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TRADE BLOCS AND CURRENCY BLOCS

Jeffrey A. Frankel

Shang-Jin Wei

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ABSTRACT

Using the gravity model to examine bilateral trade patterns throughout the world, we find clear evidence of trading blocs in Europe, the Western Hemisphere, East Asia and the Pacific. In Europe, it is the EC that operates as a bloc, not including EFTA. Two EC members trade an extra 55 per cent more with each other, beyond what can be explained by proximity, size, and GNP/capita. We also find slight evidence of trade-diversion in 1990. Even though the blocs fall along natural geographic lines, they may actually be "super-natural." Turning to the possibility of currency blocs, we find a degree of intra-regional stabilization of exchange rates, especially in Europe. Not surprisingly, the European currencies link to the DM, and Western Hemisphere countries peg to the dollar. East Asian countries, however, link to the dollar, not the yen. We also find some tentative cross-section evidence that bilateral exchange rate stability may have a (small) effect on trade. A sample calculation suggests that if real exchange rate variability within Europe were to double, as it would if it returned from the 1990 level to the 1980 level, the volume of intra-regional trade might fall by an estimated 0.7 per cent.

Jeffrey A. Frankel
Department of Economics
787 Evans Hall
University of California
Berkeley, CA 94720 USA
and NBER

Shang-Jin Wei
Kennedy School of Government
Harvard University
79 JFK Street
Cambridge, MA 02138 USA

Trade Blocs and Currency Blocs

For a long time, the analysis of regions within the world economy was not considered an especially interesting subject of research. Now, suddenly, that has changed -- largely in response to such projects as the European Monetary System, Europe 1992, European Monetary Union, the North American Free Trade Agreement, the Enterprise for the Americas Initiative, and suspicions of a Japanese sphere of influence in Asia.

This paper concerns two key aspects of the possible regionalization of economic relations, and the interaction between the two. They are trade links and currency links. That the two may be closely intertwined is evident in that a major motivation behind attempts to strengthen currency links within Europe is to reduce the extent to which exchange rate risk discourages imports and exports, and thereby to promote stronger trade links. Other important aspects, such as financial links within regions or the extent to which countries within a region share common economic disturbances, are not considered here.[1]

1. Introduction

There is more talk of regionalization, of whether the world is breaking up into three great trading blocs or currency blocs (Europe, Western Hemisphere, and East Asia; or ECU, dollar, and yen blocs), than there are attempts at hard quantitative analysis. Often studies simply report measures of the relative size of the blocs, such as shares of world trade, and measures of the extent of intra-regional trade, such as the fraction of countries' trade conducted with others in the region. But these are not measures of intra-regional bias, the extent to which countries are concentrating their economic activity with others in the region.[2]

This paper looks econometrically at three questions: (1) Is trade biased toward intra-regional partners, within each of the three potential major blocs? (2) Are exchange rates more stable within each of the three potential blocs than across them? (3) To the extent exchange rates are stabilized within a bloc, does that contribute to intra-bloc trade?

Frankel (1992) applied to the trading bloc question the natural framework for studying bilateral trade, the gravity model. The gravity model is so-called because it assumes that trade between two countries is proportional to the product of their sizes and inversely proportional to the distance between them. It has a fairly long history, but there are not many recent applications to a large cross-section of countries throughout the world. Two others are Wang and Winters (1991) and Hamilton and Winters (1992).[3] Frankel (1992) and Frankel and Wei (1992) found that: (1) there are indeed intra-regional trade biases in the EC and the Western Hemisphere, and perhaps in East Asia; but (2) the greatest intra-regional bias was in none of these three, but in the APEC grouping, which includes the U.S. and Canada with the Pacific countries; and (3) the bias in the East Asia and Pacific groupings did not increase in the 1980s.

This paper extends those results in a number of directions. First, it considers various extensions of the original gravity model estimation, to see how well the basic results hold up. Second, it looks at the extent to which exchange rates have been stabilized within the regions, and the extent to which stabilization of bilateral exchange rates promotes bilateral trade. Third, it focuses relatively more on Europe, including both the EC and EFTA, whereas the earlier papers focused relatively more on East Asia. In particular, a central motivating question is the extent to which stabilization of exchange rates within Europe has been a contributing factor to the increase in intra-regional trade there. The set-back that European Monetary Union received

in the Danish "no"-vote of June 1992, and the Exchange Rate Mechanism crisis of the Fall, means that a return to the higher levels of exchange rate variability that held in the past is a real possibility. To what extent would that reduce intra-European trade?

2. Is Europe a trade bloc?

2.1 The gravity model

One cannot meaningfully investigate the extent to which regional policy initiatives are influencing trade patterns without holding constant for natural economic determinants. A systematic framework for measuring what patterns of bilateral trade are normal around the world is offered by the gravity model. A dummy variable can then be added to represent when both countries in a given pair belong to the same regional grouping. One can check how the level and time trend in, for example, Europe compares with that in other groupings. We do not currently have measures of historical, political, cultural and linguistic ties. Thus it will be possible to interpret the dummy variables as reflecting these factors, rather than necessarily as reflecting discriminatory trade policies.

The dependent variable is trade (exports plus imports), in log form, between pairs of countries in a given year. We have 63 countries in our data set, so that there are 1,953 data points (=63x62/2) for a given year.[4] The goal, again, is to see how much of the high level of trade within each region can be explained by simple economic factors common to bilateral trade

throughout the world, and how much is left over to be attributed to a special regional effect.

One would expect the two most important factors in explaining bilateral trade flows to be the geographical distance between the two countries, and their economic size. These factors are the essence of the gravity model (and indeed are the presumed source of the name, by analogy to the formula for gravitational attraction between two masses).

A large part of the apparent bias toward intra-regional trade is certainly due to simple geographical proximity. Indeed Krugman (1991b) suggests that most of it may be due to proximity, so that the three trading blocs are welfare-improving "natural" groupings (as distinct from "unnatural" trading arrangements between distant trading partners such as the United Kingdom and a Commonwealth member). Despite the obvious importance of distance and transportation costs in determining the volume of trade, empirical studies surprisingly often neglect to measure this factor. Our measure is the log of distance between the two major cities (usually the capital) of the respective countries. We also add a dummy "Adjacent" variable to indicate when two countries share a common land border.

Entering GNPs in product form is empirically well-established in bilateral trade regressions. It can be justified by the modern theory of trade under imperfect competition.[5] In addition there is reason to believe that GNP per capita has a positive effect on trade, for a given size: as countries become more developed, they tend to specialize more and to trade more.

The equation to be estimated, in its most basic form, is:

$$(1) \qquad \log(T_{ij}) = \alpha + \beta_1 \log(GNP_i GNP_j) + \beta_2 \log(GNP/pop_i GNP/pop_j)$$

$$+ \beta_3 \log(DISTANCE) + \beta_4 (ADJACENT) + \gamma_1 (EEC_{ij}) + \gamma_2 (WH_{ij}) + \gamma_3 (ASIA_{ij}) + u_{ij}.$$

The last four explanatory factors are dummy variables. *EEC*, *WH*, and *ASIA* are three of the dummy variables we use when testing the effects of membership in a common regional grouping.

The results are reported in Tables 1, 2, and 3. These differ from the tables in Frankel (1992) principally by the explicit distinct consideration of (1) the EC, (2) EFTA, and (3) Europe overall, and the inclusion of terms to capture trade-diversion effects in Europe. We found all three standard variables to be highly significant statistically (> 99% level). The coefficient on the log of distance was about -.56, when the adjacency variable (which is also highly significant statistically) is included at the same time. This means that when the distance between two non-adjacent countries is higher by 1 per cent, the trade between them falls by about .56 per cent. We tested for possible non-linearity in the log-distance term, as it could conceivably be the cause of any apparent bias toward intra-regional trade that is left after controlling linearly for distance.[6]

The estimated coefficient on GNP per capita is about .29 as of 1980, indicating that richer countries do indeed trade more, though this term declines during the 1980s, reaching .11 in 1990. The estimated coefficient for the log of the product of the two countries' GNPs is about .75, indicating that, though trade increases with size, it increases less-than-proportionately (holding GNP per capita constant). This presumably reflects the widely-known pattern that small economies tend to be more open to international trade than larger, more diversified, economies.

We now add a few checks for econometric robustness regarding the sample of countries and their size. We tried running the equation in multiplicative form, instead of log-linear, so as to allow the inclusion of pairs of countries that are reported as undertaking zero trade.

(Under our log-linear specification, any pair of countries that shows up with zero trade must necessarily be dropped from the sample.) We find that the inclusion or omission of such countries in the multiplicative specification makes little difference to the results. The results are reported in Table A2-A3.[7] A correction for heteroscedasticity based on the size of the countries also makes little difference (reported in Table A1.)

2.2 Estimation of trade-bloc effects

If there were nothing to the notion of trading blocs, then these four basic variables would soak up all the explanatory power. There would be nothing left to attribute to a dummy variable representing whether two trading partners are both located in the same region. In this case the level and trend in intra-regional trade would be due solely to the proximity of the countries, and to their rapid rate of overall economic growth.

But we found that dummy variables for intra-regional trade are highly significant statistically. If two countries are both located in the Western Hemisphere for example, in 1980 they traded with each other by an estimated 86 per cent more than they would have otherwise [exp(.62) = 1.86], after taking into account distance and the other gravity variables.

The empirical equation is as yet too far-removed from theoretical foundations to allow conclusions to be drawn regarding economic welfare. But it is possible that the amount of intra-regional bias explained by proximity, as compared with explicit or implicit regional trading arrangements, is small enough in our results that those arrangements are welfare-reducing. This could be the case if trade-diversion outweighs trade creation.

The issue merits future research. Stein (1992) has made a start by explicitly introducing inter-continental transportation costs into the Krugman model, and showing how the desirability of trade blocs depends on them. Simulations show, for certain parameter values, that the worldwide formation of regional free-trade areas between neighbors would raise welfare if the parameter representing transportation costs exceeds a certain critical level, and would lower welfare if the parameter is less that critical level. We refer to the observed intra-regional trade bias in the latter (welfare-reducing) case as evidence of "super-natural" trading blocs, inspired by Krugman's (1991a,b) "natural trading bloc" terminology.

