BIS ECONOMIC PAPERS
No. 39 – November 1993

MEASURING INTERNATIONAL PRICE AND COST COMPETITIVENESS

by
Philip Turner and Jozef Van 't dack

BANK FOR INTERNATIONAL SETTLEMENTS
Monetary and Economic Department
Basle

BIS Economic Papers are written by members of the Monetary and Economic Department of the Bank for International Settlements and published by the Bank. The aim of the papers is to stimulate discussion of the topics with which they deal. The views expressed in them are those of their authors and not necessarily the views of the BIS.

ISBN 92-9131-037-9
ISSN 1021-2515

Contents

Tables

Text

Appendix

Graphs

Text

Appendices

Introduction*

Few economic indicators attract as much controversy as those of international competitiveness. One reason for this is the imprecision of the concept: in common parlance "competitiveness" can be used to cover almost any aspect of market performance. Product quality, the ability to innovate, the capacity to adjust rapidly to customers' needs and the absence of restrictive practices in the labour market are frequently evoked in discussions of competitiveness. This paper, however, will focus on a much narrower meaning, that based on relative prices or costs.

It might be stressed at the outset that the link between this narrow concept and economic performance more generally is not unambiguous. The ambiguity arises from the fact that its international relative price or cost position can be both cause and result of a country's economic performance. On the one hand, it is clear that if relative costs are too high, the ability to compete internationally can be compromised. On the other hand, successful economic performance can lead to an exchange rate appreciation, and thus to higher relative costs or prices. For instance, if enterprises in a country become more successful in the non-price dimensions of performance – if they are innovative, flexible, produce high-quality goods and so on – then the real exchange rate would be expected to strengthen. Price and wage competitiveness – the narrow concept – would thus appear to "worsen". But such "deterioration" would of course be a symptom of success, not of failure.

* Our first debt of gratitude is to Philippe Hainaut who was responsible for much of the extensive statistical work underlying this paper and for the revision of the BIS indices described in this paper. Thanks are also due to Willy Fritz for skilful computer programming; to Henri Bernard, Angelika Donaubauer, Elmar Koch and Ib Madsen for statistical work; and to Stephan Arthur for the graphs. Helpful comments were received from Palle Andersen, John Bispham, Horst Bockelmann, Renato Filosa, Serge Jeanneau and Sarah Johns.

A second reason for controversy is that even the narrow concept of competitiveness can be given many distinct statistical forms, using prices, wages and other costs. There is no one ideal measure, and the large number of different measures that are in common use often diverge appreciably. One purpose of the present study is to survey these measures and to examine key trends of the major currencies in the light of the various indicators, attempting where possible to account for the divergences observed.

Two general issues are raised in the construction of indices of real effective exchange rates. The first is the choice of currencies to be included in the calculation of relative indices. This is reviewed in the first part of Section I of this paper. One important aspect is the increased number of countries that "count" in international trade. In particular, the rise of the Asian NIEs and other dynamic economies in South-East Asia has increased the number of currencies that may need to be included in effective exchange rate calculations. The inclusion of such currencies implies significant modifications to the movement in real effective exchange rates. This is considered in more detail below.

The second general issue concerns the choice of price or cost measure used. As for industrial countries, there are basically three sorts of measures in common use: those based on unit labour costs in manufacturing industry; those based on consumer prices (or some other broadly-based price measure); and those based on export unit values. These classic measures are reviewed in the second part of Section I; recent revisions to the indices calculated by the BIS are also discussed.

The final part of Section I uses these measures to review actual developments in some major currencies over the past twenty years, paying particular attention to how and why different indicators can "tell a different story". The broad developments in competitiveness between Europe, the United States, Japan and the dynamic Asian economies provide a central focus. The successive exchange rate crises in Europe from September 1992 have of course given measures of intra-European competitiveness added interest, and what the different measures tell about this is also considered. The issues raised in measuring the competitiveness of commodity exporters (mainly in the developing world) are rather special and these are the subject of Section III.

However, few observers any longer rely solely on the classic real effective exchange rate indices. An apparently relatively simple exten-

sion is to take the ratio of one measure to another to paint a wider picture of a country's competitive position. Most common among these are ratios of price to cost indices as a proxy for profitability; but other ratios have also been used. These are considered in Section II of this paper.

A more radical departure from the classic real effective exchange rate is the greater emphasis placed on *levels* of competitiveness. The standard measures of relative costs and prices are limited by dependence on a quite arbitrary choice of base year. They do not allow statements such as "unit labour costs were X% higher in country X than in country Y in 1990" to be made; only statements about relative changes are possible. Yet popular assertions about actual differences in labour costs are legion. Translating this perception into operational measures has, however, always faced formidable difficulties – notably as regards the valuation of output at a consistent set of prices. But the considerable research effort made in recent years to develop carefully constructed measures of relative productivity and to compute detailed estimates of purchasing power parities has begun to tip the scales in favour of developing level-based measures, at least for a number of industrial countries. Section IV reviews some recent work in this area.

A final element of recent efforts to broaden the scope of competitiveness measures is the greater attention paid to non-manufacturing: as the relative importance of manufacturing industry declines, the need for such a re-emphasis is likely to grow. Not only are non-manufacturing outputs increasingly traded, but service inputs are frequently key components of traded goods even if these inputs are themselves not directly traded. The advent of detailed sectoral national accounts in most industrial countries has greatly widened the range of measures that can be constructed. The penultimate section of this paper uses national account statistics to take an empirical look at the distinction between tradable and non-tradable goods production, examining in particular relative productivity and profitability. This analysis is, of course, highly preliminary; nevertheless, it does serve to warn against placing undue reliance on any one measure, and also uncovers other important aspects or symptoms of competitiveness.

Looking carefully at all the different measures of competitiveness cannot but instil a good deal of reticence about basing strong conclusions on any one measure. Indeed, this is the single most important

point underlined in the concluding section. Nevertheless, there are a number of conclusions that would seem to be borne out by several measures. The first concerns the competitiveness of the main areas. South-East Asia remains highly competitive. The United States has become more competitive in recent years. The Japanese situation was always more ambiguous because of marked differences between sectors, with the country appearing extremely competitive in certain goods – notably in the electronics area – and over-priced in others. At any event, the recent sharp appreciation of the yen brought about a marked loss in the country's earlier competitiveness. Europe was much worse placed than the others in the early 1990s, with many indicators pointing to a serious competitiveness problem. Exchange rate changes in recent months have gone some way towards alleviating this. The second conclusion is that a number of European countries had become relatively uncompetitive even within Europe: here too the exchange rate adjustments since September 1992 have done much to correct divergences in intra-European competitiveness.

I. Real effective exchange rate calculations

The most frequently used indicators of (changes in) international competitiveness are the various measures of relative prices and/or costs, expressed in a common currency, widely known as real effective exchange rates. The concept of an "effective" exchange rate was developed when the collapse of the Bretton Woods system robbed the simple bilateral dollar rate, which up to then had dominated post-war discussions, of much of its meaning.[1] In its nominal version, the effective exchange rate consists of a weighted average of various bilateral rates, with the choice and weights of bilateral rates reflecting their relative importance to the economic issue being analysed – in the present study, the measurement of international competitiveness.[2] The real effective rate is the nominal rate deflated by a similarly weighted average of foreign prices or costs, relative to those at home.

Although in many countries changes in the nominal rate account for a good part of the changes in the real effective rates, nominal effective exchange rates cannot be considered as appropriate measures of competitiveness.[3] Many issues involved in the construction of nominal effective rates are however equally important for the construction of real rates, making a discussion of nominal effective rates necessary. These issues

[1] Among the first studies dealing with the construction of effective exchange rates were Hirsch and Higgins (1970) and Rhomberg (1976).

[2] Because there are several economic areas in which exchange rates play an important role the weighting structure and choice of the currency basket will tend to be different in each of these areas. Pauls (1987), for instance, distinguishes four areas: competitiveness in international trade; determination of domestic inflation; financial asset demand; and monetary policy formulation. For studies of the use of effective exchange rate indices in the latter area, see Brooks and Corfield (1991), and Ringström (1987). Schoefisch (1990) discusses the weighting structure when the exchange rate impact on domestic inflation is considered.

[3] Nevertheless, some authors, such as Rosensweig (1987), argue that the imprecision of using a nominal index instead of a real one could be offset by the timeliness of a nominal index, its greater frequency, the ease of data collection and of cross-country comparability, and the avoidance of measurement errors in the price or cost series.

are considered in the paragraphs below. The next sub-section then looks at the choice of deflator to derive real effective exchange rates; this is followed by a brief discussion of developments over the last twenty years in the light of those indicators.

Nominal effective exchange rates

Three elements are important for ensuring the proper construction and interpretation of the nominal effective exchange rate. They are: (a) the choice of currencies to be included in the index; (b) the structure of weights to be assigned to the set of selected currencies; and (c) the base period. In addition, the mathematical formulation of the calculation of the weighted average can also have an important bearing on the interpretation of the index. Two of these issues – the choice of the currency basket and the weighting scheme – have attracted most attention in the literature and will be discussed more extensively in what follows.[4] A comprehensive survey of all the issues related to measuring effective exchange rates is given in Koch (1984).

Choice of the currency basket

Although the currencies of all countries which actually or potentially compete against each other in domestic and foreign markets could be included, the currency basket selected in practice is much narrower.[5] Many currencies are officially linked to other major international currencies and could, provided that the weighting scheme is adjusted accord-

[4] The issue of the mathematical formulation of the index has been largely resolved in favour of geometric averaging. Among other advantages such averaging ensures that the change in the exchange rate between two points in time is identical irrespective of which date is chosen as the base (the so-called "time reversal" test). Moreover, it leaves the weighting structure unchanged over time. For a fuller discussion of the averaging techniques see Pinçon (1979) and Vartia and Vartia (1984). With regard to the base period for the weighting scheme, a distinction can be made between schemes constructed on a fixed basis and those adopting moving weights. In principle, fixed weights should refer to a base period representative of a trade structure that is both reasonably balanced and current. A major drawback of a fixed-weight scheme is that the trade structure is not likely to be reasonably balanced at the same time for all countries considered in the effective index. Moving weights, such as those calculated by the OECD, are continuously updated to account for changes in the direction of trade. The fact that changes in such effective rates are due both to changes in the trade structure and to changes in exchange rates complicates the interpretation of an index based on moving weights. The choice of the base period for the effective exchange rate series itself is sometimes normative, being guided by the judgement of when the currency held a "proper" or "reference" value. In this paper, however, the choice of base year is one of convenience, and is thus essentially arbitrary.

ingly, be represented in the index indirectly through the latter. Some currencies have to be excluded because they are either non-convertible or exchangeable at multiple exchange rates. Finally, nominal exchange rate indices generally contain only the currencies of those countries that enjoy similar and moderate rates of inflation. Incorporating high-inflation currencies in the index calculation would mean that nominal indexes over time become dominated by the rapidly declining external value of inflation-prone currencies.[6] For these reasons, most published exchange rate indices contain only a limited number of currencies – up to about two dozen.

Choice of weights

Four kinds of weighting schemes have gained wide acceptance: model-based weights, bilateral trade weighting, global trade weighting and double-weighting schemes.

A theoretically ideal approach – to allow nominal effective rates to serve as indicators of trade competitiveness – would involve the development of a general equilibrium model in which the various supply and demand equations for tradable goods (and/or services) are specified, along with the several feedback mechanisms characteristic to each trading country. The most prominent example of this approach is the Multilateral Exchange Rate Model (MERM) of the IMF.[7] This model seeks to estimate the medium-term effects (two to three years) of changes in the exchange rates of various industrial countries on their trade balances. Tradable goods are assumed to be distinguishable by kind and by country of production and thus to have finite price elasticities of demand in world markets. The model further allows for the fact that exchange

[5] A number of studies have sought to include a very large number of currencies in the effective exchange rate calculation. Examples of such exhaustive index calculations can be found in Cox (1986 and 1987), Feldstein and Bachetta (1987) and Morgan Guaranty (1986). The number of currencies included in the Reserve Bank of Australia's trade-weighted index fluctuates according to the number of trading partners making up at least 90% of Australia's external trade. Updates of the trade structure can thus lead to changes in the size and composition of the currency basket (Reserve Bank of Australia (1988)).

[6] See Bank of Japan (1986) and Rosensweig (1987). For instance, adding Mexico to the calculation of the US dollar's nominal effective exchange rate significantly affects its movement over the course of the 1980s: including Mexico, the dollar appreciated by one-third in effective terms between early 1980 and early 1990; excluding Mexico, a small depreciation took place.

[7] See Artus and Rhomberg (1973), Artus and McGuirk (1981), and Black (1976). Two studies by Armington (1969a and b) formed the background to this exchange rate model.

rate changes give rise to partially offsetting, endogenous adjustments in domestic costs and prices. Such feedback effects are specific to each country.[8] Finally, fiscal and monetary policies are assumed to offset the effect of exchange rate changes on the real level of economic activity, i.e. exchange rates are assumed to have only expenditure-switching effects but to leave real aggregate demand for domestically produced goods unchanged.

The MERM model can be used to estimate the relative impact of a variety of nominal bilateral exchange rate changes on a particular country's trade balance. These relative magnitudes can then be used to derive the weights to be assigned to the various bilateral rates included in the effective exchange rate index. Given the structure of the model and its underlying assumptions, a change in the MERM index thus represents the *notional* uniform proportionate change in the price of the home currency in terms of foreign currencies that would produce the same effect on the home country's trade balance as the set of changes in exchange rates that *effectively* took place.

Notwithstanding its theoretical attractions, the approach has won little lasting acceptance. Even the IMF itself ceased official publication of the MERM index in early 1992.[9] Not only can questions be asked about the assumptions underlying the model (in particular the stability of domestic output and the exogeneity of the exchange rate), but the complexity of traded goods models incorporating a vast number of demand and supply functions also implies that the model estimates are unlikely to be very robust. The associated task of quantifying the numerous parameters included in the various functions cannot be accomplished by estimation alone: many restrictions have to be imposed on the functional specification of the equations; some parameters have to be extracted from other econometric studies or from a priori reasoning. As the model builders admit themselves, all this implies a marked sensitivity of model results to the choice of parameter values.[10]

[8] Given the inclusion of these endogenous price and cost adjustments, the MERM index is strictly speaking not a nominal index but some intermediate measure between a nominal measure and a relative price/cost measure expressed in a common currency.

[9] The Bank of England and the UK Treasury, too, used the MERM weighting scheme for constructing sterling's effective exchange rate until late 1988 when it was dropped in favour of a trade-weighted index. See Central Statistical Office (1974) and Bank of England (1988).

[10] Honohan (1979) and Morgan Guaranty (1979) describe the method of deriving MERM-weights as a "black box" approach.

These practical difficulties have led most central banks, international institutions and others to rely on actual trade flows to calculate weights, notwithstanding the much weaker economic rationale of trade-based indices. It is admittedly true that drawing direct inferences from movements in these indices (e.g. about the impact on trade flows) can be dangerous as they depend on strong and possibly unrealistic assumptions about the underlying economic relationships.[11]

There are three sorts of trade-weighting structures: those based on *bilateral* trade flows, those based on *global* trade flows and those based on *double weights*. Depending on the nature of the tradable goods and the type of market on which they are traded, different weighting schemes might be appropriate, but most indices apply a single weighting structure to all or most goods traded internationally, thus ignoring differences in the degree of substitutability of rather differentiated manufactured goods versus that of more homogeneous raw commodities, the extent of complementarity or competition between foreign and locally produced goods, as well as possible non-market practices in the trade of goods such as agricultural products. The most commonly adopted approach is to base the weights on manufacturing trade alone – on the grounds that (i) such trade is typically responsive to changes in competitiveness and (ii) relatively good price and cost data are available for almost all industrial countries.[12]

The differences between the various trade-flow-based weighting schemes can be illustrated by a highly simplified example set out in Graph 1.[13] The example is based on 1990 trade flows between three

[11] For instance, Thakur (1975) has shown that using effective exchange rates based on bilateral trade weights to quantify the impact on the trade balance implicitly imposes strict and sometimes perverse constraints on the size of the volume elasticities of import demand and export supply. Moreover, weights derived from general equilibrium trade models can be negative in a number of cases. Those derived from trade patterns are by definition always positive. A similar analysis of the impact of changes in real effective exchange rates on a country's trade balance is presented in Niehans (1983). He, too, shows that a simple bilateral weighting of relative price changes implies restrictive assumptions about the price elasticities.

[12] Many services are traded internationally. Nevertheless, few effective exchange rate constructions take these international service transactions into consideration. Durand and Giorno (1987) ascribe this omission to the fact that statistics on international service transactions and, even more, on price series for these transactions, lack completeness, reliability and cross-country comparability. Attempts to develop effective exchange rate indices for specific services, in particular tourism, can be found in Rosensweig (1986b), Bank of Italy (1988) and Gibbons and Fisher (1991). Notable, too, is the weighting scheme of the European Commission which is based on trade in goods as well as services.

[13] This graph is an adaptation of a similar illustration in Honohan (1979).

major economic regions and on the estimated size of the each region's domestic production for the home market.

Domestic producers of import substitutes face competition from the various foreign producers exporting to the domestic market (see Graph 1): in the European market, for instance, both the United States and Japan are to be considered as competitors, and their relative importance to EC producers of import substitutes can be measured by their relative share in overall EC imports (viz. 76/(76+55) or 58% and 55/(76+55) or 42%, respectively).

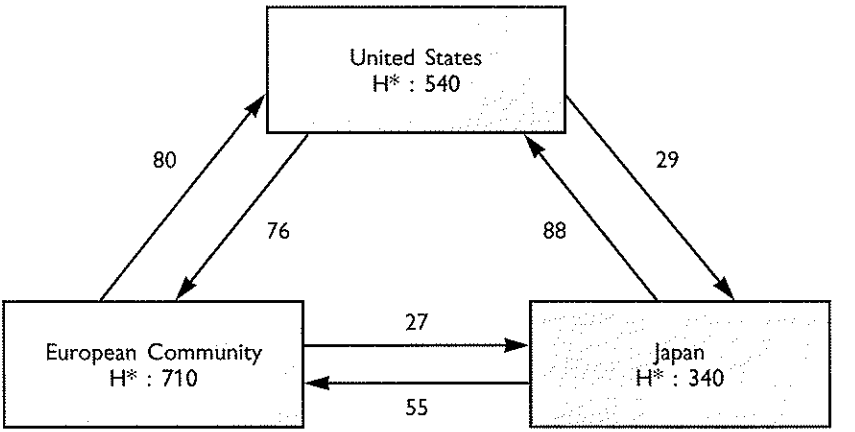
Similarly, exporters can be assumed to face competition in foreign markets from both domestic producers and other exporters. This pattern of competition has found its broadest recognition in weighting schemes applying *double weights* to exporting activity. In such schemes the bilateral exchange rates between the currency of a given country and the currencies of its competitor countries are weighted according to both (i) each of these countries' contribution to the total supply of competing goods (including the supply by domestic producers) in each separate domestic market[14] and (ii) the relative importance of each market in the given country's international trade. Hence the use of double weights.[15]

In terms of the example presented above, EC exporters are assumed to compete against US and Japanese producers in both the US and the Japanese markets. The illustration would indicate that in the United States (excluding the supply by European producers themselves) US producers (of import substitutes) claim 86% of the market (viz. 540/(540+88)), against 14% (88/(540+88)) supplied by Japanese exporters; likewise, US exporters account for 8% (29/(340+29)) of the non-European supply in the Japanese market, the remainder being supplied by Japanese producers. The second step is to weight the two markets: this is done by calculating the relative importance of the two markets to

[14] Countries or geographical areas whose currencies are not included in the effective exchange rate calculation can be dealt with in a similar manner but in those cases the supply by domestic producers is disregarded.

[15] For a detailed discussion of the derivation of a system of double weights for calculating effective rates, see Durand et al. (1992), European Commission (1985) and McGuirk (1987). In the latter paper, which underlies the derivation of the IMF's effective indices, double weights are derived for 147 categories of manufactured goods separately and subsequently combined by weighting each of these double weights by the importance of each manufactured goods in total manufactured goods exports. In essence, this method thus involves deriving triple export weights.

Graph 1
Illustrative flow of goods
In billions of US dollars



H* : domestic production for the home market.

Note: Figures based on 1990 trade flows in manufactured goods. Because trade between these countries constitutes only between 40 and 60% of their total trade, the estimate of domestic production for the home markets is similarly scaled down in this illustration.

European exporters. In the example, the US market accounts for 75% of European exports (80/(80+27)) and the Japanese market for 25%. Combining both steps would result in assigning a weight for the United States in Europe's weighting scheme of some 66% (0.75 times 86% (the US market) plus 0.25 times 8% (the Japanese market)), and, similarly, one of 34% for Japan.

Overall trade weights could be derived by combining the bilateral import weights with the double export weights, using the relative size of European imports and exports in overall European trade (exports plus imports) to average both sets of weights.[16]

Put in more formal terms, if there exist k foreign markets in which country j competes against h foreign producers, the weight given to i's

[16] An alternative approach for combining export and import weights is used by the Netherlands Bank (see Brits (1991)). Their respective weights in the overall index reflect the relative importance of domestic and foreign markets for domestically produced manufactured goods.

currency in country j's double-weighted effective index can be expressed as follows:

(a) Import weight $w_i^m = m_j^i / m_j$

(b) Export weight $w_i^x = \left(\frac{x_j^i}{x_j}\right)\left(\frac{y_i}{y_i + \sum_h x_h^i}\right) + \sum_{k \neq i}\left(\frac{x_j^k}{x_j}\right)\left(\frac{x_i^k}{y_k + \sum_h x_h^k}\right)$

(c) Overall weight $w_i = \left(\frac{m_j}{x_j + m_j}\right) w_i^m + \left(\frac{x_j}{x_j + m_j}\right) w_i^x$

where $x_j^i\left(m_j^i\right)$ = exports (imports) of country j to (from) country i

$x_j\left(m_j\right)$ = total exports (imports) of country j

y_i = domestic production in country j for its home market

The two other weighting schemes, derived from bilateral or global trade flows, are essentially special cases of the double-weighting scheme. In a *bilateral* scheme it is implicitly assumed that in each export market the domestic producer constitutes the sole competitor, completely ruling out competition from other exporters to that market (i.e. competition in "third markets"). Only in each country's home market is competition between various foreign suppliers allowed for. This weighting scheme thus assigns weights to trading partners strictly in proportion to their share in the home country's exports and imports. In terms of the example in Graph 1, the export weight given to the United States (Japan) is equal to the share of European exports to the United States (Japan) in total European exports, i.e. 75 (25)%. Note that the same outcome would have been obtained under double export weights if domestic producers of import substitutes accounted for the total of non-European supplied goods in each market (the "double" weights for the US dollar, for instance, would then be 0.75 times 100% plus 0.25 times 0%). The import weights, as well as overall trade weights, are calculated in an identical way as those derived in the previous weighting scheme. In terms of the equations derived above, under a bilateral weighting scheme equation (b) would now become $w_i^x = x_j^i / x_j$, with equations (a) and (c) remaining the same.

Finally, under a *global* scheme, it is assumed that all individual country markets collapse into a single world market in which only exporters compete. Under this assumption the currencies of partner countries are weighted in proportion to their share in world trade. The illustrative figures in Graph 1 would in this case suggest a weight for Japan, for instance, of 58% (total Japanese exports as a percentage of combined US and Japanese exports or (55+88)/(55+88+76+29)).[17] "Third market" competition is thus taken to the extreme, as domestic producers of import substitutes and the importance of particular markets to specific countries are entirely ignored. In the above example, Japan and the United States would have a fairly similar weight in the European index, although the latter country represents a much more important market and supplier for European producers.[18]

BIS indices[19]

The BIS calculates effective exchange rate indices for twenty-one industrial countries and five newly industrialised economies. The industrial countries comprise the members of the Group of Ten, as well as Australia, Austria, Denmark, Finland, Greece, Ireland, New Zealand, Norway, Portugal and Spain. The five other countries are the four Asian NIEs (Hong Kong, South Korea, Singapore and Taiwan) and Mexico.[20] The inclusion of these latter countries is new and reflects their much increased importance in world trade. Some thought was given to the inclusion of China; in the end, however, the dual exchange rate system made it impossible to define an appropriate exchange rate. Eventually, China and other countries in the developing world that are becoming important players in world commerce would need to be included.

[17] In mathematical terms, global weights could be formulated as:

$$w_i = \frac{x_i}{\sum_h x_h} \text{ or } w_i = \frac{x_i + m_i}{\sum_h (x_h + m_h)}$$

[18] A number of authors, including Cooper (1988), Honohan (1979), Koch (1984) and Rhomberg (1976), have also suggested mixed weights, based either on a combination of the weighting schemes discussed above, or on other variables (such as GDP) in addition to regular trade flows.

[19] For a fuller description of the data sources and calculation procedures, see Appendix I.

[20] As noted earlier, changes in the exchange rate of currencies of inflation-prone countries, if included, would distort calculations of nominal effective exchange rates. As Mexico experienced periods of high inflation during the 1980s it was not included in the nominal effective exchange rate calculation. The real effective exchange rate calculations discussed later do, however, include Mexico as a competitor country.

The weights assigned to this set of countries are based on the double-weighting scheme explained above. Import weights are thus derived on the basis of bilateral import shares, while export weights take account of competition in each of the twenty-six markets between domestic suppliers to the home market and exporters from the other twenty-five countries. The rest of the world provides a competitive "battle-ground" for the twenty-six countries, with each country's relative importance measured by its share in total imports of the rest-of-the-world countries. Domestic suppliers in the latter countries are therefore not assumed to compete in their own markets (or elsewhere for that matter), eliminating their exchange rate from the index calculations.

The data for calculating the weights are based on trade flows in, and domestic output (measured by value added) of, manufactured goods in 1990. To make domestic output measured on the basis of value added comparable with trade data, which are expressed in terms of the gross value of output, a correction to manufacturing value added is made so as to incorporate inputs into production from sources other than the domestic manufacturing sector itself. But with data not permitting direct estimation, such inputs are instead proxied by imports of manufactured goods in part reflecting the high and growing degree of internationalisation of manufacturing production. Finally, the supply of domestically produced manufactured goods to the home market is defined as the above measure of output of the manufacturing sector minus exports of manufactured goods.

Summary of the different measures

The system of double export weights is now widely used to construct effective exchange rate indices. Most international institutions, including the European Commission, IMF and OECD have been using this type of weighting scheme for a number of years. A number of central banks, notably those of France, Germany, Italy, the Netherlands, Spain and the United Kingdom, have also adopted this weighting method. Nevertheless, the use of a common methodology has not prevented the emergence of sometimes important quantitative differences in the derived weights. Such differences in part reflect differences in the degree of disaggregation in trade that is applied in calculating the weights. Some indices are built up from highly disaggregated data on distinct categories of manufactured goods (such as the IMF index); most others are derived

on the basis of aggregate manufacturing trade data or even broader concepts covering all goods and services traded (such as the European Commission index).

But most of the discrepancies would seem to be the result of differences in the estimation of the domestic supply of import substitutes. Quite often, the gross value of production (excluding exports) – that is, including inputs – is used to approximate these local sales. Apart from the statistical problems associated with the computation of gross value data, this approach is likely to overstate the size of domestic production of import substitutes given double-counting in production turnover figures and thus to bias the double export weights in the direction of bilateral export weights. But neither is a value added concept fully appropriate given the problems of comparability with trade data noted above.[21, 22]

Yet not all institutions have adopted a double-weighting scheme in deriving effective exchange rate indices. The most notable exceptions include the US Federal Reserve System and the Bank of Canada (which apply global weights to derive their respective dollar indices) and several US Federal Reserve Banks, a number of central banks of smaller industrial countries, as well as Morgan Guaranty (which use bilateral weights in their calculations).[23]

An overview of the weights used in the construction of the effective exchange rate indices of the three major international currencies is provided in Table 1. The most striking discrepancies can be found in the weighting schemes for the effective exchange rate of the US dollar. Given close trade relationships between the United States and Canada, a bilateral weighting scheme (such as that of the Federal Reserve Bank of Atlanta) assigns a high weight to Canada in the US dollar's effective exchange rate index. By contrast, Canada's small share in world trade

[21] The Bundesbank uses a value added concept (see Deutsche Bundesbank (1985, 1989)) but, unlike the BIS, does not attempt to adjust the resulting output figures to the gross value concept in which trade data are expressed. Nor is any correction made for domestic output sold abroad (i.e. exports).

[22] An illustration of the impact of alternative specifications of domestic production for the home market on the weighting structure is given in Appendix I.

[23] The index of the Federal Reserve Board is described in Hooper and Morton (1978). Examples of indices based on bilateral weights can be found in Anderson et al. (1987), Cox (1986), Hervey and Strauss (1987a, b), Morgan Guaranty (1978,1983) and Rosensweig (1986a). Some of these dollar indices are compared in Batten and Belognia (1987), Deephouse (1985), Hervey and Strauss (1987c), Morgan Guaranty (1979), Ott (1987), Pauls (1987) and Pauls and Helkie (1987).

leads to a low weight in an index based on global weights; the greater importance of European countries in a global weighting scheme primarily reflects intense intra-European trade rather than close trading links with the United States.[24]

Nor are indices constructed according to the common methodology of double export weights always fully comparable. Undoubtedly, the data from which weights are derived and the choice of base year contribute to these differences. But, as Table 1 shows, the choice of competitor countries also has an appreciable bearing on the weight construction. In both the effective exchange rate index of Japan and the United States calculated by the BIS, the currencies of the newly industrialised economies claim one-fifth of the total weight. The comparison of the BIS and IMF indices would, moreover, suggest that the inclusion of the NIEs' currencies has had, as its main counterpart, the erosion of the weight of the European currencies.

Graphical evidence of the difference in effective exchange rate indices calculated on the basis of different sources or methodologies is given in Graph 2. Whereas a rather close correspondence exists between indices calculated on the basis of double weights (such as those used by the BIS, the IMF and the Bundesbank), sometimes large differences can be observed between them and those based on model outcomes (e.g. MERM) or global weights (such as the index calculated by the Federal Reserve Board).

Real effective exchange rates[25]

Real effective exchange rates are defined as nominal effective exchange rates deflated by similarly weighted measures of relative prices or

[24] Quite strikingly, the importance of the BENELUX countries in the index calculated by the Federal Reserve Board is larger not only than that of Canada, but also than that of Japan. It would of course be possible to construct a *modified* global weighting system (e.g. by excluding intra-European trade).

[25] Note that the real exchange rate concept is sometimes subject to differing interpretations. One is to define the real rate as the ratio of tradable goods prices in different countries expressed in a common currency. The present section deals with this definition. Another interpretation of the real rate is the ratio of tradable to non-tradable goods prices in local markets; this is often called a measure of "internal" competitiveness as opposed to "external" competitiveness as measured by the above ratio of tradable goods prices (Dwyer (1991)). This real exchange rate measure is sometimes further distinguished (as in Holden (1991)) into separate ratios of the price of importables, respectively, exportables to that of non-tradables. The section on tradables and non-tradables below discusses these internal terms of trade. Both definitions need to be considered if the real exchange rate is understood as the implicit

Table 1

Country weights in major effective exchange rate indices

In percentages

	US dollar					Deutsche Mark				Yen		
	BIS	IMF	FRBank Atlanta	FRBoard	MERM	BIS	IMF	Bundes-bank	MERM	BIS	IMF	MERM
Base period:	1990	1980	1984	1972–75	1977	1990	1980	1984–86	1977	1990	1980	1977
Weight of[1]:												
United States	–	–	–	–	–	13.4	15.1	16.6	24.5	48.5	46.9	54.4
Japan	31.9	27.1	27.0	13.6	24.4	10.9	9.6	12.4	14.3	–	–	–
Canada	26.6	19.6	36.5	9.1	23.3	1.2	1.0	1.5	1.9	4.2	3.4	3.8
European G-10 countries	41.6	53.3	36.5	77.3	52.3	74.6	74.4	69.5	59.3	47.3	49.7	41.8
France	6.7	8.7	4.7	13.1	11.6	18.0	19.5	16.3	18.8	8.1	8.0	8.9
Germany	12.6	15.2	8.6	20.8	14.9	–	–	–	–	15.6	16.7	14.5
Italy	5.3	5.9	4.2	9.0	8.6	15.2	13.9	13.8	14.2	5.9	5.6	4.9
United Kingdom	8.1	12.6	8.8	11.9	5.8	11.6	12.3	11.7	5.4	7.4	9.4	4.6
Belgium-Luxembourg	2.3	2.9	2.8	6.4	2.7	9.2	8.8	8.3	5.5	2.7	2.4	2.1
Netherlands	2.3	2.9	3.8	8.3	3.7	9.6	8.7	8.8	6.9	2.4	2.4	2.8
Sweden	2.0	2.2	1.7	4.2	3.1	3.7	4.2	4.1	4.5	1.9	2.3	2.4
Switzerland	2.3	2.9	1.9	3.6	1.9	7.2	7.0	6.5	4.0	3.3	2.8	1.5
Memo items:												
Weight in overall index												
G-10 countries	*73.4*	*95.5*	*78.0*	*100.0*	*87.3*	*78.5*	*88.7*	*85.6*	*88.3*	*72.7*	*94.8*	*91.3*
NIEs[2]	*21.1*	–	*14.0*	–	–	*5.2*	–	–	–	*19.8*	–	–

[1] To allow for the fact that the various indices include non-G10 countries to differing degrees, the G-10 weights shown have been renormalised to one. [2] Mexico and the four Asian NIEs.

Sources: Artus and McGuirk (1981), Bank of England (1987), Deutsche Bundesbank (1989), Pauls (1987) and Rosensweig (1986). BIS weights are shown in Table A4 in Appendix I.

costs.[26] Traditionally, a distinction is drawn between real effective exchange rates defined in terms of relative prices and those defined in terms of relative costs. As far as "homogeneous" goods are concerned, price competitiveness is unlikely to be of much relevance because prices charged by different suppliers in markets for such goods cannot deviate significantly from each other. As regards trade that involves "differentiated" goods – i.e. not subject to any "law" of one price – both relative price developments and cost developments are likely to give information about competitiveness. Price-based real effective exchange rates will convey information about how producers set prices to maintain market shares in the event of a nominal exchange rate change, even at the possible expense of a significant compression of profit margins. Over a longer period, however, a substantial divergence between prices and costs is unlikely to be sustainable. The ability to compete in international markets would then be determined by the extent to which competitors face differing cost developments.

Choice of price indices

Relative export prices expressed in a common currency represent the most obvious choice for gauging price competitiveness in market conditions where some degree of pricing independence exists. Most international institutions produce real effective exchange rates calculated on this basis.

Relative export prices, however, suffer from a number of deficiencies. The most serious is that the force of international competition itself will tend to limit observed differences in export prices. Some uncompetitive enterprises can, in the short run, be induced to accept prices that do not reflect their true cost position. In addition, the calculation of export prices is by definition restricted to goods actually traded. To assess more accurately a country's underlying competitiveness, the

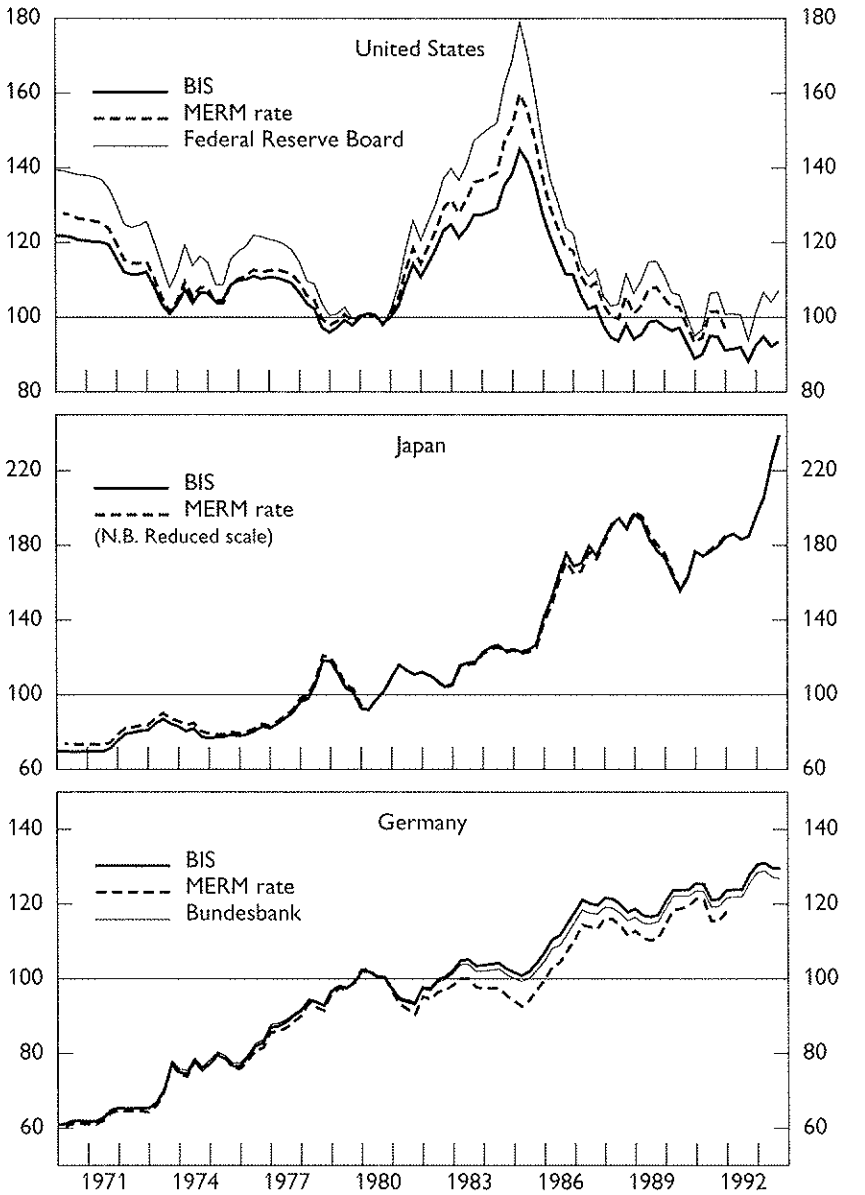
rate of exchange between baskets of goods produced in different countries (Hill (1990)). Purchasing power parities are discussed in the section on measuring the level of competitiveness (see from pp. 72).

