

Trade, Development and Political Economy

Essays in Honour of Anne O. Krueger

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3 Some Insights from Real Exchange-Rate Analysis

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It is likely that very few contemporary economists would recognize the real exchange rate as a very recent arrival on the list of important economic concepts, or would realize that real exchange-rate analysis, as we know it today, was not part of the standard preparation of international trade economists, even as late as forty or fifty years ago. It has been my good fortune to witness the arrival of this new offspring of our intellectual heritage and to observe at close hand its development over recent decades.

As is the case with most new ideas, a certain aura of haziness has surrounded the concept and the analysis, as different professionals with different backgrounds tried to use them in approaching and solving different problems. This haziness persists even to this day, though I believe I sense a gradually emerging consensus. I hope that in this chapter I will be able to help push this process along.

As an illustration of the haziness surrounding the concept of the real exchange rate (RER), let me list the titles of six different panels of the table on 'Real Effective Exchange Rate Indices', as they appear in the IMF's *International Financial Statistics (IFS)* (August, 1999, pp. 54-5). There is one panel giving indexes 'based on relative unit labour costs', another 'based on relative normalized unit labour costs', another 'based on relative value-added deflators', another 'based on relative wholesale prices', yet another 'based on relative export unit values', and still another 'based on relative consumer prices'.

This plethora of definitions very clearly reflects the diversity of opinion that must have arisen as the Fund's panel of experts tried to decide on what series the IMF should publish under the real exchange-rate label. I think that readers can easily imagine, going over the Fund's six panel headings, that each of them was thought to give evidence relative

to one class of questions or another. I do not want to take space at this point to explore precisely what questions these may have been. Rather, I want to show that there is a 'natural' definition for the real exchange rate - one that flows quite directly from the theory of international trade. Moreover, and quite surprisingly (to me), this 'natural' definition is not included among the six alternatives presented in *IFS*!! Still further, this 'natural' definition can be considered as one of the absolutely key relative prices of macroeconomic analysis. Hence for sure, it is not one that should have been overlooked. I conclude, then, that the failure of this key definition to appear on the IMF's list is a reflection of the general haziness, referred to above, that seems still to surround the concept of the real exchange rate.

The demand and supply of foreign currency

In this section I shall try to build the base for the above assertions, concentrating on the flow demand and flow supply of foreign currency.

Consider first how one would approach the problem of empirically analyzing developments in the market for any ordinary good (say tomatoes) or service (say plumbing services). One would surely want quantities and price data with which to explore the movements of supply and demand in the market in question. But if the analysis covered any significant period of time, the nominal price of tomatoes or wage of plumbers would not be the relevant price. We would instead want to express this price in real terms, by deflating it by some numeraire price or price level. Now, while a standard text on general equilibrium theory will probably tell us that we can choose 'any given price' out of the set P_1, P_2, \dots, P_n as our numeraire, no empirical worker would proceed down that path. The reason is that we want our empirical numeraire to reflect movements in the general level of prices, not the idiosyncratic movements of some individual commodity's market. Imagine trying to do a serious monetary analysis in which real cash balances were expressed by dividing the nominal quantity of money by the price of sugar! Or trying to study cyclical movements in which real GDP was obtained by dividing the nominal GDP by, say, the price of petroleum! In these cases, huge amounts of unwanted 'noise' would be introduced into our time series. Half one's energy in conducting an analysis in such terms would have to be devoted to explaining away or correcting for the idiosyncratic movements of one's ill-chosen numeraire.

I believe most empirical workers in economics would agree that there are only two readily available candidates for an all-purpose

numeraire – these are the GDP deflator and the Consumer Price Index (CPI). Each of these has a sound conceptual base – using the one, all deflated series are expressed in terms of general ‘production units’; using the other, they are expressed in terms of general ‘consumption units’. Neither of these two series is subject to the type of idiosyncratic movements that characterize the price of many individual goods and services (though one must always be alert to possible manipulation, particularly of the CPI).

Now turn to the market for foreign currency. Here, too, we have a situation of supply and demand, and the relevant price is obviously the exchange rate. The nominal exchange rate E (in a peso country) is the nominal peso price of the nominal dollar. If any sort of inflation is going on in the peso country, we would want to correct for it in the same way we would if we were analyzing the market for tomatoes or for plumbing services. That is, we would want to express it in terms of the standard empirical numeraire \bar{P}_d . This yields E/\bar{P}_d as the real peso price of the nominal dollar.

