EXCHANGE RATE DETERMINANTS OF THE US DOLLAR AND CHINESE RMB:
A CLASSICAL POLITICAL ECONOMICS APPROACH[1]

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ABSTRACT

This paper contributes to the literature on determining the real exchange rates by developing a model that is based on key propositions of the classical political economy within which the real competition governs domestic and international trade, the labor theory of value is underneath domestic and international prices and, under these conditions, the principle of absolute cost advantage shapes international trade. The econometric analysis shows that the relative real unit labor cost is a key regulator of the long-run behavior of real exchange rates in both, China and the United States of America (USA), for the period 1982-2018.

Keywords: Real exchange rates, absolute cost advantage, unit labor costs, ARDL-ECM models.
JEL Classification: C01, F14, F31, F41.

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DETERMINANTES DEL TIPO DE CAMBIO DEL DÓLAR DE ESTADOS UNIDOS Y EL RMB DE CHINA: UN ENFOQUE DE ECONOMÍA POLÍTICA CLÁSICA

RESUMEN

Este artículo es una contribución a la literatura sobre la determinación del tipo de cambio real mediante el desarrollo de un modelo basado en las proposiciones principales de la economía política clásica en la cual la competencia real gobierna el comercio nacional e internacional. La teoría del valor trabajo subyace a los precios nacionales e internacionales y, en estas condiciones, el principio de la ventaja de costos absolutos configura el comercio internacional. El análisis econométrico muestra que los costos laborales unitarios relativos son los reguladores clave del comportamiento de largo plazo de los tipos de cambio reales en China y en Estados Unidos de América en el periodo 1982-2018.

Palabras clave: tipo de cambio real; ventajas de costos absolutos; costos laborales unitarios; modelos ARDL-ECM.

Clasificación JEL: C01, F14, F31, F41.

1. INTRODUCTION

In the present work, we attempt to explain the long-run behavior of two currencies, the Chinese Renminbi (RMB) and the US dollar (USD) for the period 1982-2018 based on the classical economic premises of actual competition, labor theory of value and absolute cost advantage. We limit the analysis to these two economies because of their significant weight in international trade and of the observed intense political controversy over the effectiveness of currency manipulation policies, especially from China's side which, in the recent decades, has emerged as a major player in international trade reporting mounting surpluses.

The real exchange rates (RERS) affect the competitiveness of an economy and studying its determinants and evolution over time can give us policy insights into how an effective trade policy can be implemented. This is the reason why the long-run determinants of RERS have probably been researched more than any other topic in international finance and trade. The conventional models fail to depict the determinants of RERS and display low predictive capacity arising mainly from their re-

liance on the principles of comparative cost advantage and purchasing power parity (PPP). Thus, an alternative proposal for the determination of RERs is in demand which could help to design effective and sound policy proposals. The present paper aims to contribute to this area by developing a model that is based on key propositions of the classical political economy according to which real competition rules domestic and international trade, the labor theory of value defines domestic and international prices and the principle of absolute cost advantage shapes international trade.

The remainder of the paper is organized as follows: Section 2 briefly reviews the pertinent literature on the determinants of RERs by pointing out its theoretical and empirical shortcomings. Section 3 presents a model which, based on the principles of classical political economy, is designed to outline the determinants of RERs. Section 4 discusses and critically evaluates the econometric results derived from the application of the Auto Regressive Distributed Lag (ARDL) method on the proposed model. Finally, Section 5 summarizes and makes some concluding remarks.

2. CONVENTIONAL PROPOSALS FOR THE DETERMINANTS OF EXCHANGE RATES

The traditional proposals about the determinants of RERs rely on two basic principles: The PPP and the comparative cost advantage. Based on these two basically similar in principle theoretical approaches, it is argued that 'free' trade brings about a trade balance between two economies while their growth rates converge over time. This is the reason why 'free' trade policies are suggested and implemented so that economies can enjoy the 'mutual' benefits from their international transactions.

According to PPP principle, the price levels of the two economies display changes such that converge is attained while 'free' trade ensures the same prices for the same goods[2]. That is, the nominal exchange rate, $e_{i/j}$, adjusts so that a balance is achieved between the price levels, p_i

[2] In its absolute version, the theory of PPP states that the RER between two currencies should be equal to one while in its less restrictive version states that there should be a co-movement between the nominal exchange rate and the ratio of domestic over foreign price level.

and p_j, while the RER, $e^r_{i/j}$, of economy i for the same basket of goods in common currency with economy j is defined as:

$$e^r_{i/j} = \left(e_{i,j} \frac{p_i}{p_j} \right) \quad [1]$$

In standard international trade theory, the 'law of one price' is not employed as a mechanism determining the RERs, but as a rule defining the effectiveness and the level of competition; instead, prices converge internationally because of the principle of comparative advantage, which imposes the trade balance between the partner-economies. In fact, the PPP premise is 'tacitly' based on the principle of comparative advantage, as it basically proposes that the nominal and, consequently, the RERs converge in the long-run and remain stationary; so that the economies involved attain, at the end, a trade balance and become competitive in the commodities they specialize.

