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The U.S. trade imbalance and real exchange rate: An application of the heterogeneous panel cointegration method

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ABSTRACT

The United States economy suffers from persistent trade deficits, arising from the so-called 'global external imbalance'. Can the depreciation of the US dollar improve this phenomenon? This study for the first time applies the heterogeneous panel cointegration method to examine the long-run relationship between the real exchange rate and bilateral trade balance of the U.S. and her 97 trading partners for the period 1973–2006. Using new annual data, the empirical results indicate that the devaluation of the US dollar deteriorates her bilateral trade balance with 13 trading partners, but improves it with 37 trading partners, especially for China. In the panel cointegrated framework, a long-run negative relationship between the real exchange rate and the bilateral trade balance exists for the U.S.

1. Introduction

The United States economy has experienced a persistent deteriorating trade balance since 1976, for which trade deficits have been gradually and steadily increasing after 1991. This trend has continued into the 2000s, arising from the so-called 'global external imbalance' (Hunt and Rebucci, 2005; Narayan, 2006). Can the depreciation of the US dollar improve this phenomenon? Theories indicate that nominal exchange rate depreciation improves the trade balance in the long run, although it causes it to worsen in the short run. Nonetheless, existing empirical studies suggest conflicting conclusions. For instance, the devaluation of the dollar would improve the U.S. trade balance (Rose and Yellen, 1989; Narayan, 2006; Bahmani-Oskooee and Wang, 2007; Koo and Zhuang, 2007), but Moffett (1989) and Nadenichek (2000) argue that the U.S. trade balance with her trading partners has been weakened by currency devaluation. Lee et al. (2006) show that the revaluation of the Asian currency has no effect on the U.S. trade imbalance.

The present study advances and improves upon this literature in three ways. First, our analysis exploits a panel of countries rather than a single country, which allows for obtaining an individual country's behavior by observing the behavior of other countries since it is likely that the trade relationship between the U.S. and her trading partners is influenced by the behaviors of others.

Second, the results of earlier studies may be biased and ineffective due to the problem of endogeneity among each variable. Rose and Yellen (1989) show that the trade balance model, including the current values of income and the exchange rate, may raise the problem of potential simultaneity bias. Summary (1989) points out that exchange rates can influence trade volume and changes in trade volume may also influence the exchange rates — that is, exchange rates may not be an independent variable. Bahmani-Oskooee and Wang (2006), using data on China and her 13 trading partners, verify that trade balance, income, and real exchange rate are endogenous.

To avoid the endogeneity problem, this study utilizes the fully modified ordinary least squares (FMOLS) approach proposed by Phillips and Hansen (1990) and extended by Pedroni (2000) to re-investigate the effect of real exchange rate changes on the U.S. trade balance. Unlike previous studies, panel data models provide more informative and less collinearity among the variables, more degrees of freedom, more efficiency, and greater control of individual heterogeneity (Baltagi, 2008).

Third and finally, because the empirical results may suffer from an aggregation bias problem by using aggregated trade data (Rose and Yellen, 1989), this study applies a disaggregated (bilateral) trade balance to examine the long-run relationship between the bilateral exchange rate and the U.S. bilateral trade balance vis-à-vis her 97 trading partners, using an unbalanced annual panel dataset for the 1973–2006 period.[1]

One thing worth noting is that using panel data creates another problem in which different countries as a whole are treated as an

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[1] Hacker and Hatemi-J (2004) indicate that the monthly data may be sensitive to other events and may be noisier. This study focuses on the *long-run effects* of changes in real exchange rates on the U.S. trade balance, and so the data of lower frequency are more appropriate.

entity and not as a separate unit (Lee and Lee, 2009). Countries having different income per capita may exhibit differences in their export supply and import demand ability. The geographic structure of trade between the U.S. and her trading partners in different regions or continents is likely to be affected by geographic distance, trade restriction measures, political and economic relationships, and so on. For example, the U.S. adopts a free trade policy with North American countries, but protectionism against East Asian countries, which are main exporters of manufactured goods to the U.S. and which mostly peg their currency to the US dollar. Furthermore, the U.S. has declared the Africa Growth and Opportunity Act to aid African economic development. Thus, this study classifies the sample data into seven sub-samples to explore whether the locations and levels of the real income of the U.S. trading partners exhibit different impacts on the relationship between currency devaluation and the U.S. bilateral trade balance.

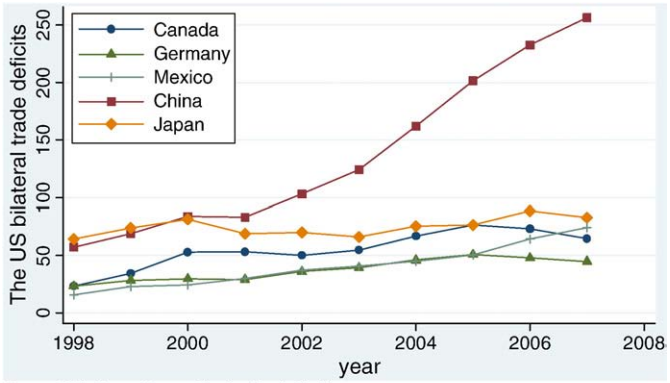
The next section briefly reviews the relationship among trade balance and macroeconomic variables in different countries. Section 3 introduces the Maddala and Wu (1999; MW hereafter) panel unit root test, Pedroni's cointegration tests, and the FMOLS technique. Section 4 establishes the empirical model and illustrates the variable definitions and data sources. Section 5 presents the empirical results and discusses the possible long-run relationships between the U.S. bilateral trade flow and real exchange rate. Section 6 offers findings and concludes.

