

**ECONOMIC GROWTH AND THE REAL EXCHANGE RATE:  
REVISITING THE BALASSA-SAMUELSON EFFECT**

Arnold C. Harberger\*

University of California, Los Angeles

Paper Prepared for a Conference Organized By

The Higher School of Economics, Moscow

April 2003

**Introduction**

This paper has much of the flavor of an assigned essay. In a meeting at The Higher School of Economics late last year, the conversation turned to the topic of how economic growth influences the real exchange rate. I had earlier (1991) briefly investigated this topic and had reported those results here in Russia. Briefly, the results were that it was hard to detect any systematic connection between economic growth on the one hand and real exchange rate changes on the other. When I mentioned this, one or two members of the group asked how my results could be reconciled with the well-known Balassa-Samuelson effect, which asserts that in the process of growth real cost reduction comes faster in the tradables goods than in nontradables, hence prices of tradables tend to fall relative to nontradables, which implies that the real price of the dollar will also tend to fall through time (with a fixed exchange rate the prices of tradables in rubles will move with their prices in dollars, but the consumer price index and the GDP will rise, relative to tradables prices because these indexes have an important component of nontradables prices). At some point in the conversation that followed Professor Yasin said “this would be a fine topic for your presentation at our Conference next April”-- thus creating my assigned topic.

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\*I am most grateful to Eduardo Ganapolsky for his research support, and to Lorraine Grams for a splendid job of manuscript preparation.

My execution of this assignment took two forms: a) some further empirical exercises and b) some review of the literature, including the pioneering articles by Balassa and Samuelson. I decided to keep these exercises largely separate from each other. Thus I have placed my substantive comments in the text of this paper, and my main discussion of Balassa's and Samuelson's papers as well as other literature in an appendix. The reason is that in discussing other people's work one is to some degree constrained by the way they formulated the problem and organized their exposition. By handling my treatment of these papers separately, I was able to treat each author's framework and organization with due respect, and at the same time, in my main text, follow my own framing of the problems and issues involved.

### **Fundamentals of Real Exchange Rate Economics**

It is extremely important to state at the outset my firm conviction that the basic structure of real exchange rate economics is well known, and not open to serious dispute by professional economists. The complications stem not from our inability to trace a logical path from cause to effect, but rather from the fact that there are so many different causal chains that can and do affect the RER. Let me here review the main ones. In doing so I will speak of the ruble as the domestic currency and the dollar as the numeraire foreign currency.<sup>1</sup>

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<sup>1</sup>The real exchange rate (RER) of a country is an equilibrium real price, and does not depend on the foreign currency that one uses as a numeraire. My definition of the RER is  $E\bar{p}^*/\bar{p}_d$ , where  $E$  is the price of the numeraire foreign currency (say dollars) in rubles,  $\bar{p}^*$  is an index of tradables prices measured in the numeraire currency, and  $\bar{p}_d$  is the general price index (CPI and GDP deflator) measured in the local currency (here rubles). If one were to use yen instead of dollars as the numeraire currency one could use the expression  $E'\bar{p}^{*'}/\bar{p}_d$ , where  $E'$  is rubles per yen and  $\bar{p}^{*'}$  is the same price index of tradables as above, but now expressed in yen. Note then that  $E' = E \times (\$/\text{¥})$  and  $\bar{p}^{*' } = \bar{p}^* \times (\text{¥}/\$)$ , where  $(\text{¥}/\$)$  is the exchange rate reflecting the number of yen it takes to buy a dollar. Thus if  $E$  is 30 and  $\bar{p}^*$  and  $\bar{p}_d$  are both 100, the RER will be 30. If at that moment  $(\text{¥}/\$)$  is 120 then  $E'$  will be  $(30/120) = .25$  and

- a) a capital movement into the country will have no effect on the real price of the dollar if it is all spent on tradables, but to the extent it is spent on nontradables it will raise their price. Seen a different way, there is no effect of people spending the dollars directly in foreign markets but if they dump the dollars in the local foreign exchange market, they cause the ruble price of the dollar to fall (or with a fixed exchange rate, cause an expansion of the ruble money supply and a consequent rise in the internal price level).
- b) outflows of capital will similarly work to raise the real ruble price of the dollar. Once again, the limiting case would be one where there is no effect -- e.g., keeping abroad the proceeds of an oil price rise.
- c) a rise in the world price of an export product, by adding to the supply of dollars, will lead to a fall in the real price of the dollar -- once again, so long as some of the proceeds of the export price boom are repatriated and spent on nontradables.
- d) real cost reduction (= TFP improvement = technical advance) in the production of a tradable good will have a similar effect to a rise in the price of an export good. If the affected good is exportable, it will lead to increased availability of foreign exchange via increased exports. If it is an importable, it will lead to reduced demand for imports and a consequent lower real price of foreign currency.
- e) real cost reduction in the production of nontradables has the opposite effect. The easiest way to see this is to recognize that an equal percentage real cost reduction in both tradables and

