

Regional Currencies Versus Dollarization: Options for Asia and the Americas

FELIPE LARRAÍN B.^a and JOSÉ TAVARES^{b,*}

^aUniversidad Católica de Chile; ^bUniversidade Nova de Lisboa

(Received November 2002; In final form April 2003)

This paper undertakes an empirical assessment of Dollarization versus regional currency union as options for the economies of East Asia, South America and Central America. We use summary indicators of bilateral integration to examine the determinants of real exchange rate volatility within each region and between each region and the United States. While Europe is characterized by a high degree of regional integration, there is evidence of increasing integration in East Asia and persistently low integration in the Americas, especially as compared to the levels of bilateral integration *vis-à-vis* the United States. Our estimates confirm the patterns of regional integration above and reveal substantial regional differences as to the determinants of real exchange rate volatility.

Key words: Central America; Currency Areas; Dollarization; East Asia; Europe; Exchange Rates; South America

JEL Codes: E42; F15; F31; F33; F36

1 INTRODUCTION

In the wake of currency crises in East Asia and other developing countries, there is a new sense of the vulnerability of all developing countries' volatile capital movements.¹ It is not clear whether intermediate exchange rate systems are a sensible policy option in developing countries, notably in Latin America, are now explicitly considering options such as official Dollarization,² while others have opted for floating. In addition, the successful transition to a common currency by a wide set of European countries³ highlights the benefits of fixed parities *vis-à-vis* trading partners. The moment is thus propitious for an examination of the potential of currency unions versus hard currency pegs.

*Corresponding author. Faculdade de Economia, Universidade Nova de Lisboa, Campus de Campolide, 1099–032 Lisboa, Portugal; Tel.: (351) 21-380-1669; Fax: (351) 21-388-6073; E-mail: jtavares@fe.unl.pt

¹The recent increase in capital mobility has brought the benefits of intermediate exchange rate systems into question. Obstfeld and Rogoff (1995) illustrate the difficulties for fixed exchange regimes in a world of high capital mobility, namely, the low credibility of central banks under speculative attacks. Eichengreen and Masson (1998) suggest that only very hard pegs and managed floats are likely to survive high levels of capital mobility.

²See *The Economist* (2002). As pointed out, if El Salvador attains high growth rates after Dollarization, several other Latin American countries may follow. On the other hand, Larraín and Velasco (2001, 2002) make the case for floating in emerging markets.

³Micco *et al.* (2002) have recently uncovered substantial trade effects following the creation of the EMU and the introduction of the Euro.

Before the Asian crisis of 1997 countries in the region relied on unilateral dollar pegs, which could not deal with the asymmetric devaluations in the wake of the fall of the yen. A common currency in East Asia might have delivered better outcomes as increasing regional trade integration in East Asia (including Japan) suggests. Bayoumi and Mauro (1999) review the case of a currency area in the ASEAN countries and conclude that on economic criteria the ASEAN is only marginally less suited for a regional currency area than Europe was just before Maastricht. The fact that the ASEAN countries have important trade flows with the three major trade areas, the US, Japan and Europe, militates against fixing with a particular currency. Reinforced by the high and rising level of trade in manufactures. Low inflation rates, budget deficits and public debt across the ASEAN, the rapid adjustment to shocks and levels of intra-regional trade similar to Europe argue for a regional currency.

Latin American countries such as Ecuador and El Salvador have adopted the US dollar in recent years, while countries in Mercosur discuss the possible future adoption of a common currency, as assessed in Eichengreen (1998). Documenting the high levels of real exchange rate variability within the region, Eichengreen concludes that monetary unification makes sense only as part of a broader integration project that addresses the underlying sources of bilateral volatility.

As for Central America, for most of the past century it has adopted monetary arrangements characterized by the fixing of the nominal exchange rate with relation to the US dollar. The instability of the 1980s led the countries in the region to abandon the peg to the dollar in succession. However, their small economic size and high degree of openness to international trade need to be weighed in any choice of an exchange rate regime. In the past analysts have argued for Dollarization⁴ as well as for the adoption of a common currency in Central America.⁵

In this paper we evaluate empirically the options of Dollarization and regional currency union in light of the literature on the determinants of real exchange rate volatility. We compute the levels of bilateral integration as well as the determinants of bilateral real exchange rate volatility for the three regions under study – East Asia, South America and Central America – improving on the existing literature in several ways. First, we provide the first explicit quantitative comparison of Dollarization versus regional currency unification for the regions studied, framing previous studies in the appropriate context. Second, our estimation method draws on both time and cross-section variation in bilateral data, the former dimension having been largely ignored in the literature.

2 REGIONAL CURRENCY AREAS VERSUS DOLLARIZATION

The seminal contributions in Mundell (1961) and McKinnon (1963), giving rise to the theory of optimal currency areas, remain the focal point for examining currency agreements between countries. According to Mundell, countries or regions that are symmetrically affected by shocks form an optimal currency area. It is not required that shocks be symmetric between countries but only that labor and capital be sufficiently mobile and prices flexible enough to

⁴Frankel recently affirmed that “Dollarization probably is a good idea for some countries in Latin America, particularly countries that are quite small and open, let’s say, some in Central America”. See IMF (1998).

⁵This possibility was first raised in Young (1965) and Triffin (1970), the first of which sketches a program for regional monetary unification. On the other hand, Kafka (1973) argued against a currency area in the region, given the poor development of financial institutions and the need to further stabilize fiscal policy choices. Kafka (1973) stated clearly that “Latin America is obviously not an optimum currency area either now or for the foreseeable future. The same is true of its subdivisions, like the Latin American Free Trade Agreement (LAFTA) and, it seems, even the Central American Common Market (CACM). In fact, many Latin American countries are only gradually acquiring the characteristics of optimum currency areas”. More recently, García, Larraín and Tavares (2001) have assessed the prospects for a common currency in Central America.

avoid persistent local pockets of unemployment. Any group of countries with a reasonable combination of these three elements – symmetry of shocks, factor mobility and price flexibility – can benefit from a common currency.⁶ In that case nominal exchange rate changes become irrelevant.