The strongest bloc effect in our gravity estimates is not any of the three most often discussed, but is the Pacific bloc that includes the United States and Canada along with East Asia, Australia and New Zealand. (This dummy variable is labelled APEC, after the membership of the Association for Pacific Economic Cooperation.) The coefficient in 1980 suggests that two APEC members trade five times as much as a typical pair of countries [exp(1.6)=5.06]. The group of East Asian countries alone also constituted a significant distinct trade bloc, with a coefficient suggesting that it doubles trade between members [exp(.8) = 2.23].

Both coefficients declined a bit during the decade, reflecting that the rapid growth in Asian/Pacific trade which many observors have remarked was entirely the result of economic growth among the individual countries. Indeed, the East Asian bloc effect loses significance in 1985 and 1990, if one allows for the greater openness of East Asia in general, and Hong Kong and Singapore in particular, simultaneously with the APEC bloc effect.[8]

The blocs that strengthened in the 1980s lay elsewhere, in the Americas and Europe. The Western Hemisphere coefficient started the decade with an implied 1.86 multiplier, as noted above, and rose to 2.46 [=exp(.9)]. The rise came entirely between 1985 and 1990. We turn now to Europe.

2.3 The European Community, the rest of Europe, and the rest of the world

The results suggest that Europe may not even have been an operational trade bloc in 1980. The estimated coefficient on the EC is only of borderline significance (The point estimate of the effect on trade is 26 per cent [exp(.23)=1.26]). Furthermore, it diminishes when a dummy variable is added to capture the overall openness of European countries. This dummy variable is defined to equal one when either one of the two countries in a given pair is located in Europe, as opposed to both. The results indicate that, as of 1980, the high level of intra-regional trade in Europe can be mostly explained by a combination of proximity, high income, and openness.

By 1985 the EC dummy had become statistically significant. The coefficient implies that two EC members trade an extra 58 per cent with each other [exp(.46) = 1.58]. It is clear that it is the European Community in particular that is having an influence, as terms for EFTA or for Europe overall are not significant.[9] Furthermore, when the term is added to capture the greater openness of European countries, even though it is again significantly positive, the significance of the EC bloc effect rises a bit rather than falling.

Why did the EC strengthen in the early 1980s? One possibility is the accession of Spain,

Portugal and Greece (which are included in the definition of EC countries throughout the sample). Another possible contributing factor, considered below, is the stabilization of exchange rates under the European Monetary System.

The EC coefficient in 1990 is a little larger than in 1985. The effect is 68 per cent [exp(.52)=1.68]. The EFTA and Europe effects are again insignificant. The major change relative to 1985 is that the coefficient on European openness, which was previously significantly greater than zero, is now less than zero, and borderline-significant. This finding bears on the famous distinction between trade-diversion and trade-creation in the literature on the welfare effects of customs unions.

The 1980 and 1985 results suggest that trade-diversion is not greater than zero, indeed that it is negative. One might wonder how the formation of a free-trade area like the EC could produce a negative "trade-diversion coefficient," or what we have called a positive openness coefficient. In theory, the reduction of trade barriers within the region should not encourage trade with other countries; if anything, it should discourage it. The answer is that countries in a given region may somewhat reduce barriers with respect to non-members, at the same time that they reduce or eliminate barriers internally. Indeed, the two policy changes may be related in a political economy sense. Some have argued that the constellation of political forces that allows liberalization with respect to trade with regional neighbors may be similar to what is required to allow liberalization more generally. The best example is Mexico's decision to negotiate the NAFTA soon after undertaking unilateral liberalization and joining GATT (Lawrence, 1991).

The 1990 result suggests a shift toward trade-diversion. While a typical European

country now trades 68 per cent more with other European countries than can be explained by natural factors, it trades an estimated 11 per cent less with non-European countries. [Further results, not reported here, suggest that the trade diversion takes place among the EFTA countries, not the EC countries.]

3. Currency blocs

3.1 Stabilization of exchange rates within the blocs

Table 4 reports statistics on the variability of exchange rates among various groupings of countries. Worldwide, monthly exchange rate variability rose in the 1980s, from a standard deviation of .33 per cent in 1980 to .38 per cent in 1990. The latter figure suggests that for a typical pair of countries, approximately 95 per cent of exchange rate changes are smaller than .76 per cent (two standard deviations, under the simplifying assumption of a log-normal distribution).

There is a tendency for exchange rate variability to be lower within each of the groups than across groups, supporting the idea of currency blocs. The lowest variability occurs within Europe. The 1980 statistic is a standard deviation of .04 per cent, and it falls by half during the course of the decade. Even though the members of the EC correspond roughly to the members of the European Monetary System,[10] non-EC members in Europe show as much stability in exchange rates (both vis-a-vis themselves and vis-a-vis other European countries) as EC members. The EC members show slightly more stability than the EFTA members in 1990, but

slightly less in 1980. These results no doubt in part reflect that the United Kingdom and the Mediterranean countries have not been consistent members of the Exchange Rate Mechanism, especially not with the narrow margins set by the others. But it also reflects that such EFTA countries as Austria are loyal members of the currency club de facto, even though they are not at all in de jure.

The members of APEC also have a relatively low level of intra-regional exchange rate variability, especially considering the diversity of the countries involved. It too fell by half in the course of the 1980s. The level of exchange rate variability is a bit higher within East Asia considered alone. This reflects that the international currency of Asia is not the yen, but rather the dollar. Results on the determination of exchange rates for nine East Asian countries in Frankel and Wei (1992) show that all place very heavy weight on the dollar in their implicit baskets.[11]

The Western Hemisphere considered alone in Table 4 shows much higher levels of exchange rate variability than any of the other groupings (in 1985 and 1990).

3.2 The influence of the dollar, yen, and DM on the values of smaller currencies

Next we examine the influence which the most important international currencies has on the determination of the values of currencies of smaller countries located around the world. One way that countries in a given area could achieve the lower levels of intra-regional bilateral exchange rate variability observed in Table 4 is to link their currencies to the single most important currency in the region. In a simple version of the currency-bloc hypothesis, one

would expect that the dollar has dominant influence in the Western Hemisphere, the yen in East Asia, and the mark (or ECU) in Europe.

The equation to be estimated is

(2) Δ *(value of currency i)* =

$\alpha + \beta_1 \Delta$ *(value of \$)* $+ \beta_2 \Delta$ *(value of yen)* $+ \beta_3 \Delta$ *(value of DM)* $+ \epsilon$.

where the change in the value of each currency is computed logarithmically. The goal is to see whether countries try to stabilize their currencies in terms of a particular major currency. Such an equation is exceptionally well-specified under a particular null hypothesis, namely that the value of the local currency is determined as a basket peg (perhaps a crawling peg, since we allow for a constant term). By "exceptionally well-specified", we mean that the coefficients should be highly significant and the R^2 should be close to 1.

In 1988, for example, there were 31 countries that were officially classified by the IMF as following a basket peg of their own design (plus another eight pegged to the SDR). They included Austria, Finland, Norway, Sweden, Iceland, and Thailand. Others, such as Korea, claimed to define the value of their currency in terms of a basket, but in fact followed an extremely loose link. Most basket-peggers keep the weights in the basket secret, so that one can only infer the weight statistically from observed exchange rate movements. Previous tests have suggested that countries that are officially classified as basket-peggers in practice often exhibit a sufficiently wide range of variation around the basket index, or else alter the parity or weights sufficiently often, that they are difficult to distinguish from countries classified as managed floaters.[12]

In applying equation (2) to a wide variety of countries, we realize that most do not follow a basket peg. If policy-makers monitor an index which is a weighted average of their trading partners, even though they allow deviations from the index depending on current macroeconomic considerations or speculative sentiments, we can meaningfully estimate the coefficients in the equation under the (restrictive) assumption that these local deviations -- the error term -- are uncorrelated with the values of the major currencies.

There is a methodological question of what numeraire should be used to measure the value of the currencies. Here we use the SDR as numeraire. The earlier tests on Asian currencies tried the Swiss franc and purchasing power over local goods as numeraires[13], in addition to the SDR. Under the basket-peg null hypothesis, the choice of numeraire makes no difference in the estimation of the weights (though more generally it does make some difference).

Table 5 reports estimates for nine EC currencies. The sample period is 1979-90, broken into three sub-samples. We also allow for the possibility of some effect of a fourth major currency, pound sterling, in memory of the role it once played as the world's international currency. We impose the constraint that the weights on the four currencies sum to 1 (by subtracting the change in the value of the pound from each of the other variables).

The EC countries, as expected, give heavy weight to the DM. In the case of Belgium, the other three major currencies get no weight, and the weight on the DM is insignificantly different from 1 during most of the period. France, Denmark and the Netherlands show some sign of a small weight on the dollar. For Italy the weight on the dollar is statistically significant, and estimated at just over 0.1; the weight on the mark is around 0.8. Greece gave heavy weight

to the dollar during the sub-period 1979-82, but this diminished thereafter. Ireland and Portugal also give some weight to the dollar in 1987-90, but, as with the others, give dominant weight to the DM throughout. No European country gives significant weight to the yen.

The implicit coefficient on the pound is equal to 1 minus the sum of the three coefficients reported. For Ireland, for example, the implicit coefficient on the pound ranges between .1 and .2. The pound is not generally significant, however. Multicollinearity between the pound and DM is very high, as one would expect. When all four major currencies are entered on the righthand side without imposing the constraint that their coefficients sum to 1, the pound loses out to the mark, and is not significantly greater than zero for any of the EMS countries. (These results are not reported here, to save space.)

The DM also dominates among the six EFTA countries, shown in Table 6. Austria exhibits a very tight peg to the DM, as expected. (The R^2 is .98 or .99.) Switzerland also gives heavy weight to the DM. It, like some Nordics, gives significant weight to the yen as well at times. The four Nordic countries have a weight on the dollar which is highly significant statistically, though still less than the DM. The weight on the pound is seen also sometimes to be statistically significant for the Nordics, in the unconstrained estimation (not reported). But the pound gets less weight than either the DM or the dollar.

Five major Western Hemisphere currencies are shown in Table 7. Colombia is close to a dollar peg (though with a large significant trend depreciation). Canada, Chile, and Mexico also have dollar weights in the neighborhood of 1.0. Argentina is the only country that consistently shows a weight on another currency (.5 on the DM) that is significant and larger than the dollar weight (.2). Its estimated weight on the pound is similar (.2). However the

pound is not significant for any of the Latin American countries.

