Discussion of *The Estimated Effects of the Euro on Trade: Why Are They Below Historical Evidence on the Effects of Monetary Unions among Smaller Countries?* By Jeffrey Frankel.

Background and summary

In an influential and provocative paper, Andy Rose (2000) reported that sharing a common currency enhanced bilateral trade by more than 200 percent.[1] The paper divided the profession into two camps: Believers and skeptics. The latter doubted the plausibility of such a large trade effect and pointed out the futility of attempting to extrapolate the post-war experience of currency unions (made mostly of small and poor countries) to countries adopting the euro. Subsequent work by Micco, Stein, and Ordoñez (2003), using data on the early years of the euro, found that the effect of the euro on bilateral trade between euro-zone countries ranged from 4 to 10 percent, when compared to trade between all other pairs of countries, and from 8 to 16 percent, when compared to trade among non-euro-zone countries.

As the euro marks its 10th anniversary, Jeff's paper provides a timely opportunity to explain the gap between Rose's and Micco et al.'s estimates and to reappraise the effect of the euro on trade.

The paper argues that the gap between estimates is not caused by any of the usual suspects. In particular, the difference is not caused by 1) lags (or the view that it takes time for currency unions to affect trade patterns); 2) omitted variables (including the Anderson-vanWincoop's multilateral resistance term[2]); 3) reverse causality (trade may lead to the formation of currency unions); or 4) threshold effects (or the view that currency unions can cause large trade increases in countries that are below a certain size or income threshold). Instead, the paper concludes that the culprit for the difference in estimates is sample size. Indeed, Micco et al. estimated the euro effect using only post-1992 data. When the whole sample (with all country pairs, going back to the mid 1940s) is used, Jeff's paper finds that sharing the euro is associated with an increase in trade among euro-zone countries of between 150 and 170 percent, very close to the tripling effect documented by Rose. The paper then argues that the large estimates for the euro (150 - 170 percent trade effect) resulting from the extended sample should be preferred.

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[1]With some exceptions, work by other scholars found confirmatory results using post-war data. See early review in Alesina, Barro, and Tenreyro (2002) and Baldwin (2006).

[2]See Anderson and van Wincoop (2002).

Comments

Explaining the source of difference in estimates is certainly a welcome contribution. The case in support of the large estimates (from the extended sample) is, however, unconvincing. To see why, let us start by looking at Figure 1, which shows the exports from euro-zone countries to other euro-zone countries relative to the aggregate GDP of the euro zone.[3] The plot shows that in 1990 the average euro-zone country was exporting 12 percent of its GDP to other euro-zone countries. The corresponding figure was (just below) 16 percent by the end of the sample.

Fig. 1. Exports from euro-zone to other euro-zone members relative to GDP

Exports from EMU to EMU members (relative to EMU GDP)
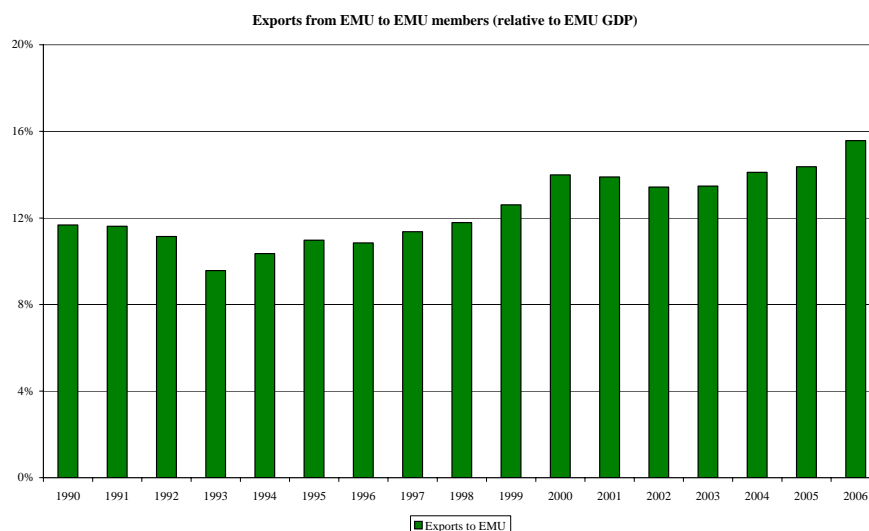
Source: Tenreyro's computation using DOTS and WDI.

