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Measuring Price Competitiveness for Industrial Country Trade in Manufactures

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Abstract

This paper describes the methods used by the Research Department to construct the indicators of price competitiveness, or real effective exchange rates, published for 17 industrial countries in International Financial Statistics. The weighting scheme used to construct these indicators is derived from a disaggregated system of demand equations encompassing trade relations in bilateral and third-country markets. Other commonly used trade-weighting schemes are shown to be special cases of the more general and less restrictive competitiveness weights. Differences in the measurement of relative price changes using indices based on other weights are explained by the greater informational content of the competitiveness weights.

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Contents

I. Introduction

An accurate measure of changes in a country's international price competitiveness is one of the key elements required to assess the sustainability of its current account position and the appropriateness of its exchange rate. 1/ To facilitate cross-country comparisons of price and cost developments among the industrial countries the Research Department has developed, for 17 industrial countries, a set of indicators of competitiveness pertaining to trade in manufactured goods. The countries for which these indicators are calculated are: Austria, Belgium, Canada, Denmark, Finland, France, the Federal Republic of Germany, Ireland, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States. The indicators are published in the Fund's International Financial Statistics (IFS) and are widely used, both within and outside the Fund, to measure changes in price competitiveness among these countries. 2/ They focus on the manufacturing sector because of the importance this sector plays in wage and price setting behavior, the large share of manufactured goods in international trade among industrial countries, and the availability of price and cost data for the manufacturing sector that are more comparable across countries than data for the economy as a whole.

The purpose of this paper is to provide a description of and rationale for the methods used by the Research Department to construct indicators of price competitiveness. 3/ These indicators are often referred to as indices of "real effective exchange rates." What they attempt to measure are the changes in a country's prices or costs in the manufacturing sector relative to those of other countries, after converting all the relevant price indices into a common currency (that is, after adjusting for changes in nominal exchange rates). It is these changes in relative prices that matter in the sense that they lead to adjustments in the manufacturing sector of the economy. To the extent that movements in manufacturing prices influence those in the services sector, these indices may also serve as a measure of the overall competitiveness of the real sector of the economy. 4/

1/ See IMF [1984] for a discussion of the role of competitiveness indicators in the assessment of a country's exchange rate.

2/ Quarterly indicators of cost and price competitiveness in manufacturing are published as part of the World Tables in IFS.

3/ Deppler [1979] provides a detailed discussion of the price and cost data that are used to construct the competitiveness indicators published in IFS. This paper focuses more on the properties and implications of various weighting systems. A brief description of the price and cost data used to construct the competitiveness indicators published in IFS is provided in Section IV of this paper.

4/ No attempt is made here to assess the extent to which cost and price developments in the services sector are correlated with those in the manufacturing sector. Furthermore, this paper does not survey the different types of weighting schemes that have been used for measuring effective exchange rates. This material has been adequately covered by Rhomberg [1976], for nominal effective exchange rates, and by Maciejewski [1983], for real effective exchange rates.

The weighting scheme used to construct the competitiveness indicators published by the Fund has recently been updated, revised, and expanded in several respects. The changes involve: an update (from 1975 to 1980) of the trade flow data used in calculating the weights; more detailed estimates of within country commodity flows (internal trade); an extension of the number of competitor countries; and a finer disaggregation of the countries and groups of countries treated as markets. An important methodological change in the weighting scheme is the inclusion of competition between domestic production and imports in the home market, as well as competition in foreign (export) markets. Thus, these weights are appropriate for constructing indicators of "total competitiveness." Because of the modifications made to the weighting scheme, it is useful to describe its conceptual basis.

In any calculation involving a comparison of the behavior of a variable in one country with that of the corresponding variable averaged over a group of other countries, an appropriate set of weights must be chosen to calculate the "average" value of the foreign variable. The central message of papers by Rhomberg [1976] and Maciejewski [1983] is that the choice of weights will depend on the question being analyzed and the desired policy objective. Section II of this paper discusses the purpose of the competitiveness indicators and provides the theoretical basis for deriving the system of weights used for calculating them. It is shown that other commonly used trade-weighting systems are special cases of the more general system used for constructing the competitiveness indicators that are described here. In Section III, results of applying the derived weighting scheme to a recent set of trade data are illustrated. Three sets of weights are calculated for the purpose of measuring changes in competitiveness in relation to the export sector, the import sector, and the combined tradable goods sector. Section IV compares the competitiveness indicators obtained using the weights derived in Section III with indicators calculated using simpler trade-weighting schemes. Conclusions follow in Section V.

II. Theoretical Basis of the Weighting Scheme Used for Constructing Competitiveness Indicators

1. Purpose and definition of competitiveness indicators

The purpose of the competitiveness indicators described in this paper is to measure changes in the international price competitiveness of manufactured goods produced by the industrial countries. 1/ For this purpose, all manufactured goods included in Sections 5 to 9 of the Standard Industrial Trade Classification (SITC) are considered tradable goods. Changes in international price competitiveness include the effects of price competition between a country's domestically produced

1/ This section extends the ideas developed in Armington (1969b) and Artus and Sosa (1978).

goods and its imports, between its exports and the domestically produced goods in its export markets, and between its own exports and those of other industrial countries that are its competitors in third markets.

A change in the relative price of a manufactured product (tradable good) between any two suppliers is defined as a change in price competitiveness. On the assumption of finite, negative elasticities of substitution for all manufactured products, such a relative price change would lead to a shift in demand from the higher-priced supplier to the lower-priced supplier. A change in price competitiveness thus defined is a demand-side concept. It is a measure of the change in the selling price of one country's product relative to that of another, other factors held constant. It does not measure changes in profitability, that is, in the difference between the selling price of a product and its production costs. The other important point to note is that this definition refers to external competitiveness, or the price competitiveness of the open sector. It does not directly include changes in relative prices between traded and nontraded goods within the domestic economy.

By defining a change in competitiveness as a change in the relative price of a tradable product that leads to a shift in demand, a criterion for judging the appropriateness of the weighting system can be established. This criterion is due to Armington (1969b), page 192. He defines an "ideal" weighting system as one that, given an equiproportionate change in the product prices of all countries, would leave the demand for any one country's products unchanged. Stated differently, the weights should be chosen so that a 10 percent increase in the price level of one country would have the same effect on the demand for its manufactured products (in real terms) as a 10 percent decline in the price levels of all other supplying countries. The set of weights that satisfies this criterion is derived in the following section.

2. Derivation of competitiveness weights

The first step in deriving the weighting scheme for the indicators of competitiveness involves choosing the appropriate model to represent the behavior of demand for manufactured products. The most frequently used model for this purpose is the imperfect substitutes model 1/ which, as its name implies, is based on the assumption that the goods of one country are imperfect substitutes for those of all others. In the case of the categories of manufactured goods considered here this assumption is easily justified by the evidence that the "law of one price" does not hold 2/ for a wide range of internationally traded manufactured products, and by the fact that there is a substantial amount of "cross trading" (importing and exporting of similar products) among the industrial countries.

1/ See Goldstein and Khan (1985), p. 1044 for a characterization of the imperfect substitutes model.

2/ Isard (1977) finds evidence of price differences among products of the same kind.

Considering the purpose at hand--assessing the effects of changes in relative prices on trade performance--the Armington demand system for products distinguished by place of production is a logical choice. 1/ This system provides a theoretical framework for analyzing the global effects of changes in price competitiveness on the demand for the manufactured products of a given country. In what follows, this system is used to derive a set of weights for constructing measures of price competitiveness that is "ideal" based on the Armington criterion.

First, it is useful to summarize the main features and properties of the Armington system. 2/ A basic feature of this system is that it regards a type of good, say cars, as a broad category or set composed of individual products that are differentiated by country of production. Thus, for example, within the category of cars, models produced by country A are assumed to be different products than the models of cars produced by country B; that is, cars produced by A are imperfect substitutes for cars produced by B. Armington derives the demand for a product in a particular market using a two-step procedure. First, the demand for the good in general is derived by maximizing a utility function which includes all goods subject to a budget constraint. Second, the demand for a specific product (the good produced by an individual country) is determined by minimizing the cost of purchasing the amount of the good derived in the first step. Using a constant elasticity of substitution (CES) function as the utility index governing choices in the second step, Armington was able to express the demand for a product in a market as a function of the level of expenditure on all products of the same type, cars in the example above, and of the individual prices of all suppliers (including the domestic supplier) of the product (cars) to the market. In Armington's notation, the demand for a good i produced by country j (or product ij) in market k can be written as follows.

$$\ln(D_{ij}^k) = b_{ij}^k + \ln(D_i^k) + \sum_{\ell} \eta_{ij/i\ell}^k (P_{i\ell}) \qquad (1)$$

where D_{ij}^k = demand for product ij (in real terms) in market k

b_{ij}^k = constant term

D_i^k = total expenditure (in real terms) on good i in market k

$\eta_{ij/i\ell}$ = income compensated price elasticity of demand for product ij with respect to a change in the price of product $i\ell$

$P_{i\ell}$ = the price of good i produced by country ℓ measured in a common currency

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1/ Armington (1969a).

2/ This section relies on Armington (1969a) and Artus and McGuirk (1981).

The last term in equation (1) is summed over all suppliers, including country j.

The separability assumption required for the two-step derivation procedure and the choice of the utility index used in the second step place restrictions on the possibilities for substitution among different kinds of products. Following Armington [1969a], it is assumed that the marginal rates of substitution between any two products of the same kind (that is, belonging to the same category of good) are independent of the quantities demanded of other of goods. Thus, the rate of substitution between Italian and French cars in the U.S. market is not influenced by the U.S. demand for color television sets or fur coats. Further, use of the CES utility index implies that the elasticity of substitution between any two suppliers of cars in a market is the same. These restrictions on substitution possibilities come into play later on when the appropriate degree of commodity disaggregation is considered, and when comparisons with other weighting systems are made.

The demand function represented by equation (1) refers to the demand for good i produced by country j (that is, product ij) in market k. As indicated by the price term, the importance (or weight) of changes in the price of product iℓ on the volume of product ij demanded in market k is directly related to the income compensated price elasticities of demand, $\eta_{ij/i\ell}$. 1/ This is more obvious if equation (1) is simplified by taking first differences and assuming no change in the level of expenditure on good i in market k. The result is

$$\Delta \ln(D^k_{ij}) = \sum_{\ell} {}^{k}\eta_{ij/i\ell} \, \Delta \ln(P_{i\ell}) \qquad (2)$$

Using the relationship between the income-compensated elasticity and the Hicks-Allen elasticity of substitution, 2/ the price elasticities, $\eta^k_{ij/i\ell}$, can be expressed as

$$\eta^k_{ij/i\ell} = \sigma^k_{ij/i\ell} \frac{T^k_{i\ell}}{\sum_{\ell} T^k_{i\ell}} \qquad \text{for } j \neq \ell \qquad (3)$$

and

$$\eta^k_{ij/ij} = -\sum_{\ell \neq j} n^k_{ij/i\ell} \qquad \text{for } j = \ell \qquad (4)$$

1/ Leamer and Stern [1970] show a similar result using an import equation. See pp. 42-46.

2/ Allen, R.G.D. [1938], p. 504.

where $\sigma^k_{ij/i\ell}$ is the Hicks-Allen elasticity of substitution between product ij and product iℓ in market k, and $T^k_{i\ell}$ represents the sales (both domestic and foreign) of good i produced by country ℓ to market k. Substituting relations (3) and (4) into (2) yields

$$\Delta\ln(D^k_{ij}) = \sum_{\ell\neq j} \sigma^k_{ij/i\ell} \frac{T^k_{i\ell}}{\sum_{\ell} T^k_{i\ell}} \Delta\ln(P_{i\ell}) - \sum_{\ell\neq j} \sigma^k_{ij/i\ell} \frac{T^k_{i\ell}}{\sum_{\ell} T^k_{i\ell}} \Delta\ln(P_{ij}) \qquad (5)$$

From (5) it can be seen that an equiproportionate change in the price of good i produced by each supplier, foreign and domestic, would leave the demand for product ij in market k unchanged, thus satisfying Armington's "ideal" condition. If this property holds for the individual trade flow, D^k_{ij}, it will also hold for various aggregations of trade flows. Thus, by aggregating equation (5) for a particular country j over goods, then over export markets and/or suppliers to the domestic market (imports), weights can be derived which have the property that equiproportionate changes in the product prices of all suppliers will leave exports, imports, and the trade balance unchanged in real terms.