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$\bar{p}^*$  will be  $(120 \times 100) = 12,000$ , so  $E' \bar{p}^* / \bar{p}_d$  will be  $(.25)(12,000) \div 100$ , which is exactly and necessarily 30, the same as  $E \bar{p}^* / \bar{p}_d$ .

nontradables should have no effect on their relative prices, and hence on the real exchange rate.<sup>2</sup>

- f) the imposition of tariffs and other import restrictions will typically reduce the demand for foreign currency and consequently lead to a reduction in the real ruble price of the dollar.
- g) Taxes on exports will typically reduce the supply of foreign currency and consequently lead to an increase in the real ruble price of the dollar. Subsidies to exports will obviously work in the opposite direction.

These are the main sources of changes in real exchange rates, and each one of them has very straightforward and well-defined effects<sup>3</sup> that do not present us with any really complicated analytical problems. If we define our terms clearly and do the analytical exercises properly, we should find no cases of professional disagreement concerning how each individual causal chain operates to affect the real exchange rate.

### **What Evidence Should We Look At?**

From the previous section it should be clear that the argument, if any, is not about the theory or analysis of real exchange rate economics but rather about the facts. It is not about how

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<sup>2</sup>For a more painstaking elaboration of this case see Arnold C. Harberger “A Note on Productivity and the Real Exchange Rate” (Moscow: USAID, 2002).

<sup>3</sup>There are some nuances that I have not discussed, but they are of minor importance. One is that if one defines the real exchange rate as  $p_t/p_n$  and uses the country's own weights in establishing  $p_t$ , it could turn out that such an index would rise rather than fall as a result of an increase in a major export product like petroleum. This ambiguity is not likely to appear if the definition  $E\bar{p}^*/\bar{p}_d$  is used, with  $\bar{p}^*$  being a general “world price index of tradables”. Another qualification is that the imposition of tariffs or other trade restrictions on imports into already-protected local import substitutes can actually end up being trade creating. For example, restricting imports of condensers used to make refrigerators will reduce the local supply of refrigerators, causing more refrigerators to be imported at the existing world price plus tariff. Such cases are interesting exercises in analysis but do not significantly modify the big picture covered by cases a) through g) above.

each given causal chain works, but rather about which causal chains are more important, and when.

So let me set out the problem as I see it. When people speak of the impact of economic growth in the real exchange rate they are referring to the long-term forces of growth, not those elements that can cause transitory hills or valleys in the time path of the RER. Thus they are not referring to the effects of capital inflows or outflows on the real exchange rate, nor are they talking about the effects of export price booms or busts. (If there were demonstrable long term trends implying that the normal growth of a country entailed a certain typical rate of capital inflow, or a certain typical rate of change of its real export price index, then I feel that these sources of RER change could legitimately be incorporated. As of now, however, I see no evidence of such “standard” capital-movement on export-price effects). Nor are we talking about the consequences of trade policy changes on the real exchange rate.

Of all the causes of RER movements that were listed above, only d) and e) -- real cost reductions in tradables and in nontradables -- represent elements that are integral parts of the process of economic growth. And, interestingly, these work in opposite directions on the real exchange rate. Thus, the question seems to boil down to whether over the long term, real cost reductions in tradables are or are not stronger than those in the nontradables area.

Luckily, Balassa treats this issue explicitly in his pioneering paper.

In a more general model, the impact on the general price level of productivity improvements in sectors producing traded goods can be examined under alternative assumptions with regard to changes in money wages. Should money wages remain unchanged and productivity improvements be translated into lower prices, the prices of traded goods will fall but service prices will not decline proportionately, restricting thereby the decrease in the general price level.

Alternatively, we may assume that money wages (and profits) rise in proportion to the growth in productivity so that the prices

of traded goods remain unchanged. Competition among labor groups will now raise wages in the tertiary sector where increases in productivity are smaller, and hence service prices will rise. Finally, in intermediate cases, the growth in productivity in the production of traded goods will exert a downward pressure on the prices of exports and import-competing goods and an upward pressure on the prices of services. [From Balassa (1964), p. 393]

There can be no doubt that Balassa believes that there is a secular tendency for the price level of tradable goods to fall relative to the price of nontradables. His Table 6 (p. 594) shows manufactured goods prices falling relative to the GDP deflator in seven countries (the United States, Belgium, France, Germany, Italy, United Kingdom and Japan) between 1953 and 1961. And in Table 5 he shows directly-measured productivity (output per worker) rising faster in agriculture and industry and rising slower in services than the overall private GDP per man,<sup>4</sup> in the seven countries listed above, minus France and plus the Netherlands, for the period 1950-60.