What are the benefits of a common currency area? The most conspicuous is the reduction in transaction costs whenever international exchanges of goods, services and capital are involved.⁷ These costs are related to fees such as the bid-ask spread and related commission fees that financial institutions charge for foreign currency transactions. Second, in common currency areas there is a concomitant decrease in uncertainty for transactions with in-area foreign partners, which is likely to foster trade and investment flows. As to the costs of establishing a common currency, they are associated with the loss of autonomy in the conduct of monetary policy. Monetary policy is an important instrument to respond promptly to asymmetric real shocks in the presence of nominal rigidities and imperfectly integrated factor markets, since changes in the nominal exchange rate lead to changes in the real exchange rate.

As opposed to a currency union, Dollarization implies the simple substitution of a given country's currency by the US dollar.⁸ The dollar is a good candidate to perform the functions of means of payment, asset to hold savings and unit of account given its stable value, its wide use in international transactions and as a reserve currency.⁹ Panama, Ecuador and El Salvador have opted for Dollarization,¹⁰ while Guatemala legalized the US dollar in parallel with domestic currency. In addition, five US possessions and six other independent countries are officially dollarized.¹¹ One of the main benefits of Dollarization is the decrease in currency risk – if not in country risk and interest rates, and the resulting convergence between domestic and US inflation.¹²

The most conspicuous cost is the loss of an independent monetary policy and control of the lender-of-last-resort function. Given the small relevance of countries considering Dollarization in US affairs, their interests as far as monetary policy stance are not likely to be taken into account by federal authorities.¹³ The loss of the lender-of-last-resort function drastically limits local authorities in their role as providers of liquidity to the banking system in times of crises, while introducing a moral hazard problem whereby local authorities may lack the incentive to properly monitor it. Furthermore, the implied loss of seigniorage revenue may not be irrelevant to the countries in question.¹⁴

⁶Bayoumi and Eichengreen (1998) argue that capital mobility may substitute for lack of labor mobility. This is correct only under restrictive conditions; in general, labor and capital mobility are both necessary.

⁷These costs are explicitly mentioned as a benefit of currency union in Mundell (1961) and they were highlighted in the build-up to monetary union in Europe.

⁸The policy we refer to in the current paper is that of official Dollarization, the monetary regime in which a country formally relinquishes the issue of domestic notes and coins and adopts the dollar as the national currency.

⁹Baliño *et al.* (1999) estimate that deposits in US dollars exceeded 30 percent of broad money in 18 countries, while in 34 others these deposits are significant, at an average level of 16 percent. In another study, Porter and Judson (1996) estimate that 55–70 percent of the total amount of dollars issued are held by foreigners, mostly in Latin America and Russia.

¹⁰In Ecuador Dollarization was initiated in January 2000 by fixing the local currency to the US dollar, and became fully-fledged by September of the same year. The Salvadoran currency began to be phased out in January 2001 and is expected to disappear completely by the end of 2003.

¹¹These are: the Marshall Islands, Micronesia, Palau, Pitcairn Island, Turks and Caicos, and the UK Virgin Islands – all with populations below 125,000.

¹²See Larrañ and Velasco (2001) for a discussion of these issues.

¹³This is further compounded when a dollarized country trades a lot with a non-dollarized neighbor, as the case of Brazil and Argentina illustrates. When Brazil opted for devaluation it forced a dramatic change in the competitiveness of Argentinean exports in Brazil, certainly adding to the Argentinean crisis.

¹⁴See Calvo (1999). For the typical developing economy under responsible monetary management, this may amount to 1–2 percent of GDP. Proposals to share the seigniorage between the dollarized economy and the US require the critical acceptance of the US, unlikely given the political overtones of the issue.

3 REGIONAL CURRENCIES VERSUS DOLLARIZATION: AN ASSESSMENT

Different criteria for establishing a currency area have been presented in the literature and these can be used as a guide to our empirical study.¹⁵ First and foremost, a high level of bilateral trade favors currency unification as the lower transaction costs of a single currency apply to a wider base.¹⁶ The composition of trade flows also matters as countries that export widely different goods are probably subject to asymmetric shocks and more likely to need frequent bilateral exchange rate adjustments.¹⁷ A second criterion for establishing a common currency area is the degree of asymmetry of underlying shocks relative to the flexibility of factor markets. The larger the idiosyncratic country shocks, the more dissimilarity exists between countries and the slower is real adjustment, the less appropriate is the option for a currency area.¹⁸

Frankel *et al.* (1998) point to three determinants of the choice of exchange rate regime: credibility, structural characteristics, and commitment to regional integration. Countries that lack fiscal and monetary discipline can fix the exchange rate as a way to import that discipline. The resulting decrease in country risk can lead to benefits through lower interest rates, higher levels of domestic investment and capital inflows.¹⁹

The institution of a common currency changes the economic relationship between its members in a fundamental way, so one should note the endogeneity of the criteria. Bilateral trade makes currency union more beneficial, but a group of countries that adopts a common currency encourages regional trade flows. Countries may be more suited for a currency area ex-post than ex-ante if it furthers trade flows, makes output cycles more synchronous and changes the responsiveness of prices to exogenous shocks.²⁰

In this paper we use a data set comprised of 37 countries in East Asia, Western Europe and North, Central and South America. The choice of countries in the sample depends on two criteria: the size of their economies and the fact that they belong to regions where Dollarization is a plausible policy choice. The full list of countries is presented in Appendix I. For each country pair in the sample we compile a set of indicators of bilateral integration, specific to each pair of countries and time period, namely:

¹⁵See Eichengreen and Masson (1998) for a survey.

¹⁶The argument goes back to McKinnon (1963) and the optimal currency area theory: major trading partners should keep fixed exchange rates since continuous adjustments of parity are costly, arbitrarily influencing the terms of trade. On the other hand, economies that are more open tend to be vulnerable to external shocks and, in the absence of price flexibility, more dependent on nominal exchange rate adjustments to pursue real adjustments.

