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No. 13, DECEMBER 1979

THE REEMERGENCE OF THE  
PURCHASING POWER PARITY  
DOCTRINE IN THE 1970s

LOUKA T. KATSELI-PAPAEFSTRATIOU

INTERNATIONAL FINANCE SECTION

DEPARTMENT OF ECONOMICS

PRINCETON UNIVERSITY · 1979

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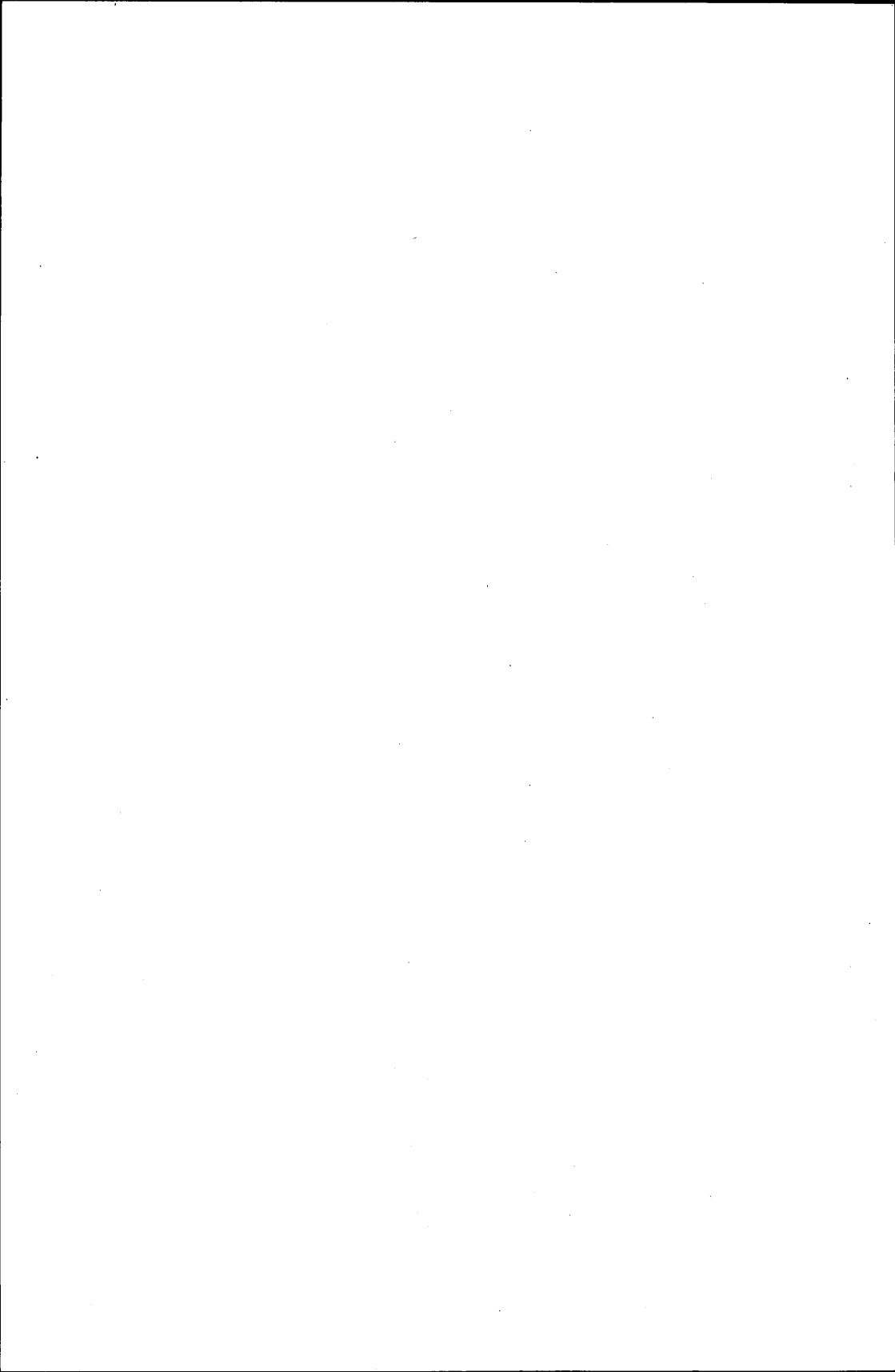
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"Each generation must rekill its phoenixes."

