Common-Currency Areas in Practice

*Andrew K. Rose**

Introduction and Motivation: Can Currency Unions Explain "Home Bias"?

Twelve countries have agreed to surrender monetary sovereignty as they join the European Economic and Monetary Union. Ecuador is currently dollarizing, and a number of other countries have already done so. What are the real benefits of relinquishing monetary control? Should Mexico, Argentina, and even Canada consider abandoning their national currencies and adopting the U.S. dollar?

In this paper, I attempt to address some of these issues. I examine the behaviour of countries that are or have been members of international currency unions. More precisely, I ask whether existing currency unions replicate the desirable features of optimal currency areas as set out by Mundell (1961). Specifically, I ask whether the countries and political units that constitute currency unions are as integrated economically as regions within nations. I find that while a common currency enhances economic integration, the degree of integration is far smaller than within nations.

A number of studies have shown that national borders inhibit economic integration. Internal trade is disproportionately large compared with international trade; relative prices are more stable inside countries than across national boundaries; domestic assets tend to be held disproportionately; and so forth (see Anderson and van Wincoop 2001). The hypothesis I implicitly

* I wish to thank Graydon Paulin for helpful comments.

investigate is that some part of the "border effect" is the result of exchange rate volatility or, more generally, the consequence of having different national monies.

This paper is empirical—my strategy is to use data on the many existing currency unions. I differentiate between intranational political unions (i.e., sovereign states with a single currency, but also common laws, political environments, cultures, and so forth) and international currency unions (i.e., sovereign countries that have delegated monetary policy to some international or foreign authority but retain sovereignty in other domains). The United States, France, and the United Kingdom are examples of political unions. Behaviour of regions within these countries is the focus of the emerging literature on intranational economics (Hess and van Wincoop 2000; Bacchetta, Rose, and van Wincoop 2001). The CFA[1] franc zone and the East Caribbean Currency Area are examples of currency unions.

My approach is to ask whether currency unions exhibit the type of economic integration that Mundell (1961) argues is desirable for an "optimum currency area." I measure a number of economic characteristics for international monetary unions, intranational political unions, and other countries. Mundell's framework implies that the gains from a common currency are proportional to the size of international transactions. Using disaggregated international trade data, I find that currency unions are more open and more specialized than non-currency-union countries of comparable size. More directly, I examine international trade patterns. Using a gravity equation, I find that trade between members of a currency union (e.g., Brunei and Singapore) is indeed much higher than trade between comparable countries with their own currencies, by a factor of over three. However, even this sizable effect is small in comparison with the "home-market bias," which shows that intranational trade is higher than international trade by a factor of almost 20, even for units of comparable economic size. That is, my estimates show that a hypothetical country as large (in terms of population, GDP, geographic area, and so forth) as Brunei and Singapore combined, would engage in much more intranational trade than Brunei and Singapore do in reality.

I examine real exchange rates and deviations from purchasing-power parity (PPP).[2] The volatility of real exchange rates is lower for members of currency unions than for countries with independent currencies. But some of this effect stems from the fact that no currency union has experienced a

1. CFA stands for Communauté Financière Africaine or Coopération Financière Africaine.
2. McKinnon (1963) has argued that, in practice, real exchange rate behaviour does not appreciably depend on the choice of monetary regime, and the desire to influence real exchange rate behaviour does not justify having an independent currency.

hyper-inflation; low-inflation countries with sovereign currencies have real exchange rate volatility that is only slightly higher than that of currency-union members. Currency-union members do not have detectably different rates of mean reversion in their real exchange rates. Compared with the benchmark of exchange rates between cities in comparably sized countries, currency unions exhibit slightly more integrated prices.

I also investigate other characteristics of currency unions. I find that business cycles are systematically more highly correlated between members of currency unions than between countries with sovereign currencies, but not as much as regions of a single country. Finally, I look at risk-sharing between members of currency unions and countries with independent currencies, by examining consumption and income, and I find only a small impact of currency union on risk-sharing.[3]

I conclude that members of a common-currency area are more economically integrated than non-currency-union members, but not nearly as much as those that are fully politically integrated. That is, "dollarized" countries are more likely to satisfy Mundell's criteria for being members of an optimum currency area, but not nearly as much as regions within a single country.

International trade entails foreign exchange transactions, unless it occurs between members of common-currency areas. While one ordinarily thinks of such costs as being small (at least for Organisation for Economic Co-operation and Development (OECD) countries facing deep liquid foreign exchange markets), avoiding these costs seems to have significant consequences. Currency unions may, therefore, encourage integration. Still, I am interested only in the association between integration and currency unions. I do not consider whether causality flows from integration to currency union (integrated countries are more likely to join and remain in currency unions), in the reverse direction (currency union induces integration) or both.[4]

In section 1, I provide a general characterization of currency-union members, taking special note of their openness and specialization. I analyze the impact of currency-union membership on international trade in section 2, and the impact on prices in section 3. Section 4 examines the

---

3. I disregard labour mobility, since it is so difficult to construct an appropriate data set, and because monetary policy can only be used to offset transitory nominal shocks where labour movement is probably inappropriate. I also ignore asset and financial market integration.

4. It is difficult to examine the direction of causality, since currency unions are long-lived. In Rose (2000), I provide more analysis that supports the idea that currency union tends to promote trade integration rather than the reverse.

international synchronization of business cycles, while section 5 looks at risk-sharing. A brief summary and conclusion follow.

1 What Do Common-Currency Areas Look Like?

1.1 A broad-brush description

The first (macroeconomic) data set I use consists of annual observations for 210 "countries" between 1960 and 1996, extracted from the 1998 World Bank World Development Indicators (WDI) CD-ROM (see Appendix 2 for a list of the countries). This data set includes all countries, territories, colonies, and other entities covered by the WDI (all are referred to as "countries," for simplicity), and is comprehensive.[5] (The data set has been checked and corrected.)

In this data set, some 1,891 (country-year) observations (24 per cent of the sample) were for members of a common-currency area; the list of countries can be found in Appendix 1. I include members of common-currency areas (such as Benin, a member of the CFA franc zone); countries that operated without a sovereign currency (such as Panama, which uses the U.S. dollar); long-term 1:1 fixers, where there is substantial currency substitution and essentially no probability of a move from parity (e.g., the Bahamas); and colonies, dependencies, overseas territories/departments/collectivities (such as Guadeloupe). Anchor countries (such as the United States and France), whose currencies are used by others, are tabulated solely for reference (i.e., they are not included as currency-union members in my empirical analysis).[6]

Table 1 shows descriptive statistics for the whole sample of available observations and for (peripheral) currency-union members. The number of available observations is tabulated, along with the mean and standard deviation. There is also a *p*-value for a *t*-test of equality of means for currency-union members and non-members.

Table 1 indicates that members of currency unions tend to be poorer and smaller than non-currency-union members. Currency unions are associated with lower and more stable inflation. However, they have lower ratios of M2 to GDP (a standard measure of financial depth), which may be because they tend to be poor. A better indicator of their financial markets may be the fact that the spread of the domestic loan rate above the London Inter-Bank Offered Rate (LIBOR) tends to be lower (even after one has excluded high-inflation observations). The country-specific standard deviation of the output

5. There are, however, many missing observations for variables of interest.
6. In the case of multilateral currency unions, there is no clear anchor.

