invest even though devaluation makes investment relatively cheaper than in their own country. On the other hand, as the yen dropped against the dollar, Japanese investors also had more incentive to stay within Japan. Because foreign exchange indebtedness became more onerous in East Asian debtor countries, consumption also slumped because of this negative wealth effect. Therefore, domestic absorption decreased faster than output slowed down so as to improve the trade balance.

Tableau 6 Crisis for an Asian Debtor Economy Depreciating against the Dollar Reinforced by a Depreciation of the Yen:

	Wealth Effect	Investment Effect	Indirect Investment	Domestic Absorption	Import	Export	Trade Balance
Debtor	↓↓	?	?	↓↓	↓↓	↑	↑↑
US	-	↓	-	↓	↓	↓	?
RoW							↓

Like other crisis economies suffering from foreign debts and forced to depreciate their currencies, East Asian crisis economies all had trade balance improvements as shown in Figure 3, Figure 4, Figure 5, Figure 6, and Figure 7. Because of the collapse of their financial sectors during the crisis, and the indirect investment effect, investment in

the crisis countries also slumped.

Barro 2001 charted investment ratios[4] for these countries between 1960 and 2000. According to his records, Indonesia, Malaysia, South Korea and Thailand all had dramatic declines in investment in 1998 and it took a long time for them to recover. The investment lapse in Philippines was relatively smaller but it was probably related to the fact that the investment ratio in Philippines had been low historically. This substantiates our argument that the trade balance improvement during the East Asian crisis was closely related to the output slowdown and investment slump.

4 Conclusions

As an extension of my previous research where only ex ante expectations of exchange rate changes exist, this paper discusses the ex post impact of a discrete exchange rate change and its implications for net trade balance. We emphasize the difference between dollar debtor and dollar creditor countries and conclude that even though currency devaluation may improve the trade balance of a debtor country, appreciation may or may not reduce the surplus of a creditor country. It is therefore inappropriate to follow the elasticity models to use exchange rate to adjust trade balance predictably when the wealth effect, investment effect and indirect investment effect (in East Asia) are all considered.

On July 21 2005, China has shifted its decade-long currency peg to the dollar by 2.1%. Although it was a small step, we deem it as a symbolic move in China's exchange rate regime. Our model attests that such a move may not induce a reduction in the trade surplus. Consequently, China may be subject to growing pressure to appreciate its

[4] Investment ratio is defined as the ratio of real investment (sum of private and public) to real GDP.

currency to “correct” the trade imbalance again, inviting massive hot money flows to speculate on further appreciations. Will China follow Japan’s steps and suffer from deflation or even a liquidity trap? The question presents additional research opportunities for the future.

List of References:

Barro, Robert J. 2001. Economic Growth in East Asia Before and After the Financial Crisis. NBER Working Papers 8330.

Calvo, Guillermo and Carmen Reinhart. 2000. Fixing for Your Life, NBER Working Paper 8006

Chinoy, Sajjid Z., 2001. Currency risk premia and unhedged, foreign-currency borrowing in emerging markets, PhD dissertation, Department of Economics, Stanford University

Dooley, Michael P., David Folkerts-Landau, and Peter Garber. 2003. An Essay on the Revived Bretton Woods System, NBER Working Paper 9971.

Eichengreen, Barry, and Ricardo Hausmann. 1999. Exchange Rate Regimes and Financial Fragility, NBER working paper 7418.

Eichengreen, Barry, and Ricardo Hausman. 2003. Currency Mismatches, Debt Intolerance and Original Sin: Why They Are Not the Same and Why it Matters, NBER Working Paper 10036.

Frankel, Jacob A., and Michael L. Mussa. 1980. The Efficiency of the Foreign Exchange Market and Measures of Turbulence. American Economic Association Papers and Proceedings 70, 374 – 81

Frenkel, Jacob A., and Michael L. Mussa. 1985. Asset Markets, Exchange Rates and the Balance of Payments" Chp 14 in Ronald W. Jones and Peter B. Kenen (eds), Handbook of International Economics Vol.2. North-Holland, pp. 679 – 747.

Friedman, Milton. 1953. The case for Flexible Exchange Rates, in Essays in Positive Economics, Chicago: University of Chicago Press.

Goldstein, Morris. 2004, China and the Renminbi Exchange Rate, Chapter 9, *Dollar Adjustment: How Far? Against What?*, edited by C. Fred Bergsten and John Williamson, Washington D.C.: Institute for International Economics.

