

# A “WISE” APPROACH TO BI-LATERAL TRADE AGREEMENTS

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## ABSTRACT

Despite the long-standing objections by economists, bi-lateral and multi-lateral trade agreements have been and are flourishing around the globe. These agreements have diminished the relevance of the World Trade Organization (WTO) and its non-discrimination doctrine. Whether these agreements are welfare increasing for all member countries, however, is open to question.

It goes without saying that when two or more countries enter into a preferential trade agreement, it is desirable that the exchange rates among the member countries be stable to prevent exchange rate fluctuations from disrupting patterns of trade. But even fixed exchange rates among the member countries are not sufficient to prevent disruptions in the prices of traded goods arising from changes in exchange rates among the major currencies. Suppose that country X enters into a preferential trading arrangement with the United States and fixes its exchange rate against the U.S. dollar. The fixed exchange rate notwithstanding, there is ample evidence that when the U.S. dollar appreciates (depreciates) against, say the euro, the U.S. dollar prices of traded goods will decrease (increase) as a result. The recent gyrations of the U.S. dollar/euro exchange rate indicate that major currency exchange rate instability is still with us. These gyrations can generate large fluctuations in the real interest rate in the traded-goods sector of the small countries that enter into such agreements.

## INTRODUCTION

Most economists look askance at bi-lateral or even multi-lateral trade agreements. One of the more important objections to such arrangements is that they violate the WTO's (formerly the GATT's) non-discrimination doctrine (i.e., the celebrated "most favored nation clause"); a second objection is that bi- or multi-lateral trade agreements may be welfare reducing for at least one of the countries involved.<sup>1</sup>

That bi- or multi-lateral trade agreements discriminate against non- member countries is self evident. Indeed, non-discrimination has been at the heart of the numerous GATT and WTO trade promotion rounds. Accordingly, bi- and multi-lateral trade agreements weaken the significance of the WTO in the international trade scene. Given the great success of the GATT trade promotion rounds over that past more than 50 years, that is not an idle concern.

The argument that bi- and multi-lateral trade arrangements may reduce welfare also is well known. By reducing tariffs and other barriers to one or a number of sources of imports,

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<sup>1</sup> Portions of this paper draw heavily on Sjaastad, 2004.

importers may well shift from the lowest cost source of those imports to a higher cost source. If Argentina were the lowest cost source for apple imports to Korea, a preferential trade agreement with the U.S. might well cause apple importers in Korea to start importing from the U.S. state of Washington, even though it is a higher cost source than Argentina. Obviously, Korea would be off as a result.

The force of the first argument against bi- and multi-lateral trade agreements has been seriously eroded by the proliferation of such agreements in the past decade, or so. Recently in a column in the *Financial Times* it was stated that there already exist 49 such agreements among the south east Asian countries. Moreover, there is a proposal to create a Free Trade Area of the Asia Pacific (FTAAP) that would embrace all 21 members of the Asia Pacific Economic Forum (APEC). Clearly, the cat is out of the bag, and a few, or even many, more such agreements can only add to the fact that the GATT and WTO non-discrimination doctrine has largely fallen by the wayside. The apparent failure of the current WTO Doha round only increases the growing irrelevance of the WTO, and hence of the non-discrimination doctrine.

The relevance of the second objection to bi- and multi-lateral trade agreements can, in principle, be mitigated by careful analysis of the effects of such agreements, but I stress only in principle. The negotiations leading to such agreements are heavily influenced by lobbyists for the industries that might be affected, but not by consumers who might benefit. The 14,000 page NAFTA treaty is shot full of special-interest preferential treatments. Indeed, that agreement did not prevent candidate Clinton in the 1996 presidential campaign from mandating a cessation of the import of tomatoes from Mexico, in order to benefit tomato growers in Florida who might vote for him as a result.

But those are not the only issues concerning bi- and multi-lateral trade agreements. The exchange rate arrangements associated with a bi-lateral or multi-lateral trade agreement are crucial. My main point is that free, or preferential, trading arrangements are best undertaken among economies that constitute an optimum currency area. Mundell's analysis (1961), in his seminal article on optimum currency areas in 1961, was in the context of the Bretton Woods international monetary system, in which exchange rates among major (and many minor) currencies were fixed. His conclusion was that an optimum currency area is one in which there was free mobility of factors. Accordingly, the U.S. and Australia are optimum currency areas, but the euro zone may not be an optimum currency area, for an obvious reason: a recent study indicates that 98 per cent of the euro zone members of the labor force are employed in the same country as their birth. But would some collection of Asian countries entering into a "free" trade area constitute an "optimum" currency area if they chose to have fixed exchange rates among them or even adopted a common currency? The answer is probably not. Even if the member countries have fixed exchange rates *vis à vis* one another or adopt a common currency, they can still experience large changes in their purchasing power parity (PPP) real exchange rates *vis à vis* one another.