Table 1
Descriptive macroeconomic statistics and measures of openness

	Whole sample			Currency unions			
	Obs.	**Mean**	**Std. dev.**	**Obs.**	**Mean**	**Std. dev.**	**Equal? (*p*-val.)**
Real GDP per capita ($)	2,454	5,285	5,262	416	3,615	4,474	0.00
Population (millions)	5,102	23.6	9.3	1,052	1.8	2.7	0.00
Inflation (%)	4,152	40.3	499	672	7.8	9.0	0.00
M2/GDP (%)	3,197	38.0	23.9	510	30.4	16.7	0.00
Loan rate—LIBOR (%)	2,131	72.7	2,643	412	5.2	6.9	0.24
Loan rate—LIBOR (%) (inflation<100%)	1,858	7.6	13.3	348	5.4	7.2	0.00
Output growth rate volatility (std. dev. %)	211	6.1	5.5	51	5.9	3.1	0.17
Budget deficit (% GDP)	2,289	–3.6	5.8	268	–3.7	6.1	0.84
Exports (% GDP)	4,732	32.3	23.7	783	39.8	23.5	0.00
Imports (% GDP)	4,729	37.8	25.4	783	53.2	27.1	0.00
Export duties (% exports)	1,621	3.4	6.1	237	2.6	3.8	0.00
Import duties (% imports)	2,226	12.3	9.6	241	18.0	8.4	0.00
Trade taxes (% revenue)	2,252	19.5	17.1	300	31.9	20.1	0.00
Current account (% GDP)	2,942	–4.5	11.5	477	–8.3	13.3	0.00
|Current account| (% GDP)	2,942	7.3	10.0	477	10.8	11.4	0.00
Gross FDI (% GDP)	2,058	1.5	2.6	339	2.0	3.4	0.00
Private capital flows (% GDP)	2,067	12.0	31.6	352	22.4	67.6	0.00

Notes: Obs. = observations.
Std. dev. = standard deviation.

growth rate, a crude measure of output volatility, seems to be similar for currency-union members and non-members. Finally, there is little indication that currency unions are associated with either more or less fiscal discipline.

1.2 Trade patterns of common-currency areas

Currency unions tend to be more open than countries with their own currencies. Exports and imports are larger as percentages of GDP to a degree that is statistically significant and economically important. Interestingly, while export duties are lower, import duties are higher for currency-union members; and the importance of trade taxes is greater. This is probably because most currency-union members have poorly developed income and value-added tax bases. Currency-union members run current accounts that are larger (in absolute value) as a percentage of GDP, and more variable. Currency unions are also more open to private capital flows and to foreign direct investment. That is, both the intertemporal and intratemporal evidence indicate that currency-union members are more open to capital than are non-members.

Members of currency unions appear more open to international flows of goods, services, and capital than countries with their own currencies. But one can overstate the importance of these differences. Currency-union members tend to be small countries, which are known to be more open than larger ones. Accordingly, I control for size and income in determining whether membership in a common-currency area is systematically associated with more intense trade.

Given that members of currency unions are more open to international influences than countries with their own currencies, it is natural to ask whether members of common-currency areas are also more specialized and therefore potentially more vulnerable to asymmetric industry shocks. Kenen (1969) was the first to discuss specialization in this context.

One way of examining this question would be to compare production structures to determine whether currency-union members are more specialized in production. However, no data set exists for this purpose. Nevertheless, it is possible to examine the patterns of specialization exhibited by countries engaging in international trade. To do so, I use the World Trade Data Base (WTDB).

The WTDB is a consistent recompilation of United Nations (UN) trade data, discussed in Feenstra, Lipsey, and Bowen (1997).[7] The WTDB is estimated to cover at least 98 per cent of all trade. Annual observations of nominal trade values (recorded in thousands of American dollars) are available in the WTDB for some 166 countries from 1970 through 1995 (see Appendix 3 for list of countries). These observations are available at the four-digit ("subgroup") Standard International Trade Classification (SITC) level (revision 2). There are a total of 897,939 observations in this three-dimensional panel (goods, countries, and years). A typical observation is the exports (totalling $740,000) from South Africa of SITC good 11 in 1970.[8]

For each country-year observation, I compute the Herfindahl Index, a measure of specialization. The Herfindahl Index is the sum of squared shares of the individual goods, defined as:

$$H_{it} \equiv \sum_{j} (x_{ijt} / X_{it})^2 \qquad j = 1, K, J,$$

7. This has been augmented with data from the UN's International Trade Statistics Yearbook.

8. SITC Code 11 denotes "Animals of the bovine species, incl. buffaloes, live." Other examples of four-digit subgroups include: "Tyres, pneumat. new, of a kind used on buses, lorries" (SITC code 6252), and "Int. combustion piston engines for marine propuls." (SITC code 7133).

where x_{ijt} denotes the exports for country *i* of SITC subgroup *j* in year *t*, X_{it} denotes total exports for *i* in year *t*, and the summation is taken over all SITC subgroups. *H* is bounded by (0,1]; a high value of *H* indicates that the country is specialized in the production of a few goods.[9]

I have some 3,045 country-year observations of the Herfindahl Index for the WTDB. Of these, 388 (13 per cent) are for countries that are currency-union members. As Table 2 shows, Herfindahl indexes for countries with their own currencies are systematically lower (averaging 0.23) than those for members of currency unions (which average 0.31). That is, members of common-currency areas tend to be more specialized. The difference is not only of economic importance; it is also statistically significant (the *t*-test for a difference in means is 5.7). Currency-union members also export (122) fewer sub-goods, on average, than countries with their own currencies, consistent with the hypothesis of greater specialization (again, the difference is statistically significant with a *t*-statistic of 17.7).

Some might point out that since currency-union members are smaller and poorer than other countries, more specialization is to be expected. I control for these other factors by regressing the Herfindahl Index on the Penn World Table (mark 5.6) measure of real GDP per capita, population, and a dummy variable that is unity if the country-year observation is for a currency-union member. The results are tabulated in the bottom part of the table. They show that my conclusions are insensitive to the addition of controls for real GDP per capita and country size. Currency-union members consistently have higher Herfindahl indexes and export smaller numbers of goods.[10] That is, members of currency unions are more open and specialized than countries with their own currencies. Of course, the fact that they are more specialized may make them more vulnerable to industry-specific shocks, and this specialization might be expected to increase the idiosyncratic nature of their business cycles; I will examine that possibility.

2 How Integrated Are Currency Unions in International Trade?

I will show that members of currency unions systematically engage in more international trade. This issue is of obvious interest, since the benefits from using a single money in terms of saved transactions costs depend on the amount of trade between two regions, as recognized since—at least—

9. The Canadian Herfindahl Index averaged around 0.04 through the sample, and was bounded by (0.028, 0.055).

10. My findings are not affected by the inclusion of country- or time-specific fixed effects, or quadratic terms for income, as in Imbs and Wacziarg (2000).

Table 2
Export specialization and currency unions

Descriptive statistics		Herfindahl Index		Number of exports	
	Obs.	Mean	Std. dev.	Mean	Std. dev.
Non-currency-union members	2,657	0.23	0.24	254	132
Currency-union members	388	0.31	0.19	132	89

Regression tests	Regressors		
Regressand	Real GDP per capita	Population	Currency union
Herfindahl Index	–0.10	–2.8	0.06
	(6.8)	(20.2)	(4.4)
Number of exports	0.02	0.0003	–67.2
	(23.9)	(24.3)	(11.9)

Notes: Absolute values of robust *t*-statistics recorded in parentheses. Intercepts are not reported. Sample size = 2,806 throughout. Coefficients for real GDP per capita (population) multiplied by 10^4 (10^7) for convenience.

Mundell (1961) and subsequently discussed in Alesina and Barro (2000). I follow Rose (2000) in using a "gravity" model of international trade as my framework. In particular, I ask whether bilateral trade between two countries is higher if they both use the same currency, holding constant a variety of other determinants of international trade.

