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## Comment      Chaiyasit Anuchitworawong

Previous research has investigated the relationship between exchange rate volatility and international trade. The literature in this area dated back several decades and the issue has been recently and rigorously reexamined, given some improvements in analytical methods, and the quantity and quality of data used to explore the relationship. Most existing studies focus on the effect of exchange rate volatility on trade, despite the fact that there are two major lines of research that differently identify the direction of relationship between the two. The main line of causality runs from exchange rate volatility to international trade, as well as the other way around, which is motivated by the early and most influential paper by Mundell (1961) on the theory of optimal currency areas, which suggested that trade flows reduce exchange rate volatility. If one adds the two strands of literature together, it becomes obvious that the exchange rate process is not exogenously given, but may, in fact, be endogenous to the level of international trade among other factors.

Most of the past studies were based on models in which the direction of causality was assumed to run from exchange rate volatility to trade, implying that the exchange rate process is driven by exogenous shocks. The findings also varied widely depending on the data and empirical methodologies being

used. The most surprising result should be drawn from Rose (2000), who found strikingly high trade creation effect of currency union membership, and by extension, of a more stable exchange rate, implying that the currency union reduces exchange rate volatility, and thus increases trade flows. A number of other studies also suggest that exchange rate volatility dampens levels of international trade, while certain papers show no significant effects or even indicate negative association. However, on the theoretical front, there are several specific assumptions that underlie the relationship between trade and exchange rate volatility. This further casts doubts on the conclusiveness of empirical evidence. More importantly, many of the existing studies did not seriously account for the endogeneity issue. It is not until recently that only few theoretical and empirical studies take into account the opposite direction of causality (Hau 2002; Tenreyro 2003).

This chapter by Broda and Romalis also tackles the endogeneity issue between exchange rate volatility and trade mentioned earlier, but approaches the problem differently. Although the authors are not the first to address the reverse-causality problem between volatility and trade, the novelty of their chapter lies in the development of a multicountry model, with four countries and two sectors based on the theory of international trade to explicitly investigate the relationship between exchange rate volatility and international trade flows. Their model is the first attempt to consider both directions of causality between trade and exchange rate volatility, and to structurally derive the empirical identification of the system of equations to test the effect of trade on exchange rate volatility, and the other way around. Furthermore, the authors use the disaggregated data for a large number of developed and developing countries during 1970 to 1997, and incorporate the difference in trading and searching costs between differentiated and homogenous products, arguing that the omission of these transaction costs in the analysis will exacerbate the extent of omitted variable bias.

The authors use theory nicely to structure the problem, and then with the aid of a reasonable econometric method of GMM to examine the issue empirically and quantitatively. Empirically, the authors find strong support to the model prediction that the exchange rate volatility reduces trade while an increase in the volume of trade decreases the volatility. Overall, the chapter tends to suggest that the endogeneity problem should be an important element that makes the impact of exchange rate volatility on international trade found in other studies overestimated. Accounting for the reverse causality issue, the effect of exchange rate volatility and currency union on trade in differentiated products is substantially reduced when using the GMM estimation method.

Although the authors provide several interesting empirical results based on the system of equations suggested by the model, one can raise a number of issues for further discussion. A few assumptions were made in the model setting. However, certain assumptions may be relaxed to make the model

more realistic. First, I am quite concerned about the assumption that trade is always balanced. Although the authors argue that it is necessary to have some long-run trade balance condition in the model, one should note that it is not true in practice. For example, trade statistics in 2004 showed that the United States had by far the greatest trade imbalance. Its trade deficit with China was about one-third of its total deficit in manufactures, while China's surplus with the United States was larger than its overall trade surplus in manufacturers. However, China was running sizable manufacturing trade deficits with many of its neighbors in the Asia Pacific region, Japan in particular (Dekle, Eaton, and Kortum 2007). In sum, there is enormous room for large bilateral imbalances even in a world with overall balance. If bilateral trade imbalances are large for the sample countries in their study, the results may be biased. It may be essential to show whether the assumption can be relaxed with minimal effects on the theoretical results of the model.