The current international monetary "system" that came into being in 1973 has resulted in three major currency areas (North America, Europe, and Japan) whose floating currencies have exhibited a great deal of volatility reflected in day to day fluctuations as well as in sustained real appreciations and depreciations, particularly in the 1973 to 1985 period, but more recently since the introduction of the euro in January, 1999. The U.S. dollar has been highly unstable *vis à vis* the yen and the European currencies and, more recently, against the euro. When the euro was introduced, the exchange rate was US\$ 1.17 per euro; the euro then depreciated to a rate of US\$

0.82 in late 2001, and has since appreciated to US\$ 1.30 and, at the time this writing, the rate is US\$ 1.27.

Many of the minor currency countries of the world continue to peg their currencies in some fashion to a major currency or, in a substantial number of cases, to an existing currency basket such as the SDR. In the Western hemisphere, the recent interest in "dollarization" may lead to an arrangement with effects similar to those in the euro zone. But in a fundamental sense even the minor currencies that are pegged to a major currency are floating. To attach one currency to another under an exchange rate rule is not the same thing when the major currencies were fixed under the Bretton Woods fixed exchange rate system. Under the current "system", with the enormous fluctuations in the major currency exchange rates, fixing one's exchange rate with respect to a single currency (or even a currency basket) is to float against the rest.

The main emphasis of this paper will be on the real effects arising from fluctuations in major currency exchange rates; as these real effects are manifested in markets for goods and services, even the minor currency countries can experience real shocks as a consequence of fluctuations in the major currency exchange rates, shocks that are transmitted through the prices of traded goods. To the extent that the law of one price holds for internationally traded goods, a change in an exchange rate means that the prices of those goods also must change *in at least one currency*, and if the major currency countries have significant market power over the international prices of their traded goods, a change in the exchange rate between two major currencies implies that those prices will change in *both* currencies. The resultant price fluctuations can impart inflationary or deflationary pressures to minor currency countries that have adopted an exchange rate rule, and these pressures can have strong effects over the domestic real interest rates of those countries. As inflationary and deflationary impulses are not necessarily identical for imports and exports, there can be significant changes in the terms of trade facing the minor currency countries as a result of a real appreciation or depreciation of a major currency.

That a real appreciation (depreciation) of the U.S. dollar tends to depress (increase) dollar prices of internationally traded goods became quite evident during the intense real appreciation of the dollar from 1980 to mid-1985. During that period the IMF commodity (dollar based) price index *fell* by 30 per cent and both import and export unit values (which are dollar based) for the developing countries as a group *fell* by about 14 per cent. All of this occurred despite a 30 percent *rise* in the U.S. consumer price index and a 15 per cent rise in the U.S. producer price index. Obviously, had the currency of a small open economy been fixed to the dollar at that time, that country would have experienced a *deflation* rate, on average, of about three per cent per annum. As the average U.S. inflation rate from 1980 to 1985 was over five per cent per annum, the inflation rate *differential* was over eight per cent per annum—and even greater for countries whose exports are heavily dominated by commodities.

This paper examines the manner in which these effects are transmitted across the world economy and the extent to which exchange rate policy can be used to combat them. We assume that there are basically two types of countries: those that are "large" in the sense that they can influence the world prices of traded goods, and the "small" countries that cannot. The large countries will be designated as "major currency" countries, quite independent of the actual status of their currencies, and the small countries will be referred as "minor currency" countries, even though their currencies may be quite important (e.g., the Swiss franc).

The remainder of the paper consists of four sections. The first section to follow contains the basic pricing model to be used throughout the analysis. In that model, we explore how changes in purchasing power parity (PPP) *real* exchange rates among the major currencies are reflected in the relative prices of internationally traded goods. The next section deals with the effects of major currency exchange rate changes.. Section III examines the effects on minor country real interest rates of real appreciations or depreciations of major currencies, and how those effects might be attenuated by an appropriate exchange rate rule. The final section presents a summary and conclusions.