### **Our Empirical Results**

What I plan to do is try as best I can to focus on cases of significant GDP growth over a period that is long enough to iron out the bulk of what we might call transitory influences on the real exchange rate. To accomplish this aim we surveyed the data of International Financial Statistics, looking for periods in which economic growth exceeded 5% per year over a period of at least a decade in length. So as not to count as secular growth periods of huge spurts in GDP, we also insisted that the initial and final years of the period should display growth rates of at least 4%. From this exercise there emerged 25 episodes of extended rapid growth, all of them in well-known countries.

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<sup>4</sup>There are two modest exceptions: In the U.S. private GDP per man rose by 3.1 percent per year, compared with 2.9 percent for industry, and in Italy both rose at 3.6 percent per year. There is no doubt, however, that for these countries and in this time period productivity as measured and reported by Balassa rose faster in Agriculture and Industry (his tradable sectors) than in services (his nontradable sector).

Since the countries were selected according to the criterion of rapid GDP growth, this automatically guaranteed a strong positive trend in this variable. Our first comparison, then, was to fit a simple trend for the real exchange rate of each of them over their full rapid-growth episode. The results are shown in Table 1a. In column (1) the real exchange rate is measured following what I consider to be the best available empirical definition of this variable -- the nominal exchange rate  $E$  (rubles per dollar) multiplied by an index of tradables prices  $\bar{p}^*$  (in this case a weighted average of the dollar price levels of the wholesale price baskets of France, Germany, Japan, the U.K. and the U.S., the weights being those used by the IMF in defining “its own” currency, the special drawing right [SDR]).

In column (3) of Table 1a we present an alternative measure: the ratio of the wholesale (or producers) price index to the CPI. The motivation for this stems from the fact “wholesale price indexes are often heavily weighted with traded goods” (Balassa, p. 592), while the CPI and the GDP deflator are broadly based indexes including large amounts of nontradables.

I have more confidence in the first measure of the RER than in this second one, but present the second nonetheless because it has often been employed by others. The results are that eighteen of the twenty-five measured RER trends are positive under the first definition [column (1)], and 9 out of the 22 are positive under the second. I do not place any special significance of the predominance of positive signs (the opposite of what Balassa expects), because I have no strong presumption that real cost reductions will be mainly concentrated in the tradables. That is Balassa’s presumption, not my own. The conclusion that I would like to draw from this comparison is simply that this evidence does not support Balassa’s presumption.

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A second set of results appears in Table 1a -- the coefficient of GDP in multiple regressions in which the RER is the dependent variable and a time trend and GDP are the independent variables (RER and GDP in logs). The coefficient of the GDP variable here can be taken to show how the real exchange rate responds to deviations of GDP from its trend. This is a case where the presumption of a negative coefficient would be stronger, because two of the important sources of special GDP growth(decline) are export price booms(busts) and major capital inflows(outflows). The results of this exercise, shown in columns (2) and (4) of Table 1a are very similar to those just discussed, in this case there is surely no clear predominance of sign.

For those who might feel uncomfortable with our first comparison, which just looks at the RER trend against the backdrop of a strongly rising trend in real GDP, I have also included Table 1b. This gives the simple regression coefficient of log RER on log GDP, for the two alternative measures of the real exchange rate. Not surprisingly, the results look very much like those of the first comparison [in columns (1) and (3) of Table 1a].

### **Interpreting the Results**

It is not at all my purpose to argue that the Balassa-Samuelson effect is never or rarely present. I truly believe that it is sometimes present, which is typically going to be where productivity increases have been largely concentrated in the tradables sector. But I also believe there will be other times where the RER moves the other way in a period of growth, and this will likely be in periods when productivity increases were largely concentrated in the nontradable sector. Under any possible combination of productivity change across sectors, we will certainly have many periods where other forces (like capital movements and commodity price booms and busts), will be the dominant forces affecting the real exchange rate. Such cases will simply give

no evidence concerning the Balassa effect, the dominant real-world scenario being different from the one Balassa contemplated.

Readers may have noted that I have at several points talked of the Balassa effect rather than the Balassa-Samuelson effect. For a longer explanation I refer them to the appendix to this paper, Section 2, where I review and summarize Samuelson's paper. The plain fact is that in that paper Samuelson does not assert a strong tendency for productivity improvements to be concentrated in the tradables. He does cite examples, like the California gold rush, which can be interpreted as reflecting such an effect, but in the main I find the Samuelson paper to be concentrated on an exposition of basic international trade theory and a discussion of various alternative versions of purchasing power parity. The Balassa effect was certainly not the main focus of Samuelson's paper, and we can even question whether it was there at all, as an assertion of general tendency.

The main conclusion that I want to draw is the lesson for policymakers that emerges from our exercises. To my mind, that lesson is please do not count on a secular trend toward an ever cheaper dollar in real terms. It may happen, and it may not happen. If you are going to reach an expectation that it will happen, that expectation should come as the outcome of a serious study of your own actual situation, not from some imputed natural outcome of a typical episode of rapid economic growth.