Kraay, Art & Jaume Ventura, 2000. Current Accounts in Debtor and Creditor Countries. Quarterly Journal of Economics, November 2000.

Lardy, Nicholas. 2003. United States–China Ties: Reassessing the Economic Relationship, Testimony before the House Committee on International Relations, Washington, DC, October 21, 2003.

Lardy, Nicholas. 2005. China: The Great New Economic Challenge?, Chapter 4, The United States and the World Economy: Foreign Economic Policy for the Next Decade, by C. Fred Bergsten and the Institute for International Economics, January 2005, Institute for International Economics.

McKinnon, Ronald I. 1990. The Exchange Rate and the Trade Balance: Insular Versus Open Economies, open Economies Review 1:17-37, 1990

McKinnon, Ronald I., and Hue Pill. 1996. Credible Liberalizations and International Capital Flows: The Overborrowing Syndrome. In *Financial Deregulation and Integration in East Asia*, ed. Takatoshi Ito and Anne O. Krueger, 7—42. Chicago: University of Chicago Press.

McKinnon, Ronald I., and Kenichi Ohno. 1997. *Dollar and Yen: Resolving Economic Conflict between the United States and Japan*. Cambridge, Mass.: MIT Press.

McKinnon, Ronald I., and Hue Pill. 1999. Exchange Rate Regimes for Emerging Markets: Moral Hazard and International Overborrowing. *Oxford Review of Economic Policy* 15 (Autumn): 19—38.

McKinnon, Ronald I., and Günther Schnabl. 2003. Synchronized business Cycles in East Asia: Fluctuations in the Yen/Dollar Exchange Rate. *The World Economy* 26 (Autumn): 1067-1088

McKinnon, Ronald I., and Günther Schnabl. 2004. The Return to Soft Dollar Pegging in East Asia: Mitigating Conflicted Virtue, *International Finance*, Vol 7, Number 2

McKinnon, Ronald I. 2005. *Exchange Rates under the East Asian Dollar Standard: Living with Conflicted Virtue*. Cambridge, Mass.: MIT Press.

Meade, James E. 1951. The Balance of Payments. London: Oxford University Press.

Noland, Marcus, Li-Gang Liu, Sherman Robinson and Zhi Wang. 1998. Global Economic Effects of the Asian Currency Devaluations. Institute for international Economics, Washington D.C.

Gourinchas, Pierre-Olivier and Helene Rey. February 2005 International Financial Adjustment. NBER Working Paper No. 11155

Roubini, Nouriel. 2005. Global Imbalances: A Contemporary Rashomon Tale with Five Interpretations..., Nouriel Roubini's Global Economic Blog, http://roubiniglobal.com.

