

IV Volume and Pattern of World Trade

Empirical work relating exchange rate variability to trade flows has taken place on several different levels. At the most aggregated level, attempts have been made to relate the growth of total world trade to the growth of world income, to see whether this relationship changes in periods of exchange rate variability. A more disaggregated approach has involved the specification of models explaining changes in bilateral trade flows over time, including exchange rate variability as an argument in the equations. A variant of this approach has been to explain differences in the level of trade, during a single time period, with reference to various characteristics of the partner countries (including variability in bilateral exchange rates). In what follows, we deal first with aggregated models of world trade, then with bilateral models based on time-series analysis, and last with bilateral models based on cross-section analysis.

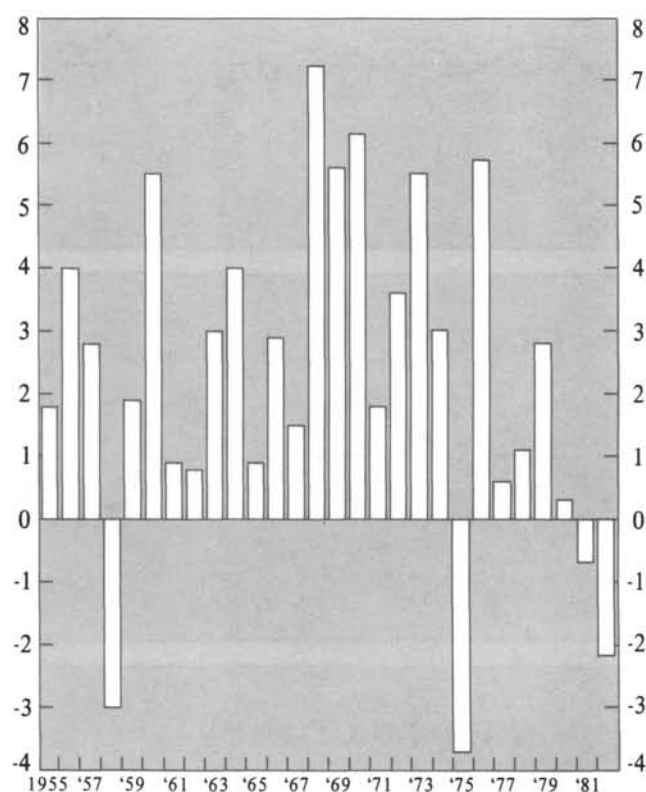
Aggregate Relationships Between Exchange Rate Variability and Trade

Perhaps the simplest test of the proposition that erratic exchange rate fluctuations have had an adverse effect on world trade is to examine what has in fact happened to the rate of growth of world trade in recent years. In undertaking this kind of exercise, it has to be recognized that other factors affect the volume of trade flows, most notably, of course, the level and rate of growth of world output.

Blackhurst and Tumlr (1980) make a rough correction for this factor by presenting a chart showing the extent to which the increase in world trade has exceeded the increase in world output over the period 1955–78. These data are reproduced and updated in Chart 3. For the period which Blackhurst and Tumlr observed, which ended in 1978, there did not appear to be any very sustained and systematic impact of the more variable exchange rates that were presumed to characterize the floating rate period. However, as may be seen quite clearly from Chart 3, the addition of four years shows quite a significant change in the relationship between the two variables.

This evidence, however, would be consistent with a change in the structure of the relationship between world

Chart 3. Number of Percentage Points by which World Export Growth Exceeded World Output Growth, 1955–82