## I. The Formal Model of Price Determination

The Appendix contains a derivation of the determinants of the price level of goods traded internationally with up to M-1 other countries by any arbitrarily chosen country X; the key result is equation (A-5) of that Appendix:

$$(1) \quad \text{PTF}_X = \sum_j^M \theta_X^j \cdot \text{PF}_j + G(Z_X),$$

where  $\text{PTF}_X$  and  $\text{PF}_j$  are, respectively, natural logarithms of price indexes *expressed in a foreign currency* for goods traded internationally by country X and the price level of country j, the  $\theta_X^j$  are non-negative fractions whose sum is unity and which measure the relative power possessed by country j in the world market over the goods traded internationally by country X. Finally,  $G(Z_X)$  is a function of a vector of variables,  $Z_X$ , that reflect the “global fundamentals” for the set of goods traded internationally by country X.<sup>2</sup> In most of what follows, the variables contained in the vector  $Z_X$  are suppressed to focus our attention on the role of the exchange rate variables.

The classic “small country” assumption corresponds to  $\theta_X^j = 0$ ; that is, country j is a *price taker* in the world market as any changes in its exchange rate and/or its price level will have no effect on the prices of its traded goods in currencies other than its own. At the other extreme, if  $\theta_X^j = 1$ , country j is a *price maker*: any change in its own price level and/or exchange rate will be reflected in an equi-proportionate change in the prices of its traded goods in all other currencies. In short, the  $\theta_X^j$  summarize the structure of the world market for country X’s traded goods; with the appropriate time series data, one can estimate those coefficients

Equation (1) also provides an insight into which country is best suited for a small country such as Korea to engage in a free or preferential trading agreement. Suppose, for simplicity, and the small country also pegs its currency to its preferred trading partner. In that case, the preferred trading partner should be the one with the largest “theta” in equation (1). The reason is that the price of the small county’s traded goods would be closely tied to the price level in the preferred trading partner.

We now turn to how “external” inflation differs from the “reference” country rate of inflation. Assuming that country X has adopted a credible exchange rate rule *vis à vis* the currency

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<sup>2</sup> Upper case Latin letters refer to the natural logarithm of variables whose arithmetic value appears in lower case letters. Exceptions will be obvious.

of country k, both  $PTF_X$  and  $PF_j$  will be denominated in currency k. In that case, equation (1) is readily manipulated into the following form;

$$(2) \quad PT_X^k = E_X^k + P_k + \sum_j^M \theta_X^j \cdot R_k^j,$$

where  $PT_X^k$  and  $P_k$  are, respectively, natural logarithms of price indexes for country X's traded goods in its own currency and the price level of country k, also in its own currency,  $E_X^k$  is the natural logarithm of the price of currency k in terms of currency X, and  $R_k^j = P_j + E_k^j - P_k$  is the PPP bi-lateral real exchange rate of country k *vis à vis* country j. The term  $G(Z_X)$  has been suppressed. Equation (2) decomposes  $PT_X^k$  into three components:  $E_X^k$ , its own exchange rate rule;  $P_k$ , the price level of country k, and a third component reflecting the behavior of the PPP bi-lateral real exchange rates between reference country k and all other countries.

Assuming now that country X has adopted a credible *fixed* exchange rate *vis à vis* the currency of country k, a dynamic version of equation (2) can be written to indicate the inflation rate in country X's traded goods sector:

$$(2') \quad \Pi_X^{T,k} = \Pi_k + \sum_j^M \theta_X^j \cdot \dot{R}_k^j,$$

where  $\Pi_X^{T,k}$  is the rate of inflation in the traded goods sector if country X,  $\Pi_k$  is the inflation rate in the reference country k and the dot over the R variable indicates the time rate of change of the PPP real exchange rate of country k *vis à vis* country j. In the usual treatment of sources of inflation in a small open economy operating under a fixed exchange rate, the second source of "external" inflation in equation (2'),  $\sum_j^M \theta_X^j \dot{R}_k^j$ , is ignored, even though it may be quite volatile and very important quantitatively. This neglect was unimportant during the period of the Bretton Woods system when PPP real exchange rates between the major currency countries were quite stable, but under the arrangement that has prevailed since 1973, the extreme volatility of those real exchange rates has been an important source of external inflation (and deflation) in countries that have adopted exchange rate rules linking their currencies to the U.S. dollar.

The distinction between external inflation being defined as  $\Pi_k$  *versus*  $\Pi_k + \sum_j^M \theta_X^j \cdot \dot{R}_k^j$  became apparent during 1975-85 period. In the first half of that period, the IMF commodity price index (a dollar based wholesale price index that does not explicitly include petroleum) rose 35 per cent relative to the U.S. Consumer Price Index, only to fall by 42 per cent with respect to that index during the second half of that period; despite the intensity of the U.S. inflation, the IMF index actually *fell* by about 30 per cent from 1980 to 1985. It is no coincidence that the 1975-80 subperiod was one of intense real depreciation of the U.S. dollar (i.e.,  $\dot{R}_{US}^j > 0$ ), whereas the 1980-85 subperiod was one of an even more intense real appreciation of the dollar (i.e.,  $\dot{R}_{US}^j \ll 0$ ).