A number of simplifying assumptions need to be made in order to reach a level of aggregation that is useful for analysis. These assumptions take the form of restrictions on equation (5), which can be rewritten as follows:

$$\Delta\ln(D^k_{ij}) = \sum_{\ell\neq j} \sigma^k_{ij/i\ell} \frac{T^k_{i\ell}}{\sum_{\ell} T^k_{i\ell}} \Delta\ln\left(\frac{P_{i\ell}}{P_{ij}}\right) \qquad (6)$$

In the first place, price series for disaggregated trade flows are generally not available in sufficient detail and for the number of countries required in order to make meaningful comparisons. If it can be assumed that the changes in individual product prices are similar to those of an aggregate price index for manufactures, then the aggregate relative price P_ℓ/P_j can be used as a proxy for $P_{i\ell}/P_{ij}$ in equation (6). There is also little information available on a consistent basis with regard to the substitution elasticities between individual products, $\sigma^k_{ij/i\ell}$; therefore, increasingly restrictive assumptions about substitution possibilities need to be imposed at each level of aggregation. Specifically, to aggregate over suppliers to a market it is assumed that, for a given commodity i in market k, the elasticity of substitution between any two suppliers of commodity i is the same, or that $\sigma^k_{i\ell/ij} = \sigma^k_i$, for $\ell\neq j$. To aggregate over goods it is assumed that the elasticity of substitution between any two suppliers to market k is the same for every commodity, or that $\sigma^k_i = \sigma^k$. Finally, to aggregate over markets it is assumed that the elasticity of substitution between any two suppliers is

the same in each market, or that $\sigma^k = \sigma$. By imposing these restrictions and substituting P_ℓ/P_j for $P_{i\ell}/P_{ij}$, equation (6) can be rewritten as

$$\Delta \ln(D_{ij}^k) = \sigma \sum_{\ell \neq j} \frac{T_{i\ell}^k}{\sum_\ell T_{i\ell}^k} \Delta \ln\left(\frac{P_\ell}{P_j}\right) \tag{7}$$

Equation (7) can be aggregated over goods and markets (both foreign and domestic) to yield a set of "total competitiveness" weights that can be used to measure the overall (taking into account both export and import relations) price movements of one country relative to those of a group of other countries. The steps required to derive the total competitiveness weights from equation (7) are shown in Appendix I. The formula for the derived weights is

$$TW_{j\ell} = \sum_k \underbrace{\frac{\sum_i T_{ij}^k}{\sum_k \sum_i T_{ij}^k}}_{(1)} \sum_i \underbrace{\frac{T_{ij}^k}{\sum_i T_{ij}^k} \frac{T_{i\ell}^k}{\sum_\ell T_{i\ell}^k}}_{(2)} \tag{8}$$

where $TW_{j\ell}$ = the weight of country ℓ in the total competitiveness index of country j;

T_{ij}^k = the sales of good i by country j to market k

The weight $TW_{j\ell}$ is a measure of the importance to be placed on a change in the relative price P_ℓ/P_j when assessing the effects of changes in price levels on country j's real trade balance for manufactures. Analogous weights can be derived for the export (import) sector that measure the importance attached to a change in the relative price P_ℓ/P_j when assessing the effect on the demand for country j's manufactured exports (imports) in real terms. Before considering these sectoral weights, it is necessary to provide an explanation of the terms in equation (8).

The weighting formula shown on the right-hand side of equation (8) has two components, labeled (1) and (2). The first component measures the relative importance of each market (domestic and foreign) in the total sales of manufactured products by the j^{th} country. It is used to obtain a weighted average over markets of the second component, which measures the degree of competition between country j and country ℓ in each market k.

The second component is constructed as the product of two terms summed over the number of goods. The right-most term is the share of country ℓ's sales of good i to market k in the total purchases (from both domestic and foreign suppliers) of good i in market k. Country ℓ's share in market k is weighted by the first term of the second component, which is the share of country j's sales of good i to market k in the total sales of manufactured goods by country j to market k. In other words, country ℓ's share of sales of good i in market k is weighted by the importance of good i in the total sales of country j to market k. Country ℓ would be a major competitor of country j in market k if it was a major supplier of products that were relatively important in the total sales of country j to market k.

To obtain a measure of the importance of the degree of competition between countries j and ℓ across all markets, the terms measuring competition between country j and country ℓ in market k are summed over markets, weighted by the importance of each market in the total sales (domestic and foreign) of country j. Thus, if countries j and ℓ sell similar products in their major markets, they will tend to have relatively large weights in each other's indices, and vice versa.

The sectoral weights for exports and imports can be derived from equation (8) by separating those terms related to competition in export markets from those related to the competition between imports and domestic production in the home market. For exports the result is

$$XW_{j\ell} = \sum_{k \neq j} \underbrace{\frac{\sum_i T_{ij}^k}{\sum_k \sum_i T_{ij}^k}}_{(1)} \underbrace{\sum_i \frac{T_{ij}^k}{\sum_i T_{ij}^k} \frac{T_{i\ell}^k}{\sum_\ell T_{i\ell}^k}}_{(2)} \tag{9}$$

where $XW_{j\ell}$ = the weight of country ℓ in the export competitiveness index of country j.

These weights differ from the total competitiveness weights of equation (8) in that the right-most terms (component (2)), which measure the degree of competition between country j and country ℓ in market k, are summed only over <u>export</u> markets, weighted by the importance of each market in the total exports of country j.

The import competitiveness weights take the form

$$MW_{j\ell} = \underbrace{\frac{\sum_i T_{ij}^j}{\sum_k \sum_i T_{ij}^k}}_{(1)} \underbrace{\sum_i \frac{T_{ij}^j}{\sum_i T_{ij}^j} \frac{T_\ell^j}{\sum_\ell T_{i\ell}^j}}_{(2)} \tag{10}$$

where $MW_{j\ell}$ = the weight of country ℓ in the import competitiveness index of country j.

In the import weight, component (2) on the right-hand side of equation (10) measures the degree of competition between imports and domestically-produced manufactured products in the home market. Component (1) measures the proportion of domestically-produced manufactures that are sold in the domestic market. Because equations (9) and (10) are components of equation (8), the weighting formula for measures of total competitiveness, they need to be normalized before they are used to calculate indices of export and import competitiveness. 1/

3. Properties of derived weights

There are three characteristics of the weights derived from the Armington system that make them preferable to more commonly used weighting systems. First is the property of symmetry discussed above. Because the weights are derived from a complete demand system, they have the property that an equiproportionate change in the price levels of all countries will leave their respective trade flows unchanged in real terms. Second, the explicit treatment of domestic sales, T^j_{ij}, provides a measure of the relative importance of competition between domestic and foreign suppliers at a detailed level of trade in the home market. For the "total" competitiveness weights, the size of domestic sales also plays a major role in determining the relative importance to place on "import" and "export" competitiveness when calculating the "total" competitiveness weights. The actual effects of including internal trade estimates in the trade matrix, T, are examined in Section III below.

The third distinguishing feature of the weighting system is the degree of commodity detail considered. The weights discussed in this paper have been built up from 143 classifications of manufactured goods. Taking into account this kind of detail helps in two ways. First, importance is placed on those commodities in which a country actually competes against other suppliers, rather than on the relative size of total manufactured exports. Second, disaggregation of manufactured products into similar commodity groups such as textile products, glassware, road motor vehicles, etc., lessens the restrictiveness of the assumption of a uniform elasticity of substitution between all pairs of suppliers of all commodities in all markets. In other words, the assumption of a uniform elasticity of substitution, which is implicit in all schemes based on trade weights, becomes less and less tenable the higher the degree of commodity aggregation (and therefore the less homogenous the commodity groups) used.

1/ Because of the commodity detail used to calculate the weights, it makes a difference whether the trade shares in each market are normalized before aggregation over commodities. If shares are normalized before aggregation, information about the relative importance of the j^{th} country, the country whose weights are being derived, as a supplier of the i^{th} good to market k will be lost. This point was clarified by discussions with Philip Young.

Two other features of the weighting system are important to note. One is that the weights are parameter free. As shown in Appendix I, *after normalization, the common elasticity of substitution cancels out.* This means that the weights do not directly measure the demand effects of changes in relative price levels, but rather are proportional to them. The other feature of the weights, which is apparent from their derivation, is that they are "demand-side" weights. They do not take into account the supply response to changes in profitability, for example. Indeed, as is the case with all trade-weighted systems, the underlying assumption is that supply is infinitely elastic. 1/ The "demand-side" nature of the weights and their independence of parameters are two characteristics that distinguish them from the weights derived from the Multilateral Exchange Rate Model (MERM). Other differences between the competitiveness weights and the MERM weights are discussed in the next section.

4. The relation between the competitiveness weights and other weighting systems

a. Relation to trade-weighting systems

Other commonly used trade-weighting systems turn out to be special cases of the more general system derived in Part 2 of this section. Aside from commodity detail, the importance of which was discussed above, the distinguishing feature of the Fund's competitiveness weights is the inclusion of internal trade estimates in the trade matrix, T. The effect of the internal trade estimates on the weight structure can be easily demonstrated if equation (8) is rewritten assuming there is only one good, say manufactures. In this case the summation over goods disappears and the weights take the form

$$TW_{j\ell} = \sum_k \underbrace{\frac{T_j^k}{\sum_k T_j^k}}_{(1)} \underbrace{\frac{T_\ell^k}{\sum_\ell T_\ell^k}}_{(2)} \qquad (11)$$

where T_j^k = the sales of manufactures by country j to market k. In equation (11), the importance of changes in country ℓ's price level in the demand for the manufactured products of country j depends on country ℓ's share in the markets that are important to j. If country j sold very little output to foreign markets, the first term on the right-hand side of equation (11) would be close to unity for k=j (that is, for the internal trade share) and close to zero for $k \neq j$. Country ℓ's importance to country j would then depend on ℓ's share in j's market, or on the bilateral import share.

1/ See Rhomberg (1976), p. 92.

$$TW_{j\ell} \approx \frac{T_j^j}{\sum_k T_j^k} \frac{T_\ell^j}{\sum_\ell T_\ell^j} \approx \frac{T_\ell^j}{\sum_\ell T_\ell^j} \tag{12}$$

In this case, country ℓ effectively competes with j only in the domestic market.

By contrast, if country j sold very little of its manufactured output domestically, its internal trade share would be close to zero and, therefore, the importance of changes in country ℓ's price level to the exports of country j would depend on ℓ's share in j's most important export markets. If country ℓ's share in j's export markets was small, but its share in its own market was large, its weight in country j's index would be approximately equal to its share in j's total exports.

$$TW_{j\ell} \approx \frac{T_j^\ell}{\sum_k T_j^k} \frac{T_\ell^\ell}{\sum_k T_k^\ell} \approx \frac{T_j^\ell}{\sum_k T_j^k} \tag{13}$$

That is, countries j and ℓ would compete mainly in country ℓ's domestic market.