### **Comparisons of Costs Across Countries**

While for practical policy purposes the element of greatest interest is the likely future movement of the real exchange rate, there are several studies that investigate the cost of a given basket of goods in different places. On the hypothesis that the tradable elements in the basket cost roughly the same in different places, the cost differences would arise because of differences

in the prices of nontradables. And if nontradables were cheaper in countries with lower real incomes per capita, that could reflect a version of the Balassa effect, which he himself mentions. This same approach, applied to purchasing power parity calculations, is sometimes called the absolute version of PPP, with its counterpart, the relative version of PPP, applying to the percentage changes in the costs of given (or at least comparable) baskets of goods over time.

Froot and Rogoff (1994) report particularly on a study by Summers and Heston (1991). Its primary conclusion is that the costs of given baskets of goods are lower in poor countries taken as a group than in rich countries as a group, but “once divided into two groups, the within-group correlations between income and the price level [of a given basket] are much less apparent.” [Froot and Rogoff (1994), p. 32] I will not dwell on this sort of cross-country comparison because I feel it is quite remote from issues connected with policy.

Nevertheless, let me take this opportunity to point out that many people have a rather stylized interpretation of productivity (both levels and changes) on the nontradable area. Many people think of haircuts, maids, gardeners and taxi drivers. Not many also think of electricity services, telecommunications services, financial services, etc. in which huge amounts of technical advance have taken place. Indeed, many labor economists believe that changes in the technology of household services were a very important factor contributing to the great surge of labor force participation by married women all over the world. (This same type of technical advance has also substantially raised the productivity of housemaids, carpenters, plumbers, and gardeners, thus giving us grounds for second thoughts even about our first impressions.) I should also add to the list of nontradables innovations the so-called supermarket revolution which, in countries where such entities are allowed to compete freely on similar terms, has ended up virtually eliminating many types of traditional-style retailing.

Thus I feel we should not underestimate the capacity of the nontradables sector to innovate. In the final analysis, I appeal to evidence like that in Table 1. The concepts used in that table make it unnecessary for us to precisely identify tradables and nontradables. Nontradables just enter as a not-explicitly-identified part of a general basket of goods like that of the CPI or the GDP deflator. Use is made of the presumption (which I believe to be correct) that wholesale price indexes mainly represent tradable goods. It is noteworthy that for the calculations of columns (1) and (2) of Table 1a, exactly the same measure of  $\bar{p}^*$ , the price index of tradables, was used in all of the cases presented.

What we see, then, as we examine real exchange rate movements in periods of rapid economic growth, is a very mixed set of results, with no strong tendency for the RER to either rise or fall. This observation should be enough to make economists and policymakers very cautious about assuming a natural connection between the long-term movements of GDP on the one hand and the real exchange rate on the other.

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## APPENDIX

In this Appendix I review the basic papers by Balassa (1964) and Samuelson (1964), which give their two names to the Balassa-Samuelson effects. I also attempt to extract the information most relevant to the questions we are here addressing, from a major survey of purchasing power parity and long run real exchange rates, by Kenneth Froot and Kenneth Rogoff (1994).

1. Bela Balassa (1964) highlights most explicitly what has come to be known as the Balassa-Samuelson effect. Not just once, but many times in the separate sections of this paper, the author focuses on the distinction between tradable and nontradable goods.<sup>5</sup>

The major element that he emphasizes is his presumption that the tradable goods sectors are the dynamic ones, with larger productivity increases over any extended period than the nontradable goods sectors. His point is most easily captured by assuming zero productivity changes in nontradables. Then, over time, different countries' real incomes per worker will grow by differing degrees, depending on their rates of productivity increase in the tradables sectors. Real wages will also go up most in the countries where such productivity increases are the greatest. Yet wages cannot be expected to rise only in the tradables sectors. Labor market

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<sup>5</sup>Balassa uses the terms "traded" and "nontraded", which the subsequent literature on the subject has correctly been replaced by "tradable" and "nontradable". The basic distinction is that between goods whose prices are fundamentally determined in a world market, and those whose prices are fundamentally set by the interaction of local supply and demand within a country. The subtle point underlying the shift in terminology is that there are not only tradable goods (exports) for which a country's supply at world prices greatly exceeds demand, side-by-side with tradable goods (imports) for which its demand at world prices greatly exceeds its supply. In addition there are those for which domestic supply is quite close to domestic demand, yet whose prices are nonetheless fundamentally determined in world markets. Goods in this latter category may not at a given point in time be "traded", but they are certainly "tradable".

equilibrium requires that wage rises extend also to areas with no productivity increase (for workers of equivalent skill and training). This means that services like those of barbers, taxi drivers and gardeners will have to rise in price to reflect the increase in the general level of wages. This in turn means that the price level of nontradables (here assuming no productivity increases in this sector) will rise more in those countries with more rapid productivity increases in the tradables sectors. If the real exchange rate is defined as  $P_t/P_n$  (price of tradables divided by price of nontradables) this real exchange rate (real price of the dollar) will end up falling by more, the greater is the increase in real income of the country. If, across countries, it is assumed that the prices of tradables are equalized at any point in time, then it will follow that in countries with high real wages, the cost of living will be higher, so long as productivity in the nontradables area do not differ across countries (or do not differ very much).