The foregoing analysis can be extended to the overall price level of a country pursuing a credible exchange rate rule against currency k. The price level of country X will be written as a geometrically weighted average of the domestic prices of her non-traded goods and services and traded goods:

$$(3) \quad \begin{aligned} P_X &= \alpha_X \cdot PNT_X + (1 - \alpha_X) \cdot PT_X^k, \\ &= PT_X^k - \alpha_X \cdot (PT_X^k - PNT_X), \end{aligned}$$

where  $PNT_X$  is a price index country X's nontraded goods and services, and  $(PT_X^k - PNT_X)$  is the *true* real exchange rate, which is a function of real variables.<sup>3</sup>

Combining equations (2) and (3) results in an expression for the price level of country X:

$$(4) \quad P_X = \alpha_X \cdot (PNT_X - PT_X^k) + (E_X^k + P_k) + \sum_j^M \theta_X^j \cdot R_k^j,$$

in which the first term reflects that country's internal relative price structure, the second term is a *purchasing power parity* component  $(E_X^k + P_k)$ , and the third term captures the structure of real exchange rates among all third countries. A dynamic version of Equation (4), in which the term  $\alpha_X \cdot (PNT_X - PT_X^k)$  is ignored but which takes into account the possibility that country X may have some market power over its own traded goods is the following:

$$(4') \quad \begin{aligned} \Pi_X &= (\dot{E}_X^k + \Pi_k) + \sum_j^M \theta_X^j \cdot \dot{R}_k^j \\ &= (\dot{E}_X^k + \Pi_k) + \sum_{j \neq X}^M \theta_X^j \cdot \dot{R}_k^j + \theta_X^X \cdot (\Pi_X - \dot{E}_X^k - \Pi_k) \\ &= (\dot{E}_X^k + \Pi_k) + \sum_{j \neq X}^M \Theta_X^j \cdot \dot{R}_k^j, \end{aligned}$$

where the new "thetas" are defined as  $\Theta_X^j \equiv \theta_X^j / (1 - \theta_X^X)$ ; as  $\sum_{j \neq X}^M \Theta_X^j = 1$ , they measure country j's share of power in the world market for country X's traded goods, *excluding country X*. The inflation rate in the reference country k is  $\Pi_k = \dot{P}_k$ , and  $\dot{E}_X^k$  is the exchange rate rule of country X. Note that the right hand side of equation (4') remains the same if we substitute  $\Pi_X^T$  for  $\Pi_X$  on the left hand side. The dot over the E variable indicates the time rate of change of that variable.

As is evident from equation (4'), country X can choose an exchange rate rule to provide any desired rate of inflation. For example, if country X preferred to have the same rate of inflation as country k ( $\Pi_X = \Pi_k$ ), it could insulate itself from shocks arising from fluctuations in major currency exchange rates by adopting the following rule:

$$(5) \quad \begin{aligned} \dot{E}_X^k &= - \sum_{j \neq X}^M \Theta_X^j \cdot \dot{R}_k^j \\ &= \sum_{j \neq X}^M \Theta_X^j \cdot \dot{R}_j^k. \end{aligned}$$

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<sup>3</sup> As is well known, the Salter (1959) effect argues that the equilibrium value of  $(PT_X^k - PNT_X)$  depends upon expenditure relative to income, Michaely (1981), for example, finds broad empirical support for the Salter effect, but the magnitude is highly variable, particularly in the short run. It is equally well known that an improvement in the external terms of trade also leads, under fairly general conditions, to an increase in  $PNT_X$  relative to  $PT_X^k$ . For a treatment that takes into account inter-temporal substitution as well, see Ostry (1988).

This rule, however, could be implemented only with a substantial lag as changes in PPP real exchange rates can be observed only well after the fact.

An alternative rule that also would insulate country X from deflationary and inflationary shocks and which could be implemented without a lag is one that sets the equilibrium inflation rate in country X equal to the *world* rate of inflation defined as the following weighted average:

$$(6) \quad \Pi_w^X = \sum_{j \neq X}^M \Theta_X^j \cdot \Pi_j,$$

and where the superscript x indicates that “thetas” are defined for country X. Setting equation (4') equal to equation (6) produces the following exchange rate rule:

$$(7) \quad \dot{E}_X^k = \sum_{j \neq X}^M \Theta_X^j \cdot \dot{E}_j^k;$$

that is, the exchange rate rule reacts immediately to changes in the *nominal* exchange rates among the major currencies. Obviously, one can readily define many other exchange rate rules to serve any specific purpose that might be desired.