[26] As stressed by Maciejewski (1983), it is not correct to characterise these indices as exchange rates, the latter being the relative price of two currencies. Rather, they represent the ratio of domestic prices to those in competing countries, expressed in a common currency. In what follows, however, the terms real effective exchange rates and relative prices (or costs) expressed in a common currency will be used interchangeably.

Graph 2

Nominal effective exchange rate calculations

1980 = 100



price indicator should also incorporate information on prices of goods that, though not currently traded, are potentially tradable, including those that fail to enter international markets because of insufficient competitiveness.

A second set of deficiencies relates to what is covered by the indices used for prices. These "price" indicators are typically derived from unit value indices and are thus not truly price indices.[27] Unit value indices – based on the average value of goods traded, rather than on a standard basket – can be heavily influenced by the composition of exports. Inter-country differences in the composition of trade – such as the relative importance of semi-manufactured goods versus that of differentiated manufactured goods in individual countries' external trade – as well as changes over time in the composition of this trade will give rise to movements in relative export prices that do not necessarily reflect changing competitiveness.[28] Another problem is that measured export unit values relate to prices set sometime in the past: a long lag could thus exist between the moment contract terms are agreed and the moment goods are actually shipped and recorded at customs. In addition, the internal transfer prices used by multinational corporations in transactions between subsidiaries and the inability to capture the extent to which differential pricing policies are followed in distinct markets limit the usefulness of relative export unit values.[29]

A third deficiency is that the use of export prices alone is inconsistent with the logic of the double-weighting scheme, which explicitly allows for competition with local producers in individual markets. To

[27] A small number of countries calculate export price indices. Such price series are published in the IMF's *International Financial Statistics* for Germany, Japan, Sweden and the United States.

[28] For instance, high rates of productivity growth in the electronics industry mean that the prices of electronic goods have tended to fall relative to those of other manufactured goods. Countries with a higher than average specialisation in such goods will tend to show a smaller increase in their aggregate index of export unit values than countries with a lower than average specialisation, even though there may be no difference for different goods considered individually. For example, the high share of electronics in Japan's exports tends to limit the increase in the country's aggregate index of export unit values. It also tends to hold down export unit values relative to consumer prices or unit labour costs in manufacturing: see below and Graph 4 in particular.

[29] Lipsey et al. (1991) attempt to resolve some of these problems by constructing an elaborate index of true export prices which also accounts for missing variables and quality changes. However, the complexity of these calculations renders it extremely difficult to obtain up-to-date price series.

the extent that the home market is more captive than export markets, producers might differentiate between prices charged for goods sold locally and prices of goods to be exported. Domestic producer prices might therefore be more relevant for domestically produced and sold goods, and export prices for output sold abroad. The price indices used in the real effective exchange rate calculation would then be a mixture of domestic producer and export prices, with the relative importance of either price series depending on the relative importance of domestic and foreign sales of the manufacturing sector of each competitor country.[30]

Consumer prices is a second measure that is widely used to deflate exchange rates. The advantages of consumer prices are that they are calculated on the basis of a basket of goods that is fairly comparable across countries, that much statistical effort goes into ensuring their accuracy, that they are rapidly available and that they are published at a fairly high frequency for a wide range of countries. However, consumer prices may be rather poor proxies of tradable goods. Consumer price indices include goods (and services) that are not internationally tradable, while at the same time excluding some important tradable goods such as capital goods.[31] Moreover, they are affected by indirect taxes, subsidies and, possibly, price controls. While recognising these deficiencies, some authors (Bank of France (1980), Enoch (1978), Wickham (1987)) have nevertheless argued that consumer prices might be quite appropriate not so much as proxies of the output prices of tradable goods, but as measures of their underlying costs. Some factors of production, in particular labour, as well as various inputs – including non-tradable inputs – into the production process indeed tend to be priced in line with consumer prices. Others (such as Kahn (1986)) have, however, urged caution, arguing that the link between consumer prices and costs can be spurious and is only short-run.

Wholesale prices or industrial producer prices are sometimes chosen to approximate more closely prices of tradable goods (this is the approach

[30] This is the procedure followed by the Bank of Italy, which uses domestic producer prices for valuing domestic output sold in the home market (see Bank of Italy (1992b)). Note that differences between prices of sales at home and those of foreign sales can give an indication of the relative profitability of producing for each market (Bank of England (1982)). This relative profitability measure is discussed in Section II.

[31] The other side of this is that the inclusion of non-tradable goods and services makes the consumer price index very useful for comparing cross-country competitiveness in the provision of tourism services.

adopted by, for instance, Morgan Guaranty and the IMF). While these prices reflect primarily output price developments in the internationally more active industrial sector, their construction varies greatly across countries due to differences in coverage and, in some cases, dubious statistical quality. Moreover, these price indices are frequently based on turnover and so tend to overweight raw commodities and semi-manufactured goods, for which price competitiveness is of limited importance. In addition, the sometimes high weight given to imported goods makes this index rather unsuitable for evaluating the competitiveness of domestic production.

Choice of cost indices

In addition to price measures, a wide range of cost indicators have been used to construct real effective exchange rates. But cost as a notion is far from unambiguous: the following paragraphs consider the various concepts.

It is important first of all to be clear about the interrelationships between the different measures. As an illustration, Table 2 considers the orders of magnitude in UK manufacturing industry from the gross value of sales to the wages paid to production workers. It is useful to follow these magnitudes back in the production process, and consider the links along the way.

Most measures based on price indices relate to the gross value of output, £250 billion in the example given. This is more than double the value of net output because of goods purchased as inputs. Such inputs include imported goods and non-traded goods. Moreover, countries' dependence on imported goods is likely to differ and this can affect measures of real exchange rate change. In the case of a depreciation, for example, the more import-dependent a country is, the smaller the real fall in terms of a gross-output-based price measure will tend to be because of the offsetting effect of higher import prices. In some small, highly specialised open economies a high proportion of purchased inputs will be imported and this inevitably limits the relative price effects of nominal exchange rate changes.

Going from the value of output net of purchased inputs to a measure of value added in the manufacturing sector requires the subtraction of the cost of non-industrial services purchased. Although this is a not insignificant element of the process (some £20 billion in the UK example),

Table 2

Sales, output, labour costs and other income: UK manufacturing industry

Description of aggregate		Amount in billions of pounds sterling	Relevant price or cost measure
Gross value of output		250	Price index
less			
Purchases of goods as inputs		140	
equals			
Net output		110	
less			
Cost of non-industrial services purchased		20	Corporate services price index
equals			
Gross value added at factor cost		90	GDP deflator (manufacturing)
of which:			
Wages and salaries		60	Average compensation of employees
Production workers	*35*		*Wage rates for production workers*
Others	*25*		
Return to capital		13	Cost of capital
Self-employed income		2	
Residual ("profit")		15	

Sources: Approximations based on 1987 data in Central Statistical Office *United Kingdom National Accounts* and *Report on the Census of Production: Summary Volume* (PA 1002).

only a few countries compute indices for the costs of such services.[32] As such services are typically non-traded, a potentially important element of competitiveness is missed by the standard measures. Differences in the efficiency of the services sectors among countries, which are not necessarily correlated with differences in the efficiency of the respective manufacturing sectors, can have an important impact on the ability of the tradable sector to compete. Indeed, it is the very inefficient provision of service inputs – often from state bodies – that is a handicap to the success of the tradable sector in many developing countries. This general issue is explored more fully in the section dealing with the tradable and non-tradable sectors below.

[32] One notable exception is the corporate services price index of the Bank of Japan (see Bank of Japan (1993)). Also Singapore's Department of Statistics combines a business service cost measure with unit labour costs to produce a unit business cost index (see Wong and Lin (1991)).

Labour earnings are only one element of total value added, albeit the most important one. Few attempts have been made to include capital costs in calculations of competitiveness, even though studies of the cost of capital generally reveal significant differences among countries.[33] Also capital intensity differs across countries, and few measures of labour costs allow for such differences.

Statistical convenience and the availability of fairly comparable data for many countries are perhaps the main reasons for the reliance on *labour costs*.[34] The economic grounds are that labour costs cover a large share of non-traded costs and that such costs can differ greatly across countries. Another reason for using labour costs is simply that a number of countries have on occasion put particular emphasis on wage costs as part of a wider programme of macroeconomic stability.[35] Earlier German wage moderation, for example, set a standard for many European countries. Nevertheless, it is important to bear in mind that labour costs give only an incomplete picture of cost competitiveness.

A major deficiency of labour costs is that they take no account of productivity changes which also affect unit production costs. For this reason, estimates of labour productivity changes are generally combined with labour cost changes to produce unit labour costs. Such calculations face three technical difficulties. First, to the extent that data on

[33] However, it should not be forgotten that the forces that tend to bring important elements of capital costs closer together internationally are stronger than those acting on labour costs. Firstly, capital goods are traded internationally so that their prices tend to converge. Secondly, international financial capital mobility tends to bring long-term interest rates in different countries more closely together. By contrast, the relative immobility of labour internationally allows large discrepancies in labour costs to persist.

[34] In addition, relative labour costs are frequently considered to be a close proxy of total variable costs given that prices of raw material inputs tend to be governed by the law of one price. This issue is analysed in a study by the OECD (1978) in which a method is outlined to adapt the measure of relative costs to possible divergences in relative commodity prices across countries. Note that labour costs should comprise non-wage labour costs, including social charges. These costs usually become available at a rather late stage when national accounts statistics are published, making it necessary in the interim period to estimate this element of labour costs, typically by assuming that these labour costs develop in line with wage costs.

[35] For instance, in 1983 the Belgian authorities introduced a competitiveness norm allowing government interference in wage formation if wage cost per employee in the private sector exceeded that in the country's seven most important trading partners. In 1989, a law was enacted that made this wage norm the core element (complemented by four other criteria) for evaluating the competitiveness of Belgian enterprises. The Belgian wage norm is critically discussed – in particular for its failure to correct wage costs for productivity changes – in Peersman and Van Poeck (1992).

output volumes and/or employment are subject to measurement errors,[36] statistics on labour productivity lack precision. Secondly, apparent gains in labour productivity due to capital labour substitution are frequently associated with rising unit capital costs, so that improvements in terms of measured relative unit labour costs overstate the true trend in competitiveness. Finally, unit labour costs are cyclically sensitive as labour productivity tends to rise in booms and fall in recessions. To eliminate these cyclical factors that do not directly reflect changing competitiveness, the IMF at one stage normalised unit labour costs by basing them on trend rather than actual labour productivity. However, distinguishing between genuine change in trend productivity and purely temporary disturbance is usually only possible in retrospect. More widespread has therefore become the practice of smoothing the labour productivity series by using multi-year moving averages or by applying statistical techniques (such as the Hodrick-Prescott filter now used by the IMF) to remove short-term variability.[37]

But the greatest difficulty with unit labour costs is that productivity is in itself endogenous, and a "strong" productivity performance might actually betray a weak competitive position. Consider, in particular, a sharp rise in real wages: this would tend to induce enterprises to substitute capital for labour, reducing employment in the process; moreover, certain marginal activities – typically where productivity is relatively low – would cease altogether. Even if productivity in each sector remains constant, measured *average* productivity would rise: this would have the effect of limiting and perhaps even reversing the measured rise in unit labour costs that would result from a real wage increase. This endogeneity has been of great practical significance for those countries that experienced a heavy loss of jobs in labour-intensive manufacturing industry during the 1980s, a loss on occasion made worse by too-high wages (or other elements of labour costs) or by overvalued currencies. In

[36] In the Irish case, an important source of mismeasurement arises from the large increase in the gross output of multinational corporations. Only a relatively small proportion of the gross value added by such corporations accrues as domestic labour or other income, and a relatively large part accrues abroad. In national accounts terms, the rate of growth of GDP has tended to exceed that of GNP. But for manufacturing only a GDP-type figure (gross value added) is available: in this sense the recorded output growth of the manufacturing sector in Ireland is inflated and, by the same token, labour productivity growth is overstated. See OECD (1987), pp.11–16 for fuller details.

[37] It might also be noted that differences in labour productivity growth among sub-sectors of manufacturing industry can bias relative unit labour costs owing to cross-country differences in the composition of the manufacturing sector.

such a case, it is a lack of international competitiveness that causes the output of tradables to fall and leads to a rise in average productivity. Great caution, then, should be exercised in using unit labour costs in cases of sizable contraction of the manufacturing sector.

To approximate more closely overall costs of production without engaging in the complicated and time-consuming task of estimating separate cost components, some indices have used *value added deflators* as indicators of relative costs.[38] Very much like export price indices, these deflators suffer from problems associated with cross-country differences and changes in the composition of aggregate value added. One important issue is how broad the sectoral coverage of the chosen value added deflator should be. The broadest measure of aggregate domestic costs is the GDP deflator. The main argument for choosing a broadly based indicator is that prices of tradable goods depend on the prices, quality and so on of non-traded inputs as well as on the efficiency of tradable goods production. The counter-argument is that the GDP deflator is too heavily weighted by non-tradable goods and services – many of which are simply consumed and not used as inputs into tradables production – as well as by non-market sectors in GDP. Another broad measure of overall costs is the deflator of total domestic expenditure; in contrast to the GDP deflator, this incorporates the costs of imported inputs but excludes those of domestically produced goods sold abroad.[39] Finally, the IMF constructs a real effective exchange rate series on the basis of value added deflators in manufacturing. Since most of these deflators are based on national accounts data and thus become available only after a considerable time lag, the estimation of more up-to-date statistics may be subject to large errors.[40]

Finally, it might be possible to construct specific indices that, while having a broader cost coverage than labour costs, avoid the pitfalls of including the extraneous information contained in general GDP deflators. Some countries attempt to construct indices for variable costs other than labour for manufacturing industry;[41] but because relatively

[38] To the extent that current cost developments determine subsequent pricing decisions, relative value added deflators can also be interpreted as indicators of likely future price trends.

[39] This measure is used by the Bundesbank to supplement its CPI-based real effective exchange rate index. See Deutsche Bundesbank (1989).

[40] The IMF usually has to extrapolate the series for five to six quarters beyond the most recent observation on the basis of wholesale prices of manufactured goods, adjusted to exclude the impact of changes in raw material prices (see Artus and Knight (1984)).

[41] Examples are the Bank of Italy (1992a) and Wong and Lin (1991).

few countries do this, international comparisons are difficult, if not impossible.

BIS indices

The BIS calculates various measures of relative costs and prices expressed in a common currency. The weighting of costs and prices in competitor countries is identical to that presented for calculating nominal effective rates, discussed in the preceding chapter, with the notable exception that real effective rates take due account of Mexico as a competitor to the twenty-five other countries included in the index construction.

Price measures used in the real effective exchange rate indices include consumer prices as well as export unit values for manufactured goods. The cost competitiveness of manufacturing is assessed by deriving relative unit labour costs for this sector. The various adjustments made to the two components of these unit costs – labour costs and labour productivity – are spelt out more fully in Appendix I.[42]

Developments since 1970

The volatility of nominal exchange rates

The period since the advent of floating exchange rates has been marked by large changes in nominal rates and by considerable volatility. Three periods could be distinguished:

(i) The first – from 1971 to 1978 – represented a rather long period of adjustment to the sudden break from the extended period of near-exchange rate stability under the Bretton Woods system of fixed exchange rates. This period was also marked by substantial changes in the prices of energy and other primary commodities: note that the higher than average dependence of Japan on imported energy meant that the yen dipped sharply at both oil shocks.

(ii) The second eight-year period – 1979 to 1986 – witnessed a massive and prolonged swing in the external value of the dollar.

[42] Briefly, labour costs are seasonally adjusted and a six-month moving average is applied in cases of excessive volatility. Labour productivity is corrected for cyclical variability by applying a three-year centred moving average. When needed, interpolation and extrapolation techniques are used to produce monthly observations or fill in missing data.

(iii) The third period – from 1987 until mid-1992 – saw a return to greater exchange rate stability, achieved either informally through commitments, usually among the G-7 countries, to avoid large fluctuations in the external value of the major currencies, or more formally, as in Europe, through the active pursuit of exchange rate stability within the framework of rather strict and explicit exchange rate agreements. This period of relative stability, however, came to an end in autumn 1992 when a series of European exchange market crises triggered the most extensive reordering of exchange rate relationships in Europe since the breakdown of the Bretton Woods system.

The varying degrees of exchange rate volatility during each of these periods is illustrated in Table 3. Compared with the near-stability of exchange rates in the second half of the 1960s, the volatility of the three major currencies increased markedly over the period 1971-78. The effective rates of the yen and the dollar in particular became increasingly volatile during those years, even when account is taken of the trend movements to which they were subject. The volatility of the dollar's effective rate rose further in the period 1979-86, when an effective appreciation of 50% between mid-1980 and early 1985 was followed by a drastic depreciation of 25% in the course of 1985-86. Although it did not suffer from such a massive swing, the yen's effective rate was marginally more volatile than the dollar rate during this period. Its weakening in effective terms as counterpart to the dollar appreciation lasted only until late 1982. With the dollar/yen rate becoming more stable thereafter, the yen, too, started to gain strength against European currencies, producing an effective yen appreciation that accelerated sharply from early 1985 onwards when the dollar depreciation set in. Although the effective depreciation of the dollar continued after 1986, it became much more moderate and significantly less volatile. The yen's stability in effective terms also increased noticeably; nonetheless the currency remained one of the most volatile in the foreign exchange markets. Since September 1992, the yen has again come under strong upward pressure, with its effective rate having risen by some 30% by October 1993.

Unlike the two other major international currencies, the Deutsche Mark displayed remarkable stability in effective terms throughout the entire post-Bretton Woods period. Indeed, its (trend-adjusted) volatility

Table 3

The volatility of major effective exchange rates[1]

	1965–70	1971–78	1979–86	Jan. 1987–August 1992
US dollar	0.6	4.3	8.2	3.2
Japanese yen	0.6	9.4	9.2	5.9
Deutsche Mark . .	2.9	3.0	3.6	2.0
Europe[2]	0.7	3.4	7.3	4.2

[1] Volatility measured from trend, i.e. the standard error of the equation regressing the monthly exchange rate series on a constant and a trend variable, divided by the mean of the series. [2] Composite index for the European G-10 countries plus Spain excluding intra-European trade (see text on p. 46 for explanations).

Source: BIS.

changed little during this twenty-year period. Even between 1979 and 1986, when its bilateral rate vis-à-vis the dollar and the yen weakened sharply, the effective exchange rate remained stable thanks to a marked strengthening against other European currencies. In this sense, much of the counterpart to the dollar's effective appreciation in the first half of the 1980s was to be found not so much in the Deutsche Mark's effective rate but in the rates of a number of European countries – notably those of Belgium, France, Italy, Sweden and the United Kingdom – which experienced effective depreciations of some 15 to 25% over the course of these five years. In the second half of the 1980s the Deutsche Mark's effective appreciation continued, initially at a rather rapid pace, but much more moderately after 1987, when exchange rates in Europe became much more stable. By the summer of 1992 the Deutsche Mark had thus appreciated by about 25% compared with early 1985. Since the summer of 1992 the currency has again come under stronger upward pressure as the currencies of a number of important European trading partners have depreciated. But because this development coincided with the strengthening of the US dollar and especially the yen, the effective appreciation of the Deutsche Mark since August 1992 was, by October 1993, limited to just over 3%.

The overall stability of the effective exchange rates of most European currencies throughout the post-Bretton Woods period (see Table 4) can be attributed to the combination of extensive intra-regional trading links and the pursuit of arrangements aimed at limiting intra-European

exchange rate variability, in particular vis-à-vis the Deutsche Mark. The high degree of trade integration within Europe is reflected in Table 5: well over three-quarters of the currency weights in most European countries' indices is accounted for by currencies of European partner countries. Among these currencies, those belonging to the European Exchange Rate Mechanism (ERM) are the most important, in particular the Deutsche Mark, which in all European indices considered here has the largest weight. Developments in the relative stability of European exchange rates can be related to the progressively greater and more successful attempts to limit the variability of intra-European exchange rates.[43] During the period 1971–78 – which broadly covers the period of European "snake" arrangements – European currencies on average were a little more stable than the dollar but not markedly so (compare the simple average of 4.1 shown in Table 4 with the 4.3 shown for the dollar in Table 3). In the two subsequent periods – when the ERM was in operation – the average volatility of European currencies was much lower than that of the dollar. An important exception to this general stability was the United Kingdom. Indeed, the amplitude of the swings in the effective rate of sterling was generally greater than that of any other major European currency.

The extensive period of exchange rate stability in Europe lasted until the autumn of 1992. In the twelve-month period from September 1992 to August 1993 unprecedented exchange market pressures forced two major EMS countries (Italy and the United Kingdom) to allow their currencies to float; two other countries (Spain and Portugal) devalued their currencies repeatedly, as did Ireland on one occasion in early 1993; and three Nordic countries (Finland, Norway and Sweden) stopped pegging their currencies to the ECU. Pressure in the foreign exchange markets continued during the summer of 1993, culminating in the

[43] Exchange market arrangements in Europe were initiated shortly after the breakdown of the Bretton Woods system. Following a decision of the EC Council of Ministers in March 1972, a number of original and prospective EC central banks as well as those of two non-EC member countries committed themselves to narrowing fluctuation margins between their currencies' bilateral rates (the European "snake"). In March 1979 the Exchange Rate Mechanism was put into place, aimed at limiting exchange rate fluctuations between the participating EMS currencies and the implicit anchor of the system, the Deutsche Mark. After linking the schilling to changing currency baskets in the early post-Smithsonian years, from the late 1970s Austria has pegged its currency to the Deutsche Mark alone. In northern Europe, the Swedish and Finnish authorities unilaterally pegged their currencies to the ECU basket (in which the Deutsche Mark has a large weight) in May and June 1991, respectively, as Norway had done already in October 1990.

Table 4

The volatility of effective exchange rates in Europe*

	1965–70	1971–78	1979–86	Jan. 1987 to	
				August 1992	Sept. 1993
French franc	3.8	4.0	4.9	2.1	2.5
Deutsche Mark . .	2.9	3.0	3.6	2.0	2.2
Italian lira	0.8	4.1	3.8	1.7	5.0
Pound sterling . . .	3.3	4.2	6.4	3.2	4.7
Belgian franc	0.6	2.0	4.5	1.7	1.8
Dutch guilder . . .	0.9	1.6	2.9	1.5	1.8
Spanish peseta . . .	3.3	7.4	4.8	2.0	5.4
Swedish krona . . .	1.2	4.4	5.2	1.1	5.0
Swiss franc	0.9	6.2	3.6	3.1	3.0
Simple average . . .	*2.0*	*4.1*	*4.4*	*2.0*	*3.5*

* Volatility measured from trend (see footnote to Table 3).

Source: BIS.

Table 5

Country weights in selected effective exchange rate indices

In percentages

In effective rate of:	Original ERM currencies*	*of which: Deutsche Mark*	Other European currencies	US dollar	Yen
Canada	8.8	*3.6*	5.1	69.9	8.7
France	51.6	*23.8*	25.1	10.9	7.1
Germany	43.4	–	30.9	10.5	8.5
Italy	54.3	*26.1*	24.9	9.2	6.2
United Kingdom	54.9	*20.0*	14.2	14.1	8.4
Belgium	64.6	*26.7*	20.4	6.8	4.6
Netherlands . . .	60.3	*29.1*	22.4	8.0	4.9
Spain	61.0	*21.2*	18.8	9.5	6.2
Sweden	47.0	*20.5*	28.0	11.6	7.0
Switzerland . . .	60.3	*30.4*	16.6	9.5	8.0

* Belgian franc, Danish krone, French franc, Deutsche Mark, Irish pound, Italian lira and the Dutch guilder.

Source: Table A4 in Appendix I.

widening of the ERM bands to +/– 15% around the bilateral central rates in August 1993.[44] In the year to August 1993, the effective rates of Finland, Italy, Spain and Sweden fell by about 20%. These effective depreciations over such a short period ranked among the largest drops recorded since the breakdown of the Bretton Woods system. The size of the movement in effective rates of these currencies was all the greater because the European exchange rate changes took place at a time when the dollar and the yen were rising against all the European currencies. By the same token, it limited the effective appreciations of the European currencies that did not depreciate, or did not depreciate by much, against the Deutsche Mark. The impact of the events in the foreign exchange market in the twelve months to September 1993 can be clearly seen in the last column of Table 4. Adding the period after August 1992 to the calculations significantly increases the volatility of the currencies that depreciated significantly, while leaving that of the other European currencies largely unchanged.

US dollar, Japanese yen and Deutsche Mark

The period of floating has also seen shifts in real exchange rates, far greater than most observers expected when the Bretton Woods fixed rate system broke down. Because no single measure of real exchange rates can be considered to be fully satisfactory in describing changes in competitiveness, the various price and cost indices considered by the BIS are used in what follows to describe broad trends in real effective exchange rates.

The various measures of the real effective exchange rate of the US dollar behaved in much the same way as its nominal effective rate.[45] Following a period of sizable and nearly steady real depreciation in 1971–78 during which US costs and prices fell by some one-third relative to those abroad, the real rate swung massively between 1979 and 1988 (see Table 6 and Graph 3). During the first phase of this cycle –

[44] With the exception of the Dutch guilder/Deutsche Mark band, which remained unchanged at +/– 2¼% around the central bilateral rate.

[45] The close correspondence between the two monthly rates since 1971 can be verified by regressing the log of the real rate, represented by relative unit labour costs, on that of the nominal rate. The US regression shows a very significant coefficient of over 1, suggesting that relative labour cost developments in domestic currency tended to accentuate changes in the dollar's nominal effective rate. The coefficient in the cases of Japan and Germany is around one-third.

Table 6

Relative unit labour costs in major areas: trend and volatility[1]

	Volatility[2]				Trend appreciation (+)/depreciation (−)[3,4]			
	1965–70	1971–78	1979–86	Jan. 1987–Aug. 1992	1965–70	1971–78	1979–86	Jan. 1987–Aug. 1992
United States	2.1	6.8	8.1	2.7	2.3	−5.8	4.0	−3.4
Japan	2.0	6.4	11.2	6.9	−3.1	4.3	2.4	−3.4
Germany	3.6	4.5	4.8	2.0	1.8	0.4	0.2	1.0
Europe[5]	..	2.9	7.4	4.3	..	0.6	−3.9	1.6

[1] Calculated from monthly data. [2] Volatility measured from trend (see footnote to Table 3). [3] Estimated coefficient of trend variable obtained when regressing relative unit labour costs on a constant and the trend variable, divided by the mean of relative unit labour costs. [4] At an annual rate. [5] Composite index for the European G-10 countries plus Spain excluding intra-European trade.

Source: BIS.

1979 to early 1985 – the decline in relative labour costs realised in the preceding seven-year period was largely wiped out. However, as the dollar depreciated sharply in the subsequent three years without provoking major increases in US wages, cost competitiveness had returned by the end of 1987 to its level of the late 1970s.[46] Moderate further nominal depreciation as well as relatively slowly rising US labour costs sustained the improvement in cost competitiveness well into 1992; even after mid-1992, as the dollar strengthened, US competitiveness deteriorated only moderately.

Most measures of the real rate of the dollar paint a broadly similar picture of US competitiveness. Between 1974 and 1987, relative consumer prices and unit labour costs moved closely together, but thereafter relative labour costs improved more than relative consumer prices thanks to real wage moderation in manufacturing and a recovery of productivity growth. Relative export unit values showed less variability than either of the other two measures during the post-Bretton Woods period. Even for a player as large as the United States, competitive forces thus appeared to limit the response of export prices to domestic cost developments.

Considering the period 1971 to mid-1993 as a whole, a very sizable drop in the various real effective rates of the dollar took place. US labour costs fell relative to those in partner countries by well over 40% over this period, while relative consumer prices fell by almost one-third; both reached in late summer 1992 their lowest level ever since the breakdown of the Bretton Woods system. Although US manufacturing lost some competitiveness in late 1992 and early 1993, its competitive outlook remained very strong when seen over a period spanning more than two decades. As discussed more fully in a later section, its absolute competitive position also remained strong.

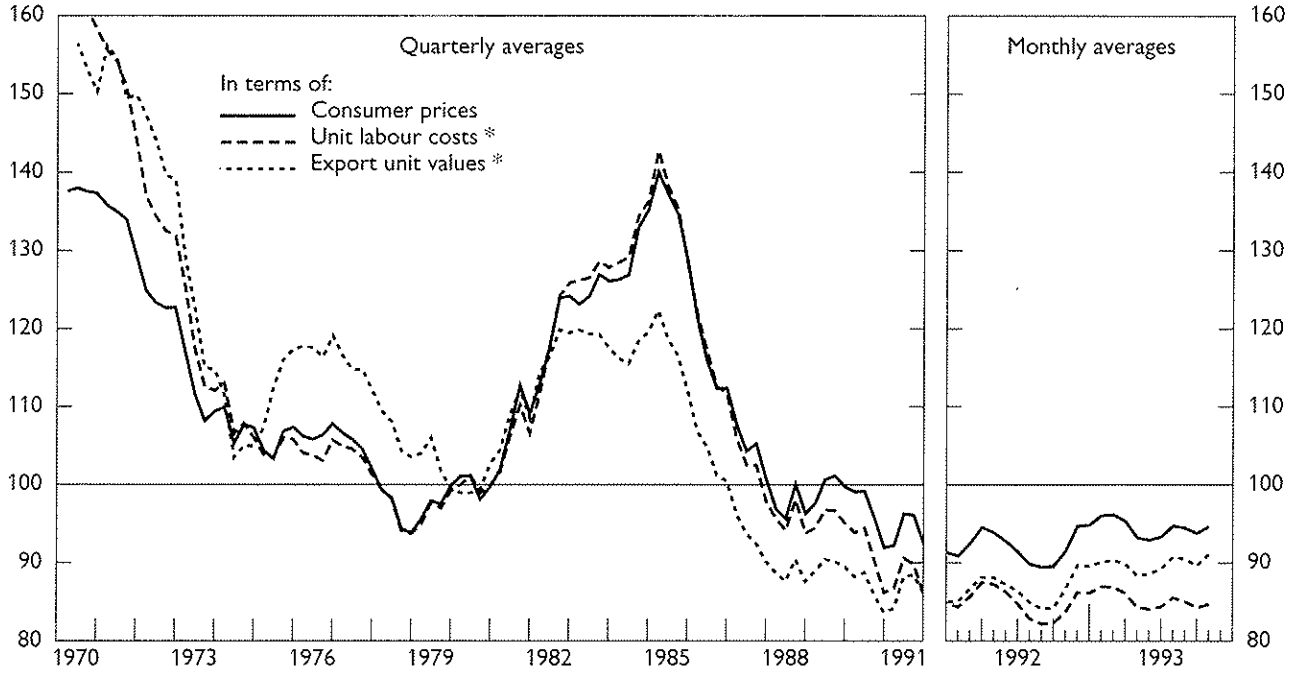
In marked contrast with developments in the United States, the Japanese manufacturing sector experienced a very substantial increase in its relative prices as well as costs over the course of the last two decades (see Graph 4). By September 1993 Japanese relative labour costs were more than twice as high as they had been in early 1971, while relative consumer prices had risen even somewhat more. This

[46] For a more detailed discussion of the factors behind the improvement in US competitiveness in the mid-1980s – including industrial restructuring, recovery of investment in plant, equipment and R&D, and foreign direct investment – see Bank of Japan (1987).

Graph 3

Real effective exchange rates: United States

1980 = 100



* In manufacturing.

Source: BIS.

was, however, appreciably less than the 250% appreciation of the yen's nominal effective rate as wage increases in Japan were limited and productivity growth strong (see for instance Daly (1991)). The rise in Japan's relative consumer prices and labour costs was at times accompanied by sizable swings, particularly between mid-1977 and the end of 1979 and again between 1985 and 1989. The volatility of relative export prices was, however, only about half that of relative consumer prices or of unit labour costs until late 1991, suggesting that Japanese exporters attempted to maintain market shares by keeping prices in line with those of their competitors and thus to offset exchange rate changes through adjustments to profit margins.[47] Since then, however, export pricing appears to have been more in line with cost developments. During the first half of 1993 the yen faced strong upward pressure, pushing all relative price and cost measures to their highest level ever.

The long-term trend rise in Japanese relative export unit values has been much lower than that of relative unit labour costs. Between 1971 and 1992 relative export unit values rose at an annual average rate of 1.4%, while the comparable rise in relative unit labour costs was 2%. Rather than to suggest a continuous squeeze of profit margins – which would hardly have been sustainable for over two decades – this probably reflected the growing importance of electronic goods in Japan's exports: in this sector rapid technical progress has reduced prices relative to the prices of other manufactured products.

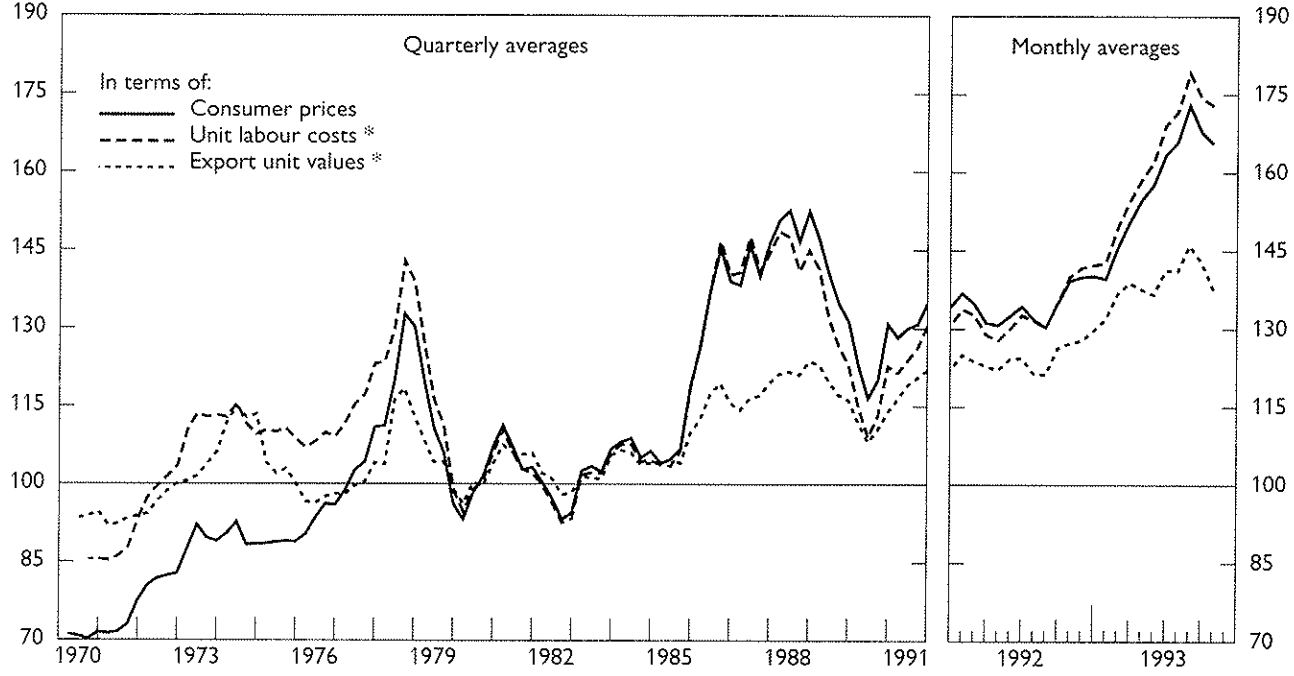
Over the last twenty years as a whole, the real effective exchange rate of the Deutsche Mark has been much more stable than that of the dollar or the yen. The sharp nominal appreciation of the Deutsche Mark that took place in the early 1970s led to a sizable real appreciation that was only partly reversed during the first oil shock (Graph 5). Modest real appreciation up to 1979 gave way to a period of significant real depreciation on all three measures shown. After 1984, the different measures began to diverge rather significantly, and by the early 1990s they were far apart. It is in terms of the unit labour cost measure that German manufacturing has seen the largest loss in competitiveness since

[47] Lower import costs also helped to moderate the rise in export prices. The issue of the pass-through of cost developments in prices was analysed extensively in the second half of the 1980s following the slow adjustment of the US current account deficit to the dollar depreciation. To quote but a few of these studies, reference may be made to Helkie and Hooper (1988), Dornbusch (1987), Krugman and Baldwin (1987), Mann (1986) and Ohno (1988).

Graph 4

Real effective exchange rates: Japan

1980 = 100



* In manufacturing.

Source: BIS.

the mid-1980s. The loss is least marked according to the CPI-based measure. One important reason for this difference – explored in more detail on p. 98 below – is the much better relative performance of the non-manufacturing sector in Germany. Because this sector's relative unit labour costs have risen more slowly than in the manufacturing sector, the costs of non-tradable inputs have probably been moderated. This may well account for the fact that the rise in relative export unit values has been below that of relative unit labour costs.[48] It is also possible, however, that in recent months competitive pressures in world markets have prevented German producers from fully reflecting labour cost increases in export prices: the widening of the gap between the two indicators from the beginning of 1992 would indeed be consistent with this.[49] CPI and unit labour cost-based measures both confirm a significant loss in German competitiveness recently, with the two measures rising by 10–15% between mid-1991 and mid-1993. As the nominal effective rate of the Deutsche Mark appreciated less over these two years, the rise in real terms in part also reflected the combination of relatively strong pressure on wage and price inflation and sluggish productivity growth.

