Honey, I Shrunk the Currency Union Effect on Trade

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1. PRELUDE

ONE of the puzzles in empirical international trade is the difficulty of finding a large and statistically significant negative effect of exchange rate variability on trade. Business managers (and also policymakers) often claim that currency fluctuations are a major obstacle for international economic integration. Since volatile exchange rates generally imply uncertainty about external returns, large and frequent changes in the exchange rate are widely expected to lower the bilateral amount of trade, holding other things constant. Surprisingly, then, a substantial body of empirical work has hardly found any association between exchange rate volatility and trade. In fact, this empirical result has become by now so established that most of the latest studies do not aim to weaken the finding, but rather try to provide explanations for it, such as the availability of hedging instruments (see, for example, Wei, 1999).

Recently, however, Andrew Rose (2000) has turned the puzzle on its head. Analysing the effect of currency unions on trade, he finds that a complete elimination of exchange rate variability not only increases trade, but that the effect is strikingly large. In particular, Rose finds that two countries that share a common currency trade three times more with one another than with countries that use a different currency.

This result, apart from being notable for itself, is particularly interesting for at least two reasons. First, there has been recently a growing tendency towards the establishment of currency unions. In Europe, twelve countries have decided to give up their national currencies for the euro. Moreover, a growing number of countries seek to cure domestic economic problems by full dollarisation, i.e. adopting a foreign currency as legal tender. Examples include Ecuador in the case of the US dollar and the former Yugoslavian republic of Montenegro in the case of the Deutschmark. Rose's results, then,

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suggest that this process of dollarisation will lead to a sizeable increase in bilateral trade.

Second, the recent finding that trade within countries exceeds border-crossing trade, adjusted for economic size and distance, by a multiple has raised a lot of interest which aims to explain this unexpected home bias. John McCallum (1995) reports that in 1988 trade between Canadian provinces was on average about 20 times greater than that between Canadian provinces and US states. Later studies for Canada (Helliwell, 1998) and Europe (Nitsch, 2000) suggest that the home bias is rather close to factor 10, but even these numbers are still far above expectations. The Rose estimate then that a common currency alone tends to treble trade would, if correct, reduce the unexplained border effect considerably.

This paper re-examines Rose's (2000) analysis. Using basically the same set of data, the aim is to provide some extensions and modifications. While Rose argues that his results are extremely robust both in statistical significance and economic magnitude, this paper shows that simple manipulations of the data set and the regression specification reduce the estimated currency union effect on trade by about one-half.

The paper consists of three further sections. Section 2 describes the regression framework and the data. Section 3 presents the results, and Section 4 concludes.

2. EQUIPMENT

a. Set-up

To identify the effect of currency unions on trade, Rose starts from a nuisance approach:

$$\ln(T_{ij}) = \beta CU + \gamma Z + \epsilon \tag{1}$$

where T_{ij} denotes the value of bilateral trade between countries i and j, CU is the variable of interest, a binary dummy which takes the value of one if i and j use the same currency and zero otherwise, Z denotes a vector of other conditioning variables with γ coefficients being nuisance parameters, and ϵ is the residual.

In a next step, then, he has to decide which factors potentially affect trade and therefore should enter the equation as controls. Fortunately, such a model is readily available. The gravity equation is a long-established and empirically highly successful framework to model trade flows. Moreover, it has been recently heavily used to explore the effects of historical, cultural, and ethnic ties on trade.[1]

So, the regression framework is fairly standard:

[1] Examples include Jeffrey Frankel (1997) on trade blocs, John McCallum (1995) on national borders, and James Rauch (1999) on ethnic ties.

$$\begin{aligned}\ln(T_{ij}) = {} & \alpha + \beta CU + \gamma_1 \ln(Y_i Y_j) + \gamma_2 \ln(Y_i Y_j / Pop_i Pop_j) \\ & + \gamma_3 \ln(D_{ij}) + \gamma_4 Cont_{ij} + \gamma_5 Lang_{ij} \\ & + \gamma_6 FTA_{ij} + \gamma_7 ComNat_{ij} + \gamma_8 ComCol_{ij} \\ & + \gamma_9 Colony_{ij} + \gamma_{10} V(e_{ij}) + \epsilon_{ij} \end{aligned} \quad (2)$$

where Y is real GDP, *Pop* is population, D is distance, *Cont* is a dummy which takes the value of one if i and j share a land border, *Lang* is a common language dummy, *FTA* is a regional trade agreement dummy, *ComNat* is a common nation dummy, *ComCol* is a common coloniser dummy, *Colony* is a dummy which is one if i colonised j or vice versa, and $V(e_{ij})$ denotes the volatility of the bilateral exchange rate.