In the case where both countries j and ℓ have internal trade shares close to zero, the competitiveness weights turn out to be equivalent to third-market weights.

$$TW_{j\ell} \approx \sum_{\substack{k\neq j \\ k\neq \ell}} \frac{T_j^k}{\sum_k T_j^k} \frac{T_\ell^k}{\sum_\ell T_\ell^k} \tag{14}$$

In this case country j and country ℓ compete with each other only in third markets.

b. Relation to MERM weights

Weights derived from the Multilateral Exchange Rate Model (MERM) 1/ measure the effects of changes in countries' nominal exchange rates on their trade balances. These effects are derived from a general equilibrium trade model that includes behavioral equations that measure the effects of changes in nominal exchange rates on:

1/ See Artus and Rhomberg [1973] and Artus and McGuirk [1981] for a description of the MERM and Rhomberg [1976] for a discussion of the weights derived from the MERM.

1) the demand for traded and nontraded goods,

2) the supply of traded and nontraded goods, and

3) the costs and prices of domestic production.

Because nominal exchange rate changes lead to changes in domestic costs and prices through well-known feedback effects, the corresponding changes in real exchange rates (relative prices) are normally less than the nominal changes.

Another important difference is that the MERM covers the total trade balance, not just manufactured goods, and includes the effects on trade volumes as well as the terms of trade. MERM weights are derived so that a change in the nominal effective exchange rate of a country by, say, 10 percent will have the same effect on its nominal trade balance as the observed bilateral nominal exchange rate changes between the currency of the country in question and other currencies.

In contrast to the MERM weights, the competitiveness weights are proportional to the effects of changes in real exchange rates (relative prices) on the real trade balance in manufactured products. As defined, they do not incorporate behavioral parameters, supply-side effects, the distinction between traded and nontraded goods, or the effects of real exchange rate changes on the terms of trade. They are specifically designed to measure the change in a country's competitiveness (in the manufacturing sector) arising from changes in relative prices vis-a-vis its trading partners. Rather than incorporating the effects of behavioral parameters on trade flows, competitiveness indicators derived on the basis of these weights are useful for estimating such parameters.

III. Calculation of the Competitiveness Weights

A substantial amount of data is required to calculate numerical values for the system of weights derived in Section II. In the first place, the coverage of each country's competitors and markets must be sufficiently broad to capture important competitive relationships. As shown in Table 1, 17 of the industrial countries are included as competitors in the derivation of the Fund's competitiveness weights, and competition in 25 markets, covering total trade in manufactures, is taken into account. Second, considerable commodity detail is required in order to make meaningful comparisons. The present weights are built up from data on 143 categories of manufactured goods (see Appendix II for a list of goods). Part 1 of this section discusses the appropriate level of commodity detail to take into account and the procedures used to derive estimates of internal trade for the community groups included. In Part 2, the weights for the three trade sectors are presented and compared with other weighting schemes. These comparisons illustrate the effects of including internal trade estimates and commodity detail on the structure of the weights.

Table 1. Competitor Countries and Markets Included in the Calculation of the Fund's Revised Competitiveness Weights

Competitor Countries	Markets
1. Austria	1. Austria
2. Belgium	2. Belgium
3. Canada	3. Canada
4. Denmark	4. Denmark
5. Finland	5. Finland
6. France	6. France
7. Germany, Fed. Rep. of	7. Germany, Fed. Rep. of
8. Ireland	8. Ireland
9. Italy	9. Italy
10. Japan	10. Japan
11. Netherlands	11. Netherlands
12. Norway	12. Norway
13. Spain	13. Spain
14. Sweden	14. Sweden
15. Switzerland	15. Switzerland
16. United Kingdom	16. United Kingdom
17. United States	17. United States
	18. Australia
	19. South Korea
	20. Singapore
	21. Hong Kong
	22. Other Industrial Countries 1/
	23. Nonmember Centrally Planned Economies 2/
	24. Oil Exporting Countries 3/
	25. Rest of the World 4/

1/ Iceland, Luxembourg, and New Zealand.

2/ The USSR, Cuba, and East European countries that were not IMF members in 1980.

3/ Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela.

4/ All other countries.

1. Data required to construct weights

a. Level of commodity disaggregation

An important consideration in choosing the appropriate level of commodity disaggregation (that is, the number of goods to consider) is the implication for substitution possibilities. In the Armington system it is assumed that there is no substitution between suppliers of products that belong to different categories of goods. The effect of this assumption can be illustrated by assuming that the following 3-digit SITC categories of transportation equipment are defined as "goods": railway vehicles, road motor vehicles, other road vehicles, aircraft, and ships. The restrictions placed on substitution possibilities by the two-step derivation procedure imply that suppliers of road motor vehicles do not compete with suppliers of aircraft or ships. However, within the commodity group road motor vehicles, suppliers of cars compete against suppliers of trucks and motorcycles. If cars and trucks were considered two different "goods," suppliers of trucks would not effectively compete against those of cars. Thus, defining "goods" too narrowly would prevent the weights from reflecting important sources of competition. On the other hand, defining "goods" too broadly can lead to the opposite problem--the weights would imply competitive relations that did not exist. Consider, for example, that transport equipment is a "good." The United States and Japan have substantial exports of transport equipment to the EEC so that if weights were calculated at this level of aggregation, it would appear that these two countries were important competitors in that market. In fact, within the transport equipment group the United States exports mainly aircraft, while Japan exports mainly road motor vehicles.

For the purpose of calculating the competitiveness weights derived in this paper, goods are defined at the 3-digit level of the Standard International Trade Classification (SITC). The SITC sections included are 5-9, which broadly cover all manufactured industrial products (a list of goods is provided in Appendix II). This level of commodity disaggregation endeavors to allow for sufficient substitution possibilities within classes of goods and for sufficient differentiation of goods to reflect actual competitive relations.

b. Estimates of internal trade

Estimates of internal trade, or the amount of domestically produced and sold goods, at the three-digit SITC level have been derived from production and trade data taken from the input-output table for each industrial exporting country. 1/ Internal trade was calculated by subtracting

1/ See Appendix III for data sources.

exports from the value of gross output of each good. 1/ Specifically, for a given country, internal trade for good i was calculated as:

$$INTT_i = GQ_i - X_i \tag{15}$$

where

$INTT_i$ = internal trade of good i

GQ_i = gross output of good i

X_i = exports of good i

The ratio of internal trade to total purchases of good i was then calculated by dividing the estimate of internal trade by the country's total purchases of good i.

$$SHINTT_i = \frac{INTT_i}{INTT_i + M_i} \tag{16}$$

where

$SHINTT_i$ = share of internal trade in total purchases of good i

M_i = imports of good i

Equation (16) yields a ratio that represents the share of the domestically-produced good i in total domestic expenditure on good i. Internal trade estimates for a particular year are then derived by applying this share to trade data for that year, 1980 in the present case. For example, if T^k_{ij} represents the exports of good i by country j to country k, internal trade of good i in country j, T^j_{ij}, can be calculated as:

$$T^j_{ij} = \frac{SHINTT_i}{(1-SHINTT_i)} \sum_{k \neq j} T^j_{ik} \tag{17}$$

or

$$T^j_{ij} = \frac{SHINTT_i}{(1-SHINTT_i)} M_i \tag{18}$$

Because the classifications used in the input-output tables vary from country to country and differ from the trade classification (SITC), it is necessary to approximate the share of internal trade for each traded good by matching up the sectors of each input-output table with the most closely related categories of traded goods. For example, assume there is a sector from an input-output table classified as metal products.

1/ Gross output includes the production of goods for intermediate and final demand.

At the 3-digit level of the trade classification there are 9 SITC codes that could be matched with metal products--call them X_1, ..., X_9 for exports, and M_1, ..., M_9 for imports. Estimates of internal trade for each of the traded goods are obtained from the less detailed input-output data by making the following calculations.

$$GQ_i = \frac{X_i}{\sum_i X_i} GQ_{mp} \tag{19}$$

$$X_i = \frac{X_i}{\sum_i X_i} X_{mp} \tag{20}$$

$$M_i = \frac{M_i}{\sum_i M_i} M_{mp} \tag{21}$$

where GQ_{mp}, X_{mp}, and M_{mp} refer to gross output, exports, and imports of the metal products sector in the input-output table.

Equations (15)-(18) above can then be used to calculate the internal trade in good i. In equations (19)-(21), the trade data used, X_i and M_i, are for the year 1980. However, the input-output data for the metal products sector refer to the year for which the table was constructed. As indicated in equation (19), the share of each good in exports was used to derive the gross output of good i from the gross output of the metal products sector. This procedure may result in biased estimates to the extent that the distribution of export products is significantly different from that of domestic output.

2. Calculated competitiveness weights

Competitiveness weights for each trade sector have been calculated for 17 of the industrial countries by applying the weighting formulas derived in Section II to the detailed trade data and internal trade estimates discussed above. Table 1 above lists the countries included in the calculation as competitor countries, and those countries and groups of countries included as markets. Estimates of within-country commmodity flows (internal trade) are used in the calculation only for competitor countries. This means that competitor countries compete with each other but not with domestic suppliers in noncompetitor markets, that is, in markets 18 through 25. All the weights derived in this section are based on 1980 trade data. Sets of weights for each country are provided in Appendix IV. The results for one country, Sweden, will be discussed here in order to illustrate the relationships among the different types of weights.

Table 2 shows the competitiveness weights, and their components, for Sweden along with four other sets of weights calculated using simpler trade-weighted schemes. The set of weights shown in columns (1) to (3) consist of the total competitiveness weights followed by its components, the import and the export competitiveness weights. Just as it was possible to decompose the total competitiveness weights, it is also possible to decompose the export competitiveness weights into two components: bilateral export weights and third-market export weights. These two components are shown in columns (4) and (5) of Table 2. The weights shown in columns (6) to (9) of the table were calculated from trade data at the level of total manufactures, that is, without commodity detail and excluding estimates of internal trade. Column (6) shows a trade-weighted average of bilateral import and export weights; column (7) shows bilateral import weights, column (8) shows bilateral export weights, and column (9) shows third-market export weights. In what follows, first the total competitiveness weights and their components will be discussed; then the competitiveness weights will be compared with the simpler trade-weighted schemes.

a. Total competitiveness weights and components

The total competitiveness weights are weighted averages of the import and export weights shown in columns (2) and (3). The relative contributions of these two components to the total weights are shown at the bottom of Table 2. In the case of Sweden, for example, import competitiveness accounts for 29 percent of the total competitiveness weight, while export competitiveness accounts for 71 percent. Bilateral export weights and third-market export weights contribute about equally to the export competitiveness weights (about 50 percent each) and to the total competitiveness weights (about 35 percent each).

For Sweden, relatively more weight is given to the two export components, an outcome that would be expected for a small open economy, other factors remaining unchanged. A relatively small country would tend to face more competition in export markets than in the domestic market because, for a wide range of imported products, there would be few domestically produced substitutes. This would be picked up in the calculations by the degree of commodity detail taken into account.