As noted above, the nominal stability of the effective rate of the Deutsche Mark (as well as that of several other European currencies) owed much to the relative stability of intra-European exchange rates. Indeed, if the implicit exchange rate relationship of the group of major European countries (the European G-10 countries plus Spain) as a whole with third countries were to be observed, it undoubtedly would exhibit much greater variability. To verify this, a "European" effective exchange rate index was constructed that abstracts from the impact of the extensive intra-European trading links between these European countries by assigning zero weights to their bilateral exchange rates and renormalising the other weights. The resulting adjusted exchange rate indices for each European country considered were subsequently weighted by the relative importance of each country's trade outside this group to arrive at a composite "European" exchange rate. Quite naturally, this calculation increases the importance of the US dollar and the yen in the

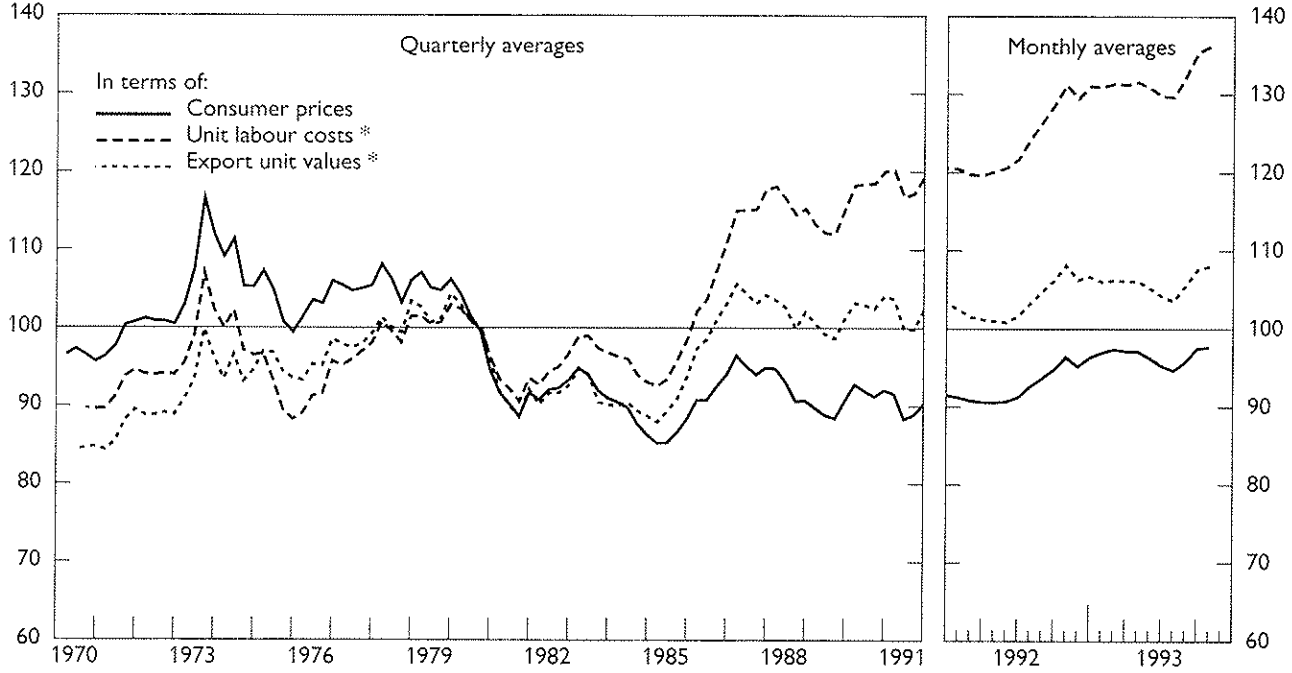
[48] But note that national accounts measures of the operating surplus do *not* suggest a fall in the profitability of manufacturing over the period 1985-91: see Graph 18 below.

[49] For a fuller discussion of trends in German competitiveness, see Schumacher (1992). In particular, competitiveness trends are decomposed on a geographical and sectoral basis in this study

Graph 5

Real effective exchange rates: Germany

1980 = 100



* In manufacturing.

Source: BIS.

exchange rate calculation – from an average of around 10% and 7% respectively in the countries' original index, to about 32% and 21% in the overall European index.

Not only in nominal terms (see Table 3) but also in real terms (see Table 6) is the variability of Europe's effective exchange rate (which is composed of exchange rates vis-à-vis non-European currencies) in general greater than that of its constituent currencies (where rates vis-à-vis other European currencies dominate). Following an increase in relative prices and costs in the course of the 1970s, European G-10 countries plus Spain as a group experienced a sharp real depreciation in the first half of the 1980s, amounting to one-third whether measured in terms of relative consumer prices or relative unit labour costs (see Graph 6). This decline was in part reversed during the years 1985–87, when the dollar depreciated strongly. In the period up to mid-1992 there were further, although smaller, losses of competitiveness, returning relative unit labour costs almost to their record levels of 1979, while relative export prices rose to new highs.[50] However, Europe's competitive position improved significantly in the wake of the European exchange rate adjustments in late 1992 and early 1993. The measures shown in the graph indicate a drop in relative prices and costs of around 15% between August 1992 and September 1993, thereby returning them to the levels recorded in late 1986, just prior to the start of the most recent long period of nominal exchange rate stability in Europe.

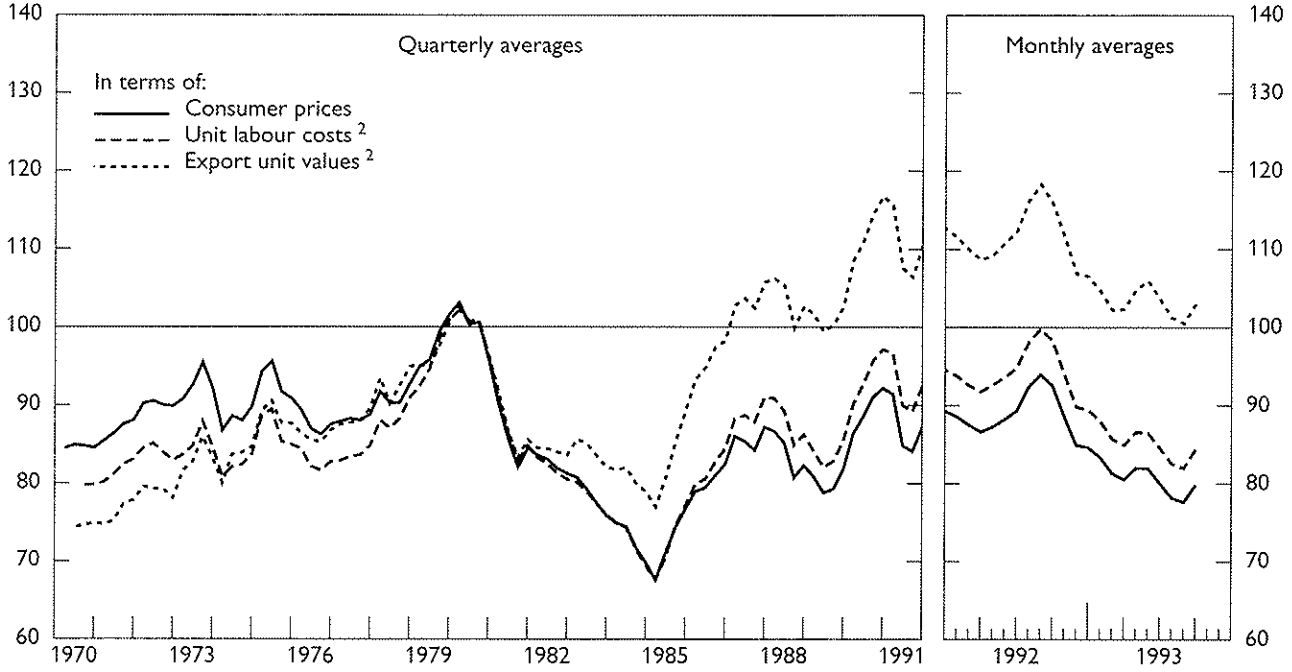
In marked contrast with trends in many other countries, Europe's export unit values relative to countries outside this group have tended to rise more steeply than other relative price or cost measures. Not only was the rise in relative export unit values between early 1985 and September 1993 much larger than that in relative consumer prices (32% compared with 17%), it also exceeded that in relative unit labour costs (24%). The large discrepancy between the two price measures might indicate that Europe's comparative advantage in the production of non-tradable goods might be greater than that in producing tradable goods. However, the more rapid rise in relative export unit values might also be in part the mirror image of developments in Japan and reflect Europe's

[50] The European Commission reached a similar conclusion, noting in its Annual Report for 1993 that an overvaluation of the real exchange rates of the EC currencies emerged in 1990 and 1991. To a large extent, the overvaluation was ascribed in this study to the cyclical divergence between the EC economies and those of other industrial countries (see European Commission (1993)).

Graph 6

Real effective exchange rates: Europe[1]

1980 = 100



[1] Composite index for the European G-10 countries plus Spain excluding intra-regional trade. [2] In manufacturing.

Source: BIS.

specialisation in those manufacturing sectors where a relatively slow rate of technological progress has not reduced relative prices as rapidly as in other manufacturing sectors.

Within Europe

Developments in the competitiveness of the major European countries in the post-Bretton Woods period are summarised in Graphs A1-9 of Appendix II. Generalisation is hazardous, but a few broad observations may help to paint the picture. Four main periods can be distinguished: the 1970s, a decade of great volatility during which most European currencies on balance nevertheless appreciated; the period of dollar strength during the first half of the 1980s; the second half of the 1980s and early 1990s, when the combination of divergent inflation rates and nominal exchange rate stability led to marked changes in competitiveness; and the period after August 1992, during which much of the change in intra-European competitiveness that had taken place during the previous five years or so was reversed.

With the exception of Italy and Sweden, the real exchange rates of European countries were higher at the end of the 1970s than they had been at the beginning. The rise was particularly marked in the case of Switzerland, as the Swiss franc strengthened, and in the case of the United Kingdom, as sterling's value was strongly boosted by a huge increase in the value of oil exports in the late 1970s and as cost and price inflation remained above average. The deterioration of cost competitiveness in Belgium, France and the Netherlands was less severe; in terms of export unit values competitiveness changed little. By contrast, a depreciating lira more than offset unfavourable cost and price developments in Italy, thus boosting the country's competitiveness in the course of the 1970s, while Sweden overcame a large loss in competitiveness in the mid-1970s by a sizable effective depreciation in late 1977.

The period of dollar strength during the first half of the 1980s allowed most of the European countries to recoup some or all of the losses in competitiveness sustained until then. In Belgium and the Netherlands relative labour costs and consumer prices fell to their lowest levels since the breakdown of the Bretton Woods system as only moderate inflation reinforced the effect of exchange rate depreciation. France, too, saw a major strengthening of competitiveness as relative consumer prices and unit labour costs fell by 10–15%. The recovery in Spain, the United

Kingdom and Sweden was less complete, while high wage and price inflation in Italy made it the only European country to experience an erosion of competitiveness during the years of dollar strength. As relative export unit values did not move much in the first half of the 1980s, the profit margins of manufacturing industry in most European countries tended to widen appreciably during this period (see the subsequent section for further details).

During the second half of the 1980s and the early 1990s competitiveness trends in Europe diverged markedly.[51] Countries where inflation remained low, notably Belgium, France and the Netherlands (the very countries that had realised substantial gains in the preceding years), maintained their competitiveness, with relative labour costs and consumer prices staying close to the lows of the mid-1980s. Switzerland, too, succeeded in preserving its competitiveness – in fact, Swiss relative consumer prices and unit labour costs, despite marked variability, have shown no clear upward trend during the past fifteen years. In the four other countries considered, where inflation remained above average for much of this period, misalignments emerged after 1985 and became more pronounced as the years went by. Compared with early 1985, competitiveness measured on the basis of relative unit labour costs had deteriorated by August 1992 by 5% in the United Kingdom (11% if compared with early 1987), 11% in Italy, and 19% in Sweden. The deterioration in terms of consumer prices amounted in Spain to 27% over the corresponding period.

The exchange rate misalignments that emerged were an important underlying factor in a series of crises in European exchange markets in the second half of 1992 and first eight months of 1993. In the year to September 1993 no fewer than five countries were forced to abandon fixed exchange rate arrangements, three others devalued and the fluctuation margins within the European Exchange Rate Mechanism were greatly expanded. These adjustments in nominal rates went a long way towards correcting the misalignments: they made it possible to return to the lows recorded in the course of the 1980s in all countries except Spain, where, by September 1993, relative consumer prices were still some 10% above their pre-1986 levels. The competitiveness indicators

[51] For more detailed discussions of wage, price and productivity developments underlying the changes in competitiveness in Europe in the 1980s and early 1990s, see European Commission (1991) and OECD (1992a).

considered here do not, then, suggest that the recent adjustments could be interpreted as trade-distorting competitive devaluations: in none of the devaluing countries did real effective exchange rates fall noticeably below the levels seen in the first half of the 1980s. The competitiveness losses in the countries whose exchange rates vis-à-vis the Deutsche Mark were not adjusted were much smaller. This stability reflected the concomitant depreciation vis-à-vis the dollar and the yen in late 1992 and early 1993, and the large share in the weight structure of these countries of each other's currency (in addition to the Deutsche Mark).

Canada and the Asian NIEs

Throughout the post-Bretton Woods period most real effective exchange rate measures for Canada swung widely. These swings represented the combined outcome of variability in Canada's nominal effective rate – itself the outcome of terms-of-trade changes (due to the importance of raw materials in Canada's exports) and changes in the stance of monetary policy – and relatively large cost increases in Canada's manufacturing sector, especially when compared with its two major trading partners, the United States and Japan. Particularly important among these cost developments was the relatively weak growth of labour productivity in Canada's manufacturing industry.[52] The significant gains in competitiveness that had accrued by early 1979 in the wake of a strong effective depreciation of the Canadian dollar could therefore not be maintained in the early 1980s. With the Canadian dollar's effective rate stabilising, competitiveness losses accumulated until late 1983. Thereafter, depressed commodity prices contributed to a renewed nominal depreciation during the years 1984–86, allowing competitiveness in terms of labour costs and consumer prices to be restored to the levels reached in the late 1970s. To counter the inflationary pressures in the economy, monetary policy was tightened in the course of the second half of the 1980s. While wages and prices reacted slowly, budget deficits remained high and productivity growth continued to lag behind that of the country's major trading partners, the effective rate of the Canadian dollar rose quickly, bringing about a strong appreciation of the real rate. Although the measure based on relative export unit values indicated only a

[52] The issue of relatively slow productivity growth is addressed in greater detail in Daly (1989), Dion and Lafrance (1993) and OECD (1992a). For a further review of competitiveness developments in Canada between 1973 and 1985, see Department of Finance (Canada) (1986).

moderate loss of competitiveness, that based on unit labour costs showed a loss of over 25% between mid-1986 and late 1991. The combination of slower rises in export prices than in labour costs was associated with a squeeze on profitability in manufacturing industry. Since late 1991 Canadian wage and price inflation has abated considerably. Combined with an effective depreciation, this improved cost competitiveness of Canadian manufacturers about 15% between late 1991 and September 1993.

Between 1975 and 1984 there was a nearly continuous increase in the Asian NIEs' relative unit labour costs, largely reflecting developments in Singapore and Taiwan. However, once the US dollar started depreciating in 1985, the NIEs attempted to stabilise their bilateral dollar rates. This resulted in a sizable gain in cost competitiveness: by the end of 1986, relative unit labour costs had returned to their level of the first half of the 1970s. This gain greatly boosted the NIEs' competitiveness in foreign markets: the surplus on their combined current account rose from $7 billion in 1984 to $24 billion in 1986. Under foreign pressure to adjust their exchange rates,[53] the NIEs allowed their currencies to appreciate strongly in effective terms after 1986. In combination with an upward drift in wage and price inflation, in particular in Korea, a rapid appreciation of the NIEs' effective rates took place in the latter part of the decade. By late 1989 relative unit labour costs were some 45% above their level of early 1987, although relative price measures suggested a much smaller deterioration.[54]

Since 1990 the NIEs have succeeded in stabilising their relative labour costs and reducing relative export unit values. The gains in competitiveness realised in Korea, where policies were tightened significantly to contain inflationary pressures, contributed much to these overall developments. Nevertheless, relative costs have remained much higher than they were in the early 1980s. However, as will be argued in Section IV below, the Asian NIEs are still highly competitive in absolute terms.

[53] Both South Korea and Taiwan came under heavy US pressure to allow their currencies to appreciate in the late 1980s. See, for example, Lindner (1992). The exchange rate provisions of the US Omnibus Trade and Competitiveness Act of 1988 mandated the Secretary of the Treasury to determine whether current account surplus countries were "manipulating their rates of exchange... for the purposes of preventing effective balance-of-payments adjustment or gaining unfair advantage in international trade".

[54] Indeed, one of the more striking developments in the NIEs' competitiveness indicators is the high degree of stability in relative export unit values: no significant trend in these relative prices can be observed for the entire period 1971–93, even though relative labour costs have varied considerably. Equally puzzling is that the measure based on consumer prices suggests virtually no loss in competitiveness over the two decades.

II. Other competitiveness ratios

A number of other aggregate indices have been used to capture certain aspects of price or cost competitiveness. This section reviews some of the more important indices in use, and considers their relative advantages and disadvantages.[55] (One important indicator, the internal terms of trade, is discussed in Section V, where the distinction between tradable and non-tradable goods is examined in detail.)

Competitiveness of imports

The first measures the price competitiveness of imports relative to similar goods that are domestically produced. Ideally this requires price indices for the home sales of domestic producers and import prices adjusted for tariffs. The index produced by the UK Department of Trade comes perhaps closest to this ideal:[56]

$$IC = PM \; / \; \sum m_i WPI_i$$

where m_i = weight of i^{th} commodity group in total manufactured imports

PM = tariff-adjusted import unit value index for manufactured goods

WPI_i = wholesale price index for domestic producers' home sales for the i^{th} good

One advantage of this indicator is that it can be calculated without having to collect data from other countries. Possible drawbacks include timing differences (wholesale prices usually measure prices for current orders while unit value indices measure delivery prices), the effects of composition shifts (even though the UK calculation involves a rather fine level of detail), and – perhaps most important – the fact that many import categories will have no domestically produced substitute.

Movements in the UK index over the past twenty years are shown in Graph 7. Although the direction of movement is very similar to that

[55] Maciejewski (1983) provides a more exhaustive discussion of the relative merits and demerits of many more possible measures. See also Enoch (1978).

[56] See the comparison with earlier indices in Central Statistical Office (1980). Note that the unit value indices used exclude erratic items (ships, aircraft, North Sea installations and precious stones).

of the other indices, the amplitude of swings observed is much smaller.[57] This may reflect a certain "pricing to market" on the part of foreign suppliers that dampens the response of import prices to changes in competitiveness. A second difference concerns medium-term changes in competitiveness. According to the import competitiveness measure, imports were about as competitive in the mid-1980s as they were in the mid-1970s; the other measures, however, reveal a significant loss of competitiveness over this period.

Nevertheless, relatively few other countries reweight detailed price indices for domestically produced home sales according to import shares. Without such a detailed reweighting, therefore, one alternative is simply to use the wholesale price index for manufactured goods (WPI), viz. simply *PM/WPI*. But this short cut has serious, and possibly decisive, shortcomings. First, the weighting of goods in most countries' WPIs is quite different from that of manufactured imports. Secondly, wholesale price indices in many countries refer to total deliveries (i.e. export as well as home sales). Finally, many wholesale price indices, based on total transactions, tend to over-weight raw materials and semi-finished goods which enter early in the production process and may therefore be effectively counted several times.

Notwithstanding these problems, the OECD has periodically computed indices of import competitiveness based on aggregate data. For most countries, it was found that the ratio *PM/WPI* has a marked downward trend (i.e. domestic wholesale prices tend to rise faster than import prices) that undermines the usefulness of the indicator as a measure of competitiveness.[58]

Other possible complements to import competitiveness measures would be measures to compare the competitiveness of different foreign suppliers in a given market, for example comparing German and Japanese suppliers in the US market. The US Bureau of Labor Statistics has recently started to publish such indicators, and recent movements in these indices shed some interesting light on the relation between changes in import prices and changes in exchange rates. The 8% appreciation of

[57] For instance, a regression relating this index of import competitiveness to the standard measure of relative unit labour costs gives:

$$\log IC = 3.39 + 0.28 \log RULC$$
$$(31.5) \quad (11.7)$$
$$R^2 = 0.60$$

[58] See Durand et al. (1992).

Table 7

US import price indices by country of origin

December 1990 = 100

	% of US imports in 1990	September 1992	September 1993	Memorandum item: Nominal exchange rates against the dollar*	
				September 1992	September 1993
European Community	17.3	105.5	99.3	100.5	84.9
Japan	18.5	102.9	110.4	109.0	127.0
Asian NIEs	12.5	100.4	99.8	101.6	98.2

*Figures for the European Community and Asian NIEs are weighted averages of US dollar exchange rates, with exports of manufactured goods to the United States used as weights.

Source: US Bureau of Labor Statistics.

EC currencies against the US dollar in the early 1990s was associated with a 5.5% increase in the average prices of US imports from the European Community from 1990 to September 1992 – above the rise in prices of imports from Japan and the Asian NIEs (see Table 7). Less than half of the subsequent depreciation of EC currencies (of about 16% on average) was reflected in import prices. The Japanese yen had appreciated much more than European currencies even by September 1992 (by 18% over the time frame used in Table 7) and yet the prices of imports from Japan rose by less than those of European imports. The subsequent appreciation of the yen over the period up to September 1993 by another 14% was accompanied by a 7% rise in the prices of imports from Japan, indicating a marked tendency of Japanese producers to absorb a significant proportion of the exchange rate change. The overall result was that the competitive position of European producers relative to their Japanese competitors in the US market improved by about 12% in the twelve months to September 1993 – much less than European currencies fell against the yen over the same period.

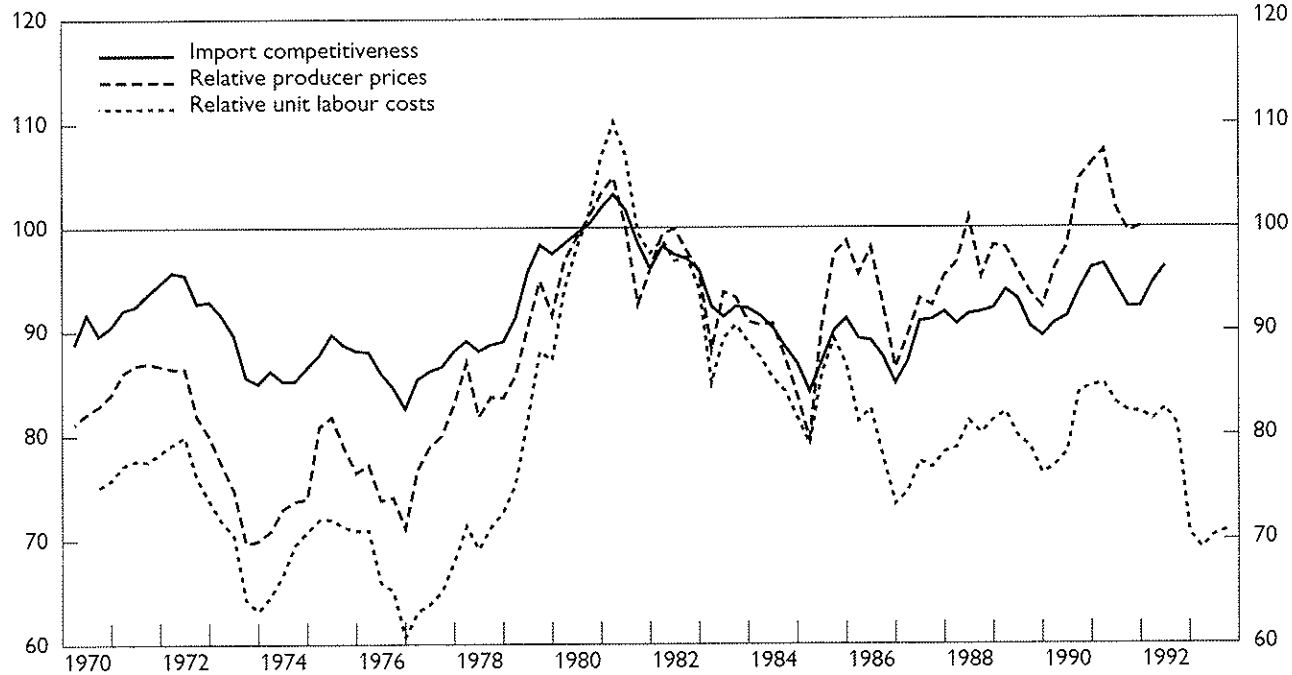
Profitability of exports relative to home sales

A second, rather similar, ratio seeks to measure changes in the profitability of exporting relative to producing for the domestic market. For this purpose the UK Department of Trade produces an index that

Graph 7

Import competitiveness in manufacturing: United Kingdom

1980 = 100



Note: The indices are defined so that a rise implies a loss in competitiveness.

Sources: CSO *Economic Trends* and BIS.

reweights detailed wholesale price indices according to the composition of exports:

$$RPROF = PX \; / \; \sum x_i WPI_i$$

where x_i = weight of i^{th} commodity group in total manufactured exports

PX = export unit value index for manufactured goods

WPI_i = wholesale price index for domestic producers' home sales for the i^{th} good.

The advantages and disadvantages of this index are much the same as those of the import competitiveness indicator. However, movements in this particular index of relative export profitability are only loosely related to other standard measures of competitiveness (see Graph 8).[59] Perhaps more seriously, this index gives a rather different picture of competitiveness from that suggested by the other indices. For instance, the relative profitability of exporting was much greater in the mid-1980s than it was in the mid-1970s, yet the other measures shown reveal a marked deterioration.

In the absence of a detailed reweighting of WPIs it would be possible to rely on the general wholesale price index for manufacturing (that is, to calculate *PX/WPI*, i.e. the WPI index as published, not an export-weighted sum). But, once again, this may well suffer from crippling defects – in particular those related to the different composition of exports.

Profitability of producing tradable goods

A third group of indicators, and one that has become more popular in recent years with the development of data on sectoral GDP, is the profitability of producing tradable goods. The tradable goods sector is usually taken to be synonymous with the manufacturing sector. A typical definition is:

$$PR = YM/ULC$$

where ULC = index of unit labour costs in manufacturing

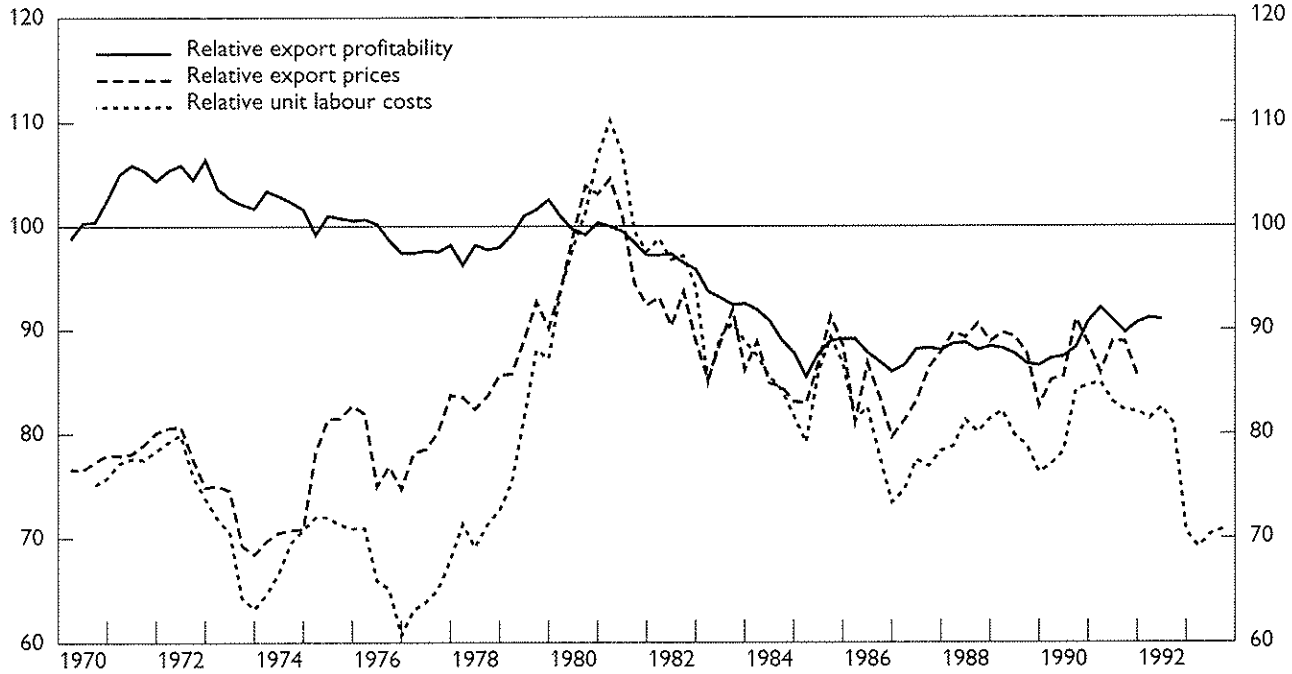
YM = value added deflator for manufacturing (ideally at factor cost).

[59] A regression relating this index of relative profitability to relative unit labour costs reveals a weak, and perverse, relation between the two series. Note that the measure of relative export profitability is shown inverted in Graph 8 (for comparability with the other measures shown).

Graph 8

Relative export profitability in manufacturing: United Kingdom

1980 = 100



Note: The indices are defined so that a rise implies a loss in competitiveness.

Sources: CSO *Economic Trends* and BIS.

The idea is that improved competitiveness would allow domestic producers of tradable goods greater profits.[60] A recent important IMF study has put particular emphasis on this measure, arguing that it is better than the conventional measures based on real effective exchange rates.[61]

However, one important limitation of this measure is that value added other than labour costs includes many elements in addition to pure profits: this important point was discussed in more detail above (see especially Table 2). For example, a shift to more capital-intensive sectors may tend to push up the value added deflator beyond any rise in unit labour costs even though no individual sector has become more profitable. A second limitation is that this index is usually very cyclically sensitive, as aggregate profits swing quite widely with the cycle.

A related ratio that measures the profitability of exporting explicitly uses the export unit value index as the indicator of "value", viz.:

$$PRX = PX/ULC$$

Compared with that based on the GDP deflator, this measure suffers from two additional defects. The first is that export unit values are based on gross values, i.e. they reflect the influence of changes in non-labour input costs as well as changes in the value added in exports. This may be particularly serious when commodity prices are changing substantially, or when exchange rate changes lead to sharp changes in the prices of imported inputs. One possible way of dealing with this problem is to combine unit labour costs with an index of raw material costs to produce a more comprehensive measure of exporters' production costs. Although an improvement, the difficulty of finding an appropriate index of input costs remains.[62] A general and more intractable problem is that non-traded services constitute an important input into manufacturing production and that few countries have price indices that adequately cover such costs.

[60] The absence of sectoral GDP data meant that earlier attempts to construct such measures had to use the overall GDP deflator – a major weakness given important differences in the trends of prices for manufactured goods and for services.

[61] This in Lipschitz and McDonald (1992).

[62] For example, the *58th BIS Annual Report*, examining profit margins of exporters in the United States, Japan and Germany, used wholesale prices of raw materials for an index of input costs. Production costs were then taken to be unit labour costs (65%) and wholesale prices of raw materials (35%). See Bank for International Settlements (1988), pp. 58–60.

The second defect is that the composition of exports may be quite different from the composition of domestic manufacturing production, and labour costs developments may differ greatly between the various sectors. This deficiency could in principle be mitigated by reweighting detailed sectoral estimates of unit labour costs by exports, much in the same way as the other ratios considered above. In practice, however, such detailed estimates of unit labour costs are not available for all countries.

Comparative indices

The indices discussed in the previous section have also been used in conjunction with comparable indices in foreign countries to produce comparative indices.[63] One example is a comparative index of profitability in the production of traded goods, viz. relative export unit values divided by relative unit labour costs.

Does a comparative indicator add much more information than the single country measure? It might be argued that the comparative formulation controls for exogenous shifts in certain common influences that affect profitability worldwide. For instance, a global recession may tend to depress export prices and profitability worldwide. A second argument is that measured profitability may have a long-term trend (e.g. due to the relative price decline in raw material prices): expressing profitability measures relative to those in other countries may mitigate the consequences of such a trend.

Some measures of comparative export profitability are shown in Graph 9. It does appear from this graph that the huge depreciation of the dollar after 1985 did allow a restoration of US export profitability ratios which had been squeezed during the period of overvaluation of the dollar. Likewise, the stronger yen apparently reduced Japanese export profitability during the second half of the 1980s, before rebounding in 1989 and 1990 when the yen weakened. A renewed bout of yen appreciation in the early 1990s again reduced measured profitability. The comparative profitability of Canadian manufacturing – not shown in the graph – was also curbed by the strength of the Canadian dollar in the second half of the decade.

[63] The word "comparative" is used to distinguish it from the use of relative in relative export prices, etc., and to avoid having to say relative relative indices.

The Asian NIEs apparently absorbed the effects of currency appreciation in the late 1980s by squeezing profit margins. Because (i) the new lower level of profitability has been sustained since early 1990 (indeed appearing to recover somewhat in 1993) and (ii) these countries' export volumes have continued to grow faster than market demand, the earlier profit levels are likely to have contained substantial elements of economic rent.

By marked contrast, profitability in Europe as a whole appears to have been remarkably stable, partly because strong movements in some European countries appear to have offset each other. The nominal appreciation of the Deutsche Mark in recent years has apparently reduced German export profitability as measured, with a particularly marked weakening in the early 1990s (Graph 10). Also the UK manufacturing sector has been subject to large swings in profitability, the consequence in part of sizable movements in the real exchange rate.

It is of interest to compare the profitability movements in other European economies during the period from the beginning of 1987 to the middle of 1992, when nominal exchange rates in Europe were relatively stable. In two of the three countries which had lower than average inflation during this period (and which, therefore, improved their competitiveness vis-à-vis other European countries) – France and Belgium – the measured profitability of exporting actually improved.[64] In the third country – the Netherlands – profitability at first fell, then recovered before again declining. In the others (which had higher inflation and where competitiveness deteriorated) – notably Italy, Sweden and Spain – export profitability weakened.

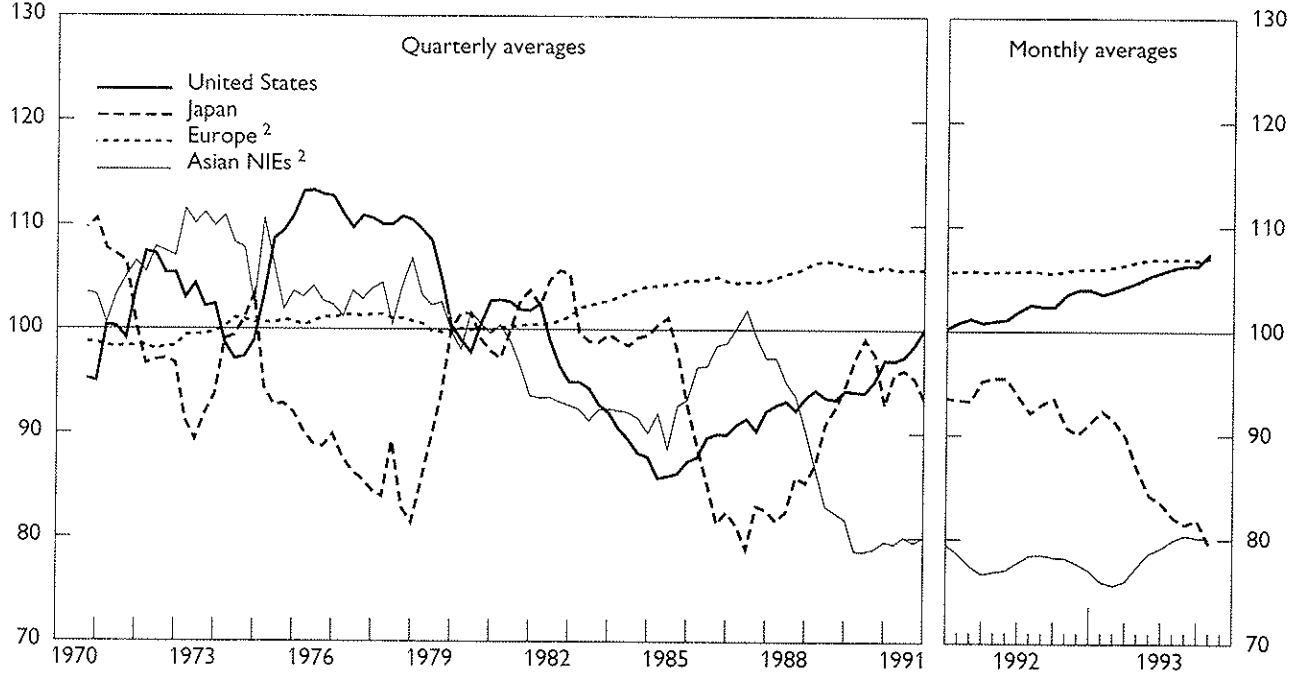
The depreciations that followed the autumn 1992 crisis in European currency markets led to some significant changes in these patterns. In particular, the comparative profitability of Italian, Spanish, Swedish and UK exporting all improved. Germany and the Netherlands saw their profits squeezed.

[64] Switzerland, which also improved competitiveness during this period, likewise saw a rise in export profitability (not shown in the graph).

Graph 9

Comparative export profitability in manufacturing[1]

1980 = 100



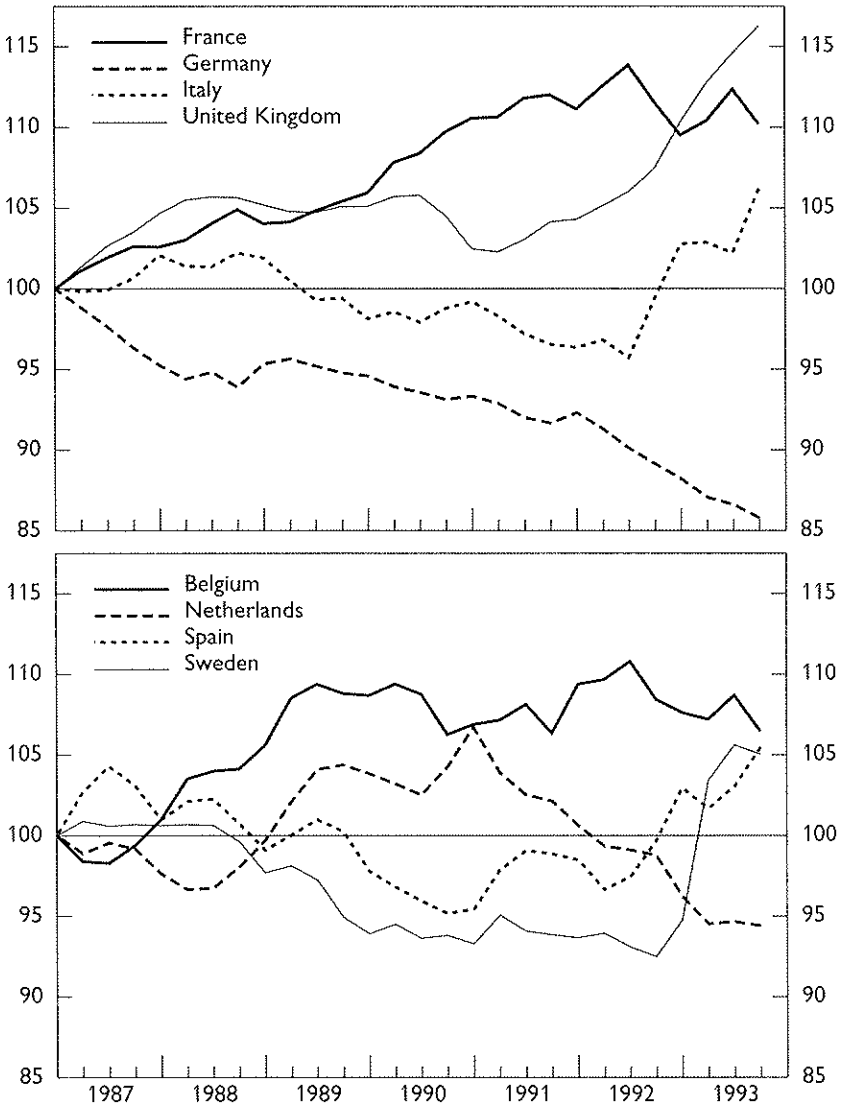
[1] Relative export unit values divided by relative unit labour costs. [2] Trade-weighted average of individual countries' indices.