The large literature that uses the gravity model of international trade points to distance, income levels, and country size as the most critical drivers of bilateral trade flows, a result that I corroborate here. The model I use is completely standard and can be written:

$$\ln(X_{ij}) = \gamma CU_{ij} + \beta_0 + \beta_1 \ln(D_{ij}) + \beta_2 \ln(Y_i Y_j / Pop_i Pop_j)$$

$$+ \beta_3 \ln(Y_i Y_j) + \delta * Z_{ij} + \varepsilon_{ij},$$

where X_{ij} denotes the value of bilateral trade between countries *i* and *j*, *CU* is a binary dummy variable that is unity if *i* and *j* use the same currency, and zero otherwise. D_{ij} denotes the distance between countries *i* and *j*, *Y* denotes real GDP, *Pop* denotes population, *Z* denotes a vector of other controls, the β and δ coefficients are nuisance coefficients, and ε denotes the residual impact of all other factors driving trade. The coefficient of interest to me is γ, which measures the impact of a common currency on international trade. A positive coefficient indicates that two countries using a common currency also tend to trade more.

I begin by estimating this equation using data from the WTDB, augmented by data from the UN *International Trade Statistics Yearbook*. Over 150 countries, dependencies, territories, overseas departments, colonies, and so forth (referred to simply as "countries" below) for which the UN Statistical Office collects international trade data are included in the data set. Country location (used to calculate Great Circle distance) is taken from the CIA's Web site, which also provides observations for other variables of interest, such as contiguity, official language, colonial background, and area.[11] Real GDP and population are taken from the 1998 World Bank World Development Indicators CD-ROM.[12] I use data from 1970, 1975, 1980, 1985, 1990, and 1995 and include time-specific controls.

Estimation results are contained in Table 3. The ordinary least squares (OLS) estimation is used, and robust standard errors are recorded parenthetically. At the extreme left of the table, the simplest gravity model is employed; that is, no auxiliary *Z*'s are included. The β coefficients indicate that the gravity model works well, in two senses. First, the coefficient estimates are sensible and strong. Greater distance between two countries lowers trade, while greater economic "mass" (proxied by real GDP and GDP per capita) increases trade. These intuitive and plausible effects are in line with the estimates of the literature; they are also of enormous statistical significance with *t*-statistics exceeding 20 (in absolute value). Second, the equation fits the data well, explaining a high proportion of the cross-sectional variation in trade patterns.

While it is reassuring that the gravity model performs well, its role is strictly one of auxiliary conditioning. I am most interested in understanding the relationship between currency-union membership and trade flows after accounting for gravity effects. Even after taking out the effects of output, size, and distance, there is a large effect of a common currency on trade. The point estimates indicate that two countries that share a common currency trade together by a factor of $exp(2.11) \cong 8.25$! This effect is not only

11. The 2000 World Factbook is available at:
http://www.odci.gov/cia/publications/factbook/index.html.

12. I sometimes include a control for common membership in a regional free trade agreement. I include a number of such agreements, including the European Union; the Canada-U.S. free trade agreement; the European Free Trade Association (EFTA); the Australia/New Zealand closer economic relationship; the Israeli/U.S. free trade agreement; the Association of Southeast Asian Nations (ASEAN); the Central American Common Market (CACM); the PNG-Australia Trade and Commercial Relations Agreement (PATCRA); the Caribbean Community (CARICOM); the South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA); and the Cartagena Agreement, all taken from the WTO's web site (http://www.wto.org).

Table 3
Modelling the effect of currency union on trade

Currency union	2.11	1.53	1.22	1.25	1.37
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
(Log) distance	−1.22	−1.09	−1.09	−1.04	−1.06
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
(Log product) real GDP per capita	0.66	0.64	0.66	0.56	0.49
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
(Log product) real GDP	0.78	0.79	0.80	0.88	0.94
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Regional trade agreement		1.31	1.25	1.08	1.17
		(0.07)	(0.07)	(0.07)	(0.07)
Common language		0.73	0.44	0.57	0.53
		(0.03)	(0.04)	(0.04)	(0.03)
Common land border		0.37	0.43	0.62	0.63
		(0.07)	(0.07)	(0.07)	(0.07)
Common colonizer			0.65	0.47	0.45
			(0.05)	(0.05)	(0.05)
Same nation			1.08	0.97	0.99
			(0.28)	(0.28)	(0.29)
Colonial relationship			2.19	1.99	1.99
			(0.07)	(0.07)	(0.07)
Number of landlocked countries				−0.39	
				(0.03)	
(Log of) sum of land area				−0.22	
				(0.01)	
(Log of) product of land area					−0.15
					(0.01)
Number of island countries					0.04
					(0.02)
R^2	0.61	0.62	0.63	0.64	0.64
Root mean-square error (RMSE)	2.05	2.03	2.00	1.98	1.98

Notes: OLS estimation. Robust standard errors recorded in parentheses.
Year-specific intercepts not recorded.
Sample size = 31,101, 1970 through 1995 at five-year intervals.
Regressand is log of real bilateral trade.

economically large, but also statistically significant at traditional confidence levels (the *t*-statistic exceeds 16).

It is hard to imagine that Canada could increase its trade with the United States eightfold by giving up the loonie. One can think of a number of reasons for this strong result. At the top of the list would be model mis-specification, implying that the currency-union variable is picking up the effect of other omitted variable(s). But this is not the case; the results are robust. Four different perturbations of the gravity model are included in Table 3; they augment the basic results with extra (*Z*) controls. These extra effects are usually statistically significant and economically sensible,

although they add little to the overall explanatory power of the model. Being partners in a regional trade agreement, sharing a common language, having the same (post-1945) colonizer, being part of the same nation (e.g., France and an overseas department such as French Guiana), and having had a colonizer-colony relationship all increase trade by economically and statistically significant amounts. Landlocked and large countries tend to trade less; islands trade more. But inclusion of these extra controls does not destroy the finding of an economically large and statistically significant positive γ. While the coefficient falls somewhat with extra controls, the lowest estimate of γ in Table 3 indicates that trade is some 340 per cent higher for members of a common currency than for countries with sovereign currencies.

In Rose (2000), I estimated a large number of gravity equations with a comparable data set spanning 1970 through 1990, and found similar results; my point estimate of γ was 1.2. I also showed those results to be robust to: the exact measurement of *CU*, the exact measure of distance, the inclusion of extra controls, sub-sampling, and different estimation techniques.

To summarize: members of a currency union trade more, *ceteris paribus*. A reasonable estimate is that trade is three times as intense for members of a common-currency area as for countries with their own currencies. While this estimate seems provocatively high, it is actually quite low compared with the well-documented size of "home bias" in international trade. McCallum (1995) and Helliwell (1998) find home bias in goods markets to be on the order of 12x to 20x, using data from Canadian provinces and American states. This is far greater than my estimates here (see Anderson and van Wincoop 2001). While membership in a common-currency area does intensify trade, it does not intensify it nearly enough for common-currency areas to resemble countries.

3 Are Prices More Integrated for Currency Unions?

In this section, I explore whether real exchange rates in currency unions are more stable in the sense of converging more quickly and having lower short-run volatility.

To answer the first question, I estimate the equation:

$$qroot_{ij} = \alpha + \beta CU_{ij} + \delta * Z_{ij} + \varepsilon_{ij}.$$

Here, $qroot_{ij}$ is the estimated autoregressive coefficient in an AR(1) regression for the (log of the) real exchange rate of country *i* relative to country *j*. A large value of $qroot_{ij}$ indicates slow adjustment of the real

exchange rate. CU_{ij} is a dummy variable that takes the value of one if countries *i* and *j* were in a currency union for the entire post-1960 period, and a zero otherwise. Z_{ij} is a vector of auxiliary conditioning variables (such as the distance between countries *i* and *j*, the volatility of the nominal exchange rate, etc.) that are included in the regression as controls, but that are not directly of interest to us. ε_{ij} is a random error that contains factors that affect the speed of adjustment of real exchange rates that are not included in my regression.

I hypothesize that β_{ij} is negative: that the persistence of real exchange rates is lower for currency-union countries. If currency unions are successful in their objective of reducing real exchange rate volatility, one measure of success is the speed at which real exchange rates converge to equilibrium.