Many studies have questioned, theoretically and empirically, the attainment of stationary RERs and conventional economics admit that the PPP hypothesis does not hold in the real world (Taylor and Taylor, 2004; Harvey, 2009). In addition, using a variety of macroeconomic fundamentals (*i.e.,* money supply, government expenditures, capital flows, trade openness, interest rate differentials, terms of trade, productivity, etc.) as determinants of RERs, numerous studies reached results that are contradictory and depended on the level of development and size of the economy, the period under consideration, the exchange rate regime and the particular model employed (Égert, Halpern, and MacDonald, 2006; Choudhri and Schembri, 2010; Corsetti, Meier, and Müller, 2012; Hnatkovska, Amartya, and Vegh, 2016; Miyamoto, Nguyen, and Sheremirov, 2019; Cuestas, Monfort, and Shimbov, 2022). As a result, these efforts are doomed to be limited to case studies not capable to provide credible answers to relevant questions and to design effective trade policies.

One outcome that has been repeatedly confirmed and questions the validity of the premises of the traditional trade theory is that some countries constantly show trade-surpluses (Japan) and others trade-deficits (USA) (Shaikh and Antonopoulos, 2013). The same is observed for various European Union countries (Seretis and Tsaliki, 2015; Tsaliki, Paraskevopoulou, and Tsoulfidis, 2018; Poulakis, Poulakis, and Chatzarakis, 2022),

for Mexico and USA (Martínez Hernández, 2010, 2017) and for China and USA (Tsoulfidis and Tsaliki, 2019). Ricci (2019) studying the trade between 16 world regions identified (as expected) two types of economies: Those with trade-surplus and those with trade-deficit. Naturally, the economies with trade-surplus are those that become international lenders by exporting their surplus as debt to economies with trade deficit.

Hence, the hypothesis that permeates 'free' trade modeling according to which equal value of goods is exchanged between trading partners (Shaikh, 2016; Tsaliki, Paraskevopoulou, and Tsoulfidis, 2018; Tsoulfidis and Tsaliki, 2019) is dubious. In effect, we come across with countries-economies that experience persistent trade surpluses and other deficits indicating that trade (domestic or international) is the mechanism through which transfers of value from the less to more technologically developed capitals, which are primarily concentrated in the developed economies, take place (Seretis and Tsaliki, 2015; Tsaliki, Paraskevopoulou, and Tsoulfidis, 2018)[3]. In other words, as Shaikh and Antonopoulos (2013) pointed out, all capitals and, by extension, economies do not equally gain from international trade, but only those with an absolute cost advantage over the others; as a result, trade imbalances between economies are persistent and gradually expand over the years. In addition, currency manipulation can neither determine nor explain the surpluses in an economy's current account (Weber and Shaikh, 2021).

A noteworthy issue arising within the traditional theory of international trade is that the various models treat national economies as trading partners; however, trade takes place exclusively between capitals (businesses) whose survival in the international arena depends on the productive conditions which in turn define prices in the domestic market and the RERs in the international arena. Hence, the search for the determining factors of RERs should focus on how these capitals organize and compete in the international markets and to what extent, if any, the outcomes of competition in the international arena differ from those in the domestic markets.

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[3] The presence of other mechanisms (due to political and historical causes) may enhance the transfer of values. Nevertheless, nowadays, trade is the main economic mechanism for the transfer of values.

3. DETERMINING FACTORS OF THE RERs

The PPP and the comparative cost advantage principles form the theoretical and empirical framework of international trade theory, regardless of the conflicting evidence and the poor predictive performance of the employed models on the determining factors of RERS (Isard, 1995; Antonopoulos, 1999; Martínez Hernández, 2017; Shaikh, 2016). Therefore, it becomes imperative to establish an alternative approach to determine the RERS which will be theoretically and empirically sound so that the subsequent economic policy proposals will be realistic and effective. In pursuing this, we construct a model based on the ideas governing the classical political economics; namely, the labor theory of value, the actual competition and the principle of absolute cost advantage.

According to the classical theory of competition, the free flows of capital between sectors and economies form two separate and dialectically unified moments: The intra-industry and inter-industry competition which impose two specific laws on the national and international transactions. The intra-industry competition imposes the 'law of one price' which gives rise to differential profitability in the capitals operating in the same industry and causes the transfer of value from the less to the most advanced producers. Inter-industry competition brings to the fore the 'law of the tendential equalization of profit rates' that defines the equilibrium price (price of production or long-run equilibrium price) of the commodity which encompasses the regulating conditions of production in the industry that is activated and incorporates the socially necessary working time required for the production of the specific commodities (Carchedi, 1991; Tsaliki and Tsoulfidis, 2015).