Samuelson, "Theoretical Notes on Trade Problems"

## 1 Introduction

In June 1977 the Ford Foundation, in collaboration with the Central Bank of Greece, sponsored a two-day conference on Purchasing Power Parity (PPP). The papers presented at that symposium were published by the *Journal of International Economics* in its May 1978 issue. They cover a wide area related to exchange rates and prices, from analyses of the historical evidence in the early 1920s to the use of PPP as partial guidance for exchange-rate management.

The conference in Athens was the most recent round of a debate that formally started in the 1920s and continued in the 1940s and later on in the 1960s.<sup>1</sup> The resurgence of interest in PPP in the 1970s can be attributed mainly to our recent experience with flexible exchange rates and, more specifically, to the highly volatile nature of their movement. The wide and often unanticipated fluctuations in the prices of key currencies have increased uncertainty in international financial markets and intensified the search for the "fundamental relationships" that determine the equilibrium value of real exchange rates both in the short and the long run. In such an environment, the PPP doctrine provides a convenient starting point for analyzing the determinants of the equilibrium value of the real exchange rate.

Despite the extensive literature on the subject, PPP remains an elusive concept, defined and used differently by different authors. While it is probably true that "under the skin of any international economist lies a deep-seated belief in some variant of the PPP theory of the exchange rate" (Dornbusch and Krugman, 1976, p. 540), the variants cover a wide range from simple truisms to more sophisticated theories of exchange-rate determination.

The theoretical foundations of PPP have been further obscured by the form of the empirical tests of the relationship. The very nature of regression analysis, the econometric tool most often used in recent empirical studies, has sometimes conveyed the erroneous impression

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<sup>1</sup> For a comprehensive survey of the literature and the debates surrounding PPP as it has evolved historically, see Officer (1976) and Isard (1978).

that PPP is a causal relationship between relative price levels and the exchange rate (the absolute version of PPP) or between their rates of change (the relative version of PPP), even though a regression, per se, cannot establish causation between variables. Given this framework, debates on either version of PPP have focused on such issues as the appropriate price vector (or index) to be used, the appropriate base period for time-series analysis, and the presence of systematic divergences of internal price ratios that would involve consistent biases in the computation of PPP from general price levels. However important such issues might be for meaningful empirical tests of the PPP doctrine, they have overshadowed a number of more fundamental theoretical questions.

It is the objective of this paper to focus on and disentangle the sometimes implicit and foggy statements about PPP that have been submerged by attempts to prove or disprove its empirical validity. In that respect, at least methodologically, this review paper is an extension, if not a restatement, of Samuelson's 1964 paper on the subject, in the sense that more emphasis is placed on the underlying theoretical structure than on the characteristics of competing versions of PPP. This approach is also in line with the spirit of the most recent literature (Myhrman, 1976; Isard, 1978; Michaely, 1978), as well as the papers that were presented in Athens. A related concept, cost parity, is not discussed in this paper, since a good summary and evaluation of the major studies can be found in Officer (1976).

Chapter 2 provides a survey of competing interpretations of PPP: (a) as a spatial- or commodity-arbitrage relationship; (b) as an imposed condition within the context of the monetary approach to the balance of payments, a condition that is usually identified with a "causal" relationship running from relative price levels to exchange rates; and, finally, (c) as a reduced-form relationship between two endogenous variables (the relative price level and the exchange rate), both of which are determined jointly as functions of exogenous variables. There are important differences across these views regarding the kinds of disturbances that are assumed to be prevalent (real vs. monetary), the process of exchange-rate determination, and the time horizon pertinent to the analysis. As will be seen in Chapter 2, these give rise to different hypotheses as to the nature of the PPP relationship, its validity, and its relevance as a policy tool.