Rose's specification, however, also has a number of notable features. First, Rose completely ignores values of zero and/or unreported trade. As Rose himself notes (p. 15) that 'many currency union pairings have no trade (as do most bilateral pairings)', simply ignoring this large number of country pairs may introduce the problem of selection bias. It remains unclear, however, how this affects the results. Since most members of currency unions are either small or poor territories with expected little trade to other countries, ignoring these observations should hardly affect the coefficient estimates. But, Rose also misses many intra-currency union observations.[2] Currency unions are often among nearby partners with positive expected trade so that dropping these observations will bias the estimated currency union effect on trade upwards. In any case, since the analysis in this paper is built on Rose's original data set, I will keep this feature.

Second, observations for currency unions make up only a very small fraction of the total number of observations, with currency unions accounting for less than one per cent of the bilateral country pairings in the sample. This is, in principle, no problem. But if currency union observations form a small subgroup which strongly deviates from the sample mean, non-linearities may produce distorted results.[3] Rose, however, provides extensive robustness checks, suggesting that modifications of the sample leave the results generally unaffected.

Third, Rose ignores observations for which trade data are available but some explanatory variables are missing. In fact, Rose loses on average about one-third of his sample, mostly due to missing GDP data. As noted above, this is not

[2] For example, in 1990 the CFA franc zone comprises 13 African countries (excluding Comoros). From the potential 78 ($=13\times12/2$) bilateral country pairs, however, only 23 are included in the sample, of which two are lost due to missing GDP data.

[3] In fact, recent discussion has centred on the question whether currency union observations are really different from the rest of the sample (Persson, 2001). Rose points to summary statistics, showing only small differences in means. There can be no doubt, however, that the common currency group is different. For instance, there is no country pair in the (revised) sample, where both currency union members speak different languages.

necessarily a problem. At a later stage, however, I will apply an estimation procedure which partly deals with this problem.

Fourth, Rose extensively pools the data, both over time and over different exchange rate arrangements. He motivates this approach by noting (p. 17) that 'few of the effects vary over time, so pooling the data simply improves the precision of the coefficient estimates.' Since the data set is large, however, there is definitely no need to pool. Instead, pooling may rather mask some details and dynamics so that I will focus on the results for individual years.

b. Data

To allow for comparability of the results, I use a corrected version of Rose's (2000) data set.[4] This choice has the advantage that the analysis covers exactly the same set of countries and territories. Moreover, I leave the trade, distance, GDP, and GDP per capita variables completely unchanged.[5] However, I depart from Rose in the definition of the dummy variables. In particular, I make three sorts of corrections.

First, I erase some obvious flaws and misclassifications. For example, Rose himself notes that in the original data set Belgium does not share a common language with any country in the sample due to difficulties of incorporating data for the Belgium-Luxembourg economic union. Also, possibly due to a coding error, New Zealand (instead of the Netherlands) is classified as a member of the European Union.

Second, I cross-checked some of the information using alternative data sources. A potential problem, for example, is the use of a country's official language based on information from the 1999 CIA world factbook. While the linguistic composition of a country rarely changes, it is not necessarily a constant, especially when the focus is on a country's 'official' language which is simply a matter of definition. Therefore, the use of a source which contains data compiled nine years after the analysed time period ends, could be problematic. Pakistan, whose official language now is Urdu, is a case in point, where English was used for official purposes until the 1973 constitution designated a 15-year transition period to Urdu. At least in the case of ASEAN, also the WTO home page provides some misleading information. In contrast to its practice for some other regional trade arrangements, the source used by Rose simply lists all actual members so that Laos and Myanmar are wrongly classified as founding members but joined ASEAN only in 1997.

[4] The data set has been graciously provided by Andrew Rose (http://haas.berkeley.edu/~arose).

[5] A rough inspection suggests that there might be further difficulties. The fact that the USA-Bermuda country pair has the highest GDP per capita in the sample probably results from the incompatibility of different data sources. Also, it is hard to believe that the exchange rate volatility between the Korean won and the French franc is zero.

Third, there are a number of ambiguities. The most obvious problem arises in the definition of when two countries share a common language. Consider, for example, the case of Nauru. According to the CIA world factbook, the official language is 'Nauruan, a distinct Pacific Island tongue'. Hence, in Rose's data set the common language dummy for Nauru enters consistently with a zero. But the factbook also notes that 'English [is] the language of school instruction, spoken and understood by nearly all.' Thus, in contrast to Rose, I classify Nauru as English-speaking.

Also the timing of preferential trade liberalisation is difficult. Rose uses the date when the trade agreement went into effect, taken from the WTO compilation. This decision, however, is arbitrary. Frankel (1997, p. 99), for example, notes that:

> [t]o test the effect of ASEAN on the change of trade, there is no one clear date on which to focus. ASEAN negotiated a preferential trade arrangement within its membership in 1977, but serious progress in removal of barriers did not even get under way until 1987. . . . It was not until January 1992 that the members proclaimed plans for an ASEAN Free Trade Area to be implemented by reduction of tariffs and nontariff barriers in phases from 1993 to 2008.