Table 3 shows the relative contributions of the component weights for all countries, along with summary statistics that help to explain the importance of each component. Countries are grouped roughly according to the size of internal trade. In general, the higher the share of internal trade, the more weight is placed on bilateral relations. The other statistics shown are the relative importance in total trade in manufactures of imports, of exports to competitor countries, and of exports to noncompetitor countries. Three points should be mentioned regarding these shares. First, imports include only imports from competitor (industrial) countries. Second, on the export side competition between competitor

Table 2. Sweden

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	2.07	2.29	1.97	1.88	2.06	2.11	2.25	1.97	2.20
Belgium	3.25	3.60	3.10	1.78	4.36	4.07	4.06	4.09	7.72
Canada	1.39	0.64	1.70	1.31	2.07	1.24	0.71	1.77	3.33
Denmark	5.47	8.10	4.39	6.99	1.91	8.48	7.55	9.41	2.34
Finland	6.63	10.13	5.18	7.27	3.19	9.17	9.24	9.11	1.74
France	8.29	6.72	8.94	8.83	9.05	6.81	6.57	7.05	9.67
Germany, Fed. Rep. of	22.26	27.12	20.26	18.69	21.75	20.99	26.95	15.04	22.02
Ireland	0.36	0.44	0.33	0.25	0.40	0.59	0.48	0.71	0.92
Italy	5.46	3.81	6.15	5.69	6.58	4.20	3.92	4.47	7.32
Japan	7.07	3.72	8.45	2.43	14.19	2.87	4.14	1.60	7.68
Netherlands	3.87	4.24	3.72	3.52	3.91	5.00	4.34	5.65	5.72
Norway	5.86	6.61	5.55	9.65	1.64	9.77	6.33	13.21	1.37
Spain	1.30	0.64	1.58	1.51	1.64	0.99	0.60	1.37	1.45
Sweden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Switzerland	2.80	2.71	2.83	3.27	2.42	3.02	2.99	3.06	3.56
United Kingdom	12.43	12.28	12.50	14.96	10.15	12.70	12.39	13.00	9.43
United States	11.48	6.95	13.36	11.98	14.66	7.99	7.48	8.50	10.35
Relative weight in total competitiveness (in percent)		29	71	35	36				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 3. Summary Statistics Related to Total Competitiveness Weights 1/

Country	Composition of Trade					Contribution of Components		
	Internal Trade Share	Average Internal Trade Share 2/	Share of Imports in Total Trade 3/	Share of Exports to Competitors in Total Trade 4/	Share of Exports to Non-competitors in Total Trade	Weight of Imports in Total Weight	Weight of Bilateral Exports in Total Weight	Weight of Third-Market Exports in Total Weight
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
United States	.93	.86	.38	.33	.29	.43	.22	.35
Japan	.97	.82	.12	.38	.50	.12	.37	.51
France	.80	.76	.45	.36	.19	.40	.28	.33
Germany, Fed. Rep. of	.83	.64	.34	.47	.19	.31	.36	.34
Italy	.84	.73	.38	.41	.21	.33	.32	.35
Spain	.85	.72	.43	.33	.24	.35	.27	.38
United Kingdom	.76	.60	.38	.37	.25	.33	.27	.40
Switzerland	.72	.61	.53	.33	.14	.41	.29	.30
Austria	.64	.52	.52	.34	.14	.38	.31	.31
Sweden	.65	.53	.43	.43	.14	.29	.35	.36
Finland	.64	.50	.41	.37	.22	.27	.34	.39
Canada	.57	.52	.50	.42	.08	.31	.52	.17
Norway	.53	.41	.58	.31	.11	.37	.27	.36
Denmark	.49	.40	.53	.37	.10	.32	.34	.34
Netherlands	.42	.35	.53	.38	.09	.28	.38	.34
Ireland	.35	.24	.59	.37	.04	.29	.41	.30
Belgium	.36	.24	.45	.46	.09	.20	.47	.33

1/ The statistics shown refer to trade in manufactures (SITCs 5-9) for 1980.
2/ Calculated as the unweighted average of all non-zero internal trade shares of 143 manufactured goods included in the calculations.
3/ On the import side, only imports from competitor countries are included in the calculations.
4/ This is the share of exports in total trade that would face competition from the domestic supplier in export markets.

countries in all markets is considered. In noncompetitor country markets, competitor countries compete only against each other, not against domestic suppliers. Therefore, only third-market competition takes place in noncompetitor markets. Third, in competitor country export markets, both bilateral and third-market competition takes place. The higher the internal trade estimate in important export markets, the greater the weight that will be placed on bilateral competition (that is, competition with the domestic supplier in export markets). The higher the weight on bilateral export relations, the closer the contribution of third-market competition will be to the share of exports going to noncompetitor countries.

The relative contributions of the three components of the total competitiveness weights depend on two factors: (1) the importance of each sector (import, bilateral export, and third-market export) and (2) the degree of competition in each of these sectors (that is, the extent to which the country in question effectively competes against other suppliers to that sector). As already mentioned, a high internal trade share in both the domestic market and major export markets would tend to place greater importance on bilateral trade relations. An example of this is found in the case of Japan. It has a high internal trade share in its own market and in its major export market, the United States, it also faces a high internal trade share. Consequently, the contributions of the bilateral import and export components of the total competitiveness weights shown in columns (7) and (8) are nearly identical to the relative importance in trade in manufactures of imports and exports to competitor countries. Further, the contribution of third-market competition is only slightly higher than the share of exports going to noncompetitor countries. Again taking the example of Sweden, we find that its internal trade share is substantially less than Japan's and its exports are less concentrated in markets with high internal trade estimates; therefore, the contribution of competition in third markets is substantially higher than the share of exports going to noncompetitor countries.

For the United States, the relatively large contribution of imports to the total competitiveness weights reflects two factors: the high internal trade share and the fact that there are many domestic substitutes for imports--in other words, there is a high degree of substitution between domestically produced goods and imports. On the export side, the contribution of U.S. bilateral export relations is relatively small because of the low internal trade share in the most important export market, Canada. For the opposite reason, in the case of Canada, the contribution of bilateral exports to total competitiveness is relatively large.

b. Competitiveness weights compared with other trade weights

The principal features of the Fund's competitiveness weights that make them different from other trade weights are the inclusion of internal

trade estimates and the degree of commodity detail. The role of internal trade in determining the relative importance of bilateral and third-market trade relations was discussed above. Here the effects of commodity detail will be examined.

Going back to Table 2, which shows the various trade weights for Sweden, columns (6) to (9) can be compared with the corresponding competitiveness weights. Starting with the bilateral weights, the bilateral import weights in column (7) can be compared with the import competitiveness weights in column (2). Differences between these two columns are due solely to the effects of commodity disaggregation. The import competitiveness weights will be larger (smaller) than bilateral weights to the extent that some domestically produced import-competing products have a relatively large (small) share in total domestically produced and consumed manufactured products. In the extreme case where each of the 143 products considered in the calculation was of equal importance (had the same share), the import competitiveness weights would be identical to the bilateral import weights. Looking at the weights for Belgium in Sweden's index, the fact that the import competitiveness weight is smaller than the bilateral import weight indicates that the products Sweden imports from Belgium have a relatively small weight in total domestically produced and consumed manufactured products. Conversely, the import competitiveness weight for Finland is larger than its bilateral import weight because its exports to Sweden compete against domestic products that have a relatively large share in domestically produced and consumed manufactures. The import competitiveness weights could deviate significantly from bilateral import weights in relatively small countries where domestic production is specialized and therefore the possibility of substituting domestically produced goods for imports is limited. See, for example, the tables of weights for Belgium and Denmark in Appendix IV.

Similar comparisons can be made between the bilateral component of the export competitiveness weights in column (4) and the bilateral export weights in column (8). As demonstrated in Section II, these two sets of weights would tend to converge if the domestic producer in each export market had a large share of the market for each good; that is, if the domestic supplier was the major competitor in each export market. It is noteworthy that there is considerably more variation in these two sets of weights than was the case for bilateral imports. Two factors account for this. First, the importance of the domestic supplier as a competitor varies across commodities. Second, there is a greater degree of specialization on the export side (reflecting comparative advantage) than on the import side. Because of this, the gains from commodity disaggregation are greater when measuring export competitiveness. The weights shown in column (4) will be larger (smaller) than those shown in column (8) to the degree that the domestic supplier is a major competitor in the products Sweden exports to that market. For example, the export competitiveness weights for the United States and the Federal Republic of Germany indicate that the products Sweden exports to these countries

face relatively strong competition from domestic suppliers. In contrast, the weights for the other Nordic countries indicate that Sweden's exports to them face relatively less competition from domestic suppliers. Differences between the third-market competitiveness weights in column (5) and those in column (9) can be interpreted in a similar fashion. These weights measure the degree to which two countries compete (sell similar products) in important third-markets. The higher competitiveness weight for the United States indicates that the United States has a relatively large share of the market for the products that Sweden is exporting to its major markets.

Direct comparisons between the total competitiveness weights in column (1) and the combined bilateral import and export weights in column (6) are more difficult to make because differences arise not only from commodity disaggregation but also from the fact that different weights are used to combine their component weights. Generally speaking, because the combined bilateral weights exclude commodity detail and third-market effects, they tend to miss competitive relations measured by the more complex competitiveness weights. Comparing the two sets of weights, this is evident from the major differences observed for the other Nordic countries and for the United States and Japan. The combined bilateral weights underestimate the degree of competition between Swedish products and those of the United States and Japan, and they overestimate competition with the Nordic countries.

IV. Calculation of Competitiveness Indicators

The competitiveness weights described in the preceding sections were derived for the purpose of measuring the effects of relative price changes on the demand for internationally traded manufactured products. Ideally, these weights should be applied to the relative prices of the products that actually enter the relevant demand functions. In general, however, such prices are not available. It was for this reason that the weighting scheme was derived from detailed product demand functions. In other words, because disaggregated price series are lacking, the weights themselves are designed to pick up information about competitive relations derived from the detailed structure of trade. To the extent that these weights contain more information about competitive relations than simpler weighting schemes, their application to the available aggregate price series will result in improved measures of changes in price competitiveness.

In this section, indicators of relative price levels derived using the competitiveness weights are compared with indicators derived using simpler trade-weighting schemes. First, the formula and the data used to calculate the indices are described, then the derived indices based on different weighting schemes are compared.

The formula used to calculate the various competitiveness indicators is as follows

$$C_j = \prod_{\ell \neq j} \left[\frac{P_j R_j}{P_\ell R_\ell} \right]^{W_{j\ell}} \qquad (22)$$

where C_j = the competitiveness indicator of country j

P_j or P_ℓ = the price index of country j or ℓ used in the calculation measured in local currency

R_j or R_ℓ = an index of the dollar cost of one unit of country j's or country ℓ's currency

$W_{j\ell}$ = the weight of country ℓ in the competitiveness indicator of country j.

The calculation involves converting the local currency price indices into indices measured in U.S. dollars and comparing the movement of country j's index relative to that of a weighted average of the other countries included in the calculation. A geometric average is used because it gives symmetric results for an equivalent upward or downward movement of the index. As defined in equation (22), an upward movement in C_j indicates a loss of competitiveness.

To facilitate the comparison of competitiveness indices constructed using alternative weighting systems, several different indices have been calculated by applying formula (22) to one of the five sets of price and cost data--wholesale prices in manufacturing--used to construct the competitiveness indicators that are published in IFS. 1/ Because the formula and the price data used to construct the various indices compared here are the same, differences among the indices are due solely to the choice of weights. Seven indices have been calculated for each country based on the weights described in Table 2 above in the case of Sweden (and shown in Appendix IV for other countries). The weighting systems used are listed below; numbers in parentheses indicate the column of the corresponding definition in Table 2.

1/ The quarterly inicators of cost and price competitiveness in manufacturing published as part of the World Tables in IFS are based on five different measures of costs and prices for the manufacturing sector, namely, unit labor costs, normalized unit labor costs (which abstract from cyclical changes in productivity that distort actual unit labor costs), value-added deflators, wholesale prices, and export unit values. Each of these measures has its strengths and drawbacks which are fully discussed in Deppler [1979] and briefly summarized in the notes accompanying the IFS table on cost and price comparisons for manufacturing.

Weighting Systems Used to Calculate Competitiveness Indices

i. Total Competitiveness Weights (1)

ii. Import Competitiveness Weights (2)

iii. Total Export Competitiveness Weights (3)

iv. Combined Bilateral Import and Export Weights (6)

v. Bilateral Import Weights (7)

vi. Bilateral Export Weights (8)

vii. Third Market Weights (9)

In contrast to the competitiveness weights (i-iii), the last four sets of weights (iv-vii) do not take into account commodity detail, that is, they are derived on the basis of trade data for total manufactures.