In each region considered thus far, Europe and the Western Hemisphere, almost all countries give dominant weight to the major currency of the region. This pattern is broken in East Asia, however. The results in Table 8 confirm those in Frankel (1992) and Frankel and Wei (1992). The weight on the dollar is very high in Thailand, Korea, and China. There is no special role for the yen. The Japanese currency is statistically significant in Singapore, and occasionally in some of the others. But the coefficient is low. The same is true of the DM and pound (which are significant, for example, in Singapore). Each of the Asian countries is more properly classed in a dollar bloc than in a yen bloc.

The Appendix reports tables that do not impose the constraint that the weights on the major currencies sum to one (and that also exclude the pound). The results are similar: the DM reigns supreme in Europe, the dollar in the Western Hemisphere, and the dollar -- not the yen -- is also dominant in East Asia. A t-test does not reject the constraint that the sum of the three coefficients is 1 for the Western Hemisphere and Asian countries, but often does reject this constraint for the European countries, perhaps reflecting the absence of the pound and French franc.

3.3. An attempt to estimate the effect of exchange rate variability on trade

One rationale for a country to assign weight to a particular currency in determining one's exchange rate is the assumption that a more stable bilateral exchange rate will help promote bilateral trade with the partner in question. This is a major motivation for exchange rate

stabilization in Europe. There have been quite a few time-series studies of the effect of exchange rate uncertainty on trade overall,[14] but fewer cross-section studies of bilateral trade.

One exception is De Grauwe (1988), which looks at only ten industrialized countries (and is motivated in part by the European experience). Two others are Abrams (1980) and Brada and Mendez (1988). We will re-examine the question here using a data set that is more recent as well as broader, covering 63 countries. A problem of simultaneous causality should be noted at the outset: if exchange rate variability shows up with an apparent negative effect on the volume of bilateral trade, the correlation could be due to the government's deliberate efforts to stabilize the currency vis-a-vis a valued trading partner, as easily as to the effects of stabilization on trade. Therefore we will also use the method of instrumental variable estimation to tackle the possible simultaneity bias.

Volatility is defined to be the standard deviation of the first difference of the logarithmic exchange rate. We start with the volatility of nominal exchange rates and embed this term in our gravity equation (1) for 1980, 1985 and 1990. The results are reported in Table 9.[15] Most coefficients are similar to those reported in the earlier results without exchange rate variability (Tables 1-3), though the EC and Western Hemisphere bloc dummy variables appear with lower coefficients, suggesting that a bit of the bloc effect may have been attributable to exchange rate links. In 1980, the coefficient for the volatility term is indeed negative and statistically significant at the 99% level. [The magnitude is moderately large.[16]] In 1985, the volatility parameter is no longer significant (with the point estimate turning positive). In 1990, the volatility coefficient actually appears statistically greater than zero.

Theoretical models of the behavior of the firm often produce the result that, because of

convexity in the profit function, exports can be an increasing function of exchange rate variability. Only when the firm is sufficiently risk-averse does the intuitive negative effect on trade emerge. Several empirical studies have taken this possibility seriously, and perhaps we should as well.[17] But before we take our econometric findings at face value, we should note that a presumably more relevant measure of exchange rate uncertainty is the volatility of the real exchange rate, which takes into account the differential inflation rates in the two countries in addition to movements in the nominal exchange rate.

Regressions with the volatility of real exchange rates are also presented in Table 9. In 1980, the log volatility parameter is still negative and statistically significant. The parameter for 1985 is still insignificant. In contrast to the regression with the volatility of nominal rates, the volatility parameter for 1990 is a statistically significant negative number [-8.04].

By way of illustration, these point estimates can be used for some sample calculations. They suggest that if the level of EC exchange rate variability that prevailed in 1980, a standard deviation of 0.050 per cent in Table 4, had been eliminated altogether, the volume of intra-EC trade would have increased by .77 per cent (=15.26 x.0504). In 1990, when both the standard deviation and its coefficient were smaller, the estimated effect on trade of eliminating exchange rate variability within the EC would have been only .15 per cent (=8.04x.019).

Worldwide, the average level of exchange rate variability in 1990 was still .376 per cent. The estimated effect of adopting fixed exchange rates worldwide was thus 3.02 per cent (=8.04x.376).

The exchange rate disruptions of the summer of 1992 may herald a return to the level of variability among the EMS countries that prevailed in 1980 Table 4 shows that this would represent an approximate doubling of the standard deviation of exchange rates, relative to the

stability that had been achieved by 1990. What would be the predicted effects on trade? The estimate in Table 9 suggests that trade would fall by .25 per cent (=8.04x(.050-.019)).

These estimated effects must be regarded as small. Gagnon (1989) argues on theoretical grounds that the effect of real exchange rate uncertainty on trade volume should be quantitatively small. In a sample calculation, he suggests that an increase in the standard deviation of the exchange rate from .05 to .08 should reduce the volume of trade undertaken by an individual exporter by 2.5 per cent, which he considers very small.

Even if the stabilization of exchange rates achieved in Europe in the 1980s indeed raise trade on the order of .25 per cent, that is very small compared to the 1/3 increase in trade bias estimated in our gravity model during the decade [1.68/1.26 = 1.34]. The exchange rate stabilization effect is only 7/10 of one per cent of the increase in the bias, which is in turn only half the total estimated 68 per cent European intra-regional trade bias in 1990.

In short, these results, while less robust than most of the other gravity equation findings, are generally consistent with the hypothesis that real exchange rate volatility depresses bilateral trade. More specifically, they would appear to be a piece of evidence that the stabilization of exchange rates within Europe has helped to promote intra-European trade, even if the effect is very small. One aspect of the OLS estimates in Table 9 might lead one to think that the role played by exchange rate stabilization is not small: the estimated trade bloc coefficients seem to fall sharply when the volatility term is included.

Such an interpretation is threatened, however, by the likelihood of simultaneity bias in the above regressions. Governments may choose deliberately to stabilize bilateral exchange rates with their major trading partners. This has certainly been the case in Europe. Hence, there

could be a strong correlation between trade patterns and currency linkages even if exchange rate volatility does not depress trade. To address this problem, we use the method of instrumental variable estimation, with the standard deviation of relative money supply as our instrument for the volatility of exchange rates.[18] The results are reported in Table 10.

Let us concentrate our discussions on the regressions involving the real exchange rates. In 1980, the volatility parameter is still negative and significant at the 95% level. But the magnitude is much smaller than without using the instrument, suggesting that part of the apparent depressing effect of the volatility was indeed due to the simultaneity bias. Strong confirmation comes an examination of the trade bloc coefficients for the EC and the Western Hemisphere: when the simultaneity is corrected, the presence of the volatility variable no longer reduces the trade bloc coefficient.

Estimates based on a logarithmic specification for the standard deviation[19] may be more appropriate for the question considered above, i.e., what would happen to the level of trade if exchange rate variability among the EMS countries now returns to the level that prevailed in 1980. Of our various estimates, the preferred one is the instrumental variables estimate for the effect of the log of real exchange rate variability in 1980: .01. This point estimate would imply that a doubling of exchange rate variability would reduce trade within Europe by 0.7 per cent (= .01(ln 2)).

In 1990, the volatility parameter turns again into a positive number. The results suggest that if exchange rate volatility did depress bilateral trade, its negative effect appears to have diminished over the course of the 1980s. This sharp change is somewhat surprising. One possible explanation is the rapid development of exchange risk hedging instruments. Our

estimates of this effect are in any case not sufficiently robust with respect to the functional form, year, or estimation technique to justify strong conclusions. But it seems safe to conclude that the effect, if it is there at all, is small in magnitude.

4. Summary of conclusions regarding Europe

Trade within Europe was at a high level even in 1980, and increased rapidly during the decade. Much of the tendency to trade intra-regionally can be explained by natural economic factors: the proximity of the countries, the size of the GNPs, and the openness of the economies. Some of the increase in intra-regional trade in the 1980s can be explained by an increase in GNP per capita (though to a lesser extent than in Pacific Asia). There was also a highly significant increase in the degree of intra-regional trade bias in the course of the decade, most readily explained by deliberate policy initiatives of the European Community. (The same was true in the Western Hemisphere.) Our estimates in Table 3 suggest that a country joining the EC in 1980 would have experienced an increase in trade with other members of 68 per cent.[20] No such effect is observed for EFTA.

We have considered in this paper the possibility that the stabilization of exchange rates during the course of the 1980s, under the Exchange Rate Mechanism, was a significant contributor to the increase in intra-regional trade. The standard deviation of exchange rates fell among EFTA countries by about half in the 1980s, and among EC countries by slightly more. Among both groups, the currencies in effect linked themselves to the mark, much as Western Hemisphere (and East Asia) currencies in effect link themselves to the dollar.

We have found some possible cross-section evidence that real exchange rate variability has an effect on trade volume. The factor appears to be larger in 1980 than later in the decade. Although the effect is statistically significant at its peak, it explains only a very small fraction of the intra-regional trade bias. The estimated effect is also less strong when we attempt to correct for simultaneity bias. It does not appear that the stabilization of European exchange rates in the 1980s played a large role in the increase in intra-regional trade.

* * *

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Table 1: EFTA and EEC as trade blocs, 1980

GNP	GNP/capita	Dist	Adja	WH2	EAEC2	APEC	EUR2	EUR1	EEC2	EFTA2	EFTA-EEC	adj.R^2 / SEE	#OBS
.73**	.29**	-.56**	.71**	.52**	.78**	1.49**			.23			.71 / 1.20	1708
.02	.02	.04	.18	.15	.27	.18			.18				
.73**	.29**	-.56**	.71**	.52**	.78**	1.49**	-.01		.23			.71 / 1.20	1708
.02	.02	.04	.18	.15	.27	.18	.16		.18				
.74**	.29**	-.56**	.70**	.53**	.78**	1.49**	-.11		.33##	.37		.71 / 1.20	1708
.02	.02	.04	.18	.15	.27	.18	.18		.23	.31			
.73**	.27**	-.53**	.75**	.63**	.76**	1.61**		.20**	.23			.71 / 1.20	1708
.02	.02	.04	.18	.15	.27	.18		.07	.18				
.73**	.26**	-.53**	.74**	.63**	.77**	1.61**		.20**	.24	.28		.71 / 1.20	1708
.02	.02	.04	.18	.15	.27	.18		.07	.18	.27			
.73**	.27**	-.53**	.75**	.63**	.76**	1.61**		.20**	.23		.01	.71 / 1.20	1708
.02	.02	.04	.18	.15	.27	.18		.07	.18		.15		

Notes:

1. **, (*), [#], {##} denote "significant at the 99%, (95%), [90%] and {85%} levels, respectively.