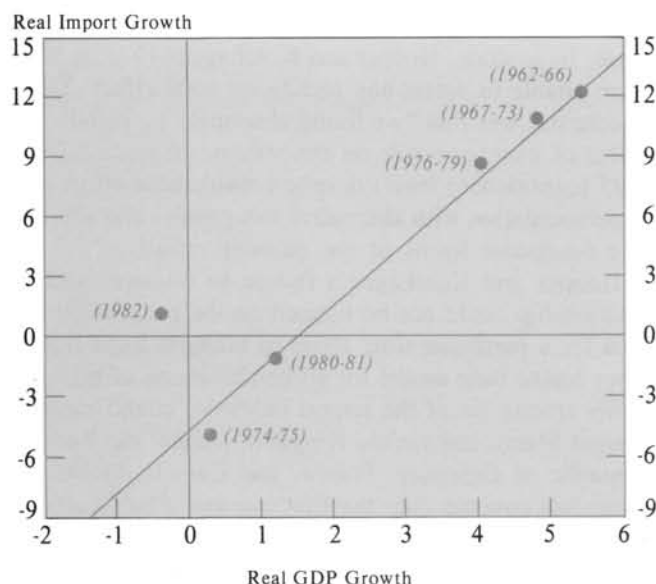
Source: Reproduced from Blackhurst and Tumlr (1980, p. 15) and updated by Fund staff.

output and trade only if there were some reason to expect that trade would always grow more rapidly than output by a fixed percentage. In fact, as Bergsten and Cline (1983) show, international trade flows tend to be particularly responsive to cyclical factors, so that trade grows considerably more rapidly than output during cyclical

upswings and less rapidly when output is stagnant or contracting. Bergsten and Cline's chart describing this relationship is reproduced as Chart 4 (with an observation added for 1982).

Chart 4. OECD Member Countries: Relationship Between Real Import Growth and Real Gross Domestic Product Growth, 1961–82

(In percent)



Source: Bergsten and Cline (1982, p. 78), with an observation for 1982 added by Fund staff.

The conclusion that would be drawn from this chart, if taken at face value, is that the poor performance of world trade in the past three to four years (the most prominent feature of Chart 3, above) can in fact be fully explained by using a different functional form to relate trade flows to GDP. There is thus no evidence that any special feature of the recent past (e.g., exchange rate variability) has had an independent negative effect on the level of trade.

However, as Bergsten and Cline would themselves undoubtedly admit, the fact that a highly simplified model provides a serviceable explanation of broad trends in world trade does not mean that other factors are not important, or could not be detected through more detailed work. In the first place, their model explains only about three fourths of the observed variance in the growth of trade flows (see Appendix II), leaving an important element still to be explained. Second, as can be seen from the chart, its good fit is strongly influenced by the observations during the 1974–75 and 1980–81 recessions. If these observations were themselves influ-

enced by exchange rate uncertainty, the latter phenomenon could be helping to determine the slope of the curve. Thus the absence of a residual in the estimated relationship cannot be taken to imply that exchange rate variability is unimportant. Third, there is no strong theoretical reason to expect the relationship to be linear as in their chart. Indeed, it seems more likely that the strong relationship between trade growth and output growth (whereby a 1 percent more rapid growth in output leads to a 3 percent increase in trade growth) is a short-run phenomenon that may not persist to the same degree when longer-run adaptations are considered.

Appendix II provides some further evidence on the link between world output and world trade. It appears that this relationship has changed over the floating rate period, compared with the 1960s. As may be seen from Chart 10 (Appendix II), which plots actual world trade growth against the growth that would be "predicted" on the basis of the relationship between output and trade that obtained during the 1960s, trade has fallen short of what might have been expected. However, the equations reported in the appendix do not reveal any systematic relationship between the size of this shortfall and the level of exchange rate variability.

Trade Flows of Individual Countries: Time-Series Analysis

A shortcoming of the studies noted above is that they may be too aggregated to detect the presence of exchange rate uncertainty in discouraging particular trade flows. This could come about for several reasons. First, since one effect of uncertainty is to induce transactors to try to avoid risk, it may be reflected in shifts in trade patterns to avoid transactions using an exchange rate that is particularly susceptible to volatility. For example, if the exchange rates between North American currencies, on the one hand, and European currencies, on the other, become more variable, but exchange rates within North America and within Europe remain reasonably stable, it may be that trade is diverted from the less stable to the more stable currency relationship. Second, it is difficult to construct a satisfactory proxy for exchange rate uncertainty for the world as a whole. Trade takes place between pairs of countries, and the aggregation of a large number of individual currency risk situations is inevitably somewhat arbitrary. Last, the number of factors that go to determine the volume of world trade cast doubt on the reliability of equations that use only a small number of explanatory variables.

