Comments on Broda and Romalis' "Identifying The Relationship Between Trade and Exchange Rate Volatility"

Mark M. Spiegel

Federal Reserve Bank of San Francisco

August 24, 2009

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% 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, implying that there is no reverse causality running from the volume of trade to exchange rate volatility. However, they argue that theory would suggest that increased trade would be expected to mitigate exchange rate volatility. They introduce a model where proximate countries engage in more bilateral trade and as a result have more similar consumption baskets. This directly implies that their real exchange rate volatility is reduced.

They also utilize their model as a vehicle for identification of the impact of increased trade on exchange rate volatility, as real exchange rate volatility impacts trade in different goods differently in their model. In particular, they assume that changes in real exchange rate volatility do not affect commodity trade volumes.

They then confirm empirically that increased trade does reduce real exchange rate variability. They obtain point estimates in their specification that suggests that trade volumes 1% larger are associated with a substantial 12% decline in bilateral real exchange rate volatility. They get weaker results for effect of exchange rate volatility on trade. Overall, they find that controlling for reverse causality reduces the effect of real exchange rate volatility on trade from 300% to 10 to 25%.

They obtain these results through a very simple theoretical model. The model has 4 countries i, 2 on each continent. Countries on the same continent are assumed to be more proximate. There is one factor of production, L, which is inelastically supplied. Trade is always balanced, and each country receives a country-specific labor productivity shock, θ_i^{-1}. All consumers identical CRRA preferences over consumption of manufactures, M, and commodities, C, with b share of income spent on M.

Commodity C is a composite good. Each country produces a different commodity, which is identical within countries and produced by perfectly competitive firms using a CRS technology where 1 unit of output for produces θ_i units of L. C is produced according to a CES function, where the elasticity of substitution between 2 commodities is equal to

$$C = \left(\sum_{i=1}^{4} \left(q_i^D \right)^{\frac{\sigma_c - 1}{\sigma_c}} \right)^{\frac{\sigma_c}{\sigma_c - 1}}.$$

The manufacturing sector produces a set of differentiated products with economies of scale and monopolistic competition. Active manufacturing producers pay a per period cost, $\alpha_1 \omega_i$, and a marginal cost of production equal to $\omega_i \theta_i$. Demand for manufacturing products is also assumed to be CES with an elasticity of substitution equal to $\sigma_m > 1$

$$M = \left(\sum_{\upsilon \in V} \left(q_\upsilon^D \right)^{\frac{\sigma_m - 1}{\sigma_m}} d\upsilon \right)^{\frac{\sigma_m}{\sigma_m - 1}}.$$

There is no foreign direct investment, so M is sold only through exports. In order to sell in a market, exporters must pay a "market development" fee equal to $\alpha_2 \omega_i$. The cost of transporting x_υ units from e to i then satisfies

$$XC_{ei}(x_\upsilon^S) = \omega(\alpha_2 + x_\upsilon^S \theta_e).$$

Trade in both manufactures and commodities are subject to iceberg costs which are higher for shipments on the other continent. For example, producers must ship τ_{1m} for 1 unit of m to arrive in other country on same continent, but must ship τ_{2m} for 1 unit of m to arrive in other continent,

where $\tau_{1m} < \tau_{2m}$. The iceberg cost specification for exports of commodity c are similar.

In equilibrium, commodity C is priced at marginal cost, while producers charge a constant markup for manufacturing which is higher for exports to the other continent because of increased transport costs. Solving the model, the authors demonstrate that only a fraction of manufacturers will choose to pay the market development cost and become exporters to each country. They then demonstrate that the value of exports of M from one country to another will be dependent on the share of firms that pay the fixed market development cost to export to the foreign country.

They then apply this result to the impact of real exchange rate volatility. In equilibrium, more proximate countries have more similar consumption bundles. As a result, productivity shocks affect relative price levels less for more proximate countries. Increased trade costs exacerbate this discrepancy. It follows that OLS regressions of trade on exchange rate volatility, similar to those found in the literature, will be biased because they ignore this channel.

Finally, the authors take this prediction to the data. As an Identification strategy, they assume that commodity trade is unaffected by exchange rate volatility, while trade in all goods have same effect on exchange rate volatility. Then with the usual assumptions that their specification is well-behaved, they estimate using GMM and compare their results with the benchmark of OLS methodology found in the literature.