2. All regressions have an intercept, which is not reported here. All variables except the dummies are in logs.

Table 2: EFTA and EEC as trade blocs, 1985

GNP	GNP/capita	Dist	Adja	WH2	EAEC2	APEC2	EUR2	EUR1	EEC2	EFTA2	EFTA-EEC	adj.R^2 / SEE	#OBS
.76**	.25**	-.70**	.75**	.34*	.57*	1.25**			.46**			.74/ 1.17	1647
.02	.02	.04	.18	.16	.26	.18			.18				
.76**	.25**	-.68**	.75**	.35*	.58*	1.26**	.10		.39#			.74 / 1.17	1647
.02	.02	.04	.18	.15	.27	.18	.16		.21				
.76**	.25**	-.69**	.74**	.35*	.58*	1.26**	.04		.45*	.23		.74 / 1.17	1647
.02	.02	.04	.18	.15	.27	.18	.17		.22	.30			
.76**	.23**	-.67**	.79**	.45**	.56*	1.38**		.20**	.46**			.74 / 1.17	1647
.02	.02	.04	.18	.15	.26	.19		.07	.18				
.76**	.22**	-.67**	.78**	.46**	.56*	1.38**		.20**	.47**	.26		.74 / 1.17	1647
.02	.02	.04	.18	.16	.26	.19		.07	.18	.27			
.76**	.22**	-.66**	.80**	.46**	.57*	1.39**		.20**	.47**		.16	.74 / 1.17	1647
.02	.02	.04	.18	.15	.26	.19		.07	.18		.15		

Table 3: EFTA and EEC as trade blocs, 1990

GNP	GNP/capita	Dist	Adja	WH2	EAEC2	APEC2	EUR2	EUR1	EEC2	EFTA2	EFTA-EEC	adj.R^2 / SEE	#OBS
.75**	.09**	-.55**	.79**	.93**	.66**	1.25**			.52**			.77/ 1.07	1647
.02	.02	.04	.16	.14	.24	.18			.18				
.75**	.09**	-.54**	.79**	.94**	.67**	1.34**	.17		.40*			.77 / 1.07	1647
.02	.02	.04	.16	.14	.24	.16	.14		.19				
.75**	.09**	-.54**	.79**	.94*	.67**	1.34**	.16		.41*	.04		.77 / 1.07	1647
.02	.02	.04	.16	.14	.24	.16	.16		.20	.27			
.75**	.11**	-.56**	.77**	.89**	.67**	1.25**		-.11##		.51**		.77 / 1.07	1647
.02	.02	.04	.16	.14	.24	.17		.07	.16				
.75**	.11**	-.56**	.76**	.89**	.67**	1.25**		-.11##		.52**	.18	.77 / 1.07	1647
.02	.02	.04	.16	.14	.24	.17		.07	.16	.24			
.75**	.10**	-.55**	.78**	.90**	.68**	1.26**		-.10	.52**		.19	.77 / 1.07	1647
.02	.02	.04	.16	.14	.24	.17		.07	.16		.14		

Table 4

9/29/92

MEAN VOLATILITY OF MONTHLY EXCHANGE RATES
(Standard Deviation of the first difference of the logs)

"Entire World" (63 countries)

80	0.0033326
85	0.0038924
90	0.0037581

Western Hemisphere

	Among Members	With the Rest-of-the-World
# OF OBS:	36	344
80	0.00082119	0.0023124
85	0.0089124	0.0075748
90	0.0092027	0.0063593

EEC	Among Members	With the Rest-of-the-World
# OF OBS:	45	375
80	0.00050407	0.0023273
85	0.00051604	0.0025506
90	0.00018748	0.0024069

EFTA	Among Members	With the Rest-of-the-World
# OF OBS:	15	239
80	0.00039787	0.0021484
85	0.00019827	0.0022575
90	0.00021040	0.0022201

Europe	Among Members	With the Rest-of-the-World
# OF OBS:	105	527
80	0.00044489	0.0024422
85	0.00039840	0.0026458
90	0.00020584	0.0025362

EAEC	Among Members	With the Rest-of-the-World
# OF OBS:	15	237
80	0.0010283	0.0023404
85	0.00072587	0.0022070
90	0.00044533	0.0023494

APEC	Among Members	With the Rest-of-the-World
# OF OBS:	28	308
80	0.00083386	0.0022884
85	0.00060796	0.0022079
90	0.00039396	0.0024002

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Table 5a: Currencies in the European Community
Weights Assigned to Foreign Currencies in Determining Changes in Value
(Constrained Estimation)

Time Period	Const	USD	Yen	DM	adj.R^2/DW	#Obs	S.E.R.
France-Franc							
79.1-82.12	-.005*	-.010	.074	.872**	.737/2.31	47	.013
	.002	.071	.056	.070			
83.1-86.12	-.003##	.066	-.005	.853**	.788/1.95	48	.012
	.002	.062	.086	.085			
87.1-90.12	-.000	.054*	-.023	.897**	.911/1.80	48	.005
	.001	.026	.038	.044			
79.1-90.12	.003**	.031	.033	.868**	.800/2.09	143	.011
	.009	.029	.033	.038			
Italy-Lire							
79.1-82.12	-.006**	.118*	.052	.782**	.747/2.13	47	.011
	.002	.060	.047	.059			
83.1-86.12	-.004**	.144**	.085	.857**	.866/2.15	48	.008
	.001	.045	.063	.062			
87.1-90.12	-.001	.120**	-.055	.808**	.879/1.67	48	.006
	.001	.027	.039	.046			
79.1-90.12	-.003**	.121**	.050#	.821**	.818/1.85	143	.009
	.001	.025	.028	.033			
Belgium-Franc							
79.1-82.12	-.005*	-.042	.043	.897**	.756/1.76	47	.013
	.002	.070	.055	.069			
83.1-86.12	-.007	.017	-.015	.958**	.975/1.84	48	.004
	.001	.022	.030	.030			
87.1-90.12	.001	.021#	-.035#	.966**	.980/1.91	48	.003
	.000	.013	.019	.022			
79.1-90.12	-.002**	-.001	.015	.931**	.887/1.64	143	.008
	.001	.023	.025	.030			

Notes: (1) All currencies are measured in terms of SDR (USD 0.42, DM 0.19, Yen 0.15, French Franc 0.12, Pound 0.12).
(2) **, (*), [#], {##}, denotes "significant at the 99%, (95%), [90%], {85%} level."
(3) The constraint that the sum of four weights equal to one is imposed in all estimations.

Table 5b: Currencies in the EC (continued)
Weights Assigned to Foreign Currencies in Determining Changes in Value
(Constrained Estimation)

Time Period	Const	USD	Yen	DM	adj.R^2/DW	#Obs	S.E.R.
Denmark-Krone							
79.1-82.12	-.005**	.018	.122**	.873**	.853/2.07	47	.009
	.001	.051	.040	.051			
83.1-86.12	-.001	.041	-.026	.955**	.942/2.46	48	.001
	.001	.032	.045	.045			
87.1-90.12	-.000	.052*	.002	.951**	.913/1.90	48	.006
	.001	.026	.038	.045			
79.1-90.12	-.002**	.019	.061*	.913**	.895/1.90	143	.008
	.001	.021	.024	.028			
Netherlands-Guilder							
79.1-82.12	-.000	-.040##	.053##	.924**	.968/2.20	48	.005
	.001	.025	.035	.034			
83.1-86.12	-.004**	.144**	.085	.857**	.866/2.15	48	.008
	.001	.045	.063	.062			
87.1-90.12	-.000	.000	-.014	.998**	.982/2.94	48	.003
	.000	.012	.018	.021			
79.1-90.12	-.000	-.007	.000	.935**	.960/2.14	143	.009
	.000	.013	.014	.017			
Greece-Drachma							
79.1-82.12	-.011**	.427**	.074	.383**	.122/1.82	47	.018
	.003	.099	.078	.098			
83.1-86.12	-.017**	.186	.069	.688**	.150/1.71	48	.036
	.005	.191	.266	.262			
87.1-90.12	-.000	.078**	-.046##	.822**	.927/2.00	48	.005
	.001	.021	.032	.037			
79.1-90.12	-.011**	.230**	.073	.543**	.215/2.01	143	.024
	.002	.066	.073	.086			

Notes: (1) All currencies are measured in terms of SDR (USD 0.42, DM 0.19, Yen 0.15, French Franc 0.12, Pound 0.12).
(2) **, (*), [#], {##}, denotes "significant at the 99%, (95%), [90%], {85%} level."
(3) The constraint that the sum of four weights equal to one is imposed in all estimations.

Table 5c: Currencies in the EC (cont.)
Weights Assigned to Foreign Currencies in Determining Changes in Value
(Constrained Estimation)

Time Period	Const	USD	Yen	DM	adj.R^2/DW	#Obs	S.E.R.
Ireland-Pound							
79.1-82.12	-.003*	.057	.022	.825**	.861/2.21	47	.008
	.001	.044	.034	.043			
83.1-86.12	-.004*	-.056	.152##	.713**	.770/1.72	48	.013
	.002	.067	.094	.093			
87.1-90.12	-.000	.078**	-.046##	.822**	.927/2.00	48	.005
	.001	.021	.032	.037			
79.1-90.12	-.002**	.036	.017	.813**	.829/1.95	143	.009
	.001	.026	.029	.033			
Portugal-Escudo							
79.1-82.12	-.010**	.211#	.064	.510**	.225/1.95	47	.020
	.003	.109	.085	.108			
83.1-86.12	-.013**	.035	.175	.471**	.441/1.83	48	.020
	.003	.106	.147	.145			
87.1-90.12	-.003**	.152**	.034	.636**	.6889/1.80	48	.005
	.001	.022	.032	.037			
79.1-90.12	-.008**	.136**	.050	.548**	.430/1.79	143	.017
	.001	.047	.052	.061			
Spain-Peseta							
79.1-82.12	.016	1.920	.534	-.108	-.060/2.39	47	.557
	.082	3.031	2.373	2.99			
83.1-86.12	-.016*	-1.687**	.367	2.125**	.758/2.06	48	.044
	.007	.237	.330	.325			
87.1-90.12	-.034	-1.266	.413	3.421	-.051/2.28	48	.593
	.087	2.777	4.106	4.767			
79.1-90.12	-.006	-.421	.376	1.487	-.012/2.31	143	.460
	.039	1.289	1.432	1.680			

Notes: (1) All currencies are measured in terms of SDR (USD 0.42, DM 0.19, Yen 0.15, French Franc 0.12, Pound 0.12).
(2) **, (*), [#], {##}, denotes "significant at the 99%, (95%), [90%], {85%} level."
(3) The constraint that the sum of four weights equal to one is imposed in all estimations.