If the paper's preferred estimates are correct, the question is then: what would exports have looked like if the euro had not been introduced? This question can be easily addressed using the paper's estimates. The estimated equation is given by:

$$\ln y_{ijt} = x_{ijt}\beta + \gamma_t EMU_{ijt} + \varepsilon_{ijt},$$

where y_{ij} is bilateral trade between two countries i and j at time t, x_{ijt} is a set of controls and EMU_{ijt} is a dummy variable that takes on the value 1 if both countries are in the euro zone, and 0 otherwise. Hence, predicted bilateral trade flows are given by:[4]

$$\hat{y}_{ijt} = \exp(x_{ijt}\hat{\beta}),$$

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[3]By euro zone here I refer to the 11 countries that adopted the euro in 1999 plus Greece.

[4]This ignores heteroskedasticity and other issues raised in Santos-Silva and Tenreyro (2006)

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if at least one of the countries is not in the euro zone, and

$$\hat{y}_{ijt} = \exp(x_{ijt}\hat{\beta} + \hat{\gamma}_t) = \exp(x_{ijt}\hat{\beta})\exp(\hat{\gamma}_t)$$

if both countries are in the euro zone. The factor $\exp(\hat{\gamma}_t)$ is the enhancement effect coming from using the euro. Hence, we can compute the counterfactual bilateral trade flows between euro members in the post-1998 period under the assumption that the euro had not been introduced as:

$$\frac{y_{ijt}}{\exp(\hat{\gamma}_t)}$$

where y_{ij} is *actual* exports between two euro-zone members and the coefficients $\hat{\gamma}_t$ $\{t = 1998...\}$ are the paper's (preferred) estimates. Aggregating y_{ijt} over all euro members, we can then compute overall exports from euro countries to other euro countries as a share of GDP, as in Figure 1. Figure 2 shows these counterfactual exports as a share of GDP, together with the actual shares (from Figure 1).

Fig. 2. Actual and counterfactual exports from euro-zone to other euro-zone members relative to GDP

Actual and counterfactual exports from EMU to EMU members (relative to EMU GDP)
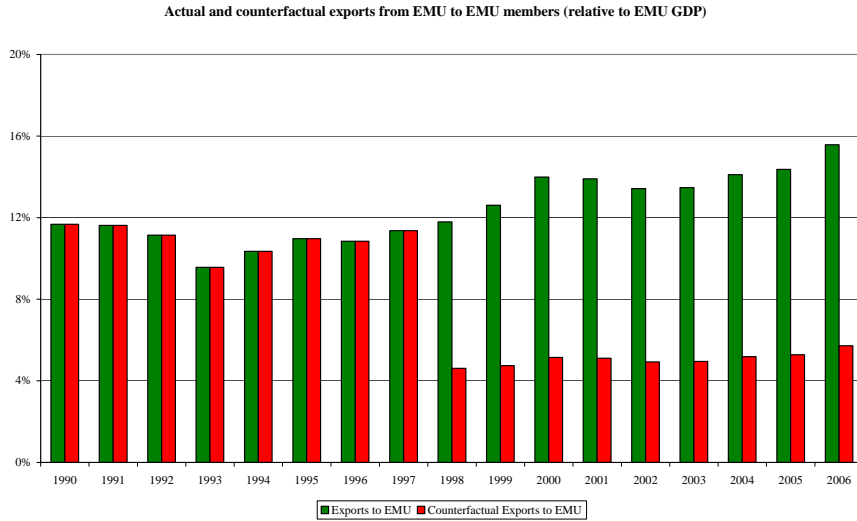
Source: Tenreyro's computation using DOTS, WDI and Frankel (2008)'s estimates

As the Figure illustrates, the paper's preferred estimates imply that if the euro had not been introduced, trade shares would have collapsed in 1998. This leaves the reader with two options: Either to believe that trade shares would have shrank dramatically without the euro, or to remain skeptical of the large estimates. I could not come up with any substantive reason for a trade fall of such dimensions. Moreover, for the reasons I will later explain, I think the estimation is misspecified and the biases generated by the misspecification become more severe when the large sample is used.