The equalization of the profit rates across industries, however, is not carried out for all capitals but only for those that produce with the best generally available production method, that is, for the regulating capital; the price that prevails in the industry ("law of one price") incorporates this average rate of profit. Essentially, the regulating capital is the type of capital that dialectically connects the two distinct moments of competition, the intra-industry and inter-industry competition. As a result, capitals within an industry enjoy different profitability despite the "law of the equalizing tendency of the rate of profit" (Guerrero, 1995; Tsoulfidis and Tsaliki, 2005). The consequence of the operation of both laws is the

transfer of value from the less to more advanced capitals (Seretis and Tsaliki, 2015; Tsaliki, Paraskevopoulou, and Tsoulfidis, 2018). Consequently, domestic or international trade favors the capitals that produce with more advanced methods of production than the corresponding regulating capitals; in other words, the capitals (firms) that operate with the lowest production costs win. Thus, advanced and better equipped capitals receive value transfers produced by other capitals; even from capitals from other countries. The final outcome is the dominance of the absolute cost advantage hypothesis, which becomes the governing principle for both domestic and international trade (Shaikh, 1991). According to this principle, the most advanced capitals through domestic and international trade prevail over the rest regardless of their location.

If the classical competition is the mechanism that shapes the rules governing domestic and international transactions, the labor theory of value is underneath the operation of real competition by determining the domestic and international prices and through them the establishment of the absolute cost advantage principle. Since the RERs express the value of a country's good into another currency, the adopted theory of value has to be in the core of their analysis. According to the labor theory of value, the relative prices of commodities are directly proportional to the relative labor times spent on their production or, as eloquently put it, to their relative vertically integrated unit labor costs (Shaikh, 1991; Guerrero, 1995; Tsoulfidis and Tsaliki, 2019)[4] reflecting labor productivity and the level of mechanization of the production process. In particular, if p is the production price of a commodity and v is its vertically integrated unit labor cost, then for two capitals, 1 and 2, operating within an economy we have:

$$\left(\frac{p_1}{p_2}\right) \cong \left(\frac{v_1}{v_2}\right) \qquad [2]$$

[4] According to Shaikh who applies the Smithian decomposition of relative prices, prices can be resolved as the sum of wage plus profits, that is, relative prices are regulated by relative vertically integrated labour costs and relative vertically integrated profit-wage ratio; however, the relative vertically integrated profit-wage ratio (regulating disturbance term) is close to 1 because the linkages between industries are strong (Shaikh, 1984, 2016).

This long-run proportional relationship between relative prices and vertically integrated unit labor cost of commodities applies not only in domestic but also in international transactions (Guerrero, 1995; Martínez Hernández, 2017; Tsaliki, Paraskevopoulou, and Tsoulfidis, 2018; Boundi-Chraki and Perrotini-Hernández, 2021). In the case of two capitals, where *i* stands for domestic and *j* for the foreign country, the RER, $e^r_{i/j}$, for the same basket of goods expressed into a common currency is defined by:

$$e^r_{i/j} = \frac{p_i e_{i/j}}{p_j} \cong \frac{v_i e_{i/j}}{v_j} \qquad [3]$$

According to the 'law of one price', the price of internationally tradable goods should be the same; hence, if P_{iT} and P_{jT} are the domestic and foreign price levels for the internationally tradable goods, respectively, the nominal exchange rate is defined as:

$$P_{iT} e_{i/j} = P_{jT} \Leftrightarrow e_{i/j} \frac{P_{jT}}{P_{iT}} \qquad [4]$$

If P_i and P_j denote the domestic and foreign general price levels, respectively, then the RER can be defined as:

$$e^r_{i/j} \cong \frac{v_i e_{i/j}}{v_j} = \frac{v_i P_{jT}}{v_j P_{iT}} = \frac{v_i P_{jT} \frac{P_i}{P_i}}{v_j P_{iT} \frac{P_j}{P_j}} = \frac{v^r_i}{v^r_j} T_{i/j} \qquad [5]$$

Where v^r_i and v^r_i are the domestic and foreign real vertically integrated unit labor costs, respectively, and $T_{i/j} = (P_i / P_{i,T})/(P_j / P_{j,T})$. Hence, the RER captures the changes that occur in the labor unit costs and in the price levels (general and internationally tradable) between the trading partners reflecting the 'law of one price' in the international arena.

In the empirical analysis that follows, we attempt to identify the determinants of the long- and short-run behavior of RERs incorporating, besides the relative real vertically integrated unit labor cost, two more variables; the real net capital flows (*RCF*) which is consistently used in

similar studies, and the $T_{i/j}$ capturing the multiple effects exerted by the price level in internationally tradable and non-tradable goods in two economies. The model subjected to empirical testing is of the form:

$$e^{r}_{i/j} = f\left[\left(\frac{v^{r}_{iT}}{v^{r}_{jT}}\right)^{+} (T_{i/j})^{+} (RCF)^{+}\right]$$

Specifically, the RER between two economies is expected to be affected:

- In the long-run, by the ratio of vertically integrated real unit labor costs of tradable goods between the two countries, v^{r}_{iT} / v^{r}_{jT}. Over time, this ratio is affected by changes either in real wages or in labor productivity or in both. When the relative real unit labor cost changes in favor of an economy, the RERs are expected to decrease, other things constant.
- In the long run, by the ratio $T_{i/j}$; this can be seen as an index capturing the price differentials effect (especially of non-tradable goods) on RER and of the economy's trade openness. Indeed, if in an economy, the prices of internationally tradable goods largely define its domestic price level, *i.e.,* the ratio ($P_i/P_{i,T}$) is small, this particular economy can be characterized as an open economy; hence, the smaller the trade openness, the higher the $T_{i/j}$, the more the appreciation of RER.