Table 6a: Currencies in EFTA
Weights Assigned to Foreign Currencies in Determining Changes in Value
(Constrained Estimation)

Time Period	Const	USD	Yen	DM	adj.R^2/DW	#Obs	S.E.R.
Austria-Schilling							
79.1-82.12	.001*	-.014	-.007	1.035**	.987/2.03	47	.003
	.000	.017	.013	.016			
83.1-86.12	-.000	.016	-.010	.994**	.992/2.59	48	.002
	.000	.012	.017	.016			
87.1-90.12	-.000	.011	.005	1.005**	.951/2.31	48	.004
	.001	.021	.031	.036			
79.1-90.12	.000	.008	-.008	1.011**	.981/2.28	143	.003
	.000	.009	.010	.012			
Finland-Markka							
79.1-82.12	-.003	.266**	.110	.477**	.256/1.80	47	.018
	.003	.100	.078	.098			
83.1-86.12	-.001	.138**	.097	.558**	.911/2.01	48	.005
	.001	.028	.039	.039			
87.1-90.12	-.001	.188**	.012	.509**	.711/1.79	48	.007
	.001	.035	.052	.060			
79.1-90.12	-.000	.182**	.088*	.526**	.577/1.90	143	.012
	.001	.033	.036	.043			
Norway-Krone							
79.1-82.12	-.003#	.280**	.097#	.489**	.463/1.37	47	.012
	.002	.066	.051	.065			
83.1-86.12	-.004*	.066	.129	.583**	.654/2.17	48	.014
	.002	.072	.100	.099			
87.1-90.12	.001	.281**	.077	.434**	.523/1.60	48	.008
	.001	.039	.058	.067			
79.1-90.12	-.002	.198**	.083*	.529**	.568/1.99	143	.012
	.001	.033	.037	.043			

Notes: (1) All currencies are measured in terms of SDR (USD 0.42, DM 0.19, Yen 0.15, French Franc 0.12, Pound 0.12).
(2) **, (*), [#], {##}, denotes "significant at the 99%, (95%), [90%], {85%} level."
(3) The constraint that the sum of four weights equal to one is imposed in all estimations.

Table 6b: Currencies in EFTA (cont.)
Weights Assigned to Foreign Currencies in Determining Changes in Value
(Constrained Estimation)

Time Period	Const	USD	Yen	DM	adj.R^2/DW	#Obs	S.E.R.
Sweden-Krona							
79.1-82.12	-.007#	.240#	.136	.354*	.070/1.84	47	.027
	.004	.145	.113	.143			
83.1-86.12	-.001#	.245**	.104**	.482**	.910/2.05	48	.004
	.001	.023	.031	.031			
87.1-90.12	-.000	.290**	.048	.473**	.713/1.41	48	.006
	.001	.026	.038	.045			
79.1-90.12	.003*	.246**	.115*	.430**	.328/1.72	143	.016
	.001	.044	.049	.058			
Switzerland-Francs							
79.1-82.12	-.002	-.115	.121#	1.041**	.729/1.63	47	.017
	.002	.091	.071	.090			
83.1-86.12	-.001	-.157*	.366**	.629**	.800/1.87	48	.013
	.002	.067	.093	.092			
87.1-90.12	-.001	.029	.100	.817**	.682/1.73	48	.013
	.002	.060	.089	.103			
79.1-90.12	-.000	-.070#	.147**	.888**	.731/1.72	143	.014
	.001	.040	.045	.053			
Iceland-Krona							
79.1-82.12	-.034**	.751	-.080	.277##	.007/2.23	47	.033
	.005	.183	.143	.181			
83.1-86.12	-.021**	.428#	-.060	.759*	.071/1.83	48	.042
	.006	.222	.309	.305			
87.1-90.12	.011**	.245*	-.077	.442*	.142/2.13	48	.021
	.003	.100	.148	.172			
79.1-90.12	-.021**	.392**	-.015	.514**	.054/1.90	143	.035
	.003	.097	.108	.126			

Notes: (1) All currencies are measured in terms of SDR (USD 0.42, DM 0.19, Yen 0.15, French Franc 0.12, Pound 0.12).
(2) **, (*), [#], {##}, denotes "significant at the 99%, (95%), [90%], {85%} level."
(3) The constraint that the sum of four weights equal to one is imposed in all estimations.

Table 7a: Currencies in Western Hemisphere
Weights Assigned to Foreign Currencies in Determining Changes in Value
(Constrained Estimation)

Time Period	Const	USD	Yen	DM	Pound	adj.R^2/DW	#Obs	S.E.R.
Canada-Dollar								
79.1-82.12	-.001	.679**	.021	.126#		.072/1.89	47	.013
	.002	.072	.057	.071				
83.1-86.12	-.002##	.883**	.011	-.010		.467/1.97	48	.009
	.001	.049	.069	.068				
87.1-90.12	-.003#	.974**	-.036	.541		.535/2.17	48	.012
	.002	.058	.085	.099				
79.1-90.12	.000	.867**	-.020	.054		.346/2.08	143	.012
	.001	.034	.038	.045				
Mexico-Peso								
79.1-82.12	-.031#	1.220#	-.610	-.429		.004/1.65	47	.120
	.018	.652	.510	.643				
83.1-86.12	-.045**	1.477**	-.039	-.476*		.485/1.83	48	.027
	.004	.153	.213	.210				
87.1-90.12	-.023**	1.333**	-.547*	-.127		.309/1.22	48	.036
	.005	.166	.246	.286				
79.1-90.12	-.032**	1.414**	-.467*	-.361		.104/1.99	143	.073
	.001	.025	.028	.033				
Argentina-Peso								
79.1-82.12	-.003#	.280**	.097#	.489**		.463/1.37	47	.012
	.002	.066	.051	.065				
83.1-86.12	-.004*	.066	.129	.583**		.485/1.83	48	.014
	.002	.072	.100	.099				
87.1-90.12	.001	.281**	.077	.434**		.523/1.60	48	.008
	.001	.039	.058	.067				
79.1-90.12	-.002*	.198**	.083*	.529**		.568/1.99	143	.012
	.001	.033	.037	.043				

Table 7b: Currencies in Western Hemisphere
Weights Assigned to Foreign Currencies in Determining Changes in Value
(Constrained Estimation)

Time Period	Const	USD	Yen	DM	Pound	adj.R^2/DW	#Obs	S.E.R.
Chile-Escudo								
79.1-82.12	-.015*	.848**	.060	.054		-.016/1.45	47	.047
	.007	.258	.202	.255				
83.1-86.12	-.022**	.917**	-.034	.224		.030/2.06	48	.039
	.006	.209	.292	.288				
87.1-90.12	-.010**	1.063**	-.032	.247*		.572/1.63	48	.013
	.002	.063	.093	.108				
79.1-90.12	-.016**	.929**	.016	.035		.083/1.68	143	.036
	.003	.100	.112	.131				
Colombia-Peso								
79.1-82.12	-.011**	.986**	-.049**	.024		.913/.71	47	.004
	.001	.021	.017	.021				
83.1-86.12	-.024**	1.090**	-.010	.017		.821/.79	48	.007
	.001	.039	.055	.054				
87.1-90.12	.020**	.971**	.063**	.006		.948/.60	48	.003
	.000	.015	.022	.026				
79.1-90.12	-.018**	1.041**	-.018	-.950		.787/.28	143	.008
	.001	.021	.023	.028				

Notes: (1) All currencies are measured in terms of SDR (USD 0.42, DM 0.19, Yen 0.15, French Franc 0.12, Pound 0.12).
(2) **, (*), [#], {##}, denotes "significant at the 99%, (95%), [90%], {85%} level."
(3) The constraint that the sum of four weights equal to one is imposed in all estimations.

Table 8: Currencies in East Asia
Weights Assigned to Foreign Currencies in Determining Changes in Value
(Constrained Estimation)

Time Period	Const	USD	Yen	DM	adj.R^2/DW	#Obs	S.E.R.
Singapore-Dollar							
79.1-82.12	-.003#	.549**	.130**	.231**	.354/2.19	47	.009
	.001	.050	.039	.049			
83.1-86.12	-.003	.697**	.275**	-.035	.324/2.10	48	.012
	.002	.066	.092	.091			
87.1-90.12	-.003**	.752**	.082	.081	.366/1.95	48	.008
	.001	.039	.058	.067			
79.1-90.12	.010	.696**	.132**	.117**	.270/2.05	143	.011
	.001	.030	.033	.039			
Thailand-Baht							
79.1-82.12	-.002	.878**	.056	.015	.378/2.08	47	.011
	.002	.072	.057	.071			
83.1-86.12	-.004	.756**	.082	.124	.028/2.10	48	.025
	.004	.131	.183	.180			
87.1-90.12	-.000	.807**	.127	.044**	.970/2.55	48	.002
	.000	.007	.011	.013			
79.1-90.12	-.002	.806**	.073##	.062	.228/2.09	143	.016
	.001	.045	.049	.058			
S.Korea-Won							
79.1-82.12	-.009*	1.025**	-.039	.181	.214/2.18	47	.027
	.004	.147	.115	.145			
83.1-86.12	-.003**	.932**	-.010	.114**	.810/1.10	48	.005
	.001	.028	.039	.038			
87.1-90.12	.004**	.983**	.129*	-.113#	.734/.80	48	.003
	.001	.040	.059	.068			
79.1-90.12	-.003#	.945**	.001	.117#	.344/1.74	143	.017
	.001	.048	.054	.063			
China,P.R.-Yuan							
79.1-82.12	-.001	.331**	.110**	.480**	.682/1.98	47	.008
	.001	.042	.033	.042			
83.1-86.12	-.011**	.957**	-.303##	.101	.673/2.01	48	.027
	.004	.142	.199	.196			
87.1-90.12	-.005	1.145**	.485*	-.685*	.275/2.17	48	.035
	.005	.164	.243	.282			
79.1-90.12	-.008**	.813**	.052	.013	.056/1.95	143	.029
	.002	.082	.091	.107			

Notes: (1) All currencies are measured in terms of SDR (USD 0.42, DM 0.19, Yen 0.15, French Franc 0.12, Pound 0.12).
(2) **, (*), [#], {##}, denotes "significant at the 99%, (95%), [90%], {85%} level."
(3) The constraint that the sum of four weights equal to one is imposed in all estimations.