What is the relevant quantity to be juxtaposed to this price? A little thought should make it clear that it is not the quantity of US dollars, but rather the quantity of *foreign exchange* being demanded and/or supplied, that is relevant. We must think of a country's exports as being its major continuing source of flow supply of foreign exchange, and of its imports as the major source of its flow demand for foreign exchange. There is no sense whatever, in a market economy, in thinking of an exchange rate with the US dollar that equilibrates Mexico's exports to and imports from the US, and of another exchange rate with the pound sterling that equilibrates Mexico's trade to and from the UK, and so on. In a world of convertible currencies the relative exchange rates of the dollar, the pound, the franc, and so on, are set in a world market that is, for practical purposes, beyond being influenced by events in Mexico. So when we develop the demand and supply for foreign currency, we take the total foreign currency demanded by the Mexican market and express it all in dollars using the contemporaneous world-market rates for the conversion.

Thus we are using an exchange rate expressed in pesos per dollar as the price which equilibrates the market for foreign exchange, with other currencies being converted to dollars at the prevailing set of cross-rates with the dollar. It is important to realize that the choice of the dollar as the standard unit of foreign currency has no special meaning, nor does it assign to the dollar any special status. If instead of using the dollar we chose to express our picture of supply and demand

for foreign currency in terms of pounds, we could do so by a simple relabeling of the axes. We could multiply the quantity axis by $\text{£}/\text{\$}$, thus expressing total foreign currency supplied or demanded in terms of pounds, and would simultaneously multiply by $\text{\$/£}$ the vertical axis, which was previously in units of real pesos per dollar, thus rendering it in new units of real pesos per £ . Hence the very same diagram used to express the supply and demand for foreign currency (measured in dollars) as a function of E/\bar{P}_d , where E is measured in pesos per dollar, can be used to depict supply and demand for foreign currency measured in pounds as a function of E/\bar{P}_d , where E is measured in pesos per pound. A given point, expressing, say, \$3 billion of foreign exchange against a price of 10 real pesos per dollar, can be relabelled as expressing £2 billion of foreign exchange against a price of 15 real pesos per pound. This change reflects nothing more than the fact that \$1.50 was the relevant dollar price of the pound at that ‘moment’.

In the same way as was shown above, the demand and supply for foreign currency could be expressed in francs, deutschmarks, euros or yen, without modifying anything except the quantity and price yardstick used in the measurement.

The real exchange rate as the key equilibrating variable for a country's international trade and payments

We are for the moment working with E/\bar{P}_d (the real price of the nominal dollar) as our concept of the real exchange rate. The best way to focus on this as the relevant variable is to assume that all world prices (measured in dollars) are given – that is, beyond the control of the country in question. In this case, the real price of the nominal dollar is equal to the real price of the real dollar, independent of the weights used in the index that defines the real dollar. (I want to postpone the question of how to choose this index until later, precisely because that choice depends very heavily on the issues treated in this section.)

The main point of this section is that the natural response of any country's economy to any of a whole host of ‘international trade disturbances’ is an adjustment of the real exchange rate, through movements either of the nominal exchange rate E , or of the general price level \bar{P}_d , or of both. A partial list follows:

- (i) The introduction of new *import restrictions* will typically shift the demand curve for foreign exchange to the left, causing the equilibrium real price of the dollar to fall.

- (ii) The introduction of *export restrictions* will typically shift the supply curve for foreign exchange to the left, causing the equilibrium real price of the dollar to rise.
- (iii) A change in the rate of inflow of foreign capital will typically add more to the supply of foreign exchange than to its demand, thus causing the equilibrium real price of the dollar to fall.
- (iv) A rise in the world price of an export good will cause the supply curve of foreign currency to shift to the right, thus causing the equilibrium real price of the dollar to fall (causing Dutch Disease, if the positive shock to foreign currency receipts is sufficiently large).
- (v) A rise in the world price p^* of an import good M_j can shift the demand for foreign exchange in either direction depending on the price elasticity of local demand for M_j , as a function of its internal relative price P_j/\bar{P}_j . With an inelastic demand, the demand for foreign exchange will shift to the right, and its equilibrium real price will rise. With an elastic demand these effects are reversed.
- (vi) A reduction in the real cost of producing a tradable good will typically add to the supply of foreign exchange if that good is an export product, and will typically subtract from the demand for foreign exchange if the good in question is an import substitute. In either case the natural consequence is a fall in the equilibrium real price of the dollar.
- (vii) A reduction in the real cost of producing a nontradable good will tend to work in the opposite direction (that is, to raise the real price of the dollar), subject to some qualifications. The broad theorem is that an equal reduction in the real cost of producing all goods and services is equivalent to an increase in real income. If, then, the equilibrium real exchange rate is invariant to changes in real income, then reducing the real unit cost of nontradables production by α per cent must have the opposite effect on the equilibrium real exchange rate from a reduction, also of α per cent, in the real unit cost of producing all tradables.