Figure 1 Japanese Trade Balance, Imports, Exports and Exchange Rate

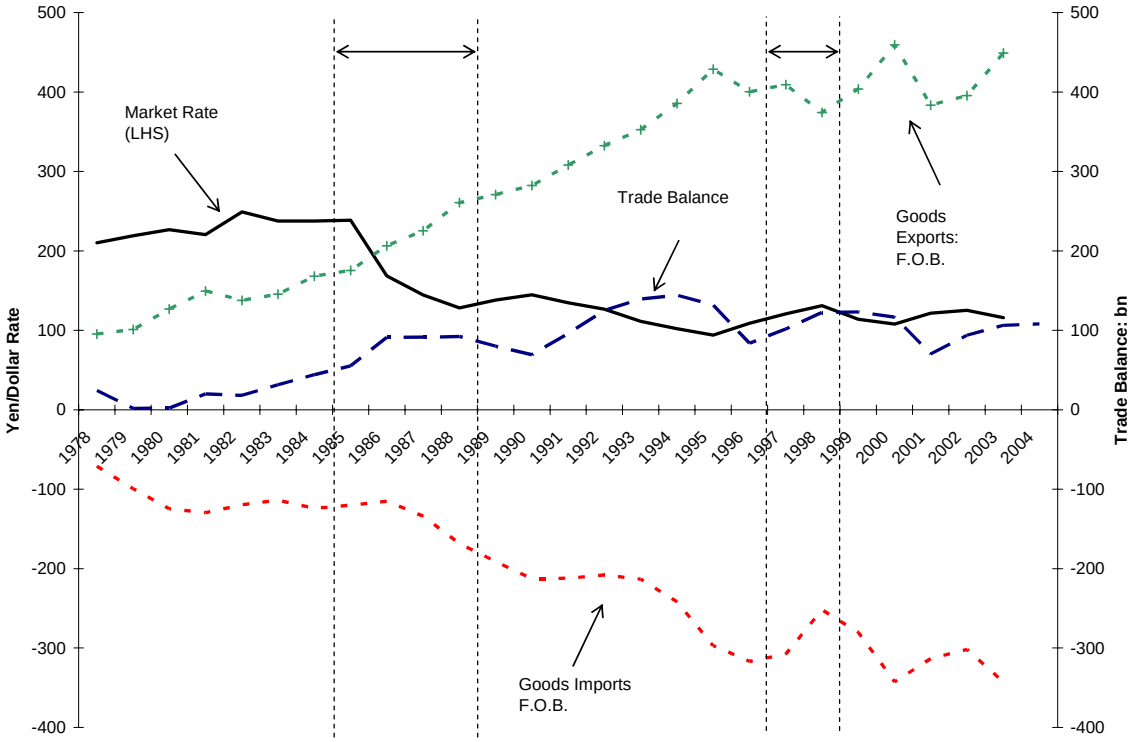

Figure 2 China: Trade Balance and Exchange Rate