  At the same time, in the short term, it reflects the Balassa-Samuelson effect, since it can be seen as a proxy of relative productivity differences between internationally tradable and non-tradable goods. In the long term, however, as pointed out, the prices of internationally tradable goods are subject to the "law of one price" formed in the international arena; hence, the prices of tradable products in the international arena do not fully reflect the domestic productivity of the industries that produce internationally tradable goods. Thus, in the long-run where the prices of tradable goods tend to equalize, the RERs are mainly affected by productivity and by extension the prices of non-tradable goods. In addition, the real unit labor cost and the prices of tradable are positively related to each other; that is, the higher their real unit labor cost the higher their prices.
- In the long-run, by the *RCF* which take place when there are differential interest rate yields between the countries. It is expected capital flows to

exert a short-run impact on the formation of RERs, since they respond quickly to any change that may occur in the trade between two countries; in fact, they should rise in deficit countries while their currency appreciates.

For Marx, and Harrod as well, trade imbalances and capital flows are interconnected aspects. An unevenness in the balance of payments leads to an increase in the interest rate for trade deficit economies and a decrease in the interest rate for economies with trade surplus. The different interest rates create capital flows from trade surplus to trade deficit economies until a balance of payments is achieved. In effect, trade surplus economies become creditors by exporting their surplus as debt to trade deficit economies (Shaikh, 2016). Thus, real capital outflows (inflows) do not necessarily affect the price level of the domestic economy but limit (increase) its liquidity (Martínez Hernández, 2017). Thus, the interest rates in the host country will decrease (increase) increasing (decreasing) the outflow (inflow) of funds which leads to a depreciation of the RER of the economy, without necessarily affecting the trade balance.

In addition, we test the PPP proposal of stationary RERs, at least in the long-run. Based on the labor theory of value, we expect that the RERs will display a non-stationary behavior, since one of its determining factors, that of the real unit labor cost, displays over time a declining trend due to increase in labor productivity. However, the differences in productivity between internationally tradable and non-tradable goods among the trade partners may exert results which may convey with stationary RERs. Roberts and Carchedi (2021) noted that the RERs are determined by the productivity in the export sectors. Guerrero (1995) argued that a country can be more competitive than the other not only due to lower wages but due to the fact that its productivity may increase more than wages. Nevertheless, within the classical political economy approach, the stationarity issues of the RERs do not arise.

In the general context of this alternative approach, Shaikh and Antonopoulos (2013) investigated the RER between the USA and Japan for the years 1962-2008 while Martínez Hernández (2010) examined the RER between Mexico and the USA for the period 1970-2003; they found that the relative real unit labor cost of tradable goods is the key determinant for the RERs. In a study of 16 Organisation for Economic

Co-operation and Development (OECD) countries, Martínez Hernández (2017) concluded that a relative reduction in the real unit labor costs improves the terms of trade for 15 of the 16 countries of his analysis and, therefore, it becomes the key regulator of the long-run RERs. Antonopoulos (1999), examining the trade weighted RERs between Greece and 12 OECD countries for the years 1964-1998 concluded that they depend on the relative unit labor costs. Boundi-Chraki (2021), in his work for the North American Free Trade Agreement (NAFTA) countries during the period 1995-2014, found that the vertically integrated real unit labor costs determine the RER while Boundi-Chraki and Perotini-Hernández (2021) reached the same conclusion in their study for the NAFTA and the European Union countries. Similar were the results in the studies by Casey (1996) for Canada, Ruiz Nápoles (1996) for Mexico, and Roman (1997) for Spain.

4. EMPIRICAL INVESTIGATION OF THE DETERMINANTS OF RER

In this section, we investigate empirically the long-run behavior of the Chinese RMB and the USD for the period 1982-2018. The selection of the specific economies was made because of their mounting weight in international trade and of the recent political controversy over the effectiveness of currency manipulation policies. Hence, a rigorous analysis of the determinant factors of RER between these two economies can offer an understanding of their current trade position but also may help design effective trade policy which, after all, is the objective of the intense debate at a theoretical, empirical and, mainly, political level. The model employed in our analysis is[5]:

$$RER_{i/j,T} = c + \beta_1 RULC_{i/j,T} + \beta_3 RCF_i + \beta_4 T_{i/j} + e_i \qquad [6]$$

Where $RER_{i/j,T} = e^r_{i/j}$ is the RER of country i weighted by its trade volume of tradable goods with 17 trade partners, j. $RULC_{i/j,T} = v^r_{i,T} / v^r_{j,T}$ is the ratio of real unit labor cost for tradable goods of country i weighted by

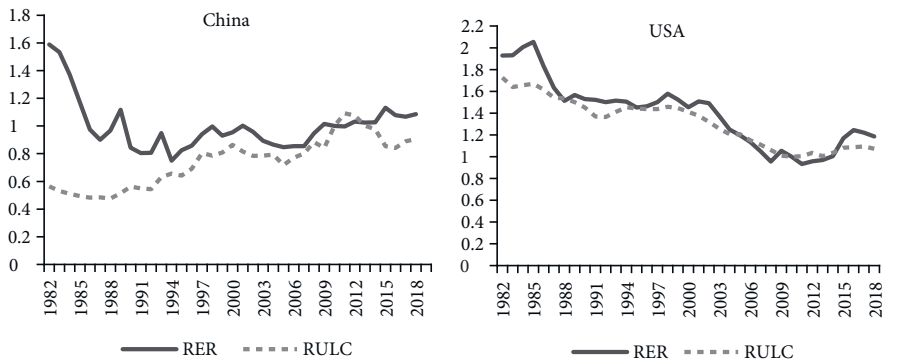
[5] The data sources and description of computations of relevant variables are provided in Appendix A.