¹⁷Kenen (1969) emphasizes this point. Bofinger (1994) states that countries with a more diverse production and export base are less likely to require bilateral exchange rate adjustments.

¹⁸The empirical prediction is thus that the bilateral real exchange rate volatility is lower for pairs of countries whose output shocks are strongly correlated.

¹⁹Other authors have criticized the credibility argument. Tornell and Velasco (1995) argue that flexible exchange rate regimes may actually provide a higher degree of macroeconomic discipline. Whether fixed exchange rates provide more fiscal discipline depends on the government rate of discount. If only the short term matters for the government a flexible exchange rate regime may provide more discipline. Westbrook and Willet (1999) criticize the credibility argument on different grounds. First, traditional pegs would not provide sufficient credibility and more credible institutional arrangements would be necessary. Second, pegging to a currency that does not fulfill the optimum currency area criteria would not be a credible move in itself.

²⁰Currency unions have other dynamic effects. Fatás (1997) argues that currency unification has opposing effects on the correlation of shocks across countries: while increased regional specialization decreases output shock correlation, the higher intensity of demand linkages and intra-industry trade increases shock correlation. Frankel and Rose (1996, 1998) have shown that trade integration and the correlation of country business cycles are mutually reinforcing, whereas Bayoumi and Eichengreen (1998) present evidence that more trade integration leads to lower exchange rate variability. In the labor market front, Marsden (1992) argues that regional integration and the parallel product market integration decrease the market power of firms so that labor markets become more responsive to short-term conditions. The idea is that firms with no market power cannot cushion short-term fluctuations in profitability so that wages have to adjust immediately and thus labor markets respond more directly to economic shocks.

- bilateral real exchange rate variability;
- output shock dissimilarity, the degree of correlation of output fluctuations;
- bilateral trade intensity, the share of bilateral trade flows in a country's GDP;
- export similarity, the degree to which two countries rely on similar export products;
- country size, measured as the average of the two countries' absolute GDPs.²¹

Each variable is averaged over the periods 1970–79, 1980–89 and 1990–97. The use of different time periods allows us to assess how the feasibility of Dollarization versus regional currency unification changed over time, the latter dimension having been insufficiently explored in the empirical literature on currency areas and Dollarization. Our starting point is to compare the average value of real bilateral exchange rate volatility within each region and between the countries in the region and the United States.

Table I below reports summary statistics of the indicators of bilateral economic integration compiled by region for the three decades in the sample, the 1970s to the 1990s. In Appendix I we describe exactly how the indices of real exchange rate volatility, asymmetry of output shocks, dissimilarity of exports and intensity of bilateral trade were constructed. Table I presents, in order, the value of the bilateral indicators when only one of the countries in the country pair belongs to the region, the within-region values (when both countries are in the region) and the same value when one country is in the region and the other is the United States.²² For the three decades considered Europe has the lowest values of intra-regional real exchange rate volatility, almost half the level in Asia, a third of Central America's and a fourth of South America's. Our data show that while Europe's level of real exchange rate volatility decreased slightly from a low level in the 1970s, Asia experienced a dramatic decrease, and in the 1990s has approached European levels of exchange rate volatility. South America and Central America, on the other hand, experienced substantial fluctuations, with an increase in the 1980s and a decrease in the 1990s to levels still substantially higher than Europe's and Asia's.²³ As for the evolution of regional exchange rate volatility versus the US dollar, Asia stands out with the lowest level of volatility, followed by Europe and Central America and South America, at higher levels. A comparison of exchange rate volatility within the region as compared to volatility versus the dollar in the 1990s allows us to conclude that regional currency unification in Europe seems more feasible than Dollarization, while in Asia the Dollarization option looked relatively more attractive in the past than it does in the 1990s. As to South and Central America, currencies display lower volatility versus the dollar than among themselves.

Columns (4) to (6) report on the asymmetry of output shocks, where a higher value of the index is associated with more asymmetry, *i.e.* lower correlation of output among the countries considered. Europe stands out again for a low degree of output asymmetry, followed by Central America and East Asia. The evolution over time shows a slight decrease in the asymmetry of output shocks in Europe from already low levels in the 1970s. As to the asymmetry of output shocks relative to the US economy, Europe stands out again, followed by Central America, East Asia and South America and the evolution over time parallels that

²¹It is often recommended that small open economies peg their currencies to the currency of the main trading partner. See IMF (1998). Eichengreen and Masson (1998) state that "small countries that trade extensively with large neighbors and/or have large tourism receipts benefit little from an independent monetary policy". Small countries may benefit relatively more from the reduction in transaction costs and uncertainty, as the common currency is a way to bypass the thinness of local exchange markets, avoiding substantial fluctuations.

²²The sample average by indicator and decade and the sample average for bilateral indicators with the US are also reported as benchmarks.

²³Interestingly, Central America displayed levels of real exchange variability in the 1970s – a period of substantial efforts toward regional integration – that are actually lower than Europe's in the same decade.

TABLE I Indicators of Bilateral Integration.