For these reasons a number of investigators have focused on the determinants of bilateral trade flows. The basic approach has been to specify an equation that

explains the level and rate of growth of bilateral trade flows over time, including some measure of exchange rate variability as one of the determinants. The other factors that are included generally cover demand conditions in the importing country and relative prices.

A number of early studies focused on experience in the nineteenth century and in the interwar period. These are summarized in Yeager (1976), who found little evidence of an adverse impact of exchange rate variability on trade. Of more direct relevance to current circumstances, which are, of course, quite different from those of fifty or a hundred years ago, is the evidence presented in more recent studies. These studies have also had the added advantage of being able to use more advanced statistical techniques.

One of the first such papers is that by Clark and Haulk (1972), which antedates the move to generalized floating in 1973. They investigate the experience of Canada during the period 1952–70, during the earlier part of which the Canadian dollar floated, before being pegged again in 1962. The indicator of variability which they use is the standard deviation of daily rates about the average for each quarter, applied to both the spot and the 90-day forward quotation, though they recognize that variability over longer periods would be required to correspond better to the planning horizon used by firms.

Clark and Haulk did find that exchange rate variability was significantly greater in the flexible than in the fixed rate period, and that the determinants of Canadian exports and imports seemed to shift somewhat between the two periods. However, inclusion of exchange rate variability in the trade equations did not add to their explanatory power. They concluded that nominal exchange rate variability did not adversely affect Canadian trade during this period, though they conceded that a different formulation of their model could perhaps lead to a different result.

A test in the same vein is presented by Makin (1976), who attempted a preliminary assessment of the effects of floating on trade, using data up to the end of 1973. Makin fitted import equations for the Federal Republic of Germany, Japan, the United Kingdom, and Canada, using as his variability measure a moving standard deviation calculated from six-month blocks of data. Like Clark and Haulk, he is unable to detect any systematic relationship between exchange rate variability and trade volume.

These early studies suffered from a number of shortcomings, most of which were recognized by the authors themselves. First, the exchange rate variability they measured was either limited in extent, as in the case of Canada, or in time, as in the case of studies that included only two or three quarterly observations from the flexible rate period. Second, they did not take explicit account of the possibility of exchange rate movements and relative prices offsetting one another. Third,

they used the variability in the exchange rate against one currency (the U.S. dollar) as a proxy for exchange rate uncertainty effects on all trade flows.

A paper by Hooper and Kohlhagen (1978) addresses some (though not all) of these difficulties by covering an additional two years and disaggregating the trade of individual countries into its constituent bilateral flows. In their theoretical analysis, Hooper and Kohlhagen show that the effect of exchange rate uncertainty on price depends on the currency in which international contracts are denominated. As far as volumes are concerned, theoretical considerations are unambiguous in suggesting that increased uncertainty should reduce the level of trade. In practice, Hooper and Kohlhagen (1978, p.505) were unable to detect any significant such effect. Their conclusion was that “we found absolutely no significant effect of exchange risk on the volume of trade (at the 0.95 [confidence] level) despite considerable effort and experimentation with alternative risk proxies and alternative functional forms of the quantity equation.”

Hooper and Kohlhagen’s failure to discover such a relationship could not be blamed on the peculiarities of data for a particular time series of bilateral trade flows. They tested their model for all combinations of bilateral flows among six of the largest industrial countries—the United States, the United Kingdom, Japan, the Federal Republic of Germany, France, and Canada. However, their data covered only the first two and a half years of the floating rate period, and it could be argued that their tests were unable to capture possible lagged adverse effects of the greater volatility that has characterized exchange rate behavior since 1973. Although Hooper and Kohlhagen used numerous alternative proxies for exchange rate variability, they were all of a relatively short-term character, covering periods of not more than three months. Partly because of the short-term orientation of their variability measure, they used only nominal exchange rate variability, and did not attempt to estimate “real” exchange rate movements through the use of deflating techniques.