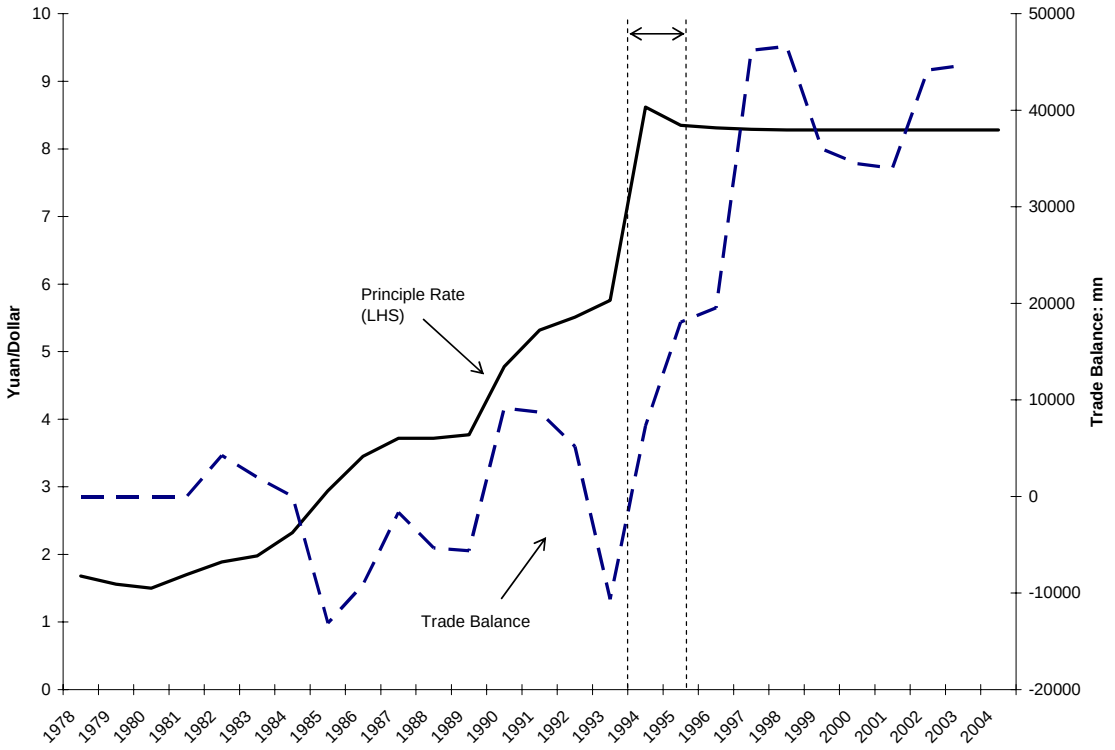

Figure 3 Korea: Trade Balance and Exchange Rate

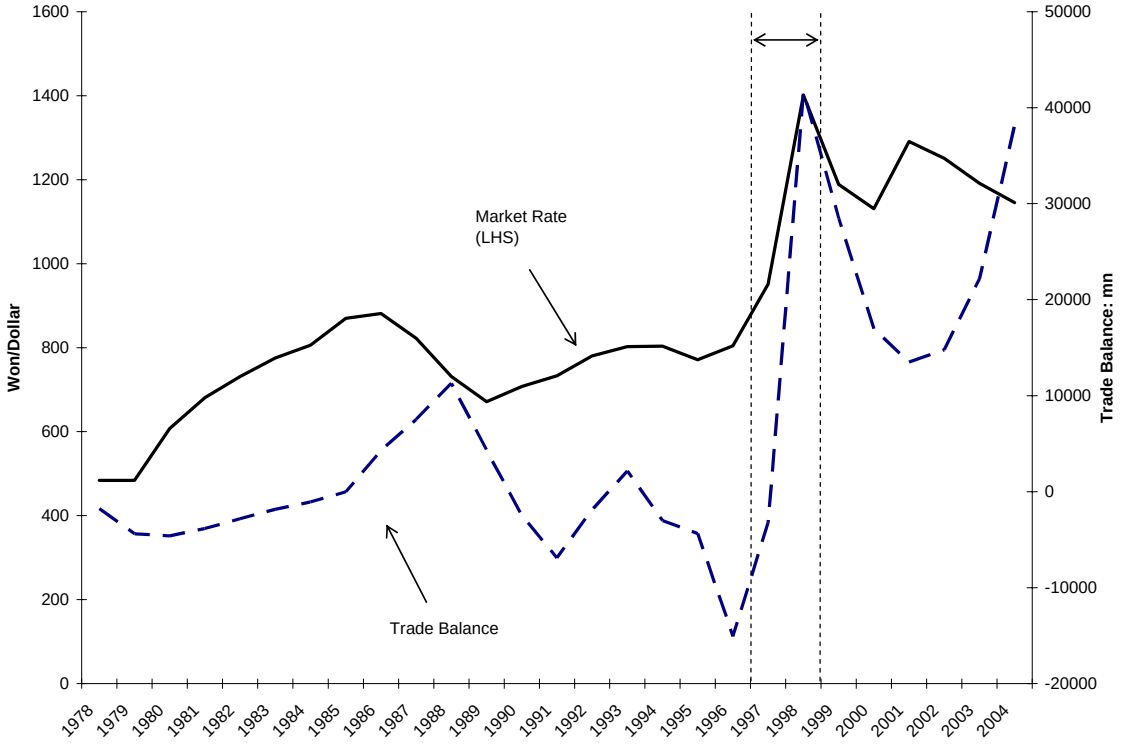

Figure 4 Malaysia: Trade Balance and Exchange Rate