With respect to country cross-section data, Balassa says (p. 587) “the arguments of the present paper lead us to expect random deviations to occur around a curve indicating the relationship between the “ratios of purchasing power parities to exchange rates,”<sup>6</sup> on the one hand, and per capita income levels, on the other. What he is saying is simply that, measured in U.S. dollars or any other numeraire currency, given bundles of goods that include nontradables will be cheaper in poorer than in richer countries. This will be true, of course, if nontradables really are cheaper in the poorer countries.

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<sup>6</sup>Purchasing power parities here have to be considered as the prices in two distinct currencies of a given bundle of goods. Balassa cites data from Kravis and Davenport in which comparisons are made by pricing in the U.S. and eleven other countries the GNP basket of the U.S., and also pairwise comparisons of the cost, in the U.S. and in each of the other countries, of that country's GNP basket.

Balassa also addresses the issue of changes in the real exchange rates over time. Here he uses the same hypothesis of zero or low productivity change in the nontradables sector. He presents data relating the change in productivity per man hour in manufacturing to the change in the relative price of manufactured goods (Table 6 and Figure 2, pp. 594-95). Not surprisingly, he finds that where manufacturing productivity increased the most, the fall in the relative price of manufactures is the greatest.

This exercise of Balassa's is not empty, as it may at first appear to some readers. If in each country manufacturing wages kept pace with productivity in that sector, it would easily be possible that none of the benefits of the productivity advance would be passed on to consumers, in which case we would not see a tendency for manufactured product prices to fall more in cases of greater productivity increase. There is also the obverse possibility that productivity increases in manufacturing would have a high positive correlation with productivity increases in other sectors, in which case, once again, the link between high manufacturing productivity increases and large drops in the relative price of manufactured goods would be broken.

Balassa tells a very straightforward story, but it is very distinctly and explicitly tied to the underlying hypothesis (in his case an assumption) that productivity differentials across countries are small in the nontradables area, and so too are changes in nontradables productivity over time. He does present data for seven countries on the annual rates of productivity increase in individual sectors 1950-60, and finds that services lagged behind industry and agriculture in all seven countries (Table 5, p. 193). In another table, he shows that for eight European countries vis-a-vis the United States, the relative costs of specified services baskets were less than the corresponding relative costs for GNP baskets (Table 3, p. 589, covering the year 1950). Notably, the specified services did not include either electricity or telecommunications.

2. Paul Samuelson (1964), does not emphasize the tradables/nontradables distinction in the same way as Balassa. Rather, his paper is a series of notes that might be entitled “Theoretical Underpinnings of Real Exchange Rate Economics”. Here I will attempt only a brief survey of his main points.

First, he notes that even if, measured in labor or other real units, one country produces everything more cheaply than another, this does not imply an absence of trade, or of gains from trade. Either through the adjustment of the nominal exchange rate, or through the adjustment of relative wages for a given fixed exchange rate, the rich country will end up exporting those commodities in which it has the greatest cost advantage and importing those goods in which its cost advantage is lowest. In short, the real exchange rate will adjust so as to bring about an equilibrium of trade, in which each country exports those goods in which it has a comparative advantage.

Second, Samuelson notes that if the first country is, in different industries, between twice and five times as efficient as the second, the equilibrium with trade will lead to its real wage rate being somewhere between two and five times that of the second country (not outside these limits). [Samuelson is using a simple, Ricardian labor-cost model here.]

Third, when the cost ratios differ for different goods, there will typically one good (or group of goods) which will be at the margin. For these goods, according to Samuelson, purchasing power parity will apply precisely, and real wages will precisely reflect relative productivities. Translated into our language, Samuelson is saying here that the real exchange rate will help to determine a country’s comparative advantage.

Fourth, capital movements can affect a country’s comparative advantage in the sense indicated above. Inflows of funds allow a country to import without having to pay with its

exports. “If our wage levels stay high enough, we can be undersold in every good. ...The whole of our imports would then have to be financed by capital movements or gold.”

Fifth, when goods are traded (or tradable) the law of one price should prevail. Without transport costs, tariffs or other impediments to trade, we would have the law of one price for all goods. Then purchasing power parity would apply for any given weighted average of prices (though not, Samuelson emphasizes, for different weighted averages reflecting two countries’ different baskets of goods).