2. Background and literature review

Fig. 1 displays the U.S. bilateral trade deficits with her top five trading partners, which were approximately US$523 billion in 2007 and accounted for 64% of the total trade deficit (US$816 billion). Despite the U.S. bilateral trade deficits with Canada, Germany, Japan, and Mexico being maintained under US$100 billion in recent years, China surpassed Japan to become the largest source of the U.S. bilateral trade deficits after 2000. In particular, these bilateral trade deficits with China have rapidly increased and reached a record level of US $256.3 billion in 2007.

We briefly review a number of arguments made in previous works, specifying to which type of data each applies. Based on the data used, the existing studies can be classified into two categories: aggregated or disaggregated (bilateral) trade data.[2] Using aggregated trade data, Moffett (1989) indicates that the long-run merchandise trade balance adjustment path looks like a sine wave, which means currency devaluation may deteriorate the U.S. trade balance. Bahmani-Oskooee (1991) finds that a long-run currency depreciation can improve the trade balance of least developed countries. Using the cointegration approach and error correction model (ECM), Lal and Lowinger (2002) point out that depreciation will increase the trade balance of India and Pakistan. Singh (2002) uses Indian data from 1960 to 1995 and suggests that the devaluation of the real effective exchange rate leads to an improvement in Indian trade balance. In contrast, Narayan (2004) and Duasa (2007), utilizing an autoregressive distributed lag (ARDL) approach, show that there is no long-run relationship between trade balance and the real exchange rate for Malaysia and New Zealand, respectively. Wang et al. (2007) find that there is little Renminbi (RMB) misalignment — that is, the RMB is not consistently undervalued, implying China's exchange rate policy may not play an important role in her trade surpluses.

The insignificant relationship between trade balance and exchange rate may arise from using aggregated trade data. Nadenichek (2000) adopts a two-country real business cycle model and confirms that a depreciation of the real exchange rate causes a deterioration of the U.S. trade balance with Japan, and thus the U.S. trade deficit with Japan cannot be diminished. Using the Johansen cointegration approach, ECM, and dynamic ordinary least squares (DOLS), Thorbecke (2006) finds that an appreciation of the RMB will lead to a generalized appreciation of Asian currencies that could impact China's processed exports, and thus help to reduce the U.S. trade deficit with China. Garcia-Herrero and Koivu (2007) indicate that a real appreciation of the RMB will reduce Chinese exports to the U.S., but it has no impact on Chinese imports from the U.S.



Source: U.S. Census Bureau, Foreign Trade Division.

Fig. 1. U.S. bilateral trade deficits (in US$ billion) with her top five trading partners, 1998–2007.

Yol and Baharumshah (2007) utilize the panel cointegration technique to examine the effects of exchange rate changes on the bilateral trade balance between ten African countries and the U.S. Their study reveals that a real exchange rate depreciation improves the bilateral trade balance for Botswana, Egypt, Kenya, Nigeria, Tunisia, and Uganda vis-à-vis the U.S., but worsens Tanzania's trade balance with the U.S. Harb (2007) also use the panel cointegration technique to estimate the price and income elasticities of imports and exports between Arab countries and the Euro zone. He presents that Arab imports from Europe are price elastic and income inelastic, however, the price and income elasticities of Arab exports to Europe are uncertain. Utilizing the ARDL approach, Bahmani-Oskooee and Harvery (2006) suggest that a real depreciation of the Malaysian Ringgit can increase Malaysia's trade balance with China, France, Germany, Indonesia, and the U.S. Narayan (2006) reports that a real devaluation of the Renminbi (RMB) improves the bilateral trade balance with the U.S. in the short run and long run.

Some works argue that a rise in U.S. net savings or higher productivity in the U.S. could improve the U.S. trade deficits. For example, Lee et al. (2006) indicate that the low levels of private and public saving rates relative to investment in the U.S. are the main factor for the massive U.S. current account deficits. McKinnon (2007) indicates that to reduce the U.S. current account deficits, net savings need to be increased in the U.S. and reduced abroad, particularly in Asia. Furthermore, Batra and Beladi (1998) show that countries exporting manufactured goods will have a persistent trade surplus, and countries with a large manufacturing sector will have higher productivity growth rates. The differentials in productivity growth rates could explain the trade imbalance. Obstfeld and Rogoff (2007) find that an increase in productivity of the U.S. tradable sector or of the Euro area and Japan's non-tradable sector could reduce the huge U.S. trade deficits. Cova et al. (2008) show that a 1% increase in the U.S. productivity in the non-tradable sector will reduce her trade account by 0.16% of GDP.

3. Econometric technique

Before carrying out the Pedroni panel cointegration tests, this paper uses the Augmented Dickey–Fuller (ADF) Fisher (1932) unit root test developed by Maddala and Wu (1999, hereafter MW) to verify that the variables are non-stationary, i.e., integrated of degree of one ($I(1)$). This paper then applies the group-mean FMOLS to estimate the coefficients of long-run relationships among these variables.

[2] Table A1 summarizes the selected empirical studies.