Charts 1 to 3 illustrate the relationships among the seven indices for Sweden, the Federal Republic of Germany, and the United States, respectively. The indices are based on quarterly data covering the period 1978 through mid-1986, a period during which there were substantial real exchange rate movements. Charts for the other industrial countries are provided in Appendix V. As shown in formula (22) above, a rise in an indicator indicates a loss of competitiveness. Quadrant I of the charts shows the three indices based on the competitiveness weights. Because the total competitiveness weights are calculated as a weighted average of the import and export competitiveness weights, the total competitiveness indicator will, by definition, fall between the import and export competitiveness indicators. For all countries, the total competitiveness indicator is closer to the export component because it has a larger weight in the total index than the import component (see Table 3 above for the relative weights of the components of the total competitiveness weights). Sweden and the Federal Republic of Germany have weights on the export component of about 70 percent, while the United States has a weight of 57 percent on that component.

In quadrant III of the charts the indicator based on the total competitiveness weights is compared with those based on simple bilateral import and export weights. For Sweden and the Federal Republic of Germany the total competitiveness indicators lie below the indicators based on bilateral trade weights, while for the United States, the total competitiveness indicator lies above the bilateral trade based indicators. This behavior reflects the fact that, since 1980 the United States has lost competitiveness in third markets, which are not accounted for in bilateral weights, and that Sweden and the Federal Republic of Germany have gained competitiveness in third markets. This is more obvious when

CHART 1

SWEDEN

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

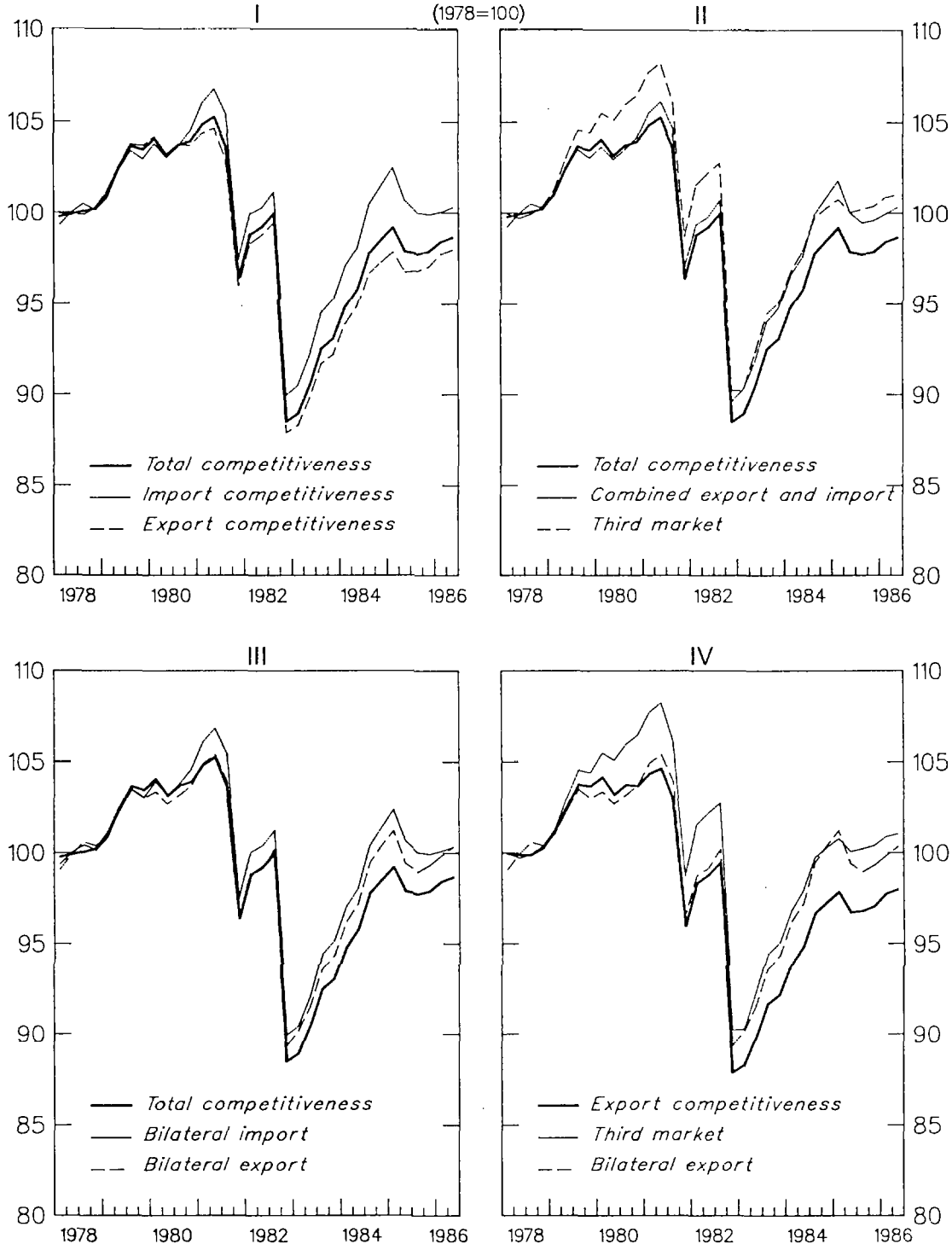


CHART 2

FEDERAL REPUBLIC OF GERMANY

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

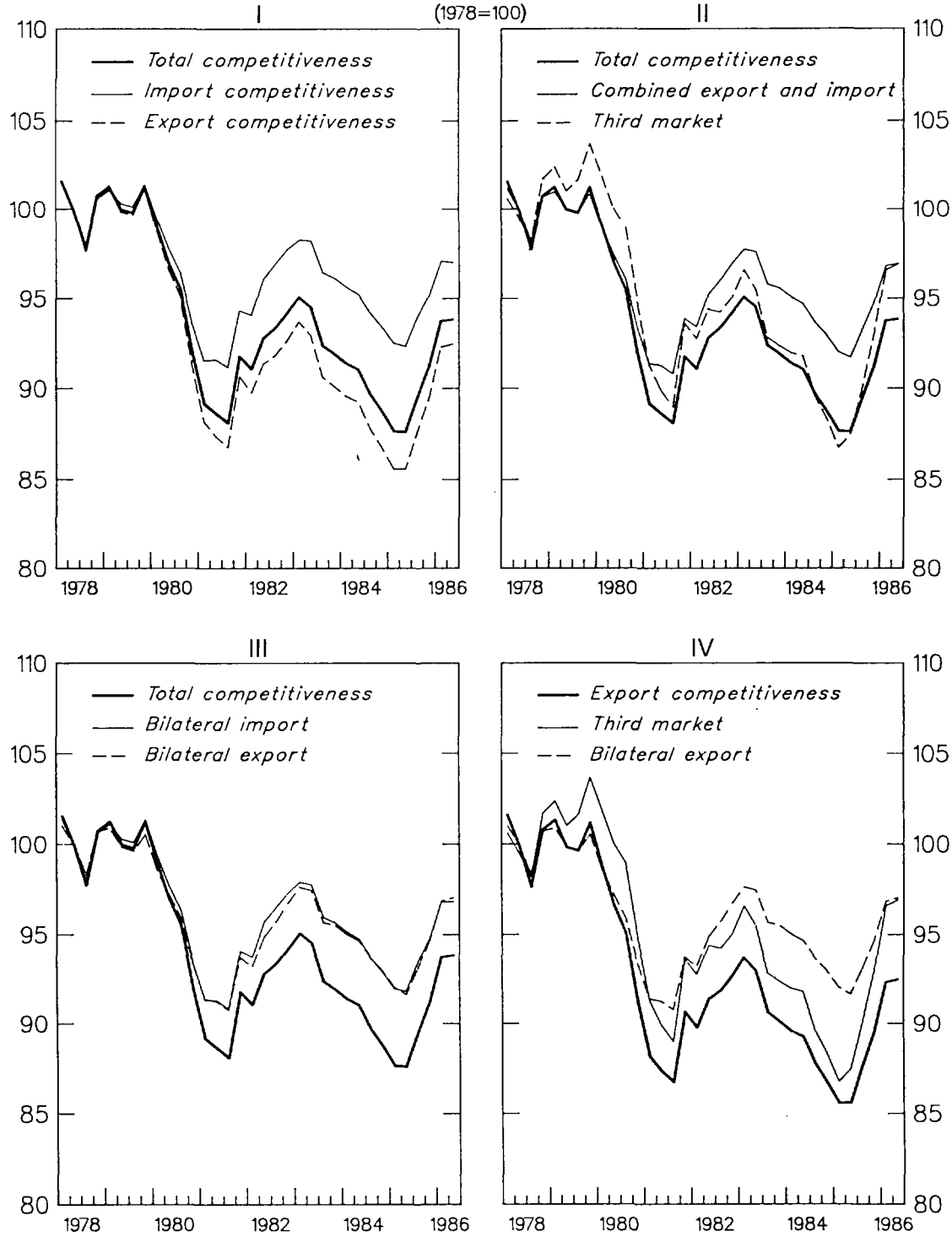
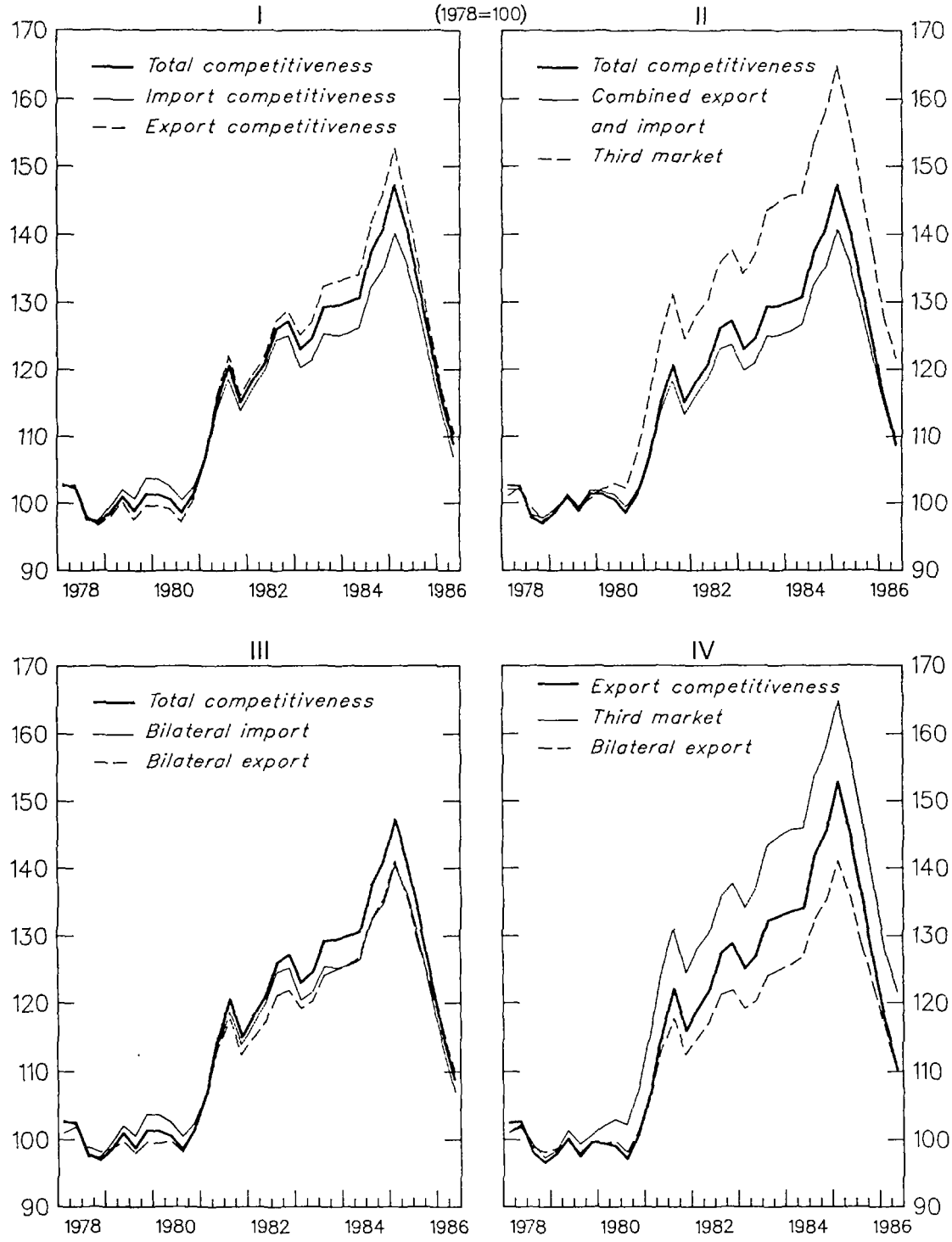