Source: BIS.

Graph 10

Comparative export profitability in manufacturing in Europe*

Fourth quarter 1986 = 100



* Relative export unit values divided by relative unit labour costs.

Source: BIS.

III. The developing world and countries in transition

Methodological issues: commodity exporters and multiple exchange rates

Significant differences, much wider than those observed in industrial countries, exist between developing countries in the composition of their exports and imports. Few developing countries have the diversified production base typical of most industrial countries. Most specialise in the production of, and trade in, one or a few basic goods. The homogeneous nature of these basic products implies that they typically cannot be distinguished by place of origin and that their prices are set in general by the interplay of demand and supply in world markets.[65] A few countries dominate the market for their main export product; most are small economies with modest market shares. One consequence of these differences is that the derivation of effective exchange rates for developing countries cannot be as uniform as in the case of industrial countries with well-diversified economies.

The homogeneous nature of goods traded by commodity-producing developing countries precludes the use of the trade-flow-based indices discussed in the section on real effective exchange rates. Developed to address trade in diversified, imperfectly substitutable goods, a weighting scheme based on double export weights would clearly be inappropriate. But bilateral or global weighting schemes would also seem deficient. A bilateral scheme assigns the largest weights to the exchange rates of those countries which constitute a given country's main market, fully disregarding other markets and suppliers with whom there are no direct trade links but whose operations and transactions could have a significant bearing on the price formation in world commodity markets. A global weighting scheme, if based on overall trade, would meanwhile tend to bias the weights in favour of industrial countries, and would thus produce weights that are nearly identical for all developing countries, irrespective of the specialisation of their trade.[66]

To deal more appropriately with primary-commodity-producing countries, most authors have therefore advocated a commodity-by-commodity

[65] For a more extensive analysis of how developing countries' international trade can be modelled, see Bélanger (1976), Feltenstein et al. (1979) and Ridler and Yandle (1972).

[66] Bilateral and global weighting schemes are, nevertheless, frequently used. The former type of scheme underlies, for instance, the calculations in Aghevli and Montiel (1991), the latter type those in Wood (1991).

approach to measure the impact of exchange rate changes on trade performance. In this approach, exchange rate changes are assumed to affect supply and demand schedules for the various primary commodities, thus resulting in adjustments in the world price of these goods and, in turn, in the commodity-producing countries' export earnings. As shown in Wickham (1987), the change in the world price of a given commodity – and thus the impact on an exporting country's trade performance – can be expressed as a function of the weighted average of the exchange rates of countries exporting this same commodity and the weighted average of the exchange rates of commodity-consuming countries, the weights being proportional to these countries' relative share in world exports or imports of the commodity under consideration. The relative importance of exporters' versus that of importers' exchange rates is determined by the size of world supply and demand elasticities of the commodity. For instance, if supply is inelastic but demand elasticities high, importers' exchange rates are given the greater emphasis.

Although developing countries tend to be classified according to their main export products, they are never entirely specialised in these goods. Moreover, on the import side the composition of goods is likely to be quite distinct from that on the export side. As a result, effective exchange rate calculations for developing countries should include a combination of weighting schemes relevant to each of the distinct components of their trade. The above method of calculating effective exchange rates should thus apply to their trade in primary commodities, while a different weighting scheme – preferably one based on double export weights – should apply to their trade in more differentiated manufactured goods.[67]

Such a combination of weighting schemes is adopted by the IMF in its calculation of the effective exchange rates of a number of developing countries. Trade in manufactured goods is broken down by type of good and market, making due allowance for third-market competition; (non-oil) primary commodities are distinguished only by type, with weights constructed as described above.

A number of important caveats have to be made with regard to the use and interpretation of effective exchange rate indices of developing

[67] This procedure would also be useful for a number of industrial economies that have important commodity-producing sectors (such as Australia and Canada).

countries. The first problem concerns the choice of price or cost indicator to be used to deflate nominal exchange rates. As the typically modest market position of developing countries limits their price-setting ability in markets for differentiated goods and as their trade in primary commodities tends to be subject to the law of one price, output price indicators would appear to be less useful in gauging competitiveness than cost indicators. Nevertheless, price series, and in particular consumer prices, are usually the only indicators that are available with sufficient currentness and periodicity.[68] To the extent that these prices are indicative of cost developments, they would, however, also partly cover aspects of cost competitiveness.

Irrespective of the availability of price and exchange rate series, a further cautionary note has to be sounded with respect to the economic relevance of some of these indices. In many developing countries arbitrary price controls distort consumer prices, rendering real effective exchange rates based on such prices less informative or even erroneous. Moreover, in many countries black market exchange rates coexist with official ones and not infrequently different exchange rates apply to distinct types of current account transactions. As Edwards (1989) and Wood (1991) indicate, effective exchange rate trends can differ significantly depending on which exchange rate is used.[69]

Finally, even though the adoption of a framework in which primary commodities are traded in a single world market is in principle sound, this approach is not always representative of actual price and quantity mechanisms in these markets. Buffer stock agreements, quotas and bilateral trade arrangements can drive a wedge between prices actually charged and those that would theoretically clear markets. In such circumstances weighting schemes derived on a commodity-by-commodity basis

[68] Wood (1991) uses GDP deflators to calculate real effective exchange rates. Apart from conceptual issues, including the valuation of subsistence agricultural activities and government services, this approach implies that only annual data can be calculated and that the most "recent" data relate to developments that took place several years earlier. In his 1991 study, the latest observations were for 1984.

[69] Comparing China's average real effective exchange rate in 1980-84 with its average level in 1960-64, Wood (1991) estimates that no real depreciation took place when black market rates are used, while official rates show a depreciation of nearly 40%. The divergent behaviour between the two series was due to the narrowing of the discount of the black market rate to the official rate. Edwards (1989) finds that in nearly half of the twenty-eight developing countries with significant parallel foreign exchange markets, the real rate calculated on the basis of the black market rate was negatively correlated with that calculated on the basis of the official rate between 1963 and 1983.

would need to be adapted to the particular conditions prevailing in these markets.

Recent developments

Large gains in competitiveness have been realised in many major regions outside the industrial world since the early 1980s. According to IMF calculations based on the methodology described above, relative consumer prices expressed in a common currency fell by between 17% (in Latin America) and 60% (in Africa and Asia) between 1980 and the middle of 1993 (see Graph 11).[70] In the Middle East, however, relative consumer prices rose by 40% between 1980 and late-1992.[71]

The real effective depreciation in many regions of the developing world represented a significant turnaround from developments in earlier years. In Latin America and Africa competitiveness had deteriorated markedly in the late 1970s and early 1980s, given many countries' reluctance to adjust exchange rates to growing inflation differentials vis-à-vis their major trading partners. Mostly for the purpose of correcting imbalances in their balance of payments against the background of terms-of-trade losses, slowing export market growth, the debt crisis and rising domestic inflation, many countries in these regions adopted a floating exchange rate system in the course of the 1980s.[72] As a result, they saw their currencies depreciate significantly against the US dollar, the main intervention currency, when the dollar itself weakened sharply against other major currencies. While the real depreciations continued thereafter in Africa and Asia, real exchange rates in Latin America tended to appreciate between 1987 and the middle of 1993.[73] In part this was due to rising capital inflows putting upward pressure on nominal exchange rates.

[70] It should be noted that the country coverage for Africa is not complete, including only 85% of that continent's total GDP, and that South Africa is included in this regional average.

[71] This rise owed much to significant terms-of-trade improvements in many of the region's countries in the first half of the 1980s. Note that during the first half of 1993 the real effective rate for the Middle East is likely to have depreciated sharply as a result of the very marked exchange rate adjustments that took place in Iran.

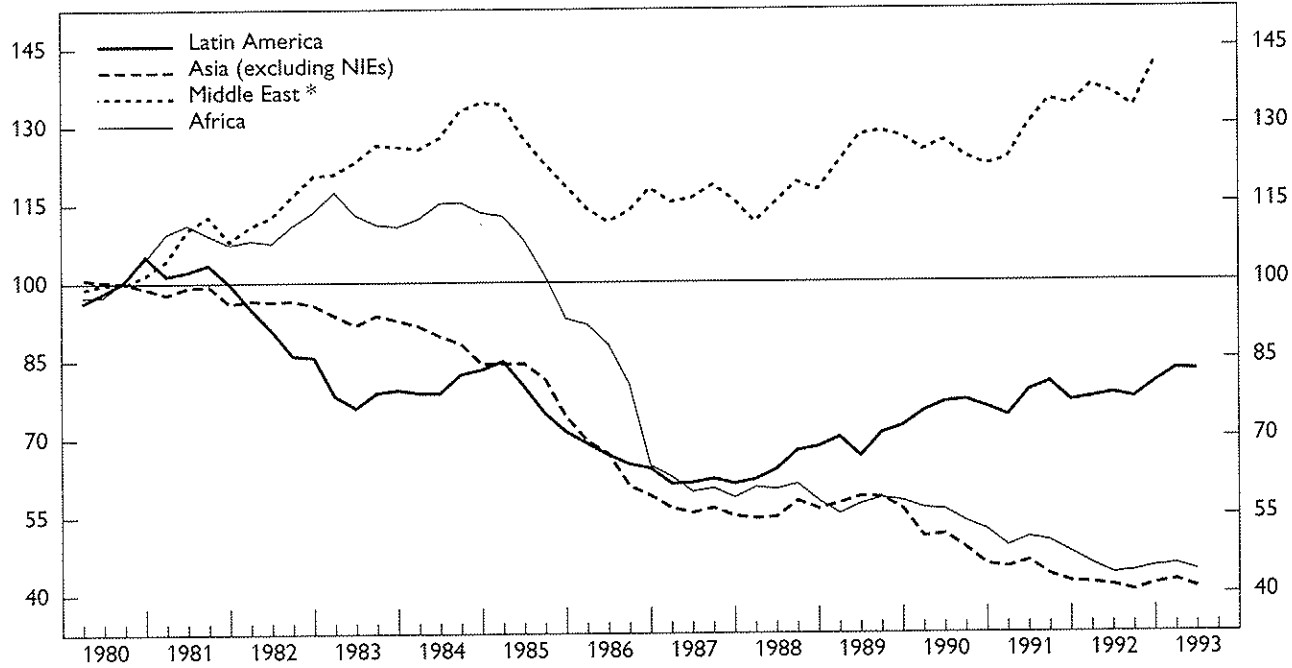
[72] This change was also motivated by the desire to improve resource allocation by better integrating official and (black market) parallel foreign exchange markets. For a description of exchange rate arrangements in developing countries, see Aghevli, Kahn and Montiel (1991).

[73] It should be noted, however, that regional developments at times masked quite contrasting trends in individual countries. For instance, the slow appreciation of Latin America's real effective rate after 1987 was the outcome of a marked deterioration in the price competitiveness of the two major economies in that region – Brazil and Mexico – and the strong competitive position maintained in other Latin American countries.

Graph 11

Real effective exchange rates: developing countries

1980 = 100



* Including Cyprus, Malta and Turkey.

Source: IMF.

Countries in transition

The recent reorientation of former Comecon countries towards international markets has focused much attention on the measurement of competitiveness in these countries. The absence of well-established measures of unit labour costs compels reliance on what price indicators are available – usually consumer or producer prices. However, choosing between these two is far from easy. While certain purely statistical features of consumer price indices – a wide range of goods surveyed, high frequency and so on – would suggest good statistical quality, their value in a period of price liberalisation is severely compromised. In particular, the increase in measured prices from a price control period to a period of liberalised prices is likely to overstate inflation because inflation under price control tends to be disguised (by changes in quality, availability, etc.).[74] Hence, a loss of competitiveness revealed by consumer price-based real effective exchange rates during the last few years may be more apparent than real.

This difficulty might prompt the use of producer prices were it not for the problems of relying on such prices. To the extent that relatively homogeneous semi-finished products are important, the scope for sizable deviations from "world" prices would, in the absence of trade or other restrictions, in any case be limited, suggesting that indices based on producer prices would not be a guide to competitiveness. Moreover, certain features of the recent transition process may have meant that actually observed prices were not good guides to underlying and sustainable competitiveness. The sale of the excessive stocks typically held by enterprises in command economies and the absence of hard budget constraints on many enterprises during the early years of transition are two important factors that may have distorted prices. If producer prices were thus "artificially" depressed, then the loss of competitiveness would be understated.[75]

Real effective exchange rates based on both price measures are shown for the countries most advanced in transition in Graph 12. It can be seen that there is a marked divergence between the two measures.

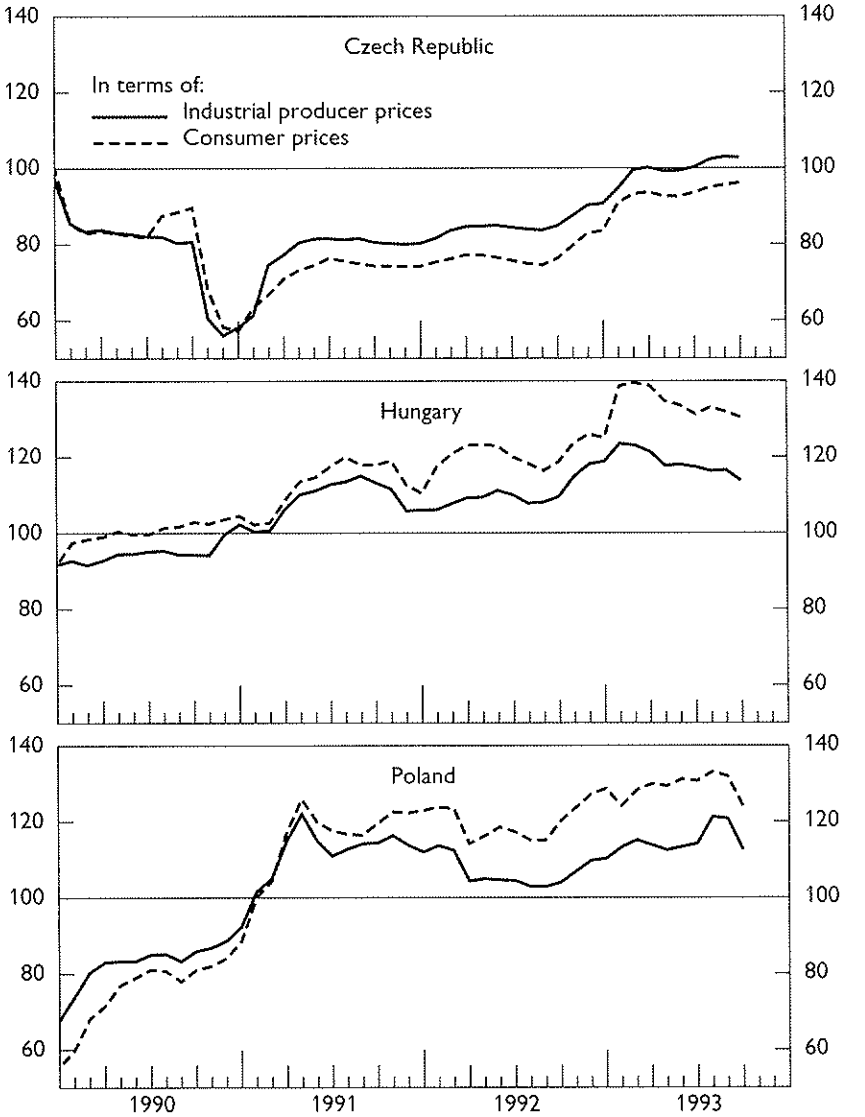
[74] For an illuminating discussion of index number biases under price liberalisation, see Osband (1992).

[75] Similar arguments would of course apply to measures based on export prices or unit values.

Graph 12

Real effective exchange rates in selected eastern European countries

1980 = 100



Source: BIS.

IV. Measuring the level of competitiveness

Most measures of competitiveness are only measures of *changes* in competitiveness. This section considers two approaches to measuring levels of price or cost competitiveness at a given point in time. The first is based on purchasing power parity calculations and the second on estimates of unit labour costs in a common currency (usually US dollars).

Purchasing power parities (PPPs)

The notions that international trade tends to bring prices in different countries into equality, and that any deviation of actual prices in any particular country from world prices can be taken as a symptom of disequilibrium, have a long history in economic thought. The theory of price equalisation under international trade was already being expounded in the early nineteenth century.[76] The term purchasing power parity appears to have been first coined by Cassel *as a first approximation* to the calculation of new equilibrium exchange rates after the abandonment of the gold standard in 1914 and in the light of very rapid wartime and post-war inflation.[77] However, he explicitly recognised the influence of other factors on actual exchange rates such as differential trade restrictions, capital movements and expectations.[78]

Earlier writers had recognised that not all goods were equally tradable, and Harrod's pre-war textbook contains a rather complete exposition of how the price levels of different kinds of goods compared internationally.[79] He distinguished three classes of goods: *international goods*, by which he meant homogeneous goods for which a well-defined world market existed (mainly foodstuffs and raw materials); *quasi-international*

[76] Wheatley (1803) wrote "the facility with which the reciprocal communication of nations is carried on, has a necessary influence on the markets of all, and approximates the price of their produce to a general level". (Cited in Angell (1926), who provides a very full survey of the early literature on international price relations.)

[77] ".... the purchasing power parity is here calculated on a basis of the fall in the value of money since 1914. Consequently we start from a rate of exchange which has existed at a certain equilibrium of international trade .... [although relative prices within a country have also changed] .... the depreciation in the value of money has been so tremendous and has gone to such different lengths in different countries, that the dislocation of the exchanges brought about thereby must have quite paramount importance." Cassel (1922), pp. 141-2.

[78] Kravis and Lipsey (1983) provide a useful summary of the earlier literature.

[79] In a chapter entitled "Comparative price levels" in Harrod (1939).

goods, by which he meant goods subject to product differentiation so that apparently similar goods could command different prices; and, finally, *domestic goods* sheltered from international competition – he included most services and non-tradable capital equipment.

Although the price levels of international goods in different countries tended to converge (with quasi-international goods showing a weaker tendency to convergence), the price levels for domestic goods in different countries would be the same only in certain rather special and unlikely circumstances.[80] Moreover, he added, all retail goods contained significant domestic-good elements so that purchasing power parity was unlikely to hold for the general price level.

In addition, Harrod suggested that international differences in productivity were likely to be much greater for international than for domestic goods. As a result, the prices of domestic goods would tend to be higher in the more efficient countries. This key insight, restated by Balassa (1964), became the differential productivity model of the relative price of tradables (i.e. international and quasi-international goods in Harrod's parlance) and non-tradables (domestic goods).[81] According to this model, world markets determine the prices of tradable goods; wages in the tradable sector depend on productivity and determine wages in the non-tradable sector; because international differences in productivity are smaller for non-tradables than for tradables, prices of non-tradables are higher in higher-productivity or higher-income countries.[82]

A considerable amount of statistical effort has gone into calculating purchasing power parities during the post-war period.[83] The first group

[80] The three conditions he set out were:
(a) the relative efficiency of producing international and domestic price goods must be the same in the two countries,
(b) the ratio of factor rewards in the international goods industry to the domestic goods industry be the same,
(c) the ratio of the price mark-up over cost for international and domestic goods must be the same for both countries.

[81] Marris (1984) records that Ricardo noted this rule much earlier (in 1821): "the prices of home commodities are ... higher in those countries where manufactures flourish".

[82] This model is based on the Salter-Swan two-sector model of an open economy. Various Scandinavian writers developed it in the context of incomes policy formulation (notably Aukrust & Holte – see, e.g., Aukrust (1977)), stressing the importance of the export sector in wage formation. French work in a similar vein stressed the importance of import prices (notably Courbis (1975)).

[83] Kravis (1984) summarises earlier studies of purchasing power.

was a series of studies sponsored by the OEEC.[84] These studies had the original feature of estimating purchasing power parities according to two expenditure bundles – the US and European expenditure patterns respectively. As may be expected from consumer demand theory, the different weighting systems made a very large difference indeed to the calculation: for instance, one pound sterling was "worth" $3.47 when a typical US bundle of goods had to be bought, but worth $4.59 for a typical European bundle.[85] Further studies by the United Nations, the World Bank and other institutions greatly expanded the country scope of PPP calculations.

The organisation of huge expenditure surveys by Eurostat in the 1970s (under the auspices of the UN's International Comparison Project (ICP)) led to the development, for European Community countries, of extremely detailed price comparisons as a basis for PPP calculations of many expenditure categories.[86] In the early 1980s the OECD extended the comprehensive Eurostat surveys to its non-EC members. These surveys were the most detailed yet, and, for the 1990 surveys, the products list covers over 2,150 consumer goods and services, thirty occupations in government, education and health services, 250 types of equipment goods and twenty-three construction projects.[87]

Table 8 summarises purchasing power parity calculations for GDP over forty years – the first in 1950, and the latest in 1990. It is clear from this table that exchange rates have *not* in general reflected the relative purchasing power of the currency – perhaps the first, important conclusion of studies of purchasing power parity.[88]

To some extent the discrepancy between PPPs and actual exchange rates reflects the importance of non-tradable goods, which tend to be more expensive in the higher-income countries, as Harrod had argued. A large number of empirical studies have indeed confirmed that the ratio of purchasing power parity to the exchange rate is positively related to real per capita GDP. Just how important this relation was in 1990

[84] Reported in Gilbert and Kravis (1954) and Gilbert et al. (1958).

[85] The official exchange rate was $2.80 to the pound (Gilbert and Kravis (1954), p. 24).

[86] Perhaps the fullest description of Eurostat's methodology accompanied the publication of the 1980 Survey (see Eurostat (1983)).

[87] OECD (1992b), p. 5. The product specifications used were extremely detailed: for instance, "cheese" included a "250 gramme pack of Camembert cheese". See Blades and Roberts (1987) for further details.

[88] It might be noted that Tootell (1992) finds that PPP does not even hold for regions within the United States – largely because of non-traded goods.

Table 8

Forty years of PPP calculations[1]

Country	1950			1960			1980			1990		
	PPP[2]	Exchange rate	Exchange rate's deviation from PPP (%)	PPP[2]	Exchange rate	Exchange rate's deviation from PPP (%)	PPP[2]	Exchange rate	Exchange rate's deviation from PPP (%)	PPP[2]	Exchange rate	Exchange rate's deviation from PPP (%)
United States ...										0.88[3]	1.00	−12.0
Japan				225.0	359.6	−37.4	240.0	227.0	+ 5.7	172.0	145.0	+18.8
Canada				1.070	0.996	+ 7.4	1.080	1.170	− 7.7	1.150	1.170	− 1.5
Europe			−28.4			−31.0			+13.8			+ 6.4
France	264	350	−24.6	3.50	4.90	−28.6	5.24	4.23	+23.9	5.82	5.45	+ 6.9
Germany	3.02	4.20	−28.1	3.00	4.17	−28.1	2.37	1.82	+30.2	1.84	1.62	+13.9
Italy	435.0	625.0	−30.4	448.0	620.6	−27.8	749.0	856.0	−11.3	1,251.0	1,198.0	+ 4.4
United Kingdom	0.251	0.357	−29.7	0.226	0.357	−36.7	0.487	0.430	+13.3	0.530	0.560	− 5.4
Belgium	40.8	50.2	−18.7	37.1	50.0	−25.8	36.6	29.2	+25.4	34.7	33.4	+ 3.8
Netherlands ...	2.33	3.80	−38.7	2.38	3.77	−36.9	2.53	1.99	+27.1	1.91	1.82	+ 4.9
Spain				31.05	60.00	−48.3	63.65	71.70	−11.2	96.40	101.90	− 5.4
Sweden				4.21	5.18	−18.7				8.22	5.92	+38.9
Switzerland				3.68	4.32	−14.8				1.94	1.39	+39.7

[1] Shown as units of local currency per US dollar, so that a fall indicates an appreciation. The figures for France in 1950 refer to old French francs. [2] Geometric mean of estimates based on different expenditure weights. [3] Before the 1990 survey PPPs were published with the United States as reference country (so that the US PPP was unity by definition); in 1990 PPPs were calculated in terms of the OECD as a whole (so that the US PPP differed from unity).

Sources: Gilbert and Kravis (1954), Gilbert and associates (1958), Beckerman (1966), Ward (1985) and OECD (1992b).

Table 9

Regression analysis of the ratio of PPPs to the actual exchange rate in 1990

Equation number		Coefficient of GDP per head[1]	F-statistic	$\bar{R}^2$
(i)	GDP	0.55 *5.5*	30.6	0.58
(ii)	Government-affected non-tradable goods and services[2]	0.89 *9.0*	81.5	0.79
(iii)	Other non-tradable goods and services[3] . .	0.52 *4.6*	21.6	0.50
(iv)	Tradable goods[4]	0.13 *1.2*	1.3	0.02

Notes: (1) The equations were estimated in the form:
log PPP/ER = a + b log YPC
where PPP is the purchasing power parity exchange rate for the relevant expenditure group, ER is the average spot exchange rate, YPC is per capita income in US dollars valued at PPP and exchange rates are expressed in units of local currency per US dollar.
(2) The regressions were estimated over all OECD countries except Iceland and Luxembourg.

[1] t-statistics shown in italics. [2] Rent, fuel, and power; medical and health care; government final consumption expenditure. [3] Purchased transport services; education, recreation and culture; restaurants, cafes and hotels, and construction. [4] Gross fixed capital spending on machinery and equipment.

Sources: OECD (1992b), *National Accounts Vol. II*, national data and BIS.

can be seen from Table 9, where the results of some simple regressions are tabulated.[89]

These regressions are based on all OECD countries with the exception of the two very small ones – Iceland and Luxembourg. The equation for GDP as a whole (equation (i) in the table) indeed shows a strong, positive relationship: on average a 1% increase in real per capita GDP relative to other OECD countries increases the PPP/ER ratio by 0.55%. Equations (ii) and (iii) – which attempt to separate those elements of non-tradable expenditure that are in many countries heavily influenced by government policy (and so may be distorted from the more

[89] Balassa (1964), Kravis and Lipsey (1983, 1987 and 1988) and Clague (1986) report similar regression results, although usually including a larger number of explanatory variables.

Table 10

Actual exchange rate as a percentage of the PPP exchange rate "predicted" by real per capita income in 1990

Below 85%					
United States	69.5	Canada	82.7	Portugal	82.7
Between 85% and 115%					
New Zealand	86.1	United Kingdom	88.1	Australia	88.4
Turkey	92.0	France	94.8	Belgium	95.2
Italy	97.0	Netherlands	98.3	Germany	98.4
Austria	99.4	Spain	104.0	Japan	104.4
Greece	111.4	Switzerland	111.9		
Above 115%					
Ireland	117.2	Denmark	120.7	Sweden	124.5
Norway	126.8	Finland	134.1		

Note: For explanations, see text.

market-oriented non-tradables) – show that the relationship is particularly strong for non-tradables. Hence the international configuration of the prices of non-tradable goods does indeed depend on relative income levels as the differential productivity model suggests.[90]

The definition of "true" tradable goods is more difficult. A number of potentially tradable goods (e.g. agricultural products, textiles, etc.) are excluded because trade is at present distorted by various protectionist arrangements. Others are excluded because heavy indirect taxation distorted the comparison (e.g. cars for personal use).[91] This left the category of machinery and equipment investment. The PPP/ER ratio for this sector showed no significant relation with per capita GDP (see equation (iv)), suggesting that prices for these goods were not influenced by relative income levels.

Differences between the actual and predicted PPP/ER ratio (using the GDP equation (i)) for 1990 are shown in Table 10. The largest difference is that for the United States: the PPP/ER ratio is about 30% below what (high) US per capita income would lead one to expect. For both

[90] Discussed more fully from pp. 93 below.

[91] The PPPs tabulated by the OECD are based on expenditure statistics valued at market prices (i.e. including indirect taxes). In a number of smaller countries, the PPP for personal transport equipment was three times that of the average PPP for total GDP (because of extremely high taxes on private car purchase).

Germany and Japan, however, the difference is very small. The Nordic countries, by contrast, typically have PPP/ER ratios well above predicted levels.[92]

The theoretical expectation that international goods arbitrage would keep PPPs for tradable goods closer to the actual exchange rate (i.e. prices in a common currency would tend to converge) than PPPs for non-tradable goods is only partly borne out by the data (see Table 11). For Japan, Canada, Australia and New Zealand the PPP for tradables is indeed much closer to the actual exchange rate than is that for non-tradables. But this is not the case either for the United States or for Europe, where the PPP/exchange rate divergences are greater for tradables than for non-tradables. One possible explanation is that both the United States and Europe represent large economic areas where intra-area trade dwarfs trade with the outside world. Goods arbitrage between these areas is imperfect, thus allowing sometimes large price differentials between the United States and Europe. In particular, much European trade is intra-European and apparently takes place at prices quite different from those prevailing in the outside world. One indication that intra-European trade does bring traded goods prices in Europe closer together is that the variance of the PPPs for tradables is, within Europe, rather small, while that for non-tradables is relatively large.[93]

Whatever the explanation, the finding that European tradables prices are about one-quarter above, and those in the United States one-quarter below, industrial world average prices has important implications for any assessment of the relative competitiveness of the two areas. It suggests that European exchange rates in 1990 were too high relative to the dollar – an issue which will be further examined below.

Nevertheless, most European countries' exchange rates vis-à-vis the Deutsche Mark were (in 1990) remarkably close to the ratio of their

[92] High indirect taxation is probably one reason for this difference. Adding the ratio of indirect tax receipts/GDP to equation (i) in Table 8 gives:

$$\log (PPP/ER) = \text{Constant} + 0.58 \log YPC + 0.22 \log (T/Y)$$
$$(6.0) \qquad (1.7)$$

$R^2 = 0.62$ F-statistic = 18.1

This provides only limited support for the view that part of the difference reflects indirect taxation (a coefficient of log (*T/Y*) closer to unity – i.e. a one-for-one relation between taxes and prices – would have provided stronger support).

[93] A similar finding was noted in a recent report by the Committee of Governors of the EC central banks. This report found that the differential between inflation in the non-traded sector and that in the traded sector was larger in 1992 than it had been for a decade. (European Community (1993), p.14).

Table 11

The exchange rate and PPPs for tradables and non-tradables in 1990

	Actual exchange rate	PPP for non-tradables	Exchange rate deviation from PPP (%)	PPP for tradables	Exchange rate deviation from PPP (%)
United States . .	1.000	0.822	− 17.8	0.759	− 24.1
Japan	144.8	188.5	+ 30.2	149.0	+ 2.9
Canada	1.167	0.993	− 14.9	1.100	− 5.7
Australia.	1.280	1.172	− 8.5	1.270	− 0.8
New Zealand . .	1.675	1.458	− 12.9	1.650	− 1.5
Europe[1]			+ 7.8		+ 23.3
France	5.445	5.711	+ 4.9	7.040	+ 29.3
Germany	1.616	1.840	+ 13.9	2.000	+ 23.8
Italy	1,198	1,332	+ 11.2	1,612	+ 34.5
United Kingdom	0.560	0.590	+ 5.4	0.661	+ 18.0
Austria	11.37	12.82	+ 12.8	12.70	+ 11.7
Belgium	33.42	36.12	+ 8.1	39.80	+ 19.1
Netherlands . . .	1.821	2.011	+ 10.4	2.140	+ 17.5
Switzerland . . .	1.389	1.915	+ 37.9	1.780	+ 28.1
Denmark	6.189	8.190	+ 32.3	8.290	+ 34.0
Finland	3.823	5.579	+ 45.9	5.240	+ 37.1
Norway	6.260	7.893	+ 26.1	9.650	+ 54.2
Sweden	5.919	8.750	+ 47.8	6.930	+ 17.1
Greece	158.4	125.5	− 20.8	198.0	+ 25.0
Ireland	0.603	0.617	+ 2.3	0.712	+ 18.1
Portugal	142.6	88.9	− 37.6	170.0	+ 19.3
Spain	101.9	105.4	+ 3.4	128.6	+ 26.2
Turkey	2,613	1,343	+ 48.6	1,900	− 27.3
Absolute mean[2]			20.6		21.6
Variance			638.0		376.0

[1] Weighted average using PPP-valued GDP weights in 1990. [2] Unweighted.

PPP for tradables to that of Germany (see Table 12). For example, these purchasing power calculations for tradable goods yield a PPP of French francs 3.52 per Deutsche Mark, very close to the actual exchange rate during 1990. With two exceptions, the exchange rates vis-à-vis the Deutsche Mark of the ERM currencies were all within 5% of the ratio between these countries' and the German PPP for tradables. The two

exceptions were Italy and Denmark, but even in these countries the gap was still less than 10%.

The closeness of the actual to the PPP exchange rate is not of itself evidence that exchange rates are in line with price competitiveness.[94] It merely shows that goods markets are well integrated, and that producers in each country are largely price takers. How *competitive* producers are depends on cost differences which are not equalised by international competition – and this focuses attention on labour costs.

Labour costs in US dollars

Hourly labour costs

The simplest comparisons of labour costs internationally are those obtained by using current exchange rates to translate hourly wage rates into a common currency. The US Bureau of Labor Statistics, Eurostat and the Swedish Employers' Confederation, the main sources of such data, extend such comparisons by incorporating also estimates of non-wage labour costs such as holiday pay, employer social security contributions and payroll taxes.[95] The latest estimates of the Bureau of Labor Statistics (those for 1992) are shown in Table 13.

One striking development that emerges from this table is the extent to which the ordering of labour costs among industrial countries has changed over the last fifteen years or so. In 1975, Japanese and UK hourly wages were less than half US levels; Germany and some other northern European countries had wages broadly in line with those in the United States. In southern Europe they were much lower, about one-third of US levels. Wages in the Asian NIEs as a whole were only about 8% of US rates, with big differences between the four economies. By 1992, the gap between US and Japanese wages had been eliminated, as had that between those in the United States and the United Kingdom. Moreover, all other major European countries had higher hourly wage costs than the United States, with German, Swedish and Swiss hourly labour costs being the highest. In particular, non-wage

[94] However, marked divergences of actual from PPP exchange rates for tradable goods – as seen between Europe and the United States – do suggest that exchange rates are out of line with relative price competitiveness.

[95] Eurostat conducts detailed surveys for European Community countries every four years (the latest, covering 1988, is reported in Eurostat (1992a)), with less detailed and partly estimated results also published for the intervening years (Eurostat (1992b)).

Table 12

European exchange rates vis-à-vis the Deutsche Mark and PPPs for tradables in 1990

	Average exchange rate against the Deutsche Mark	Ratio vis-à-vis the German PPP for tradables
France	3.37	3.52
Germany	1.00	1.00
Italy	742	806
United Kingdom	0.347	0.331
Austria	7.04	6.35
Belgium	20.7	19.9
Netherlands	1.13	1.07
Switzerland	0.86	0.89
Denmark	3.83	4.15
Finland	2.37	2.62
Norway	3.87	4.83
Sweden	3.66	3.47
Greece	98.0	99.0
Ireland	0.373	0.356
Portugal	88.2	85.0
Spain	63.1	64.3

labour costs are much higher in Europe than in the United States. Moreover, the gap between wages in northern and southern Europe closed considerably. Finally, wages in the four Asian NIEs rose to about 30% of US levels, and the cross-country differences narrowed appreciably.

Measures of wage or labour costs, however, fail to take account of productivity differences, which typically explain much of the international differences in wage costs. The measurement of productivity faces formidable difficulties – aggregating labour of different qualities, measuring the capital stock, allowing for differences in the composition of output and so on.[96] Two distinct approaches have been adopted in an attempt to quantify productivity differences between countries. The first has relied on detailed industry-based data, sometimes using such data to build up an aggregate picture. This is probably the ideal approach, but it is a laborious statistical task. In recent years, however, a series of mainly

[96] See Griliches (1987) for a concise discussion of the various measurement problems.

Table 13

Hourly wage and labour costs in manufacturing in US dollars[1]

	Direct pay[2]	Social insurance and other non-wage costs	Total hourly compensation	Memo item: Hourly compensation relative to US levels	
	1992			1975	1992
United States	12.52	3.65	16.17	100.0	100.0
Japan	14.04	2.12	16.16	47.2	99.9
Canada	14.47	2.55	17.02	94.0	105.3
European G-10 countries[3]	15.10	4.90	20.00	79.9	123.7
France	12.07	4.81	16.88	71.1	104.4
Germany	20.03	5.91	25.94	99.8	160.4
Italy	13.47	5.94	19.41	73.4	120.0
United Kingdom	12.27	2.42	14.69	53.0	90.8
Belgium	16.07	5.94	22.01	100.8	136.1
Netherlands	16.04	4.68	20.72	103.5	128.1
Sweden	16.65	7.58	24.23	112.9	149.8
Switzerland	19.45	3.81	23.26	95.8	143.8
Other European countries[3]	8.74	2.74	11.47	36.2	71.0
Greece	5.59[4]	1.34[4]	6.93[4]	26.6	42.9[4]
Spain	10.10	3.29	13.39	39.8	82.8
Portugal	3.81	1.20	5.01	24.8	31.0
Australia	10.96	1.98	12.94	87.7	80.0
Asian NIEs[5]	..	..	4.84	7.9	29.9
Hong Kong	3.77	0.12	3.89	11.9	24.1
Singapore	4.24	0.77	5.00	13.2	30.9
South Korea	4.38	0.55	4.93	5.2	30.5
Taiwan	4.81	0.38	5.19	6.3	32.1
Mexico	..	..	2.35	22.6	14.5

[1] Production workers in manufacturing. [2] Includes holiday pay and seasonal bonuses. [3] Weighted average using PPP-valued GDP weights in 1990. [4] Estimated. [5] Trade-weighted figures as published by the US Bureau of Labor Statistics.