	<i>Real exchange rate volatility</i>			<i>Asymmetry of output shocks</i>			<i>Dissimilarity of exports</i>			<i>Intensity of trade</i>		
	<i>(1)</i> <i>1970s</i>	<i>(2)</i> <i>1980s</i>	<i>(3)</i> <i>1990s</i>	<i>(4)</i> <i>1970s</i>	<i>(5)</i> <i>1980s</i>	<i>(6)</i> <i>1990s</i>	<i>(7)</i> <i>1970s</i>	<i>(8)</i> <i>1980s</i>	<i>(9)</i> <i>1990s</i>	<i>(10)</i> <i>1970s</i>	<i>(11)</i> <i>1980s</i>	<i>(12)</i> <i>1990s</i>
All	0.1218	0.1795	0.1150	0.0330	0.0441	0.0302	11.64	11.48	10.44	0.52	0.61	0.66
All–Europe	0.1139	0.1885	0.1238	0.0315	0.0405	0.0290	12.08	11.49	10.16	0.28	0.28	0.30
Europe	0.0564	0.0558	0.0519	0.0260	0.0193	0.0153	6.69	6.28	5.94	1.38	1.80	1.91
USA–Europe	0.0643	0.1350	0.0988	0.0261	0.0256	0.0188	6.64	6.35	3.87	0.80	1.08	0.98
All–East Asia	0.1215	0.1588	0.1046	0.0320	0.0461	0.0292	12.45	11.79	10.68	0.33	0.41	0.46
East Asia	0.1090	0.0986	0.0578	0.0304	0.0417	0.0233	13.12	11.56	8.27	1.97	2.41	2.76
USA–East Asia	0.0921	0.0696	0.0617	0.0264	0.0399	0.0242	11.58	9.61	6.70	4.16	5.82	6.07
All–South America	0.1494	0.2172	0.1271	0.0369	0.0526	0.0351	12.58	12.96	12.13	0.21	0.22	0.23
South America	0.2024	0.2566	0.1470	0.0418	0.0609	0.0432	11.90	12.11	11.00	0.27	0.34	0.37
USA–South America	0.1321	0.1878	0.0961	0.0382	0.0520	0.0332	13.67	13.95	8.76	2.08	2.43	2.77
All–Central America*	0.0947	0.2134	0.1498	0.0323	0.0430	0.0312	11.98	13.08	12.66	0.27	0.24	0.23
Central America*	0.0406	0.2028	0.1312	0.0302	0.0372	0.0223	4.25	3.99	4.33	1.24	0.99	0.83
USA–Central America*	0.0320	0.1397	0.1067	0.0259	0.0293	0.0239	12.71	13.54	11.16	4.80	4.54	4.33
USA–all countries	0.0876	0.1345	0.0888	0.0297	0.0372	0.0249	10.64	10.27	9.06	2.63	3.24	3.41

Note: All–country pairs refers to the sample average; Europe, East Asia, South America and Central America to country pairs where both countries belong to the same region; all–*region* to the average value for pairs including a country in the region and one outside; USA–*region* to the pairs comprising the United States and a country in the region. Central America excludes Nicaragua.

of intra-regional volatility. South America is the only region that has higher intra-regional output asymmetry than asymmetry versus US output, and significantly so.

Columns (7) to (9) report on the dissimilarity of export base, a measure of how different the export structures of two countries are: the larger the index, the more the countries differ as far as their pattern of exports for the eight first SITC codes at 1-digit level. Central America comes out as the most homogeneous region, which is not surprising given that these countries share similar specialization patterns in agricultural products and textiles. Central America is also the region that differs the most from the US in its pattern of specialization. Europe, East Asia and South America all have patterns of country exports that differ more within than between the region and the United States. Countries in the same region tend to become more similar over time, both within regions and with the United States, which may reflect a general tendency toward diversification as economies grow in income per capita.

Finally, the last three columns in Table I present summary statistics for the intensity of bilateral trade, a measure of trade integration. As the level of bilateral trade between two countries increases – as a share of their respective GDPs – the intensity of trade index increases concomitantly. East Asia now stands out as the most integrated set of countries as far as trade while South America is at the other extreme. Trade integration tends to grow over time in all regions, the exception being Central America. As to bilateral trade intensity *vis-à-vis* the United States, East Asia is the most integrated, now closely followed by Central America. Furthermore, all regions tend to trade more with the US than with its neighbors, the exception being Europe. In the case of the Americas, one should also take notice of the extremely low absolute levels of regional trade integration.

In sum, as far as indicators of bilateral integration are concerned, Europe comes out as a deeply integrated group of countries, regardless of the gauge chosen, and European countries are more closely integrated with their neighbors than with the US. This fact confirms the appropriateness of Europe as a benchmark of a regionally integrated region, against which regional currency unification in other areas is to be assessed. East Asia as a region has seen remarkable progress in the degree of regional integration over time: real exchange rate volatility, the asymmetry of output shocks and the degree of export dissimilarity decreased while trade intensity increased. In fact, in the 1990s East Asia comes close to European levels of regional integration. While Asia displays levels of regional integration with the US similar to the regional levels, both South and Central America seem more integrated with the US than within themselves.²⁴

We now turn to examining the determinants of bilateral real exchange rate volatility, in particular how it is affected by the intensity of trade, dissimilarity of exports and the asymmetry of output shocks. Our data set includes 37 countries for each decade – the 1970s, the 1980s and the 1990s – including the largest economies in East Asia, South America and Western Europe. The panel estimates determine whether countries in a given region display intra-regional exchange rate volatility or exchange rate volatility versus the dollar that is significantly different from the sample average. In Table II we assess this by including appropriate dummy variables in the panel specification, capturing, respectively, bilateral region–US observations and intra-regional observations. In Table III we estimate the impact of each determining factor on exchange variability versus the dollar and versus the other regional currencies. This is done by the interaction of the appropriate dummies with the determining factors (independent variables) in each specification. There, a significant coefficient associated with a factor indicates that the factor at stake is more/less important for the pair of countries captured by the dummy than for the typical pair in the sample.

²⁴In both regions, significant macroeconomic imbalances in the 1980s led to lower levels of regional integration and integration versus the US dollar in that decade. That has been only partially reversed in the 1990s.

TABLE II Determinants of RER Volatility—Within-region and Against US Dollar Dummies.