Chapter 3 reviews recent empirical studies on PPP, in terms of both methodology and most important findings. The theoretical distinctions drawn in Chapter 2 carry over to the empirical work, which can be



divided into (a) tests of the commodity-arbitrage relationship, (b) tests of the international propagation of disturbances under fixed exchange rates, (c) "causality" tests that run from prices to exchange rates, and (d) tests of real exchange-rate variability. Chapter 3 also reviews the typical methodological questions that have been raised in reference to empirical work on PPP, such as the choice of the price index, weighting scheme, and base year; the identification of commodities and historical periods; and the process by which results are evaluated.

The concluding section evaluates the usefulness of PPP in light of recent events and in the context of a wider search for meaningful criteria for exchange-rate management.

## 2 Purchasing Power Parity: Alternative Interpretations

Starting from the premise that exchange rates are generally kept in line with relative price levels, PPP states that the equilibrium values of currencies should be intimately linked to their internal purchasing power. In its *absolute* version, PPP implies that the equilibrium value of the exchange rate between the currencies of any pair of countries should be equal to the ratio of the countries' price levels; in its *relative* version, that the rate of change of the exchange rate should be equal to the difference in the rates of inflation. In logarithmic terms, the absolute version asserts that

$$\ln S_t = \ln (P_t / P_t^*), \quad (1)$$

while the relative version asserts that

$$\Delta \ln S_t = \Delta \ln P_t - \Delta \ln P_t^*, \quad (1')$$

where  $S_t$  = ratio of domestic to foreign currency units at time  $t$

$P_t$  = domestic price index

$P_t^*$  = foreign price index.

Thus PPP is both a positive and a normative hypothesis about the value of bilateral or effective real exchange rates, which, if the theory holds, should be unity in long-run equilibrium.

As was suggested in the Introduction, a careful review of the literature would indicate that there are at least three theoretical interpretations of PPP.

### *PPP as a Spatial-Arbitrage Relationship*

The view of PPP as a spatial-arbitrage relationship equates it with what is commonly known as the "law of one price." At the individual commodity level, perfect arbitrage would ensure that the price of each commodity is equalized across countries. In that case, the domestic price of a foreign currency would equal the ratio of the internal price of the commodity in question to its foreign price, and the same holds true for its rate of change. In other words, for each commodity  $j$ ,

$$S_t = P_{j,t} / P_{j,t}^* \quad j = 1, 2, 3, \dots, \quad (2)$$

or, in the relative version,

$$\Delta \ln S_t = \Delta \ln P_{j,t} - \Delta \ln P_{j,t}^* \quad (2')$$

where  $P_j$  = domestic price of commodity  $j$   
 $P_j^*$  = foreign price of commodity  $j$

It should be clear that equation (2) would hold only in the case of perfect information in the commodity markets and in the absence of transport costs, trade impediments, and price discrimination. Equation (2') would hold only in the absence of asymmetric changes in transport costs and trade impediments. As shown in Chapter 3, the presence of market imperfections is significant enough to put seriously in question the validity of perfect commodity arbitrage even on an individual commodity level.

Even if arbitrage could ensure that export prices of identical goods originating in different countries but denominated in a common currency were the same, this would not necessarily imply an invariant competitive relationship among countries or invariant relative opportunity costs of production. Thus PPP calculations based upon the price of homogeneous commodities come close to being trivial.

Moving from spatial arbitrage for individual commodities to larger subsets of homogeneous goods, one is faced with even more serious problems. If equation (2) holds for each commodity, then it will hold for any equally weighted price index. As Samuelson (1964) points out, if individual countries use different weights in computing price indexes, there can be no reason to expect the "law of one price," as reflected by equation (2), to hold for indexes across countries.

These aggregation problems tend to be significant, since countries' tastes, economic structures, and accounting practices vary widely. Along with informational imperfections and the presence and asymmetries of trade impediments, they make the international equalization of traded-good prices highly improbable both on the individual and aggregate commodity levels.

The assumption of equalization of traded-good prices through PPP obscures the distinction between the actual and the equilibrium real exchange rate. As Samuelson (1964, p. 147) points out, if trade costs and impediments were zero and accounting practices were identical, "every ruling exchange rate would turn out to be the PPP equilibrium rate." In econometric applications, computed results turn out to be different from those predicted by PPP precisely because of such different weights and the presence of transportation costs and trade

impediments. Testing the "law of one price" thus becomes a test of the magnitude and importance of trade distortions, cross-country asymmetries, and information lags.