Since the signing of an agreement already indicates the desire for closer economic integration, I depart from Rose and rather use this date as a starting point.

Taken together, I change 4,157 data points. Given a total of 33,903 observations, these manipulations affect about 12 per cent of the sample. An Appendix lists major changes, and a detailed list of all corrections made to the Rose data set is available from the author on request.

3. ACTION

a. Warming Up

Rose's results have raised a number of criticisms. The most often noted qualification is that the currency unions in Rose's data set are often very small countries, mostly islands and former colonies, which have adopted the currency of a larger country. An application of the results to larger countries therefore seems to be overly ambitious.

However, at least two other features are also noteworthy. First, the single currency group often includes trade flows between a colonising country and some highly subsidised and, therefore, highly dependent territories. Subsidies from the French government, for example, account for as much as one-half of Guadeloupe's GNP. Hence, it is not surprising that France supplies more than 70 per cent of the islands' imports, with imports vastly exceeding exports.[6] Rose aims to control for this effect by including both a same nation dummy and a

[6] Rose's focus on the *total* volume of *bilateral* trade also masks this discrepancy.

colonial dummy. It is questionable, however, whether these dummies really capture this strong trade effect. The same nation dummy, for example, also applies to trade flows between two overseas territories such as Reunion and New Caledonia which probably trade very little with each other due to a similar production structure. Similarly, the colonial dummy also applies to colonial relationships which date back three to four decades.

Second, the currency union subgroup includes country-pairs with historically strongly distorted trade patterns. For example, in 1776 the Danish government assumed a full monopoly of trade with Greenland, and the Greenland coast was closed to foreign access and was not reopened until 1950. Also for landlocked Bhutan, which did not have a currency until the 1960s, trade and transit arrangements with India play a critical role.

b. More Power

While this anecdotal evidence may provide a plausible explanation for the surprisingly large effect of currency unions on trade, it is not a substitute for rigorous statistical analysis. On the contrary, these arguments rather give some more inspiration for further robustness checks and extensions.

I begin then with a simple replication of Rose's analysis, but use instead the corrected data. Table 1 presents the results. To allow a convenient comparison of the results, columns (1)–(5) repeat Rose's original estimates, taken from Table 2 in Rose (2000). The figures show an average coefficient on the currency union variable of slightly above 1.20, implying that two countries with the same currency trade on average over three times ($\exp[1.2] = 3.3$) more with each other than two countries with different currencies.

Columns (6)–(10) report the results for the corrected data. Not surprisingly, the coefficient estimates on the standard gravity controls remain basically unaffected. But also the estimates on most of the other control variables are fairly robust, despite the large number of changes made to the original data set. The only notable differences are a slight fall in the effect of sharing a land border on trade, an increase in the trade-enhancing effect of a common language, and a change with varying sign in the effect of being part of the same nation.

Given this robustness of other coefficients, it is quite interesting to note that the estimates on the common currency dummy display the largest changes in magnitude. Moreover, with one exception,[7] the currency union effect decreases in size. With an average value of about 1.06, the trade-enhancing effect falls to about factor 2.9.

[7] Rose's unusually low estimate for 1970 is the result of a misclassification of several Caribbean island economies which were at the same time coded both as members of the United Kingdom (correct) and ex-colonies (incorrect).