	<i>Within-region</i>					<i>Against US dollar</i>			
	(1) <i>All decades</i>	(2) <i>All decades</i>	(3) <i>1970s</i>	(4) <i>1980s</i>	(5) <i>1990s</i>	(6) <i>All decades</i>	(7) <i>1970s</i>	(8) <i>1980s</i>	(9) <i>1990s</i>
Asymmetry of output shocks	1.933** (8.66)	1.774** (7.61)	0.769** (5.06)	3.353** (5.75)	1.575** (10.23)	1.789** (7.58)	0.759** (5.02)	3.509** (5.90)	1.602** (10.33)
Dissimilarity of exports	0.003** (2.66)	0.003** (2.85)	0.000 (-0.18)	0.008** (2.62)	0.002** (3.04)	0.003** (2.37)	-0.001 (-0.74)	0.008** (2.42)	0.001** (2.03)
Intensity of trade	-0.008** (-6.00)	-0.006** (-4.55)	-0.009** (-5.61)	-0.003 (-1.25)	-0.004** (-3.29)	-0.007** (-4.09)	-0.009** (-4.83)	-0.005 (-1.32)	-0.004** (-3.05)
Economic size	-0.009** (-2.82)	-0.004 (-1.35)	0.011** (4.22)	-0.027** (-3.20)	0.009** (5.03)	-0.004 (-1.36)	0.012** (4.23)	-0.028** (-3.30)	0.008** (4.86)
East Asia	-	-0.047** (-5.12)	0.013* (1.63)	-0.118** (-6.86)	-0.038** (-6.93)	-0.040** (-4.17)	0.006 (0.65)	-0.097** (-4.79)	-0.041** (-7.26)
Europe	-	-0.047** (-6.26)	-0.055** (-7.83)	-0.026 (-1.26)	-0.035** (-7.19)	-0.041** (-5.17)	-0.064** (-7.73)	-0.003 (-0.13)	-0.034** (-7.02)
Central America	-	0.148* (1.89)	-0.057** (-4.11)	0.436** (2.38)	0.100** (4.28)	0.116* (1.94)	-0.062** (-5.88)	0.362** (2.53)	0.068** (3.36)
South America	-	0.017* (5.51)	0.090** (-2.83)	-0.067** (1.99)	0.017** (1.31)	0.012 (4.99)	0.075** (-2.90)	-0.062** (0.83)	0.006
Year dummies	Yes	Yes	-	-	-	Yes	-	-	-
Nr observations	2223	2223	741	741	741	2223	741	741	741
R^2	0.18	0.19	0.16	0.18	0.30	0.19	0.17	0.18	0.29

Note: See Appendix I for data description. In parentheses, we report t -statistics using heteroskedastic-consistent standard errors. ** indicates statistically significant at the 1% level and * statistically significant at the 5% level. All specifications include a constant, not reported for reasons of parsimony. In columns (2) through (5) region dummies correspond to observations where both countries belong to the designated region; in columns (6) through (9) region dummies refer to bilateral observations where one country belongs to the region and the other is the United States.

Table II presents estimates of the determinants of real exchange rate volatility for the decades of the analysis, adding, in turn, dummies for the within-region and US dollar pairs. As can be verified, the higher the degree of asymmetry of output shocks, the higher is bilateral real exchange rate volatility, and the estimates are highly significant, regardless of the decade considered. Second, the more dissimilar the export base is, the higher the exchange rate volatility is, and this variable gains in significance in the 1980s and 1990s. As to the intensity of bilateral trade, as expected, it is negatively associated with the level of exchange rate volatility, significantly so in the 1970s and 1990s. The fourth and last explanatory variable, the size of the economies, has a less clear pattern of association with real exchange rate volatility: whereas larger countries tend to display higher bilateral real exchange volatility in the 1970s and 1990s, the opposite holds for the 1980s.²⁵ The goodness of fit of the OLS regressions shows that the fit improves over time and is substantially higher in the 1990s than in the 1970s. The sign and significance of the regional dummies tell us how much higher (or lower) is the real exchange rate volatility between two countries in the same region, after controlling for its four determinants.²⁶ East Asia and Europe come out with negative coefficients, indicating lower RER volatility than country characteristics alone would predict. The coefficient on the Central American dummy is negative for the 1970s but positive for the other decades, while South America's coefficient is negative in the 1980s and positive otherwise.²⁷

In Table III, columns (1) through (4), we add interactions of each of the regional dummies with the four basic explanatory variables. For example, the asymmetry of output shocks is entered directly and interacted with each of the four regional dummies.²⁸ The results are to be interpreted so that the coefficient on the asymmetry of output shocks is the sum of the average effect for the sample (first coefficient reported) and its interaction with the respective region dummy.²⁹ We can verify that for East Asia, an increase in the asymmetry of shocks actually tends to decrease RER volatility and the same is true for Europe and South America in the 1980s. Central America, on the other hand, experiences greater increases in volatility with changes in the asymmetry of output shocks.³⁰ As for export dissimilarity, there are few differences in its impact across regions and decades. The intensity of bilateral trade comes out as having a greater impact on the decrease of RER volatility in Central America than in other regions.

In columns (5) through (8) of Table III we turn to the determinants of bilateral real exchange rate volatility versus the US dollar. Results parallel those in the first four columns

²⁵Developing countries – especially in South and Central America – experienced a substantial increase in exchange fluctuations in the 1980s. Since these countries are comparatively small in terms of GDP, the negative coefficient for size in the 1980s may just be capturing the lower volatility of currencies in developed countries of North America and Western Europe.

²⁶In other words, and assuming the econometric model is appropriately specified, how much two countries in a given region see their bilateral RER volatility increase (decrease) by the fact that they are in the same region. The regional dummy measures the impact of all time-unvarying regional characteristics, policy or otherwise, which affect RER volatility.

²⁷This may seem puzzling given the high degree of RER volatility in South America in the 1980s, the highest in the sample as can be verified in Table I. The explanation resides in the fact that the coefficients on the explanatory variables in the 1980s are larger than the same coefficients in the 1970s and 1990s. As South American countries had higher regional levels of output shock asymmetry and export dissimilarity and lower levels of regional trade integration, the higher RER volatility for South America is accounted for by the explanatory variables rather than the regional dummy.

²⁸The presence in the sample of the United States, Mexico and Canada assures that there will be no perfect collinearity between these variables.

²⁹The region names under each explanatory variable name refer to the respective interaction.

³⁰The US embargo on Nicaragua, with the resulting dramatic drop in output and hyperinflation, accounts in great part for this result.