their trade volume real unit labor costs of the 17 trade partners, *j*. The lack of input-output data for such a long period restricts us to use real unit labor costs instead of the vertically integrated real unit labor costs. In addition, the analysis refers only to manufacturing industries since they mostly produce internationally tradable goods[6]. RCF_i is the real net capital flows of country *i*. $T_{i/j} = \tau_i/\tau_j$ is the index capturing the various effects that price differentials may exert on RER determining factors and are not captured by the stochastic term. *c* and *e* are the constant and the residual, respectively. The *i* refers to domestic economy and *j* represents the foreign consisted of the weighted average of 17 countries.

Figure 1 presents the evolution of the $RER_{i/j,T}$ (solid line) and $RULC_{i/j,T}$ (dashed line) for China and USA. The period of analysis is 1982-2018 which is long enough to capture the changes occurring during the different phases of the last economic cycle.

In Figure 1, we observe that the two variables under consideration follow a common pattern over time in both countries. For the US (right-hand side panel), the rising value of the dollar stopped after the Plaza Agreement (1985) which imposed its devaluation against the currencies

Figure 1. The trade-weighted RER and real unit labor cost of tradable goods, China and USA, 1982-2018 (2010 = 100)



[6] A higher unit labor cost implies lower rate of labor exploitation and defines the competitive position of an economy against those with an absolute cost advantage (Guerrero, 1995; Astarita, 2013).

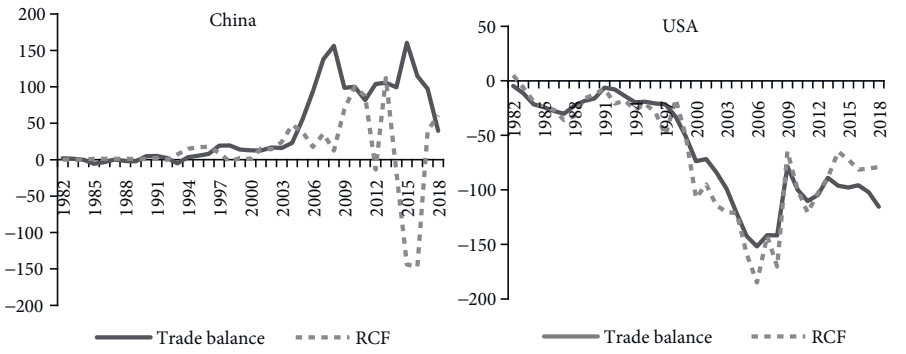
of Japan, West Germany and the United Kingdom. The ensuing Louvre Agreement (1987) prioritized international exchange rate stability and the stabilization of the USD, which continued to decline in international foreign exchange markets following closely the decline in the unit labor cost. As for China (left-hand side panel), in the first years of the analysis, the RMB followed a declining trend which has been reversed since 1994 following closely the real unit labor cost. Hence, we may argue that over the years, China's relative real unit labor cost has increased indicating that the trade-weighted unit labor costs of its partners decrease faster. Hence, we observe that the Chinese RER appreciates over the years despite the currency manipulation that the Chinese authorities are considered responsible and accused.

In Figure 2, we present the trade balance (solid line) and net real capital flows (dashed line) of China and the US for the period 1982-2018.

In Figure 2, we observe that the US economy experiences persistent trade deficits while China displays persistent trade surpluses; it is worth noting that the same pattern exists in their bilateral trade. We also see that the real net capital flows follow an erratic behavior; in fact, for China we observe that till 2014 there are inflows and for the following years outflows while the US for the whole period experiences only outflows. Hence, the real net capital flows do not 'correct' trade imbalances and are expected to display short-run effects on RERs as well.

We continue the analysis by testing the proposed model (Equation [6]) in order to identify the presence of cointegration and long-run effects

Figure 2. Trade balance and capital flows, China and USA, 1982-2018 (2010 = 100)



between the examined variables. We employ the ARDL method[7]. We also perform the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to ascertain that our variables are not I(2) (see Tables B1-B4, Appendix B). The results reveal that the trade-weighted RER for the USA is not stagnant at first levels questioning, thus, the claim made by the PPP principle; the corresponding variable for China is I(0). Since we deal with a mixture of I(0) and I(1) time series, the ARDL is the most appropriate method to investigate cointegration and long-run relationship between the variables; the structure of time lags in the model is selected based on the Akaike Information Criterion. Table 1 presents the Bounds Tests.

The results in Table 1 confirm the presence of cointegration; thus, we proceed with the estimation of the long-run multipliers, which are presented in Table 2.

