The currency union effect on trade is decreasing over time

José de Sousa

University of Paris Sud and CES, University of Paris 1, France

A R T I C L E   I N F O

Article history:
Received 23 December 2011
Received in revised form
28 June 2012
Accepted 11 July 2012
Available online 16 July 2012

JEL classification:
F15
F33

Keywords:
Currency unions
Dollarization
Trade
Gravity
Poisson

A B S T R A C T

Estimating a theoretical gravity model over a sixty-year period, from 1948 to 2009, I found an unexpected trend: the currency union impact on trade is decreasing over time. This result suggests that with trade and financial globalization, currency unions become less and less important for promoting trade.

© 2012 Elsevier B.V. All rights reserved.

1. Introduction

Rose (2000) documented a striking result: two countries that share a currency trade three times as much as they would with different currencies, ceteris paribus. By Web-posting his data sets and programs, Rose gave the profession a unique opportunity to carry out “search and destroy” missions on the currency union (CU) effect on trade (see Baldwin, 2006; Santos Silva and Tenreyro, 2010, for recent reviews). Rigorous estimates for CU effects and how they vary over time are important for the economic debate between those who see major advantages of adopting a common currency and those who see more costs than benefits.

In this paper, I document an unexpected trend: the CU impact on trade is decreasing over time. In contrast, the literature finds that the size of the CU effect is stable (Rose, 2000, Table 1) or increasing over time (Glick and Rose, 2002, Table 3).

Why is the CU effect decreasing over time? It could be that with trade and financial globalization, CUs become less and less important for promoting trade. If this economic argument is valid, then the downward trend should be relatively insensitive to the different kinds of CUs. Using the data and specification of Rose (2000), Levy Yeyati (2003) documented differential effects on trade between multilateral and unilateral CUs. However, I find a downward trend for both currency arrangements, i.e., when countries negotiate multilaterally to set up a CU and when they adopt unilaterally the currency of an anchor.

The documented downward CU effect is based on a theoretically consistent estimation of the gravity equation: year by year, from 1948 to 2009, in its multiplicative form, by the Poisson pseudo-maximum likelihood (PPML) estimator with importer and exporter fixed effects. This estimator addresses two typical problems in estimating gravity equations with the OLS: sample selection and inconsistency (Santos Silva and Tenreyro, 2006). The sample selection results from the conventional logarithmic transformation of the dependent variable that converts the zeros of the non-trading pairs to missing values. The OLS inconsistency comes from the fact that the expected value of the log-linearized error will depend on covariates. This inconsistency is a first-order issue. I find that the OLS estimates of the CU are quite stable while the PPML estimates are decreasing over time, with or without incorporation of the zeros. Thus, in 1948, two countries that share a currency trade eight times as much as they would with different currencies, ceteris paribus, while in 2009 CUs are found to have no positive effect on trade.

The rest of the paper is organized as follows. In Section 2, I briefly describe the specification and data. In Section 3, I present the results. The last section concludes.

I thank two anonymous referees for their encouragement and constructive remarks. I am grateful to Peter Egger, Keith Head, Jean Imbs, Joachim Jarreau, John Romalis and Joao Santos Silva for much helpful advice and insightful discussions on this topic. I also thank Jules Hugot for outstanding research assistance.

Tel.: +33 1 44 07 82 55
E-mail address: jdesousa@univ-paris1.fr.

0165-1765/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
doi:10.1016/j.econlet.2012.07.009
2. Specification and data

2.1. Specification

Adopting the assumptions of an endowment economy, Armington specialization and identical constant elasticity of substitution, Anderson and van Wincoop (2003) derive a theoretical gravity equation:

$$X_{ij} = \frac{Y_i E_i Y_j e_i}{(\tau_{ij}/P_i P_j)^{1-\sigma}}.$$  (1)

where $X_{ij}$ is the nominal value of exports from country i to country j, $Y_i$ is the total sales by origin i, $E_i$ is the total expenditure of destination j, $Y_j$ is the nominal value of world output, $\sigma$ is the elasticity of substitution between the countries’ goods, $\tau_{ij} \geq 1$ is the iceberg-type trade costs (i.e., the units of the product that must be shipped to j for one unit to arrive) and $P_i$ is f’s multilateral trade resistance (i.e., a price index that depends positively on trade barriers between i and all of its trading partners). From Eq. (1), two steps are necessary to get an estimable equation.