Source: US Department of Labor, Bureau of Labor Statistics, *International comparisons of hourly compensation costs for production workers in manufacturing, 1992* (Report 844, April 1993).

bilateral studies have been undertaken as part of the International Comparison of Output and Productivity (ICOP) project. To value output at internationally consistent prices, these studies compare ex-factory average

values for comparable specific products, and apply the unit value ratios thereby calculated to output for a whole industry or branch. As a result of this work a more accurate picture of relative productivity levels is now emerging for a growing number of countries.[97] However, one disadvantage of the industry approach is that it relies on measures of *gross* output, and so includes intermediate inputs as well as value added.

The second approach is to take the short cut of relying on more aggregate data (usually from the national accounts), a method inevitably dependent on certain rather strong assumptions.[98] Nonetheless, the focus on a value-added measure, rather than a gross output measure, is theoretically correct. Also, the less onerous statistical requirements of this approach do allow its extension not only to many different sectors of the economy (which do not in any case have the detailed production-based data found for manufacturing industry) but also to a larger number of countries. A further advantage is that the definition of labour costs in the national accounts (compensation of employees) can be somewhat broader than the wage costs of production workers (which is usually used in the "micro" studies). Following this approach, one logical way to value output at internationally consistent prices is to use purchasing power parity exchange rates. The main stumbling block in the way of that approach is that PPPs are derived from domestic expenditure and not from output, and are therefore not ideally suited to valuing outputs in different countries. For aggregate GDP this problem can be circumvented by subtracting total net imports and indirect taxes from total expenditure; but this is not easy to do for one specific sector of the economy – e.g. manufacturing – without making certain strong assumptions. The second-best approach underlying the results presented below was to take a weighted average of the PPPs of those categories of expenditure that largely contain manufacturing goods.

Although the various studies have yielded somewhat different estimates of relative productivity levels, there is an underlying picture that emerges independently of the precise method of calculation – as the different estimates cited in Table 14 clearly demonstrate. Studies that follow the "micro" approach are summarised in the first three columns.

[97] These studies are reviewed in van Ark (1993). The various studies are shown in Table 14.

[98] Hooper and Larin (1989) is one well-known example.

The fourth column shows the results of applying the second approach – using PPPs to value manufacturing output as measured in the national accounts.[99]

There is of course no single "best" approach and each measure has certain defects. One important finding of the "micro" studies is that relative productivity levels vary considerably across industries: a country may have a relative advantage in industry X but not in industry Y. This cross-industry variability is particularly evident in bilateral comparisons involving Japan.[100] This underlines the need to treat with considerable caution any measure of differences in average productivity levels in manufacturing industry as a whole.

The estimates in the various studies cited are averaged in the final column of Table 14. By 1990, Japanese hourly productivity is estimated to have been about 15% below US levels. The evidence suggests that part of this gap can be explained by the greater capital intensity of US industry and by differences in the structure of manufacturing. European productivity appears to be further behind US levels – an average of about 20–25% below – yet the studies find that relatively little of this gap can be accounted for by purely capital-intensity or compositional effects.[101] Moreover, labour productivity within Europe varies rather widely, with that in the United Kingdom being particularly low.

The average estimates of hourly productivity can be combined with the estimates of total compensation from the national accounts to yield estimates of levels of unit labour costs (see Table 15).[102] The most striking conclusion which can be drawn from this calculation is that European unit labour costs in 1990 were much higher than those in the rest of the world. German labour costs, for instance, were about 50% above US levels. By contrast, US and Japanese unit labour costs were rather close together. There was a wide dispersion in European unit labour costs, with Belgium and (especially) the Netherlands facing costs that were rather low by European standards even if still 30% or so above

[99] The methodology employed to derive these estimates is described in detail in Appendix III.

[100] A number of studies have found that Japan's productivity levels are particularly high in certain sectors (e.g. electrical goods). A rather detailed study by Jorgenson and Kuroda (1990) found that US/Japanese relative productivity by industry diverged sharply in the 1980s.

[101] Table 4 of van Ark (1993) summarises various factors explaining the productivity gaps uncovered.

[102] Unit labour costs can of course be derived directly, viz. total labour earnings divided by value added. See Appendix III for details.

Table 14

Comparative estimates of relative labour productivity in manufacturing in 1990

Output per hour valued at PPPs, in dollars; US output per hour = 100

Study	Szirmai and Pilat (1990)	Daly (1988)	ICOP/ NIESR[1]	National accounts[2]	Geometric mean
Base year of original estimates[3]	1985	1986	1984 & 1987	1990	1990
United States . . .	100.0	100.0	100.0	100.0	100.0
Japan	86.6[4]	93.0	87.8	78.1	86.2
Canada	–	64.9	–	78.6	71.4
Australia				57.2	57.2
Europe[5]					72.0
France	–	71.2	78.0	83.1	77.3
Germany	–	86.5	83.4	81.8	83.9
Italy	–	65.3	–	62.0	63.6
United Kingdom .	–	42.5	62.4	50.4	51.1
Belgium	–	83.6	–	87.3	85.4
Netherlands . . .	–	–	91.0	95.8	93.4
Sweden	–	71.3	–	83.0	76.9
South Korea	16.6[4,6]	–	–	29.2	22.0
Taipei China				31.7	31.7

[1] Based on a series of articles in the *National Institute Economic Review* [see van Ark (1990a, 1990b, 1992) and O'Mahony (1992)] and the ICOP project at the University of Groningen [see Pilat and van Ark (1992)]. [2] See Appendix III for details of this calculation. [3] All estimates have been re-based to 1990, using the changes in output per hour calculated by the US Bureau of Labor Statistics. [4] Geometric average of estimates prepared at different relative prices structures which were, respectively:

	US prices	Japanese/South Korean prices
Japan	90.2	64.6
South Korea	19.2	10.8

[5] Weighted average using PPP-valued GDP weights in 1990. [6] For South Korea, the update uses the ratio of industrial production to the product of manufacturing employment and average weekly hours in manufacturing (from IMF *International Financial Statistics* and ILO *Bulletin of Labour Statistics*).

US levels.[103] It is notable that the large difference between Europe and the United States is similar to the difference in price levels observed in the previous section on purchasing power parities (see page 78 above). Canadian unit labour costs were also well above US levels, mainly because of much lower productivity. Unit labour costs in the two Asian NIEs shown in this table remained well below those in the industrial world. Anticipating some of the findings to be presented in Section V below (see in particular Graph 19), this configuration of competitiveness levels appears to have affected the differing trends in the structure of output: the higher are absolute labour costs the more likely is it that the tradable share of output shrinks.

It is of considerable interest to combine these estimates of unit labour cost levels with the standard measures of changes in unit labour costs so that the actual 1990 levels can be used as the base indices. The results are shown in Graph 13. It can be seen from the graph that the correction in the value of the dollar that began in 1985 had effects on the Asian economies that were quite different from those on the European economies. While the rise of the dollar moved unit labour costs in the Asian NIEs towards the levels prevailing in the United States, their absolute levels remained low. Even Japanese unit cost levels had moved only a little above US levels by 1990; only in recent months did a much stronger yen put Japanese cost levels well above those in the United States.

In Europe, however, currency movements during the second half of the 1980s had the effect both of driving European unit costs well above US levels and of widening Japan's cost advantage over Europe. Moreover, these gaps tended to increase during much of 1991 and into 1992. Indeed they reached a peak in mid-1992, just before the European exchange market crisis broke. The subsequent depreciations of most European currencies against the Deutsche Mark combined with a certain strengthening of the dollar had, by late 1993, considerably reduced –

[103] However, US per capita output growth in recent years is overstated: a rebasing of output using 1987 price weights reduces the weight of computers and related products and leads to a lower estimate for the growth of real GDP in manufacturing. See US Department of Commerce *Survey of Current Business* (May 1993), pp. 36–7. Professor Donald Daly drew attention to this important revision, and pointed out that this would mean that the studies shown in Table 14 probably overstate the United States' productivity edge over the rest of the industrial world. The graphs in this paper that use national accounts estimates are based on 1982 weights.

Table 15

Average hourly compensation, productivity and unit labour costs in manufacturing

In US dollars, in 1990

	Average hourly compensation (1)	Output per hour valued at PPPs (US = 100) (2)	Unit labour costs[1] (1)/(2)	Memorandum: unit labour costs in October 1993[2]
United States	17.81	100.0	100.0	100.0
Japan	15.38	78.1	110.6	165.9
Canada	16.88	78.6	120.6	108.5
Australia	11.49	57.2	112.9	100.3
Europe[3]	18.52	72.7	143.1	136.8
France	21.26	83.1	143.6	142.2
Germany	22.37	81.8	153.5	171.2
Italy	14.81	62.0	134.1	107.4
United Kingdom	13.03	50.4	145.2	126.3
Belgium	20.77	87.3	133.6	125.2
Netherlands	20.58	95.8	120.6	129.1
Sweden	21.66	83.0	146.5	106.0
South Korea	2.40	29.2	46.2	47.0
Taiwan	4.43	31.7	78.6	81.2

[1] Rebased so that United States = 100. [2] Derived by applying BIS unit labour cost indices to the 1990 base year estimates. [3] Weighted average using PPP-valued GDP weights in 1990.

Source: BIS calculations based on national accounts and purchasing power parity calculations: see Appendix III.

but not eliminated – this large unit labour costs gap. According to the calculation shown in the final column of Table 15, average European unit labour costs were still about 35% above US levels by October 1993. This average, however, disguises a marked intra-European divergence created by recent sharp changes in nominal exchange rates. Exchange rate depreciation has brought Swedish and Italian dollar costs broadly down to US levels; by October 1993, Italian and Swedish unit labour costs were only 6–7% above those prevailing in the United States. Although the depreciation of sterling has brought costs more closely in line with other industrial countries, UK unit labour costs were still more than 25% above US levels by autumn 1993.

While the large gap between costs in Belgium, France and the Netherlands and those in the United States has narrowed in recent months,

German costs remain very high. The general implication of these developments is that absolute unit cost levels in individual European countries are now further apart from each other than in recent years.[104] However, the strong appreciation of the yen in the first half of 1993 pushed Japanese unit labour costs levels well above the European average – an excess of some 20% by October 1993. Canadian and Australian unit labour costs have fallen significantly, and the competitive position of the Asian NIEs has been preserved.

National accounts: ULCs for tradables and non-tradables

The calculations using national accounts have the added advantage of broader sectoral coverage. In particular, it is possible to compare unit labour costs in the non-tradable sector with that in manufacturing, the main tradable sector. In this case, however, the absence of data on hours worked in the different non-tradable sectors means that labour costs have to be defined as per year, that is, total compensation of employees divided by total employment.[105] As before, productivity per worker in dollar terms is derived from output valued at PPP, not actual, exchange rates. These calculations of average wage costs and productivity can be combined to yield measures of unit labour costs in dollars.

The results of these calculations for the tradable and non-tradable sectors[106] are shown in Table 16. According to this calculation, unit labour costs of the Japanese *tradable* sector are no higher than those in the United States, and are well below those in Europe – largely because of very high productivity in manufacturing. It is in the *non-tradable* sector that Japanese labour costs are high, largely because of relatively low output per head in that sector. The importance of the tradable/non-tradable distinction is explored more fully in the following section.

[104] This is somewhat paradoxical in light of the fact that the changes in nominal exchange rates that took place in Europe during the period after September 1992 by and large improved the competitive position of those countries which had lost competitiveness in the late 1980s, and conversely. It is not clear how this apparent contradiction can best be reconciled.

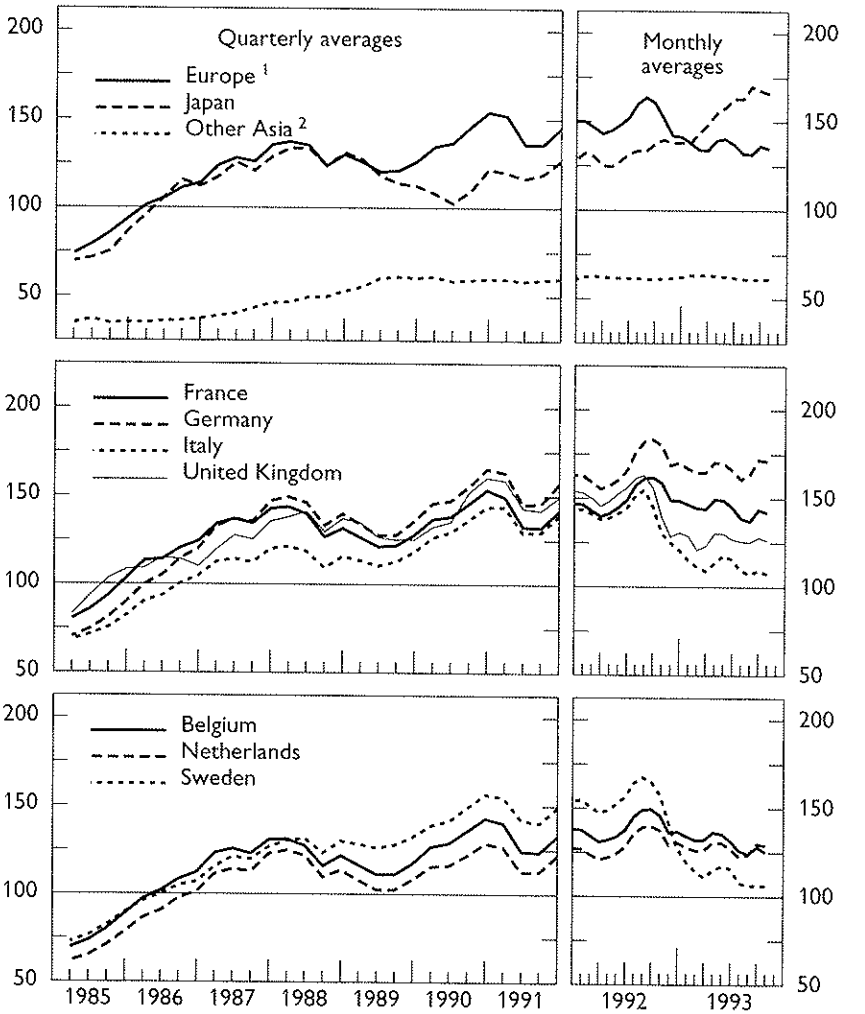
[105] As explained in more detail in Appendix III, these calculations embody an estimate for the earnings of the self or family-employed.

[106] See Appendix III for further details.

Graph 13

Comparative levels of unit labour costs in recent years

In manufacturing, United States = 100



Notes: The estimates of unit labour costs relative to US levels in 1990 (shown in Table 15) have been extended using the estimates of unit labour costs underlying the BIS competitiveness indicators. The averages for Europe and other Asia are weighted according to 1990 GDP valued at PPPs.

[1] Of the European countries shown. [2] South Korea and Taiwan.

Sources: Table 15 and BIS indices of unit labour costs (which have been smoothed): see Appendix III.

Table 16

Unit labour costs in the tradable and non-tradable sectors

In US dollars per unit of output, 1991 estimate

	Tradable sector	Non-tradable sector	Non-tradables as a % of tradables
United States	57.9	57.2	99
Japan	58.5	95.7	164
Canada	72.2	65.9	91
Europe*	83.4	70.2	84
France	76.8	64.3	84
Germany	84.2	60.6	72
Italy	80.4	60.0	75
United Kingdom	93.3	79.9	86
Belgium	72.7	58.1	80
Netherlands	66.4	75.6	114
Sweden	92.2	125.4	136

Note: The tradable sector is all manufacturing; non-tradables are construction, wholesale and retail distribution, restaurants, hotels, transport, storage, communication, social and personal services. Calculations are based on value added (valued at PPPs) and total labour earnings as computed in the national accounts. For further details see Appendix III.

* Weighted average using PPP-valued GDP weights in 1990.

Increased competition with low-cost areas

The need to take account of differences in absolute cost levels finds perhaps its clearest illustration when competition from the emerging economies in Asia is considered. Indeed, it is competition from this area of the world that attracts the greatest comment from industrialists in the developed world. Their perception, at least, is that this competition has, in recent years, become more formidable – a perception supported, moreover, by Asia's greatly increased share of world trade in manufactured goods.

But the traditional indicators of competitiveness – based as they are on changes, not levels – tend to obscure this important force. One important change in the nature of international competition facing industrial countries in recent years is the much greater importance of low-cost areas, particularly – but not exclusively – in Asia.

These Asian countries have, during the last six years or so, seen significant real appreciation of their exchange rates. This means that

index-based measures of competitiveness show that industrial countries' competitiveness vis-à-vis them has improved. Yet their importance in world trade has greatly increased in recent years, so that industrial countries face much greater competition from countries with lower absolute unit labour costs. The calculations of such cost levels for South Korea and Taiwan (shown in Table 15) suggest that labour remains much cheaper than in any major industrial country even when account is taken of productivity differences. Other Asian countries – for which data on absolute levels of unit labour costs are generally not available – have much cheaper labour. The greater presence on world markets of "new" industrialised countries with far lower labour costs than in the "old" industrial world has thus inevitably complicated the assessment of competitiveness.

V. Tradables and non-tradables

The distinction between tradable and non-tradable goods has several implications for the measurement of international competitiveness. The first is that measures of competitiveness based on general or economy-wide price or cost indices may not give an accurate measure of *international* competitiveness. Such indices typically include a mixture of tradable and non-tradable goods (or sectors, in the case of cost comparisons), and movements in the non-tradable sectors may have no *direct* bearing on international competitiveness. However, the word *direct* deserves some emphasis. The efficiency of the non-tradable sector affects the cost of non-tradable supplies to the tradable sector and so *indirectly* influences international competitiveness: see Table 2 above. Concretely, the manufacturing sector draws on extensive non-tradable services – construction, transport, business, financial services and so on – and its success in international markets depends in part on the terms on which it can get these inputs.[107] This issue is all the more important because cross-border differences in non-tradables prices are likely, given the absence of international competition, to be greater than for tradables prices, and enterprises producing tradable goods will in general be forced to rely on indigenous producers of non-tradables. This is explored in more detail below.

The second implication concerns the interpretation of tradable goods prices. In the theoretical limiting case where tradable goods prices are determined on international markets and where arbitrage by trade ensures that the law of one price prevails, a small country has to take tradable goods prices as given. In such circumstances, measures based on relative prices lose their meaning, and other measures must be used. One such alternative measure is profitability in the traded sector. As the exchange rate appreciates, tradable goods prices – constant in foreign currency – fall in local currency terms; unless unit labour costs fall – whether as a result of lower wages or of higher productivity – the profitability of the traded sector declines.[108] Moreover, prices of non-tradable goods, depending on supply and demand in the home market

[107] Also, international tourism makes many non-tradable goods effectively tradable.

[108] This makes the simplification of excluding other costs: see Table 2 on page 31 above and the earlier discussion.

only, do not change.[109] This suggests a second measure of international competitiveness: the internal terms of trade (i.e. the price of tradables relative to non-tradables). Similar arguments can be made for relative productivity developments and for relative profitability. Finally, changes in the tradable share of output can be interpreted as reflecting the consequences of changing competitiveness. The following sections review these measures for the larger trading areas.

It should be remembered, however, that the distinction between tradables and non-tradables is difficult to apply with any precision in aggregate economic statistics because most categories include tradable and non-tradable goods. Even a particular tradable good will contain non-tradable elements – retail margins, for example, mean that consumer prices for tradable goods have non-traded elements. The same is true for non-tradable goods. The strategy adopted in this paper is to classify a sector or expenditure group as a "tradable" or a "non-tradable" group only when it seems plausible that a very large part of the sector/expenditure group is likely to fall into one or the other category. Where there was doubt, or where the tradable or non-tradable elements were likely to be more or less balanced, no classification was made.

The allocation used for the main sectors given in the OECD National Accounts are shown in Appendix III. The manufacturing sector was used as the proxy for the tradable sector; not classified were three sectors (agriculture, mining and public utilities) in which, although they contained important elements that were clearly tradable, effective tradability was in practice limited by trade constraints and other official restrictions. The non-tradable sector included most other sectors, with the notable exception of the financial/real estate sector, affected as this is by rather special influences.[110]

Internal terms of trade

One attraction of defining the real exchange rate as the price of tradables relative to non-tradables is that it is firmly rooted in the economic theory of the balance of payments. Salter's famous two-sector model

[109] Aside, of course, from second-order general equilibrium effects from the exchange rate change.

[110] In the absence of purchasing power parity calculations for the output side of GDP, a somewhat different classification was used for the purchasing power parities reported above.

of an open economy[111] (one sector the tradable sector, the other the non-tradable sector) still provides the frame of reference for much economic thinking about balance of payments adjustment, combining in a simple way a macroeconomic dimension (aggregate expenditure and income) with a microeconomic dimension (relative prices). And much recent economic research has indeed been couched in these terms.[112] Moreover, there have been some recent ambitious empirical attempts to construct measures from very detailed data.[113]

Despite its theoretical attractions, the practical usefulness of the internal terms of trade (i.e. the price of tradables relative to non-tradables) is limited by the fact that the relative price of tradables tends to decline steadily over time as real per capita income rises.[114] Hence a decline in the relative prices of tradable goods cannot, by itself, be taken as evidence of a loss of competitiveness – as it sometimes is in highly simplified economic models. Moreover, the rate at which the ratio of tradables to non-tradables prices declines (relative to real income growth) varies greatly across countries.[115]

One possible way to rescue the empirical usefulness of the internal terms of trade is to "correct" it for developments in real per capita income and then examine movements in the actual internal terms of trade relative to its "corrected" value. The results of such a calculation are shown in Graph 14. With one or two exceptions, however, it is difficult to detect much competitiveness-related pattern in the movement in the internal terms of trade thus calculated.[116] One exception

[111] Salter (1959). Swan was apparently the originator of this model, although he published later.

[112] For good recent discussions see De Gregorio et al. (1993), Dwyer and Lowe (1993), Lipschitz and McDonald (1992).

[113] Using input-output tables, Dwyer (1992) developed a tradable/non-tradable classification for some 108 sectors in the national accounts which was then used to construct price indices for the two sectors.

[114] For the reasons spelled out in the differential productivity model mentioned above.

[115] The estimated elasticities of the internal terms of trade with respect to growth in real income per head (over the period 1970-91) are (t-statistics in parentheses):

United States	- 1.24	(23.0)	France	- 0.24	(4.2)	Belgium	- 1.55	(16.4)
Japan	- 0.85	(17.4)	Germany	- 0.14	(3.1)	Netherlands	- 1.04	(4.4)
Canada	0.15	(2.2)	Italy	- 0.95	(14.7)	Sweden	- 0.02	(0.2)
			United Kingdom	- 0.34	(4.8)			

[116] Wickham (1993) reached a similar conclusion looking at Columbian and Kenyan developments: real effective exchange rate indicators did not provide accurate information on movements in the internal terms of trade. Dwyer and Lowe (1993) show that the internal terms of trade and measures of real effective exchange rates move similarly only if the law of one price holds and if relative prices overseas are constant.

is Italy, where the internal terms of trade do seem to move inversely with relative unit labour costs in dollars so that a real depreciation of the lira tends to increase the price of tradable relative to non-tradable goods. The estimated coefficient implies that a 10% fall in relative unit labour costs increases the tradables/non-tradables price ratio by 4.3%.[117] There is also evidence of a similar, but weaker, relationship in France, but none for any other country studied. For one country – the United Kingdom – there is some evidence that the relative price of tradables (perversely) appeared to rise as UK cost competitiveness declined.[118]

Differential productivity

Consider first relative productivity. According to two much-cited stylised facts:

(i) the rate of productivity growth in the tradable sector tends to be greater than in the non-tradable sector;

(ii) the cross-country dispersion of productivity growth in the non-tradable sector tends to be lower than in the tradable sector – usually because of the greater labour intensity in services.[119]

This productivity bias towards tradables can have significant implications for the measurement of relative productivity between countries; in particular, economy-wide measures (i.e. including both tradables and non-tradables) may differ significantly from measures based on the tradable sector alone, which may be more relevant for international competitiveness.

National-accounts-based estimates of annual productivity growth for the major industrial economies during the last twenty years or so are shown in Table 17. These estimates indeed confirm the two stylised

[117] The equation for Italy which summarises this is:

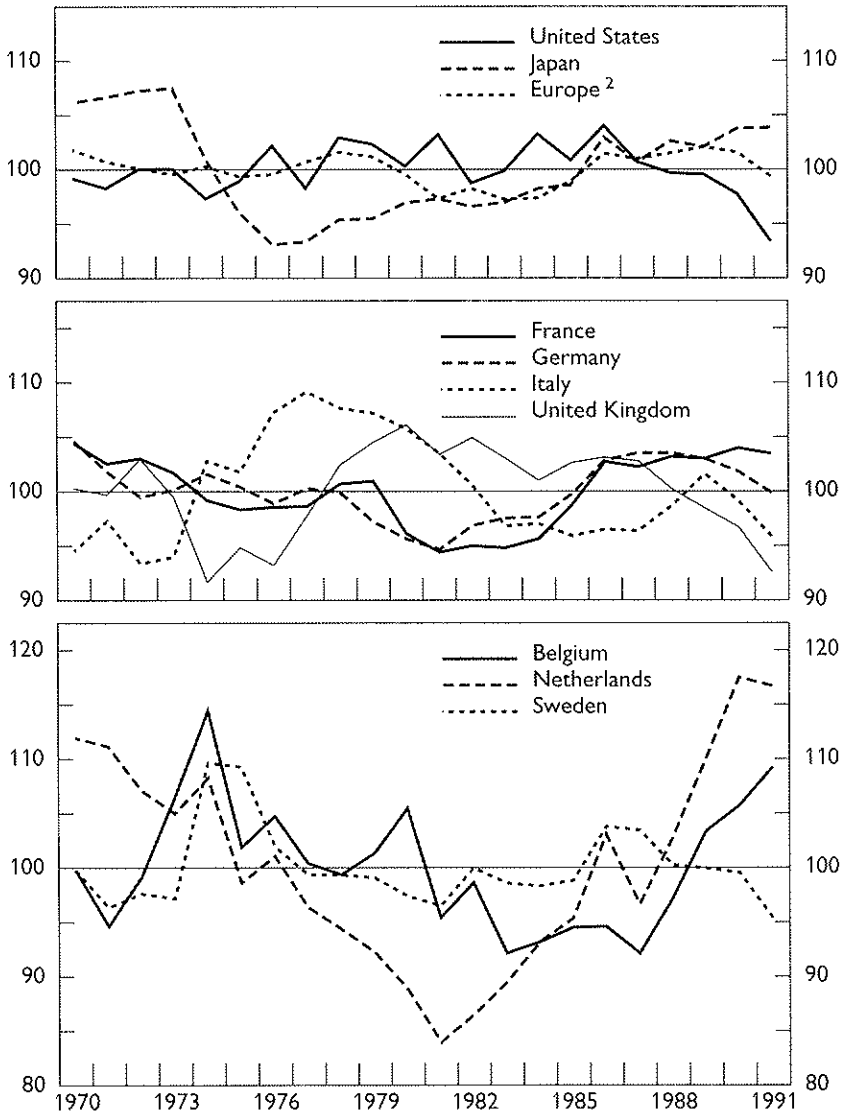
$$\log ADJTOT = 6.59 - 0.43 \log RULC \qquad R^2 = 0.40$$
$$(12.9) \quad (3.9) \qquad\qquad DW = 0.65$$

[118] Melliss's (1993) examination of disaggregated consumer prices also uncovered a large gap between the price trends of tradable and non-tradable goods in Italy; he also noted a significant difference in the case of Spain. Noting a recent similar divergence in the case of the United Kingdom but not in France or Germany, he observed that, "it may be no coincidence ... that those ERM currencies with a level of competitiveness which may have concerned markets and which depreciated in mid-September 1992, had substantial divergences between inflation rates in the tradable and non-tradable sectors".

[119] These stylised facts have often been used to explain why services are much cheaper in poor countries. See Bhagwati (1984) and Kravis and Lipsey (1983, 1987).

Graph 14

Internal terms of trade[1]



[1] Ratio of tradables to non-tradables prices adjusted for changes in real GDP per capita (see page 94 for explanation). [2] GDP-weighted average of the European countries shown.

Source: See Appendix III.

Table 17

Average annual productivity growth in the tradable and non-tradable sectors[1]

In percentages

	Tradable sector (1)	Non-tradable sector (2)	Relative productivity effect = (1) minus (2)
United States	3.0	0.7	2.3
Japan	5.1	2.1	3.0
Canada	2.0	1.0	1.0
Europe	3.1	1.5	1.6
France	3.1	2.1	1.0
Germany	2.2	2.0	0.2
Italy	4.3	1.4	2.9
United Kingdom	2.9	0.4	2.5
Belgium	5.3	1.6	3.7
Netherlands	4.3	1.7	2.6
Sweden	2.0	1.9	0.1
Mean[2]	3.4	1.5	1.9
Variance	1.5	0.4	

[1] 1970 to 1991. Productivity defined as value added at constant prices divided by total employment. [2] Unweighted.

Sources: Calculations as described in Appendix III based on OECD *National Accounts, volume II* and national sources.

facts just outlined. On average, productivity in the tradable sector grew by a little less than 2 percentage points faster annually than productivity in the non-tradable sector (see the average line in the table). Also, the cross-country variance in the non-tradable sector is only 0.4, compared with about 1.5 for tradables. The following paragraphs examine some particular international comparisons in more detail.

The relative productivity effect for the United States is somewhat smaller than that for Japan. Indeed, this gap was much more marked in the 1970s (see Graph 15), a feature emphasised by Marston (1987). Noting that Japan enjoyed a much more pronounced edge over the United States in tradable sector productivity growth, he drew the conclusion that maintaining the competitiveness of US goods required a real appreciation of the yen against the dollar significantly larger than

economy-wide comparisons of competitiveness would suggest.[120] After 1982, however, productivity growth in the US tradable sector picked up as the strong dollar subjected the tradable sector to severe competitive pressure.[121] But the measured spurt in productivity in part arose from the disappearance of those activities in which the United States was only marginally competitive internationally.

The difference in the long-term productivity trends in the two sectors is reflected in the differential unit labour cost developments (see Graph 16). Because labour mobility should tend to equalise wage rates in the tradable and non-tradable sectors of a given economy, the differential in unit labour costs should indeed be dominated by the productivity differential. Over the period 1970 to 1991 as a whole, Japanese unit labour costs in the non-traded sector rose by a cumulative 280% relative to US unit labour costs – a greater differential than seen in the traded sector.

However, the relative productivity edge of the tradable over the non-tradable sector in Europe – 1.6% annually over the period 1970–91 – is much smaller than in either the United States or Japan (see the top panel of Graph 15). Accordingly, competitiveness measures based on unit labour costs in the tradable sector (panel B of Graph 16) suggest that Europe suffered a significant loss of competitiveness in tradable goods during the 1980s that was not mirrored by the non-tradable sector. By 1991 unit labour costs in the non-tradable sector were actually below those in the tradable sector – whereas in Japan they were 64% higher (see Table 16 above).

Of greater interest, however, is the marked difference among the larger European economies shown in the middle panel of Graph 15. The two outliers are Germany and Italy. The result for Germany is unusual in that there is virtually no difference between productivity growth in the non-tradable and tradable sectors. The differential for Italy, by contrast, is the largest of the major industrial economies and reflects above-average productivity growth in the tradable sector, as well as below-average productivity growth in the non-tradable sector.

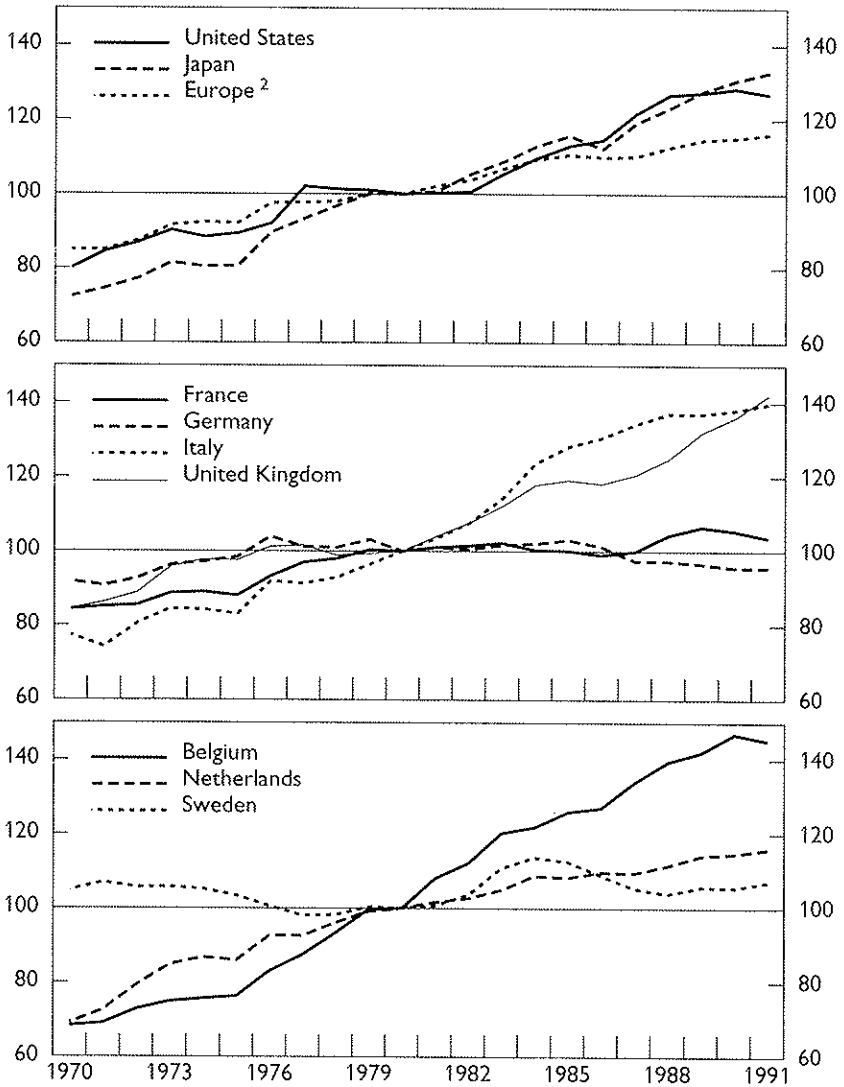
[120] He calculated that, over the period 1973-83, productivity in the US tradable sector grew by 13.2% faster than the US non-tradable sector while the differential was 73.2% for Japan.

[121] According to the calculations that underlie Graph 15, productivity in the US tradable sector grew at an annual average of more than 5%. However, see footnote 103 (p. 86) above for an important qualification about the measurement of productivity in US manufacturing.

Graph 15

Productivity in the tradable relative to the non-tradable sector[1]

1980 = 100



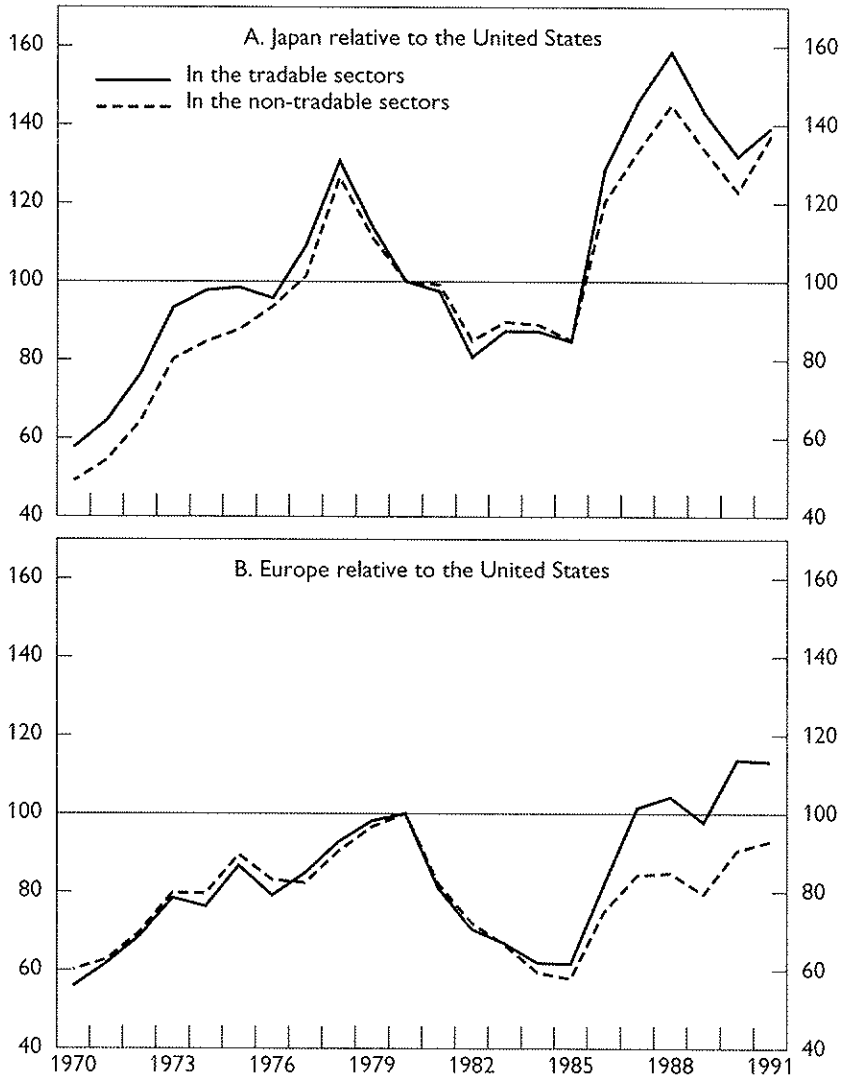
[1] Tradable goods productivity divided by non-tradable goods productivity. [2] GDP-weighted average of the European countries shown.

Source: See Appendix III.