From the results presented in Table 2, we can point out the following:

- For both countries, the error correction term (adjustment speed) is negative, less than one in absolute term and statistically significant, indicating the presence of long-run causal relationship from the explanatory variables to the dependent one.
- From the value of the error correction term, which indicates the rate of adjustment to long-run equilibrium, we may say that, after a shock, the speed of adjustment differs between the economies; China reaches long-term equilibrium much faster than the USA.
- The $RULC_{i/j,T}$ variable is statistically significant with a positive sign in both economies. These results confirm that, in the long run, the RER is shaped by the relative real unit labor costs of the tradable goods in both economies.
- The $T_{i/j}$ variable is positive and statistically significant for both economies (at 10% significance level for the USA). Thus, as expected, in the

[7] The advantages of the ARDL method are well established in the literature. The ARDL method can cope with the examination of systems of equations reducing it to a single equation, since it considers that all variables are endogenous, gaining, among other things, degrees of freedom. At the same time, it can investigate long-term and short-term effects and has the ability to control the existence of a long-term relationship in small samples (Nkoro and Kelvin, 2016). It can also be applied to mix of I(0) and I(1) time series, but not I(2) (Pesaran, Shin, and Smith, 2001).

Table 1. Bounds tests, China and USA, 1982-2018

China		USA	
Lower: I(0) Bound	Upper: I(1) Bound	Lower: I(0) Bound	Upper: I(1) Bound
3.615	4.913	3.615	4.913
F-statistic = 17.84348 Degrees of freedom = 3		F-statistic = 13.53139 Degrees of freedom = 3	

Table 2. Long-run multipliers and speed of adjustment, China and USA, 1982-2018

China			
Variable	Coefficient	T-statistic	Probability
$RULC_{i/j,T}$	0.763450	5.753331	0.0000
$T_{i/j}$	0.339307	2.193473	0.0397
RCF_i	0.096076	2.486555	0.0214
EC-term	–0.809831	–9.031623	0.0000
USA			
Variable	Coefficient	T-statistic	Probability
$RULC_{i/j,T}$	0.759868	0.759868	0.0041
$T_{i/j}$	1.498059	1.498.059	0.0970
RCF_i	0.375054	0.375054	0.0075
EC-term	–0.317159	–8.107026	0.0000

long run, an increase in this ratio leads to an appreciation of the RER. One explanation for the significance level of the value of $T_{i/j}$ for the USA economy might be the fact that the prices of tradable to non-tradable goods in the USA are close to those of its trade partners while for China this difference is expected to be significant.

- The RCF_i variable is statistically significant and positive for both countries, a common finding in the relevant literature. At the same time, it is clear that the impact of net capital flows on China's RER is much smaller than that of the US economy.

- Another interesting outcome is that in China the long-run effects of RCF_i on RER are much less than those of the $RULC_{i/j,T}$; the same but with much less intensity is observed for the US economy.

Tables B5 and B6 in Appendix B present the error correction models for China and USA, respectively while Table B7 presents the diagnostic tests for the ARDL models used confirming that our results are robust.

5. CONCLUSIONS

In this paper, we explored the dynamics of the RERs based on the premises of the classical political economy; that is, the principle of absolute cost advantage, the labor theory of value and the theory of real competition. The synthesis of them constitutes the theoretical framework upon which our empirical research was conducted. We argue that a model based on the premises of the classical political economy is a reliable alternative proposal for the determination of the RERs according to which the classical competition governs domestic and international transactions, and the labor theory of value is behind the principle of the absolute cost advantage that dominates in both domestic and international trade.

To empirically test the validity of these hypotheses, we examined the long-run behavior of two currencies, the Chinese RMB and the USD. Intentionally, we dealt with these two economies which are immense international trade players and there is an ongoing theoretical and political debate as to what extent currency manipulation affects their respective trade performance. By using the ARDL method, we investigated the extent to which the real unit labor cost defines the RER in China and the USA during the period 1982-2018. The empirical results confirm that for both economies, the real unit labor costs exert a long-run positive and statistically significant effect on their RER; the other explanatory variables employed in the model exert also significant effects, as expected from the theory.

The above results confirm the premises of the classical political economy tradition that international trade is guided by the principle of absolute cost advantage according to which labor (and its approximation by the real unit labor cost) shapes the domestic and international transactions. Our analysis has shown that in both economies under investigation,

the RERs are defined mainly by their real unit labor costs in the long run. This outcome indirectly provides support to the well established thesis within the classical political economy tradition that trade is not, by definition, mutually beneficial for all economies as transfers of value take place from the less to more advanced capitals. In addition, the RERs do not automatically change in order to balance international trade as the mainstream trade theories suggest.