The functional form for trade costs ($\tau_{ij}$) has first to be specified. We follow, as a benchmark, Rose and van Wincoop (2001), who used Eq. (1) to estimate the CU effect on trade, and assume that $\tau_{ij}$ is a stochastic log-linear function of observables.

$$\ln \tau_{ij} = \rho \ln \text{dist}_{ij} + z_i \beta + \gamma \text{CU}_i + u_{ij},$$  (2)

where $u_i$ is a random error, $\text{CU}$ is the common currency union dummy, dist is the bilateral distance, a typical proxy for transportation costs, and $z_i$ is a vector whose elements are dummies indicating whether two countries share a land border, share a language, share a free trade agreement (FTA), have had a common colonizer after 1945, are currently in a colonial relationship, or were/are the same state for a long period.

The second step is to model the monadic $i$ ($Y_i$, $P_i$) and $j$ ($E_j$, $P_j$) terms in Eq. (1). I use the simplest solution, that consists in replacing monadic terms by exporter and importer country fixed effects, $\alpha_i$ and $\alpha_j$ respectively. Given this solution and the trade costs function (2), the conventional approach for estimating (1) is to take logs of both sides to obtain a linear regression model (dropping the constant term)

$$\ln X_{ij} = \alpha_i + \alpha_j + \delta \ln \text{dist}_{ij} + z_i (1-\sigma) \beta + \lambda \text{CU}_i + (1-\sigma) u_{ij},$$  (3)

where $\delta = \rho(1-\sigma)$ and $\lambda = (1-\sigma) \gamma$. Eq. (3) is simply estimated with OLS. On the downside, the log model (3) drops zero values of trade and can cause severe inconsistency. In contrast, I use the PPML technique and estimate consistently

$$X_{ij} = \exp(\alpha_i + \alpha_j + \delta \ln \text{dist}_{ij} + z_i (1-\sigma) \beta + \lambda \text{CU}_i) e_i,$$  (4)

where $e_i = \exp((1-\sigma) u_{ij}).$


2.2. Data

Following the advice of Rose (2001) that “a larger data set is unambiguously more informative than a smaller one”, I extend the Glick and Rose (2002) sample, on the basis of the same source of trade data, i.e., the International Monetary Fund’s Direction of Trade Statistics. The sample covers 203 countries and the period 1948–2009, which is of crucial importance since this includes the euro creation in 1999. Bilateral distance and various dummies contained in $z_i$ come from the CEPII distance database, except the free trade agreement and currency union dummies.

3. Results

To get theoretically consistent parameter estimates, I run Eqs. (3) and (4) year by year, from 1948 to 2009, with directional country fixed effects. Standard errors are clustered at the country-pair level. I consider that the pair of countries $ij$ is in the same cluster as $ji$ because a common shock may affect both directions of trade. To save space, I plot in Fig. 1 the annual estimates of the CU dummy and the clustered 95% confidence interval around the point estimate.

Fig. 1 depicts interesting differences. In the left panel, the OLS CU effect is quite stable until 1992, despite a temporary drop at the end of the seventies. As an illustration of this stability, given the sampling error, the CU effect in 1948 is not statistically different from the one in 1992, that is forty-four years later. In 1948, two countries that share a currency trade 187% ($=\exp(1.05) - 1 \times 100$) as much as they would with different currencies, against 135% ($=\exp(0.85) - 1 \times 100$) in 1992. After 1992, the OLS CU effect decreases and is equal to zero from 1998 onwards.