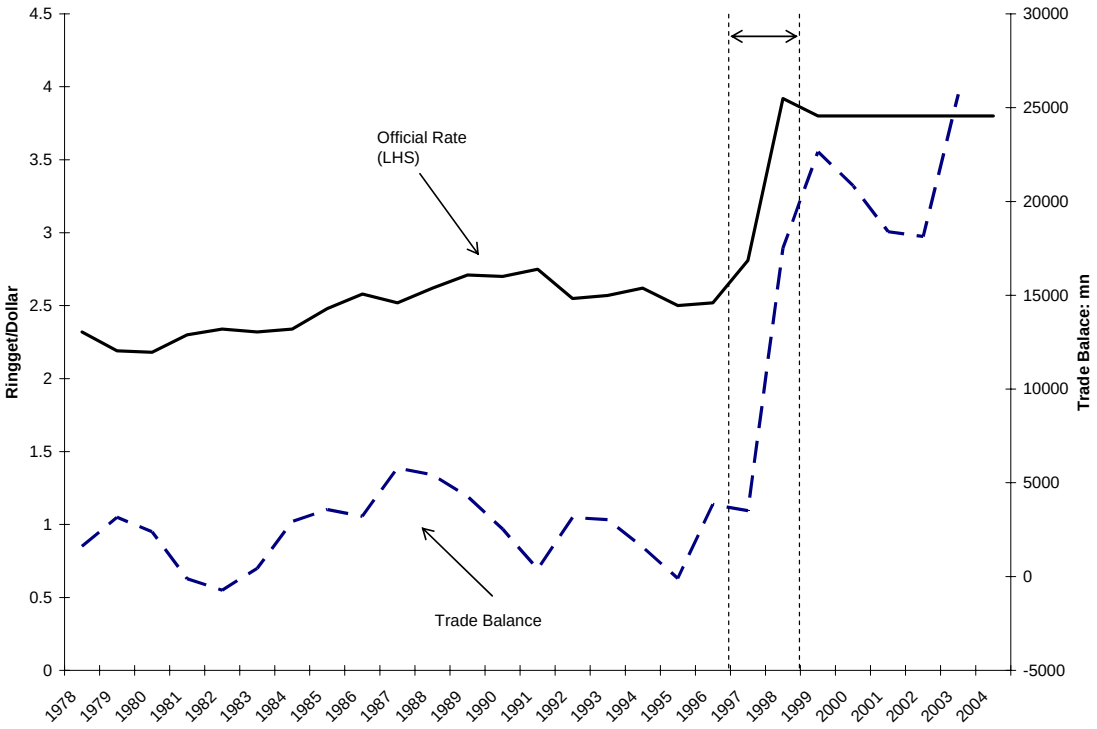

Figure 5 Indonesia: Trade Balance and Exchange Rate

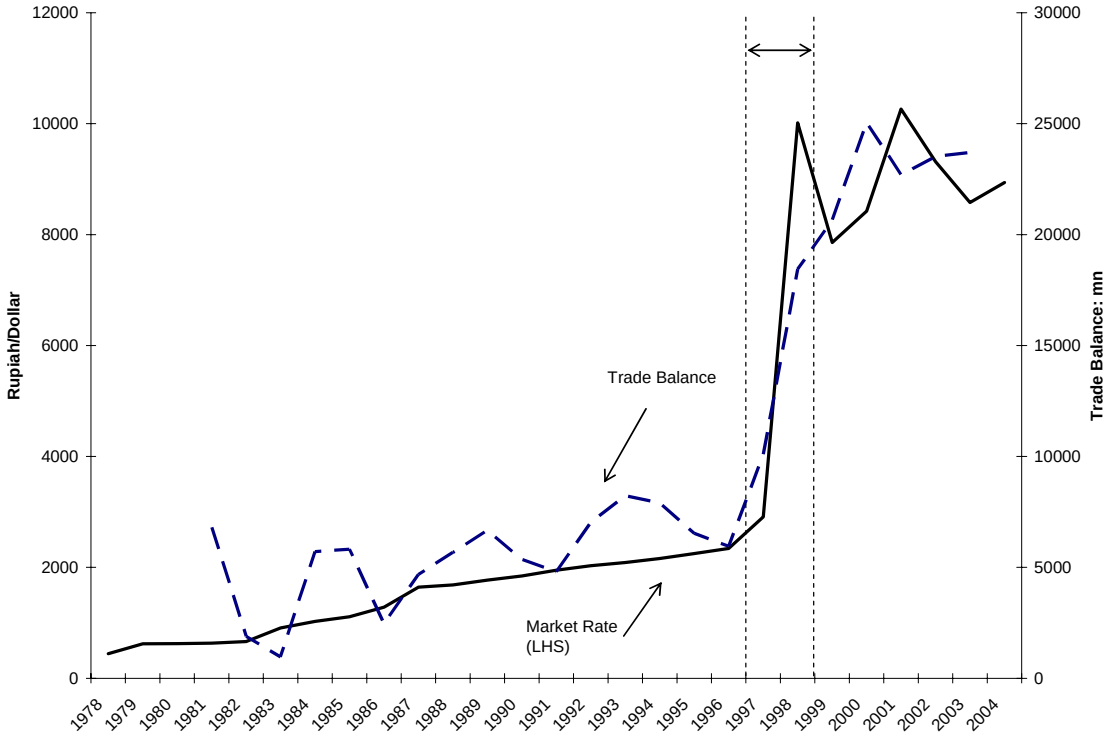

Figure 6 Thailand: Trade Balance and Exchange Rate

