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Comment Silvana Tenreyro

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 postwar 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 noneuro zone countries.

As the euro marks its tenth anniversary, Frankel's chapter provides a timely opportunity to explain the gap between Rose's and Micco, Stein, and Ordoñez's estimates and to reappraise the effect of the euro on trade.

The chapter argues that the gap between estimates is not caused by any of the usual suspects. In particular, the difference is not caused by (a) lags (or the view that it takes time for currency unions to affect trade patterns); (b) omitted variables (including the Anderson and Van Wincoop multilateral resistance term);[2] (c) reverse causality (trade may lead to the formation of currency unions); or (d) 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 chapter concludes that the culprit for the difference in estimates is sample size. Indeed, Micco, Stein, and Ordoñez (2003) 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, Fran-

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

2. See Anderson and Van Wincoop (2002).

kel's chapter 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 chapter then argues that the large estimates for the euro (150 to 170 percent trade effect) resulting from the extended sample should be preferred.

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), however, is unconvincing. To see why, let us start by looking at figure 5C.1, which shows the exports from euro zone countries to other euro zone countries relative to the aggregate gross domestic product (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.

If the chapter'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 easily be addressed using the chapter's estimates. The estimated equation is given by:

$$\ln y_{ijt} = x_{ijt}\beta + \gamma_t \, \mathrm{EMU}_{ijt} + \varepsilon_{ijt},$$

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]

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

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 $\hat{\gamma}_t$ $\{t = 1998 \ldots\}$ are the chapter's (preferred) estimates. Aggregating y_{ijt} over all euro members, we can then compute overall exports from euro

3. By euro zone, here, I refer to the eleven countries that adopted the euro in 1999, plus Greece.

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

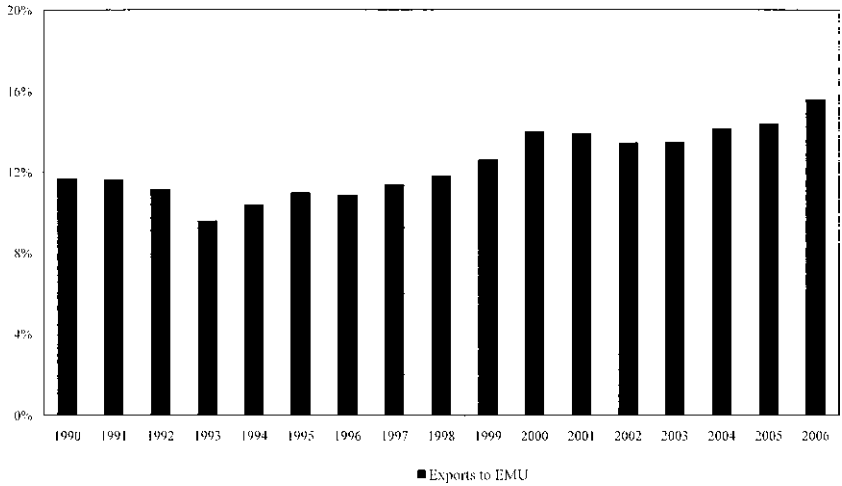

Fig. 5C.1 Exports from euro zone to other euro zone members relative to GDP
Source: Tenreyro's computation using Direction of Trade Statistics (DOTS; International Monetary Fund) and World Development Indicators (WDI; World Bank).

countries to other euro countries as a share of GDP, as in figure 5C.1. Figure 5C.2 shows these counterfactual exports as a share of GDP, together with the actual shares (from figure 5C.1).

As the figure illustrates, the chapter'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 believe that trade shares would have shrank dramatically without the euro or 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 chapter tries to address: endogeneity and sample size. I would like to discuss them in more depth.