There are at least two important concerns raised by the estimation approach that the paper tries to address: Endogeneity and sample size. I would like to discuss them in more depth.

1. Endogeneity: A natural experiment

In an almost self-contained section, the paper argues that endogeneity is not a serious problem in the estimation and therefore not the source of the large estimates. To make this point, the paper studies bilateral trade patterns between countries in the euro zone and countries in the CFA-franc zone.[5] The latter, which were pegging their currency to the French franc before the introduction of the euro, continued to peg their currency to France's, that is, to the euro, after 1999. These countries hence found their currency almost accidentally pegged to that of all other countries in the euro zone. This historical "accident" is an ideal quasi-experiment to evaluate the effect of a strong peg on trade. And it is obviously an important exercise in its own right, of fundamental value for development macroeconomists. The author should be commended for the idea. As before, however, I would like to comment on the size of the trade-enhancement effect.

To gauge the trade impact of the strong peg between the CFA-franc and the euro, the paper introduces a dummy variable that takes on the value 1 if one of the countries is in the CFA-franc zone and the other is in the euro zone (currently or in the future) and 0 otherwise; so, for example, for the pair Italy-Congo, this dummy is always 1. This dummy is then interacted with year dummies from 1980 to 2006 so as to estimate the extra trade between CFA and euro-zone country pairs over time. That is:

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\begin{aligned}
\ln y_{ijt} = \ & x_{ijt}\beta + \gamma_1 \cdot \textit{One Country in CFA the other in EMU} \times 1980 + \\
& +\gamma_2 \cdot \textit{One Country in CFA the other in EMU} \times 1981 + \\
& +\gamma_3 \cdot \textit{One Country in CFA the other in EMU} \times 1982 + \\
& \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\
& +\gamma_{28} \cdot \textit{One Country in CFA the other in EMU} \times 2006 + \varepsilon_{ijt}
\end{aligned}
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As before, the estimated coefficients $\hat{\gamma}_1$ through $\hat{\gamma}_{28}$ relate to the extra trade between

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[5]The CFA-franc zone comprises two different monetary unions: The "West African Economic and Monetary Union," which uses the West African franc CFA (where CFA stands for *Communauté financière d'Afrique*) and the "Economic and Monetary Community of Central Africa," which uses the Central Africa CFA franc (where CFA stands for *Coopération Financière en Afrique Centrale*).

a CFA member and a euro-zone member (future or current). Figure 3 below plots these coefficients together with the one- and two-standard-error bands against time (as reported in the paper), highlighting the year in which the euro was introduced. Interestingly, trade between these two groups of countries has been historically larger than trade between other country pairs (the coefficients are always positive). The Figure also shows a stark increase in trade in 1997. The timing is not perfect for the euro, as trade seems to jump before the actual introduction of the euro; the paper acknowledges this point straight away but compellingly argues that the effect may have been anticipated as expectations of the euro became more firmly established. There is, however, some confusion regarding the magnitude of the effect. The paper estimates CFA franc-euro effect of about 70 per cent in the post-1997 period (with $70\% = [\exp(0.55) - 1] \cdot 100\%$, where 0.55 is an average of the point estimates of the $\hat{\gamma}$-coefficients over the post-1997 period). The enhancement effect, however, should be computed as the difference between the post- and pre-1997 (or the relevant year) periods, since trade between these two groups was already large in the 1980s. The average $\hat{\gamma}$-coefficient in the pre-1997 period was about 0.35, implying that the enhancement effect could not have been larger than 20 percent ($20\% = [\exp(0.55 - 0.35) - 1] \cdot 100\%$). This number is much closer to Micco et al.'s estimates than to Rose's, suggesting that endogeneity may have after all played an important role in Rose's estimates. **But this should not distract us from the main finding: The euro has increased trade between CFA-franc-zone and euro-zone countries; this is an unexpected, positive, and important by-product of the euro.**

Fig. 3. CFA-Euro zone coefficients and standard-error bands.