CHART 3

UNITED STATES

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)



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it is observed that the indicators based on bilateral imports (in quadrant III) and those based on import competitiveness weights (in quadrant I) are very similar owing to the similarity in the two import weighting systems. This is not the case on the export side. For Sweden, the indicator based on bilateral exports (in quadrant III) lies above the total competitiveness indicator, in contrast to the export competitiveness indicator shown in quadrant I, which lies below it. As shown in quadrant IV, by the end of the period the bilateral export indicator for Sweden is about 4 percent higher than the export competitiveness indicator while for Germany it is 5 percent higher than the export competitiveness indicator. These differences arise because the bilateral export weights exclude commodity detail and third-market effects, as mentioned above. In the absence of commodity composition effects, the export competitiveness indicator in quadrant IV would fall between the bilateral export and third-market indicators. The fact that for Sweden and the Federal Republic of Germany, the export competitiveness indicators lie outside the range defined by the simple bilateral export and thirdmarket indicators implies that the countries against which they are actually competing (that is, the countries that sell similar products) are not necessarily those that have the largest aggregate trade shares in their major export markets. This is in contrast to the United States; its export competitiveness indicator falls between the simple bilateral export and third-market indicators, suggesting that its main competitors are also those countries that have the largest aggregate trade shares in its major markets.

Quadrant II shows the total competitivenss indicator compared with an indicator constructed using the combined bilateral import and export weights and with the third market indicator. The bilateral import-export indicator is frequently used as a proxy for an indicator intended to measure the trade balance effects of relative price changes. For Sweden, the total competitiveness indicator is generally below the other two indicators because, taking into account commodity composition, relative price movements against its major competitors have been somewhat less than those measured by the other two indicators. The other noteworthy feature in the case of Sweden is that the bilateral import-export indicator and the third market indicator are at about the same level in the latter part of the period. This outcome occurs because Sweden's price level has risen relative to countries that have similar weights in both the bilateral import-export indicator and the third market indicator, namely, the Federal Republic of Germany and the United States. Thus, even though the structures of the two sets of weights show substantial differences, the corresponding indicators can show similar changes depending on what relative price changes have taken place.

For the Federal Republic of Germany, the total competitiveness indicator is nearly identical to the third market indicator, but substantially below the bilateral import-export indicator during 1983-84. This is because, during this period, the price level in Germany had declined relatively more with respect to competitor countries, namely the United States and Japan, than with respect to major bilateral trade partners, that is, European countries. Note that because of the realignments within the European Monetary System in July 1985 and April 1986, the third-market indicator diverges significantly from the total competitiveness indicator from mid-1985 to mid-1986. In the case of the United States, the total competitiveness indicator is closer to the bilateral import-export indicator than to the third-market indicator. There are two reasons for this outcome. First, bilateral imports have a relatively large weight in the total competitiveness indicator, and second, the rise in the U.S. price level has been less against its most important bilateral trade partner, Canada, than against its major competitors in third markets.

The above examples illustrate the point that the relation of the total competitiveness indicator to other trade-weighted indicators is not constant across countries or over time but will vary depending on individual country circumstances. For this reason, when measuring changes in competitiveness, it is preferable to use an indicator that gives an appropriate weight to each of the three components of international price competitiveness--bilateral import, bilateral export, and third-market export--and that is based on sufficient commodity detail to capture competitive relations among countries.

V. Conclusions

In this paper, a change in international price competitiveness for manufactured products was defined as a change in the relative price of a tradable product that leads to a shift in demand. On the basis of this definition, a weighting scheme was derived from a disaggregated system of demand equations encompassing trade relations in bilateral and third-country markets. These weights have the property that an equiproportionate change in each country's price level of manufactured products would leave corresponding real trade flows unchanged. It was shown that other commonly used trade-weighting schemes were special cases of the more general competitiveness weights derived here. Comparisons between the competitiveness weights and simpler weighting schemes were used to illustrate the effects of including internal trade estimates and commodity detail--two distinguishing features of the competitiveness weights--in the calculation of the weights. Substantial differences in the structure of the competitiveness weights and simpler weighting schemes were explained by the greater informational content of the competitiveness weights.

Competitiveness indicators based on simpler weighting schemes were compared with indicators based on the competitiveness weights. While the movements in these indicators were broadly similar, there were substantial differences in relative price changes measured by alternative indices. More importantly, it was shown that the relation of the total competitiveness indicator to other trade-weighted indicators of competitiveness was not uniform across countries or over time. This means that no single proxy for the total competitiveness weights emerged as a second best alternative. The implication of this result is that the total competitiveness weights, which contain detailed information about competitive relations in bilateral and third markets, are preferable to simpler trade weighting schemes because they give a more appropriate weight to each relevant component of international price competitiveness.

Derivation of Weighting Scheme Used to Construct Indices of Competitiveness

A simplified form of the Armington demand equation was derived in Section II of this paper by placing restrictions on substitution possibilities and by assuming that movements in the prices of products produced by a given country were highly correlated with those of an aggregate price index for all products produced by that country. Based on these restrictions, and assuming no change in the level of total expenditure on a given good, changes in the demand for product i by country j in market k can be written as a function of changes in the relative prices of producing countries.

$$\Delta \ln(D_{ij}^k) = \sigma \sum_{\ell \neq j} \frac{T_{i\ell}^k}{\sum_{\ell} T_{i\ell}^k} \Delta \ln(\frac{P_\ell}{P_j}) \qquad (1)$$

Where $T_{i\ell}^k$ represents the sales (both domestic and foreign) of good i produced by country ℓ to market k. To get the total demand for any group of goods such as manufactures the product demand equations given in (1) must be aggregated by commodity. This is done by weighting the demand for each product by the share of that product in the total demand for goods of a certain kind produced by country j. Using the T matrix defined above the weights are

$$W_{ij}^k = \frac{T_{ij}^k}{\sum_i T_{ij}^k}$$

If there are n commodities in a group of goods, the aggregate equation for market k can be obtained by summing the weighted equation for each commodity in the group. Thus, the change in demand for the manufactured products of country j in market k can be written

$$\Delta \ln D_j^k = \sum_{i=1}^{n} W_{ij}^k \Delta \ln D_{ij}^k = \sum_{i=1}^{n} W_{ij}^k \sigma \sum_{\ell \neq j} S_{i\ell}^k \Delta \ln(\frac{P_\ell}{P_j}) \qquad (2)$$

where $S_{i\ell}^k = \frac{T_{i\ell}^k}{\sum_{\ell} T_{il}^k}$.

If equation (2) is expanded, for example, for the case of three producing countries and two goods and if the producing country j is the second country, the right hand side of equation (2) can be written.

$$\sigma\left[W_{12}^{k}\left(S_{11}^{k}\Delta\ln\left(\frac{P_1}{P_2}\right) + S_{13}^{k}\Delta\ln\left(\frac{P_3}{P_2}\right)\right) + W_{22}^{k}\left(S_{21}^{k}\Delta\ln\left(\frac{P_1}{P_2}\right) + S_{23}^{k}\Delta\ln\left(\frac{P_3}{P_2}\right)\right)\right] \tag{3}$$

which is the same as

$$\sigma\left[W_{12}^{k}\ S_{11}^{k}\Delta\ln\left(\frac{P_1}{P_2}\right) + W_{12}^{k}\ S_{13}^{k}\Delta\ln\left(\frac{P_3}{P_2}\right) + W_{22}^{k}\ S_{21}^{k}\Delta\ln\left(\frac{P_1}{P_2}\right) + W_{22}^{k}\ S_{23}^{k}\Delta\ln\left(\frac{P_3}{P_2}\right)\right] \tag{4}$$

Regrouping by price terms yields

$$\sigma\left[\left(W_{12}^{k}\ S_{11}^{k}\Delta\ln\left(\frac{P_1}{P_2}\right) + W_{22}^{k}\ S_{21}^{k}\Delta\ln\left(\frac{P_1}{P_2}\right)\right) + \left(W_{12}^{k}\ S_{13}^{k}\Delta\ln\left(\frac{P_3}{P_2}\right) + W_{22}^{k}\ S_{23}^{k}\Delta\ln\left(\frac{P_3}{P_2}\right)\right)\right] \tag{5}$$

The weights on the relative price terms are now apparent. In the demand equation for commodities produced by country j in market k, the relative price term $\frac{P_\ell}{P_j}$, for $\ell \neq j$, has the weight

$$RPW_{\ell j}^{k} = \sum_{i} W_{ij}^{k}\ S_{i\ell}^{k} = \sum_{i} \frac{T_{ij}^{k}}{\sum_{i} T_{ij}^{k}}\ \frac{T_{i\ell}^{k}}{\sum_{\ell} T_{i\ell}^{k}} \tag{6}$$

The change in the demand for j's output of the aggregate good in market k can now be written

$$\Delta\ln(D_j^k) = \sigma \sum_{\ell \neq j} RPW_{\ell j}^{k}\ \Delta\ln\left(\frac{P_\ell}{P_j}\right) \tag{7}$$

To obtain the weight to give to the relative price term $\frac{P_\ell}{P_j}$ in the change in the demand for country j's total output, that is to all markets,

equation (7) has to be summed over markets. This can be done by weighting equation (7) by the share of j's output sold to each market (including the domestic market), k, in j's total output (or sales) and by summing across markets. The result obtained is

$$\sum_k TS_j^k \, \Delta\ln(D_j^k) = \sigma \sum_k TS_j^k \sum_{\ell \neq j} RPW_{\ell j}^k \, \Delta\ln\left(\frac{P_1}{P_j}\right) \tag{8}$$

$$\text{where } TS_j^k = \frac{\Sigma T_{ij}^k}{\sum_k \Sigma_i T_{ij}} \tag{9}$$

Expansion of the right-hand side term for three exporting countries, with j being the second country, and two market yields

$$\sigma\Big[TS_2^1\left(RPW_{12}^1\Delta\ln\left(\frac{P_1}{P_2}\right) + RPW_{32}^1\Delta\ln\left(\frac{P_3}{P_2}\right)\right) + TS_2^2\left(RPW_{12}^2\Delta\ln\left(\frac{P_1}{P_2}\right) + RPW_{32}^2\Delta\ln\left(\frac{P_3}{P_2}\right)\right)\Big] \tag{10}$$

Regrouping by relative price terms results in

$$\sigma\Big[TS_2^1 \, RPW_{12}^1\Delta\ln\left(\frac{P_1}{P_2}\right) + TS_2^2 \, RPW_{12}^2\Delta\ln\left(\frac{P_1}{P_2}\right) + TS_2^1\left(RPW_{32}^1\Delta\ln\left(\frac{P_3}{P_2}\right) + TS_2^2 \, RPW_{32}^2\Delta\ln\left(\frac{P_3}{P_2}\right)\right)\Big] \tag{11}$$

The weight on the aggregate relative price term, $\Delta\ln\left(\frac{P_\ell}{P_j}\right)$, in the demand for country j's total output turns out to be

$$TW_{j\ell} = \sum_k TS_j^k \cdot RPW_{\ell j}^k \tag{12}$$

Substituting equations (6) and (9) into (12) yields

$$TW_{j\ell} = \sum_k \frac{\sum_i T^k_{ij}}{\sum_k \sum_i T^k_{ij}} \sum_i \frac{T^k_{ij}}{\sum_i T^k_{ij}} \frac{T^k_{i\ell}}{\sum_\ell T^k_{i\ell}} \tag{13}$$

and the change in the demand for country j's total output of the aggregate good in all markets can be written

$$\Delta \ln(D_j) = \sigma \sum_{\ell \neq j} TW_{j\ell} \Delta \ln\left(\frac{P_\ell}{P_j}\right). \tag{14}$$

Categories of Manufactured Goods Used to Construct Competitiveness Weights

SITC Group	Item
512	Organic chemicals
513	Inorganic chemicals: Elements, oxides and halogen salts
514	Other inorganic chemicals
515	Radioactive and associated materials
521	Mineral tar and crude chemicals from coal, petroleum and natural gas
531	Synthetic organic dyestuffs, natural indigo and colour lakes
532	Dyeing and tanning extracts, and synthetic tanning materials
533	Pigments, paints, varnishes and related materials
541	Medicinal and pharmaceutical products
551	Essential oils, perfume and flavor materials
553	Perfumery and cosmetics, dentifrices and other toilet preparations (except soaps)
554	Soaps, cleansing and polishing preparations
561	Fertilizers, manufactured
571	Explosives and pyrotechnic products
581	Plastic materials, regenerated cellulose and artificial resins
599	Chemical materials and products, n.e.s.
611	Leather
612	Manufactures of leather or of artificial or reconstituted leather, n.e.s.

