Terms of trade, catch-up, and home-market effect: The example of Japan

Dieter M. Urban [*]

Department of Economics and Law Studies, Johannes Gutenberg-University Mainz, 55099 Mainz, Germany

Urban, Dieter M.—Terms of trade, catch-up, and home-market effect: The example of Japan

This paper explores theoretically and empirically the medium- and long-run relation of the terms of trade (ratio of traded goods prices) and economic growth of a pair of countries—one of which experiences a major catch-up process towards the other. Two theoretical interdependencies between the terms of trade and economic growth are offered: the home-market effect and the productivity-shock effect. These two effects are tested against each other in a cointegration analysis on data for Japan and the US from 1971 until 1997. Income is cointegrated with the terms of trade. The relevant empirical channel is the home-market effect. However, financial-market effects appear also to be relevant. *J. Japanese Int. Economies* **21** (4) (2007) 470–488. Department of Economics and Law Studies, Johannes Gutenberg-University Mainz, 55099 Mainz, Germany.
© 2007 Elsevier Inc. All rights reserved.

JEL classification: F31; F41; O41

Keywords: Convergence; Real exchange rates; PPP; Terms of trade; Cointegration

1. Introduction

Textbook exchange rate tests report evidence on the purchasing power parity hypothesis by either finding the nominal exchange rate to be cointegrated with price indices or the real exchange rate to be stationary in a unit root test. This holds for most OECD countries for which sufficiently

[*] Fax: +49 (0) 6131 39 25527.
E-mail address: dieter.urban@uni-mainz.de.

long time series data are available.[1] An exception is the Japanese–US real exchange rate, since the Japanese yen has appreciated in real terms by some 90% from 1972 until 1997.[2] Attempts have been made to explain this real appreciation by the Balassa–Samuelson model.[3] In this model a real appreciation of the yen results from prices of Japanese nontradables growing faster relative to prices of US nontradables, since Japanese productivity growth of the nontraded goods sector was behind those of the traded-goods sector. This effect has been confirmed to be empirically relevant by Marston (1987) and Rogoff (1992). However, this view has been challenged recently by two empirical criticisms.

The first one is the terms-of-trade volatility puzzle by Engel (1999). He decomposes the real exchange rate change into the change of the relative price of traded to nontraded goods in one country relative to the other and changes in the terms of trade (changes of the relative price of traded goods). The Balassa–Samuelson model explains only the first component, but not the second, because the terms of trade are assumed to be constant in this model. However, only 50% of the yen real-exchange-rate appreciation against the US dollar is explained by the first component attributed to the Balassa–Samuelson effect. Then the question is: What explains the remainder, i.e. the average real appreciation of the Japanese terms of trade?

The second empirical criticism concerns the country selection bias problem (Froot and Rogoff, 1995). The real exchange rate is a relative price. In general equilibrium, a relative price is only stationary if its fundamentals are stationary. Froot and Rogoff (1995) suggest that countries which change their relative income position may not have a stationary real exchange rate.

The purpose of this paper is to study theoretically and empirically the medium- and long-run relation between the terms of trade and income of industrialized countries. First, we offer two theoretical channels which relate the terms of trade to income growth in a stochastic and dynamic general equilibrium model with flexible terms of trade: the home-market effect (Krugman, 1980) and the productivity-shock effect (Backus et al., 1991). The home-market effect predicts that countries which grow faster have a *real appreciation* of their terms of trade. The productivity-shock effect predicts that countries which grow faster will have a *real depreciation* of their terms of trade. Second, we test these two theories in a cointegration analysis. In a sample on Japan and the US covering the years 1971 until 1997. We deviate from most previous real exchange rate studies using cointegration methods by deriving the estimation equation directly from intertemporal general equilibrium models with rational agents. We ask next whether income belongs in the cointegration space together with the terms of trade. Since it does, we ask further which of the two channels is empirically supported. Finally, we test for other fundamental variables that may also belong in the cointegration space.

Our findings are first that income is cointegrated with the terms of trade and second the home market effect of income on terms of trade is supported. However, income does not provide a full explanation for medium-run, terms-of-trade changes. Financial variables (long-term, nominal government-bond-yield differentials) also belong in the cointegration space without affecting the conclusion on the relation between income and the terms of trade.

The rest of this study is organized as follows: Section 2 defines more precisely the Engel (1999) puzzle for the Japanese terms of trade vis-à-vis the US. Furthermore, the intuition of two opposing theories of terms-of-trade changes are explained while the formal models are relegated

---

[1] A survey is Froot and Rogoff (1995). Engel (2000) has recently challenged this view.

[2] See Engel (1999). More formally, cointegration tests typically reject a cointegrating relation between the nominal yen–US dollar exchange rate and respective price indices (see, e.g., Serletis, 1994; Juselius and MacDonald, 2004).

[3] See Balassa (1964) and Samuelson (1964).