I use the word 'typically' in characterizing the natural response to a disturbance because there are significant exceptions to the rule. For example, a tariff on a good (condensers) that is an input into import-substitute production (refrigerators) will tend to raise the local cost of producing the end-product in question (refrigerators). All this will lead to a reduction in imports of the input (condensers) and an increase in importation of the final product (refrigerators). With fixed proportions

the latter effect will outweigh the former, so the net effect on the country's demand for imports will be positive. Here is a case where a rise in the particular tariff rate (that on condensers) is trade creating!

This is not, however, the place to explore such nuances in detail, or even to try to provide an exhaustive list. Our focus here is not on the source of the disturbances but on the response. Whatever may cause a shift in the supply and/or demand for foreign exchange, so as to open up a breach between them at the 'old' real exchange rate, will cause a movement of the real exchange rate that will work to close that breach, via movements either in E , or in \bar{P}_d , or in both.

This, to me, describes the key role that the real exchange rate plays in the economics of international trade. It is a role that can be occupied by no other variable, and is at the same time one that is utterly essential in bringing about full adjustment in the face of all kinds of disturbances. It then follows, I firmly believe, that our empirical definition of the real exchange rate should be one that is compatible with, sensitive to, and hopefully reflective of this role.

Converting foreign currency from nominal to real units

The world is never so kind as to present us with a pattern of world prices that stays constant while an economy like Mexico's or Indonesia's receives and responds to some major international shock. One must simply recognize that world prices P_j^* have their own movements through time, and that even broad averages of them typically exhibit significant amounts of drift over quinquennia and decades, less often over years, and rarely over quarters or months. This means that the issue of converting foreign currency to real terms is not always critical. For example, the overshoots of the real exchange rate of Argentina (1982), Mexico (1983, 1995) and Indonesia (1998) took place in a sufficiently short span of time, within which E/\bar{P}_d moved so dramatically (over a factor ranging from two to six) that one could simply forgo adjusting for the comparatively minuscule contemporaneous adjustments of \bar{P}^* (the world price level), much less lose sleep over precisely what index to use in constructing \bar{P}^* .

But there are plenty of problems (for example, the analysis of the real exchange-rate history of a country over, say, three or four decades) for which an adjustment is needed to take us from E/\bar{P}_d (the real price of the nominal dollar) to $E\bar{P}^*/\bar{P}_d$ (the real price of the real dollar). For such exercises one would have to choose a specific index for \bar{P}^* . Here we try to examine some of the main considerations that should guide

which they are traded, prices that can be adjusted to an appropriate cost, insurance, and freight (CIF) or free on board (FOB) basis for any country. But not so for nontradables, where nearly all the standard examples fail. Restaurant meals contain nontradable services, but tradable dinnerware, kitchen equipment and food items. Taxi rides likewise are built up from nontradable services and tradable cars, tyres, and fuel.

If we use the index i to refer to nontradable inputs and the index j to refer to tradable inputs, any given final product price can be represented as a weighted sum of the prices of its inputs, that is, $P_f = \sum_j \alpha_j P_j + \sum_i \alpha_i P_i$. For a true, tradable final product, P_f will be determined in the world marketplace and an increase in the world price will give rise to increased rents (P_i) to one or more domestic factors. I think that the products that we commonly call nontradable have the characteristic that P_f is determined mainly or exclusively by the equilibrium of domestic supply and demand. But this does not stop it from being an average of tradable and nontradable components.