TABLE 1
A First Look

	Rose's Data					*Corrected Data*				
Dependent Variable:	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
Log of Bilateral Trade	*1970*	*1975*	*1980*	*1985*	*1990*	*1970*	*1975*	*1980*	*1985*	*1990*
Currency union	0.87*	1.28**	1.09**	1.40**	1.53**	1.04**	0.93*	0.99**	1.25**	1.07**
	(0.43)	(0.41)	(0.26)	(0.27)	(0.27)	(0.39)	(0.39)	(0.23)	(0.26)	(0.31)
Exchange rate volatility	−0.062**	0.001	−0.060**	−0.028**	−0.009**	−0.061**	−0.003	−0.060**	−0.027**	−0.009**
	(0.012)	(0.008)	(0.010)	(0.005)	(0.002)	(0.012)	(0.008)	(0.010)	(0.005)	(0.002)
Output	0.77**	0.81**	0.81**	0.80**	0.82**	0.79**	0.82**	0.81**	0.80**	0.83**
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Output per capita	0.65**	0.66**	0.61**	0.66**	0.73**	0.64**	0.65**	0.60**	0.66**	0.73**
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
Distance	−1.09**	−1.15**	−1.03**	−1.05**	−1.12**	−1.08**	−1.14**	−1.01**	−1.03**	−1.12**
	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)
Contiguity	0.48*	0.36#	0.73**	0.51**	0.65**	0.34	0.21	0.67**	0.43*	0.56**
	(0.21)	(0.19)	(0.18)	(0.18)	(0.18)	(0.21)	(0.19)	(0.18)	(0.18)	(0.18)
Language	0.56**	0.36**	0.28**	0.36**	0.50**	0.60**	0.47**	0.42**	0.45**	0.51**
	(0.10)	(0.10)	(0.09)	(0.08)	(0.08)	(0.10)	(0.09)	(0.08)	(0.08)	(0.08)
Free trade area	0.87**	1.02**	1.26**	1.21**	0.68**	1.10**	1.06**	1.20**	1.21**	0.71**
	(0.16)	(0.21)	(0.16)	(0.17)	(0.14)	(0.17)	(0.18)	(0.15)	(0.15)	(0.15)
Same nation	1.02	1.37*	1.11**	1.36*	0.86#	2.52**	1.70**	0.99*	0.85	0.27
	(0.74)	(0.59)	(0.39)	(0.63)	(0.52)	(0.46)	(0.38)	(0.40)	(0.62)	(0.56)
Same coloniser	0.91**	0.73**	0.52**	0.47**	0.59**	0.75**	0.52**	0.36**	0.35**	0.56**
	(0.15)	(0.14)	(0.12)	(0.12)	(0.12)	(0.15)	(0.14)	(0.12)	(0.12)	(0.12)
Colonial relationship	2.52**	2.40**	2.28**	2.05**	1.75**	2.14**	2.16**	2.25**	2.05**	1.76**
	(0.23)	(0.19)	(0.14)	(0.14)	(0.15)	(0.20)	(0.18)	(0.14)	(0.14)	(0.15)
No. of observations	4052	4474	5092	5091	4239	4052	4474	5092	5091	4239
Adj. R^2	0.57	0.59	0.62	0.64	0.72	0.58	0.59	0.62	0.65	0.72
S.E.R.	2.18	2.18	2.03	1.94	1.75	2.17	2.18	2.03	1.93	1.75

Notes:
OLS estimation. White heteroscedastic-consistent standard errors in parentheses. **, * and # denote significant at the 1%, 5% and 10% level, respectively. Constant not reported. Major changes made to Rose's original data set are described in an Appendix. A detailed list of corrections is available from the author on request.

TABLE 2
More Corrections

	Extended FTA coverage				
Dependent Variable: Log of Bilateral Trade	*(1) 1970*	*(2) 1975*	*(3) 1980*	*(4) 1985*	*(5) 1990*
Currency union	0.95*	0.82*	0.86**	1.12**	0.78**
	(0.37)	(0.38)	(0.23)	(0.25)	(0.30)
Exchange rate volatility	−0.061**	−0.003	−0.061**	−0.027**	−0.009**
	(0.012)	(0.008)	(0.010)	(0.005)	(0.002)
Output	0.79**	0.82**	0.81**	0.80**	0.83**
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Output per capita	0.63**	0.66**	0.61**	0.66**	0.73**
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
Distance	−1.06**	−1.11**	−1.00**	−1.03**	−1.09**
	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)
Contiguity	0.34#	0.14	0.58**	0.42*	0.47**
	(0.20)	(0.18)	(0.18)	(0.18)	(0.18)
Language	0.60**	0.48**	0.43**	0.44**	0.51**
	(0.10)	(0.09)	(0.08)	(0.08)	(0.08)
Free trade area	1.28**	1.17**	1.10**	1.22**	0.99**
	(0.17)	(0.17)	(0.15)	(0.16)	(0.15)
Same nation	2.44**	1.75**	1.09**	0.95	0.55
	(0.45)	(0.38)	(0.40)	(0.62)	(0.55)
Same coloniser	0.74**	0.53**	0.35**	0.35**	0.55**
	(0.15)	(0.14)	(0.12)	(0.12)	(0.12)
Colonial relationship	2.17**	2.16**	2.25**	2.05**	1.76**
	(0.20)	(0.18)	(0.14)	(0.14)	(0.15)
No. of observations	4052	4474	5092	5091	4239
Adj. R^2	0.58	0.59	0.62	0.65	0.73
S.E.R.	2.16	2.18	2.03	1.93	1.74

Notes:
OLS estimation. White heteroscedastic-consistent standard errors in parentheses. **, * and # denote significant at the 1%, 5% and 10% level, respectively. Constant not reported.