613	Fur skins, tanned or dressed (including dyed)
621	Materials of rubber
629	Articles of rubber, n.e.s.
631	Veneers, plywood boards, "improved" or reconstituted wood and other wood, worked, n.e.s.
632	Wood manufactures, n.e.s.
633	Cork manufactures
641	Paper and paperboard
642	Articles made of paper pulp, of paper or of paperboard
651	Textile yarn and thread
652	Cotton fabrics, woven (not including narrow or special fabrics)
653	Textile fabrics, woven (not including narrow or special fabrics), other than cotton fabrics
654	Tulle, lace, embroidery, ribbons, trimmings and other small wares
655	Special textile fabrics and related products
656	Made-up articles, wholly or chiefly of textile material, n.e.s.
657	Floor coverings, tapestries, etc.
661	Lime, cement and fabricated building materials, except glass and clay materials
662	Clay construction materials and refractory construction materials
663	Mineral manufactures, n.e.s.
664	Glass

665	Glassware
666	Pottery
667	Pearls and precious and semi-precious stones, unworked or worked
671	Pig iron, spiegeleisen, sponge iron, iron and steel powders and shot and ferro-alloys
672	Ingots and other primary forms (including blanks for tubes and pipes) of iron or steel
673	Iron and steel bars, rods, angles, shapes and sections (including sheet piling)
674	Universals, plates and sheets of iron or steel
675	Hoop and strip of iron or steel
676	Rails and railway track construction material of iron or steel
677	Iron and steel wire (excluding wire rod)
678	Tubes, pipes and fittings of iron or steel
679	Iron and steel castings and forgings, unworked, n.e.s.
681	Silver, Platinum and other metals of the platinum group
682	Copper
683	Nickel
684	Aluminum
685	Lead
686	Zinc
687	Tin
688	Uranium and thorium and their alloys

689	Miscellaneous non-ferrous base metals employed in metallurgy
691	Finished structural parts and structures, n.e.s.
692	Metal containers for storage and transport
693	Wire products (excluding electric) and fencing grills
694	Nails, screws, nuts, bolts, rivets and similar articles of iron, steel or of copper
695	Tools for use in the hand or in machines
696	Cutlery
697	Household equipment of base metals
698	Manufactures of metal, n.e.s.
711	Power generating machinery, other than electric
712	Agricultural machinery and implements
714	Office machines
715	Metalworking machinery
717	Textile and leather machinery
718	Machines for special industries
719	Machinery and appliances (other than electrical) and machine parts, n.e.s.
722	Electric power machinery and switchgear
723	Equipment for distributing electricity
724	Telecommunications apparatus
725	Domestic electrical equipment
726	Electric apparatus for medical purposes and radiological apparatus

729	Other electrical machinery and apparatus
731	Railway vehicles
732	Road motor vehicles
733	Road vehicles other than motor vehicles
734	Aircraft
735	Ships and boats
812	Sanitary, plumbing, heating and lighting fixtures and fittings
821	Furniture
831	Travel goods, handbags and similar articles
841	Clothing (except fur clothing)
842	Fur clothing (not including headgear) and other articles made of furskins; artificial fur and articles thereof
851	Footwear
861	Scientific, medical, optical, measuring and controlling instruments and apparatus
862	Photographic and cinematographic supplies
863	Developed cinematographic film
864	Watches and clocks
891	Musical instruments, sound recorders and reproducers and parts and accessories therefor
892	Printed matter
893	Articles of artificial plastic materials, n.e.s.
894	Perambulators, toys, games and sporting goods

895	Office and stationery supplies, n.e.s.
896	Works of art, collector's pieces and antiques
897	Jewelry and goldsmiths' and silversmiths' wares
899	Manufactured articles, n.e.s.

Data Sources

Trade data: The detailed 1980 trade data used in the calculations was obtained from the World Bank's Trade Analysis and Reporting System.

Input-output tables: Input-output tables were obtained from the following sources.

The Statistical Office of the European Communities provided 1975 input-output tables for Belgium, Denmark, the Federal Republic of Germany, France, Italy, the Netherlands, Spain, and the United Kingdom.

National sources were used to obtain input-output tables for the following countries. The date after the country name indicates the year for which the table was compiled.

1. Austria(1976): Strukturen und Interdependizen der österreichischen Wirtschaft, Josef Richter, Wein 1981.

2. Canada(1979): Provided by the Input-Output Division of Statistics Canada.

3. Finland(1980): Tilastotiedotus statistisk rapport, Central Statistical Office of Finland, 1983.

4. Ireland (1976): Irish Input-Output Structures, 1976, E.W. Henry, Economic and Social Research Institute, Dublun, 1980.

5. Japan(1975): Economic Statistics Annual, 1979, Statistics Department, The Bank of Japan, March 1980.

6. Norway(1975): Provided by The Central Bureau of Statistics, Norway.

7. Sweden(1975): Provided by the national authorities.

8. Switzerland(1975): L'interdépendence de l'economie Suisse, provided by the Swiss National Bank.

9. United States(1979): Summary Input-Output Tables of the U.S. Economy: 1976, 1978, and 1979, Bureau of Economic Analysis Staff Paper 39, January 1983, U.S. Department of Commerce.

Wholesale prices

Whole prices for the manufacturing sector refer to the manufacturing or industry component of the wholesale or producer price index. These data are collected from national sources by the Current Studies Division, IMF Research Department.

Table 2a. Austria

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	0	0	0	0	0	0	0	0	0
Belgium	2.78	2.49	2.96	1.03	4.89	2.65	2.80	2.42	9.95
Canada	0.67	0.20	0.95	0.49	1.41	0.42	0.21	0.75	1.60
Denmark	1.06	0.72	1.27	1.17	1.37	1.19	0.76	1.87	1.72
Finland	1.65	0.69	2.24	1.01	3.48	0.93	0.57	1.48	1.39
France	7.28	5.07	8.62	5.90	11.35	5.32	5.26	5.43	13.62
Germany, Fed. Rep. of	43.42	58.25	34.44	49.61	19.17	52.83	57.57	45.53	15.00
Ireland	0.26	0.23	0.27	0.13	0.41	0.25	0.24	0.27	0.76
Italy	10.90	10.85	10.93	11.11	10.74	10.12	10.49	9.53	10.05
Japan	5.08	2.35	6.74	1.67	11.84	1.99	2.45	1.26	6.24
Netherlands	3.09	2.95	3.17	1.98	4.37	3.46	3.09	4.03	7.35
Norway	0.85	0.37	1.13	0.94	1.33	0.85	0.33	1.66	1.21
Spain	1.10	0.34	1.56	1.05	2.08	0.60	0.33	1.02	1.71
Sweden	2.96	2.47	3.27	3.08	3.45	3.01	2.33	4.06	3.70
Switzerland	7.24	7.75	6.93	10.85	2.98	9.26	7.81	11.49	4.43
United Kingdom	5.82	3.38	7.30	5.87	8.74	4.44	3.52	5.85	10.03
United States	5.84	1.89	8.23	4.11	12.39	2.68	2.24	3.35	9.96
Relative weight in total competitiveness (in percent)	100.0	37.7	62.3	31.3	31.0				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2b. Belgium

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	1.13	0.67	1.25	0.81	1.86	0.83	0.60	1.05	2.64
Belgium	0	0	0	0	0	0	0	0	0
Canada	0.82	1.05	0.76	0.29	1.42	0.55	0.71	0.39	2.36
Denmark	0.77	0.47	0.84	0.67	1.09	0.89	0.47	1.30	1.44
Finland	0.58	0.49	0.60	0.33	0.98	0.40	0.28	0.51	1.22
France	20.72	19.77	20.95	28.47	10.32	20.90	17.89	23.84	10.63
Germany, Fed. Rep. of	27.55	30.10	26.92	29.52	23.25	27.39	29.65	25.19	23.72
Ireland	0.38	0.48	0.36	0.15	0.66	0.48	0.63	0.34	0.92
Italy	7.28	5.19	7.79	7.96	7.56	6.24	5.45	7.02	10.63
Japan	4.42	3.02	4.76	0.49	10.80	1.95	3.33	0.60	6.50
Netherlands	9.47	18.13	7.34	9.25	4.63	15.68	14.85	16.49	5.94
Norway	0.66	0.43	0.71	0.44	1.10	0.58	0.27	0.87	1.02
Spain	1.52	1.14	1.61	1.19	2.20	1.08	0.93	1.22	2.21
Sweden	1.90	1.82	1.92	1.31	2.78	1.82	1.85	1.79	3.30
Switzerland	3.51	1.54	4.00	3.31	4.97	3.21	2.07	4.33	4.12
United Kingdom	10.07	6.67	10.90	9.79	12.48	10.56	10.90	10.22	9.15
United States	9.24	9.05	9.29	6.03	13.90	7.44	10.12	4.83	10.05
Relative weight in total competitiveness (in percent)	100.0	19.7	80.3	47.0	33.2				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2c. Canada

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	0.33	0.24	0.37	0.07	1.26	0.18	0.23	0.12	0.73
Belgium	0.99	0.53	1.20	0.49	3.34	0.73	0.49	1.01	4.01
Canada	0	0	0	0	0	0	0	0	0
Denmark	0.20	0.21	0.19	0.05	0.61	0.15	0.18	0.12	0.80
Finland	0.54	0.17	0.71	0.17	2.33	0.19	0.15	0.23	0.69
France	2.73	1.91	3.10	1.10	9.12	1.39	1.55	1.20	6.94
Germany, Fed. Rep. of	4.05	3.05	4.50	0.94	15.22	2.42	3.21	1.49	16.80
Ireland	0.23	0.44	0.13	0.06	0.34	0.34	0.42	0.24	0.65
Italy	1.63	1.47	1.71	0.61	5.01	0.99	1.23	0.70	5.37
Japan	7.43	7.28	7.50	1.76	24.78	4.56	6.87	1.82	35.45
Netherlands	0.92	0.44	1.14	0.62	2.73	1.05	0.36	1.86	2.32
Norway	0.33	0.26	0.36	0.04	1.33	0.15	0.19	0.10	0.57
Spain	0.58	0.40	0.66	0.20	2.05	0.26	0.30	0.22	1.15
Sweden	0.98	1.02	0.97	0.26	3.11	0.73	0.97	0.46	2.21
Switzerland	0.64	0.69	0.62	0.27	1.67	0.52	0.65	0.36	2.71
United Kingdom	4.42	4.07	4.58	3.06	9.18	3.98	4.01	3.96	8.50
United States	74.00	77.82	72.26	90.31	17.93	82.37	79.20	86.12	2.62
Relative weight in total competitiveness (in percent)	100.0	31.3	68.7	51.6	17.1				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2d. Denmark