My real exchange rate data are based on annual consumer price indexes and exchange rates from my World Bank macroeconomic data set. For each country in the data set, I first estimate an AR(1) regression (with intercept, given that the price data are in index form) for (log) real exchange rates from 1960 to 1996.[13] I use the slope coefficient in these time-series regressions as the regressand in the cross-sectional regression defined above.[14]

The results reported in Table 4 indicate no support for the hypothesis that real exchange rates adjust more quickly in currency unions. The first column of the table reports results for the basic regression. In addition to the currency-union dummy variable, the regression contains the log of distance (in miles) between countries *i* and *j*, a dummy variable for whether *i* and *j* are divisions of the same country (e.g., metropolitan France and Guadeloupe), the standard deviation of the first difference of the log of the nominal exchange rate, and a constant. The currency-union dummy variable has a positive sign, but is not statistically significant at conventional levels.

The other variables in the regression are not of direct interest, but I note that two variables are highly significant in this and each of my other specifications: the same-country dummy and the nominal exchange rate volatility. As expected, the coefficient on the same-country dummy is negative, indicating that real exchange rates adjust more quickly for these pairs. Also unsurprisingly, the speed of adjustment is significantly faster when nominal exchange rate volatility is higher. Transitory real exchange rate volatility is closely associated with volatile nominal exchange rates. When shocks to nominal exchange rates are very large and lead to large misalignments of real exchange rates, there is rapid adjustment.

---

13. I only estimate the AR(1) if there are at least 15 observations for each country.
14. To illustrate with an example, the Canadian-American root is 0.90.

Table 4
Real exchange rate persistence and currency unions

Controls	OLS	Inflation control	Country dummies, inflation	Max. inflation	Without high-inflation countries
Currency union	0.03	0.01	0.10	0.01	–0.00
	(1.0)	(0.5)	(3.9)	(0.3)	(0.1)
(Log) distance	–0.00	0.00	0.02	0.01	–0.00
	(0.5)	(0.0)	(0.5)	(0.2)	(0.4)
Same nation	–0.12	–0.11	–0.06	–0.11	–0.10
	(3.3)	(3.9)	(3.3)	(4.2)	(4.5)
Nominal exchange rate volatility	–0.13	–0.22	–0.16	–0.26	–0.28
	(18.0)	(11.4)	(3.3)	(21.2)	(13.2)
Intercept	0.90	0.89		0.90	0.92
	(34.4)	(34.3)		(34.6)	(34.4)
Number of observations	3,647	3,647	3,647	3,647	3,236

Notes: Absolute values of robust *t*-statistics recorded in parentheses.
Regressand is estimated root from autoregression of log real exchange rate.

The other specifications in Table 4 introduce additional control variables (whose coefficients are not reported in the table). The second column introduces average inflation rates in countries *i* and *j*; their presence does not appreciably alter the effect of the other regressors. The third column includes the same control variables as the second column but also includes a dummy variable for each country. In this specification, the currency-union dummy variable is significant, but with a positive sign. That is, real exchange rates are more persistent in currency-union countries. The fourth and fifth regressions reported in Table 4 control for high inflation in alternative manners. The regression in the fourth column includes the maximum annual inflation rate of each country, while the regression of the fifth column is identical to the base specification reported in the first column but excludes all countries that have experienced high inflation. (High inflation is defined here as average inflation that exceeds 100 per cent.) I find the coefficient on the currency-union dummy is not changed under these specifications. One can conclude from Table 4 that being a member of a currency union does not increase the adjustment speed of real exchange rates. Rose and Engel (2000) provide further corroborative evidence.

To summarize, the speed of adjustment of real exchange rates is not clearly related to monetary union, or even to political union. This result is perhaps not surprising. The literature has found mixed results concerning the speed of adjustment of prices within countries and across borders. Parsley and Wei (1996) find that prices converge rapidly between cities in the United States. The speed of convergence is much greater than is typically found for real

exchange rates between countries (see Rogoff 1996). But, their data are for prices of very narrowly defined goods (as opposed to the aggregate price indexes used in international comparisons), and they have no comparable data for countries other than the United States. In contrast, Rogers and Jenkins (1995) and Engel, Hendrickson, and Rogers (1997) find no significant difference between intranational and international speeds of convergence of aggregate real exchange rates.

In contrast, there is a well-known "border" effect for short-term volatility of real exchange rates. For example, Engel and Rogers (1996) find that U.S.-Canadian relative prices are far more volatile than relative prices between cities within each country, even taking into account distance between cities. I ask here whether currency unions have a similar effect in reducing real exchange rate volatility. In Table 5, I report results from regressions of the form:

$$qvol_{ij} = \alpha + \beta CU_{ij} + \delta * Z_{ij} + \varepsilon_{ij}.$$

Here, $qvol_{ij}$ is a measure of the volatility of the real exchange rate of countries *i* and *j*. I use as my measure the standard deviation of the residual from the AR(1) regressions discussed above. This measures the volatility of shocks to real exchange rates, as distinct from variance arising from slow adjustment. As before, CU_{ij} is a dummy variable that takes the value of one if countries *i* and *j* were in a currency union. Z_{ij} is a vector of other variables that are included in the regression as controls, and ε_{ij} is a random error.[15]

The regression specifications across the five columns of Table 5 are identical to those of Table 4, except that the regressand is the *volatility* of the real exchange rate rather than its *persistence*. In all specifications, the currency-union dummy variable is negative and is highly significant in all but the last specification. The specification that appears most plausible here is the third one, which contains dummy variables for each country. In this regression, the log of distance has a positive and significant sign, indicating that more distant countries have greater real exchange rate volatility. The variance of the change in the (log) nominal exchange rate is a highly significant variable in this regression (and all others). My interest is focused on the currency-union dummy, which is very statistically significant: being a member of a currency union reduces the standard deviation of annual real exchange rates by 6 percentage points.

I conclude that real exchange rates have much lower short-term volatility among currency-union countries, even holding constant the volatility of the

15. To continue with the example, the Canadian-U.S. volatility is 3.8 per cent.

Table 5
Real exchange rate volatility and currency unions

Controls	OLS	Inflation control	Country dummies, inflation	Max inflation	Without high-inflation countries
Currency union	–0.04	–0.02	–0.06	–0.02	–0.01
	(5.9)	(3.4)	(7.9)	(3.3)	(0.8)
(Log) distance	–0.005	–0.005	0.005	–0.006	–0.000
	(2.2)	(2.8)	(6.1)	(3.5)	(0.1)
Same nation	0.05	0.04	0.00	0.04	0.02
	(1.5)	(1.7)	(0.4)	(1.8)	(1.5)
Exchange rate volatility	0.28	0.40	0.11	0.41	0.48
	(27.5)	(24.4)	(4.5)	(31.2)	(39.6)
Intercept	0.12	0.11		0.11	0.05
	(7.2)	(6.9)		(7.8)	(5.0)
Number of observations	3,647	3,647	3,647	3,647	3,236

Absolute values of robust *t*-statistics recorded in parentheses.

nominal exchange rate. That is, the reduction in real exchange rate variance is not solely attributable to fixed exchange rates; currency-union membership appears to stabilize real exchange rates through other channels as well. But, real exchange rate volatility of currency-union members is still higher, on average, than for cities within countries.

4 Business Cycle Synchronization and Currency Unions

I now examine whether countries that use the same currency tend to have more highly synchronized business cycles. This has been a natural question to ask since Mundell (1961); countries with highly synchronized business cycles forego little monetary independence if they share a common currency. Thus, countries with highly synchronized business cycles have a higher propensity to adopt a common currency (Alesina and Barro 2000). Of course, since a common monetary policy also eliminates idiosyncratic monetary policy, causality flows in the reverse direction. Members of a common-currency union should experience more synchronized business cycles, since they do not experience national monetary policy shocks. Rather than try to determine either part of the relationship structurally, I am simply interested here in discovering whether members of a common-currency area experience more synchronized business cycles. This question is particularly interesting, because I have already found that currency-union members are quite specialized in international trade, making them potentially subject to asymmetric shocks.