The chapter also focuses on the market entry decision of exporting firms and further assumes no price rigidities in the model, implying that there is no role of price rigidities to the exchange rate. Although prices are likely to be flexible in the long run, one should note that there exists short-run market rigidities, particularly on the downward side. The study by Carlton (1986) suggests that prices for many transactions remain rigid for periods exceeding one year. There has also been the tendency for nominal rigidities to increase over time, particularly in developed economies. Hanes and James (2003) found that there is evidence of some manufacturing wage rigidity in the United States beginning in the late nineteenth century, which appears to have persisted into the twentieth century. Since the prices are not freely adjusted in short periods, this may bring about inefficient allocation of resources.

In the presence of price rigidities, firms set export prices before demand and exchange rate shocks are realized. As a consequence, firms encounter with greater price risk when invoices are denominated in foreign currency. Such uncertainty will affect the optimal pricing rule. Under a fixed exchange rate regime, productivity shock with normal price rigidities tends to have many more spillovers onto the real exchange rate volatility, while it is less affected under a flexible regime where certain mechanisms are in place to help offset an adverse shock. Moreover, in the presence of price rigidities, countries are likely to be more specialized under flexible exchange rates than under fixed exchange rates. Since the chapter includes only a small fraction of fixed exchange regime pairs in the sample set, and there exist short-term price rigidities in practice, the chapter should be carefully interpreted because exchange rate variability in a flexible exchange rate regime other than the fixed regime may create sectoral adjustment to shocks for firms located in the net-exporting countries, and cause further disturbance for firms producing the same goods in the net-importing country, resulting in more specialization in activities the countries can do the best, which

allows the patterns of interindustrial and intraindustrial trade to change. In addition to the differences in the countries' consumption baskets that are claimed in the chapter to affect real exchange rate movement, real exchange rates commonly measured as the ratio of price levels across countries also depend on the international specialization pattern (Bravo-Ortega and Giovanni 2005).

With respect to exchange rate uncertainties that are not resolved before the decisions are made, the chapter should therefore put some concern on the level of financial market development—whether actual hedging instruments as a substitute to invoicing strategies are present and actively utilized in the countries to reduce or eliminate exposure to exchange rate variations. Also, the central banks' intervention in the foreign exchange markets to smooth exchange rate variability should be considered another important element that affects the extent of exchange rate volatility.

The chapter takes into account the composition of trade—commodity and manufactured goods—by assuming that the exchange rate volatility solely affects trade in differentiated manufactured goods, meaning that commodity trade is unaffected by exchange rate volatility ( $\alpha_c = 0$ ). However, the exchange rate volatility may, in fact, affect the level of trades, varying across sectors. There are many reasons other than the degree of homogeneity, such as the level of competition, the production scale, accessibility to hedging instruments, storability, and so forth. In the literature, exchange rate uncertainty has a more pronounced impact on agricultural trade compared with trade in chemicals and other manufactured goods (Cho, Sheldon, and McCorrison 2002), positively affects poultry exports to Thailand (Langley et al. 2000), and negatively affects vegetable and fruit flows among the Organization for Economic Cooperation and Development (OECD) countries (Karemera et al. 2010). In sum, the effect is rather commodity-specific and not uniform across individual commodities. Given that countries are striving to move toward or become specialized in producing and exporting specific products, it is interesting to also test the impact of volatility on specific individual products.

Another general comment that should be noted is the consequence of rapid economic globalization during the past few decades. The chapter does include preferential trade agreement (PTA) between each pair of countries as a dummy variable in almost all tables, but not in table 3.1, to control for the trade impact of PTA. However, it might be a poor proxy for preferential trade because the level of trade in tariff lines and tariff rates between PTA partners where preferences are imposed are likely to matter more.

The important implication from this study seems to suggest that exchange rate stabilization through, for instance, the adoption of currency or monetary union membership can help boost international trade. In contrast to the findings found in the past studies, the magnitude of the impact of exchange rate volatility on trade flows has been substantially scaled down. Although

the authors confirm the trade-enhancing effect of the membership, the chapter is silent in demonstrating that the benefits of entering into membership must be weighed against the costs.

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## Comment Mark M. Spiegel

There are many studies in the literature that have identified a large effect of exchange rate volatility on the volume of trade. For example, Frankel and Rose (2002) found a 300 percent increase in trade volume as a result of joint membership in a monetary union. This result has been challenged in a number of papers, some of which have reduced the magnitude of the effect, but the qualitative result of an economically important impact of joint membership in a monetary union has held up empirically.

Broda and Romalis take this stylized fact as their starting point, noting that these studies typically take the exchange rate process as exogenous,