The results in Table 2 allow for two additional corrections. In particular, I modify the dummy variable which captures the effects of preferential trade arrangements to include also the Caribbean Free Trade Association (CARIFTA), the predecessor of the Caribbean Community (CARICOM), and the Economic Community of West African States (ECOWAS), established in November 1975.[8]

As shown, this small extension lowers the estimated currency union effect further. The average coefficient value falls to 0.9, meaning that members of a currency union trade 2.5 times as much as countries with separate currencies. For three of the five

[8] The motivation for including ECOWAS is that it covers some countries of the CFA franc zone. It is debatable whether ECOWAS has made any progress in regional trade liberalisation. Nonetheless, it shows the desire for closer economic integration which has recently even surfaced in a discussion about the establishment of a monetary union (see Masson and Pattillo, 2001).

years, the estimate even clusters around 0.8, suggesting that the trade-multiplying effect is probably closer to factor 2 than factor 3 (exp[0.8] = 2.2). Moreover, it should be noted that, in contrast to Rose, the trade-enhancing effect of a common currency is now considerably smaller than the effect of a regional trade agreement.

c. Getting Hot

In a next experiment, I relax the assumption that controls take identical coefficient values for all covered subgroups. Earlier research has shown, for example, that the effect of preferential trade arrangements varies sizeably across different trade blocs (see, for example, Frankel, 1997). A similar reasoning might also apply to languages and various colonial relationships so that I enter separate dummies for those control variables.

The results in Table 3 are striking. There is indeed sizeable variation in the estimated coefficients on controls which were previously assumed to be similar. If one allows for different language dummies, for instance, it turns out that, while the trade-enhancing effect of English and French is almost of the same magnitude, the fact that two countries share Spanish as a common language has no effect on their bilateral volume of trade, and two Arabic-speaking countries even trade sizeably less with each other than countries with different languages.

The most notable feature of this exercise is, however, the large drop in the estimated coefficient on the variable of interest. In three out of five cases, the coefficient is now not statistically different from zero. Only for 1980 and 1985, membership in a currency union has measurable effects on bilateral trade patterns, increasing trade volumes by about 80 per cent (exp[0.6] = 1.8). Averaging the results for the whole 20-year period yields a currency union coefficient of about 0.38, suggesting a trade effect of about 46 per cent. Compared with Rose's results, this means that the common currency effect is almost smaller by an order of magnitude.

Summing up, while this exercise might be a very strong test, the results clearly suggest that a simple generalisation of Rose's estimates to calculate the potential trade-enhancing effect of adopting another country's currency will in most cases give misleading results.

Another interesting issue is whether the trade effect varies across different currencies. Rose already explores the sensitivity of his results for several subsets of the sample and finds that the exclusion of observations by different criteria has no sizeable effect on the estimated coefficients. This indicates that the trade expansion is fairly similar across currencies.

In this section, however, I pursue a different strategy. In particular, I estimate separate dummy variables for different currencies; an approach that has been very popular in estimating the effects of preferential trade arrangements. Moreover, Eichengreen and Irwin (1995) analyse trade flows in the 1930s and show that different currency blocs had very different implications for trade.

TABLE 3
Separate Control Dummies

Dependent Variable: *Log of Bilateral Trade*	*(1)* *1970*	*(2)* *1975*	*(3)* *1980*	*(4)* *1985*	*(5)* *1990*
Currency union	0.25	0.18	0.63*	0.60*	0.25
	(0.45)	(0.44)	(0.25)	(0.29)	(0.30)
Exchange rate volatility	−0.051**	0.001	−0.060**	−0.027**	−0.008**
	(0.012)	(0.008)	(0.010)	(0.005)	(0.002)
Output	0.80**	0.83**	0.82**	0.81**	0.84**
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Output per capita	0.64**	0.66**	0.63**	0.68**	0.75**
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
Distance	−1.13**	−1.21**	−1.08**	−1.10**	−1.11**
	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)
Contiguity	0.40#	0.35#	0.75**	0.58**	0.40**
	(0.21)	(0.19)	(0.18)	(0.18)	(0.18)
Language					
English	1.02**	0.85**	0.79**	0.66**	0.52**
French	0.94**	0.88**	0.60**	0.88**	0.52**
Spanish	−0.42*	−0.23	0.004	0.19	0.41**
Arabic	−0.52	−1.59**	−1.30**	−1.25**	−0.09
Other	0.55	0.73#	1.26**	1.12**	0.85*
Free trade area					
EU	−0.01	−0.38**	−0.12	−0.01	0.06
EFTA	0.72**	0.42	0.33	0.21	−0.01
ASEAN	2.34**	2.02**	1.65**	1.76**	1.49**
CARIFTA/CARICOM	2.64**	2.11**	1.81**	1.71**	1.36**
Andean	1.17**	0.87*	−0.03	−0.39	0.04
ECOWAS	0.78**	1.09#	2.26**		
Other	3.27**	2.63**	2.42**	2.49**	2.59**
Same nation					
UK	1.88**	1.35**	0.71#	0.17	
France			1.40**	1.58*	0.97
Other	3.11**	0.95			0.88
Same coloniser					
UK	0.39*	0.21	0.27*	0.28*	0.45**
France	1.02**	1.00**	−0.05	0.14	0.84**
Other	−1.56**	0.004	0.66	−4.12**	
Colonial relationship					
UK	1.66**	1.60**	1.79**	1.63**	1.42**
France	2.01**	2.07**	1.85**	1.52**	1.82**
Other	2.77**	3.32**	3.15**	2.81**	2.53**
No. of observations	4052	4474	5092	5091	4239
Adj. R^2	0.58	0.60	0.63	0.65	0.73
S.E.R.	2.15	2.16	2.01	1.91	1.73

