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## Effects of exchange rate variations on bilateral trade with a vehicle currency: Evidence from China and Singapore



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### ABSTRACT

Using a testable gravity-type bilateral trade model derived from an underlying demand and supply model, this paper explores the effects of exchange rate variations on bilateral trade in an exchange rate regime with a vehicle currency. The introduction of the vehicle currency allows us to figure out whether variations in the trade volume due to the fluctuation of the bilateral exchange rate are primarily due to changes in demand or in supply, or both. More specifically, in this theoretical framework, the appreciation of one country's currency against the vehicle currency is expected to promote its imports, but the effect of revaluation of the country's currency against the vehicle currency on its exports is ambiguous. Moreover, high volatility of the exchange rate of one country's currency against the vehicle currency is also expected to depress its import volume. From the empirical point of view, the decomposition of the bilateral exchange rate of two currencies into the bilateral rates of these two currencies against the vehicle currency provides a new alternative to avoid the econometric problem of potential reverse causality in assessing the effects. Through compiling a novel monthly bilateral-trade dataset between China and Singapore over 21 years or 252 months, we empirically test the predictions of our model, which get robust support from the results.

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## 1. Introduction

The relationship between exchange rates and international trade has been widely investigated in the literature, both theoretically and empirically. One stream of the literature focuses on the effect of exchange rate revaluation on trade balance, basically driven by the traditional question of whether depreciation of one country's currency would improve the country's current account balance. One well-known answer to this question is the Marshall–Lerner condition, pioneered by [Marshall \(1923\)](#) and [Lerner \(1946\)](#). Another well-known answer to this question is the so-called *J*-curve effect, which examines the short- and long-run effect of a currency's depreciation on the balance of trade. The *J*-curve effect was first figured out by [Magee \(1973\)](#), followed by [Bahmani-Oskooee \(1985\)](#), [Rose and Yellen \(1989\)](#) and [Backus et al. \(1994\)](#). For a thorough review of the literature about the effect of exchange rate revaluation on the trade balance, one may refer to [Bahmani-Oskooee and Ratha \(2004\)](#), [Auboin and Ruta \(2011\)](#), and [Huchet-Bourdon and Korinek \(2011\)](#).

Another stream of literature dealing with the relationship between exchange rate volatility and trade flows emerged with the breakdown of the Bretton Woods System in 1973, which was followed by increased volatility of exchange rates. In particular, the heavily debated question is whether exchange rate volatility depresses international trade. Following the seminal work by [Clark \(1973\)](#), which established a negative relationship between exchange rate volatility and international trade based on a simple but relatively well-known model, a huge body of literature has been trying to answer the question of whether exchange rate volatility depresses international trade, both theoretically or empirically. Unfortunately, however, no consensus has been achieved. For example, [Hooper and Kohlhausen \(1978\)](#) redefined [Clark's \(1973\)](#) model and tested it empirically, but found no significant negative effects of exchange rate volatility on trade volume; [Cushman \(1983\)](#) reported some significant negative effects using a similar methodology. More recent research includes [Cushman \(1986, 1987\)](#), [Koray and Lastrapes \(1989\)](#), [Poza \(1992\)](#), [Chowdhury \(1993\)](#), [Caporale and Doroodian \(1994\)](#), [Arize et al. \(2000\)](#), [Aristotelous \(2001\)](#), [Barkoulas et al. \(2002\)](#), [IMF \(2004\)](#), and [Huchet-Bourdon and Korinek \(2011\)](#). For a more detailed review, one may refer to [Auboin and Ruta \(2011\)](#).

However, the role of exchange rate regimes as an important factor in trade practice, especially in trade invoicing and settlement, has long been neglected in the literature, especially in the empirical literature. One reason might be the current dominance of the US dollar (USD) and the Euro in the invoicing of international trade.<sup>1</sup> Another reason might be that the vast majority of studies in this field examine the United States and its trading partners, and hence there is no vehicle currency problem involved. In this paper, with a simple testable model, we explore the effects of exchange rate variations on bilateral trade in an exchange rate regime with a vehicle currency. This is tested based a novel monthly bilateral trade dataset between China and Singapore over 21 years.

Specifically, we first derive a testable gravity-type bilateral trade model from an underlying demand and supply model with a vehicle currency introduced. A vehicle currency refers to the case where the bilateral trade is invoiced or settled by neither the currency of the home country nor that of the destination country, but by a third currency. In such cases, the effects of the bilateral exchange rates of both countries' currencies to the third vehicle currency would emerge and are even expected to dominate the bilateral exchange rate of the trading countries' currencies. Moreover, the introduction of the vehicle currency can help identify the source of variations in the trade volume due to fluctuations of the bilateral exchange rate in the sense that whether the demand or the supply responds or both. For example, the exchange rate of the export country's currency to the vehicle currency is expected to affect the trade directly and mainly through the supply side of the transaction. More specifically, in this theoretical framework, the appreciation of the import country's currency against the vehicle

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<sup>1</sup> According to [Goldberg and Tille \(2008\)](#), the US dollar is the primary invoice currency choice in transactions to and from the United States, and it is also a dominant currency in the invoicing of both exports and imports by countries outside of Europe. For example, both Korea and Thailand use the US dollar for more than 80% of trade transactions. Similarly, Japan, Australia, and Malaysia use it in more than 50% of their trade transactions. Even in the Euro-area countries, the US dollar is still used in about a third of exports and close to 40% of imports. In addition, the Euro-area countries make substantial use of the Euro, which is the invoice currency on 40 to 50% of exports.

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