The regressions I estimate take the form:

$$Corr(s)_{ij} = \alpha + \beta CU_{ij} + \delta * Z_{ij} + \varepsilon_{ij},$$

where $Corr(s)_{ij}$ denotes the estimated correlation between real GDP for country *i* and real GDP for country *j* detrended with method *s*; *CU* is a binary dummy variable that is unity if countries *i* and *j* are members of the same currency union; α and δ are nuisance coefficients, *Z* is a vector of controls, and ε denotes omitted residual factors. The coefficient of interest is β; a positive β indicates that two countries with a common currency tend to have more tightly correlated business cycles. Since my analysis is reduced-form in nature, I am not able to determine whether countries with more tightly synchronized business cycles tend to belong to common-currency areas, or whether membership in a currency union tends to synchronize business cycles (or both).

In forming the regressand, I take advantage of my macroeconomic data set (the list of potential countries is tabulated in Appendix 1). For each pair of countries in the sample, I estimate the bivariate correlation between detrended annual real GDP for countries *i* and *j* over the sample period from 1960 to 1996 (or the maximum available span of data).[16] I use country-specific first-differences of natural logarithms to detrend the data; log-linear time-trend models produce similar results. After (the natural logarithm of) each country's real GDP has been detrended, I estimate simple bivariate correlations between the detrended GDP series.[17] Results are tabulated in Table 6.[18]

The extreme left column of each of the tables presents a simple OLS regression of business cycle synchronization on the currency-union dummy variable. I find a positive β coefficient, indicating that business cycles are more synchronized for countries that trade more. The size and statistical significance of the estimate depend on the detrending method used.

Six perturbations of the basic model are also displayed in Table 6 to check the sensitivity of the analysis. The first five perturbations (all estimated with

16. I only estimate the bilateral correlation if I have at least five matching GDP observations for each country.

17. Thus, I first separately detrend Afghani and Australian real GDP by taking growth rates. I then estimate the correlation between the two detrended real GDPs over time (the actual correlation is –0.002). I repeat this procedure for all possible country pairs, and this results in a vector of correlations. For regressors, I use the same set of regressors used in the gravity model of trade. That is, I model business cycle synchronization as being a function of the distance between the countries, the product of their real GDPs, the product of their real GDP per capitas, and so forth.

18. The Canadian-U.S. correlation is 0.81.

Table 6
Business cycle synchronization and currency unions

Currency union	0.05	0.10	0.07	0.11	0.11	0.10	0.11
	(1.4)	(1.9)	(1.3)	(2.0)	(2.0)	(1.9)	(2.1)
(Log) distance		–0.04	–0.03	–0.03	–0.03	–0.02	
		(8.8)	(4.7)	(4.7)	(4.7)	(4.3)	
(Log product) real GDP per capita		0.04	0.04	0.03	0.04	0.04	
		(15.0)	(13.6)	(13.1)	(11.8)	(12.8)	
(Log product) real GDP		0.00	0.00	0.00	0.00	–0.00	
		(2.7)	(2.7)	(1.7)	(1.3)	(0.7)	
Regional trade agreement			0.14	0.15	0.15	0.16	
			(6.5)	(7.0)	(6.2)	(7.4)	
Common language			0.02	0.03	0.03	0.03	
			(1.8)	(3.2)	(3.2)	(3.2)	
Land border			0.05	0.04	0.04	0.04	
			(1.6)	(1.4)	(1.4)	(1.2)	
Common colonizer				–0.08	–0.08	–0.07	
				(5.7)	(5.5)	(4.7)	
Same nation				0.13	0.13	0.14	
				(1.3)	(1.3)	(1.4)	
Colonial relationship				–0.05	–0.05	–0.04	
				(1.8)	(1.8)	(1.3)	
Number of landlocked countries					0.00		
					(0.0)		
(Log of) sum of land area					0.00		
					(0.1)		
(Log of) product of land area						0.00	
						(1.8)	
Number of island countries						–0.02	
						(3.5)	
(Log of) bilateral trade							0.02
							(13.4)
RMSE	0.262	0.236	0.234	0.233	0.233	0.233	0.243

Notes: Regressand is bilateral correlation of real GDPs (1960–96), detrended by first-difference of natural logs.
OLS estimation, except for last column (instrumental variables with first nine regressors as instrumental variables).
Absolute robust *t*-statistics recorded in parentheses. Intercepts not recorded.
Sample size = 4,419, except for bivariate regression where sample size = 5,913.
Regressand is bivariate correlation of real GDPs (1960–96), detrended via growth rates.

OLS) simply add extra control regressors to the right-hand side of the equation (i.e., extra *Z*'s). I chose the five different sets of regressors used in Table 3 (they encompass the controls used by Clark and van Wincoop (1999); other controls sets, including country fixed effects, deliver similar results). Robust *t*-statistics are displayed in parentheses.

The estimates in Table 6 indicate that business cycles are more tightly synchronized for members of a currency union. The exact point estimate depends on both the detrending method and the exact set of auxiliary regressors. But the coefficient is consistently positive and almost always statistically significant at conventional levels. Being a member of a common-currency area increases international business cycle correlations by perhaps 0.1, an economically significant amount.[19]

In the right-hand column of the tables, the natural log of bilateral trade between countries *i* and *j* is used as the sole control regressor, following Frankel and Rose (1998). This is an important test of the model, since Clark and van Wincoop find that inclusion of trade as a control destroys the border effect. When trade is included, its coefficient is estimated with IV, using the first nine regressors of the gravity equation as instrumental variables.[20] Trade appears to have a strong positive effect on business cycle synchronization. This result corresponds well with the literature. For instance, Frankel and Rose found that increased international trade induces more tightly synchronized business cycles, using data from the OECD; my result is consistent with theirs. Controlling for trade, however, does not destroy the significance of β.

To summarize, countries that are members of a common-currency union tend to have more highly synchronized business cycles; the correlation is perhaps 0.1 higher on average for currency-union members than for non-members. While economically and statistically significant, the size of this effect is small in an absolute sense. Most recently, Clark and van Wincoop compare the coherences of business cycles within countries and across countries, using annual data for both employment and real GDP. They show that intranational business cycle correlations are approximately 0.7 for regions within countries, but in the range of (0.2, 0.4) for comparable

19. As a robustness check, I have substituted the correlation between labour forces for the correlation between GDPs (employment, unemployment, and industrial production data are simply not available for many countries, even at the annual frequency). This regressand also delivers a consistently positive, statistically significant effect of currency union on business cycle coherence.

20. This is necessary, because while trade may affect business cycle synchronization, it is equally plausible that causality flows in the reverse direction, as pointed out by Frankel and Rose.

regions drawn across countries. That is, the effect of international borders on business cycle synchronization ranges between 0.3 and 0.5. Thus, only a small part of the "border effect" is explained by membership in a common-currency area.

5 Common-Currency Areas and Risk-Sharing

In this section, I turn to international risk-sharing. It is well known that the apparent degree of international risk-sharing is low. In a classic contribution, Feldstein and Horioka (1980) found that national saving and investment rates are highly correlated, apparently inconsistent with international risk-sharing. Alternatively, if risk-sharing opportunities were widespread, there should be little country-specific idiosyncratic consumption risk. As Backus, Kehoe, and Kydland (1992) noted, in the presence of risk-sharing, consumption should be more highly correlated than output across countries. In fact, the data show the opposite. Furthermore, as French and Poterba (1991) and others have reported, there is strong home bias in asset holdings. There seems to be very little international diversification of portfolios.

Obstfeld and Rogoff (2001) have argued that international risk-sharing might be diminished in the presence of transactions costs. Specifically, they cite costs of trading goods (rather than assets) as an impediment. They also note that these costs might conceivably be related to the need to make foreign exchange transactions to buy and sell goods internationally. In other words, countries that are members of currency unions might do more risk-sharing.