But sixth, transport costs really are important, and in effect they determine the tradability of different goods and services. “I cannot import cheap Italian haircuts, nor can Niagara Falls honeymoons be exported.” (p. 148) At the time of the California gold rush, the price of gold was the same in booming California as it was in depressed Vermont, but the prices of most things were much higher in California, the differences having to do with transportability and labor mobility. Wages were 10 times as high in California as in Vermont, eggs (hard to transport) eight times as high, wheat (easier to transport) two times as high and gold (very easy to transport) basically at parity. This is about as close as Samuelson gets to saying that services will be more expensive in a richer (per capita) economy than in a poorer one. But he really does not enter at all into differential productivities here; he is mainly focusing on transport costs.<sup>7</sup>

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<sup>7</sup>Implicitly, of course, if wages in California are 10 times those of Vermont, and eggs cost only 8 times their Vermont price, the productivity of California labor in the egg industry should be 1.25 times that of Vermont workers, so long as eggs are actually produced in both places. By the same token, California labor should be 5 times as productive as Vermont labor in the production of wheat, if that item is produced in both places. These statements are truisms if they refer to the marginal physical productivity of labor (L) in producing any product (X) in a competitive setting, for the textbooks tell us that  $w = MPP_L^X P_X$ .

Seventh, Samuelson recognizes that the “unrealistic model of complete factor price equalization between two countries with geographically similar production functions ... and almost similar factor endowments ... will equalize both the real wage and the external interest rate” (p. 152). In that case the law of one price will hold even for nontradable goods. But Samuelson emphasizes that “the case is not realistic” and that the law-of-one-price parity it generates would not be modified by “unilateral capital flows or anything else.”

Eighth, he goes on to make explicit the normal influence of capital flows, saying “an autonomous outflow of capital or aid will call for an equilibrating drop in our relative wage level” (p. 153). In today’s language, it will call for an equilibrating rise in the real exchange rate (defined as the real ruble price of the real dollar).

I have not summarized a rather long disquisition by Samuelson, commenting on a very rigid interpretation of purchasing power parity by Houthakker, nor have I dealt with his concluding section, which comments on the possible overvaluation of the dollar in the late 1950s and early 1960s. Both of these themes are rather far afield from the Balassa-Samuelson effect, and can be followed up independently by interested readers.

I was surprised in my reading of the Samuelson paper, because its content and focus were so different from what I had been led to expect by the frequent references in the literature to the Balassa-Samuelson effect. That effect is very well stated and defended by Balassa, in his firm affirmations of a low “propensity” for productivity increase in the nontradables sector, and in his several attempts to marshal empirical evidence in its favor. So far as I can see, Samuelson makes no such direct assertion anywhere in the paper. As I see it, Samuelson’s paper can best be considered to be both a concise restatement of important parts of the received theory of international trade and at the same time a precursor of modern real exchange rate economics. I

find nothing in his comments that I would interpret as predicting a secular trend toward currency appreciation as a country's per capita income grows through time, or a tendency for the cost of baskets of goods to be cheaper in countries with higher productivity.

I have no hesitancy in recognizing that what I now will now call the Balassa effect follows directly, if indeed productivity tends to be significantly more stagnant in the nontradables area and more dynamic in the tradables sectors. However, my main contention, here and elsewhere, is that the data do not lead to any strong presumption that growing productivity leads to secular RER appreciation. It does so when productivity improvement is greater in the tradables area; it does the opposite when the improvement is greater in the nontradables sector. The evidence seems to be that there is something like a 50-50 division between these two cases -- at least among episodes of sustained and rapid economic growth, which is where the Balassa effect would seem to have the greatest applicability.

3. Kenneth A. Froot and Kenneth Rogoff (1994) have done what is to my knowledge the best and most extensive review of the literature on the long run trends of real exchange rates. The Balassa-Samuelson effect is explicitly considered only in one section of their paper, but most of the paper has a direct bearing on it. Hence my review will attempt a broad coverage of the entire paper.

I am somewhat disappointed with the degree to which Froot and Rogoff (as well as Balassa and Samuelson) focus their analysis on purchasing power parity (PPP) instead of the real exchange rate. But perhaps they were simply reflecting in their review, the way the literature itself approached the questions it investigated. In any case readers should understand that it was

others, not I, who concentrated so much attention on PPP.<sup>8</sup>

But here we simply follow where the authors lead. They start out with test of simple PPP, dealing with tests that a given CPI basket of goods will have the same prices (measured in any one currency) in different countries (absolute PPP) and that changes over time in the CPIs of any two countries will tend to be the same (again measured in any one of their currencies).

First, we should state that everybody agrees that PPP will tend to hold if the only disturbances involved are monetary ones (exemplified in the textbooks by simply changing the denomination of a country's currency). The problem is that many real-world disturbances are real rather than monetary. Then comes the questions, how important are they -- how important per se, and how important relative to the contemporaneous monetary disturbances? Simply posing these questions leads one to expect that if real disturbances are not very important, and certainly if their magnitude tends to be much smaller than that of monetary disturbances, many tests will tend to confirm the relevance of PPP. Thus, tests of whether nominal exchange rates in high inflation countries tended to reflect the degrees of cumulative inflation came out strongly positive (p. 6).