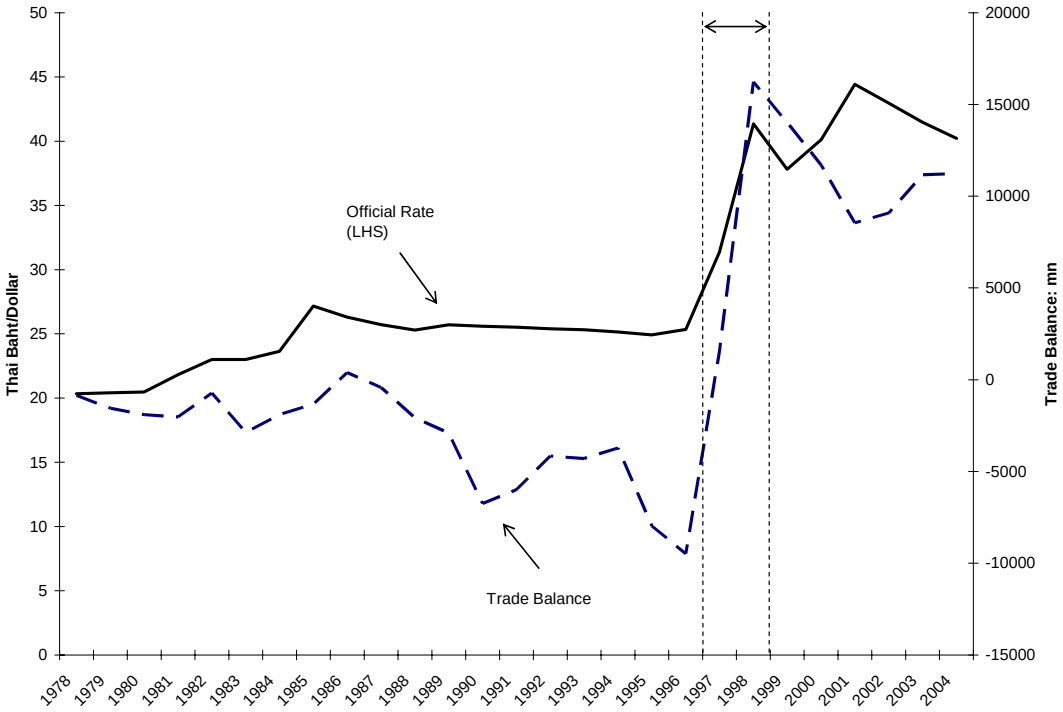

Figure 7 Philippines: Trade Balance and Exchange Rate

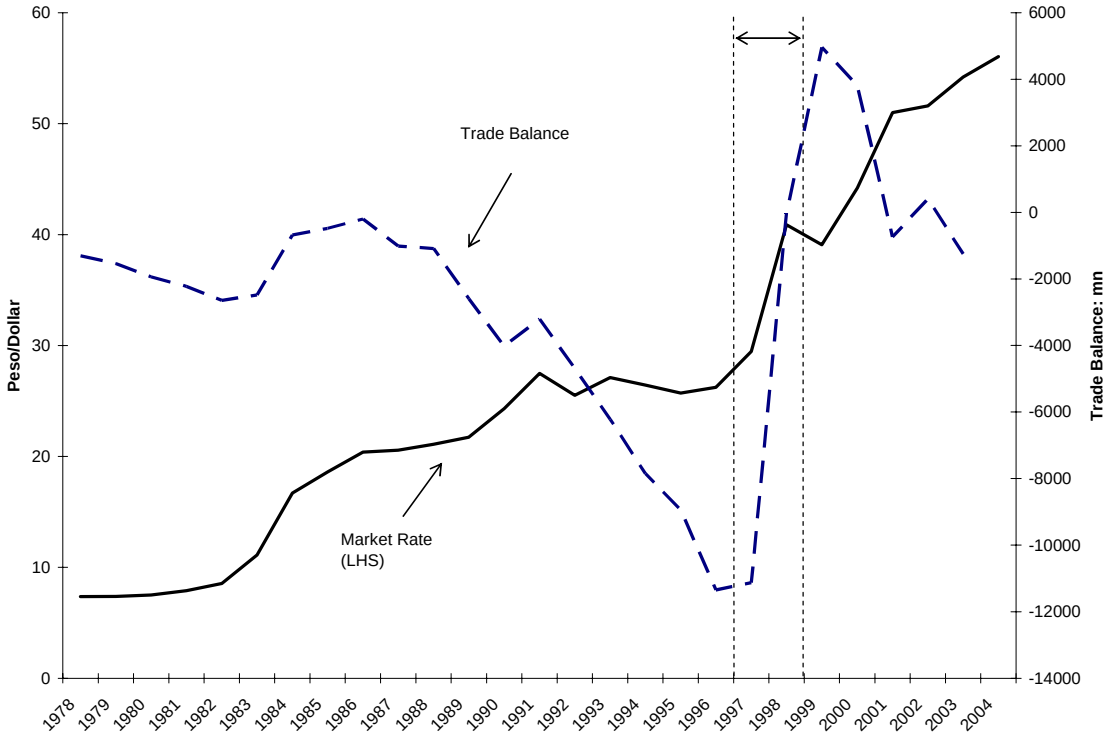

Figure 8 Singapore: Trade Balance and Exchange Rate