So we can think of the GDP deflator, or any other weighted average of final-product prices, as being a weighted average of tradable and nontradable prices, even though we never (or hardly ever) really see a final good or service that reflects only nontradable prices. Thus if our final product price index is $\bar{P} = \sum_j \lambda_j P_j$, this transforms into $\bar{P} = \sum_j \lambda_j \sum_i \alpha_{ij} P_i + \sum_j \lambda_j \sum_j \alpha_{jj} P_j$, and can thus be said to be a weighted average of tradable and nontradable components.

The consequence of all of this is that we really cannot produce, out of direct observations, the empirical counterpart to P_i/P_n . But that is no problem as we can easily obtain something like P_i/\bar{P}_i , which can alternatively be expressed as $P_i/(\lambda P_n + (1-\lambda)P_i)$, where λ and P_n are not observed. (In all these price-level formulations, units are assumed to be defined such that all base-period prices are equal to one.)

Thus if \bar{P}^* represents a relevant index of the world price of tradables, one can say that for given world prices \bar{P}^* , when our measure of RER ($= E\bar{P}^*/\bar{P}_i$) goes up or down, this reflects a rise or fall in a sort of P_i/P_n variable.

The real problem is, in my opinion, that even though we are obviously free to define things as we wish, we do not really want to define the real exchange rate as something that moves up or down with the price level of the country's own tradables.

Consider first a definition of \bar{P}^* that was some sort of weighted average of the world prices of the exports and imports of the country in question. Now, let the world price of petroleum rise for Mexico or Indonesia, or the price of coffee for Brazil or Colombia. In the first

this choice. Let me approach this discussion by showing how our own intellectual history may have led people astray, in at least two important ways.

Consider first the way international trade theory was traditionally taught. Who will ever forget country A and country B, which constituted the whole world in countless exercises covering everything from comparative advantage, to the theory of tariffs, to the gold-standard, specie-flow adjustment mechanism? Well, I believe that this grounding in a two-country world is what led many people to think of the real exchange rate as a symmetrical concept – with country A's real exchange rate with country B being the reciprocal of country B's real exchange rate with country A. It only takes a little reflection to see that a real exchange-rate measure defined in a symmetrical way will not, even in an old-fashioned two-country model, perform the equilibrating function that we identified in the previous section as its principal role. One gets to that result only when our model has not only just two countries but also just two goods. Then the RER is just the relationship, in one currency or another, between the prices of the two goods, that is, EP_b/P_a or $(P_a/E)/P_b$.

But once nontradables enter the picture we must recognize that their prices in country A play a major role, while their prices in country B play no role at all in A's own adjustment to a given disturbance. From these two conclusions it follows that the price level of nontradables in A must be reflected somewhere in A's RER measure, while the price level of nontradables in B (and, more generally, in other countries) should not be reflected. How, then, can any proper real exchange rate be symmetrical, in the sense of using the same type of index in the numerator (for \bar{P}^*) and in the denominator (for \bar{P}_i)? Yet please note that every one of the IFSS six definitions of the real exchange rate is symmetrical in this sense.

The theoretical literature of modern, real-exchange-rate economics does not fall into this trap. Here the most common norm is to work with a single country producing two or three goods. If two, they are tradables and nontradables. If three, they are exportables, importables and nontradables. In either case, the price level of nontradables, P_n , plays a key role in the resulting models, where typically the RER is defined as P_i/P_n .

The problem here is that we have no direct empirical counterpart to the concept of the nontradable good. I tell my students that for the most part nontradables are like quarks or black holes – things we never really observe directly but whose existence we can both deduce from our theory and infer from our observations. It is really very simple. All internationally traded goods can be said to have international prices at

instance this would cause the index \bar{P}^* to rise. Of course, the greater availability of foreign exchange would cause the real price of the nominal dollar (E/\bar{P}_d) to fall, but this would only help turn a 'perverse' effect on the RER into an ambiguous one.

I use the word 'perverse' not because of some anomalous reaction (as with Giffen goods) but rather in a sort of semantic sense. All (or at least most) of us are completely at home with the idea of Dutch Disease. It is natural, therefore, for us to think that an oil boom in Indonesia or a coffee boom in Colombia will lead to a reduction in the real cost of the real dollar, that is, in a reduction of the RER defined in this way. Yet if we choose to use an index of the world prices of the country's exports and imports as our measure of \bar{P}^* , we do not get a clear-cut result, even in a very obvious Dutch Disease situation. The answer is *not to include the country's export prices in the index for \bar{P}^** , at least not with weights corresponding to their importance in that country's trade.