An important implication of equation (4) is that, while a credible exchange rate rule may result in interest rate parity, it is not sufficient to assure equality of *real* rates of interest. Even if the nominal interest rate in country X were to be governed by the nominal interest rate in country k and the exchange rate rule ( $E_X^k$ ), the (short run) inflation rate in country X will be influenced by changes in real exchange rates among third countries, which can give rise to potentially large real interest rate differentials.

## II. Effects of Fluctuations in Major Currency Exchange Rates

Assume now that two small open economies, X and Y, have entered into a free trade arrangement, and that both have a fixed exchange rate *vis à vis* the currency of country k, which implies that they also have fixed exchange rates *vis à vis* one another. Returning to equation (2), changes in the price levels in the traded goods sectors of the two countries, X and Y, holding  $P_k$ ,  $E_X^k$  and  $E_Y^k$  constant, are as follows:

$$(9) \quad \Delta PT_X^k = \sum_j^M \theta_X^j \cdot \Delta R_k^j,$$

$$(10) \quad \Delta PT_Y^k = \sum_j^M \theta_Y^j \cdot \Delta R_k^j.$$

As countries X and Y must have quite different sets of traded goods (otherwise the free trade arrangement would be pointless), the parameters  $\theta_X^j$  and  $\theta_Y^j$  must be quite different. As a result, when, say, the U.S. dollar depreciates against the euro and the yen, the traded goods sectors of the two countries might experience quite different rates of inflation, in this context, however, the relevant changes are in the major currency exchange rates.

Several empirical studies concerning estimates of the “thetas” indicate that only two or three currency blocs have significant market power, those being the U.S. dollar and euro blocs and, to a lesser extent, the yen bloc. Consider the case where only the U.S. dollar and the euro blocs are relevant. In that case,  $\theta_X^{EU} + \theta_X^{US} = \theta_Y^{US} + \theta_Y^{US} = 1.0$  and  $\Delta R_{US}^{US} \equiv 0.0$ . Suppose further that

the euro bloc dominates the world markets of country X's traded goods (e.g.,  $\theta_X^{EU} = 0.8$ ), but that the U.S. dollar bloc dominates those markets for country Y's traded goods (e.g.,  $\theta_Y^{US} = 0.8$  so  $\theta_Y^{EU} = 0.2$ ), and that over a certain period of time the U.S. dollar has depreciated against the euro such that  $\Delta R_{US}^{EU} = 0.3$  (30 per cent), as we have recently seen. The result is  $\Delta PT_X^{US} = 24$  per cent and  $\Delta PT_Y^{US} = 6$  per cent! That is, the U.S. dollar prices of country Y's traded goods will have risen very little, and the euro prices of country X's traded goods also will have fallen very little, meaning that the U.S. dollar prices of that country's traded goods will have risen a lot. The upshot is that the price level of country X's traded goods, in U.S. dollars, has risen by 18 per cent relative the price level of country Y's traded goods, as is readily seen by subtracting equation(10) from equation (9):

$$(11) \quad \Delta(PT_X^k - PT_Y^k) = \sum_j^M (\theta_X^j - \theta_Y^j) \cdot \Delta R_k^j,$$

which, in the above example, simplifies to:

$$(12) \quad \Delta(PT_X^{US} - PT_Y^{US}) = (\theta_X^{EU} - \theta_Y^{EU}) \cdot \Delta R_{US}^{EU}.$$

Since both countries have fixed their exchange rates against the U.S. dollar, and they trade freely with one another, their trading relations would be severely disrupted. Moreover, if the fixed exchange rate regime in both countries is credible, they should have quite similar nominal interest rates, indicating that the *real* interest rates in the traded goods sectors of the two countries would be very different. The above scenario is, of course, an extreme one, but it illustrates the nature of the problem, a problem that cannot be solved by fixed exchange rates among the members of a preferential trading group, or even by the creation of a common currency for the member countries.

Since the euro bloc dominates the world market for country X's traded goods, a somewhat better outcome would be achieved if that country were to fix her exchange rate against the euro instead of the U.S. dollar. In that case  $\Delta PT_Y^{US}$  remains positive at six per cent, but  $\Delta PT_X^{EU} = -6$  per cent, so the effect on the real interest rate in country X's traded good sector is much reduced; note, however, that  $\Delta PT_X^{US}$  remains at 24 per cent.