In addition, we may point out that useful proposals may be drawn for the exercise of effective economic policies. Specifically, effective exchange rate policies should aim to a course of actions and implementation of strategies that will lower the real unit labor cost. The latter can be attained in two ways; either by decreasing real wages with limited effect in the long-run, or by implementing policies that increase labor productivity. In fact, the continuous improvement in labor productivity emerges as the most effective tool for establishing a sustainable exchange rate policy in the long run. ◄

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APPENDIXES

Appendix A. Data sources and variable derivations

1. The trade partners for China and the USA are: Australia, Brazil, Canada, Denmark, France, Germany, Italy, Japan, South Korea, Mexico, Netherlands, Norway, Singapore, Spain, Sweden and UK. Data on bilateral trade can be found in International Monetary Fund (IMF), Direction of Trade Statistics.
2. The manufacturing price index (MPI) is taken from OECD. For China, Italy and Brazil the MPI was approximated by the ratio of real value added in manufacturing over the current one using data from the Conference Board: *The Conference Board International Labor Comparisons Program*, January 2020. For Singapore is taken from the *Singstat*.
3. The consumer price index (CPI) and the producer price index (PPI) are from the IMF. For China the CPI is from National Bureau of Statistics of China while for PPI, we used the Purchasing Price Index for Industrial Producers from the same source. The completion of time series data for CPI and PPI for China and PPI for France was made with interpolation. In addition, for Brazil and Singapore, we employed the wholesale price index from the World Bank: *World Development Indicators*.
4. The nominal exchange rate as well as the data needed for the computation of the real unit labor cost in manufacturing is from Conference Board: *The Conference Board International Labor Comparisons Program*, January 2020.

5. The nominal net capital flows, computed as inflows minus outflows, are taken from the IMF: *Balance of Payments and International Investment Position Statistics*. We used the Gross Domestic Product (GDP) deflator from the World Bank: *World Development Indicators* to estimate the real net capital flows.

The variables of the model have been constructed as follows:

1. For the construction of the trade-weighted real exchange rate, $RER_{i/j,T} = e^{r}_{i/j} = (MPI_i * e_{i/j}) / MPI^{w}_{j}$, we followed the steps:

   a) We estimated the trade weights, TW_j, as follows:

$$TW_1 = \frac{(X_1 + I_1)}{\sum_{j=1}^{n=17} (X_j + I_j)}$$

   Where X_1 and Y_1 are the exports and imports, respectively, of the examined economy 1, and X_j and I_j the exports and imports, respectively, of all foreign trade partners.

   b) The term MPI^{w}_{j} is the trade-weighted geometric mean of *MPI* of foreign, *j*:

$$MPI^{w}_{j} = \prod_{j=1}^{n=17} (MPI_j \varepsilon_{j/\$})^{TW_j}$$

   Where $\varepsilon_{j/\$}$ is the nominal exchange rate of country *j* with respect to USD.

2. The relative real unit labor cost of tradable goods, $RULC_{i/j,T}$, is estimated as follows:

   a) For the real unit labor cost, $RULC_{i,T}$, we use the CPI_i.

   b) The relative trade-weighted real labor unit cost for tradable goods for 17 trading partners is derived as:

$$RULC_{jT} = \prod_{j=1}^{n=17} \left(\frac{ULC_{j,T}}{CPI_j} \right)^{TW_j}$$

   The real relative unit labor cost for tradable goods is:

$$RULC_{i/j,T} = \frac{RULC_{iT}}{RULC_{jT}}$$

3. For $T_{i/j}$, we followed the following steps:

a) For the domestic economy, we have $\tau_i = CPI_i/PPI_i$.

b) The trade-weighted τ_j of the 17 trading partners is estimated as follows:

$$\tau_j = \prod_{j=1}^{n=17} \left(\frac{CPI_j}{PPI_j} \right)^{TW_j}$$

Consequently:

$$T_{i/j} = \frac{\tau_i}{\tau_j} = \frac{\frac{CPI_i}{PPI_i}}{\frac{CPI_j}{PPI_j}}$$

Appendix B. Empirical results

Table B1. Unit root tests, levels, USA, 1982-2018

		$RER_{i/j,T}$		$RULC_{i/j,T}$		RCF_i		$T_{i/j}$	
		PP	ADF	PP	ADF	PP	ADF	PP	ADF
With constant	t-statistic	–1.6265	–1.8496	–1.5781	–0.9584	–2.1533	–2.1872	–1.8044	–1.5576
	p-value	0.4591	0.3513	0.4832	0.7571	0.2261	0.2141	0.3725	0.4934
With constant and trend	t-statistic	–1.5721	–2.4166	–1.5921	–1.9545	–1.9974	–2.0045	–2.1271	–2.1126
	p-value	0.7842	0.3652	0.7763	0.6050	0.5830	0.5792	0.5139	0.5217
Without constant and trend	t-statistic	–1.6462	–1.8637	–2.7111	–1.7046	–0.6843	–0.8386	–0.0599	–0.0588
	p-value	0.0934	0.0601	0.0081	0.0833	0.4135	0.3457	0.6561	0.6564

Table B2. Unit root tests, first differences, USA,1982-2018

		$\Delta(RER_{i/j,T})$		$\Delta(RULC_{i/j,T})$		$\Delta(RCF_i)$		$\Delta(T_{i/j})$	
		PP	ADF	PP	ADF	PP	ADF	PP	ADF
With constant	t-statistic	–3.8072	–3.9752	–4.2185	–4.1887	–7.5019	–7.5294	–5.5186	–5.5186
	p-value	0.0064	0.0041	0.0022	0.0024	0.0000	0.0000	0.0001	0.0001
With constant and trend	t-statistic	–3.7768	–4.0684	–4.1343	–4.1024	–7.5575	–7.5575	–5.6974	–5.6977
	p-value	0.03	0.0153	0.013	0.0141	0.0000	0.0000	0.0002	0.0002
Without constant and trend	t-statistic	–3.7538	–3.8332	–3.8804	–3.8295	–7.5806	–7.6104	–5.5975	–5.600
	p-value	0.0004	0.0004	0.0003	0.0004	0.0000	0.0000	0.0000	0.0000