A paper by Coes (1981) investigated the impact of exchange rate uncertainty on trade flows in Brazil using real exchange rates, and covering quite long periods of relatively more stable and relatively more variable exchange rates. Brazil adopted a crawling peg system in August 1968, and, as can be seen from Chart 5, which is taken from Coes’ paper, that date separates a period of extreme volatility in the real dollar/cruzeiro rate from a period of relative stability. Coes proposes a measure of monthly variability in exchange rates as a proxy for real exchange rate uncertainty, and includes this (along with price and income variables) in an equation explaining exports by sector.

Coes’ equations are based on annual data, and cover exports of 22 sectors, both manufacturing and primary products. The great majority of his equations show that

Chart 5. Brazil: The Real Brazilian Cruzeiro/U.S. Dollar Rate, 1957–74

Source: Coes (1981, p. 115).

uncertainty has a highly significant impact on export volumes. While this evidence is suggestive, it should be interpreted with caution, as Coes himself acknowledges. In the first place, other changes in the Brazilian economic environment occurred at the same time as the adoption of the crawling peg. The restoration of domestic economic and financial stability, and the resumption of sustained economic growth, may have been more important factors than the reduction of exchange rate instability—although the latter factor cannot really be separated from the measures that were undertaken to restore domestic economic stability.

It should also be noted that the degree of real exchange rate instability in Brazil prior to 1968 was unusually large, and in part reflected an economic and political environment of considerable uncertainty. It would not necessarily be appropriate to assume that proportional effects on trade would flow from reductions in exchange rate variability when the initial degree of variability was smaller and resulted from different causes. Nevertheless, Coes' analysis suggests that, when uncertainty reaches substantial proportions, it can have a marked adverse effect on trade flows.

Cushman (1983) uses real exchange rate variability in his investigation of uncertainty effects on trade flows among industrial countries. Basically, his model resembles that of Hooper and Kohlhagen (1978), with the advantages of (i) more recent data and (ii) the use of real

as opposed to nominal exchange rates. The uncertainty measure used in each bilateral trade flow equation is quarterly variability in the bilateral exchange rates, in real terms. The price index used to deflate nominal exchange rates is relative movements in wholesale prices. For reasons given above, this may not be the best available deflator, but its use is unlikely to bias the results substantially. Cushman's results can be interpreted as providing some, though not overwhelming, support to the proposition that exchange rate variability adversely affects trade flows. Of the fourteen sets of bilateral trade flows, real exchange rate variability is significantly and negatively associated with trade flows in six cases, against only two where the association is statistically significant and positive. However, among the six cases where the relationship is not significant at the 95 percent confidence level, only two have negative signs while four have positive signs.

The studies reviewed here have for the most part been based on data for the early part of the floating exchange rate period. With the exception of the papers by Coes (1981) and Cushman (1983), the evidence they evaluate refers to the variability of nominal exchange rates. Since it has been argued earlier that real exchange rates may be of more relevance for international trade flows, and since the two studies using real exchange rates have shown more impact on trade, Appendix IV presents an updating of Cushman's work, though on a somewhat cruder basis,

using data through 1981. No significant impact of exchange rate variability on trade was found through the updating.

Bilateral Trade Flows: Cross-Section Studies

An alternative to tests that attempt to explain changes in trade volumes over time are those that compare the level or rate of growth of trade across countries at a given point in time. The hypothesis to be tested is that the level or rate of growth of trade flows will be greater when the relevant exchange rate is more stable. Kenen (1979) takes a group of 16 industrial countries and tests whether the rate of growth of their exports between 1973–74 and 1976 was systematically related to the variability in their exchange rate. Four definitions of variability are used (two real and two nominal), but none is statistically significant. In a more disaggregated vein, Abrams (1980a) specifies a model in which the level of trade between countries is explained by factors such as income levels, geographic proximity, and membership in trade associations. He also includes a measure of exchange rate variability, which is defined as the variability, in nominal terms, of monthly exchange rate observations over the previous year. He finds that his exchange rate variability measure is significantly related to the volume of bilateral trade flows. In a simulation exercise, he finds that the volume of trade in 1976 could have been expected to be almost 20 percent larger had exchange rate variability been the same as in 1970.