Import prices do not give us the same kind of trouble, in part because the change in the world price of any particular import good will in any case have an uncertain effect on the RER, depending on the price elasticity of demand for imports of that good. Thus, a weighted average of the world prices of a country's imports is a more plausible candidate for the index \bar{P}^* .

But before leaving the topic of import prices, let me note that they, too, can lead us into trouble if we choose a definition of the RER that reflects the *internal price of tradables* relative in theory to nontradables, in practice to some general index \bar{P}_d . The source of trouble here is the mirror image of the Dutch Disease case. We are all aware that new import restrictions cause the demand for foreign currency to shift to the left, and its equilibrium real price to fall. But those very import restrictions cause the affected import and/or importable-goods prices to rise. Hence an index \bar{P}^* that included the gross-of-tariff world prices of import goods would tend to rise with the imposition of a new tariff, thus tending to offset its 'natural' effect of causing (E/\bar{P}_d) to fall. Once again, we get an ambiguous outcome in place of the 'normal' one. This exercise leads us to insist that if an import price index is used for \bar{P}^* , it should be an index of CIF prices in the open world market, and not of internal (for example, tariff-inclusive) prices for this set of tradable goods.

The preceding discussion makes clear that there are significant problems with many commonly-used country-specific definitions of \bar{P}^* . This by itself suggests that it may be worthwhile to seek a definition that is not country-specific. There are many precedents for this in economic analysis. On the whole, when we define real wages across occupations,

regions, and so on, we do not typically seek separate consumer price indexes according to the specific consumer baskets of each occupation or region. Instead, we typically treat the national CPI as a general numeraire for the purpose of defining real wages.

In a similar way, we can think of defining \bar{P}^* as a generalized bundle of tradable commodities, priced, as I like to put it, in the middle of the Atlantic and Pacific Oceans. I believe that it would be a worthwhile use of the research resources of the IMF and/or the World Bank to institutionalize the building and maintenance of such an index. The weights attaching to the different goods and services entering this index could correspond to their relative importance in world trade, though I believe a better case could be made for using weights that correspond to their relative importance in world production. Such an index would serve the purposes of being a world-price numeraire for tradable goods generally.

I was led to think in these terms by working with the World Tables and the individual country balance-of-payments data presented in *International Financial Statistics*. Consider the World Tables presenting time series covering some thirty-odd years of current dollar value of exports and imports of member countries. For most purposes, these series would be far more useful if they were expressed in real terms. The same is true for series on balance-of-payments deficits and surpluses, on international debt, and so on. Of course, there is always the possibility of converting these various series into real terms on a country-by-country basis, using country-specific dollar-price indexes for the purpose. But not only is that a lot of work; one also runs into serious problems of comparability among researchers. To me, the potential advantages of a well-defined, widely-accepted world numeraire are so great as to be essentially beyond dispute.

But what to do in the meantime, that is, before the IMF or the World Bank creates this numeraire? Here I have an interim suggestion that has at least the merit of having been tested by experience. This is an index that I call the SDR-WPI. I and many of my students have been using it for some 15 years, in many different international and domestic applications where something like a world price level numeraire is called for. So far the snake has not risen up to bite us, not even once.

What then, is this SDR-WPI? Conceptually it is very simple. It builds on the notion that on the whole, indexes of wholesale and producer prices are heavily weighted with internationally-tradable goods. Consider, then, that the WPIs of the US, Japan, Germany, France and the UK are each a separate local-currency price of a basket of tradables. If we are to define \bar{P}^* in terms of US dollars, we then want to convert these

local currency prices to dollar prices by multiplying them by $\$/\text{¥}$, $\$/\text{DM}$, and so on. We then convert the results to an index basis with, say, 1990 equal 100, and combine the five indexes using the same weights as the IMF uses in defining the SDR. These weights have changed gradually over time, mainly to reflect the growing relative importance of the Japanese economy. In our own uses of the SDR-WPI, we have typically selected the set of weights that defined the SDR for our particular base year, and used that set of weights to define a constant-weight SDR-WPI for that particular exercise or study. I believe, however, that if one were to build an SDR-WPI for general, profession-wide use, it would be convenient to build into it the changing weights used by the Fund for the SDR. The simplest way to do this would be to build the index Divisia-style, with each year's percentage changes in the component WPIs being weighted by that year's SDR weights.