Frenkel (1978, p. 172) notes that those who adopt a strict view of PPP as a traded-good arbitrage relationship tend to advocate the use of traded-good prices rather than more general price series for meaningful tests of PPP. Emphasis on individual commodity prices, however, is not synonymous with espousal of a commodity-arbitrage view. For example, the following statement by Ohlin (1967, p. 290) is quoted by Frenkel (1978) as representative of the commodity-arbitrage view: "Foreign exchange rates have nothing to do with the wholesale commodity price level as such but only with individual prices. . . ." Ohlin's point, however, taken in context, is that the use of aggregate price levels does not imply anything about the equilibrium exchange rate and that "changes in individual prices may be relevant [for exchange-rate determination], even though the level of commodity prices happens to be constant."

The spatial-arbitrage hypothesis has also been applied to broader price indexes; in such cases, a wider definition of PPP is invoked, where the use of aggregate price levels or indexes such as the consumer price index or the GNP deflator is justified on the ground that prices of traded and nontraded commodities move together. The extreme position often typical of monetarist models is that countries produce one homogeneous good whose price is equalized across countries through perfect commodity arbitrage. More frequently, nontraded goods are explicitly introduced, but their prices are kept in line with those of traded goods through high degrees of substitution in consumption or production.

The price adjustment for nontraded goods is assumed in most cases to be instantaneous; as Dornbusch (1978, p. 5) notes, this assumption disregards the potential limited substitutability between supply sources, the overall state of slack in the economy, and the expected persistence of relative price changes. It also disregards the presence of biases in the calculated PPP relationship due to systematic divergences of internal price ratios across countries. Balassa (1961, 1964) and others have demonstrated (see Officer, 1976, for an extensive review) that even if perfect commodity arbitrage ensures the equalization of prices of traded goods, higher productivity growth in the nontraded-good sector of advanced countries, relative to that in less advanced countries, would require a rising internal price ratio of traded to nontraded goods in the advanced country. Thus, high substituta-

bility in demand among goods is not a sufficient condition for the use of general price indexes to test for PPP. Officer (1976, p. 22) points out that a similar shortcoming would arise in tests of the relative version of PPP if there is a systematic "increase (decrease) over time in the advanced country's productivity advantage." The fact that productivity or other structural differences across countries can cause differences in internal relative prices is one of the most serious criticisms of the PPP relationship. As we shall see, this criticism applies equally well to both "causal" and "equilibrium" views of the PPP doctrine.

The preceding discussion leads to the conclusion that the spatial-arbitrage hypothesis, which might be valid for a subset of homogeneous commodities, should not be invoked on behalf of a broader definition of PPP unless one is prepared to argue that prices of traded and nontraded goods always move in unison.

Despite these criticisms, the spatial-arbitrage approach to PPP is widely adopted in studies concerning the international transmission of inflation under fixed exchange rates. According to Genberg (1978),

Discussions of the transmission of inflation naturally start with a price increase abroad and then try to identify the channel by which domestic prices are affected. The most common such channel is probably that suggested by the arbitrage hypothesis. This hypothesis, which is also referred to as the traded goods model of the 'law of one price,' simply states that the price of a homogeneous commodity must be the same in all countries provided the market for this commodity is internationally integrated . . . (p. 248).

Thus,

PPP under fixed exchange rates implies that inflation rates must, subject to certain reservations, be equal in all countries of an integrated world economy . . . (p. 252).

A similar view of PPP under fixed exchange rates characterizes a number of other studies on the international transmission of price disturbances, such as those by Dornbusch (1973), Connolly and Taylor (1976), Swoboda (1977), and Katseli-Papaefstratiou (1979). Aside from differences in the particular structure of the models, all of these studies share the same underlying assumptions—perfectly integrated commodity markets for traded goods and high substitutability of non-traded and internationally traded commodities.