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<sup>8</sup>Once one recognizes that the real exchange rate has the fundamental role, both in fixed and flexible systems, of equilibrating a country's trade and payments, it becomes the interesting variable to explain. And right from the start, it is a within-country variable -- it is Russia facing the rest of the world, not Russia facing the U.S., or Russia facing Hungary, or India or Germany. Moreover, the real exchange rate by its nature should properly have different price indexes in its numerator and denominator, to reflect tradables as distinct from nontradables ( $P_T/P_N$ ) or tradables as distinct from a general price level  $\bar{p}_d$  that must include nontradables with an appropriate weight. PPP on the other hand almost by its very definition, looks for the same type of index to be present in both numerator and denominator, and for the concept to be a bilateral one -- one country vis-a-vis another -- rather than one country vis-a-vis the rest of the world.

There followed a very large literature more directly focused on the real exchange rate -- asking the question whether the real exchange rates follow a random walk, or whether they are mean-reverting. Before mentioning the results that emerge when these hypotheses are explored, I must stop to comment on the absence of underlying economics in the way that they are framed. A quick sketch of the argument would go like this -- if all real disturbances are permanent, that generates a random walk; if all real disturbances are transitory, then the resulting time series should be mean reverting. But if disturbances of both types are present, the resulting sum should also have the characteristics of a random walk (except if the variance of the mean-reverting part is much larger than that of the random walk part). Thus, the authors say, “the basic result in the empirical literature is that if one applies unit root [= random walk] tests to bilateral industrialized country monthly data, it is difficult to reject the null of a unit root for currencies that float against each other” (p. 10).

My comment is that very clearly some real-world disturbances last a long time and others are evanescent. Sometimes one type will dominate, sometimes another. I see no reason whatsoever to frame the problem in the following super-mechanical way:

Suppose that PPP indeed holds over the long run and that deviations from PPP follow an AR(1) process (on monthly data) with serial correlation  $\rho$  and error variance  $\sigma^2$ .  
 ...Suppose that the autoregression is run in a panel data set with  $T$  observations and  $N$  independent bilateral exchange rates, each governed by the same stochastic process. (p. 11)

I find it very easy to rationalize the general thrust of the results reported by Froot and Rogoff. A random walk has the property that the variance of the variable in question grows through time (the variance of its first differences being constant). Thus, when the time period chosen for study is relatively short it is hard to reject the random walk. But when very long

horizons are used, the data do not exhibit the ever-growing variances (in the drift of the levels of the real exchange rate away from the initial point) that a full-fledged random walk would imply.

More importantly, why should one be asking this kind of question? I know for a fact that many disturbances (like the discovery of diamonds or oil) have very lasting effects on those countries' real exchange rates, while I know equally well that others (political crises, natural disasters) have a shorter duration. I think we should watch for all kinds of disturbances, and try to identify both their magnitude and their likely durability when we see them.

Section 3.3 of the Froot and Rogoff paper is entitled "Long Term Productivity Differentials and the Real Exchange Rate". They report on results by Balassa (supporting the Balassa effect) and by Officer (showing the results to be highly sensitive to the choice of years and countries). There are recent results from Summers and Heston (1991) on an absolute interpretation of PPP. These show the price level of given baskets to be much lower in poor countries as a group than in rich countries as a group, but "once divided into two groups, the within-group correlations between income and price level are much less apparent" (p. 32).

Other studies reported on simply ask whether productivity differentials between tradable and nontradable goods have the expected impact on the real exchange rate. These studies, by Hsieh (1982); Marston (1990); Edison and Klován (1987); and DeGregorio, Giovannini and Wolf (1994) come to affirmative answers to this question, but this does not say that productivity in the tradables sector typically grows faster than that in nontradables, which is I believe the proper statement of the Balassa effect. In my view, nearly everybody agrees that, ceteris paribus, productivity advances in nontradables leads to currency appreciation, and productivity advance in nontradables to currency depreciation.

Some of the most interesting results reported by Froot and Rogoff are those of two studies one by DeGregorio, Giovannini and Wolf (1994), and the other by DeGregorio and Wolf (1994). In the first study there were three explanatory variables of  $P_T/P_N$  -- relative productivities in tradables and nontradables, the share of government spending in GDP, and the level of real GDP<sub>N</sub>. All variables ended up highly significant in a panel regression of the 14 OECD countries for the 1971-85 period. There is a highly significant positive coefficient on the real GDP variable, suggesting that the Balassa effect is indeed at work, and important. However, in their later paper, DeGregorio and Wolf add a terms-of-trade variable to the regression, and find that once it is introduced, the coefficient of the income variable becomes statistically insignificant. The authors conclude “that the income variable in the [previous] regression may be proxying for terms of trade shocks.” That is, booms and busts in the world prices of major export commodities may be driving the income variable, with a corresponding effect in producing a low real price of foreign currency (as in Russia during the recent and present oil price boom).