I run a cross-sectional regression of the form:

$$ccorr_{ij} = \alpha + \beta CU_{ij} + \delta * Z_{ij} + \varepsilon_{ij},$$

where, $ccorr_{ij}$ is calculated as the correlation of the first difference in the log of consumption per capita for country *i* with the analogue for country *j*. The right-hand side of the regression is of the same generic form as the regressions of the previous two sections. Thus, CU_{ij} is a dummy variable that is unity if countries *i* and *j* were in a currency union; Z_{ij} is a vector of control variables; and ε_{ij} is a random error. The consumption data in this section are taken from the Penn World Tables, and are adjusted for PPP. The data are annual, and the maximum data span available is from 1960 to 1992.[21]

21. Again, I only estimate the bilateral correlation if I have at least 15 matching observations for each country. The Canadian-U.S. consumption correlation is 0.67.

Table 7 reports the regression results. If risk-sharing is greater among currency unions, I expect a positive coefficient on the currency-union dummy. If more distant countries find it more difficult to share risks, I also expect a negative coefficient on the log of distance. I report results from six regressions. All of them include the currency-union dummy and log distance as explanatory variables. The first regression (reported in the first column) uses a single intercept. The second regression uses a comprehensive set of country-specific fixed effects, so that the dummies for both *i* and *j* take on a value of one when the regressand is $ccorr_{ij}$. The third regression is identical to the first, but is estimated with weighted least squares.[22] The second set of three regressions repeats the analysis, but augments the regression with the bivariate correlation between the growth rates of output (that is, the correlation of the first difference in the log of output for country *i* with the analogue for country *j*, the analogue to the regressand).

The results are weak. The log of distance always enters significantly with the correct sign. The currency-union dummy always enters with the correct sign. However, it is not significant in the first specification; it is only of marginal significance in the second; and it is highly significant only in the third. In all three estimates, the economic size of the effect of currency unions is small. For instance, the currency-union effect is to increase the consumption correlation by 0.04 with weighted least squares. Since the intercept term in the regression is 0.31, then ignoring the effect of distance (that is, for two countries whose log distance is zero), being in a currency union raises the consumption correlation from 0.31 to 0.35.

Even these modest results may overstate the risk-sharing opportunities within currency unions. A high correlation of consumption for a pair of countries may not actually reflect greater risk-sharing opportunities between those two countries. It may simply reflect less idiosyncratic risk. That is, the consumption of two countries may be correlated simply because their output is correlated. Thus, even in the absence of avenues for risk-sharing, there may be a high consumption correlation that should not be interpreted as indicating substantial international risk-sharing.

This concern is particularly relevant, since in the previous section I found that business cycles are more highly correlated for currency-union countries. Therefore, controlling for the degree of output correlation is a potentially important robustness check. I pursue this by adding the actual correlation of (detrended) GDP per capita as a control in the right-hand columns of

22. Specifically, I give proportionately greater weight to observations in which the correlation is based on more data. That is, when I can base a correlation on 32 years of data, that correlation in the cross-sectional regression receives double the weight of a correlation based on only 16 years of data.

Table 7
Risk-sharing and currency unions: Consumption correlations

Controls	OLS	Country dummies	Weighted least squares	OLS	Country dummies	Weighted least squares
Currency union	0.05	0.10	0.04	0.07	0.11	0.03
	(0.9)	(1.8)	(4.13)	(1.2)	(1.9)	(3.9)
Log of distance	–0.03	–0.04	–0.03	–0.02	–0.03	–0.02
	(6.3)	(7.9)	(39.9)	(3.4)	(5.9)	(22.9)
Constant	0.29		0.31	0.15		0.39
	(7.8)		(49.1)	(4.3)		(166.2)
Output correlation				0.28	0.19	0.16
				(19.4)	(12.3)	(26.3)

Note: Absolute value of robust *t*-statistics reported in parentheses.

Table 7. As it turns out, the output correlation coefficient is always statistically and economically significant as a control variable, but its presence has little effect on my estimate of β.

I have found little statistically and economically significant evidence that international risk-sharing is enhanced by membership in a currency union. This is perhaps unsurprising, given the absence of substantive international fiscal-transfer arrangements and the shallow private financial markets of most currency-union members.

Summary and Conclusion

This paper contributes to the dollarization dialogue by quantifying some of the features associated with common currencies, using actual data. Using the historical record, I have found that the extra degree of integration associated with a common currency is substantial but finite. Members of international currency unions tend to experience more trade, less volatile exchange rates, and more synchronized business cycles than do countries with their own currencies.

Of course, since well-integrated countries are more likely to adopt a common currency, some of these integration "effects" of currency union may be illusory. In other words, the causality may flow from integration to currency union rather than the reverse.

While members of international currency unions are more integrated than countries with their own monies, they remain far from integrated when compared with the intranational benchmark of regions within a country.

Appendix 1
Currency Unions in the Macroeconomic Data Set

CFA franc zone

Benin
Burkina Faso*
Cameroon
Central African Republic
Chad
Comoros
Congo (Republic of)
Côte d'Ivoire
Equatorial Guinea
Gabon
Guinea-Bissau
Mali
Niger
Senegal
Togo

United States

American Samoa
The Bahamas
Bermuda
Guam
Liberia
Marshall Islands
Micronesia (Federated States of)
Northern Mariana Islands
Palau
Panama
Puerto Rico
Virgin Islands (U.S.)

France

French Guiana
Guadeloupe
Martinique
Mayotte
Monaco
New Caledonia
Reunion

East Caribbean Currency Area (ECCA)

Antigua and Barbuda
Dominica
Grenada
St. Kitts and Nevis
St. Lucia*
St. Vincent and the Grenadines

South Africa

Lesotho
Namibia
Swaziland

United Kingdom

Channel Islands
Ireland
Isle of Man

Australia

Kiribati
Tonga

East Africa

Kenya*
Tanzania
Uganda

France* and Spain

Andorra

India

Bhutan

Singapore

Brunei

Denmark

Faeroe Islands
Greenland

Switzerland

Liechtenstein

Belgium

Luxembourg

Israel

West Bank and Gaza

* Denotes country treated as anchor in multilateral currency unions.

Appendix 2
Countries, Territories, Colonies, and Other Entities in the Macroeconomic Data Set

Afghanistan, Albania, Algeria, American Samoa, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Aruba, Australia, Austria, Azerbaijan, The Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bermuda, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Cape Verde, Cayman Islands, Central African Republic, Chad, Channel Islands, Chile, China, Colombia, Comoros, Congo (Democratic Republic of), Congo (Republic of), Costa Rica, Côte d'Ivoire, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt (Arab Republic of), El Salvador, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Faeroe Islands, Fiji, Finland, France, French Guiana, French Polynesia, Gabon, The Gambia, Georgia, Germany, Ghana, Greece, Greenland, Grenada, Guadeloupe, Guam, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong China, Hungary, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Isle of Man, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Korea (Democratic People's Republic of), Korea (Republic of), Kuwait, Kyrgyz Republic, Lao PDR, Latvia, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Lithuania, Luxembourg, Macao, Macedonia FYR, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Martinique, Mauritania, Mauritius, Mayotte, Mexico, Micronesia (Federated States of), Moldova, Monaco, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, Netherlands Antilles, New Caledonia, New Zealand, Nicaragua, Niger, Nigeria, Northern Mariana Islands, Norway, Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Reunion, Romania, Russian Federation, Rwanda, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia and Montenegro (formerly Yugoslavia), Seychelles, Sierra Leone, Singapore, Slovak Republic, Slovenia, Solomon Islands, Somalia, South Africa, Spain, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Tanzania, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, Virgin Islands (U.S.), West Bank and Gaza, Yemen (Republic of), Zambia, and Zimbabwe.