TABLE III Determinants of RER Volatility—Regional Interactions with Determinants.

	<i>Within-region</i>				<i>Against US dollar</i>			
	<i>All decades</i>	<i>1970s</i>	<i>1980s</i>	<i>1990s</i>	<i>All decades</i>	<i>1970s</i>	<i>1980s</i>	<i>1990s</i>
<i>Asymmetry of output shocks</i>	1.782** (7.03)	0.701** (4.28)	3.155** (5.03)	1.492** (8.73)	1.771** (6.80)	0.666** (4.03)	3.197** (4.98)	1.436** (8.24)
*East Asia	-3.987** (-7.02)	-1.939** (-2.54)	-4.461** (-4.24)	-1.254** (-3.64)	-4.196** (-7.89)	-1.220* (-1.73)	-4.854** (-4.70)	-1.271** (-4.22)
*Europe	-0.378 (-0.70)	0.062 (0.21)	-2.802** (-3.22)	-0.401 (-0.91)	-0.502 (-0.97)	0.136 (0.47)	-1.194 (-1.08)	-0.125 (-0.29)
*Central America	2.311 (0.83)	-0.518** (-2.94)	25.980** (5.34)	4.224* (1.66)	1.613 (0.77)	-0.409** (-2.41)	22.319** (6.66)	4.993** (2.53)
*South America	-0.491 (-1.04)	1.861** (4.27)	-2.192** (-2.44)	0.716 (1.40)	-0.178 (-0.39)	2.630** (6.28)	-2.091** (-2.40)	1.247** (2.63)
<i>Dissimilarity of exports</i>	0.004** (2.95)	0.000 (0.23)	0.009** (2.53)	0.002** (3.28)	0.004** (2.84)	0.000 (-0.38)	0.009** (2.62)	0.002** (3.16)
East Asia	0.000 (0.18)	0.001 (0.44)	-0.007 (-1.32)	-0.002 (-1.68)	0.000 (-0.17)	0.003** (1.61)	-0.010** (-2.08)	-0.002* (-1.88)
*Europe	-0.006** (-2.88)	0.001 (0.95)	-0.015** (-4.36)	-0.004** (-2.58)	-0.008** (-3.57)	0.002 (1.07)	-0.018** (-4.27)	-0.004** (-3.17)
*Central America	0.000 (0.01)	-0.001 (-0.23)	-0.130 (-1.12)	-0.005 (-0.43)	0.033 (1.60)	-0.003** (-1.81)	0.049** (2.60)	-0.001 (-0.09)
South America	-0.004 (-1.74)	-0.005 (-1.51)	-0.008* (-1.67)	-0.002 (-0.76)	-0.005** (-2.32)	-0.004 (-1.30)	-0.010** (-2.04)	-0.004* (-1.68)

TABLE III (Continued)

	<i>Within-region</i>				<i>Against US dollar</i>			
	<i>All decades</i>	<i>1970s</i>	<i>1980s</i>	<i>1990s</i>	<i>All decades</i>	<i>1970s</i>	<i>1980s</i>	<i>1990s</i>
<i>Intensity of trade</i>	-0.010** (-5.26)	-0.015** (-5.65)	-0.008** (-2.08)	-0.008** (-6.24)	-0.010** (-2.86)	-0.017** (-5.22)	-0.004 (-0.43)	-0.009** (-4.98)
*East Asia	0.006** (2.15)	0.010** (3.27)	0.005 (0.73)	0.008** (5.66)	0.006 (1.57)	0.011** (3.17)	0.001 (0.05)	0.008** (3.80)
*Europe	0.007** (2.65)	0.013** (4.22)	0.005 (1.28)	0.006** (3.29)	0.006 (1.44)	0.015** (4.18)	-0.001 (-0.10)	0.007** (2.94)
Central America	-0.194 (-1.93)	0.014** (3.22)	-0.373** (-2.90)	-0.055 (-1.41)	-0.101** (-2.40)	0.014** (3.92)	-0.061 (-1.21)	-0.009 (-0.69)
South America	0.030 (1.80)	0.116** (3.69)	0.022** (2.64)	0.007 (0.46)	0.001 (0.18)	0.002 (0.12)	0.004 (0.29)	0.002 (0.52)
<i>Economic size</i>	-0.004 (-1.14)	0.012** (4.25)	-0.028** (-3.22)	0.009** (5.52)	-0.004 (-1.33)	0.012** (4.21)	-0.030** (-3.53)	0.010** (5.98)
*East Asia	0.003** (2.44)	0.002* (1.63)	0.006* (1.84)	0.000 (-0.39)	0.003** (3.16)	0.000 (-0.13)	0.009** (2.80)	0.000 (-0.36)
*Europe	0.000 (-0.22)	-0.003** (-4.65)	0.005** (2.49)	-0.001 (-1.06)	0.001 (0.77)	-0.004** (-4.90)	0.005** (2.58)	0.000 (-1.01)
*Central America	0.010 (1.01)	-0.001 (-1.28)	-0.002 (-0.08)	0.003 (0.74)	0.001 (0.15)	-0.001 (-1.23)	-0.041** (-4.77)	-0.001 (-0.56)
*South America	0.003** (2.26)	0.002 (0.94)	0.007** (2.04)	0.000 (0.22)	0.004** (2.49)	0.001 (0.46)	0.008** (2.48)	0.000 (-0.03)
Year dummies	Yes	-	-	-	Yes	-	-	-
Nr observations	2223	741	741	741	2223	741	741	741
R ²	0.21	0.21	0.22	0.32	0.21	0.20	0.24	0.32

Note: See Appendix I for data description. In parentheses, we report *t*-statistics using heteroskedastic-consistent standard errors. ** indicates statistically significant at the 1% level and * statistically significant at the 5% level. All specifications include a constant, not reported for reasons of parsimony. In columns (1) through (4) region dummies correspond to observations where both countries belong to the designated region; in columns (5) through (8) region dummies refer to bilateral observations where one country belongs to the region and the other is the United States.

of Table III. The asymmetry of output shocks in East Asia is negatively related to the bilateral RER volatility versus the dollar, while the opposite holds for Central America in the 1980s and 1990s. In sum, asymmetry is a much more important determinant of volatility *vis-à-vis* the dollar for Central American countries than for the typical pair of countries in the sample. Export dissimilarity is less important in explaining the volatility of European and South American currencies versus the dollar, particularly in the 1980s.