TABLE 1a

## Real Exchange Rates in Episodes of Rapid Growth

<u>Country<sup>a</sup></u>	Real Exchange Rate		$\bar{P}_w / \bar{P}_d$	
	<u>Trend Alone</u>	<u>GDP Coefficient In Multiple Regression</u>	<u>Trend Alone</u>	<u>GDP Coefficient In Multiple Regression</u>
Australia	0.007	0.053	-0.007***	0.096
Canada	-0.002	2.327	-0.003**	1.139
Chile	-0.024	-1.296	-0.020	-0.668
Colombia	0.019***	1.796*	0.011***	1.125*
Costa Rica	0.015***	-0.752	0.022***	-1.534**
Costa Rica	-0.019***	-1.080	-0.019***	-0.006
Dominican Rep.	0.004*	-0.021	n.a.	n.a.
Ecuador	0.005	0.039	n.a.	n.a.
El Salvador	0.014***	-0.426	0.018***	-0.765
Greece	0.001	0.167	0.006***	-0.222
India	0.031***	-2.429	-0.012***	-0.384
Indonesia	0.024***	-3.791***	0.015***	0.449
Israel	0.022***	0.896	-0.008**	0.169
Japan	-0.041***	0.178*	-0.025***	0.009
Korea	-0.005**	-0.282	-0.013***	0.099
Malaysia	0.011***	-0.918***	-0.003	-0.058
Mexico	0.001	-2.079**	0.001	-0.835**
Netherlands	-0.031***	0.716	-0.022	-0.430
Pakistan	0.024***	1.681*	0.007***	-0.097
Paraguay	0.003	2.026**	n.a.	n.a.
Philippines	0.026***	-3.962*	0.009***	1.272*
Singapore	0.010***	-1.039**	-0.024***	0.213
Spain	-0.018***	-1.720**	-0.024***	0.022
Thailand	0.002*	-0.412*	-0.001	-0.189
Venezuela	0.034***	0.896	0.013***	0.669**
# of Plus Signs	18	11	9	11
# of Minus Signs	7	14	13	11

Source: International Financial Statistics (CD Rom and Annual Yearbooks).

(continued)

Table 1a (continued)

Real Exchange Rate Definition  $E\bar{P}^*/\bar{P}_d$ .

$E$  = Nominal price of U.S. dollar in local currency.

$\bar{P}^*$  = Dollar price index of wholesale baskets of 5 countries, weights based on those of SDR.

$\bar{P}_d$  = CPI of the country.

$\bar{P}_w$  = Wholesale price index of the country (alternative = producer price index).

\*\*\* = 0.001 probability level.

\*\* = 0.01 probability level.

\* = 0.05 probability level

<sup>a</sup>For each country's rapid growth period, see Table 1b.

TABLE 1b

## Real Exchange Rates in Episodes of Rapid Growth

<u>Country</u>	<u>Period</u>	Real Exchange Rate	$\bar{P}_w / \bar{P}_d$
		<u>GDP Coefficient In 2-Variable Regression</u>	<u>GDP Coefficient In 2-Variable Regression</u>
Australia	1959-76	0.142	-0.138***
Canada	1964-74	-0.009	-0.053
Chile	1984-00	-0.370***	-0.307***
Colombia	1959-80	0.353***	0.195***
Costa Rica	1962-79	0.235***	0.339***
Costa Rica	1986-99	-0.385***	-0.374***
Dominican Rep.	1962-81	0.061*	n.a.
Ecuador	1959-80	0.065	n.a.
El Salvador	1959-78	0.265***	0.326***
Greece	1958-78	0.012	0.093***
India	1980-99	0.552***	-0.214***
Indonesia	1968-97	0.362***	0.240***
Israel	1958-74	0.262***	-0.094*
Japan	1958-79	-0.459***	-0.561***
Korea	1966-00	-0.066**	-0.165***
Malaysia	1970-00	0.154***	-0.045
Mexico	1958-81	-0.001	0.001
Netherlands	1959-73	-0.625***	-0.443***
Pakistan	1973-96	0.412***	0.116***
Paraguay	1970-85	0.122	n.a.
Philippines	1959-80	0.476***	0.170***
Singapore	1974-00	-0.136***	-0.330***
Spain	1958-74	-0.290***	-0.367***
Thailand	1959-96	0.030*	-0.018
Venezuela	1959-77	0.623***	0.243***
# of plus signs		16	9
# of minus signs		9	13

Source: International Financial Statistics (CD Rom and Annual Yearbooks).

(continued)

Table 1b (continued)

Real Exchange Rate Definition  $E\bar{P}^*/\bar{P}_d$ .

$E$  = Nominal price of U.S. dollar in local currency.

$\bar{P}^*$  = Dollar price index of wholesale baskets of 5 countries, weights based on those of SDR.

$\bar{P}_d$  = CPI of the country.

$\bar{P}_w$  = Wholesale price index of the country (alternative = producer price index).

\*\*\* = 0.001 probability level.

\*\* = 0.01 probability level.

\* = 0.05 probability level