The identification of PPP with a spatial commodity-arbitrage relationship also applies to models of flexible exchange rates. For example, in their study of short-run exchange-rate determination, Dornbusch and Krugman (1976) identify and evaluate the PPP doctrine as essen-

tially a spatial-arbitrage relationship. Their criticism of PPP focuses on the unrealistic nature of such assumptions as the perfect integration of commodity markets (the "law of one price"), no transport costs or duties (pertinent to the absolute version of PPP), and constant terms of trade following external disturbances (pertinent to the relative version of PPP). As they themselves note, however, these assumptions are not necessary in a Casselian "neutral-money" model in which PPP is not at all dependent on arbitrage.

Haberler (1975, p. 24) adopts a view similar to Dornbusch and Krugman's as to the nature of the PPP doctrine: "The proposition that general price levels in different countries are connected through the prices of internationally traded goods is the foundation of the PPP doctrine. . . ." Similarly, Wihlborg (1978, p. 4) argues that "PPP between two currencies/countries, holds when *all* commodities have the same price in both countries. . . ." In their studies, Kravis and Lipsey (1971, 1974, 1977, 1978) identify their tests of the "law of one price" and the behavior of relative prices as tests of the PPP relationship and the pure monetarist approach to the balance of payments. Thus, the identification of PPP with perfect commodity arbitrage is quite common even in recent literature. The accompanying table summarizes the main objections raised in reference to this view.

#### *PPP within the Context of the Monetary Approach to the Balance of Payments*

In their writings on PPP, Cassel (1916, 1918, 1921, 1928) and Keynes (1923) focused on the determination of the equilibrium value of exchange rates. Cassel (1921, p. 38) wrote:

The purchasing power parities represent the true equilibrium of the exchanges, and it is of great practical value to know those parities. It is in fact to them we have to refer when we wish to get an idea of the real value of currencies whose exchanges are subject to arbitrary and sometimes wild fluctuations. . . .

In some of his earlier writings, Cassel used for PPP the equivalent term "theoretical rate of exchange." It is thus apparent that PPP, at least for its originator,<sup>1</sup> was the equilibrium value of the real exchange rate quite distinct from the observed real exchange rate. Despite this view, neither the separation between short run and long run nor the distinction between an equilibrium and a causal relationship are alto-

<sup>1</sup> Whether or not Cassel was the founder of the PPP doctrine is still a disputable point; he was the first, however, to formalize the concept as it is presently known and to test it empirically.

THE "LAW OF ONE PRICE": A SUMMARY OF THE DEBATE

Argument	Major Objections	
	Absolute Version	Relative Version
Perfect arbitrage on the individual commodity level for traded goods	$S_i = P_{j,t} / P_{j,t}^*$ Imperfect information Absence of transportation costs and trade impediments Price discrimination	$\Delta \ln S_i = \Delta \ln P_{j,t} - \Delta \ln P_{j,t}^*$ Imperfect information Asymmetric changes in transportation costs and trade impediments
Perfect arbitrage of traded goods, where $P_{T,t} = \sum_{j=1}^n w_j P_{j,t}$	$S_i = P_{T,t} / P_{T,t}^*$ All of the above and Differences in weights Distinction between actual and equilibrium exchange rates	$\Delta \ln S_i = \Delta \ln P_{T,t} - \Delta \ln P_{T,t}^*$ All of the above and Asymmetric changes in weights
Perfect arbitrage across all goods	$S_i = P_i / P_i^*$ All of the above and Biases due to systematic differences in levels of productivity in the nontraded-good sectors Low substitutability between traded and nontraded goods in consumption or production	$\Delta \ln S_i = \Delta \ln P_i - \Delta \ln P_i^*$ All of the above and Biases due to systematic differences in rates of changes of productivity in nontraded-good sectors

gether clear in the literature. This is mainly due to the fact that PPP was, and still is, seen by many authors as an extension of the quantity theory of money in an open economy.<sup>2</sup> In his insightful review of the early debates on exchange-rate determination, Myhrman (1976) stresses the similarities between the positions held by the Cap party in eighteenth-century Sweden or by the Bullionists in England fifty years later and those held in our day by the proponents of the monetary approach to the balance of payments. According to both Ricardo (1810, 1817) and Wheatley (1803, 1807, 1819), two of the most prominent Bullionists, both the price level and consequently the exchange rate were determined by the quantity of note issues; the effects of real disturbances such as food shortages, changes in emigrant remittances, or military expenditures could be only temporary, since they were fully anticipated by private market participants.