Graph 16

Real exchange rates: indices of unit labour costs for the tradable and non-tradable sectors*

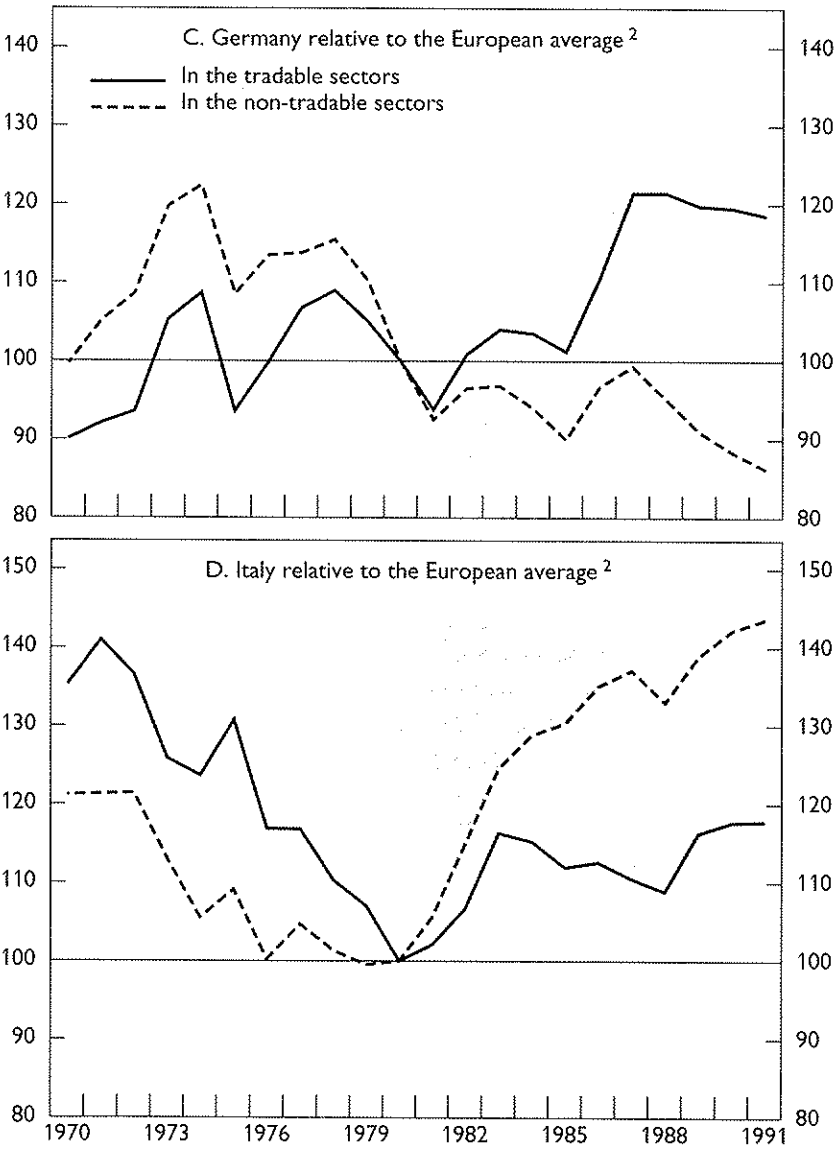
1980 = 100



* An increase indicates an appreciation.

Source: BIS.

Graph 16 (cont.)



[1] An increase indicates an appreciation. [2] Average of European countries aggregated using 1990 GDP weights at PPP exchange rates, excluding Germany and Italy respectively.

Source: BIS.

This difference has important implications for the measurement of competitiveness in these two countries. In the tradable sector, unit labour costs in Germany have risen well in excess of those in other European countries (see panel C of Graph 16), suggesting a rather sharp loss in German competitiveness. Yet performance in the non-tradable sector has been much better: German productivity rose faster than the European average, and hence unit labour costs in this sector increased much more slowly than in the rest of Europe. As noted, Germany's actual performance on world markets will depend on both sorts of costs.

The Italian case is almost a mirror image of the German. In the tradable sector, Italy has more than held its own vis-à-vis its European competitors; but in the non-tradable sector the country saw a huge real appreciation. Economy-wide measures – consumer prices, GDP deflator – lie between these two extremes, but still suggest a marked real appreciation.

The strong productivity performance of the tradable sector was partly a response to the relatively firm exchange rate policy pursued by Italy after 1982. The financing of redundant industrial and construction sector wage earners out of public funds facilitated a major labour shakeout. Selective investment incentives contributed to the modernisation of the manufacturing sector. The non-tradable sector, less exposed to international competition, did not face the same pressure to adjust; nor did it receive the same degree of government financial support.[122]

A similar, but much less marked differential was also apparent in the United Kingdom. The main factor here appears to have been the very severe squeeze on competitiveness in the early 1980s, which pushed a large number of marginal enterprises in the tradable sector out of business (discussed below; see also Graph 19 on page 110). As discussed more fully below, the decline in tradable sector's share of output during the 1980s was particularly steep in the United Kingdom.

Differential profitability

The link between cost-based measures of competitiveness – such as productivity and unit labour costs, as just discussed – and prices is profi-

[122] This is based on OECD (1989a), particularly Chapter II on industrial adjustment, which provides an analysis of the determinants of Italian productivity developments in the 1980s.

tability. Because the tradable sector is exposed to international competition, while the non-tradable sector is not, changes in international competitiveness can affect the profitability (rather than the prices) of the tradable sector. Indeed, some analysts have suggested that profitability in the tradable sector gives a better measure of competitiveness than do the standard measures based on relative costs or prices.[123]

The measure of profitability (labelled PROF) that could be derived from the national accounts is, like that of productivity, simple and rather crude, viz. the net operating surplus as a percentage of value added. Where possible, indirect taxes were subtracted, and some allowance was made for the effective earnings of the self-employed.[124] Because the concept of operating surplus *net* of capital consumption was used (again when the data allowed), returns to capital were excluded from this measure to the extent that they were accurately captured in the national accounting measures of capital consumption.

How much light does relative profitability throw on competitiveness? Some very simple measures, based on national accounts, are shown in Graph 17. One surprising feature of the comparison between the main economic areas shown in the top panel is the comparative stability in the relative profitability of the traded sector in Japan: the very large swings in the real exchange rate of the yen during the 1980s might have been expected to have led to much greater fluctuation in relative profitability. The closeness of the estimates for the United States and Europe suggests that both were dominated by the recession in the early 1980s – the demand for tradables may tend to be more cyclically sensitive than non-tradables – and the eventual recovery.

The sharp appreciation of the yen in the early 1970s reduced what were the apparently excess profits of the Japanese tradable sector (see Graph 18). Since then profitability has remained more stable than in either the United States or Europe. This may well reflect the avoidance of severe recessions as well as other means of offsetting the wide swings seen in the real value of the yen.[125] The profitability of the US tradables sector appears to be dominated more by cyclical factors than by swings in the real exchange rate (see the simple regressions reported

[123] For example, this is the conclusion of Lipschitz and McDonald (1992).

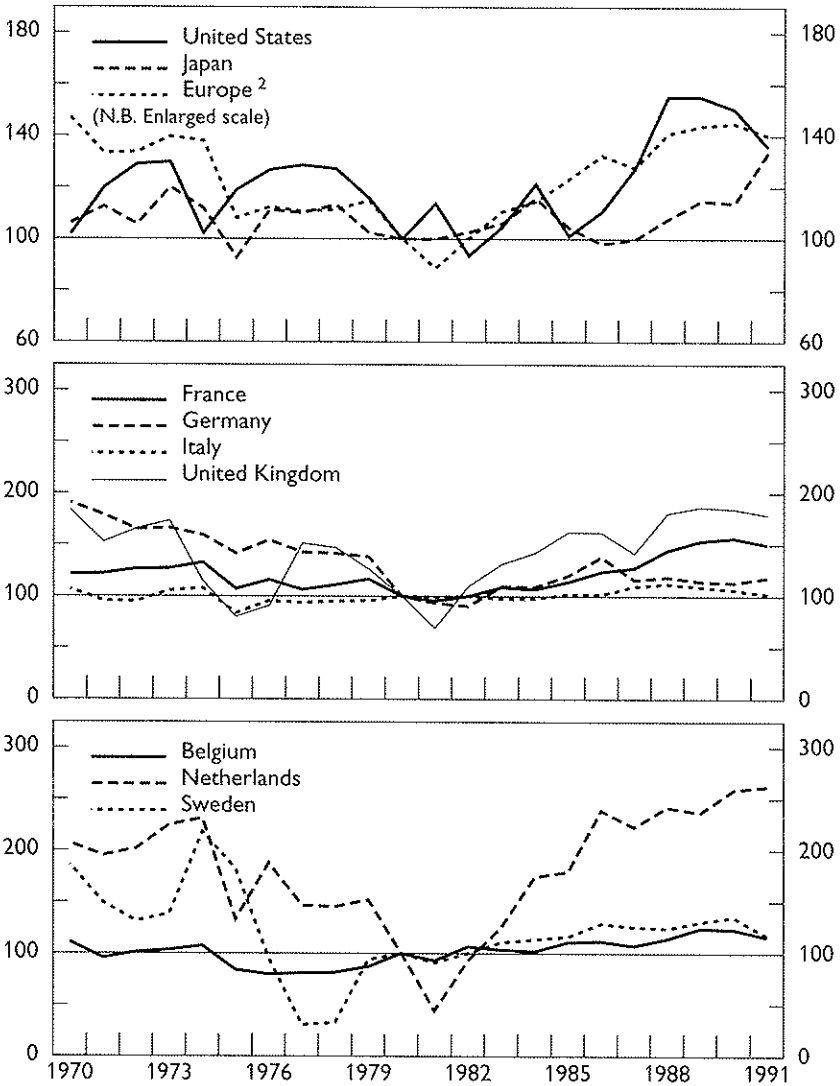
[124] See Appendix III for further details.

[125] One suggestion is that Japanese enterprises are particularly adept at increasing productivity and limiting wage costs in response to real yen appreciation.

Graph 17

Profitability in the tradable relative to the non-tradable sector[1]

1980 = 100



[1] Tradable goods profit share divided by non-tradable goods profit share. [2] GDP-weighted average of the European countries shown.

Source: See Appendix III.

below). The European picture is more mixed. The profitability of the German tradable sector declined steadily during the 1970s – perhaps also a reflection of the marked real appreciation of the Deutsche Mark during this decade. Although profitability recovered somewhat in the first half of the 1980s, in the second half it tended to weaken again. Elsewhere in Europe, the first half of the 1980s also saw profit margins in the tradable sector largely restored. Since 1989, however, tradable sector profitability has declined steadily in Europe – a decline shared by all four major European countries (with the United Kingdom suffering the steepest decline). Among the smaller European economies, Sweden saw huge swings in profitability. An explosion of wage costs in the first half of the 1970s greatly damaged Swedish competitiveness, leading to a severe profit squeeze towards the end of the decade. The devaluations of 1981 and 1982 led to a real effective depreciation of 20 to 25%[126] that had the major effect of rebuilding profitability in the early 1980s. But this strengthening was itself eroded in later years, culminating in a steep decline in profits in the early 1990s. By contrast, Belgium and the Netherlands – both of which strengthened their relative cost competitive position during the 1980s – saw a sustained improvement in the competitive position of their tradable sector.

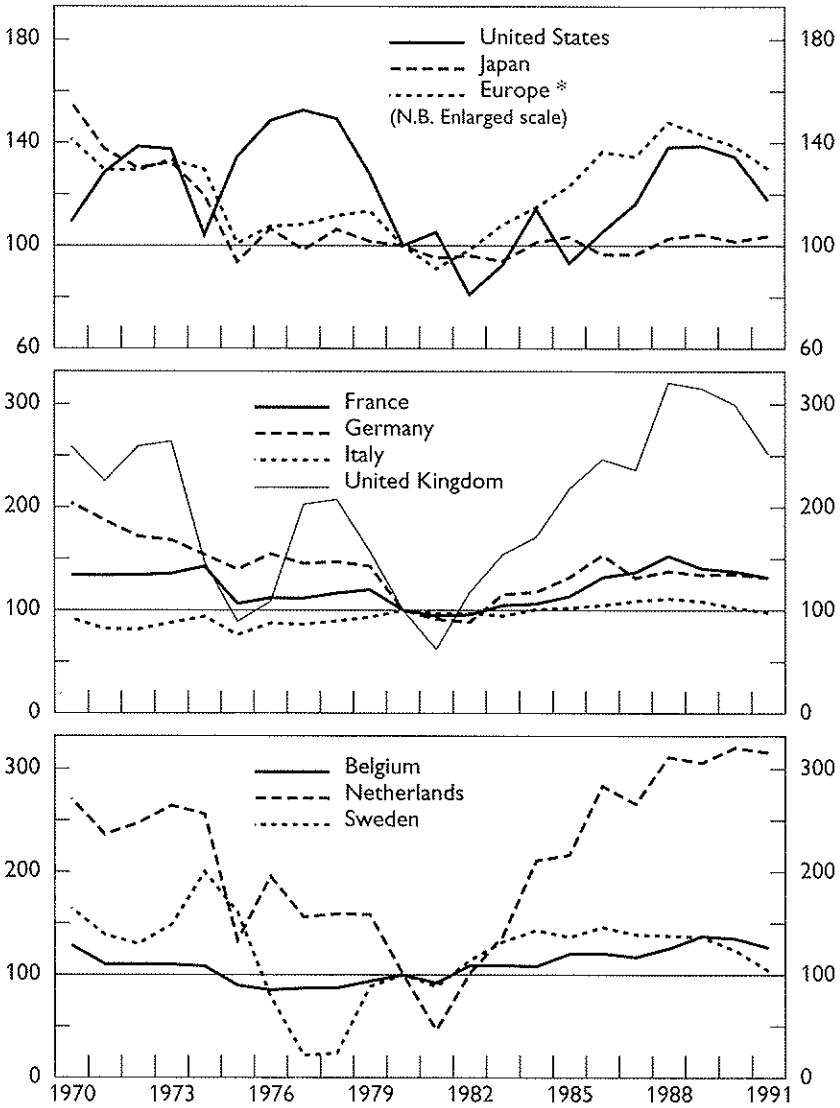
The relationship between profitability and competitiveness (as measured by relative unit labour costs) and demand factors (foreign as well as domestic) is summarised in a pooled regression for the ten major industrial countries shown in Table 18.[127] The impact of competitiveness is indeed much stronger on the tradable than on the non-tradable sector (an elasticity of – 0.93 compared with only – 0.27). This coefficient implies that a 10% increase in unit labour costs reduces profitability in the tradable sector by 9.3%. It is also true that profitability in the tradable sector tends to be much more sensitive to cyclical developments abroad than that in the non-tradable sector. This feature sometimes makes it difficult to disentangle cyclical from competitive influences on tradable sector profitability. It also means that the ratio of tradables to non-tradables profitability as an indicator of competitiveness must be used with caution as it also depends importantly on the international economic cycle.

[126] See OECD (1989b).
[127] The United Kingdom excluded: see below.

Graph 18

Profitability in the tradable sector

1980 = 100



* GDP-weighted average of the European countries shown.

Source: See Appendix III.

Table 18

Profitability, competitiveness and demand pressure: pooled regressions

	Whole economy	Tradable sector	Non-tradable sector	Ratio of tradables to non-tradables
Relative unit labour costs (RULC)	–0.38	–0.93	–0.27	–0.65
	8.7	*6.2*	*5.1*	*4.9*
Demand pressure at home (DD)	0.74	0.26	0.24	0.02
	5.1	*0.5*	*1.4*	*0.1*
Demand pressure in foreign markets (FD) .	0.45	2.74	0.29	2.46
	2.5	*4.4*	*1.3*	*4.5*

Notes: (i) The regressions were run in the form:
$\log PROF = a_0 + a_1 \log RULC_{-1} + a_2 \log DD + a_3 \log FD$
over ten countries for the period 1971–91 (making 210 observations).
PROF is a measure of profitability.
The constant term was allowed to vary for each country.
(ii) Demand pressure in foreign markets was export-weighted.
(iii) t-statistics shown in italics.

The size of the impact of changes in relative unit labour costs on profitability differs markedly across countries. As might perhaps be expected, the evidence indicates that competitiveness plays a relatively minor role in explaining movements of profitability in the United States; even so, the profit ratio between the tradable and non-tradable sectors (see the final three columns of Table 19) *is* affected by relative unit labour costs.[128] The size of the coefficient on RULC – which can be interpreted as a short-run or impact elasticity – suggests that a 10% rise in relative unit labour costs reduces profitability in the tradable sector by 2.8%. However, Japanese profitability is rather more affected by changes in competitiveness (with an estimated elasticity of – 0.47 for tradable sector profitability with respect to relative unit labour costs), though not so much as in Germany, where the estimated elasticity is – 0.98. In most of the other industrial countries the estimated elasticity is substantial. While the Swedish tradable sector appears unusually

[128] Hung (1992) also finds that US manufacturing profits are sensitive to the real exchange rate of the dollar. Over the long run, he finds that a 10% appreciation of the dollar reduces manufacturing profits by 6%.

sensitive to changes in competitiveness, there is no evidence that Dutch or UK profitability in the tradable sector is affected by competitiveness (although the coefficients have the theoretically correct sign).[129] In both cases, however, profitability is very sensitive to foreign demand (see the coefficients in Table 19).

It may also be noted that profitability in the non-tradable sector is also apparently affected by relative unit labour cost developments in Japan, Italy, the Netherlands and Sweden, although generally by less than the tradable sector itself. This may well reflect the dependence of the non-tradable sector on the prosperity of the tradable sector.

Differential output developments

A final possible symptom of change in competitiveness is shifts in the relative weights of the tradable and non-tradable sectors of the economy. The evolution of the tradables share of output over the period 1970 to 1991 is shown in Graph 19. At the beginning of this period, the tradables share of output was much higher in Europe than in the United States or in Japan. Within Europe, the most "tradable" nations were Germany and the United Kingdom; Italy was the least tradable.

During the twenty years to 1991, and despite huge swings in the real exchange rate of the dollar, the tradables share in the United States remained remarkably constant. There was only a very slight dip in the early 1980s (possibly partly a result of rapid dollar appreciation); otherwise, it is difficult to detect any very strong relationship between movements in the real exchange rate and the tradables share.[130] This may suggest that the underlying competitive position of the United States, notably in capital goods, has been strong enough to withstand rather wide swings in the real value of the dollar. The finding in Section IV that US labour cost levels – adjusted for productivity – remain well below those in other industrial countries lends support to the thesis of a healthy underlying competitive position.

[129] Part of the explanation for the United Kingdom being the odd man out may be that the boom associated with the development of gas and oil from the North Sea boosted profitability in related manufacturing sectors at about the same time as the real exchange rate was very strong. At any event, using profitability estimates that exclude North Sea-related companies increases somewhat the coefficient of RULC in the equation shown in Table 19.

[130] However, Arndt (1988), using a rather different definition of tradables/non-tradables, found that the US tradable share of GNP *did* decline from 1981 to 1985 when the dollar was very strong.

Table 19

Profitability, competitiveness and demand pressure: individual country results

Country	Whole economy			Tradable sector			Non-tradable sector			Ratio of tradables to non-tradables		
	RULC	DD	FD	RULC	DD	FD	RULC	DD	FD	RULC	DD	FD
United States	0.06	1.04	0.04	−0.28	2.29	−1.15	0.19	1.99	−2.43	−0.47	0.30	1.28
	0.9	*2.9*	*0.1*	*1.4*	*2.1*	*0.7*	*1.4*	*2.9*	*2.4*	*3.0*	*0.4*	*1.1*
Japan	−0.44	0.60	1.92	−0.47	0.55	2.07	−0.51	−0.28	2.25	0.04	0.83	−0.18
	4.5	*1.5*	*2.4*	*5.1*	*1.5*	*2.7*	*4.1*	*0.6*	*2.2*	*0.4*	*1.8*	*0.2*
Canada	−0.53	0.38	−0.43	−0.40	0.46	0.72	−0.03	0.08	0.20	−0.37	0.39	0.52
	4.5	*2.0*	*1.2*	*2.1*	*1.5*	*1.3*	*0.3*	*0.4*	*0.5*	*1.8*	*1.2*	*0.9*
France	−0.64	−0.04	1.31	−0.91	−0.22	2.91	0.65	−0.13	0.76	−1.56	−0.08	2.15
	3.0	*0.1*	*2.0*	*2.2*	*0.2*	*2.3*	*2.4*	*0.2*	*0.9*	*4.2*	*0.1*	*1.9*
Germany	−0.16	2.05	−0.53	−0.98	1.41	1.44	0.11	1.48	−1.04	−1.09	−0.07	2.48
	0.8	*5.2*	*0.9*	*1.5*	*1.1*	*0.8*	*0.6*	*4.7*	*2.2*	*1.5*	*0.0*	*1.2*
Italy	−0.53	1.11	−0.52	−1.06	3.04	−1.23	−0.74	1.27	−0.95	−0.32	1.77	−0.28
	5.6	*3.1*	*1.3*	*5.0*	*3.8*	*1.4*	*5.7*	*2.6*	*1.7*	*2.1*	*3.1*	*0.4*
United Kingdom	−0.05	−0.23	2.06	−0.53	−1.59	9.00	−0.28	0.16	3.16	−0.25	−1.75	5.83
	0.3	*0.3*	*3.2*	*0.7*	*0.6*	*4.1*	*1.0*	*0.1*	*3.5*	*0.5*	*1.0*	*4.2*
Belgium	−0.21	1.18	0.20	−0.68	1.40	0.29	0.05	0.13	0.22	−0.63	1.26	0.07
	3.4	*3.9*	*0.5*	*13.2*	*5.6*	*0.8*	*1.1*	*0.6*	*0.7*	*9.5*	*3.9*	*0.1*
Netherlands	−1.53	0.63	0.90	−0.78	−3.76	7.45	−0.46	−0.71	1.13	−0.31	−3.05	6.32
	10.6	*2.0*	*3.2*	*0.7*	*1.4*	*3.2*	*4.4*	*3.1*	*5.6*	*0.3*	*1.2*	*2.9*
Sweden	−1.01	0.89	0.00	−4.43	−0.47	1.83	−1.60	0.55	0.33	−2.83	−1.02	1.5
	13.7	*3.4*	*0.0*	*4.0*	*0.1*	*0.6*	*9.2*	*0.9*	*0.7*	*2.7*	*0.3*	*0.5*

Note: The equations took the form of

$$\log PROF = a_0 + a_1 \log RULC_{-1} + a_2 \log DD + a_3 \log FD$$

where PROF is a measure of profitability

RULC is relative unit labour costs in US dollars, usually lagged by one year (BIS index)

DD is a measure of demand pressure in the domestic economy (capacity utilisation or the ratio of actual to trend GDP)

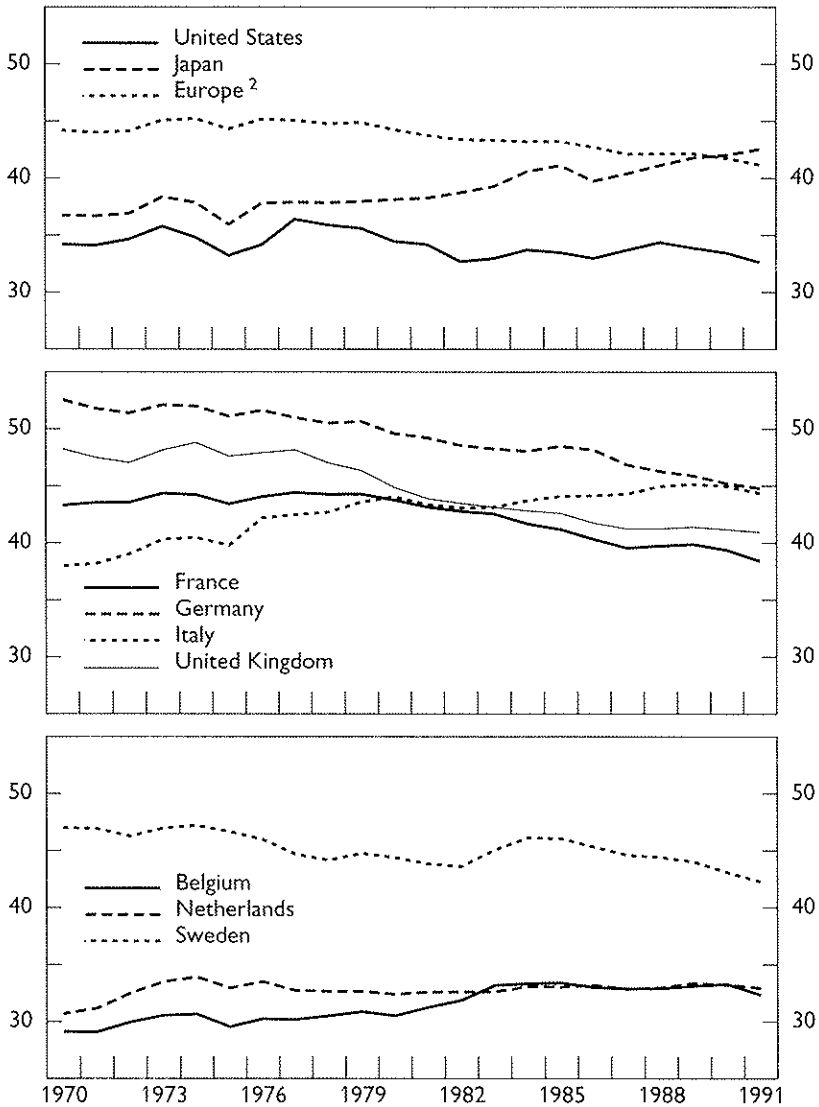
FD is a measure of demand pressure in foreign markets (export-weighted)

Equations were estimated on annual data over the period 1971–91; t-statistics shown in italics.

Graph 19

Tradables share of output[1]

In percentages



[1] At constant prices. [2] GDP-weighted average of the European countries shown.

Source: See Appendix III.

The Japanese tradables share, by contrast, tended to rise during the 1980s, after showing no clear trend during the 1970s. By 1980, the tradables share stood at 38.5% of output (a little higher than it had been in 1970) and by 1990 it had risen to 42.4%. Japan was thus the only major country whose production became more tradable-intensive during the 1980s.

In Europe as a whole, the tradables share has tended to decline during this period, falling below the Japanese share by the late 1980s. This decline is perhaps what might have been expected from the higher real exchange rates seen in Europe towards the end of the 1980s, and thus tends to confirm what has been noted above about declining European competitiveness.

Within Europe, the United Kingdom registered the steepest decline, with the tradables share falling from about 50 to 40%. Again, this is broadly consistent with the marked real appreciation of sterling.[131] Germany and France also saw sharp falls. The Italian share grew sharply during the 1970s before stabilising, overtaking both France and the United Kingdom in the process. The Swedish tradables share recovered in the wake of the real depreciation of the krona in the early 1980s. Likewise, a relatively good competitiveness position during much of the 1980s appears to have contributed to the stabilisation of the Belgian and Dutch tradables shares.

[131] This interpretation is supported by Muellbauer and Murphy (1990), who find that the growth of UK investment by sector (over the period 1979 to 1987) was negatively correlated with the sector's tradability: in other words, they suggest investment has been steered towards the non-tradable sectors and away from the tradable sectors.

Conclusions

The most obvious methodological conclusion that follows from this review is that no single, comprehensive measure of competitiveness can be regarded as *the* appropriate indicator. Some measures are clearly defective, and all are incomplete. Economy-wide measures – such as consumer price indices – have the virtue of being relatively comprehensive, but are not sufficiently focused on those sectors of the economy that compete internationally – the tradable sectors. Almost all more specific measures relate to manufacturing industry: this is not ideal as services are also an important part of international commerce. But the concentration on manufacturing may not yield estimates which are too misleading, at least for large and well-diversified industrial economies.

For most such countries, the real effective exchange rate based on relative unit labour costs in manufacturing is probably the best single indicator;[132] even so, it still needs to be supplemented by other measures. For economic and statistical reasons it cannot be regarded as a precise indicator. Indeed, the term real effective exchange rate is itself unfortunate as it suggests a degree of precision that does not in fact exist. If the productivity movements that underlie the relative unit labour costs calculation are distorted by large changes in the composition of output – such as might occur, for instance, when whole sectors are forced out of business – then relative unit cost developments would be positively misleading. Relative consumer prices are often helpful, if not ideal, indicators. Relative export unit values are probably the least helpful.

A second conclusion, almost the corollary of the first, is that a country's international competitive position permeates its whole economy, so that the symptoms of inadequate competitiveness are to be found almost everywhere. This strengthens the case for looking at many indi-

[132] For instance, relative unit labour costs in addition to relative consumer prices were found in Marquez (1992) to be best suited for modelling and forecasting US trade.

cators in addition to the standard measures of real effective rates. Two topics of relevance emerge from this paper – the relationship between the tradable and non-tradable sectors of the economy and the importance of measures of profitability.

Because of their different exposure to international competition, the tradable and non-tradable sectors can develop along quite divergent paths. Productivity, profitability and so on in the two sectors are often radically different. The production of non-tradable goods and services for final consumption at home has little direct bearing on competitiveness (but it does have a distinct effect on the standard of living). It is of course well known that non-tradables prices differ more internationally than do prices of tradables. Yet it is not correct to assume that only tradables count in determining a country's international performance. The quality and price of non-tradable inputs into the production of tradables will influence the competitiveness of tradables; since, by definition, tradables producers will not be able to import non-tradable goods and services, the efficiency of the non-tradable sector will also be important. This paper has uncovered notable, and not easily explainable, differences in productivity in the tradable relative to non-tradable sector. One serious deficiency in most countries' statistical measures of competitiveness is the absence of data on the cost of services and other non-manufacturing inputs into manufacturing industry. For these reasons, a certain degree of caution is warranted in drawing conclusions on the basis of indicators for the tradable goods sector.

One common symptom of inadequate competitiveness is a squeeze on profitability, particularly in the tradable goods sector. The paper has found clear evidence that movements in the real effective exchange rate have a major impact on profitability, and that the cross-country variations in this sensitivity are broadly what would be expected given differences in dependence on international trade. Furthermore, profitability in the tradable sector is more sensitive to competitiveness than profitability in the non-tradable sector. The implication of this is that exporting and import-competing enterprises tend to maintain sales in the face of deteriorating competitiveness, at least in the short run. A continued, apparently "strong" performance cannot, therefore, always be taken as evidence of adequate competitiveness.

A third conclusion is that attempts to measure absolute competitiveness should not be dismissed out of hand. In recent years, much

statistical effort has gone into refining estimates of purchasing power parities, usually at quite a detailed level. Moreover, in-depth studies of productivity have begun to provide a foundation for eventual absolute measures of unit labour costs. The calculations in this paper shown in Table 15 provide some useful quantification of the size of the competitive differences between the United States, Europe, Japan and the Asian NIEs. Combined with the usual indices of unit labour costs, they also point to widening differences in cost levels in individual European countries in the wake of substantial recent changes in nominal exchange rates. As ever, the estimates that result will still need to be treated with caution. But they can, with other indicators, help to form a picture of a country's underlying competitive position.

The implications of the various measures for different countries' competitiveness have been discussed throughout this paper, and they do not lend themselves to easy summary. However, one general conclusion that can be drawn from almost all indicators was that the European lack of international competitiveness in the middle of 1992, on the eve of the prolonged currency crisis, appeared acute. Nonetheless, all the caveats in this paper suggest it would not be wise to base any conclusion on competitiveness indicators alone: the diagnosis of European competitiveness would thus have to be supported by other symptoms of deteriorating competitiveness – such as the large adverse swing in Europe's trade balance in recent years or the persistent rise in unemployment or some other macroeconomic indicator.

A good part of the European loss of competitiveness was corrected after mid-1992 as a number of European currencies depreciated against the Deutsche Mark and as the dollar and (especially) the yen strengthened. Between August 1992 and September 1993, Europe's unit labour costs relative to those of non-European competitors fell by some 15%, and this in time should provide a powerful stimulus to the European economy as a whole. Those currencies that have maintained their fixed DM parities unchanged during this period have seen appreciation against other European currencies largely offset by depreciation vis-à-vis non-European currencies: their real effective rates have changed remarkably little. But this has been less true of the Deutsche Mark, which has appreciated further in real effective terms.

Appendix I

BIS indices of effective exchange rates

As noted in the main text of this study, the BIS calculates effective exchange rate indices for twenty-six countries (the "competitor countries"), including all industrial countries,[1] the four Asian NIEs and Mexico. Given the latter country's experience with high inflation and unsettled foreign exchange markets between 1982 and 1988, the *nominal* effective exchange rates calculated by the BIS are derived from a weight matrix that excludes Mexico as a competitor country. The weight matrix does, however, include Mexico when *real* effective exchange rates are calculated. Nominal effective exchange rates are calculated on a daily basis, while real rates are on a monthly basis. All series average 100 in 1990. In what follows, a number of issues related to the index calculations will be discussed.

Trade flow figures

The weight construction is based on trade in manufactured goods - SITC categories 5 through 9 - among the twenty-six competitor countries, as well as on exports of the latter countries to five other regions. These rest-of-the-world regions comprise: Other Europe, Africa, Latin America excluding Mexico, Middle East and Asia excluding the Asian NIEs but including Oceania. Manufactured goods exports, as well as output of the manufacturing sector, of the rest-of-the-world regions are assumed not to compete with goods produced by the competitor countries and are thus ignored in the weight calculations. The weight calculations proceed along the lines sketched in the first section of this study,

[1]Iceland and Turkey are not included, however. Belgium and Luxembourg are considered as a single currency and trading area. Germany refers to western Germany only.

i.e. bilateral import shares determine the import weights and export weights are derived from a double-weighting system. These two sets of weights are used to calculate, using geometric averaging, an import-weighted and export-weighted effective exchange rate series. The overall effective exchange rate is then calculated as the weighted average of these two effective exchange rate series, using as weights the importance of exports and imports in total trade (exports plus imports).

For the twenty-one industrial countries, data on manufactured goods imports from and exports to all twenty-six competitor countries, as well as on exports to the rest-of-the-world regions, are derived from OECD, *Foreign Trade by Commodities (Series C)*. Trade flows among the NIEs and Mexico, as well as their exports to the rest-of-the-world regions, are derived from United Nations trade statistics and/or (partly estimated) from national sources.[2]

Note that statistics of exports from a given country i to another country j (x_j^i) frequently tend to be different from those of country j's imports from country i (m_j^i). These discrepancies typically reflect valuation differences (FOB versus CIF) or reporting errors. To reduce the discrepancies, the weight calculations were based on "adjusted" exports defined as $(0.93\ m_j^i+x_j^i)/2$. Note also that in the OECD-statistics some exports and imports are not geographically distributed. These unspecified trade flows were disregarded in the calculations.

Domestic output sold in local markets

Severe data problems arise with respect to the concept of domestic output of manufactured goods sold locally. The use of production turnover figures is handicapped by the lack of accurate data and, more importantly, by the presence of double-counting - basically reflecting the inputs into manufacturing originating from other domestic manufacturing enterprises. Neither is the use of value added figures satisfactory because these data exclude inputs coming from abroad or produced by domestic non-manufacturing enterprises. Without these inputs *value added* figures cannot be readily compared with trade flow figures which are based on

[2] Because the sum of partner countries' exports to Hong Kong far exceeds any reasonable estimate of imports of manufactured goods effectively used in Hong Kong, corrections to Hong Kong's imports of manufactured goods (and accordingly to partner country exports to Hong Kong) were made, consisting of eliminating that part of Hong Kong's imports that is directly re-exported.

gross value.[3] The BIS has nevertheless chosen to use value added figures but to bring them closer to the gross value basis in which trade figures are expressed, by proxying the missing data on inputs into manufacturing, other than those produced by domestic manufacturing enterprises, by imports of manufactured goods.[4] Domestically produced and sold goods are then this output concept minus exports of manufactured goods. While being far from ideal, this measure avoids the emergence of very small, or even negative, estimates of domestically produced and sold goods in small, very open economies; at the same time this method does not materially affect the estimates in larger, more closed economies where the position of domestic producers in the local market remains large irrespective of the output measure used.

It should be recognised that, as indicated in Armington (1969b) and Durand and Giorno (1987), alternative specifications of this supply component can lead on occasion to marked differences in the outcome of the weight calculations. These differences can be illustrated for the weight construction of the Dutch guilder's effective exchange rate index, presented in Table A1. The export weights of the currencies of selected competitor countries are calculated in this table under alternative assumptions with respect to the importance of local suppliers in the various markets. They show particularly marked differences for Belgium and the Netherlands' non-European trading partners. If local suppliers dominate their home market, the close bilateral trading relationship between the Netherlands and Belgium and the much weaker one with non-European countries fully determine the weights. In the opposite case, in which local suppliers can claim only a negligible share of the market, the weights show that competition from non-European producers in Dutch export markets is very significant, while the importance of Belgian producers shrinks markedly. Both aspects of bilateral trade relationships and third market competition are represented in the case where local as well as foreign suppliers compete in each market. The balance between both aspects is determined by the degree of openness, or import penetration,

[3] An attempt to produce compatible trade and production data can be found in Berthet-Bondet and Pin (1988). Their estimates, however, do not fully address the problems of double-counting and lack of accuracy.

[4] Data on manufacturing value added in most industrial countries are derived from OECD, *National Accounts* (Volume II: detailed tables). In the cases of Ireland, Portugal and Switzerland, the 1990 data were estimated on the basis of historical (OECD) data. National sources are used for the United States, the United Kingdom, the Asian NIEs and Mexico.

Table A1

Export weights for the Dutch guilder's effective exchange rate index under alternative assumptions

In percentages

Weight of currency of:	Assumptions with respect to market competition		
	Local suppliers dominate[1]	Both local and foreign suppliers compete[2]	Foreign suppliers dominate[3]
Belgium	17.7	7.8	5.7
Germany	25.8	25.0	20.0
Other European countries	47.8	49.2	47.7
United States	4.6	8.1	9.9
Japan	1.0	5.1	8.9
NIEs and Canada	2.5	4.3	7.4

[1] Weighting scheme based on bilateral export shares. [2] Supply from local producers proxied by valued added minus net exports of manufactured goods. [3] Weighting scheme based solely on competition in third markets.

in each market, which is sensitive in turn to the broadness of the chosen concept of domestic output for the local market.

The structure of import and export weights for calculating the effective exchange rate indices of the currencies of the major industrial countries is presented in Tables A2 and A3. Indicative overall weights are shown in Table A4. They are calculated as the average, weighted according to the relative share of imports and exports in total trade, of import and export weights.