Defining real-exchange-rate equilibrium

The most natural approach to defining real-exchange-rate equilibrium is to work with the demand for imports and the supply of exports, with the quantity units defined as real dollars (or other currency of choice) and with the price axis representing the RER defined as real pesos per real dollar.

Thus we start with a demand for foreign currency derived from the demand for imports, and a supply of foreign currency derived from the supply of exports. Their crossing point gives us the equilibrium RER if there are no international capital movements or losses of reserves by the Central Bank or payments of interest and dividends in what the *IFS* classifies as 'income items' and no current transfers. All these items taken together comprise the 'net resource transfer' to or from the country, and it is this net resource transfer that in the end can finance an excess of imports over exports or that can be financed by an excess of exports over imports.

Happily for us economists, there is a very convenient identity between $(M^d - X^s)$ and $(T^d - T^s)$. The first parenthesis represents the excess of import demand over export supply in a period; the second represents the excess of the country's total demand for tradable goods and services over its total supply of them. If I_{pd} represents the flow of importables produced and demanded at home and E_{pd} represents the flow of exportables produced and demanded at home, we have $T^d = M^d + I_{pd} + E_{pd}$, and $T^s = X^s + I_{ps} + E_{ps}$. From this the identity $(M^d - X^s) \equiv (T^d - T^s)$ follows directly. The equilibrium RER can then be seen to be

that which generates a zero excess demand measured either as $(M^d - X^s)$ or as $(T^d - T^s)$. (To permit the necessary aggregation, all these flows must be expressed in a common unit - the 'dollar's worth'.)

This works very well as long as we are dealing with a net resource transfer of zero. But if the net resource transfer (NRT) is different from zero, it must be presumed to have an effect on the underlying demand pattern. If an inflow of \$1000 is spent on tradables it will by itself cause $(T^d - T^s)$ and $(M^d - X^s)$ to increase by \$1000, so the extra supply of foreign exchange in this sense creates its own demand, and there is no need for the RER to change.

If, on the other hand, the net resource transfer is spent on nontradables, it creates an excess demand in the nontradables market matched by an excess supply of foreign exchange. In this case the equilibrating function of the RER is called into play, and the real price of the real dollar must fall to close the gap.

The easiest way to build up loci of potential equilibrium positions, under different amounts of net resource transfer, is to consider the excess demand $(T^{*0} - T^{*0})$, where T^{*0} and T^{*0} are the demand and supply of tradables, each measured in units of real dollars' worth and built on the assumption of a zero net resource transfer. If there is in fact a zero net resource transfer, the equilibrium RER is determined by the intersection of these curves. The T^{*0} and T^{*0} curves will shift due to disturbances like import and export restraints, technological advances, and so on, and the equilibrium RER will shift with them. But we are here focusing on disturbances represented by the NRT itself, or by changes in it.

The key proposition here is that the NRT is not itself the relevant variable. One needs to know how the NRT is divided into its two components, $B_t + B_n$. We have seen that B_t (borrowing spent on tradables) does not affect the equilibrium RER, while B_n (borrowing spent on nontradables) does. Our key conclusion is that one finds the equilibrium RER by inserting a wedge equal to B_n (measured in real dollars) between the T^{*0} and T^{*0} loci defined above.

Unfortunately, to implement this concept empirically one must know how the NRT of any given period is divided into B_t and B_n . This is easy to do for a company's borrowings but very difficult for a nation's. One really ought to work with all the separate items of gross inflow and gross outflow that constitute the NRT, and find B_{ij} and B_{ij} for each of them before finally aggregating these component flows into B_t and B_n for the nation. To my knowledge nobody has done this. Most analysts, including myself, have instead worked with the NRT itself, or with capital account data. The preceding paragraphs should serve to

warn us how potentially treacherous it is to take these common shortcuts. Bad results are to be expected from using NRT or capital flow data to explain movements in the RER whenever there are (usually unknown to us) substantial changes in the fraction of net flows that is spent in nontradables.

