

Purchasing Power Parity and Balassa–Samuelson Effects

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The Balassa–Samuelson (BS) hypothesis is often criticized for one of its fundamental, but oversimplified assumptions related to Purchasing Power Parity (PPP) holding which can be confirmed for cross-country tradables' prices, implying nontraded-sector prices are solely responsible for inducing trend deviations in real exchange rate. The assumption, when empirically tested, does not always hold valid, revealing a price difference in tradables for Asian countries against the world (U.S.), a potential driver of their trend in real exchange rate deviations (appreciation).

Balassa–Samuelson hypothesis

purchasing power parity

1. Introduction

Real exchange rate misalignment from its long-run equilibrium is a much-debated policy issue of international macroeconomics and finance ^[1]. The term 'misalignment' implies real exchange rate demonstrating a trend departure from its (underlying) long-run ideal or equilibrium level(s), that otherwise would have prevailed in the nonexistence of various factors including inward-looking monetary policy, persistent imbalances in current and capital account, nominal price rigidities, and many others. So far, no consensus is reached on this issue, determining the factors truly responsible for inducing real exchange rates' permanent departure from their long-run equilibrium.

Since the beginning of the transition process in general, and from the time of the eruption of the Asian financial crisis of 1997–1998 in particular, the regional states of East Asia have experienced considerably higher rates of inflation and seen a degree of real exchange rate appreciation. A handful of empirical studies have revealed that the real appreciation of Asian currencies has much to do with the structural shifts occurring in these economies, in their urge to catch up the developed world ^{[2][3][4][5][6]}. The idea can be traced back to the phenomenon of the productivity–real exchange rate nexus proposed by ^[7] and formalized individually by ^{[8][9]}. The productivity–real exchange rate nexus, proposed by above authors is known by the name of Balassa–Samuelson (BS) effect.

The Balassa–Samuelson (BS) hypothesis proposes that growing and transition economies tend to bring a higher degree of technological advancements to them ^{[10][11]}. Nevertheless, such an advancement is biased towards their traded sector. The nontraded sector remains relatively deprived of technological developments as a result. With the home country being more focused on traded-sector development, the relative growth performance of the intercountry traded sector for the home economy will be more pronounced. Assuming a state of a perfect labor

market, the marginal product of labor will improve consequently. This will inflate the traded-sector wage rate at home and the wage-induced inflation will prevail economy-wide, with labor being perfectly mobile across sectors. Assuming Purchasing Power Parity (PPP) for intercountry traded sectors, the sectoral prices tend to demonstrate international arbitrage and therefore converge in international markets. However, no such convergence takes place on the part of nontraded-sector prices, with them being largely driven by domestic market forces. Inflating wage rates will trigger cost–push inflation, with nontradables' prices being a particular prey to this, thus pushing up the general price level of the country. Such a trend inflation in the economy will make the real exchange rate of the home country appreciate against the foreign, causing permanent deviations to the country's PPP from its long-run equilibrium.

One of the biggest criticisms of the BS hypothesis is of its unrealistic underlying assumptions. Many interesting studies have estimated the BS model by relaxing its over idealist assumptions and come up with surprising and unconventional results which they would have acquired otherwise [11]. Ito, et al. [4] while investigating APEC (Asia-Pacific Economic Cooperation) countries over a period of thirty years, reveal that the real exchange rate for regional economies is largely driven by cross-country relative price movements of tradable sectors. Such a finding is in sharp contrast to the BS theory which staunchly believes in the definite existence of PPP for tradable sectors and renders nontraded sectors solely responsible for inducing trend departures to the real exchange rate. This tremendous finding of [4] has proven to be a breakthrough in the current works on the similar line of research; therefore, the validity of PPP for traded-sector prices was investigated for other regions also [6][12][13][14][15][16][17][18][19][20][21][22][23]. Ref. [21] investigated the underlying causes of deviations in tradables' prices from PPP for ten organization for economic co-operation and development (OECD) states and found the consumption of nontraded-sector goods (the distribution sector in particular) as one of the significant contributors to this problem. Such an unavoidable participation of nontradables into the production of tradables bears serious implications for price arbitrage mechanisms of international goods markets.