### III. Real Rates of Interest in Small Countries

Fluctuations in PPP real exchange rates among the major currency countries have a direct impact on real interest rates in small countries. If the exchange rate rule on major currency k is credible, we expect strong interest rate parity to hold, albeit with a spread:

$$(13) \quad i_X^k = i_k = \dot{E}_X^k = \text{spread},$$

where the  $k$  superscript on  $i_x^k$  indicates that the exchange rate rule is defined on currency  $k$ .<sup>4</sup> We now turn to the factors that influence real interest rates in small countries and, in particular, the role of exchange rate rules.

It is clear from equation (4) that if a country adopts a single currency exchange rate rule with a constant rate of devaluation (including zero), it will be subject to inflationary and deflationary shocks arising from fluctuations in the PPP real exchange rates among the major currencies. Indeed, during the rapid real depreciation of the U.S. dollar that occurred during the second half of the 1970s, several Latin American countries experienced inflation rates far higher and real interest rates far lower than could be explained by their exchange rate rules (the infamous *tablitas*, which were defined on the U.S. dollar) and the U.S. inflation rate. This behavior was sharply reversed during the first half of the 1980s when the rapid appreciation of the U.S. dollar, particularly during 1981-82, imposed strong *deflationary* pressures and very high real interest rates on those countries.

Equation (13) indicates that a single currency exchange rate rule can prevent changes in major currency exchange rates from impacting on domestic nominal interest rates but the domestic *real* rate of interest will still be affected by the gyrations in their inflation rates. On the other hand, if a country adopts a more complex rule, such as described by equations (5) and (7), to insulate itself from inflationary or deflationary impulses due to fluctuations in the major currency real exchange rates, the rule itself will create disturbances in the domestic *nominal* interest rate. Insofar as single currency exchange rate rules are concerned, then, the choice is only with respect to the *mechanism* by which real interest rates are pummeled by the instability of the major currency exchange rates. To illustrate this, consider the (*ex post*) real rate of interest in the traded goods sector of country  $X$ , which we write in the usual Fisherian manner:

$$(14) \quad r_x^T = i_x - \Pi_x^T,$$

where the values of  $i_x$  and  $\Pi_x$  depend upon the exchange rate rule and reference currency (usually taken to be currency  $k$  in the case of a single currency exchange rate rule). Substituting equation (13) for  $i_x$  and equation (4') (with  $\Pi_x$  replaced with  $\Pi_x^T$  on the left hand side of that equation) for  $\Pi_x^T$ , we obtain the important result that:

$$(15) \quad r_x^{T,k} = r_k - \sum_{j \neq X}^M \Theta_X^j \cdot \dot{R}_j^k + \text{spread},$$

where the  $k$  superscript on  $r_x^{T,k}$  indicate that the exchange rate rule has been defined on currency  $k$ , and  $r_k$  is the real interest rate in country  $k$ . What is important to note from equation (15) is that, while the currency against which that rule is defined still matters, *the exchange rate rule itself,  $\dot{E}_X^k$ , cancels out*. As far as the real interest rate is concerned, one rule is as good as any other—as long as it is credible.

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<sup>4</sup> Interest rates may not be exactly arbitrated as transaction taxes, country risk, etc., introduce systematic spreads which we assume to be uncorrelated with the exchange rate movements among the major currencies. Moreover, since the nominal rate of interest in country  $X$  cannot be negative, the maximum rate of *appreciation* of that country's currency *vis à vis* currency  $k$  is  $i_x^k$  plus the spread. Were the exchange rate rule to require an appreciation at a rate greater than  $i_x^k$ , presumably the spread would have to increase.

The explanation for the “irrelevance” of the exchange rate rule is very simple: the rule determines only the channel by which external disturbances are transmitted to the domestic real rate of interest. A rule that eliminates those disturbances to the inflation rate may well introduce them into the nominal rate of interest; at worst, such a rule might exacerbate exchange rate risk to the extent that the country’s access to the international capital market is adversely affected. A rule that avoids the latter (e.g., a fixed exchange rate) cannot neutralise external disturbances to the domestic inflation rate.

#### **IV. Summary and Conclusions**

Despite the long-standing arguments made by economists, bi-lateral and multi-lateral trade agreements have been and are flourishing around the globe. These agreements have diminished the relevance of the World Trade Organization and its non-discrimination doctrine. Whether these agreements are welfare increasing for all member countries, however, is open to question.