Summing up, we have statistically verified that East Asia and Europe have lower within-region volatility and volatility *vis-à-vis* the dollar than the representative country in the sample, and these two regions experience a decrease in the levels of RER volatility over time. Central and South America, on the other hand, have periods with lower and higher than predicted levels of volatility. As to the determinants of exchange rate volatility, we find that the asymmetry of output shocks is less important for East Asia than for other regions, while export dissimilarity is less important for Europe and South America. Bilateral trade integration seems to be a particularly important factor in determining exchange rate volatility in Central America. These results hold for both within-region RER volatility and volatility with respect to the US dollar. They suggest that exchange rate arrangements comprising Central American countries should emphasize trade integration, while export dissimilarity is not important for South American countries.

4 CONCLUSION

This paper conducts an empirical examination of the option of Dollarization framed as an alternative to regional currency unification, in light of the recent literature on the determinants of real exchange rate variability. We present bilateral indicators of economic integration to assess the relative attractiveness of the two options for East Asia, Central America and South America. The experience of the European Union is used as a benchmark, given that region's recent option for a regional currency area. We study the determinants of real exchange rate volatility within each of these regions and between each region and the United States. In this way the paper is able, for the first time, to analyze the degree of within-region integration as compared to the degree of integration with the US economy, suggesting which of the two options – Dollarization or regional currency area – seems more appropriate on empirical grounds.

Real exchange rate volatility is lowest for the European Union and highest for South America, with East Asia experiencing a decrease in volatility over time while Central America experienced an increase. With the exception of Europe, all regions experience lower bilateral exchange rate volatility with the US than with their regional partners. Europe is also, by far, the region with the lowest within-region output shock asymmetry, and the only – with East Asia in the 1990s – for which it is lower than with the US. Export dissimilarity is lowest for Central America and then for Europe, with East Asia experiencing a substantial decrease since the 1970s. As to the depth of bilateral trade integration, East Asia and then Europe are the most integrated regions, but Europe again stands out as the only region with average within-region trade intensity levels that are higher than average trade intensity with the US. In sum, as might be expected, Europe stands out as the most deeply integrated region and European countries are more closely integrated within themselves than with the United States. Out of the other three regions, and since the 1970s, East Asia made substantial progress in all indicators of regional integration. In the 1990s, Asian intra-regional indicators closely approach those of Europe. As to Central America and South America, these regions stand out for their high levels of integration relative to the US, higher than the level of integration with their respective regional partners. Both Latin American regions experienced

large swings in the degree of integration, with a general decrease in the 1980s and a reversal in the 1990s.

An analysis of the determinants of real exchange rate volatility across regions and time shows that greater asymmetry in output shocks or export patterns and lower levels of bilateral trade are associated with larger fluctuations in real exchange rates. The size of the economy affects exchange rate volatility in a less straightforward way, though there is evidence that smaller countries experience higher exchange rate volatility. When regional dummies are used in addition to the usual determinants of exchange rate volatility, we verify that Europe and East Asia have lower than expected within-region volatility, while Central and South America tend to have higher than expected volatility. The same pattern emerges when we use dummies for each region in relation with the US.

We find evidence that the asymmetry of output shocks is more important for Central America and less for East Asia than for the typical sample country, and export dissimilarity is less important a factor in determining exchange rate volatility for European countries. The intensity of bilateral trade is almost unimportant for East Asia and Europe.

We derive several important messages from our empirical results. First, currency union in Europe was a natural choice given the high degree of intra-regional integration. Second, East Asia has progressively approached European levels of integration, though currency union is not currently an active policy option. Third, Central and South America, in spite of some suggestions of regional currency integration, display low levels of regional integration, namely, relative to the levels of integration with the US economy. Finally, there is evidence that the determinants of real exchange rate volatility differ between regions so that different issues need to be addressed if efforts at currency unification are to be successful. Moreover, we find evidence of substantial heterogeneity as to the effects of different factors on real exchange rate volatility, suggesting previous studies in the literature have ignored an important dimension of country experience.

Acknowledgements

We have benefited greatly from discussions with Cristina Garcia, and from the comments of an anonymous referee and of the editor. John Huffstot provided editorial assistance. As for financial support, Felipe Larraín thanks DIPUC at Universidad Católica, and José Tavares thanks INOVA.

References

- Baliño, T., Bennett, A. and Borenzstein, E. (1999) Monetary policy in dollarized economies. IMF Occasional Paper no. 171, Washington DC: IMF.
- Bayoumi, T. and Eichengreen, B. (1998) Exchange rate volatility and intervention: implications of the theory optimum currency areas, *Journal of International Economics*, **45**(2), 191–209.
- Bayoumi, T. and Mauro, P. (1999) The suitability of ASEAN for a regional currency agreement. IMF Working Paper. Washington, DC: IMF.
- Bofinger, P. (1994) Is Europe an optimal currency area?, In Steinherr, A. (Ed.) *30 Years of European Monetary Integration*. London: Longman.
- Economist*, *The* (2002) El Salvador learns to love the Greenback, *The Economist*, 28 September, 34–35.
- Eichengreen, B. (1998) Does Mercosur need a single currency? NBER Working Paper No. 6821.
- Eichengreen, B. and Masson, P. (1998) Exit strategies: policy options for countries seeking greater exchange rate flexibility. IMF Occasional Paper No. 168. Washington, DC: IMF.
- Fatás, A. (1997) EMU: countries or regions? Lessons from the EMS experience, *European Economic Review*, **41**, 3–5.
- Frankel, J. A. and Rose, A. (1996) Economic structure and the decision to adopt a common currency. University of California, Berkeley, Center for International and Development Economics Research (CIDER) Working Paper No. C96/073.