Cost and price indicators

The BIS uses two price measures and one cost measure to derive real effective exchange rates. The price series comprise consumer prices and export unit values of manufactured goods. National sources constitute the primary source for these price series, although at times supplementary information on export unit values is taken from OECD trade statistics. For very volatile series, smoothing techniques based on a four-month moving average are used. When needed, quarterly series are converted into monthly observations by simple linear interpolation.

Table A2

Import competitiveness weights in BIS effective exchange rate calculations

In percentages

In index of:	US	JP	CA	BE	FR	DE	IT	NL	ES	SE	CH	GB
Weight of:												
United States (US)	–	35.5	71.2	4.8	10.3	8.6	6.1	7.9	8.9	10.2	7.0	12.5
Japan (JP)	26.8	–	8.7	3.0	5.8	8.8	3.9	4.7	6.6	6.6	5.4	7.8
Canada (CA)	20.4	1.6	–	0.3	0.5	0.5	0.4	0.7	0.4	0.7	0.2	1.2
Other non-European countries	0.6	2.5	0.2	0.1	0.1	0.2	0.2	0.1	0.0	0.1	0.1	0.6
Europe	28.1	39.5	13.2	90.3	80.2	76.8	86.8	83.2	80.8	78.4	84.6	72.0
European Community	24.3	33.4	11.0	83.5	72.2	60.0	75.4	75.4	74.0	61.6	77.0	61.7
Belgium-Luxembourg (BE)	1.2	1.6	0.5	–	10.2	9.3	7.2	15.9	3.9	3.5	3.5	5.5
France (FR)	3.5	7.1	1.9	17.1	–	14.5	17.5	8.1	17.3	6.0	10.9	10.6
Germany (DE)	8.2	12.3	3.4	30.3	25.1	–	30.9	32.8	23.0	23.9	38.7	21.7
Italy (IT)	3.4	5.3	1.6	5.8	15.2	12.4	–	5.0	13.9	5.1	11.1	6.9
Netherlands (NL)	1.1	0.9	0.5	16.6	4.4	8.4	6.2	–	3.6	3.8	3.5	8.5
Spain (ES)	0.7	0.7	0.3	1.5	5.6	2.8	3.7	1.3	–	1.1	0.9	2.4
United Kingdom (GB)	5.1	4.5	2.3	10.3	8.3	8.0	7.4	9.3	7.6	8.8	6.1	–
Other EC countries	1.1	1.1	0.5	1.8	3.5	4.6	2.5	3.1	4.7	9.5	2.1	6.2
Other European countries	3.9	6.1	2.2	6.8	8.0	16.8	11.4	7.8	6.8	16.8	7.6	10.3
Asian NIEs and Mexico	24.1	21.0	6.8	1.6	3.2	5.2	2.7	3.4	3.3	4.1	2.8	6.0

Note: SE = Sweden; CH = Switzerland.

Table A3

Export competitiveness weights in BIS effective exchange rate calculations

In percentages

In index of:	US	JP	CA	BE	FR	DE	IT	NL	ES	SE	CH	GB
Weight of:												
United States (US)	–	35.2	68.4	8.6	11.6	12.0	11.7	8.1	10.3	13.0	12.2	16.0
Japan (JP)	18.8	–	8.7	6.3	8.4	8.3	8.1	5.1	5.8	7.3	10.6	9.1
Canada (CA)	18.3	3.6	–	0.8	1.3	1.2	1.2	0.8	1.0	1.7	1.2	1.8
Other non-European countries	2.8	2.9	0.8	0.5	0.6	0.8	0.8	0.6	0.4	1.4	1.0	1.8
Europe	43.2	38.9	14.8	79.7	72.9	72.5	73.1	82.0	78.0	71.6	68.9	65.6
European Community	37.6	33.3	12.9	71.4	63.8	56.1	62.5	72.7	71.2	57.9	62.3	56.2
Belgium-Luxembourg (BE)	2.3	2.2	0.8	–	5.6	5.7	3.9	7.8	3.9	3.7	3.4	4.7
France (FR)	6.9	5.4	2.0	16.0	–	13.9	15.7	12.3	18.7	7.8	10.5	11.4
Germany (DE)	10.7	11.0	3.8	23.2	22.4	–	22.2	25.0	18.4	17.3	21.8	17.9
Italy (IT)	4.4	4.0	1.6	9.2	11.8	11.6	–	8.9	11.4	6.6	10.2	8.0
Netherlands (NL)	2.6	2.1	0.9	8.1	5.1	6.9	3.7	–	3.8	4.5	3.4	5.1
Spain (ES)	1.9	1.5	0.5	2.9	5.7	4.0	5.1	3.0	–	2.7	2.5	3.5
United Kingdom (GB)	7.0	5.8	2.8	8.9	9.8	9.9	7.9	11.8	8.7	9.7	7.6	–
Other EC countries	1.8	1.5	0.6	3.1	3.5	4.1	4.1	3.9	6.3	5.7	2.8	5.7
Other European countries	5.7	5.6	2.0	8.3	9.2	16.3	10.5	9.3	6.8	13.8	6.6	9.4
Asian NIEs and Mexico	16.9	19.3	7.3	4.1	5.1	5.3	5.1	3.5	4.6	4.9	6.3	5.7

Note: SE = Sweden; CH = Switzerland.

Table A4

Overall competitiveness weights in BIS effective exchange rate calculations

In percentages

In index of:	US	JP	CA	BE	FR	DE	IT	NL	ES	SE	CH	GB
Weight of:												
United States (US)	–	35.3	69.9	6.8	10.9	10.5	9.2	8.0	9.5	11.6	9.5	14.1
Japan (JP)	23.4	–	8.7	4.6	7.1	8.5	6.2	4.9	6.2	7.0	8.0	8.4
Canada (CA)	19.5	3.0	–	0.5	0.9	0.9	0.9	0.7	0.6	1.2	0.7	1.5
Other non-European countries	1.5	2.8	0.4	0.3	0.4	0.5	0.5	0.3	0.2	0.8	0.5	1.1
Europe	34.5	39.1	13.9	84.9	76.6	74.3	79.2	82.6	79.7	74.9	76.8	69.1
European Community	29.9	33.3	11.8	77.4	68.1	57.8	68.3	74.1	72.9	59.7	69.7	59.2
Belgium- Luxembourg (BE)	1.7	2.0	0.6	–	7.9	7.2	5.4	12.0	3.9	3.6	3.5	5.1
France (FR)	4.9	5.9	1.9	16.6	–	14.2	16.5	10.0	17.9	6.9	10.7	11.0
Germany (DE)	9.2	11.4	3.6	26.7	23.8	–	26.1	29.1	21.2	20.5	30.4	20.0
Italy (IT)	3.9	4.3	1.6	7.5	13.6	11.9	–	6.9	12.9	5.8	10.7	7.4
Netherlands (NE)	1.7	1.7	0.7	12.3	4.7	7.6	4.8	–	3.6	4.2	3.5	7.0
Spain (ES)	1.2	1.2	0.4	2.2	5.6	3.5	4.5	2.1	–	1.9	1.7	2.9
United Kingdom (GB)	5.9	5.4	2.5	9.6	9.1	9.1	7.7	10.5	8.0	9.2	6.9	–
Other EC countries	1.3	1.4	0.5	2.5	3.5	4.3	3.4	3.4	5.3	7.5	2.4	6.0
Other European countries	4.6	5.8	2.1	7.5	8.6	16.5	10.9	8.5	6.8	15.2	7.1	9.9
Asian NIEs and Mexico	21.1	19.8	7.0	2.9	4.1	5.2	4.0	3.5	3.8	4.5	4.5	5.9

Note: SE = Sweden; CH = Switzerland.

Relative cost measures are based on unit labour costs. From national account statistics, information is collected on (i) total labour compensation and (ii) labour productivity in manufacturing. As in most cases data are only available on a yearly basis, higher frequency data that are consistent with the annual figures are generated by applying the Ginsburgh interpolation technique (see Ginsburgh (1973)).[5] In some countries, the derived monthly labour cost data contain a marked seasonal pattern, in part due to the payment of bonuses, differences in the number of monthly working days, etc. To correct for these patterns, data are seasonally adjusted using the X-11 seasonal adjustment programme of the US Bureau of the Census. Monthly productivity data are smoothed to eliminate their cyclical behaviour by computing a three-year moving average, centred in the middle of the period. The annual percentage change yielded by the latest three-year moving average that can be calculated is used to bring the productivity series up-to-date.

Except for consumer prices, data on the necessary prices and unit labour costs tend to lag behind. To produce fairly current real exchange rate indicators, extrapolation is frequently needed. The extrapolation techniques involve either applying information contained in related series (see the footnote below) to the missing observations or, in the absence of related information, applying the annual percentage increase in prices or labour costs for the latest month for which actual observations are at hand to the subsequent months for which no such data are available. The most recent trend in the various measures of real effective exchange rates should therefore be treated with the necessary degree of caution.

[5] This technique estimates the monthly movement in unit labour costs on the basis of "related" statistical series, such as average wages or earnings, manufacturing employment and industrial output.

Appendix II

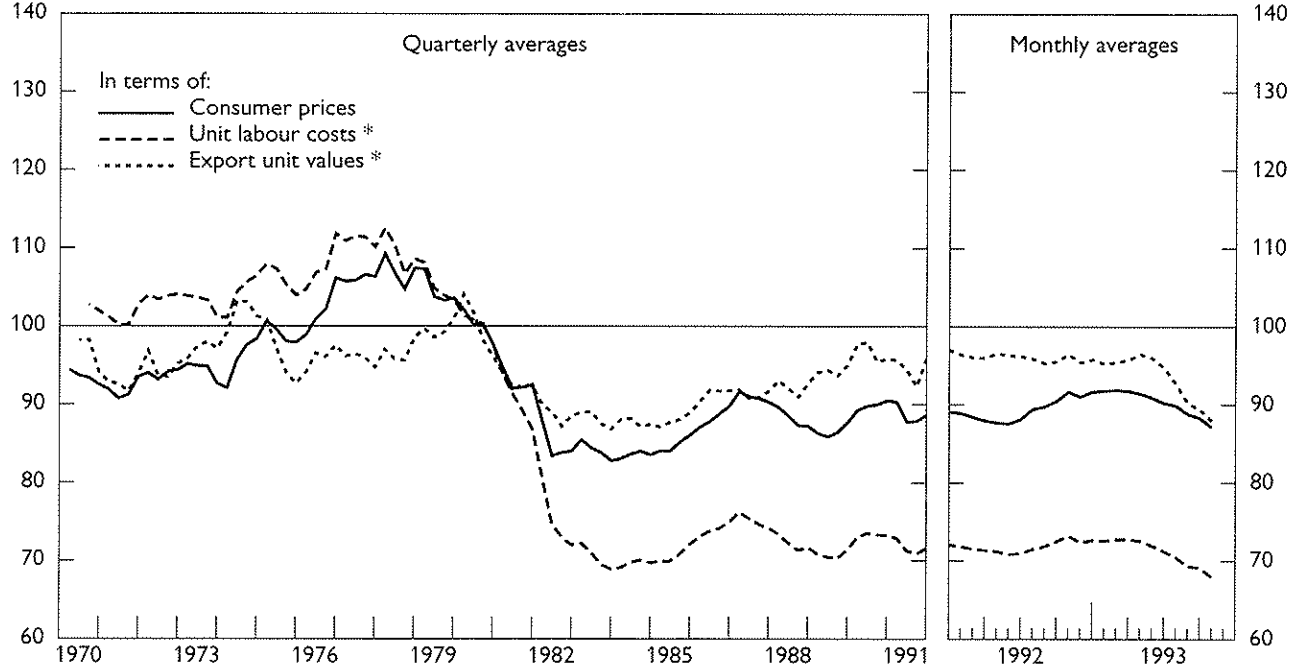
Real effective exchange rate measures for selected countries

Graphs A1 to A9 present the various real effective exchange rate series based on relative consumer prices, export unit values and unit labour costs for the main industrial countries discussed in the section on real effective exchange rates. Graph A10 summarises developments in the combined price and cost competitiveness of the group of the Asian NIEs. These real rates for the NIEs are derived by setting their respective weights in the original indices equal to zero and renormalising the other weights. The adjusted indices are subsequently averaged into a single index, using as weights the relative importance of each NIE in trade with countries outside the NIE region.

Graph A1

Real effective exchange rates: Belgium

1980 = 100



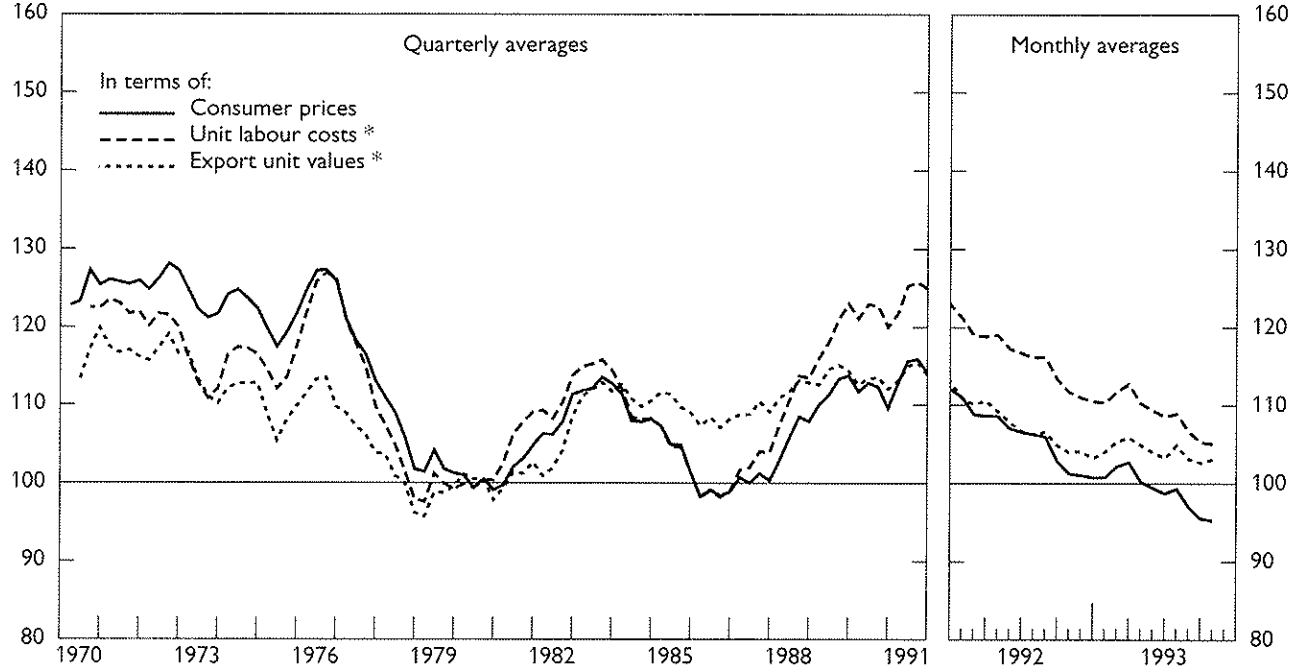
* In manufacturing.

Source: BIS.

Graph A2

Real effective exchange rates: Canada

1980 = 100



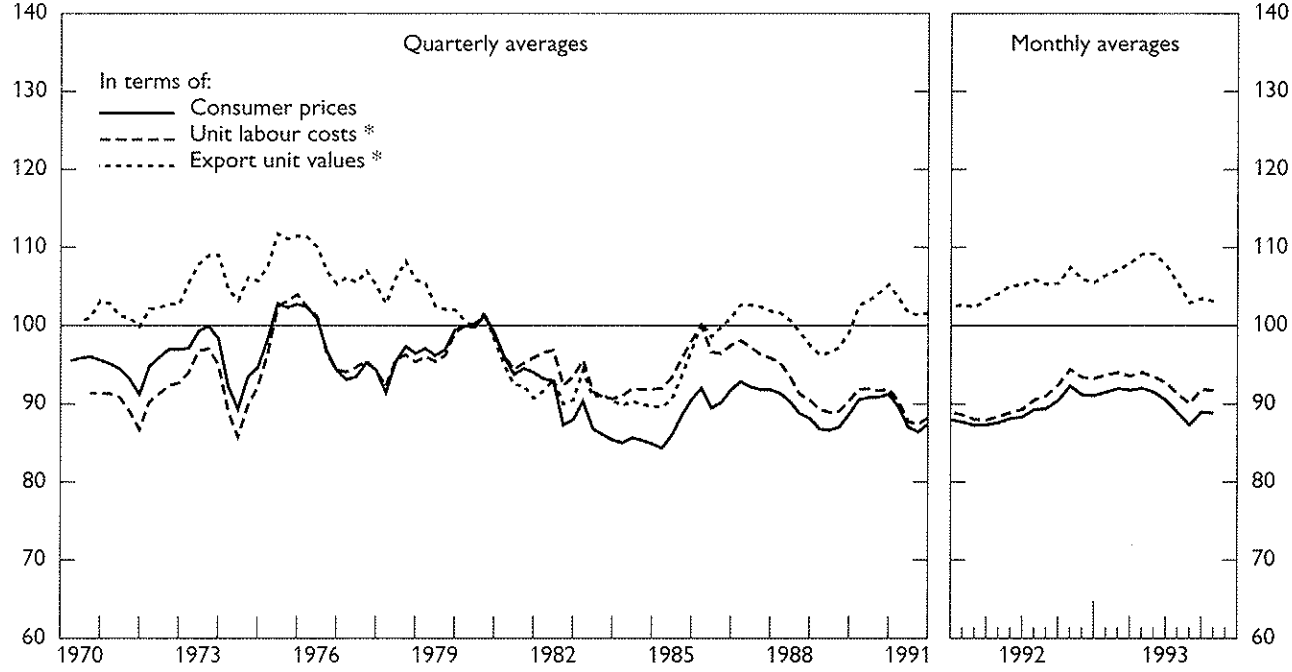
* In manufacturing.

Source: BIS.

Graph A3

Real effective exchange rates: France

1980 = 100



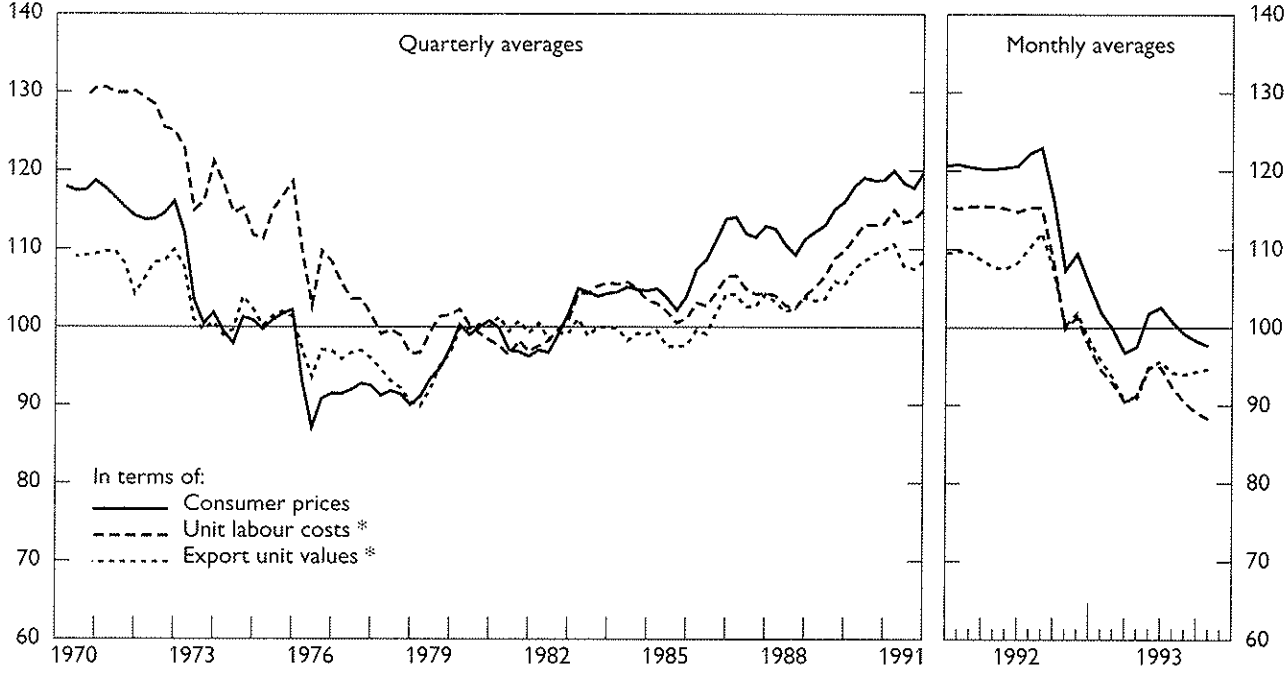
* In manufacturing.

Source: BIS.

Graph A4

Real effective exchange rates: Italy

1980 = 100



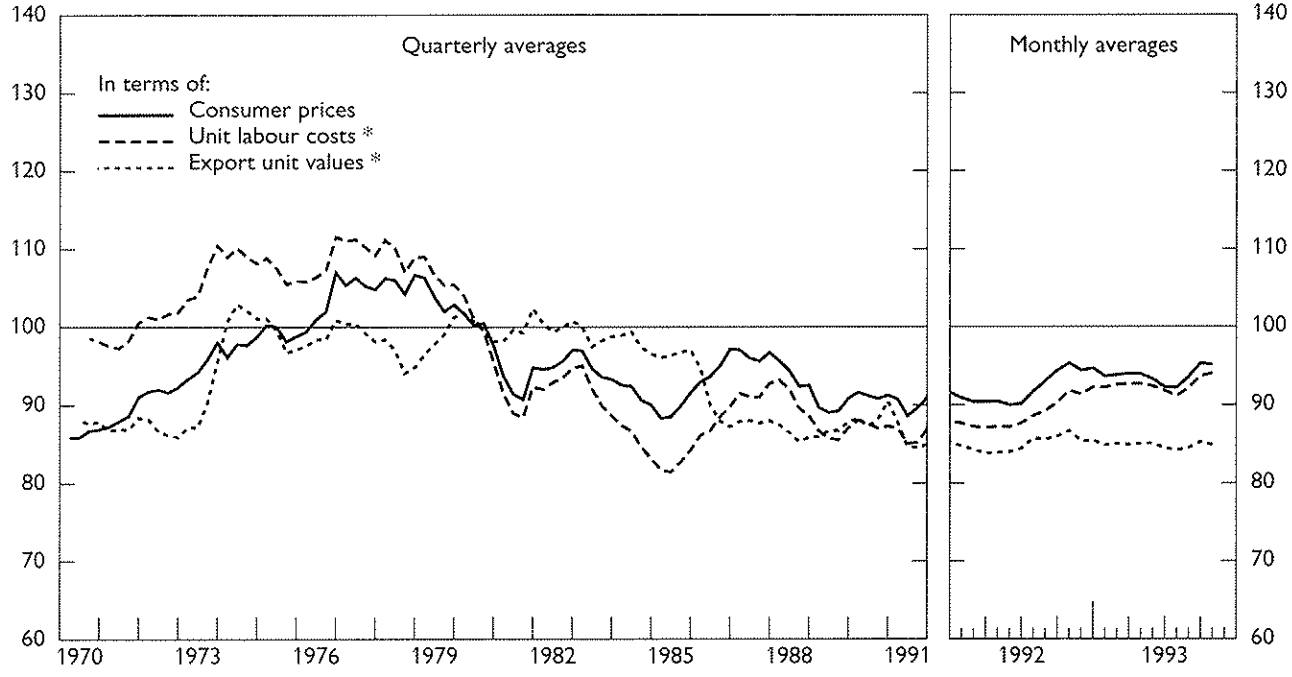
* In manufacturing.

Source: BIS.

Graph A5

Real effective exchange rates: Netherlands

1980 = 100



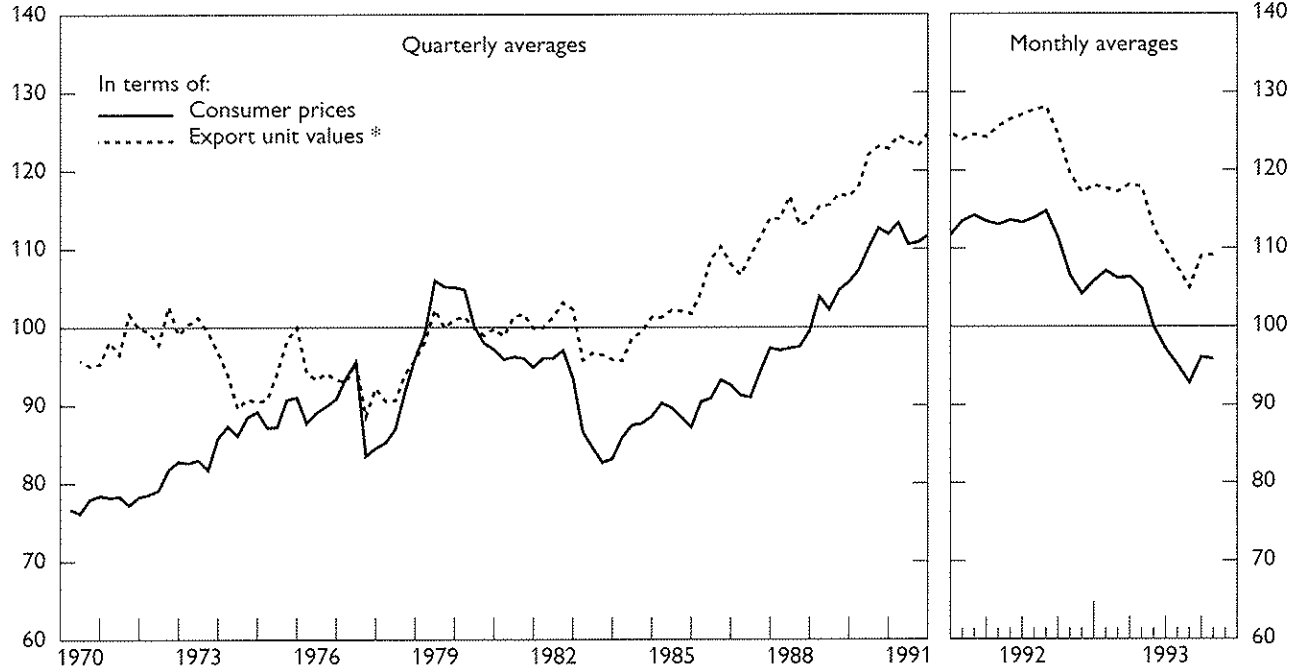
* In manufacturing.

Source: BIS.

Graph A6

Real effective exchange rates: Spain

1980 = 100



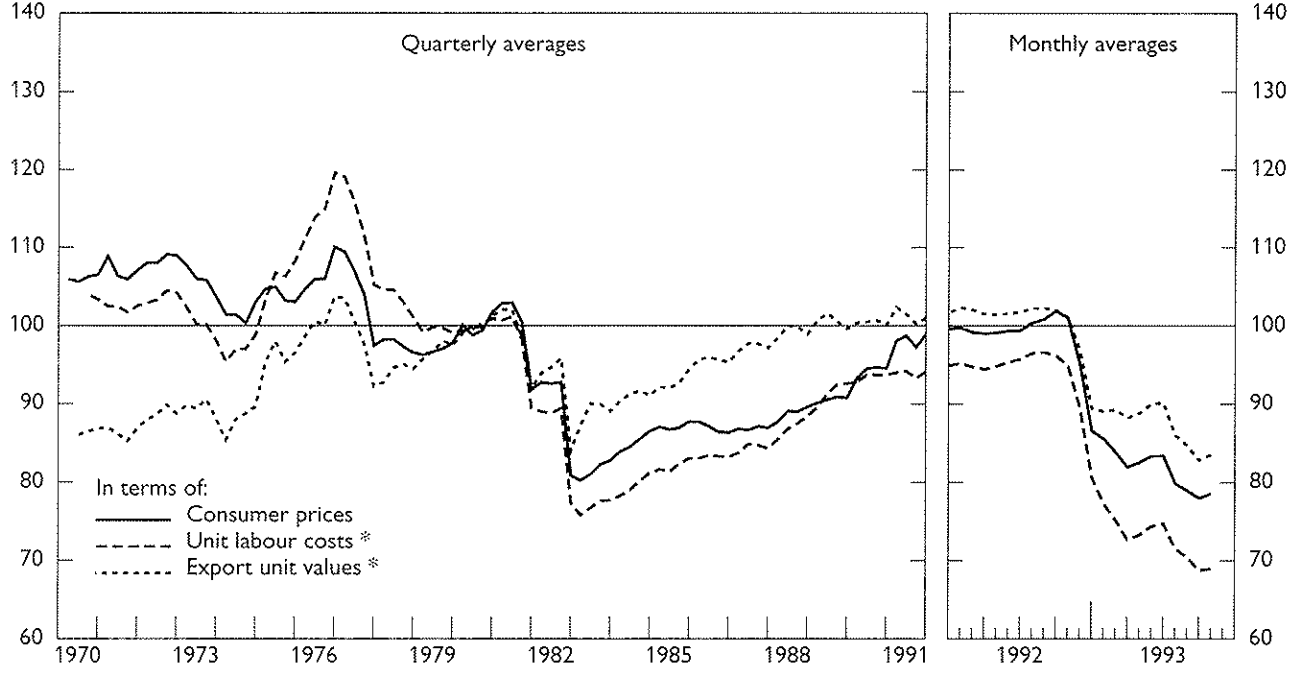
* In manufacturing.

Source: BIS.

Graph A7

Real effective exchange rates: Sweden

1980 = 100



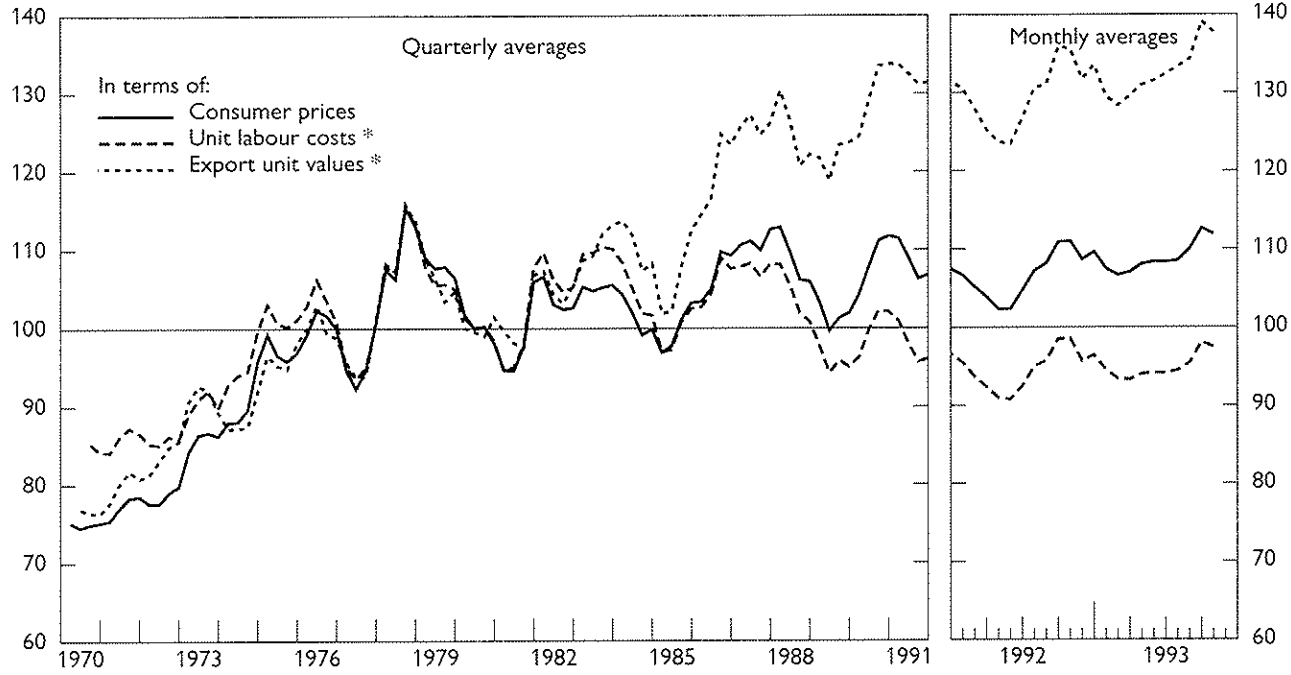
* In manufacturing.

Source: BIS.

Graph A8

Real effective exchange rates: Switzerland

1980 = 100



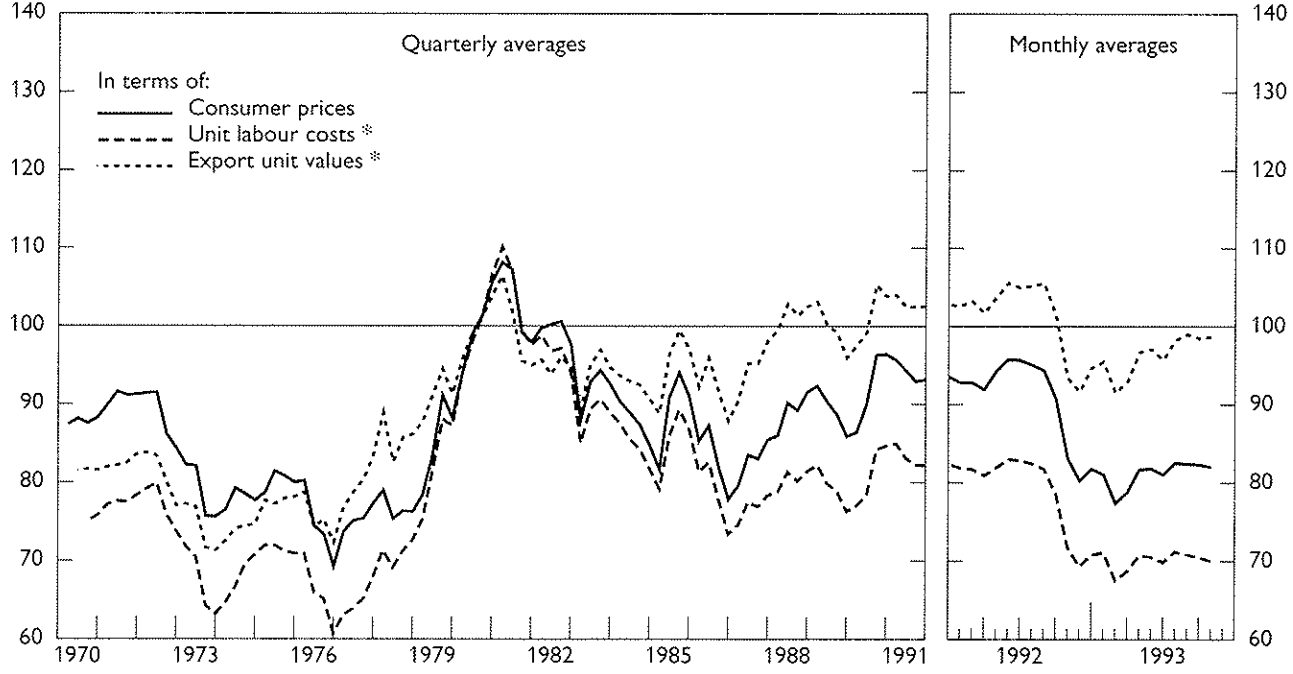
* In manufacturing. Unit labour costs are estimated from incomplete data.

Source: BIS.

Graph A9

Real effective exchange rates: United Kingdom

1980 = 100



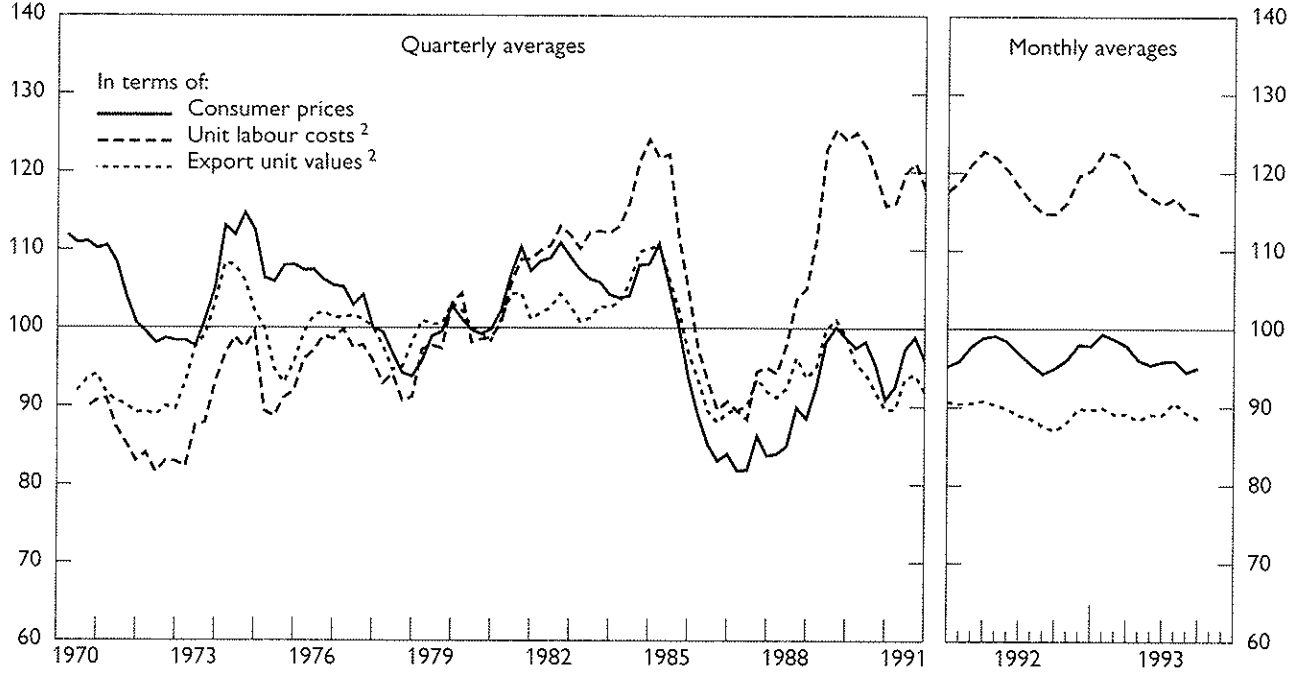
* In manufacturing.