Source: World Bank World Development Indicators, 1998.

Appendix 3
List of Countries

Afghanistan, Albania, Algeria, Angola, Argentina, Australia, Austria, Bahamas, Bahrain, Bangladesh, Barbados, Belize, Benin, Bermuda, Bhutan, Bolivia, Brazil, Brunei, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Cayman Islands, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo (Republic of), Costa Rica, Côte d'Ivoire, Cuba, Cyprus, Denmark, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Ethiopia, Faeroe Islands, Fiji, Finland, France, French Guiana, Gabon, Gambia, Germany (West), Ghana, Greece, Greenland, Grenada, Guadeloupe, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Kiribati, Korea (Democratic People's Republic of), Korea (Republic of), Kuwait, Lao, Lebanon, Liberia, Libya, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Martinique, Mauritania, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Myanmar (Burma), Nepal, Netherlands, Netherlands Antilles, New Caledonia, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Reunion, Romania, Rwanda, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Singapore, Solomon Islands, Somalia, South Africa, Spain, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Sweden, Switzerland, Syria, Taiwan, Tanzania, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Arab Emirates, United Kingdom, United States, Uruguay, Venezuela, Vietnam, Western Samoa, Yemen North, Yugoslavia, Zaire, Zambia, and Zimbabwe.

Source: World Trade Data Base.

References

Alesina, A. and R.J. Barro. 2000. "Currency Unions." National Bureau of Economic Research Working Paper No. 7927.

Anderson, J. and E. van Wincoop. 2001. "Gravity with Gravitas: A Solution to the Border Puzzle." National Bureau of Economic Research Working Paper No. 8079.

Bacchetta, P., A.K. Rose, and E. van Wincoop (conference organizers). 2001. *Lessons of Intranational Economics for International Economics* conference. < http: //www.haas.berkeley.edu/~arose/INC.htm >. *Journal of International Economics*. Forthcoming (selected papers).

Backus, D.K., P.J. Kehoe, and F.E. Kydland. 1992. "International Real Business Cycles." *Journal of Political Economy* 100 (4): 745–75.

Clark, T.E. and E. van Wincoop. 1999. "Borders and Business Cycles." Federal Reserve Bank of New York Staff Report No. 91.

Engel, C., M.K. Hendrickson, and J.H. Rogers. 1997. "Intranational, Intracontinental, and Intraplanetary PPP." *Journal of the Japanese and International Economies* 11 (4): 480–501.

Engel, C. and J.H. Rogers. 1996. "How Wide Is the Border?" *American Economic Review* 86 (5): 1112–25.

Feenstra, R.C., R.E. Lipsey, and H.P. Bowen. 1997. "World Trade Flows, 1970–1992, with Production and Tariff Data." National Bureau of Economic Research Working Paper No. 5910.

Feldstein, M. and C. Horioka. 1980. "Domestic Savings and International Capital Flows." *Economic Journal* 90 (358): 314–29.

Frankel, J.A. and A.K. Rose. 1998. "The Endogeneity of the Optimum Currency Area Criteria." *Economic Journal* 108 (449): 1009–25.

French, K.R. and J.M. Poterba. 1991. "Investor Diversification and International Equity Markets." *American Economic Review* 81 (2): 222–26.

Helliwell, J.F. 1998. *How Much Do National Borders Matter?* Washington: Brookings Institution Press.

Hess, G. and E. van Wincoop. 2000. *Intranational Macroeconomics.* Cambridge, England: Cambridge University Press.

Imbs, J. and R. Wacziarg. 2000. "Stages of Diversification." Centre for Economic Policy Research Discussion Paper No. 2642.

Kenen, P.B. 1969. "The Theory of Optimum Currency Areas: An Eclectic View." In *Monetary Problems of the International Economy,* edited by R.A. Mundell and A.K. Swoboda, 41–60. Chicago: The University of Chicago Press. Proceedings of a conference held by The University of Chicago.

McCallum, J. 1995. “National Borders Matter: Canada-U.S. Regional Trade Patterns.” *American Economic Review* 85 (3): 615–23.

McKinnon, R.I. 1963. “Optimum Currency Areas.” *American Economic Research* 53 (4): 717–25.

Mundell, R.A. 1961. “A Theory of Optimum Currency Areas.” *American Economic Review* 51 (4): 657–65.

Obstfeld, M. and K. Rogoff. 2001. “The Six Major Puzzles in International Macroeconomics: Is There a Common Cause?” *NBER Macroeconomics Annual 2000*. Cambridge, Mass.: MIT Press.

Parsley, D.C. and S.-J. Wei. 1996. “Convergence to the Law of One Price without Trade Barriers or Currency Fluctuations.” *Quarterly Journal of Economics* 111 (4): 1211–36.

Rogers, J.H. and M. Jenkins. 1995. “Haircuts or Hysteresis? Sources of Movements in Real Exchange Rates.” *Journal of International Economics* 38 (3–4): 339–60.

Rogoff, K. 1996. “The Purchasing Power Parity Puzzle.” *Journal of Economic Literature* 34 (2): 647–68.

Rose, A.K. 2000. “One Money, One Market: The Effect of Common Currencies on Trade.” *Economic Policy* 30: 7–33.

Rose, A.K. and C. Engel. 2000. “Currency Unions and International Integration.” National Bureau of Economic Research Working Paper No. 7872.

Discussion

Graydon Paulin

Overview

The paper by Andrew Rose examines the impact of currency unions on the economic behaviour and performance of their members. This empirical paper uses results from a gravity model of international trade as its key component. To obtain a sufficiently large sample of countries participating in currency unions, the author uses data sets that incorporate a broad range of economic areas. Areas such as Micronesia, Kiribati, the Channel Islands, Monaco, and Greenland, all members of a currency union, are not the standard fare of macroeconomic analysis. My own view, however, is that there is a wealth of information in these data sets that is all too often ignored. The author's efforts to put them to good use are therefore to be welcomed. Of course, we must be concerned with how well the results obtained for relatively small economic units will apply to much larger ones, such as Canada, Europe, and the other large industrialized economies. The results may not scale in a linear fashion. I'll return to this point.

Currency Unions and Trade

Perhaps the most interesting, and provocative, result relates to the impact of a currency union on trade among participating members. The base result suggests that trade between two members of a currency union will be over eight times greater than would have otherwise been the case. Turning it around, this suggests that there are large impediments to trade created by the lack of a common currency. Assuming that increased trade is welfare-enhancing, then this points to significant potential benefits from joining such a union.

A determined effort is made to check the robustness of this result, including the addition of a number of conditioning variables, such as the presence of regional trade agreements and variables drawing on cultural similarities (e.g., a common language). While the magnitude of the trade effect declines, to about 3 1/2 in one equation, the impact is still large and statistically very significant.

The question we must ask, however, is why is this happening—why does a currency union boost trade to such an extent (even more than a regional trade agreement, according to the author's results)? The traditional response has been that between countries with separate currencies, exchange rate volatility creates uncertainty that could lower the equilibrium level of trade. However, the literature typically does not demonstrate a large impact through this channel. A survey by Bank of Canada economist Agathe Côté, for example, finds very little impact from exchange rate volatility onto trade (Côté 1994). In fact, earlier work by Rose (1999) included a measure of nominal exchange rate volatility as an additional conditioning variable. A negative impact from exchange rate volatility to trade was obtained (although one must be careful of possible simultaneity bias), but a large and *separate* positive impact from the presence of a currency union remained.[1]

So what exactly is at work here? Perhaps a currency union does lend itself to something similar to a "home-bias" effect that has been shown with respect to intraregional trade. Although this effect remains robust in response to the addition of various conditioning variables, the apparent size of the "home-bias" effect is still surprisingly large in an absolute sense. This raises the possibility that the currency-union variable is picking up some other aspect of the trade relationship between these countries.