Fluctuations in nominal exchange among the major currencies (the U.S. dollar, the euro, and the yen) can have profound effects on the external prices of goods traded internationally by small open economies. Small countries entering into preferential trading arrangements will generally have different compositions of their imports and exports (otherwise, the preferential trading arrangement would be pointless), and hence they will tend to be affected asymmetrically by changes in, for example, the U.S. dollar/euro exchange rate. As a result, the prices of traded goods of the various member countries can diverge substantially when the major currency exchange rates fluctuate, leading to a disruption of trade among those countries. In addition, the real rate of interest in the traded goods sectors of the member countries can be strongly affected, both positively and negatively, by fluctuations in the major currency exchange rates. These unfortunate consequences will prevail even if all members of the preferential trading group peg their currencies to the same major currency or even create a common currency.

There do exist, of course, single currency exchange rate *rules* that can neutralise the effects of major currency fluctuations on the domestic prices of traded goods, but adoption of such rules either will introduce movements in the nominal (and hence real) interest rates in the country in question, or it will exacerbate exchange rate risk, undermining that country’s access to the international capital market. Moreover, there exists no exchange rate rule defined on a *single* major currency that can neutralize the effects of fluctuations of the major currency exchange rates on both domestic interest rates and the domestic prices of a country’s traded goods. The reason is straightforward; an exchange rate rule defined on a single currency admits but one instrument—the exchange rate rule itself, and a single instrument cannot target both the nominal interest rate and the inflation rate.

One solution might be to adopt two exchange rates, one for commercial operations and a second one for financial transactions. In the past this approach has been employed (for other reasons) by several Latin American and some European countries but with little success as it is difficult to eliminate the leakage between two markets with different prices for the same currency. A second, and more viable solution is to define exchange rate rules on currency baskets, but that is a topic for another paper.

## APPENDIX: Exchange Rates and Prices of Traded Goods

Ignoring transport costs, tariffs and other barriers to trade, the “law of one price” for internationally traded good  $q$  states that:

$$(A-1) \quad P_q^i = P_q^j = E_i^j,$$

where  $P_q^i$  is the (natural logarithm of the) price of currency  $j$  in terms of currency  $i$ .<sup>5</sup> With no loss of generality, set  $i = X$ ; i.e., the currency of country  $X$  will be the *reference* currency. The *excess* demand for good  $q$  in country  $j$ ,  $D^{j,q}$ , will be written as function of its *real* price and a vector  $Z_q^j$  of all other relevant variables (i.e., the market “fundamentals” for country  $j$ ):

$$(A-2) \quad \begin{aligned} D^{q,j} &= D^{q,j} \left[ \left( P_q^j - P_j \right), Z_q^j \right] \\ &= D^{q,j} \left[ \left( P_q^X - E_X^j - P_j \right), Z_q^j \right] \end{aligned}$$

where  $P_j$  is the (natural logarithm of the) price level in country  $j$ . Since

$P_q^X - E_X^j - P_j = \left( P_q^X - P_X \right) - \left( E_X^j + P_j - P_X \right) \equiv P_q^{X,R} - R_X^j$ , where  $R_X^j$  is the PPP bilateral real exchange rate between countries  $X$  and  $j$ , country  $j$ 's excess demand for good  $q$  is a function of the natural logarithm of the ratio of its *real* price in country  $X$  to the PPP bi-lateral real exchange rate between countries  $X$  and  $j$ :

$$D^{q,j} = D^{q,j} \left[ \left( P_q^{X,R} - R_X^j \right), Z_q^j \right].$$

In a world of  $M$  countries, market clearing requires that the  $M$  excess demands sum to zero:

$$\sum_j^M D^{q,j} \left[ \left( P_q^{X,R} - R_X^j \right), Z_q^j \right] = 0.$$

The summation is then differentiated totally and rearranged:

$$dP_q^{X,R} = \sum_j^M \left( D_1^{q,j} / D_1^q \right) dR_X^j - \left( D_2^{q,j} / D_1^q \right) dZ_q^j,$$

where  $D_1^{q,j} \equiv \partial(D^{q,j}) / \partial(P^{X,R} - R_X^j)$ ,  $D_2^{q,j} = \partial(D^{q,j}) / \partial Z_q^j$ , and  $D_1^q \equiv \sum_j^M D_1^{q,j}$ .<sup>6</sup> A local linear approximation relating the *real* price of good  $q$  to PPP bi-lateral real exchange rates is obtained by integration:

<sup>5</sup> To the best of author's knowledge, this approach was first developed by Ridler and Yandle (1972) to analyse the effect of exchange rates on commodity prices. The actual model presented in this appendix first appeared Sjaastad (1985).