Source: BIS.

Graph A10

Real effective exchange rates: Asian NIEs[1]

1980 = 100



[1] Composite index for the four Asian NIEs excluding intra-regional trade. [2] In manufacturing.

Source: BIS.

Appendix III

National accounts: tradables and non-tradables

The decomposition between tradables and non-tradables was guided by data availability in the standard national accounts. The main source was OECD *National Accounts* supplemented where necessary with national statistics. The tradable sector was proxied by the manufacturing sector. Although two sectors contained important elements that were clearly tradable (agriculture and mining) they were not classified because trade and other official restrictions limit effective tradability in practice. The non-tradable sector excluded the government and the financial/real estate sector (where earnings tend to be dominated by interest rate movements, the notional rent on owner-occupied housing and other special factors). The non-tradable sector thus included four sub-sectors: construction; wholesale and retail trade, restaurants and hotels; transport, storage and communications; community, social, educational, medical, recreational and personal services. However, there were, usually slight, differences in the precise sectoral definitions used in countries' national accounts: in some cases the closest definition available was taken.

The country coverage was the Group of Ten countries with the exception of Switzerland for want of data. The mnemonics used are given at the end of this note; although the definitions used were usually self-explanatory, some further clarification on a number of points follows below.

Indirect taxes less subsidies

Where possible, the value of value added in a particular sector was adjusted for indirect taxes (T) and subsidies (S). However, value added taxes, typically not included in the sector estimates of value added, could not be excluded.

Operating surplus

This concept of profits (*OS*) is given in the sectoral national accounts by the identity:

$$V \equiv W + CC + OS + T - S$$

In this case, the operating surplus is a net concept (i.e. after deduction of depreciation or capital consumption). However, not all countries provide sectoral estimates of capital consumption (*CC*); in those countries (Belgium, Canada, France, Italy and Sweden), the gross operating surplus had to be used.

Dependent employment and self-employed/family workers

In the national accounts, the concept of labour earnings is typically captured by compensation of employees. Although this is a rather comprehensive measure of labour costs,[6] it does not include the implicit earnings of the self-employed. The self-employed are a relatively small proportion of the labour force in most industrial countries, with two important exceptions – Japan and Italy.

There are usually no good statistics on the "true" labour earnings of the self-employed. In the national accounts, for instance, such earnings are usually combined with total entrepreneurial and other income items which include a significant element of returns to capital. Some approximate estimate is therefore necessary. Normally self- or family-employed workers receive smaller annual wages than dependent employees. One reason is that family-employed workers tend to work part-time; another is that the self-employed tend to work in the more labour-intensive sectors. On the basis of Japanese data, it was decided to assume that average labour earnings in the self- or family-employed sector were one-half of the levels seen in the dependent employment sector.[7] This is rather arbitrary, but is perhaps more accurate than the two extremes.[8]

[6] As well as wage costs, it includes also employers' contributions for social security, private pension and other welfare schemes.

[7] Japanese data on size of enterprises show that monthly cash earnings in small enterprises (where the self-employed are relatively important) are about one-half monthly earnings in enterprises employing more than five workers. (Source: *Statistical Yearbook of Japan.*)

[8] A number of studies (e.g. Lipschitz and McDonald (1992)) define unit labour costs as derived from the national accounts as total compensation of employees divided by value added. This implicitly assumes zero productivity for the self-employed.

Hence, total returns to labour, *WAGE*, are given by:

$$WAGE = W + 0.5(W/ED)ES$$

Likewise, the operating surplus adjusted for the earnings of the self-employed (compensation of employees have already been subtracted from value added to get to the operating surplus), *PR* is given by:

$$PR = OS - 0.5(W/ED)ES$$

Measuring value added at purchasing power parities

First, the national accounts measures of sectoral value added at constant prices – in national currencies – were rebased to 1990 prices (i.e. so that the value and constant price observations for 1990 are the same).

Purchasing power parities were taken from OECD *Purchasing power parities and real expenditures 1990: EKS results volume 1*. For tradables, a weighted average of the PPPs for personal transport equipment and fixed investment in machinery and equipment was used (with 1990 expenditures used as weights). For non-tradables, a weighted average of the PPPs for construction; restaurants, cafés, hotels; education, recreation and culture; and purchased transport services.

Levels of unit labour costs in total manufacturing

There were two elements in this measure, the calculation of value added in manufacturing at international prices and that of total compensation.

In the absence of production-based purchasing power parities for total manufacturing, an estimate was derived by weighting together certain expenditure components published in the OECD's detailed PPP calculations. The categories selected as heavily reflecting manufacturing output were consumers' expenditure on clothing and footwear, personal transport equipment and fixed investment in machinery and equipment; the individual PPPs were weighted together by actual expenditure in 1990. In the absence of detailed expenditure-based PPPs for South Korea and Taiwan, the estimate was based on a weighted average of the consumption and investment PPPs given in Summers and Heston (1991). Value added was based on GDP in market prices in the manufacturing sector, and total compensation was also taken from the national accounts,

with the adjustment described above for non-dependent employment. Hence, unit labour costs in manufacturing were defined as

$$\frac{WAGEM \times ER}{VM \times PPP90M}$$

The intermediate steps used the US Bureau of Labor Statistics' estimates of total hours in manufacturing.

Mnemonics used

Code	Description	Equation
CC	Capital consumption	
E	Total employment	
EM	Total employment, manufacturing	
ED	Dependent employment	
EDM	Dependent employment, manufacturing	
ER	Spot exchange rate	
ES	Self-employed, family workers, etc.	$E - ED$
ESM	Self-employed, family workers, etc., manufacturing	$EM - EDM$
H	Total annual hours worked in manufacturing	
OS	Operating surplus	$V - W - CC - T + S$
P	Value added deflator adjusted for indirect taxes	$100 \times (V - T + S)/Q$
PPP_{90}	Purchasing power parity (vis-à-vis the US dollar in 1990)	
$PPP_{90}M$	Purchasing power parity for manufacturing in 1990	
PRODY	Productivity	Q/E
PROF	Profit share (after deduction for self-employed)	$\frac{[OS - 0.5(W/ED)ES]100}{V - T + S}$
Q	Value added at constant prices	
Q_{90}	Value added at constant 1990 prices (national currency terms)	
$Q_{\$}$	Value added at constant 1990 international prices	$Q_{90} \times PPP_{90}$
$Q_{\$}M$	Value added in manufacturing at constant 1990 international prices	$Q_{90}M \times PPP_{90}M$

QH	Value added per hour in manufacturing	$Q_{\$}M/H$
S	Subsidies	
T	Indirect taxes	
ULC	Unit labour costs	*[W + 0.5(W/ED)ES]/Q*
V	Value added at current prices	
VM	Value added at current prices, manufacturing	
W	Compensation of employees	
WM	Compensation of employees, manufacturing sector	
WAGE	Total earnings of labour (including self-employed)	*W + 0.5(W/ED)ES*
WAGEM	Total earnings of labour (including self-employed), manufacturing sector	*W+0.5(WM/EDM)ESM*

Bibliography

Aghevli, Bijan B. and Peter J. Montiel (1991). "Exchange rate policies in developing countries", in Claassen (1991), pp. 205-237.

Aghevli, Bijan B., Moshin S. Khan and Peter J. Montiel (1991). "Exchange rate policy in developing countries: some analytical issues". *IMF Occasional Paper No. 78*, March.

Anderson, Gerald H., Nicholas V. Karamouzis and Peter D. Skaperdas (1987). "A new effective exchange rate index for the dollar and its implications for U.S. merchandise trade". Federal Reserve Bank of Cleveland *Economic Review*, Quarter 2, pp. 2-23.

Angell, James W. (1926). *The theory of international prices: history, criticism and restatement.* Cambridge, Massachusetts: Harvard University Press.

Ark, Bart van (1990a). "Comparative levels of labour productivity in Dutch and British manufacturing". *National Institute Economic Review*, February, pp. 71-85.

Ark, Bart van (1990b). "Manufacturing productivity levels in France and the United Kingdom". *National Institute Economic Review*, August, pp. 62-77.

Ark, Bart van (1990c). "Comparative levels of manufacturing productivity in postwar Europe: measurement and comparisons". *Oxford Bulletin of Economics and Statistics*, November, special issue, pp. 343-374.

Ark, Bart van (1992). "Comparative productivity in British and American manufacturing". *National Institute Economic Review*, November, pp. 63-73.

Ark, Bart van (1993). "The ICOP approach - its implications and applicability", in Szirmai et al. (1993), pp. 365-398.

Armington, Paul S. (1969a). "A theory of demand for products distinguished by place of production". *IMF Staff Papers*, March, pp. 159-178.

Armington, Paul S. (1969b). "The geographic pattern of trade and the effects of price changes". *IMF Staff Papers*, July, pp. 179-201.

Arndt, Sven (1988). "An evaluation of policies to resolve the trade deficit", in Albert E. Burger (1988), pp. 287-315.

Arndt, Sven and J. David Richardson (eds.) (1987). *Real-financial linkages among open economies.* Cambridge, Mass.: MIT Press.

Artus, Jacques R. and Malcolm D. Knight (1984). "Issues in the assessment of the exchange rates of industrial countries". *IMF Occasional Paper No. 29*, July.

Artus, Jacques R. and Rudolf R. Rhomberg (1973). "A multilateral exchange rate model". *IMF Staff Papers*, November, pp. 591-611.

Artus, Jacques R. and Anne Kenny McGuirk (1981). "A revised version of the multilateral exchange rate model". *IMF Staff Papers*, June, pp. 275-309.

Aukrust, Odd (1977). "Inflation in the open economy: a Norwegian model", in Krause and Salant (1977).

Balassa, Bela (1964). "The purchasing-power parity doctrine: a reappraisal". *Journal of Political Economy*, December, pp. 584-596.

Bank for International Settlements (1988). *58th Annual Report 1987-88*. Basle.

Bank of England (1982). "Measures of competitiveness". *Bank of England Quarterly Bulletin*, September, pp. 369-375.

Bank of England (1988). "Revisions to the calculation of effective exchange rates". *Bank of England Quarterly Bulletin*, November, pp. 528-529.

Bank of France (1980). "Une méthode de mesure de la compétitivité internationale des produits français: application à la période 1970-1978". Banque de France *Bulletin Trimestriel*, March, pp. 19-34.

Bank of Italy (1988). "Recent tourism trends and new indicators of competitiveness". Banca d'Italia *Economic Bulletin*, October, pp. 20-21.

Bank of Italy (1992a). "The Italian economy and the balance of payments". Banca d'Italia *Economic Bulletin*, February, pp. 16-30.

Bank of Italy (1992b). "The Bank of Italy's real effective exchange rate indicators". Banca d'Italia *Economic Bulletin*, October, pp. 73-81.

Bank of Japan (1986). "On effective U.S. dollar exchange rate indices". *Research and Statistics Department Special Paper No. 147*, December.

Bank of Japan (1987). "U.S. competitiveness in manufacturing". *Research and Statistics Department Special Paper No. 153*, September.

Bank of Japan (1993). "Corporate service price index". Bank of Japan *Quarterly Bulletin*, May, pp. 51-70.

Batten, Dallas S. and Michael T. Belongia (1987). "Do the new exchange rate indexes offer better answers to old questions?". Federal Reserve Bank of St. Louis *Review*, May, pp. 5-17.

Beckermann, Wilfred (1966). *International comparisons of real incomes*. Development Centre of the Organisation for Economic Cooperation and Development.

Bélanger, Gérard (1976). "An indicator of effective exchange rates for primary producing countries". *IMF Staff Papers*, March, pp. 113-136.

Berthet-Bondet, Claude, Derek Blades and Annie Pin (1988). "The OECD compatible trade and production data base 1970-85". OECD Department of Economics and Statistics *Working Paper No. 60*, November.

Bhagwati, Jagdish N. (1984). "Why are services cheaper in poor countries?". *Economic Journal*, June, pp. 279-286.

Black, Stanley W. (1976). "Multilateral and bilateral measures of effective exchange rates in a world model of traded goods". *Journal of Political Economy*, June, pp. 615-621.

Blades, Derek and David Roberts (1987). "A note on the new OECD benchmark purchasing power parities for 1985". *OECD Economic Studies*, Autumn, pp. 183-197.

Brits, J.H. (1991). "Revision of the weighting method for calculating effective exchange rates". De Nederlandsche Bank *Quarterly Bulletin*, September, pp. 27-39.

Brooks, Ray and Ian Corfield (1991). "Further assessment of alternative exchange rate indices as monetary policy indicators". *Reserve Bank of New Zealand Discussion Paper G91/3*, December.

Bryant, Ralph C., Gerald Holtham and Peter Hooper (eds.) (1988). *External deficits and the dollar: the pit and the pendulum*. Washington, D.C.: The Brookings Institution.

Burger, Albert E. (ed.) (1988). *US trade deficit: causes, consequences and causes.* Proceedings of the twelfth annual economic policy conference of the Federal Reserve Bank of St. Louis. Federal Reserve Bank of St. Louis.

Cassel, Gustav (1922). *Money and foreign exchange after 1914.* London [etc.]: Constable and Co. Ltd. pp. 137-162.

Central Statistical Office (1974). "The 'effective' exchange rate for sterling". *Economic Trends*, June, xxix-xxxv.

Central Statistical Office (1980). "Revised measures of UK trade competitiveness in manufactures: technical note". *Economic Trends*, May, pp. 88-89.

Claassen, Emil-Maria (ed.) (1991). *Exchange rate policies in developing and post-socialist countries.* San Francisco: ICS Press.

Clague, Christopher (1986). "Determinants of the national price level: some empirical results". *The Review of Economics and Statistics*, May, pp. 320-23.

Cooper, S.A. (1988). "Estimating New Zealand's real effective exchange rate". *Reserve Bank of New Zealand Discussion Paper G88/7*, November.

Courbis, R. (1975). *Compétitivité et croissance en économie concurrencée.* Finance et Economie appliquée, Volume 48. Paris: Durnod.

Cox, Michael W. (1986). "A new alternative trade-weighted dollar exchange rate index". Federal Reserve Bank of Dallas *Economic Review*, September, pp. 20-28.

Cox, Michael W. (1987). "A comprehensive new real dollar exchange rate index". Federal Reserve Bank of Dallas *Economic Review*, March, pp. 1-14.

Daly, Donald J. (1988). *Japanese manufacturing competitiveness: implications for international trade.* Toronto: University of Toronto - York University Joint Centre for Asia Pacific Studies.

Daly, Donald J. (1989). "Canada's international competitiveness", in Rugman (1989), pp. 37-54.

Daly, Donald J. (1991). "International competitiveness of Japanese manufacturing". *Managerial and Decision Economics*, April, pp. 93-102.

Daly, Donald J. (1992). "Measuring comparative productivity performance: issues in level comparisons for manufacturing". *Paper prepared for joint meeting of Canadian Economics Association, Canadian Association of Business Economics and University of Prince Edward Island.* Ontario. June.

Daly, Donald J. (1992). "Exchange rates and trade flows: recent Japanese experience". *Business and the Contemporary World*, Winter, pp. 86-100.

Daly, Donald J. (1993). "International competitiveness and smaller nations: new perspectives on porter". *Management International Review*, Ontario, February, pp. 86-100.

Deephouse, David L. (1985). "Using a trade-weighted currency index". Federal Reserve Board of Atlanta *Economic Review*, June/July, pp. 36-41.

De Gregorio, José, Alberto Giovannini and Thomas H. Krueger (1993). "The behavior of non-tradable goods prices in Europe: evidence and interpretation." *IMF Working Paper 93/45.* May.

Department of Finance (Canada) (1986). "Measuring Canada's international competitiveness". *Quarterly Economic Review*, December, pp. 37-45.

Deutsche Bundesbank (1985). "New calculation of the external value of the Deutsche Mark and foreign currencies". *Monthly Report of the Deutsche Bundesbank*, January, pp. 38-45.

Deutsche Bundesbank (1989). "Revision of the method of calculating the external value of the Deutsche Mark and foreign currencies". *Monthly Report of the Deutsche Bundesbank*, April, pp. 43-50.

Dion, Richard and Robert Lafrance (1993). "Productivity and competitiveness of Canadian firms since 1980". *Bank of Canada Review*, Spring, pp. 43-56.

Dollar, David and Edward N. Wolff (1988). "Convergence of industry labor productivity among advanced economies, 1963-1982". *The Review of Economics and Statistics*, November, pp. 549-558.

Dornbusch, Rudiger (1987). "Exchange rates and prices". *American Economic Review*, March, pp. 93-106.

Durand, Martine and Claude Giorno (1987). "Indicators of international competitiveness: conceptual aspects and evaluation". *OECD Economic Studies No. 9*, Autumn, pp. 147-182.

Durand, Martine, Jacques Simon and Colin Webb (1992). "OECD indicators of international trade and competitiveness". *OECD Economic Working Paper No. 120*, July.

Dwyer, Jacqueline (1991). "Issues in the measurement of Australia's competitiveness". Supplement to *The Economic Record*, pp. 53-59.

Dwyer, Jacqueline (1992). "The tradeable/non-tradeable dichotomy: a practical approach". *Australian Economic Papers*, December, pp. 443-459.

Dwyer, Jacqueline and Philip Lowe (1993). "Alternative concepts of the real exchange rate: a reconciliation". Reserve Bank of Australia *Research Discussion Paper No. 9309*, July.

Eatwell, John, Murray Milgate and Peter Newman (eds) (1987). *The new Palgrave: a dictionary of economics*. London: Macmillan.

Economic Planning Advisory Council (Australia) (1991). "Competitiveness: the policy environment". *Council Paper No. 47*, April.

Edwards, Sebastian (1989). "Real exchange rates in the developing countries: concepts and measurement". *NBER Working Paper No. 2950*, April.

Edwards, Sebastian and Liaquat Ahamed (1986). *Economic adjustment and exchange rates in developing countries*. Chicago: The University of Chicago Press.

Enoch, C.A. (1978). "Measures of competitiveness in international trade". *Bank of England Quarterly Bulletin*, June, pp. 181-195.

European Commission (1985). "The calculation of double export weights for use in deriving effective exchange rates". Mimeo.

European Commission (1991). "Wage adjustment in the European Community: The experience of the 1980s". *European Economy, No. 50 (special edition), Annual Economic Report*, December, pp. 63-89.

European Commission (1993). "US, Japanese and Community competitiveness developments". *European Economy, No. 54, Annual Report for 1993*, pp. 159-178.

European Community (1993). Committee of Governors of the Central Banks of the Member States of the EEC. *Annual Report 1992*. April.

Eurostat (1983). *Comparison in real values of the aggregates of ESA*. Luxembourg: Statistical Office of the European Communities.

Eurostat (1992a). *Labour costs 1988* (2 vols.). Series 3C. . Luxembourg: Statistical Office of the European Communities.

Eurostat (1992b). *Labour costs: updating 1989-90*. Series 3C. Luxembourg: Statistical Office of the European Communities.

Fagerberg, Jan (1988). "International competitiveness". *The Economic Journal*, June, pp. 355-374.

Feldstein, Martin and Philippe Bacchetta (1987). "How far has the dollar fallen?" NBER *Working Paper No. 2122*, January.

Feltenstein, Andrew, Morris Goldstein and Susan M. Schadler (1979). "A multilateral exchange rate model for primary producing countries". *IMF Staff Papers*, September, pp. 543-582.

Gibbons, Jean D. and Mary Fisher (1991). "Real exchange rate indexes applied to Mexico's international tourism receipts". *Social and Economic Studies*, 40:3, pp. 177-185.

Gilbert, Milton and associates (1958). *Comparative national products and price levels: a study of western Europe and the United States*. Organisation for European Economic Cooperation. January.

Gilbert, Milton and Irving, B. Kravis (1954). *An international comparison of national products and the purchasing power of currencies*. Organisation for European Economic Cooperation.

Ginsburgh, Victor A. (1973). "A further note on the derivation of quarterly figures consistent with annual data". *Applied Statistics*, Vol. 22. Fall, pp. 368-374.

Giovannetti, Giorgia (1992). "A survey of recent empirical tests of the purchasing power parity hypothesis". *Banco Nationale del Lavoro Quarterly Review*, March, pp. 81-101.

Griliches, Zvi (1987). "Productivity: measurement problems", in Volume 3 of Eatwell et al. (1987), pp. 1010-1013.

Hakkio, Craig, S. (1992). "Is purchasing power parity a useful guide to the dollar?". Federal Reserve Bank of Kansas City *Economic Review*, Third Quarter, pp. 37-51.

Harrod, R.F. (1939). "Comparative price levels". Chapter IV in his *International Economics*. London: Nisbet and Co. Ltd; Cambridge: Cambridge University Press, pp. 60-82.

Helkie, William L. and Peter Hooper (1988). "An empirical analysis of the external deficit, 1980-86", in Bryant et al. (1988), pp. 10-56.

Hervey, Jack L. and William A. Strauss (1987a). "The international value of the dollar: an inflation-adjusted index", Federal Reserve Bank of Chicago *Economic Perspectives*, January/February, pp. 17-28.

Hervey, Jack L. and William A. Strauss (1987b). "Technical correction: the inflation-adjusted index of the dollar". Federal Reserve Bank of Chicago *Economic Perspectives*, March/April, pp. 29-31.

Hervey, Jack L. and William A. Strauss (1987c). "The new dollar indexes are no different from the old ones". Federal Reserve Bank of Chicago *Economic Perspectives*, July/August, pp. 3-22.

Hill, John K. (1990). "The trade balance and the real exchange rate". Federal Reserve Bank of Dallas *Economic Review*, November, pp. 1-15.

Hill, Peter (1986). "International price levels and purchasing power parities". *OECD Economic Studies*, Spring, pp. 133-159.

Hirsch, Fred and Ilse Higgins (1970). "An indicator of effective exchange rates". *IMF Staff Papers*, November, pp. 453-487.

Holden, Merle (1991). "Real exchange rates and their measurement". *The South African Journal of Economics*, March, pp. 1-15.

Holzer, Stefan (1992). "Purchasing power parity - a guide for long-term currency movements". Swiss Bank Corporation *Economic and Financial Prospects 4*, pp. 5-8.

Honohan, Patrick (1979). "Exchange-rate indices". Central Bank of Ireland *Quarterly Review*, Summer, pp. 76-92.

Hooper, Peter and John Morton (1978). "Summary measures of the dollar's foreign exchange value". *Federal Reserve Bulletin*, October, pp. 783-789.

Hooper, Peter and Kathryn A. Larin (1988). "International comparisons of labor costs in manufacturing". Board of Governors of the Federal Reserve System *International Finance Discussion Papers No. 330*, August.

Hooper, Peter and Kathryn A. Larin (1989). "International comparisons of labor costs in manufacturing". *Review of Income and Wealth*, December, pp. 335-355.

Hooper, Peter and J. David Richardson (eds.) (1991). *International economic transactions.* Chicago and London: University of Chicago Press.

Hsieh, David A. (1982). "The determination of the real exchange rate: the productivity approach". *Journal of International Economics*, May, pp. 355-362.

Hulten, Charles R. (ed.) (1990). *Productivity growth in Japan and the United States.* National Bureau of Economic Research Studies in Income and Wealth, Volume 53. Chicago and London: University of Chicago Press.

Hung, Juann (1992). "Assessing the exchange rate's impact on US manufacturing profits". Federal Reserve Bank of New York *Quarterly Review*, Winter 1992-93, pp. 44-63.

Jorgenson, Dale W. and Masahiro Kuroda (1990). "Productivity and international competitiveness in Japan and the United States, 1960-1985", in Hulten (1990), pp. 29-55.

Kahn, Mohsin S. (1986). "Comment" (on Harberger A.C. "Economic adjustment and the real exchange rate"), in Edwards and Ahamed (1986), pp. 419-423.

Koch, Elmar B. (1984). "The measurement of effective exchange rates". *BIS Working Paper No. 10*, September.

Krause, Lawrence B. and Walter S. Salant (eds.) (1977). *Worldwide inflation: theory and recent experience.* Washington D.C.: Brookings Institution.

Kravis, Irving B. (1976). "A survey of international comparisons of productivity". *Economic Journal*, March, pp. 1-44.

Kravis, Irving B. (1984). "Comparative studies of national incomes and prices". *The Journal of Economic Literature*, March, pp. 1-39.

Kravis, Irving B. and Robert E. Lipsey (1983). "Toward an explanation of national price levels". *Princeton Studies in International Finance No. 52*, November.

Kravis, Irving B. and Robert E. Lipsey (1987). "The assessment of national price levels", in Arndt and Richardson (1987), pp. 97-134.

Kravis, Irving B. and Robert E. Lipsey (1988). "National price levels and the prices of tradables and nontradables". *American Economic Review*, May, pp. 474-478.

Krugman, Paul R. and Richard E. Baldwin (1987). "The persistence of the US trade deficit". *Brookings Papers on Economic Activity, No. 1*, pp. 1-43.

Lindner, Deborah J. (1992). "The political economy of the won: US-Korean bilateral negotiations on exchange rates". Board of Governors of the Federal Reserve System *International Finance Discussion Paper No. 434*, July.

Lipschitz, Leslie and Donogh McDonald (1992). "Real exchange rates and competitiveness: a clarification of concepts, and some measurements for Europe". *Empirica*, 19(1), pp. 37-69.

Lipsey, Robert E., Linda Molinari and Irving B. Kravis (1991). "Measures of prices and price competitiveness in international trade in manufactured goods" in Hooper and Richardson (1991), pp. 144-199.

McGuirk, Anne K. (1987). "Measuring price competitiveness for industrial country trade in manufactures". *IMF Working Paper 87/34*, April.

Maciejewski, Edouard B. (1983). "'Real' effective exchange rate indices". *IMF Staff Papers*, September, pp. 491-541.

Maddison, Angus (1982). *Phases of capitalist development*. Oxford: Oxford University Press.

Mann, Catherine L. (1986). "Prices, profit margins, and exchange rates". *Federal Reserve Bulletin*, June, pp. 366-379.

Marquez, Jaime (1992). "Real exchange rates: measurement and implications for predicting U.S. external imbalances". Board of Governors of the Federal Reserve System *International Finance Discussion Papers No. 427*, March.

Marris, Robin (1984). "Comparing the incomes of nations: a critique of the international comparison project". *Journal of Economic Literature*, March, pp. 40-57.

Marston, Richard C. (1987). "Real exchange rates and productivity growth in the United States and Japan", in Arndt and Richardson (1987), pp. 71-96.

Melliss, Chris (1993). "Tradable and non-tradable prices in the United Kingdom and European Community". *Bank of England Quarterly Bulletin*, February, pp. 80-91.

Morgan Guaranty Trust Company (1978). "Effective exchange rates: nominal and real". *World Financial Markets*, May, pp 3-17.

Morgan Guaranty Trust Company (1979). "Effective exchange rates compared". *World Financial Markets*, April, pp. 6-14.

Morgan Guaranty Trust Company (1983). "Effective exchange rates: update and refinement". *World Financial Markets*, August, pp. 6-14.

Morgan Guaranty Trust Company (1986). "Dollar index confusion". *World Financial Markets*, October/November, pp. 14-21.

Muellbauer, John and Anthony Murphy (1990). "How fundamental are the UK's balance of payments problems?" Mimeo. Prepared for the workshop "The UK Economy 2000: Innovation, Investment and Survival", The Institute of Mechanical Engineers, London, 25th January 1990.

Niehans, Jürg (1983). "Zur Aussagekraft effektiver Realkurse". *Schweizerische Zeitschrift für Volkswirtschaft und Statistik*, September, pp. 393-397.

OECD (1978). "The international competitiveness of selected OECD countries". *OECD Economic Outlook - Occasional Studies*, July, pp. 35-52.

OECD (1987). *OECD Economic Survey 1987/87: Ireland.*

OECD (1989a). *OECD Economic Surveys 1988/89: Italy.*

OECD (1989b). *OECD Economic Surveys 1988/89: Sweden.*

OECD (1992a). *OECD Economic Surveys 1991/92: Canada.*

OECD (1992b). *Purchasing power parities and real expenditures: 1990*, volume 1.

OECD (1992c). "Measurement and implications of changes in OECD international competitiveness". *OECD Economic Outlook No. 52*, December, pp. 50-57.

Officer, Lawrence H. (1976). "The productivity bias in purchasing power parity: an economic investigation". *IMF Staff Papers*, November, pp. 545-579.

Ohno, Kenichi (1988). "Export pricing behavior of manufacturing: a US-Japan comparison". *IMF Working Paper 88/78*, August.

O'Mahony, Mary (1992). "Productivity levels in the British and German manufacturing industry". *National Institute Economic Review*, February, pp. 46-63.

Osband, Kent (1992). "Index number biases during price liberalisation". *IMF Staff Papers*, June, pp. 287-309.

Ott, Mack (1987). "The dollar's effective exchange rate: assessing the impact of alternative weighting schemes". Federal Reserve Bank of St. Louis *Review*, February, pp. 5-14.

Owen, David and Ian Parkes (1991). "Measures of real exchange rates and competitiveness". *Treasury Bulletin. Vol. 2, Issue 1.* Winter 1990-91, pp. 25-32.

Pauls, Dianne B. (1987). "Measuring the foreign-exchange value of the dollar". *Federal Reserve Bulletin*, June, pp. 411-422.

Pauls, Dianne B. and William L. Helkie (1987). "A reassessment of measures of the dollar's effective exchange value". Board of Governors of the Federal Reserve System *International Finance Discussion Papers No. 306*, April.

Peersman, G. and A. Van Poeck (1992). "De Belgische competitiviteitswet: een betwistbaar instrument". *Tijdschrift voor Economie en Management*, September, pp. 285-300.

Pilat, Dirk and Bart van Ark (1992). "Productivity leadership in manufacturing: Germany, Japan and the United States, 1973-1989". University of Groningen *Research Memorandum No. 456*.

Pinçon, René (1979). "Réflexions méthodologiques concernant les calculs de taux de change ponderés et d'indices de compétitivité". Banque de France *Cahiers économiques et monétaires No. 10*, February, pp. 89-107.

Reserve Bank of Australia (1988). "Trade-weighted index". *Bulletin*, October, p. 21-23.

Rhomberg, Rudolf R. (1976). "Indices of effective exchange rates". *IMF Staff Papers*, March, pp. 88-112.

Ridler, Duncan and Christopher A. Yandle (1972). "A simplified method for analyzing the effects of exchange rate changes on exports of a primary commodity". *IMF Staff Papers*, November. pp. 559-578.

Ringström, Olle (1987). "The exchange rate index - an instrument for monetary and exchange rate policy". Central Bank of Sweden *Quarterly Review*, No. 4, pp. 16-26.

Rogoff, Kenneth (1992). "Traded goods consumption smoothing and the random walk behavior of the real exchange rate". Bank of Japan *Monetary and Economic Studies*, November, pp. 1-29.

Rosensweig, Jeffrey A. (1986a). "A new dollar index: capturing a more global perspective", Federal Reserve Bank of Atlanta *Economic Review*, June/July, pp. 12-22.

Rosensweig, Jeffrey A. (1986b). "Exchange rates and competition for tourists". Federal Reserve Bank of Boston *New England Economic Review*, July/August, pp. 57-67.

Rosensweig, Jeffrey A. (1987). "Constructing and using exchange rate indexes". Reserve Bank of Atlanta *Economic Review*, Summer, pp. 4-16.

Roy, A.D. (1982). "Labour productivity in 1980: an international comparison". *National Institute of Economic and Social Research Economic Review*, August, pp. 26-37.

Rugman, Alan M. (ed.) (1989). *International business in Canada: strategies for management.* Scarborough, Ontario: Prentice-Hall Canada.

Salowsky, Heinz (1992). "Industrielle Arbeitskosten im internationalen Vergleich 1970-1991" *W-Trends - Quartalhefte zur Empirischen Wirtschaftsforschung.* March, pp. 33-48.

Salter, W.E.G. (1959). "Internal and external balance: the role of price and expenditure effects." *Economic Record.* pp.226-38.

Schoefisch, Ulf (1990). "Exchange rate and foreign price indices: are trade weights appropriate?". Reserve Bank of New Zealand *Discussion Paper G90/4*, May.

Schoefisch, Ulf (1992). "Measures of external and internal competitiveness". Reserve Bank of New Zealand *Reserve Bank Bulletin*, March, pp. 27-38.

Schumacher, Dieter (1992). "Zum Einfluss realer effektiver Wechselkurse auf die Wettbewerbsfähigkeit", Deutsches Institut für Wirtschaftsforschung *Vierteljahreshefte zur Wirtschaftsforschung*, Heft 1/2, pp. 27-48.

Summers, Robert and Alan Heston (1991). "The Penn world table (mark 5): an expanded set of international comparisons, 1950-1988". *The Quarterly Journal of Economics*, May, pp. 327-368.

Swedish Employer's Confederation (1992). *Wages and total labour costs for workers - international survey 1980-1990.* February.

Szirmai, Adam and Dirk Pilat (1990). "Comparisons of purchasing power, real output and labour productivity in manufacturing in Japan, South Korea and the U.S.A., 1975-85". *Review of Income and Wealth*, March, pp. 1-31.

Szirmai, Adam, Bart van Ark and Dirk Pilat (eds.) (1993). *Explaining economic growth.* Amsterdam: North Holland.

Thakur, Subhash M. (1975). "A note on the concept of effective exchange rate". *IMF Departmental Memoranda Series 75/59*, July.

Tootell, Geoffrey M.B. (1992). "Purchasing power parity within the United States". Federal Reserve Bank of Boston *New England Economic Review*, July/August, pp. 15-24.

Vartia, Yrjö O. and Pentti L.I. Vartia (1984). "Descriptive index number theory and the Bank of Finland currency index". *Scandinavian Journal of Economics*, No. 3, pp. 352-364.

Ward, Michael (1985). "Purchasing power parities and real expenditures in the OECD". Paris: OECD.

Wickham, Peter (1987). "A revised weighting scheme for indicators of effective exchange rates". *IMF Working Paper 87/87*, December.

Wickham, Peter (1993). "A cautionary note on the use of exchange rate indicators". *IMF Paper on Policy Analysis and Assessment 93/5*, March.

Wong, Soon Teck and Peck Siu Lin (1991). "Unit business costs". *Singapore Statistical News*, October, pp. 1-15.

Wood, Adrian (1991). "Global trends in real exchange rates 1960-84". *World Development*, April, pp. 317-332.

BIS ECONOMIC PAPERS

No. 1 Credit and liquidity creation in the international banking sector, by Helmut Mayer, November 1979.

No. 2 US monetary aggregates, income velocity and the Euro-dollar market, by Warren D. McClam, April 1980.

No. 3* "Rules versus discretion": an essay on monetary policy in an inflationary environment, by Alexandre Lamfalussy, April 1981.

No. 4 Theories of the growth of the Euro-currency market: a review of the Euro-currency deposit multiplier, by R.B. Johnston, May 1981.

No. 5 The theory and practice of floating exchange rates and the rôle of official exchange-market intervention, by Helmut Mayer, February 1982.

No. 6 Official intervention in the exchange markets: stabilising or destabilising?, by Helmut Mayer and Hiroo Taguchi, March 1983.

No. 7 Monetary aggregates and economic activity: evidence from five industrial countries, by Geoffrey E.J. Dennis, June 1983.

No. 8* The international interbank market: a descriptive study, July 1983.

No. 9 Financial innovations and their implications for monetary policy: an international perspective, by M.A. Akhtar, December 1983.

No. 10 Adjustment performance of open economies: some international comparisons, by W.D. McClam and P.S. Andersen, December 1983.

* Also available in French

No. 11 Inflation, recession and recovery: a nominal income analysis of the process of global disinflation, by J.A. Bispham, February 1984.

No. 12 Interest rate futures: an innovation in financial techniques for the management of risk, by A.B. Frankel, September 1984.

No. 13 International interest rate relationships: policy choices and constraints, by J.T. Kneeshaw and P. Van den Bergh, January 1985.

No. 14 The stability of money demand functions: an alternative approach, by Palle S. Andersen, April 1985.

No. 15 Interaction between the Euro-currency markets and the exchange markets, by Helmut W. Mayer, May 1985.

No. 16 Private ECUs potential macro-economic policy dimensions, by Helmut W. Mayer, April 1986.

No. 17 Portfolio behaviour of the non-financial private sectors in the major economies, by E.P. Davis, September 1986.

No. 18 The evolution of reserve currency diversification, by Akinari Horii, December 1986.

No. 19 Financial market supervision: some conceptual issues, by Jeffrey C. Marquardt, May 1987.

No. 20 Rising sectoral debt/income ratios: a cause for concern?, by E.P. Davis, June 1987.

No. 21 Financial market activity of life insurance companies and pension funds, by E.P. Davis, January 1988.

No. 22 Reserves and international liquidity, June 1988.

No. 23 Changes in central bank money market operating procedures in the 1980s, by J.T. Kneeshaw and P. Van den Bergh, January 1989.

No. 24 Inflation and output: a review of the wage-price mechanism, by Palle S. Andersen, January 1989.

No. 25 The US external deficit and associated shifts in international portfolios, by Michael Dealtry and Jozef Van 't dack, September 1989.

No. 26 Japan's experience of financial deregulation since 1984 in an international perspective, by K. Osugi, January 1990.

No. 27 Leverage and financing of non-financial companies: an international perspective, by C.E.V. Borio, May 1990.

No. 28 Banks' involvement in highly leveraged transactions, by C.E.V. Borio, October 1990.

No. 29 Developments in external and internal balances: a selective and eclectic review, by P.S. Andersen, October 1990.

No. 30 Capital flows in the 1980s: a survey of major trends, by Philip Turner, April 1991.

No. 31 Aggregate demand, uncertainty and oil prices: the 1990 oil shock in comparative perspective, by Michael M. Hutchison, August 1991.

No. 32 The development of the international bond market, by Richard Benzie, January 1992.

No. 33 Budget policy and the decline of national saving revisited, by Michael M. Hutchison, March 1992.

No. 34 The liberalisation of Japan's financial markets: some major themes, by Masahiko Takeda and Philip Turner, November 1992.

No. 35 The valuation of US dollar interest rate swaps, by Julian S. Alworth, January 1993.

No. 36 The nature and management of payment system risks: an international perspective, by C.E.V. Borio and P. Van den Bergh, February 1993.

No. 37 Commercial paper markets: a survey, by J.S. Alworth and C.E.V. Borio, April 1993.

No. 38 The management of foreign exchange reserves, by Scott Roger, July 1993.