Notes:
OLS estimation. White heteroscedastic-consistent standard errors in parentheses. **, * and # denote significant at the 1%, 5% and 10% level, respectively. Constant and standard errors for detailed dummy estimates not reported.

TABLE 4
Does the Trade Effect Differ Across Currency Unions?

	'Original' FTA Dummy				
Dependent Variable: *Log of Bilateral Trade*	*(1)* *1970*	*(2)* *1975*	*(3)* *1980*	*(4)* *1985*	*(5)* *1990*
Currency union					
Eastern Caribbean dollar	3.11**	0.43	1.85**	1.31**	0.83**
	(0.59)	(0.68)	(0.32)	(0.25)	(0.26)
CFA franc	0.77*	1.22**	0.76*	1.37**	2.28**
	(0.37)	(0.44)	(0.32)	(0.48)	(0.36)
French franc	2.97**		1.07*	2.21**	2.89**
	(0.23)		(0.47)	(0.67)	(0.52)
US dollar	−0.14	0.77	0.21	0.53	−1.51*
	(0.89)	(0.81)	(0.31)	(0.60)	(0.64)
Australian dollar	5.72**	4.84**	5.42**	3.23**	3.56**
	(0.12)	(0.11)	(0.10)	(0.16)	(0.17)
Other currencies	0.26	−0.38	2.61**	1.32**	3.90**
	(0.21)	(0.35)	(0.47)	(0.23)	(0.18)
	Including CARIFTA and ECOWAS				
Dependent Variable: *Log of Bilateral Trade*	*(1)* *1970*	*(2)* *1975*	*(3)* *1980*	*(4)* *1985*	*(5)* *1990*
Currency union					
Eastern Caribbean dollar	1.92**	0.43	2.00**	1.33**	0.75**
	(0.60)	(0.68)	(0.31)	(0.25)	(0.25)
CFA franc	0.80*	1.22**	0.45	1.01*	1.75**
	(0.37)	(0.44)	(0.30)	(0.42)	(0.34)
French franc	3.01**		1.04*	2.22**	2.73**
	(0.23)		(0.48)	(0.67)	(0.52)
US dollar	−0.12	0.77	0.23	0.53	−1.53*
	(0.89)	(0.81)	(0.30)	(0.60)	(0.64)
Australian dollar	5.73**	4.84**	5.44**	3.24**	3.63**
	(0.12)	(0.11)	(0.10)	(0.17)	(0.17)
Other currencies	0.30	−0.38	2.62**	1.35**	3.75**
	(0.21)	(0.35)	(0.48)	(0.23)	(0.17)

Notes:
OLS estimation. White heteroscedastic-consistent standard errors in parentheses. **, * and # denote significant at the 1%, 5% and 10% level, respectively. Coefficients on exchange rate volatility, output, output per capita, distance, common border, language, FTA, same nation, same coloniser, colonial relationship, and constant not reported.

The results in Table 4 strongly confirm their findings. The estimated coefficient on the common currency dummy varies sizeably across different currencies. On the low end of the estimates, the US dollar has no measurable effect on trade. Countries that have adopted this currency as legal tender do not trade more with each other (and may even trade less) than two otherwise similar countries with separate currencies. On the high end of the estimates is the Australian dollar, where the estimated trade-multiplying effect ranges up to factor

300 (exp[5.7] = 298.9). Since the Australian dollar has been adopted, besides by Australia, by only a few small Pacific island economies, this result illustrates that the often-raised concern the overall estimates may mostly stem from small and poor countries in the sample is warranted.[9]

The results also display large fluctuations in the magnitude of the estimated currency effect over time. For the CFA franc zone, for instance, the coefficient increases from 0.76 in 1980 to 2.28 ten years later, implying that the trade-multiplying effect may have risen from factor 2 to factor 10. Instead of illustrating a strong reorientation in African trade, however, this result rather demonstrates that the estimates are very sensitive to the actual data sample. In contrast to earlier years, for example, the 1990 CFA franc sample covers only bilateral trade observations if either Senegal or Togo were the trade counterpart.