Specifying demand functions in international trade

Let me begin this section by setting out my favourite specification for the demand function for 'tradable good j '.

$$T_j^d = a_0 + a_1\gamma + a_2 RER + a_3(P_j/EP^*) + B_{jt} + a_5(M^s - M^{(t)})/\bar{P}_d \quad (3.1)$$

There is a great deal of international trade economics imbedded in this simple function. Not much need be said about the income term, γ , which is 'standard'. But the price terms contain an important subtlety. We have seen that the RER is the key variable that moves to eliminate potential disequilibria in the market for foreign exchange. In so doing it represents a movement in the price of what I call 'the greatest real-world composite commodity' - a country's tradables. It is as if the prices of all tradable goods and services were in a huge elevator, moving up and down *together*. We can learn nothing about the elasticity of wheat demand with respect to the RER if we fit a standard function in which the price variables are of the standard type P_j/\bar{P}_d for wheat and its main substitutes. That function has interest of its own but tells us nothing about a_2 . In theory, a_2 should be obtained from an 'elevator experiment', where in fact we move all tradables prices up and down together. In practice we have to use a measure like EP^*/\bar{P}_d to try to capture (imperfectly) the same effect.

What we're really doing with the coefficients a_2 and a_3 is a sort of nesting of substitution terms. One could broaden this nesting and have one term representing the price of wheat relative to the prices of grains, another reflecting the price of grains relative to the price of food, yet another showing the price of food relative to the price of tradables, and finally the RER itself (the price of generalized tradables relative to \bar{P}_d).

The main point is to focus on a_2 . The elasticity here is bound to be extremely low. Estimates of price elasticity for an aggregate like food typically hover in the range of -0.25 to -0.50 . But the substitutability between food and non-food has to be substantially greater than that between food and the mysterious aggregate we call nontradables. This

latter would be a plausible guide to the magnitude of the own-price elasticity of tradables demand.¹

Now since the demand for tradables is, for the reason indicated, likely to be 'everywhere and always' of very low elasticity, this puts the supply of tradables into a very critical position. If the elasticity of supply is also low, even moderate shocks can lead to high volatility of the RER. If, on the other hand, the supply of tradables is quite elastic, this can help keep the RER within a relatively modest range, even in the face of substantial shocks. I believe we have real-world counterparts to these situations. The overall supply of tradables is almost certain to be quite inelastic in countries whose tradables sector is dominated by agriculture, mining and fishing. These would include Argentina, Brazil, Chile and Indonesia, among many others. Countries whose tradables sector is dominated by manufacturing and services would include Hong Kong, Korea, Singapore and Taiwan, plus the great bulk of the advanced industrial countries. All would tend to have a reasonably elastic supply of tradables. The reason is that these are activities whose outputs can be as much as doubled, simply by adding another shift. This entails some premium in real costs, but not, in general, a huge one. Hence we expect the volatility of a country's real exchange rate to depend quite critically on its industrial structure.

The coefficient a_3 has no real counterpart in the macro-trade literature, since it is really tracking the idiosyncratic movements of the price P_j of a particular tradable good (or subset). But it surely belongs in the demand equation for that good. The term in B_{jt} appears without a coefficient. This simply represents how much of foreign borrowing (or better, of the net resource transfer) was spent on good j . We can adjust this term in steps, and perhaps get some additional insights at each step. In my own work, I used to represent this term as a_4NRT , making the net resource transfer the explanatory variable and then emphasizing that the coefficient a_4 could vary a lot from event to event, even in the same country in adjacent periods. I now prefer to put just B_{jt} because that presentation makes the same point, louder and clearer.

Going still another step, we get to the practice, frequently found in the literature, of making demand depend not on real income but on total real expenditure. This treats $(\gamma + NRT)$ as the relevant explanatory variable, and implicitly assumes that we spend borrowed money the same way we spend income. That may sometimes be true, but certainly not reliably so. Country borrowing has sometimes fed construction booms (largely nontradable), sometimes gone to buy capital and consumer goods (largely tradable). The mix depends on who is borrowing

and for what purpose. Readers will sense immediately the link of the B_{jt} term to the income-expenditure approach to the balance of payments, where one finds quite extensive use of expenditure variables similar to $(Y^* + NRT)$.

The final coefficient in equation (3.1) is a_5 . It is aimed at capturing the type of adjustment emphasized in the monetary approach to the balance of payments. It is built in the style of disequilibrium economics, with increments to flow demand arising whenever unwanted stocks are present. I believe this is a far better way to represent the monetary approach than through continuous-equilibrium models, but that is another story. Here I only want to emphasize that the coefficient a_5 is dependent on our choice of period. An excess holding of \$1000 of real monetary balances could give rise to extra spending of \$50 within a week, \$150 within a month, \$300 within a quarter and \$600 within a year, so a_5 could go from 0.05 to 0.60 for total spending, which in turn would be divided between tradables and nontradables.