In the literature, the supply-side explanations of real exchange rate misalignments are less often investigated for Asian countries. The BS hypothesis is certainly the most primitive and authentic notion on the subject; nevertheless, keeping in view the economic transition occurring in East Asia for the last two decades, the model is not revisited for the region with enough criticism [5][24][25][26][27][28][29][30][31]. The present research takes a step forward and offers a novel contribution to existing works on Asia, studying the productivity–real exchange rate nexus from a new perspective. The study is an improvement over [32] work, examining a more liberal and relaxed version of the BS theorem for an extended sample study period. The standard version of the BS theory is econometrically tested in its modified form, permitting the inexistence of PPP for tradables, thus (plausibly) inducing trend departures to the real exchange rate from its long-run equilibrium. The estimable equation for this new variant of the theory is established in a way so that domestic prices of tradables may sufficiently depart away from their foreign (U.S.) counterpart, thus allowing violation of one of the core assumptions of the BS hypothesis, i.e., PPP always holds valid for tradable sectors. Such a scheme of theoretical modelling will not only pave the way to acquiring more realistic estimates of the BS theory, but also unveil the actual contribution of traded-sector prices, which otherwise are always understood as playing a dormant role in driving real exchange rate trend movements.

Such an approach will not only be supportive for obtaining more reliable estimates of the BS effect but will also provide an insight into the role of tradables' prices in determining real exchange rate trend departures from the long-run equilibrium.

2. Theoretical Background of PPP and BS Effects

One of the fundamental beliefs of the BS theory rests on the assumption that intercountry traded-sector prices significantly converge, i.e., PPP holds for tradables. The belief owes to one of the model's underlying assumptions stating that home and foreign traded-sector goods are perfect substitutes; therefore, PPP inevitably holds for the sector. Therefore, the real exchange rate based on tradables' prices (rerT) tends to equate to one or reach to one. Such a notion holds strong theoretical implications for the dynamic behavior of, i.e., rerT tends to be mean reverting and any shocks received will be transient and short-lived only. With technology infusion being more pronounced for the traded sector (for transition economies in particular), domestic marginal labor productivity (MPL) will grow at a faster pace, thus pulling up the wages for the sector. Nevertheless, the inflated wage rate would not affect traded-sector prices, with the sector (strictly) observing PPP with its foreign counterpart. This whole situation reflects on the home economy's real exchange rate which result permanent deviation (appreciation).

To relax this assumption in favor of the nonexistence of PPP in cross-country traded-sector prices, one needs to revisit the standard version of the BS model. The standard (international) version of the theory models the overall real exchange rate of a catching-up economy against its relative sectoral productivity differential with its trading partners(s).

$$rer = -\beta \left\{ \left(\gamma / \delta a^T - a^{NT} \right) - \left(\gamma / \delta a^{T*} - a^{NT*} \right) \right\} \quad (1)$$

where γ/δ imply sectoral labor intensity which is assumed to be homogenous across countries; see for detail Ishaq (2016) from where some part of the material is taken.

rer = Overall real exchange rate of catching up (home) country against its (foreign) trading partner. rer is a combination (product) of nominal exchange rate (bilateral one) between home and foreign and their relative (overall) prices measured through a value-added-based GDP deflator.

$$RER_t = \frac{E_t P_t^*}{P_t} \quad (2)$$

A logarithmic transformation of the variables' yields:

$$rer_t = e_t + p_t^* - p_t \quad (3)$$

a = Measure of sectoral labor productivity. Labor productivity is proxied through real value-added-based Average Labor Productivity (APL). T, NT= Traded and nontraded sectors, respectively. *= Foreign variables.

However, if PPP does not hold for cross-country tradables, the biased relative productivity of home tradables can cause trend departures in real exchange rates from their long-run equilibrium through both nontraded and traded-sector price movements. In such an event, Equation (4) will be restated as:

$$rer^{NT} = \left(e + p^{T*} - p^T \right) - \beta \left\{ \left(\gamma / \delta a^T - a^{NT} \right) - \left(\gamma / \delta a^{T*} - a^{NT*} \right) \right\} \quad (4)$$

p^{T*} and p^T are home and foreign tradable sector prices, measured through their value-added-based GDP deflator.

Equation (5) can be titled as the relaxed version of the BS hypothesis. Starting from the first term on the right-hand side of Equation (5), it reflects the state of PPP existing for cross-country tradables, thus subsiding the effects of relative prices of tradables on the real exchange rate of the catching-up country. The term therefore assumes a value of zero in the instance of valid PPP holding between intercountry tradables. However, if PPP is invalidated, then there are fair chances of tradables' prices to induce trend departures in relative prices of nontradables, so that they may see long-lived deviations from their equilibrium. The valid and significant existence of such behaviors on the part of intercountry tradables' prices holds serious implications for the standard BS proposition, therefore challenging the standard version of the BS model accusing relative prices of nontradables (only) for displacing real exchange rates from their PPP-based long-run equilibrium.