The table also shows the effect of redefining the FTA dummy. Allowing for CARIFTA in 1970 reduces the estimate of the trade-enhancing effect of the Eastern Caribbean dollar from factor 22 (exp[3.1] = 22.2) to about factor 7 (exp[1.9] = 6.7). Correcting for ECOWAS between 1980 and 1990 lowers the coefficient on the CFA franc zone dummy from an average of about 1.5 (corresponding to factor 4.5) to about 1.0 (factor 2.7).

In sum, the results suggest that there are large differences in the estimated effect of a common currency on trade, both over time and across currencies. So, even if one takes the estimated magnitudes not too literally and simply uses the average figure as a rough benchmark, the real trade-enhancing effect of adopting a foreign currency could strongly deviate from calculations based on these estimates.

d. Keep On Pushin'

One of the potential shortcomings of Rose's analysis is the limited data sample. Even for the sample of country pairs for which trade data are available, Rose loses on average about one-third of the observations due to missing data for some explanatory variables, such as GDP, GDP per capita and exchange rate variability. An elegant way to overcome this obstacle is to apply a regression specification proposed by Johannes Bröcker and Herold Rohweder (1990). The basic idea is to summarise all purely country-related information in country-specific dummy variables which are to be estimated. Typical candidates for those non-interaction variables that focus exclusively on information from one of the trading partners are a country's GDP and GDP per capita. In fact, apart from the fact that the dependent variable in Rose's analysis is the bilateral volume of total trade, preventing a distinction between an exporting and an importing country, there is no reason to enter both countries' GDP in combined form. So, if one splits-up these variables (as is frequently done in the literature (Frankel, 1997, pp.

[9] Interestingly, adding a measure of geographic remoteness leaves the estimates largely unchanged.

58–61, particularly motivates the product form by noting that the Helpman-Krugman theory predicts that countries with similar levels of output per capita will trade more than countries with dissimilar levels)), deletes them and instead enters country-fixed effects, the regression equation reduces to:

$$\begin{aligned}\ln(T_{ij}) = \alpha + \beta CU + \gamma_1 \ln(D_{ij}) + \gamma_2 Cont_{ij} + \gamma_3 Lang_{ij} \\ + \gamma_4 FTA_{ij} + \gamma_5 ComNat_{ij} + \gamma_6 ComCol_{ij} \\ + \gamma_7 Colony_{ij} + \gamma_8 V(e_{ij}) + \phi C_{ij} + \epsilon_{ij} \qquad (3)\end{aligned}$$

where C is a vector of country dummies.

This specification then allows to include all trade pairs with missing GDP data, and only those observations are lost for which no data on exchange-rate volatility are available.

Table 5 presents the results. Bröcker and Rohweder (1990) propose to estimate the equation by quasi-maximum likelihood. However, OLS yields quantitatively similar results so that I prefer this simpler approach. Moreover, as the aim of this exercise is to look at the estimated currency union effect for different sample sizes, I report only the variable of interest. I begin with Rose's original sample and data. As shown in the left part of the table, the modified regression specification yields slightly larger estimates on the currency union variable than in the earlier benchmark specification. The average value of about 1.4 implies a trade-multiplying effect slightly above factor 4 ($\exp[1.4] = 4.1$). In a second experiment, I explore the corrected sample. Interestingly, the estimate is now much less affected by the corrections than before. The coefficients fall only marginally to an average of about 1.3. A plausible explanation is that changes were only made to dummy variables so that the impact of reclassifications is probably moderated by country fixed effects. Finally, I extend the sample to include all observations for which data are available. The results are striking. Enlarging the sample by about one-quarter has a large effect on the estimated common currency variable. While the coefficients remain statistically highly significant, the magnitude falls to about 0.8, implying that common currency doubles ($\exp[0.8] = 2.2$) instead of quadruples trade.

4. FINALE

In a series of papers, Andrew Rose has recently argued that two countries that share a common currency trade on average three times more with each other than an otherwise identical country pair with separate currencies. This finding is in stark contrast to earlier results on the very limited impact of exchange rate variability on trade.

This short paper re-examines Rose's (2000) analysis and provides some modifications and extensions. Three results are particularly noteworthy.

TABLE 5
Adding Previously Unexplored Data

	Rose's Original Data and Sample			*Corrected Data and Original Sample*			*Corrected Data and Extended Sample*		
	Currency Union	*No. of Obs.*	*Adj. R^2*	*Currency Union*	*No. of Obs.*	*Adj. R^2*	*Currency Union*	*No. of Obs.*	*Adj. R^2*
1970	0.98*	4052	0.68	1.26**	4052	0.68	0.73*	5076	0.69
	(0.41)			(0.38)			(0.29)		
1975	1.53**	4474	0.66	1.37**	4474	0.66	0.72*	5583	0.69
	(0.43)			(0.39)			(0.29)		
1980	1.42**	5092	0.68	1.37**	5092	0.68	1.02**	6062	0.71
	(0.28)			(0.26)			(0.22)		
1985	1.34**	5091	0.70	1.30**	5091	0.70	1.17**	5888	0.73
	(0.35)			(0.30)			(0.23)		
1990	1.48**	4239	0.76	1.07**	4239	0.76	0.82**	6326	0.77
	(0.29)			(0.31)			(0.27)		

Notes:
OLS estimation with country fixed effects. White heteroscedastic-consistent standard errors in parentheses. **, * and # denote significant at the 1%, 5% and 10% level, respectively. Coefficients on exchange rate volatility, distance, common border, language, FTA, same nation, same coloniser, colonial relationship, and constant not reported.