This is in many respects a surprising result, given the rather mixed conclusions that emerged from other studies, and the question naturally arises how robust it is with respect to changes in the specification of Abrams' model. In a subsequent paper, Abrams (1980b) presented results based on quarterly exchange rate variability, using real rates. This latter study, which used the same data base, found a much weaker association between exchange rate variability and trade flows. Not only was the statistical significance of the relationship much less, but the size of the coefficient was also considerably smaller. A similar simulation to the previous one suggested that the extent of trade loss in 1976 was only of the order of 1 percent. Given the revealed sensitivity of his results, Abrams cautions against drawing strong conclusions.

Another paper using cross-section analysis is that of Thursby and Thursby (1981), who attempted to see whether the change in the export/gross national product ratio over the period 1973–77 varied between countries depending on the variability in their exchange rates. They employed both nominal and real exchange rates, and used both wholesale and consumer prices as deflators. In none of the tests was exchange rate variability found to be significant.

A somewhat more sensitive test performed by Thursby and Thursby involves disaggregating trade flows by ex-

port destination, and pooling data for five years. This gives them 95 observations for each country (exports to 19 trading partners in each of five years). Bilateral exports (in value terms) are made to depend on bilateral exchange rate variability, relative income levels, and the change in the exchange rate. Three statistical measures of variability and three different exchange rate series (one nominal and two price adjusted) are used. There are thus nine separate variability series for each of the 20 countries—180 equations in all. Exchange rate variability is found to be negatively correlated with trade volumes in almost 90 percent of the cases reviewed. Approximately half of these cases are significant at the 95 percent confidence interval, lending some support to the hypothesis that exchange rate uncertainty inhibits trade.

An interesting feature of the Thursbys' results is that no significant impact from exchange rate variability is detected from aggregated data, yet a pattern of significant effects tends to show up when bilateral flows are identified separately. The Thursbys suggest that this is consistent with exchange rate variability affecting the pattern, but not the overall volume, of trade for each country. This does not seem entirely plausible: if a higher degree of exchange rate variability systematically caused a reduction in bilateral trade flows, then one would expect the country whose average variability had increased most would tend to have a lower export/gross national product ratio. On the whole, it seems more likely that if the phenomenon suggested by the disaggregated equations actually exists, and variability does affect trade flows, it is not strong enough to emerge in a significant manner in more aggregated equations, where its influence is likely to be overwhelmed by other factors.

The Evidence from Surveys

An alternative method for obtaining some impression of the effect of exchange rate variability on trade flows is simply to poll participants in international trade. This method has a number of obvious drawbacks: the responses depend to some extent on the nature of the question, and being an expensive technique the samples may be small and/or the responses insufficiently considered for great confidence to be placed in them. Nevertheless, sample surveys provide the only opportunity to assess directly what participants in international markets believe to be the effect on their behavior of exchange rate variability. Furthermore, they are clearly superior to anecdotal evidence by which the perceived experience of individual traders is extrapolated to derive general conclusions.

An early such survey was conducted by the Federal Reserve Bank of Boston (Fieleke, 1971) following the

floating of the Canadian dollar. The questions revolved around whether the greater variability of the Canadian dollar in the year and a half following its floating on June 1, 1970 had led to greater costs in transactions with Canadian residents, or had otherwise inhibited trade. One hundred and fifty-six U.S. companies trading with Canada responded to the questionnaire, and none of them reported having decided against entering into a transaction with a Canadian resident on the grounds that forward cover would be too difficult or expensive to obtain. On the basis of this and other questions, Fieleke (p. 187) concluded that "the evidence presented in this study does not support the claim that international trade is impaired by flexibility in the exchange rate." It should be noted, however, that the period of flexibility covered by the survey was short, the degree of actual variability in the U.S./Canadian rate limited, and the questionnaire rather specifically directed to the adequacy of forward market facilities. Thus, while it is true that the survey did not reveal evidence of adverse effects from exchange rate variability, neither should it be taken as strong confirmation that such effects do not exist.