- Frankel, J. A and Rose, A. (1998) The endogeneity of the optimum currency area criteria, *Economic Journal*, **108**(449), 1009–1025.
- García-López, C., Larraín, F. and Tavares, J. (2001) Exchange Rate Regimes: Assessing Central Americas's Options. In F. Larraín (Ed.) *Economic Development in Central America, Vol. I*. Cambridge, MA: Harvard University Press.
- IMF Economic Forum (1998) Dollarization: fad or future for Latin America. Available online at: <<http://www.imf.org/external/np/tr/1999/TR990624.htm>>, Washington, DC: IMF.
- Kafka, A. (1973) Optimum currency areas and Latin America, In: Johnson, H. G. and Swoboda, A. K. (Eds) *The Economics of Common Currencies. Proceedings of the Madrid Conference on Optimum Currency Areas*. Cambridge, MA: Harvard University Press.
- Kenen, P. (1969) The theory of optimum currency areas: an eclectic view, In: Kenen, P. (Ed.) *Exchange Rates and the Monetary System: Selected Essays of Peter B. Kenen*. Economists of the Twentieth Century Series. Aldershot: Elgar.
- Larraín, F. and Velasco, A. (2001) Exchange-rate policy in emerging market economies: the case for floating, *Princeton Essays in International Finance*, no. 224 (December).
- Larraín, F. and Velasco, A. (2002) How should emerging economies float their currencies?, *The Economics of Transition*, **10**(2), 365–392.
- Marsden, D. (1992) European integration and the integration of European labour markets, *Labour*, **6**(1), 3–35.
- McKinnon, R. (1963) Optimum currency areas, *The American Economic Review*, **53**(4), 717–725.
- Micco, A., Stein, E. and Ordoñez, G. (2002) The currency union effect on trade: early evidence from the European Union. Mimeo, Inter-American Development Bank.
- Mundell, R. (1961) A theory of optimum currency areas, *American Economic Review*, **51**(4), 509–517.
- Obstfeld, M. and Rogoff, K. (1995) The mirage of fixed exchange rates, *Journal of Economic Perspectives*, **9**(4), 73–96.
- Porter, R. and Judson, R. (1996) The location of US currency: how much is abroad?, *Federal Reserve Bulletin*, Vol. 82 (October), 883–903.
- Tornell, A. and Velasco, A. (1995) Fixed versus flexible exchange rates: which provides more fiscal discipline? National Bureau of Economic Research Working Paper No. 5108.
- Triffin, R. (1970) Proyecto para un Fondo Centroamericano de Estabilización, *Revista del Banco Hipotecario de El Salvador, San Salvador*, **5**(2), 167–182.
- Westbrook, J. and Willet, T. (1999) Exchange rates as nominal anchors: an overview of the issues, In: Sweeney, R. J., Wihlborg, C. G. and Willett, T. (Eds) *Exchange-Rate Policies for Emerging Market Economies: Political Economy of Global Interdependence*. Colorado: Westview Press.
- Young, J. (1965) Central American Monetary Union, Guatemala. US Department of State, Agency for International Development, Regional Office, Central American and Panama Affairs.

APPENDIX I – DATA

The data set uses information for 39 countries for the period 1970–97. The countries in the sample are the following:

Europe: Belgium–Luxembourg, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, and the UK. *Asia:* Hong Kong, Indonesia, Korea, Japan, Malaysia, Philippines, Singapore, and Thailand. *South America:* Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Paraguay, Uruguay, and Venezuela. *Central America:* Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua. *Nafta:* Canada, Mexico, and the US.

The time periods considered are 1970–79, 1980–89, 1990–97, and 1970–97. In the case of the export dissimilarity, trade intensity and country size variables, the last two periods are actually 1990–96 and 1970–96. The variables used in the regression analysis are constructed as follows:

REAL EXCHANGE RATE VOLATILITY (SD (Δe_{ij})): This variable is calculated as the standard deviation, over each period of time, of the change in the log of the bilateral real exchange rate for countries i and j . The real exchange rate is constructed using consumer price indices and nominal exchange rate data from the IFS.

ASYMMETRY OF OUTPUT SHOCKS (SD ($\Delta y_i - \Delta y_j$)): This variable is calculated as the standard deviation, over each period of time, of the difference in the shocks to countries i and j . Output shocks for each country are calculated as annual change in the log of real GDP. The source for real GDP data is the IFS series of GDP. Missing values were completed with national sources or the World Development Indicators from the World Bank.

DISSIMILARITY OF EXPORTS (DISSIMILARITY $_{ij}$): This variable is calculated adding up, for the eight first SITC codes at 1-digit level, the absolute value of the difference between countries i and j of the export shares for each category. Code 9, “Not elsewhere classified, gold and military equipment”, was removed from total exports, as in many cases it leads to errors given the size of the items not elsewhere classified. Previous studies in the literature have computed this measure based on four categories only. Then, the mean is taken over a period of time. Export shares by SITC are calculated using a combined data set obtained from merging the Feenstra, Lipsey, Bowen data set (1970–92) and the Statistics of Canada data set (1980–96).

INTENSITY OF TRADE (TRADE $_{ij}$): This variable is calculated as the mean, over each period of time, of the average of the two bilateral-export-to-GDP ratios for each pair of countries i and j , that is,

$$\frac{\frac{X_{ij}}{GDP_i} + \frac{X_{ji}}{GDP_j}}{2}$$

Bilateral export data come from the same trade data set mentioned above while GDP data come from World Development Indicators 1998, GDP in current dollars.

ECONOMIC SIZE (SIZE $_{ij}$): This variable is calculated as the mean, over each period of time, of the average of the GDPs of countries i and j (expressed in logs). The GDP data are in constant dollars and come from the World Development Indicators 1998. For Germany prior to the unification, the data come from IFS.