First, simple manipulations of the data set reduce the estimated trade-enhancing effect of a common currency from about factor 3.3 to about factor 2.5. For three out of five years, the coefficient estimates are even close to factor 2, suggesting that a common currency doubles instead of trebles trade.

Second, it is possible to find a specification in which the effect of currency unions on trade is essentially zero. Allowing for isolated effects of different languages, preferential trade arrangements and colonising countries, the estimated coefficient on the common currency dummy becomes statistically insignificant.

Third, the trade-multiplying effect varies across different currencies. The estimates range from a completely unaffected trade pattern for countries which have adopted the US dollar to trade flows exceeding average trade by 30,000 per cent for countries adopting the Australian dollar. These results suggest that projections about the potential trade-enhancing effect of adopting a common currency are, at best, extremely unreliable.

APPENDIX

Major Corrections Made to the Rose (2000) Data Set

Currency union

Country	*Re-coded as*
Barbados	Eastern Caribbean dollar (1970); US dollar
Belize	US dollar
Brunei	Singapore dollar
Brit. I.O.T.	US dollar
French S.A.T.	French franc (CFA franc)
Guinea-Bissau	(CFA franc); joined CFA franc zone in 1997
Mauritania	CFA franc (1970)

Common language

Country	*Re-coded as*
Belgium	Dutch, French
Belize	Spanish
Bermuda	English
Brit. I.O.T.	English
Brunei	English
Cayman Islands	English
Cook Islands	English
Cuba	Spanish

Common language (Continued)

Country	*Re-coded as*
Cyprus	English, Greek, Turkish
Falkland Isl.	English
French Guiana	French
French S.A.T.	French
Gibraltar	English
Greenland	Danish
Grenada	English
Guadeloupe	French
Kenya	English
Kiribati	English
Lebanon	Arabic
Libya	Arabic
Mauritania	Arabic
Morocco	French; French is language of much business, government, diplomacy, and postprimary education (CIA World Factbook, 1981)
Nauru	English; English, the language of school instruction, spoken and understood by nearly all (CIA World Factbook, 1981)
Neth. Antilles	Dutch
New Caledonia	French
Pakistan	English (1970–1985); English is lingua franca (CIA World Factbook, 1981)
Panama	English; about 14 per cent speak English as native tongue, many Panamanians bilingual (CIA World Factbook, 1981)
Seychelles	English, French
Somalia	(Arabic, English)
Sri Lanka	English; English commonly used in government and spoken by about 10 per cent of the population (CIA World Factbook, 1981)
St. Helena	English
St. Pierre Miq.	French
Switzerland	Italian (English)
Turks & Caicos	English
Yemen	Arabic

Free trade area

Country	*Re-coded as*
Bahamas	CARICOM (1985–90)
Belgium	EC/EU

Free trade area (Continued)

Country	*Re-coded as*
Brunei	ASEAN (1985–90)
Costa Rica	CACM
Laos	(ASEAN)
Myanmar	(ASEAN)
Netherlands	EC/EU
New Zealand	(EC/EU)

Same nation

Country	*Re-coded as*
Cook Islands	New Zealand; association with New Zealand
Niue	New Zealand; association with New Zealand

Same coloniser/Colonial relationship

Country	*Re-coded as*
Algeria	France
Bermuda	UK
Brit. I.O.T.	UK
Brunei	UK
Burundi	Belgium (Portugal)
Cambodia	France
Cayman Islands	UK
Falkland Isl.	UK
French Guiana	France
French S.A.T.	France
Gibraltar	UK
Guadeloupe	France
Guinea-Bissau	Portugal
Haiti	(Netherlands)
Israel	UK; League of Nations mandate under British administration
Jordan	UK; League of Nations mandate under British administration
Kiribati	UK
Libya	Italy
Malaysia	UK
Maldives	UK
Morocco	(Spain)
Neth. Antilles	Netherlands
New Caledonia	France

Same coloniser/Colonial relationship (Continued)

Country	*Re-coded as*
New Zealand	(UK)
Oman	(UK)
Somalia	Italy (France)
St. Helena	UK
St. Pierre Miq.	France
Suriname	(Portugal)
Togo	(UK)
Turks & Caicos	UK
U.A.E.	UK
Vietnam	France
Yemen	UK

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