Their OLS benchmark specification implies that a 10% increase in exchange rate volatility decreases trade in M by 0.7%, while a 10% increase in trade decreases exchange rate volatility 0.3%. However, their GMM results suggest that the effect of volatility on trade is decreased by 70%. This reduces the estimated currency union effect on trade from 250% to a much more plausible 25%.

Let me next turn to some comments. First, I really liked this paper, particularly the simple and intuitive model. It motivates and endogenous channel for the reverse effect of trade influencing exchange rate variability. The model makes use of the differences in the impacts of exchange rate volatility on commodities and differentiated products to obtain identifying restrictions that the authors then carefully take to the data. All in all, a quality piece of work that yields the important result that the estimated impact of currency unions on trade is far lower than the values found in the literature.

However, this is not the first paper to address the endogeneity issue. As noted by the authors, Frankel and Wei (1993) instrumented for reverse causality using the standard deviation of relative money supplies. They also find that reduced exchange rate variability has a small impact on the level of trade. Similarly, Persson (2001) uses treatment effects for the impact of joining a currency union, while Tenreyro (2007) uses proximity to a "monetary anchor" country as proxies for exchange rate variability. Again, both find minimal impact from nominal exchange rate variability on the volume of trade flows, similar to the results in this paper.

I am most concerned about the similarity of this paper to that of Hau (2002). As in this paper, Hau models the consumption bundle as a function of openness. The channel is somewhat different in his paper, as more closed economies have a lower share of tradables in their consumption bundle, resulting in increased real exchange rate volatility. Hau then also takes his model to the data and confirms that economically open economies have lower real exchange rate volatility. Overall, the qualitative stories and results appear quite similar to that in this paper. The authors are careful to cite all of this existing literature, but the lack of novelty in the empirical results implies to my mind that the primary contribution of the paper is the new model and the identification strategy used in the empirics.

When taking the model to the data, I am also concerned that the determinants of the share of manufacturers that go abroad is posited to be solely a function of relative exchange rate volatility. Even according to the strict specification in the model, the share of manufacturers that go abroad is also a function of transport costs. Now, the paper does condition on exporter-importer fixed effects, but relative transport costs may differ empirically across commodities.

The broader literature also focuses on firm heterogeneity. There is extensive evidence that firms that export are larger and more productive. One would think that the empirical specification would attempt to account for likely differences in such characteristics beyond controlling for exporter and importer fixed effects. Are these sources of heterogeneity likely to be less time-varying than real exchange rate variability?

I also think that the imposition of a constant share of expenditure on M and C is a little restrictive. In reality, there are likely to be some opportunities to substitute between the two classes of commodities. For example, recent skyrocketing oil prices coincided with large increases in the price of

fuel-efficient vehicles. If these commodities are sufficiently substitutable, the identification vehicle used could be compromised.

There are also likely to be independent channels for exchange rate variability to adversely affect trade volumes, other than the exchange rate variability channel stressed in the paper. For example, one must also acknowledge that even though prices are likely to be flexible in the long run, there are likely to be persistent short run price rigidities. This is outside the scope of the model, but trade is usually invoice in some currency, and in each period some party will likely bear the risk of that invoicing. This is true even if the risk is put off to a third party. The cost of inducing an alternate party to bear this risk will also be likely increasing in the severity of exchange rate volatility. As such, exchange rate volatility is likely to affect the ability to invoice in a single currency, and thereby affect economic decisions, including the pattern of trade.

I would also point out that the effects of joining a currency union may go beyond the effect of reduced exchange rate volatility. There are macroeconomic policy rules typically associated with membership in a currency union, most famously those associated with the Maastricht Treaty rules for eligibility for the European Monetary Union. Common monetary union members may also be in other associations, again the European example comes first to mind, that require policy harmonization in other dimensions, for example labor and financial regulatory policies. These alternative channels may also increase trade volumes, leading to a possible bias to the currency union coefficient if we attribute the currency union effect to be solely a function of reduced exchange rate variability.

References

Hau, Harold, (2002), "Real Exchange Rate Volatility and Economic Openness: Theory and Evidence," Journal of Money, Credit, and Banking, 34(3), 611-630.

Frankel, Jeffrey and Shang-Jin Wei, (1993), "Trade Blocs and Currency Blocs," NBER Working Paper No. 4335.

Frankel, Jeffrey A., and Andrew K. Rose, (2002), "An Estimate of the Effect of Currency Unions on Trade and Growth," Quarterly Journal of Economics, 117(2), 437-466.

Tenreyro, Sivana, (2007), "On the Trade Impact of Nominal Exchange Rate Volatility," Journal of Development Economics, 82, 485-508.