There is clearly a kinship between the income-expenditure and the monetary approaches to balance-of-payments analysis. In putting the two together in the same model it is therefore important to avoid any implicit double-counting of effects. This could, for example, entail defining B_{jt} so as to exclude $a_5(M^s - M^d)/P_d$. The best way to check on this is to set up a simple dynamic model and work through a series of simulations.

I want to keep the two approaches separate because I truly believe that we have learnt different important things from each. The monetary approach, in my view, called attention to a 'new' adjustment mechanism, whereby equilibrium could be restored (after, say, the printing of ΔM^s in a fixed-exchange-rate world) without there being any significant resort to either price adjustment or interest-rate changes. In the end, of course, this all happens through an induced loss of international reserves – that is, through a net resource transfer carried out through reducing the nation's foreign assets rather than increasing its foreign liabilities.

Is foreign borrowing an adjustment mechanism?

I cannot conclude this chapter without addressing an issue that has haunted me for some thirty years. I was very glad to be present as the monetary approach was unveiled and evolved at the University of Chicago in the late 1960s and early 1970s. I savoured every step of this development, feeling I was learning something both new and important. But in the end there was one troubling 'conclusion' – namely the sense that one got from many representatives of the monetary approach that

somehow the RER didn't exist, or if it existed its equilibrium didn't vary much (or at all). As one who believes that real exchange-rate analysis brought in equally important new insights, I have always resisted this overtone in the monetary approach literature. But to confirm its existence consider the following recent citation: 'The equilibrating mechanism with financial integration is not the RER. Rather it is changes in banks' net financial position.'²

There is no question that a healthy capital market can do a lot to smooth out potential fluctuations in the short- or medium-term equilibrium RER. This is what private sector arbitrage (over time) would do; it is also what well-placed Central Bank intervention in a floating exchange-rate system would try to accomplish. In this way, borrowing can be used to spread the real costs, say, of a natural disaster, over a number of years. So yes, international borrowing operations have the capacity to smooth out RER fluctuations, and hold the RER to a time path that mainly reflects its long-term upward or downward drift. But this, to me, only says that borrowing helps when serious RER adjustment is not needed.

But what about the case of Japan, from the 1950s to the 1980s? Here a continual appreciation of the real exchange rate was required by differential productivity advances as between tradables and nontradables. Here, to prevent appreciation, that is, to make foreign currency more costly, would call for the country to lend, not borrow, abroad. This is precisely what Japan did, and massively so, being the principal supplier of funds to the international capital markets for decades – yet even that did not prevent a huge equilibrium appreciation of the yen.

Similarly, high levels of financial integration have not prevented very significant upward and downward movements in the real exchange rates of Germany, France and the United Kingdom.

The coefficient a_2 reflects the focus of the traditional 'elasticities approach'. The only thing to bear in mind here is that most of the elasticities literature deals with elasticities of demand for imports and/or of supply of exports, and not the elasticity of demand for tradables as such. So one would have to effect the requisite transformation. As a result, I would propose that the profession simply accept that foreign borrowing operates to reduce the equilibrium RER at times, while acts of repayment operate to raise it at times. A big current rise can be prevented by accepting a long series of imperceptible future increases, but when the true long-term equilibrium level of the RER changes, acts of borrowing cannot prevent fundamental RER adjustments from taking place through variations either in the nominal exchange rate E or in the domestic price level P_d .

Notes

1. When all goods are divided into two composites C and G, the own-price elasticity of C consists of (minus) the unweighted sum of the cross-elasticities of C with respect to the prices of all components of G, or equivalently, of (minus) the value-weighted average of the cross-elasticities of all components of C with respect to the price of G. The elasticity of food w.r.t. the price of nontradables is thus one member of a set which, when averaged over all components of tradables, yields the own-price elasticity of tradables.
2. Juan Luis Moreno-Villalaz, 'Lessons From the Monetary Experience of Panama: a Dollar Economy With Financial Integration', *The Cato Journal*, 18 (3) (Winter 1999) p. 438.