<sup>6</sup> The *excess* demand in country  $j$  is  $D^j \equiv D^j - S^j$ , where  $D^j$  and  $S^j$  are domestic demand and supply, respectively. The slope of the excess demand function is  $\left( D^j / P_q^{j,R} \right) \cdot \eta_j - \left( S^j / P_q^{j,R} \right) \cdot \varepsilon_j$ , where  $\eta_j \leq 0$  and  $\varepsilon_j \geq 0$  are the elasticities of domestic demand and supply, respectively, with respect to the real price of the commodity in country  $j$ . It is clearly evident that the slope is non-positive.

$$(A-3) \quad P_q^{X,R} = \sum_j^M \mathfrak{Q}_j^q \cdot R_X^j + F(Z_q),$$

where  $\mathfrak{Q}_j^q \equiv D_1^{q,j} / D_1^q$  and  $F(Z_q)$  is the integral of  $-\sum_{j=1}^M (D_2^{q,j} / D_1^q) dZ_q^j$ . The excess demand [equation (A-2)] may be either positive or negative but, as all  $D_1^{q,j}$  are non-positive, the  $\mathfrak{Q}_j^q$  are non-negative fractions that sum to unity.  $F(Z_q)$  captures the  $Z_q^j$  vectors (the global fundamentals) and that term is explicitly assumed to be orthogonal to the  $RER_X^j$ . The fundamentals include all factors (including expectations) that influence the global demand for and supply of good  $q$  other than exchange rates.

The structure of the world market for good  $q$  is *summarised* by the  $\mathfrak{Q}_j^q$  in equation (A-3), as those parameters measure the *relative market power* possessed by each participating country. In the limiting case of  $\mathfrak{Q}_j^q = 0$ , country  $j$  is a *price taker* in the world market for good  $q$  as any change in its real exchange rate *vis à vis* reference currency  $X$  will have no effect on the real price of good  $q$  in currency  $X$ . At the other extreme, if  $\mathfrak{Q}_j^q = 1$ , country  $j$  is a *price maker* in that market as any change in its real exchange rate will be fully reflected in an equi-proportionate change in the real price of good  $q$  country  $X$ . Moreover, the magnitudes of the  $\mathfrak{Q}_j^q$  have no logical relation to existing patterns of international trade.

The expression for the price of good  $q$  can be generalized to an index of the real prices of any set of  $N$  traded goods (e.g., imports and/or exports) denominated in currency  $X$ ; that is defined as  $PT_X^R \equiv \sum_q^M w_q P_q^{X,R}$ , where the  $w_q$  are non-negative weights that sum to unity. Combining that index with the above expression for  $P_q^{X,R}$  results in:

$$\begin{aligned} PT_X^R &\equiv \sum_q^N w_q \left[ \sum_j^M \mathfrak{Q}_j^q \cdot R_X^j + F(Z_q) \right] \\ &= \sum_q^N \left[ \sum_j^M (w_q \cdot \mathfrak{Q}_j^q) \cdot R_X^j \right] + G(Z_X), \end{aligned}$$

where  $G(Z_X) \equiv \sum_q^N w_q F(Z_q)$  captures the global fundamentals for the set  $N$  of traded goods.

Moreover, as the  $\sum_q^N w_q \cdot \mathfrak{Q}_j^q$  terms are non-negative and sum to unity,  $PT_X^R$  can be written as a weighted average of the  $R_X^j$ :

$$(A-4) \quad PT_X^R = \sum_j^M \theta_X^j \cdot R_X^j + G(Z_X),$$

where  $\theta_X^j \equiv \sum_q^N w_q \cdot \mathfrak{Q}_j^q$ . The  $\theta_X^j$  have the same interpretation as the  $\mathfrak{Q}_j^q$ ; they measure the relative market power possessed by country  $j$  over the prices of the *set*  $N$  of goods traded internationally by country  $X$ . The  $\theta_X^j$  will not be the same for different sets of goods (e.g., importables *versus*

exportables), but the  $PT_X^R$  index can be tailored to refer to any subset of tradables for any country by choosing the  $w_q$  to correspond to that subset.

Equation (A-4) can be converted into an index defined on nominal prices simply by adding  $P_X$  to both sides of equation (A-4):

$$PT_X = \sum_j^M \theta_X^j \cdot (E_X^j + P_j) + G(Z_X).$$

Moreover,  $PT_X$  can be expressed in the currency of, say, country Y by using the identity

$E_X^j \equiv E_X^i + E_i^j$  and the property that  $\sum_j^M \theta_X^j = 1$ :

$$(A-5) \quad PTF_X = \sum_j^M \theta_X^j \cdot PF_j + G(Z_X),$$

where the appended “F” indicated that both  $PT_X$  and  $P_j$  are expressed in a foreign currency (i.e.,  $PTF_X = PT_X - E_X^i$  and  $PF_j = P_j + E_i^j$ ). It is this expression that appears as equation (1) in the text.

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