If at some initial equilibrium position PPP holds, so that the ex-

<sup>2</sup> The evaluation of Cassel's position is harder (see Holmes, 1967).

change rate for two countries is inversely proportional to the ratio of their price levels, an expansion in the monetary base will increase the overall domestic price level under full-employment conditions without affecting relative commodity prices. The same might possibly hold true, as Michaely (1978) points out, in the case of some real disturbances such as economic growth or an increase in the foreign price level, if their effects are "neutral," that is, succeed in maintaining the same level of excess demand in the system for all commodities and assets. As this "neutrality" tends to be unlikely, however, in the presence of real disturbances, the theory has been cast traditionally in terms of monetary shocks.

The ensuing change in the internal price level following a monetary disturbance will then be completely offset by a change in the nominal exchange rate, "there being no other reason for the fluctuations of exchange than to maintain the par of produce. . ." (Wheatley, 1819, p. 21). Thus, PPP in this framework is intimately linked to (a) the dominance of monetary disturbances, (b) the quantity theory of money, and (c) the notion that the purpose of purchasing foreign exchange is to secure purchasing power in some particular currency (Kalamotousakis, 1978, p. 164).

This version of PPP theory is consistent with a clearly established causal relationship that, as we have seen, runs from monetary disturbances to the price level and then to exchange rates. So long as the price level is determined by the money stock, and velocity and real income are held constant, the only truly endogenous variable is the exchange rate. This line of argument is also at the core of the monetary theory of the balance of payments (Frenkel, 1976; Bilson, 1978a) and is implicit in a number of econometric tests of the PPP relationship that regress the exchange rate on relative prices (see Chap. 3 for an extensive review).

As was pointed out in the discussion at the Athens conference, the issue raised here is analogous to that posed by interest parity, or even by the Phillips-curve relationship in a closed-economy framework. In all three cases there is a stipulated reduced-form relationship between two variables that requires a theory behind it to become operationally meaningful.

Even as early as the 1920s, criticism of the PPP causal relationship, as presented schematically above, developed along the following distinct lines:

On the empirical side, the operational validity of the concept was



questioned in view of the inherent econometric problems posed by tests of either the absolute or relative versions of the PPP relationship (choice of base period, change in trade impediments, productivity differences, etc.).

On the theoretical level, the major objections focused either on the value of the long-run equilibrium real exchange rate, most notably by Keynes (1923) or, more typically, on the specified process of short-run exchange-rate determination. Regarding the first set of objections, the main point of contention had to do with the importance of the exogenous disturbances and their implication for the reestablishment of PPP.

In his *Tract on Monetary Reform*, Keynes (1923), argued that if disturbances are monetary, "then we may expect that purchasing power parity and exchange value will come together again before long" (p. 95). If, however, disturbances are on account of movements of capital, or reparation payments, or changes in the relative efficiency of labor, "then the equilibrium point between purchasing power parity and the rate of exchange may be modified permanently" (p. 97) as a result of disturbances in the "equations of exchange." A similar point was made later by Taussig (1941, pp. 357ff.), who argued that "If something happens to disturb the conditions of demand for export or imports; or if invisible items enter which disturb the barter terms of trade—then the purchasing power parity does not hold." Thus, the dominance of monetary disturbances was shown to be crucial for the continuation of PPP as the equilibrium value for the real exchange rate. Nonmonetary disturbances and real structural changes would, in all probability, change relative prices internally and cause substantial deviations of the equilibrium real exchange rate from its PPP level (Samuelson, 1964; Officer, 1976).

The traditional formulation of PPP was more widely questioned, however, for its stipulated links between prices and exchange rates (Zolotas, 1928; Einzig, 1935). It was argued that both government and private participants can intervene in the foreign-exchange market for portfolio-allocation purposes rather than for the procurement of foreign exchange to meet current-account flows. Kalamotousakis's (1978) review of Zolotas's contribution to the PPP debate, for example, points to the latter's discussion of "qualitative factors" behind the process of exchange-rate determination. As early as 1928, Zolotas argued that under conditions of "instability" in international financial markets, the desire to secure purchasing power becomes less important than "quali-