Causality is one potential problem. The author is clear that his paper does not directly address the issue of causality between currency union and trade, given the reduced-form approach. But if countries that have an above-average propensity to trade with each other are more likely to enter into currency unions, it may not be appropriate to interpret the results as meaning that currency unions lead to higher trade.

A second problem is the accuracy and interpretation of the trade data. Putting aside the inevitable problem of incomplete or inaccurate data, trade in the small economic units under investigation is subject to a number of possible biases. This is important when you consider that many countries in the currency-union sample have a relatively high degree of trade openness. In part, this is a reflection of their small size, leading to a dependence on

1. In one example, Rose shows that entering a currency union could have a positive impact on trade an order of magnitude greater than reducing exchange rate volatility to zero.

trade to secure access to a broad range of goods. But exports alone, for a good number of the countries in the sample, exceed 50 per cent of GDP.

Some currency-union countries undertake substantial transshipment of goods, which can boost their trade figures enormously. Re-exports occur as part of all countries' trade, but they can account for a relatively large proportion of trade in small economies. The principal database used in the analysis (the World Trade Data Base) in fact makes some adjustment for entrepôt trade, but the adjustment is partial at best. As a result, exports of domestic goods may be overstated for this group of small countries.

Some of these island economies (that are part of currency unions) have had large petroleum refineries located in them, which can have a huge impact on domestic GDP and exports. Other economies receive substantial financial assistance from anchor countries (or other sources). Some of them belong to custom unions with the anchor country or other currency-union members. On this latter point, the legal and regulatory framework affecting trade among different groups in the sample differs enormously. To truly capture the conditioning effects of regional trade arrangements on export patterns, a greater effort to differentiate between the types of arrangements is necessary (as opposed to the dummy-variable approach taken).

Applying the Results to Other Countries

The economic areas in the currency-union sample are small, with a mean population and per capita real GDP of about one-fifth of that of the whole sample. They are much smaller in comparison to the large industrialized economies, and for the most part they have economic structures that are quite different from the larger countries. For example, they are likely to have much less sophisticated financial structures.

The countries in the sample that are not part of a currency union also differ widely. But of most interest to us are the larger industrialized economies, such as Canada and the major European economies. Are they likely to realize trade gains from joining a currency union of the magnitude suggested by this study? Probably not. These countries already have a large proportion of their domestic production oriented towards trade goods, and a large proportion of that already goes towards prospective (or actual, in the case of the European Economic and Monetary Union (EMU)) partner countries (see Table 1).

Table 1
Export shares (per cent)

	1995	1998
	Canada	
Exports/GDP	38	42
Share of exports to the United States	80	86
	EU-15	
Exports/GDP	30	32
Share of exports to other EU-15 countries	62	63

Notes: 1995 represents the final year of the author's estimation sample. 1998 is included for purposes of comparison and is the year prior to European monetary union.

Source: IMF Direction of Trade Statistics Yearbook, 2000 and National Accounts of OECD Countries, OECD, Volume II, 1988–98.

The industrialized countries also enjoy deep financial markets and a substantial degree of financial integration, which could be expected to facilitate trade in its own right. For that reason, the author might have found it useful to include some measure capturing the role of financial depth and integration in his analysis.

Other Results

Rose uses the data to produce a number of interesting results. Members of common-currency areas tend to be more specialized (i.e., they have a higher Herfindahl Index for exported goods). Despite greater specialization, which may conceivably lead to a greater incidence of asymmetric shocks, members of a currency union appear to have more tightly synchronized business cycles (although the effect is not large, with a regional trade agreement being more important in this regard). These results are, as indicated above, subject to concerns about causality (i.e., is it the currency union that causes the higher correlations, or vice versa?).

Is there a greater incidence of risk-sharing among members of a currency union? In contrast to the results obtained for trade, the currency-union coefficient in these regressions is typically small and statistically insignificant. In effect, a currency union reduces the domestic "home-bias" effect with respect to trade, but not with respect to risk-sharing. Why this is the case is not clear.

Where Next?

Empirical studies of the effects of currency unions are constrained by the fact that there have been few "new" currency unions and by the fact that existing currency unions were concentrated within small economic units. However, there are now at least two recent, and more relevant, examples: Germany, beginning in the early 1990s, and EMU, begun in 1999. Germany represents a political union, as well, which reduces its usefulness for our purposes; thus, analysis will likely concentrate on the larger EMU.

EMU represents a wealth of potential research opportunities, once the passage of time has led to a sufficient body of data. Unfortunately, like Germany, EMU does not represent a pure example of a currency union, with steps being taken in the direction of a common policy framework and a reduction of regulatory differences. Thus, it will be difficult to disentangle the effects of monetary union from other influences, although that will not prevent researchers from trying.

References

Côté, A. 1994. "Exchange Rate Volatility and Trade: A Survey." Bank of Canada Working Paper No. 94–5.

Rose, A.K. 1999. "One Money, One Market: Estimating the Effect of Common Currencies on Trade." National Bureau of Economic Research Working Paper No. 7432.

General Discussion

John Crow led off the session by noting that he was intrigued by the relative lack of evidence of price integration, and he wondered whether Andrew Rose was surprised by the results as well. Rose responded that he was indeed surprised—and not especially pleased—that the price results on price integration across countries were so negative. He added that because trade is higher among currency-union countries, prices should be more similar and the goods market more integrated.

Crow followed up with a question for Daniel Racette by asking whether the burden of proof in the case of adopting a common currency or dollarization should lie with those who want that change rather than with advocates of the status quo. Racette replied that he agreed entirely. He added, however, that he was disturbed by the disparity in the figures being put forward—about 0.15 per cent of consumption in favour of a flexible rate found in the Macklem et al. paper—compared with those demonstrated by Rose for common currencies. He said that in spite of Rose's impressive figures, however, he remained a strong supporter of the flexible exchange rate.

Charles Freedman asked whether currency unions create or divert trade. Also, does the non-convergence of real exchange rates mean that mis-alignments are no smaller in currency unions? Rose replied in the affirmative to the latter question. In the case of trade diversion, he argued that it could arise without hurting welfare, since the currency union is removing a barrier. However, his work with Frankel found that common-currency members tend to trade more with other partners, as well as with their common-currency partners.

In response to a query from Robert Leeson about the applicability of his results to larger countries, Rose noted that his other work with Frankel shows that the benefits of currency union flow primarily to the smaller partners. Paul Masson stated that the currency-union examples were mostly

small and poor partners linked to a richer and larger pivot country. Rose said that the West African CFA franc zone and the Eastern Caribbean currency association are not formally linked to the french franc and U.S. dollar. They are multilateral currency unions. The results for multilateral currency unions are no different than for those countries that unilaterally adopt the currency of their major trading partner. Dan Ciuriak asked about the effects on growth. Rose and Frankel estimate that greater openness influences growth. Doubling or trebling trade, therefore, can have a large effect. They estimate that if Canada were to unilaterally dollarize, there would be a long-run 20 per cent increase in GDP.

Chris Ragan was concerned about reverse causality: could the effect of currency unions on trade be explained by the fact that the political decision to join a currency union was based on economic variables? Rose thought that the reverse-causality argument is an academically reasonable subject but of no empirical importance. Political scientists have not found any effect of economic variables in the decisions to join currency unions.

Lawrence Schembri wondered whether currency unions could also lead to other policies that might facilitate trade, such as the provision of transport infrastructure. Rose replied that he is unaware of any evidence to support this assertion. Schembri also asked whether the gains from exploiting comparative advantage might be reason for the large trade volumes among common-currency-union members and not the common currency per se. Rose noted that he has controlled for comparative advantage by eliminating country pairs with very large trade volumes to ensure that the results are not excessively dependent on those pairs. Michael Bordo mentioned research by Flandreau showing that the Austro-Hungarian Empire generated high levels of trade among its members and these were relatively large countries.