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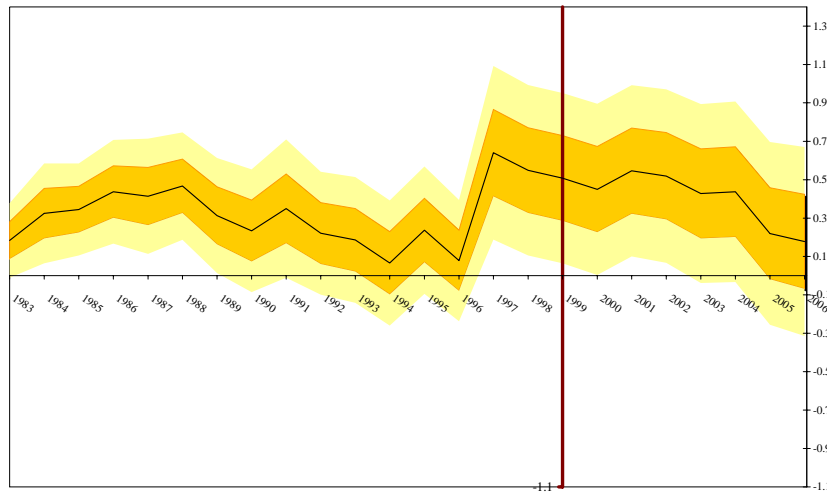
2. Sample size (and the problems with zeroes and heteroskedasticity)

The paper argues that the gap between 10 and 200 percent in estimates is almost fully explained by sample size. When the full sample (with all country-pairs, going back to the mid 1940s) is used, the estimated coefficient on the euro becomes close to 200 percent. As argued earlier, it is impossible to conceive an enhancement effect of such magnitude without making heroic assumptions. Still, it is of academic interest to ask why and how the paper can obtain such large estimates in the full sample. To understand why, notice that the large-sample specification imposes the same coefficients of the gravity equation to all country pairs over time. The paper argues that this is a good strategy, as more information is available to pin down the coefficients on other gravity variables. But it is not clear to me why one should do that: Coefficients may indeed have changed over time and across countries and constraining the estimated parameters to be constant could lead to serious misspecification. This adds problems to the already misspecified estimation, which uses the logarithm of bilateral trade, a variable that 1) frequently (in more than 30 percent of the observations) takes the value zero and 2) is highly hetoreskedastic. Both the presence of zeroes and heteroskedasticity lead to inconsistent estimates in logarithmic specifications, as shown in Santos-Silva and Tenreyro (2006). The larger sample makes the problem of zeroes and heteroskedasticity much more severe as there is a larger proportion of zeroes in the sample going back to the mid 1940s and as it includes highly heterogeneous countries, increasing the relevance of heteroskedasticity. In sum, there is every reason to try to avoid the large-sample estimates, unless an appropriate estimator is used. My suggestion is to use the estimator proposed in Santos-Silva and Tenreyro (2006), together with time-varying coefficients on the gravity variables and the euro effect.

Final remarks

An enjoyable and stimulating article that will give new impetus to the debate over the pros and cons of currency unions.

References

[1] Alesina, A., R. Barro, and S. Tenreyro (2002), "Optimal Currency Areas," NBER Macroeconomics Annual, Mark Gertler and Kenneth Rogoff, eds. Cambridge, MA: MIT Press, 2002.

[2] Anderson, J. and E. van Wincoop (2003), "Gravity with Gravitas: A Solution to the Border Puzzle," *American Economic Review*, 93, 170-192.

[3] Baldwin, R. (2006), "In or Out: Does It Matter? An Evidence-Based Analysis of the Euro's Trade Effects," June 2006, CEPR.

[4] Micco, A., E. Stein, and D. Ordoñez (2003), "The Currency Union Effect on Trade: Early Evidence from EMU," *Economic Policy*, October 2003, 315–356.

[5] Rose, A. (2000), "One Money, One Market: Estimating the Effect of Common Currencies on Trade," *Economic Policy*, 30, 7–46.

[6] Santos-Silva, J.M.C. and S. Tenreyro (2006), "The Log of Gravity," *The Review of Economics and Statistics*, 88, 4: 641-658.