Endogeneity: A Natural Experiment

In an almost self-contained section, the chapter 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 chapter 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

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 *Commu-*

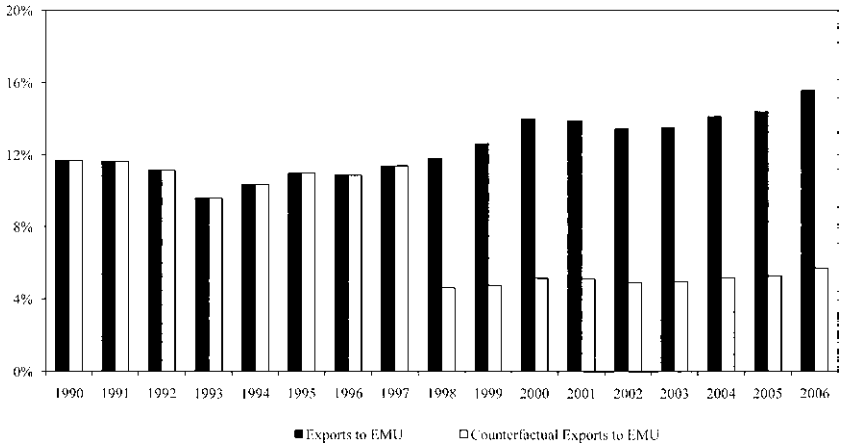

Fig. 5C.2 Actual and counterfactual exports from euro zone to other euro zone members relative to GDP

Source: Tenreyro's computation using DOTS, WDI, and Frankel's (2008) estimates.

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 and is 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 chapter 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 European Monetary Union (EMU; 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:

$$\begin{aligned}\ln y_{ijt} = x_{ijt}\beta &+ \gamma_1 \cdot \text{one country in CFA, the other in EMU} \times 1980 \\ &+ \gamma_2 \cdot \text{one country in CFA, the other in EMU} \times 1981 \\ &+ \gamma_3 \cdot \text{one country in CFA, the other in EMU} \times 1982 \\ &\quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \\ &+ \gamma_{28} \cdot \text{one country in CFA, the other in EMU} \times 2006 + \varepsilon_{ijt}.\end{aligned}$$

nauté Financiére d'Afrique), and the Economic and Monetary Community of Central Africa, which uses the Central African CFA franc (where CFA stands for *Coopération Financière en Afrique Centrale*).

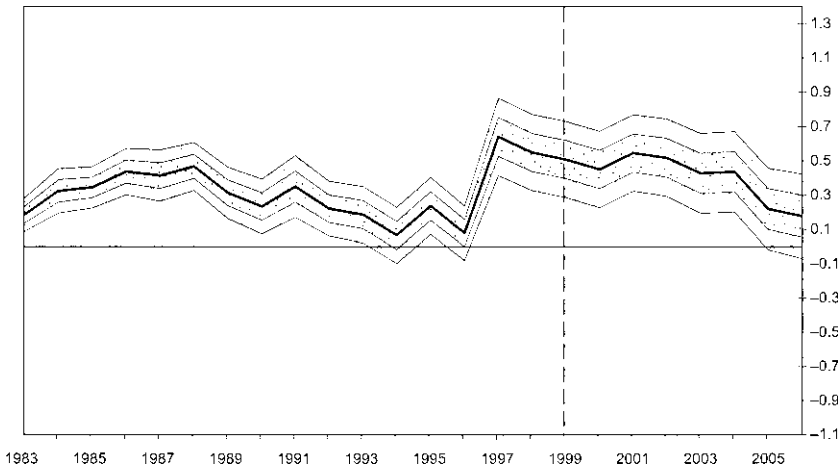

Fig. 5C.3 CFA-euro zone coefficients and standard error bands

As before, the estimated coefficients $\hat{\gamma}_1$ through $\hat{\gamma}_{28}$ relate to the extra trade between a CFA member and a euro zone member (future or current). Figure 5C.3 plots these coefficients together with the one- and two-standard-error bands against time (as reported in the chapter), 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 chapter acknowledges this point straight away but compellingly argues that the effect may have been anticipated as expectations of the euro became more firmly established. However, there is some confusion regarding the magnitude of the effect. The chapter estimates a CFA franc-euro effect of about 70 percent in the post-1997 period (with 70 percent = $[\exp(0.55) - 1] \cdot 100$ percent, 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, as 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 percent = $[\exp(0.55 - 0.35) - 1] \cdot 100$ percent). This number is much closer to Micco, Stein, and Ordoñez's estimates than to Rose's, suggesting that endogeneity may have played an important role in Rose's estimates after all. *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.

Sample Size (and the Problems with Zeroes and Heteroskedasticity)

The chapter 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 chapter 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 chapter 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 (a) frequently (in more than 30 percent of the observations) takes the value 0 and (b) 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

Frankel has written an enjoyable and stimulating article that will give new impetus to the debate over the pros and cons of currency unions.

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