Table 9: Exchange Rate Volatility and Bilateral Trade
(OLS Estimation)

		Volat	GNPs	GNP/cap	Dist	Adj	WH	EEC	EFTA	EAEC	APEC	adj.R^2	S.E.E.
1980													
			.74**	.29**	-.56**	.72**	.52**	.23		.88**	1.51**	.71	1.20
			.02	.02	.04	.18	.15	.18		.27	.17		
	Nominal	-56.11**	.77**	.24**	-.74**	.24	.13	-.14	-.08	.96**	1.31**	.74	1.17
	Ex Rate	7.45	.02	.02	.05	.21	.23	.18	.32	.36	.19		
	Real	-15.26**	.74**	.27**	-.70**	.48*	.17	-.09	-.22	.90*	1.40**	.76	1.14
	Ex Rate	5.25	.02	.02	.05	.22	.20	.18	.38	.37	.22		
1985													
			.76**	.25**	-.70**	.75**	.33**	.44*		.59*	1.28**	.74	1.17
			.02	.02	.04	.18	.16	.17		.26	.17		
	Nominal	.23	.77**	.24**	-.72**	.61**	.26##	.45*	-.02	.79*	1.18**	.75	1.16
	Ex Rate	.49	.02	.02	.04	.19	.17	.18	.31	.36	.19		
	Real	.09	.77**	.25**	-.77**	.46*	-.05	.26##	-.19	.72*	1.13**	.78	1.12
	Ex Rate	.53	.02	.02	.05	.22	.20	.17	.31	.36	.21		
1990													
			.75**	.09**	-.56**	.79**	.92**	.47**		.69*	1.36**	.77	1.07
			.02	.02	.04	.16	.14	.16		.24	.15		
	Nominal	5.23**	.78**	.09**	-.66**	.53**	.67**	.41**	-.03	.68*	1.35**	.80	1.02
	Ex Rate	.58	.02	.02	.04	.16	.14	.16	.28	.32	.17		
	Real	-8.04#	.79**	.12**	-.61**	.35#	.53**	.29	-.09	.91**	1.12**	.83	.97
	Ex Rate	4.39	.02	.02	.04	.20	.17	.17	.27	.27	.17		

Table 10: Exchange Rate Volatility and Bilateral Trade
(Instrumental Variable Estimation)

		Volat	GNPs	GNP/cap	Dist	Adj	WH	EEC	EFTA	EAEC	APEC	adj.R^2	S.E.E.
1980													
	Nominal	-.15E-04##	.73**	.27**	-.55**	.74**	.60**	.23	.07	.91**	1.48**	.71	1.20
	Ex Rate	.07E-04	.02	.02	.04	.18	.15	.18	.32	.27	.17		
	Real	-.19E-04**	.73**	.27**	-.55**	.76**	.64**	.23	.07	.90**	1.48**	.71	1.20
	Ex Rate	.07E-04	.02	.02	.05	.18	.15	.18	.32	.27	.17		
1985													
	Nominal	.28E-05	.76**	.25**	-.70**	.75**	.32*	.45**	-.06	.58*	1.29**	.74	1.17
	Ex Rate	.73E-05	.02	.02	.04	.18	.16	.18	.32	.26	.17		
	Real	.41E-05	.76**	.25**	-.70**	.75**	.31*	.45**	-.06	.58*	1.29**	.74	1.17
	Ex Rate	.75E-05	.02	.02	.04	.18	.16	.17	.32	.26	.17		
1990													
	Nominal	.18E-04*	.76**	.11**	-.56**	.78**	.84**	.49**	-.07	.66**	1.38**	.77	1.07
	Ex Rate	.07E-04	.02	.02	.04	.16	.14	.16	.29	.24	.15		
	Real	.23E-04**	.76**	.11**	-.56**	.75**	.80**	.49**	-.07	.65**	1.38**	.78	1.06
	Ex Rate	.08E-04	.02	.02	.04	.16	.14	.16	.29	.24	.15		

Notes:

(1) The volatility variable is in level. The volatility of the relative money supply is used as its instrument. All the other variables except the dummies are in logarithm. All the regressions have an intercept for which the estimate is not reported here.

(2) Standard errors are below the coefficient estimates.

(3) **, *, # and ## denote "statistically significant" at the 99%, 95%, 90% and 85% levels, respectively.

Appendix: Sensitivity of Results to Overweighting Small Countries or to Excluding Zero-Trade Pairs

Table A1: Weighted Least Squares (With the log of the product of the GNPs as the weights)

	GNP	GNP/capita	Dist	Adjac	WH	EEC	EFTA	EAEC	APEC	adj.R^2	S.E.E.	#Obs
1980	.75**	.29**	-.56**	.69*	.53**	.24		.89**	1.48**	.72	1.19	1708
	.02	.02	.04	.17	.15	.17		.26	.16			
	.74**	.29**	-.56**	.68**	.53**	.23	.07	.89**	1.48**	.72	1.20	1708
	.02	.02	.04	.18	.15	.17	.32	.26	.16			
1985	.77**	.25**	-.70**	.72**	.31*	.43**		.59*	1.26**	.74	1.16	1647
	.02	.02	.04	.18	.15	.17		.25	.16			
	.76**	.25**	-.70**	.72**	.31*	.44**	-.06	.59*	1.26**	.74	1.16	1647
	.02	.02	.04	.18	.15	.17	.32	.25	.16			
1990	.75**	.09**	-.56**	.76**	.90**	.47**		.69**	1.35**	.78	1.05	1573
	.02	.02	.04	.16	.14	.15		.23	.14			
	.74**	.10**	-.55**	.71**	.86**	.51**	-.04	.68**	1.33**	.79	1.03	1573
	.02	.02	.04	.15	.14	.14	.28	.22	.13			

Notes:

(1) **, (*), [##] denotes "significantly different from zero at the 1%, (5%), [15%] level."

(2) All the regressions have an intercept whose estimates are not reported here. All variables except the dummies are in logarithm.

Table A2: Non-linear Least Square Estimation
(Including data points for which trade is zero)

	GNP	GNP/capita	Dist	Adjac	WH	EEC	EFTA	EAEC	APEC	adj.R^2	S.E.E.	#Obs
1980	.56**	.23**	-.28**	.47**	.29**	.51**		.58**	.82**	.86	1347	1953
	.01	.02	.02	.03	.04	.05		.08	.03			
	.58**	.22**	-.31**	.45**	.26**	.43**	.09	.57**	.81**	.86	1360	1953
	.01	.02	.02	.03	.04	.05	.23	.08	.03			
1985	.65**	.18**	-.44**	.42**	-.21**	.40**		.13*	.95**	.93	1164	1953
	.01	.01	.02	.03	.04	.04		.06	.03			
	.67**	.18**	-.46**	.42**	-.23**	.38**	.23	.16*	.94**	.93	1301	1953
	.01	.01	.02	.03	.04	.04	.22	.06	.03			
1990	.59**	.14**	-.36**	.47**	.10**	.45**		.00	1.03**	.90	2373	1953
	.01	.01	.02	.03	.04	.04		.06	.03			
	.60**	.13**	-.38**	.48**	.08**	.41**	-.00	.01	1.00**	.90	2393	1953
	.01	.01	.02	.03	.04	.04	.22	.06	.03			

Notes:

(1) **, (*), [##] denotes "significantly different from zero at the 1%, (5%), [15%] level."

(2) All the regressions have an intercept whose estimates are not reported here. All variables are in levels.

Table A3: Non-linear Least Square Estimation
(excluding data points for which trade is zero)

	GNP	GNP/capita	Dist	Adjac	WH	EEC	EFTA	EAEC	APEC	adj.R^2	S.E.E.	#Obs
1980	.56**	.23**	-.28**	.47**	.29**	.51**		.57**	.83**	.86	1439	1708
	.01	.02	.02	.04	.05	.05		.09	.04			
	.58**	.21**	-.31**	.45**	.25**	.43**	.09	.55**	.81**	.86	1453	1708
	.01	.02	.02	.04	.05	.05	.25	.09	.04			
1985	.65**	.18**	-.45**	.42**	-.23**	.38**		.10##	.95**	.93	1262	1647
	.01	.01	.02	.03	.04	.05		.07	.03			
	.65**	.18**	-.46**	.41**	-.24**	.36**	.20	.10##	.95**	.93	1266	1647
	.01	.01	.02	.03	.04	.05	.23	.07	.03			
1990	.59**	.13**	-.37**	.47**	.09*	.44**		-.02	1.04**	.90	2634	1573
	.01	.02	.02	.03	.04	.04		.06	.03			
	.60**	.12**	-.38**	.47**	.06##	.39**	-.02	-.03	1.02**	.90	2669	1573
	.01	.02	.02	.03	.04	.04	.23	.06	.03			

Notes:

(1) **, (*), [##] denotes "significantly different from zero at the 1%, (5%), [15%] level."

(2) All the regressions have an intercept whose estimates are not reported here. All variables are in levels.

Appendix Table 4a: Weights Assigned to Foreign Currencies in Determining Changes in Value (European Community)

Time Period	Const	USD b1	Yen b2	DM b3	adj.R^2/DW	Chow/White	S.E.R.	T-test b1+b2+b3=1
France-Franc								
74.1-78.12	-.001##	-.273	.148	.370**	.31/1.79	2.29/7.86	.018	-2.12
	.002	.357	.103	.127				
79.1-83.12	-.005**	-.170	.078*	.812**	.70/2.25	1.02/3.59	.013	-1.39
	.002	.119	.039	.071				
84.1-87.12	-.001	-.046	-.031	.841**	.86/2.08	1.83/11.54	.009	-1.05
	.001	.137	.074	.077				
88.1-92.8	.000	-.185**	-.024	.806**	.94/2.21	.94/4.68	.005	-2.64
	.001	.069	.032	.052				
Italy-Lire								
74.1-78.12	-.005*	-.246	.076	.054	-.01/1.85	.40/9.57	.023	-2.42
	.003	.451	.092	.169				
79.1-83.12	-.006**	.023	.052	.742**	.74/2.17	1.01/5.46	.010	-1.16
	.001	.088	.037	.053				
84.1-87.12	-.003**	.426**	-.082*	.933**	.89/2.11	2.54/20.30	.007	2.32
	.001	.136	.037	.052				
88.1-92.8	-.003	-.174#	-.063*	.713**	.93/1.78	.22/9.35	.005	-3.51
	.001	.089	.029	.062				
Belgium-Franc								
74.1-78.12	.000	-.169*	-.056##	.933**	.92/1.93	3.33/6.44	.007	-2.19
	.001	.083	.035	.045				
79.1-83.12	-.004**	-.154	.044##	.859**	.77/1.76	1.02/2.37	.012	-1.42
	.001	.119	.030	.041				
84.1-87.12	-.000	-.090	-.029##	.938**	.98/2.38	.31/12.83	.004	-1.95
	.001	.070	.018	.040				
88.1-92.8	.000	-.133**	-.042*	.909**	.97/2.72	.45/3.71	.004	-2.40
	.000	.048	.021	.034				

Notes: (1) All currencies are measured in terms of SDR (USD 0.42, DM 0.19, Yen 0.15, French Franc 0.12, Pound 0.12).
(2) Heteroskedasticity-consistent standard errors are reported below coefficient estimates.
(3) **, (*), [#], {##}, denotes "significant at the 99%, (95%), [90%], {85%} level."