Since the relative prices of intercountry tradables in a common currency ($e+p^{T*}-p^T$) are fairly comparable to tradable-prices-based real exchange rate (rer^T), Equation (5) will become:

$$rer^{NT} = rer^T - \beta \left\{ \left(\gamma / \delta a^T - a^{NT} \right) - \left(\gamma / \delta a^{T*} - a^{NT*} \right) \right\} \quad (5)$$

$$rer^{NT} = rer^T - \beta \tilde{a} \quad (6)$$

where $\tilde{a} = \left(\gamma / \delta a^T - a^{NT} \right) - \left(\gamma / \delta a^{T*} - a^{NT*} \right)$

The empirical verification of the BS theory is done for Asian countries, but only in a handful of studies. There is a mix of evidence on the productivity–real exchange rate nexus ^[10] proposed under the BS theorem; therefore, no consensus on this matter has been reached so far. A substantial number of studies find only partial (or even no) empirical support in favor of the BS proposition for developing Asian countries ^{[24][29][30][31][33]}. Their inability to obtain sufficient econometric evidence in support of the BS effect may be owed to the underlying model assumption of PPP for traded-sector goods, which is challenged (empirically) by several non-Asian studies ^{[31][34][35][36][37]}. Nevertheless, the refutation of PPP assumption (for tradables) does not invalidate the BS mechanism. It only causes the problem of under-specification to the standard version of the BS model ^[6]. The lack of sufficient convergence between cross-country tradables may cause rerT to depart from its PPP-based long-run equilibrium and therefore may yield deficient BS estimates.

It can be seen that earlier works on this subject to see what amount of evidence can be obtained in favor of the valid existence of long-run PPP for tradables. As evident from earlier works, tradables' prices are found to be volatile, experiencing long-lived deviations. Bilateral nominal exchange rates, unregulated markets, product differentiation, trade barriers, intermarket distances, transportation cost, etc., are those few causes which are investigated empirically for their ability to obstruct convergence in intercountry traded-sector prices, thus preventing PPP to hold in the long-run. For Canada, Germany, Japan, and the U.S., Ref. ^[34] confirms the inexistence of PPP. Using highly disaggregated sample data, nominal exchange rate fluctuation is found to determine the relative prices of tradables at a high level of statistical significance. Ref. ^[38] also does not obtain enough statistical evidence in support of the PPP theorem while testing Canada and the U.S., as the traded-sector prices of two countries do not tend to demonstrate an equi-proportionate relationship over longer periods of time. Additionally, Canadian tradables' prices turn out to be highly sensitive towards the nominal exchange rate of the country. Testing Canada for confirming the valid existence of the Law of One Price (LOP), Ref. ^[37] received no encouraging results and attributed its inexistence towards the real exchange rate (CPI-based) of the country against the U.S. Moreover, physical distance and border restriction are also found to be significant factors behind the failure of LOP for Canada.

The phenomenon of PPP is less often studied for Asia. Ref. ^[4] work is taken to be the pioneer work for Asia, Western Hemisphere and Oceania countries studying the productivity–real exchange rate nexus under the framework of the Balassa–Samuelson hypothesis. Investigating three regions vis à vis the U.S., for the dominant number of countries, long-run sustained departures are found in relative traded-sector prices. ^[39] explored the PPP phenomenon from a new, different perspective by discrimination between its 'strong' and 'weak' variants. This new perspective of PPP validation has received much popularity and has been tested in many commendable research studies ^{[40][41][42][43]}. Extracted from a similar viewpoint of PPP testing, Ref. ^[6] investigated the equi-proportionate relationship between home and U.S. tradables' prices for nine emerging Asian countries using error correction representation. Their findings decline the PPP theorem for at least half of the subject countries. Likewise, mixed evidence in favor of PPP is obtained in ^[44] work examining Asian countries. Nevertheless, some valid empirical support is yielded (only) for PPP in tradables' prices when the restriction homogenous cointegration vectors are imposed in the model.

Overall, there exists a limited amount of empirical evidence for Asia to develop a clear understanding around the subject. Only a handful of studies have examined the effects of internally biased productivity growth trends in favor of tradables and the consequent permanent deviations in intercountry traded-sector prices from their PPP equilibrium levels. These content deals with testing two distinct but interlinked conditions for investigating the authenticity of the BS effect for emerging Asian countries, (i) validating (invalidating) the existence of long-run PPP for traded-sector prices of sample Asian states against the U.S, and (ii) testing the BS hypothesis when the core assumption of tradables' PPP is relaxed in favor of its nonexistence for those states whose traded-sector prices are evidently found to be deviating from long-run PPP.

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