Table B3. Unit root tests, levels, China,1982-2018

		$RER_{i/j,T}$		$RULC_{i/j,T}$		RCF_i		$T_{i/j}$	
		PP	ADF	PP	ADF	PP	ADF	PP	ADF
With constant	t-statistic	–3.8544	–3.7826	–1.0183	–0.9525	–3.2801	–3.6155	–2.4641	–2.8669
	p-value	0.0056	0.0067	0.7363	0.7594	0.0234	0.0103	0.1326	0.0593
With constant and trend	t-statistic	–6.0104	–3.3298	–2.4911	–4.7589	–3.2182	–4.4562	–3.1706	–2.8892
	p-value	0.0001	0.0776	0.3304	0.0031	0.097	0.0064	0.1068	0.1777
Without constant and trend	t-statistic	–1.4139	–1.4515	0.6900	0.7645	–3.2471	–3.3501	–0.3745	–2.4074
	p-value	0.144	0.1346	0.8602	0.8745	0.0019	0.0014	0.4993	0.0175

Table B4. Unit root tests, first differences, China,1982-2018

		$\Delta(RER_{i/j,T})$		$\Delta(RULC_{i/j,T})$		$\Delta(RCF_i)$		$\Delta(T_{i/j})$	
		ADF	PP	ADF	PP	ADF	PP	ADF	PP
With constant	t-statistic	–5.2604	–5.2693	–5.1739	–4.3784	–14.1523	–4.7108	–6.1606	–4.2321
	p-value	0.0001	0.0001	0.0002	0.0016	0.0000	0.0008	0.0000	0.0023
With constant and trend	t-statistic	–5.9281	–5.868	–5.1054	–4.3131	–13.6053	–4.6905	–6.1158	–4.1793
	p-value	0.0001	0.0001	0.0011	0.0093	0.0000	0.0041	0.0001	0.0125
Without constant and trend	t-statistic	–5.2562	–5.2694	–5.0782	–5.0785	–13.3866	–4.7053	–6.1637	–4.2973
	p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

Table B5. Error correction equivalent of ARDL (4, 0, 1, 2) equation, China, 1982-2018

Variable	Coefficient	t-statistic	Probability
c	–0.027371	–3.147.002	0.0049
$\Delta(RER_{i/j,T}(-1))$	–0.268638	–2.971.286	0.0073
$\Delta(RER_{i/j,T}(-2))$	–0.380776	–4.213.148	0.0004
$\Delta(RER_{i/j,T}(-3))$	–0.417824	–4.686.889	0.0001
$\Delta(T_{i/j})$	0.603318	5.706.738	0.0000
$\Delta(RCF_i)$	0.001256	0.067340	0.9469
$\Delta(RCF_i(-1))$	–0.043076	–2.245.263	0.0356
*D*_2015	0.147240	2.503272	0.0206
R^2		0.813028	
$\overline{R}^2$		0.750704	

Table B6. Error correction equivalent of ARDL (2, 4, 3, 3) equation, USA, 1982-2018

Variable	Coefficient	t-statistic	Probability
c	–0.292715	–7.810869	0.0000
$\Delta(RER_{i/j,T}(-1))$	0.404154	5.194946	0.0001
$\Delta(RULC_{i/j,T})$	0.321560	2.048202	0.0598
$\Delta(RULC_{i/j,T}(-1))$	0.408220	2.484461	0.0262
$\Delta(RULC_{i/j,T}(-2))$	–0.736343	–4.602734	0.0004
$\Delta(RULC_{i/j,T}(-3))$	0.783939	6.043305	0.0000
$\Delta(T_{i/j})$	–1.199025	–3.877496	0.0017
$\Delta(T_{i/j}(-1))$	–1.080029	–4.407893	0.0006
$\Delta(T_{i/j}(-2))$	–1.376179	–4.787496	0.0003
$\Delta(RCF_i)$	0.039238	1.997317	0.0656
$\Delta(RCF_i(-1))$	–0.139374	–6.326892	0.0000
$\Delta(RCF_i(-2))$	–0.095056	–3.932351	0.0015
*D*_2011	0.086148	2.144593	0.0500
*D*_2009	0.229551	5.349420	0.0001
*D*_1998	–0.061645	–2.263909	0.0400
R^2		0.960110	
$\bar{R}^2$		0.924912	

Table B7. Diagnostic tests

		China	USA
Normality	Jarque-Bera	3.507743	1.012702
	Probability	0.173102	0.602691
Serial correlation	F-statistic	0.605100	2.365805
	Probability	0.5562	0.1361
Heteroscedasticity	F-statistic	1.224591	1.471886
	Probability	0.3308	0.2340
Reset-Ramsey	F-statistic	1.395804	0.256657
	Probability	0.2513	0.6209