Appendix Table 4b: Weights Assigned to Foreign Currencies in Determining Changes in Value

Time Period	Const	USD b1	Yen b2	DM b3	adj.R^2/DW	Chow/White	S.E.R.	T-test b1+b2+b3=1
Britain-Pound								
74.1-78.12	.001##	-1.74**	-.04##	-.428**	.97/1.92	4.52*/21.94	.003	-59.04
	.000	.05	.020	.020				
79.1-83.12	-.000	-1.71**	-.002	-.461**	.97/1.94	23.52**/19.71	.003	-65.78
	.000	.052	.010	.023				
84.1-87.12	-.001	-2.50**	-.062*	-.513**	.96/1.60	16.83**/37.1**	.005	-30.97
	.001	.161	.031	.047				
88.1-92.8	-.000	-1.98**	.011	-.63**	.99/2.46	9.67**/20.99	.002	-57.38
	.000	.032	.013	.020				
Denmark-Krone								
74.1-78.12	-.002	-.031	-.010	.849**	.77/1.98	1.82/5.36	.011	-.87
	.002	.121	.048	.065				
79.1-83.12	-.005**	.073	.116*	.884**	.86/2.10	.32/33.80	.009	.56
	.001	.129	.051	.041				
84.1-87.12	-.001	-.145*	-.011	.877**	-.94/2.46	1.43/7.93	.006	-1.79
	.001	.112	.038	.078				
88.1-92.8	-.000	-.007	-.035	.902**	.92/2.02	.52/8.21	.006	-.77
	.001	.011	.041	.073				
Netherlands-Guilder								
74.1-78.12	-.001	-.177#	-.047	.875**	.82/2.53	1.52/3.09	.010	-1.71
	.001	.098	.043	.065				
79.1-83.12	-.001	-.163*	-.002	.853**	-.93/1.77	1.15/5.69	.006	-3.52
	.001	.066	.022	.035				
84.1-87.12	-.000	-.122*	-.002	.942**	.97/2.81	1.56/4.16	.004	-1.71
	.001	.064	.023	.036				
88.1-92.8	-.000	-.118#	-.019	.934**	.94/2.82	.37/3.52	.005	-1.21
	.001	.066	.039	.041				
Greece-Drachma								
74.1-78.12	-.005**	.203#	-.043	.294*	.17/1.52	2.48/48.31	.011	-2.47
	.002	.111	.076	.142				
79.1-83.12	-.013**	-.061	.055	.309**	.04/2.10	.89/2.58	.027	-1.70
	.003	.311	.077	.119				
84.1-87.12	-.014**	.481	.065	.835**	.27/1.88	1.55/3.01	.027	.55
	.004	.375	.092	.186				
88.1-92.8	-.008**	-.249**	.541	.599**	.88/1.63	1.11/10.37	.006	-3.49
	.001	.090	.053	.060				

Note: See notes for Table 1a.

Appendix Table 4c: Weights Assigned to Foreign Currencies in Determining Changes in Value

Time Period	Const	USD b1	Yen b2	DM b3	adj.R^2/DW	Chow/White	S.E.R.	T-test b1+b2+b3=1
Ireland-Pound								
74.1-78.12	.001*	-1.74**	-.036#	-.428**	.97/1.92	4.51*/21.93	.003	-58.99
	.000	.051	.020	.020				
79.1-83.12	-.004**	-.13##	.028	.765**	.80/2.13	.78/1.90	.009	-2.41
	.001	.089	.029	.054				
84.1-87.12	-.002	.53**	.066	.592**	.79/2.05	.73/6.54	.011	-2.97
	.002	.197	.090	.151				
88.1-92.8	.000	-.18**	-.022	.808**	.97/2.49	1.42/9.65	.003	-3.69
	.000	.04	.024	.036				
Portugal-Escudo								
74.1-78.12	-.012**	-.016	-.135	.499**	.10/2.04	.88/2.71	.028	-1.15
	.003	.208	.106	.107				
79.1-83.12	-.012**	-.41##	.051	.315**	.12/1.89	3.13/3.53	.025	-2.75
	.003	.282	.064	.114				
84.1-87.12	-.009**	-.24**	.068**	.535**	.96/1.16	4.29/9.02	.004	-6.81
	.001	.06	.024	.038				
88.1-92.8	-.001	-.38**	.075##	.461**	.77/1.98	1.93/6.40	.009	-3.16
	.001	.133	.048	.091				
Spain-Peseta								
74.1-78.12	.005	.30#	.142##	.162#	-.03/1.94	.37/1.37	.033	-.60
	.084	.171	.089	.091				
79.1-83.12	-.010**	-.128	-.076	.204*	.06/2.04	1.01/13.83	.016	-3.99
	.002	.161	.088	.092				
84.1-87.12	-.001	.009	-.821	.708**	.73/1.92	1.14/17.70	.011	-1.04
	.002	.148	.087	.107				
88.1-92.8	-.001	-.576**	.020	.418**	.73/2.14	1.83/8.13	.011	-3.45
	.001	.176	.066	.121				

Note: See notes for Appendix Table 4a.

Appendix Table 5a: Weights Assigned to Foreign Currencies in Determining Changes in Value (EFTA)

Time Period	Const	USD b1	Yen b2	DM b3	adj.R^2/DW	Chow/White	S.E.R.	T-test b1+b2+b3=1
Austria-Schilling								
74.1-78.12	.001	.017	.009	.910**	.93/2.03	.76/2.81	.006	-.54
	.001	.041	.025	.040				
79.1-83.12	-.001##	-.003	-.011	1.035**	.98/1.79	3.27/20.41	.024	.48
	.000	.026	.014	.028				
84.1-87.12	-.000	.022	-.020	1.001**	.99/2.02	.76/8.07	.003	.04
	.000	.039	.019	.021				
88.1-92.8	.000	.039	.025	1.003**	.96/2.71	1.20/1.64	.004	.48
	.001	.077	.024	.055				
Finland-Markka								
74.1-78.12	-.003#	-.029	.022	.446**	.31/2.00	1.78/3.95	.015	-1.82
	.002	.134	.050	.097				
79.1-83.12	-.002	.018	.115*	.401**	.28/1.80	.87/1.06	.016	-1.88
	.002	.068	.050	.052				
84.1-87.12	-.001	-.370**	.047##	.487**	.90/2.13	1.86/9.17	.006	-5.81
	.001	.080	.029	.048				
88.1-92.8	-.001	1.199*	.016	.285*	.44/2.00	1.07/1.79	.015	-2.56
	.002	.132	.050	.127				
Norway-Krone								
74.1-78.12	-.003##	.114	-.048	.811**	.65/1.80	1.23/6.04	.013	-.47
	.002	.147	.052	.113				
79.1-83.12	-.003*	.025	.100*	.397**	.43/1.53	2.13/4.23	.012	-2.71
	.001	.134	.050	.066				
84.1-87.12	.005**	-.281	.045	.563**	.64/1.94	.91/10.05	.014	-1.83
	.002	.201	.075	.140				
88.1-92.8	-.000	-.396**	-.017	.398**	.75/1.88	3.23/6.82	.008	-4.00
	.001	.151	.046	.092				

Note: See notes for Table 4a.

Appendix Table 5b: Weights Assigned to Foreign Currencies in Determining Changes in Value

Time Period	Const	USD b1	Yen b2	DM b3	adj.R^2/DW	Chow/White	S.E.R.	T-test b1+b2+b3=1
Sweden-Krona								
74.1-78.12	-.004	.272#	-.015	.816**	.51/1.91	1.69/3.06	.017	.22
	.003	.151	.062	.110				
79.1-83.12	-.006*	.149	.147#	.246##	.09/1.81	2.55/2.19	.024	-2.09
	.003	.123	.078	.153				
84.1-87.12	-.001*	-.129#	.061*	.447**	.90/1.76	1.19/7.66	.005	-5.42
	.001	.071	.025	.040				
88.1-92.8	.001	-.310*	-.030	.371**	.71/1.90	1.78/17.29	.008	-3.96
	.001	.127	.046	.082				
Switzerland-Franc								
74.1-78.12	-.005##	-.143	.103	.843**	.47/1.89	.64/25.58	.023	-.43
	.003	.348	.143	.149				
79.1-83.12	-.002	-.103	.136*	.960**	.66/1.78	.92/6.15	.017	-.03
	.002	.192	.059	.110				
84.1-87.12	-.002	-.515**	.307**	.653**	.88/1.67	.78/20.31	.010	-2.15
	.001	.155	.077	.101				
88.1-92.8	-.002	-.255	.038	.727**	.69/1.90	.50/12.21	.013	-1.21
	.002	.208	.093	.144				
Iceland-Krona								
74.1-78.12	-.022**	1.23**	-.034	.088	.03/2.17	2.28/3.90	.047	.30
	.006	.462	.168	.237				
79.1-83.12	-.035**	.829*	-.048	.404##	.02/2.11	2.38/6.30	.042	.29
	.005	.401	.105	.265				
84.1-87.12	.010*	.142	-.064	.367#	.02/2.00	1.45/2.32	.026	-.84
	.004	.184	.088	.192				
88.1-92.8	-.008**	-.390#	.027	.277	.25/1.93	4.21/5.56	.019	-1.81
	.003	.232	.083	.202				

Note: See notes for Appendix Table 4a.