The OLS results somewhat contrast with the PPML results shown in the right panel of Fig. 1. In 1948, the PPML CU effect implies that, other things being equal, trade between two countries that share a currency is eight times larger than the trade between two countries using different currencies ($=\exp(2.11) \approx 8$). The CU effect is then decreasing sharply from 1948 to 1998. It even becomes significantly negative at the beginning of the nineties. As a comparison with the positive OLS estimate in 1992, the corresponding PPML estimate is negative (but statistically insignificant). Finally, in 1999, presumably due to the euro creation, the average CU effect increases to zero.

There is one interesting similarity between OLS and PPML estimates: from 1999 onwards the average CU effect is not statistically different from zero. However, the interpretation of this similarity differs. The OLS pre-euro effect tends to be larger, which suggests a comparatively smaller effect of the euro on trade. In contrast, the PPML pre-euro effect tends to be lower. This suggests a comparatively bigger effect of the euro on trade.

The contrasting results of Fig. 1 imply that the choice of the estimator matters. The PPML can address both inconsistency of
the OLS and sample selection. The latter results from the logarithmic transformation converting the zeros of the non-trading pairs to missing values. On average, depending on the year, this transformation leaves out about 50% of the observations. Dropping these observations can cause additional biases in the estimation. This can be “particularly problematic when one considers small or poor countries (such as the ones that have been clients in or part of multilateral currency unions in Rose’s data)” (Santos Silva and Tenreyro, 2010, p. 57). However, the PPML estimates are remarkably similar using the whole sample or the positive-trade subsample.7 Thus, the inconsistency of the OLS, addressed with the PPML, appears to explain the contrasting results of Fig. 1.

Interestingly, the distance puzzle, that the volume of trade has become increasingly sensitive to distance, is an empirical regularity that also depends crucially on the choice of the estimator. The role of geographical distance as a trade deterrent is significantly lower under PPML (Santos Silva and Tenreyro, 2006). My annual regressions confirm this finding. Fig. 2 depicts the increase in the absolute value of the OLS distance elasticity over time, documented in Disdier and Head (2008). With PPML the puzzling increase of the distance elasticity vanishes.8

Why does sharing a currency have smaller effects on trade over time? It could be that with trade and financial globalization, the CUs become less and less important for promoting trade. As out pointed above, if this is a valid economic argument, then the downward trend should be relatively insensitive to the different kinds of CUs. Using the Rose (2000) data and specification, Levy Yeyati (2003) documented differential effects on trade between multilateral and unilateral currency unions. The latter are hub and spokes currency arrangements (Baldwin, 2006), i.e., some countries (the spokes) unilaterally adopt the currency of a larger country (the hub) as legal tender. They represent two kinds of bilateral trade flows: between the hub and a spoke and between the spokes. To check whether the downward CU effect is driven by the differences in currency arrangements, I separate the CU dummy in Eq. (4) into two parts: (1) a multilateral CU dummy and (2) a unilateral CU dummy. They each represent about 1% of the observations. Fig. 3 plots the annual PPLM estimates of both dummies.9 The evolution of both effects mirrors the evolution of the average CU effect (right panel of Fig. 1): i.e., a downward trend over time. There are some apparent differences: (1) between the mid-80’s and mid-90’s, the multilateral CU effect is zero (before 1991) or negative (after 1991), while the unilateral CU effect is positive (but statistically significant only in 1988); (2) in 1999, the multilateral CU effect, capturing the euro creation impact, is rising while the unilateral CU effect is still decreasing.

---

7 See De Sousa (2011) for a replication of the right panel of Fig. 1 using the positive-trade subsample. It is worth noting that the PPML estimator performs very well even when the proportion of zeros is very large (see Santos Silva and Tenreyro, 2011).

8 See Dias (2011) for a similar result and Yotov (2012) for a simple solution to the distance puzzle.

9 The estimation results are available in De Sousa (2011).
4. Conclusion

Estimating a theoretical gravity model over a sixty-year period, I found an unexpected trend: the CU impact on trade is decreasing over time. This effect is found to be economically and statistically large until the seventies, then negative and finally insignificant at the beginning of the 21st century. This result holds when separating unilateral from multilateral currency unions. It could be that with trade and financial globalization, the currency unions appear to become less and less important for promoting trade.

References