A later study sponsored by the Conference Board (Duerr, 1977) did not attempt to measure costs but focused more on the various alternative hedging mechanisms. A panel of 75 representatives of major U.S. manufacturing firms participated in the survey, which did not, however, pose specific questions allowing an easy classification of responses. In summarizing the views of panelists, Duerr notes (p. 2) that "the great majority of panelists cooperating in this survey agree that the system of floating exchange rates . . . has made the practice of international business much more difficult." As evidence of this, he quotes three statements of panelists, each of whom seems to be more concerned about substantial swings in exchange rates than about short-term variability.

Although the results of the Conference Board study reveal a much less sanguine assessment of exchange rate flexibility than the Federal Reserve Bank of Boston survey, the two are not necessarily inconsistent. By the time of the Conference Board study, floating exchange rates had become generalized, and the amplitude of fluctuations was much greater than the earlier movements of the Canadian dollar against the U.S. dollar. Nevertheless, apart from revealing that exchange rate matters had become a more widespread source of concern to corporate managers, the Conference Board study does not provide much indication of how this might have affected decisions to engage in international transactions.

A more comprehensive study of corporate risk management practices emerged from a survey undertaken by the British North America Committee in 1981 (Blin, Greenbaum, and Jacobs, 1981). Twenty-seven companies domiciled in Canada, the United Kingdom, and the United States responded to the survey, which revealed a

wide and growing use of systematic hedging procedures to protect against foreign exchange risk. While recourse to such hedging mechanisms clearly involves costs (in terms of management time as well as direct payments to financial intermediaries), the authors of the study (p. 4) concluded that "the firms interviewed and surveyed for this report . . . have indeed adapted to the reality of unpredictable exchange rates. They do not appear to have refrained from increasing their direct foreign investment in the face of rate uncertainties." The authors did not attempt to reach a similar conclusion on trade, but if they had done so, it would presumably have been similar. Most responding firms reported that they had increased the frequency of price adjustments in response to foreign exchange rate volatility, but only two of twenty-seven felt this imposed any significant costs. Similarly, most respondents did not experience problems in practice with fixed price contracts, and those that did mostly employed hedging mechanisms.

The survey that bears most directly on the issue of whether exchange rate volatility has affected trade is that undertaken by the Group of Thirty (1980). Separate questionnaires were sent to banks (from whom 35 replies were received) and to major international corporations (an unspecified number) in five countries. The paper did not attempt to classify the replies received but rather to provide an analytical interpretation in verbal form. The question most relevant to the subject of this section was as follows: "3. Have floating rates rendered international trade more or less attractive? Have they, in fact influenced the level of your international trade?" (p. 40). All respondents replied that floating exchange rates had had a negligible impact on the level of their foreign trade. Similarly negative replies were given to questions on whether floating rates and the need to manage foreign exchange exposure had led to increases in costs or price, and whether floating had led to a cutback in foreign investment.

Banks were also asked about the effect of exchange rate floating on the costs of international trade and investment in real terms. Most replied that there had been some increase, but that it was minimal, and marginal compared with other sources of instability in the system.

Overall, the evidence from surveys provides little support for the proposition that exchange rate variability has had a major adverse effect on the volume of international trade. For a variety of reasons, however, some of which have already been mentioned, this kind of evidence has to be interpreted with special care. First, the samples are generally small. Second, for the most part they cover large and diversified companies, which are perhaps better able to cope with the uncertainties of exchange rate variability than smaller firms. Third, they are not always addressed to the same question as that discussed here. For example, the Group of Thirty's questionnaire asked all of its questions in terms of "floating" exchange rates

rather than exchange rate variability. One respondent pointed out that floating itself had little effect because if rates had been pegged, they might have been just as unstable. In other words, respondents may have been thinking more of the mechanism by which exchange rates moved rather than the extent to which they moved.

For all these reasons, no strong conclusions should be drawn from the results reported here. Nevertheless, it is of interest that, even in studies undertaken as late as 1980 and 1981, businessmen in general were not reporting significant adverse effects on trade and investment from the system as it was operating then.