Appendix Table 6: Weights Assigned to Foreign Currencies in Determining Changes in Value (Western Hemisphere)

Time Period	Const	USD b1	Yen b2	DM b3	adj.R^2/DW	Chow/White	S.E.R.	T-test b1+b2+b3=1
Canada-Dollar								
74.1-78.12	-.004#	1.20**	-.028	.174*	.44/2.18	1.55/10.78	.013	1.27
	.002	.198	.070	.082				
79.1-83.12	-.001	.434**	.024	.063	.11/1.94	.87/6.18	.012	-2.64
	.002	.127	.050	.059				
84.1-87.12	-.002	.564**	-.024	-.049	.35/2.04	.97/10.28	.011	-1.74
	.002	.199	.065	.148				
88.1-92.8	.001	.950**	-.037	-.022	.66/1.91	.97/12.80	.011	-.31
	.001	.250	.073	.154				
Mexico-Peso								
74.1-78.12	.002	-2.522	-.124	-1.744##	.17/1.62	6.14**/42.71**	.065	-1.28
	.006	1.972	.283	1.073				
79.1-83.12	-.031*	.147	-.583	-.616	.01/2.13	1.24/10.68	.106	-1.27
	.014	.777	.586	.665				
84.1-87.12	-.050**	1.541*	-.317	-.279	.39/1.61	3.35/14.43	.037	-.06
	.004	.680	.334	.325				
88.1-92.8	-.006**	.941**	.032	-.046	.86/.98	3.69/1.75	.006	-.37
	.001	.096	.036	.070				
Chile-Escudo								
74.1-78.12	-.079**	.471	.569##	-.095	-.01/1.00	9.50**/8.16	.067	-.04
	.011	.670	.363	.390				
79.1-83.12	-.015**	.909**	.033	.082	.01/1.54	1.83/2.88	.045	.04
	.005	.295	.106	.150				
84.1-87.12	-.023**	1.144*	.051	.275	.02/2.05	1.30/12.50	.037	.50
	.006	.475	.123	.263				
88.1-92.8	-.008**	.618*	.056	-.513**	.61/1.78	.26/14.43	.016	-1.72
	.002	.225	.127	.165				
Colombia-Peso								
74.1-78.12	-.008**	.979**	.063*	-.057	.79/.66	4.02/13.07	.006	-.12
	.001	.059	.029	.044				
79.1-83.12	-.013**	.930**	-.060**	.022	.86/.47	18.34**/12.00	.005	-1.50
	.001	.057	.013	.029				
84.1-87.12	.023**	1.13**	.028	.017	.73/.46	11.52**/16.44	.009	.77
	.001	.202	.058	.072				
88.1-92.8	-.019**	1.06**	.040##	.026	.94/.34	7.71**/7.79	.004	1.00
	.001	.059	.026	.045				

Note: See notes for Appendix Table 4a.

Appendix Table 7: Weights Assigned to Foreign Currencies in Determining Changes in Value (East Asia)

Time Period	Const	USD b1	Yen b2	DM b3	adj.R^2/DW	Chow/White	S.E.R.	t-test b1+b2+b3=1
Singapore-Dollar								
74.1-78.12	-.001	.354**	.034	.394**	.39/2.12	1.71/44.77**	.009	-1.17
	.002	.114	.055	.118				
79.1-83.12	-.002*	.443**	.127*	.167*	.32/2.01	.48/25.59	.010	-1.82
	.001	.116	.046	.083				
84.1-87.12	-.002##	.600**	.187##	.027	.25/2.30	6.79**/21.14	.012	-.60
	.001	.193	.117	.098				
88.1-92.8	.004**	.514**	.147**	.010	.46/2.18	2.37/5.63	.008	-1.35
	.001	.125	.049	.095				
Thailand-Baht								
74.1-78.12	-.000	.982**	.011	.012	.98/1.73	.87/4.26	.002	.13
	.000	.017	.011	.008				
79.1-83.12	-.002	.841**	.057	-.000	.42/2.04	.80/9.80	.012	-.57
	.001	.146	.055	.031				
84.1-87.12	-.005	.667**	.091#	.144	.01/2.13	.34/2.20	.024	-.16
	.004	.142	.055	.178				
88.1-92.8	-.001	.738**	.104**	-.024	.82/1.10	.95/4.26	.005	-1.09
	.001	.030	.021	.049				
S.Korea-Won								
74.1-78.12	-.004	1.18**	.149	-.073	.21/2.11	.71/3.18	.025	.50
	.004	.186	.148	.077				
79.1-83.12	-.008*	1.23**	-.032	.211*	.23/2.15	.24/2.15	.024	1.12
	.003	.225	.029	.096				
84.1-87.12	-.001	.928**	-.015	.074	.71/.49	9.94**/7.48	.000	-.07
	.001	.140	.046	.067				
88.1-92.8	-.000	.963**	.091##	-.090	.78/.57	13.63**/7.08	.009	-.13
	.001	.160	.057	.109				
China,P.R.-Yuan								
74.1-78.12	-.002	.263*	-.202**	.551**	.54/2.28	2.41/28.35	.010	-1.92
	.002	.118	.073	.109				
79.1-83.12	-.000	.222*	.105**	.392**	.54/1.75	1.86/8.60	.009	-2.09
	.001	.095	.029	.055				
84.1-87.12	-.012**	-.033	-.271##	-.146	.06/2.03	3.92/23.99	.026	-2.19
	.003	.689	.166	.360				
88.1-92.8	-.006##	.654*	.278	-.620	.27/2.11	1.36/17.42	.034	-.66
	.004	.336	.210	.520				
Hong Kong-Dollar								
74.1-78.12	-.000	.940**	-.023	.204**	.42/1.86	1.61/4.50	.010	.57
	.002	.108	.041	.068				
79.1-83.12	-.006#	.587**	.114	.302**	.10/1.88	.76/4.25	.022	.01
	.003	.147	.081	.112				
84.1-87.12	-.000	.987**	-.004	.026#	.97/2.65	.38/6.08	.002	.30
	.000	.035	.016	.016				
88.1-92.8	.000	.991**	-.010	.000	.99/2.23	.31/2.84	.002	-.33
	.000	.025	.010	.015				

Notes

1. Among recent studies of the regional patterns to economic disturbances are Bayoumi and Sterne (1992), Bayoumi and Eichengreen (1992) [and Goto and Hamada (1992)]. Bayoumi and Sterne also study saving-investment correlations in this context, and find that capital mobility by this test is higher within regions than across regions. [Chinn and Frankel (1992) study whether interest rates in small countries are more responsive to the region's major financial center than to the world's other major financial centers. The finding is generally "no" for Asia (but "yes" for Europe).] All the various aspects of possible regional links are interrelated. Stabilization of exchange rates within regions, for example, could help explain each of the other aspects of regionalization.

2. Frankel (1991b) presented a back-of-the-envelope measure of intra-regional bias: the ratio of the intra-regional trade share to the share of world trade. Anderson and Norheim (1992) use similar calculations of "intensity of trade indexes."

3. The focus of these papers was on potential Eastern European trade patterns; but they report statistically significant within-region biases to the following groupings: EC, Latin America, ASEAN, former British colonies, GSP, and EC preferences under the Lome convention.

4. The list of countries, and regional groupings, is given in an Appendix to Frankel (1992).

5. The specification implies that trade between two equal-sized countries (say, of size .5) will be greater than trade between a large and small country (say, of size .9 and .1). This property of models with imperfect competition is not a property of the classical Heckscher-Ohlin theory of comparative advantage. Helpman (1987) and Helpman and Krugman (1985, section 1.5). Foundations for the gravity model are also offered in papers surveyed by Deardorff (1984, pp.503-06) and Wang and Winters (1992). We have also tried to capture classic Heckscher-Ohlin effects, first by including bilateral absolute differences in GNP/capita figures, and then by including some factor endowment variables with data (for a subset of 656 of our 1,953 pairs of countries) generously supplied by Gary Saxonhouse (1989). There is some support for these terms [not reported here]. The other coefficients are little affected.

6. Described in Frankel (1992).

7. The use of the multiplicative form itself changes the results, however. Wang and Winters (1992) addressed the problem of trade flows so small as to be recorded as zero in another way: by trying the tests substituting fractions (like .5) of the minimum recordable unit for the zeros. They too found that it made little

substantive difference.

8. Table 5 in Frankel (1992).

9. This is the same result found by Hamilton and Winters (a significant coefficient of .7 on the EC and zero on EFTA). But it is the opposite of the conclusion one might draw from simple statistics on the magnitudes of intra-regional trade in the EC 12 and Western Europe as a whole, if one did not hold constant for proximity. Grant, Papadakis and Richardson (1992, p.48).

10. Of the EC 12, only Greece had not joined the Exchange Rate Mechanism by early 1992 (though Italy and the United Kingdom dropped out soon thereafter).

11. Only Singapore and Indonesia, and at times Malaysia and Thailand, appear to put significant weight on the yen, and the weight is usually less than .1, as against .9 to 1.0 on the dollar. [It is not a coincidence that many Asian/Pacific countries call their currencies "dollar." Nor, given the economies of scale in the use of an international currency, is it surprising that the dollar is the choice of Asia, as the rest of the world. On the three major candidates for international currencies, see Alogoskoufis and Portes (1992) and Frankel (1991a).]

12. Why do countries keep the weights secret? It allows the governments to devalue their currencies secretly when they so desire. But secret weights undermine the governments' ability to commit credibly to a low inflationary monetary policy. (Lowell, 1992.)

13. Frankel and Wei (1992) and Frankel (1992), respectively.

14. For example, Hooper and Kohlhagen (1978), Kenen and Rodrik (1986) and Akhtar and Hilton (1984). The literature is surveyed in IMF (1983).

15. These results extend those in Table 13a of Frankel and Wei (1992), by adding the EFTA bloc variable, and measuring volatility as the level of the standard deviation rather than its log (thus allowing the experiment of asking how much trade would go up if exchange rate variabilities like those reported in Table 4 were reduced to zero).

16. The estimate in Frankel and Wei (1992) suggests that, on average, a doubling of the standard deviation reduces bilateral trade by an apparent 4.6 percent (= .066 log 2), holding constant all other variables.

17. For example, Caballero and Corbo (1989), who find a negative relationship empirically however.

18. The argument in favor of this choice of instrument is that relative money supplies and bilateral exchange rates are highly correlated in theory (they are directly linked under the monetary theory of exchange rate determination), and in our data, as well, but monetary policies are less likely than exchange rate policies to respond to bilateral trade.

19. Reported in Frankel and Wei (1992).

20. This figure does not even take into account the outcome of more recent measures toward greater integration associated with 1992.