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	1.85	2.01	1.77	1.38	2.16	1.75	1.82	1.66	2.45
Belgium	3.27	4.23	2.83	1.16	4.50	4.18	5.21	2.67	7.74
Canada	0.69	0.28	0.88	0.69	1.07	0.54	0.33	0.84	2.53
Denmark	0	0	0	0	0	0	0	0	0
Finland	3.45	4.24	3.09	2.95	3.23	3.43	3.25	3.68	3.10
France	7.07	5.17	7.94	7.06	8.82	5.74	5.49	6.11	9.65
Germany, Fed. Rep. of	24.66	28.18	23.04	26.28	19.80	25.41	28.33	21.15	19.98
Ireland	0.56	0.47	0.60	0.52	0.67	0.71	0.46	1.08	0.89
Italy	5.24	4.32	5.67	3.41	7.92	3.71	4.28	2.89	7.56
Japan	5.10	2.91	6.11	2.23	10.00	2.96	3.93	1.53	6.84
Netherlands	4.49	5.62	3.97	3.58	4.37	5.57	5.31	5.95	5.80
Norway	4.88	5.13	4.76	7.76	1.77	7.66	5.11	11.36	1.96
Spain	1.15	0.71	1.35	1.11	1.59	0.86	0.72	1.06	1.36
Sweden	13.63	19.05	11.14	17.23	5.04	17.75	16.64	19.37	5.66
Switzerland	3.09	2.89	3.18	3.04	3.32	2.84	2.92	2.72	3.69
United Kingdom	11.81	11.15	12.11	13.08	11.15	11.49	11.30	11.78	9.71
United States	9.06	3.65	11.55	8.52	14.58	5.40	4.90	6.14	9.91
Relative weight in total competitiveness (in percent)	100.0	31.5	68.5	34.3	34.2				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2e. Finland

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	3.11	2.18	3.45	1.45	5.17	1.78	2.12	1.40	2.24
Belgium	2.66	2.64	2.66	1.32	3.82	2.44	2.99	1.83	7.43
Canada	2.06	1.23	2.36	0.60	3.88	0.86	0.92	0.78	2.49
Denmark	3.74	4.04	3.63	4.30	3.05	4.48	3.72	5.34	3.52
Finland	0	0	0	0	0	0	0	0	0
France	7.18	5.07	7.97	7.36	8.48	5.57	5.33	5.83	9.24
Germany, Fed. Rep. of	19.83	23.99	18.28	18.19	18.36	19.48	23.40	15.09	21.79
Ireland	0.36	0.23	0.41	0.45	0.38	0.57	0.30	0.88	1.06
Italy	4.81	3.80	5.18	2.63	7.37	3.16	4.00	2.22	7.13
Japan	5.49	3.63	6.18	1.23	10.42	3.17	5.25	0.85	6.70
Netherlands	3.87	3.72	3.92	3.68	4.13	4.20	3.64	4.82	5.60
Norway	3.98	3.19	4.28	5.42	3.30	5.25	2.94	7.83	2.60
Spain	1.59	1.14	1.75	1.59	1.89	1.10	0.95	1.28	1.31
Sweden	17.88	24.95	15.25	23.76	7.96	25.11	23.65	26.75	4.74
Switzerland	2.45	2.79	2.32	2.57	2.11	2.68	3.03	2.28	3.53
United Kingdom	12.83	12.53	12.94	17.75	8.81	14.68	12.54	17.07	9.30
United States	8.18	4.85	9.42	7.72	10.88	5.47	5.22	5.75	10.00
Relative weight in total competitiveness (in percent)	100.0	27.1	72.9	33.6	39.3				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2f. France

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	1.33	0.86	1.64	1.27	1.95	1.14	0.83	1.52	2.89
Belgium	9.31	15.24	5.44	6.36	4.67	14.32	15.04	13.44	8.49
Canada	1.01	0.53	1.32	0.80	1.76	0.72	0.52	0.96	3.25
Denmark	0.74	0.65	0.81	0.62	0.96	0.84	0.66	1.06	1.41
Finland	0.70	0.61	0.76	0.48	0.98	0.62	0.56	0.70	1.19
France	0	0	0	0	0	0	0	0	0
Germany, Fed. Rep. of	27.42	30.97	25.11	29.32	21.59	28.12	30.86	24.78	22.60
Ireland	0.41	0.41	0.40	0.28	0.51	0.52	0.45	0.61	0.98
Italy	14.70	15.95	13.89	19.95	8.83	15.86	15.33	16.50	8.00
Japan	6.45	2.79	8.83	1.94	14.59	2.38	2.93	1.70	7.51
Netherlands	5.01	5.81	4.49	3.25	5.53	6.11	5.89	6.38	7.53
Norway	0.58	0.36	0.72	0.44	0.96	0.55	0.38	0.77	1.00
Spain	3.86	4.18	3.65	5.25	2.32	4.21	3.97	4.49	1.62
Sweden	2.18	2.03	2.27	1.87	2.61	2.09	1.97	2.23	3.28
Switzerland	4.00	3.63	4.25	5.79	2.96	4.87	3.75	6.24	4.12
United Kingdom	10.12	8.20	11.38	11.64	11.16	9.56	8.38	10.98	9.66
United States	12.17	7.79	15.03	10.74	18.62	8.09	8.47	7.63	11.18
Relative weight in total competitiveness (in percent)	100.0	39.5	60.5	27.6	33.0				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2g. Germany, Federal Republic of

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	5.00	5.84	4.63	7.12	2.02	6.80	5.55	7.70	1.79
Belgium	7.79	12.83	5.56	4.73	6.44	11.26	12.59	10.32	10.73
Canada	0.94	0.37	1.20	0.63	1.79	0.75	0.51	0.92	4.36
Denmark	1.64	1.95	1.50	1.66	1.32	2.23	1.82	2.53	1.58
Finland	1.21	1.23	1.21	1.12	1.30	1.31	1.15	1.42	1.52
France	17.25	16.63	17.53	21.67	13.20	16.87	16.11	17.42	12.08
Germany, Fed. Rep. of	0	0	0	0	0	0	0	0	0
Ireland	0.52	0.77	0.41	0.26	0.57	0.64	0.75	0.56	0.92
Italy	12.27	13.90	11.56	13.41	9.62	12.18	14.32	10.65	9.00
Japan	8.45	6.92	9.12	2.59	15.96	3.73	6.61	1.68	8.00
Netherlands	7.73	10.95	6.31	7.31	5.26	11.83	10.70	12.64	5.83
Norway	0.87	0.56	1.01	1.08	0.94	1.46	1.16	1.67	1.13
Spain	2.20	1.83	2.36	2.62	2.10	2.04	1.80	2.22	1.98
Sweden	3.68	3.48	3.76	3.69	3.84	3.86	3.33	4.24	3.85
Switzerland	6.24	6.66	6.06	7.94	4.09	7.20	6.44	7.74	3.75
United Kingdom	10.85	8.23	12.00	10.87	13.18	8.83	8.44	9.11	10.86
United States	13.36	7.85	15.79	13.31	18.38	9.00	8.74	9.18	10.99
Relative weight in total competitiveness (in percent)	100.0	30.6	69.4	35.5	33.9				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2h. Ireland

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	0.87	0.47	1.04	0.73	1.46	0.57	0.39	0.84	1.76
Belgium	3.18	1.94	3.70	1.91	6.19	3.51	2.04	5.83	8.26
Canada	1.57	0.77	1.90	2.29	1.36	1.84	0.97	3.22	3.52
Denmark	1.08	1.17	1.04	0.70	1.52	1.10	1.11	1.08	1.44
Finland	0.65	0.92	0.54	0.27	0.91	0.68	0.80	0.48	1.53
France	7.52	4.79	8.65	7.37	10.43	5.50	4.74	6.71	11.08
Germany, Fed. Rep. of	15.25	9.10	17.81	16.85	19.14	11.30	9.43	14.25	19.64
Ireland	0	0	0	0	0	0	0	0	0
Italy	5.09	2.73	6.07	4.51	8.23	3.27	2.68	4.19	7.93
Japan	3.91	3.61	4.03	1.01	8.23	2.15	3.06	0.72	8.03
Netherlands	3.63	3.04	3.87	2.22	6.17	3.79	2.87	5.24	6.30
Norway	0.55	0.62	0.53	0.47	0.60	0.55	0.47	0.66	1.25
Spain	1.28	0.81	1.48	1.30	1.73	0.99	0.87	1.19	1.71
Sweden	1.75	1.40	1.89	1.53	2.39	1.92	1.87	2.00	3.71
Switzerland	1.75	0.74	2.17	1.23	3.48	0.91	0.73	1.20	3.60
United Kingdom	38.53	58.55	30.19	46.39	7.71	52.52	57.76	44.24	5.05
United States	13.39	9.33	15.07	11.21	20.43	9.40	10.20	8.14	14.51
Relative weight in total competitiveness (in percent)	100.0	29.4	70.6	41.0	29.6				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2i. Italy

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	2.82	2.70	2.88	3.30	2.49	3.19	2.46	3.86	2.63
Belgium	4.62	7.13	3.36	2.02	4.60	6.28	7.44	5.22	10.80
Canada	0.85	0.50	1.03	0.75	1.30	0.75	0.50	0.97	3.28
Denmark	0.78	0.52	0.91	0.63	1.17	0.80	0.53	1.05	1.37
Finland	0.66	0.37	0.81	0.44	1.15	0.52	0.36	0.67	1.14
France	20.77	23.34	19.49	27.72	11.87	23.29	22.75	23.79	10.15
Germany, Fed. Rep. of	27.55	32.08	25.29	29.75	21.17	29.81	31.70	28.06	21.32
Ireland	0.39	0.42	0.37	0.19	0.54	0.45	0.47	0.44	0.86
Italy	0	0	0	0	0	0	0	0	0
Japan	6.39	2.09	8.53	2.04	14.55	1.85	2.25	1.49	7.66
Netherlands	3.87	5.00	3.30	2.25	4.28	4.84	4.93	4.76	6.94
Norway	0.46	0.39	0.50	0.39	0.60	0.52	0.36	0.67	0.95
Spain	3.22	2.92	3.37	3.42	3.33	3.13	2.94	3.30	2.01
Sweden	2.03	2.19	1.95	1.29	2.55	1.89	2.10	1.69	3.17
Switzerland	4.67	4.64	4.68	6.06	3.41	5.69	4.89	6.43	4.22
United Kingdom	9.33	8.16	9.91	9.23	10.54	8.79	8.38	9.17	9.17
United States	11.59	7.55	13.61	10.53	16.46	8.19	7.94	8.42	10.42
Relative weight in total competitiveness (in percent)	100.0	33.3	66.7	32.1	34.6				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2j. Japan

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	1.09	0.92	1.12	0.52	1.54	0.75	0.80	0.74	1.52
Belgium	2.33	1.00	2.51	0.86	3.69	2.35	1.57	2.59	6.18
Canada	3.24	3.25	3.24	2.72	3.60	4.15	3.24	4.43	20.28
Denmark	0.63	0.78	0.61	0.31	0.83	0.76	0.69	0.79	1.10
Finland	0.63	0.39	0.66	0.31	0.91	0.63	0.34	0.71	0.95
France	7.58	5.16	7.91	3.55	11.02	4.19	5.79	3.71	8.46
Germany, Fed. Rep. of	15.78	14.09	16.02	10.82	19.71	10.97	12.36	10.55	17.00
Ireland	0.25	0.22	0.25	0.18	0.30	0.36	0.20	0.41	0.76
Italy	5.31	4.47	5.43	1.58	8.17	2.23	3.99	1.69	6.64
Japan	0	0	0	0	0	0	0	0	0
Netherlands	2.31	1.42	2.44	1.07	3.41	3.13	1.34	3.67	3.90
Norway	0.76	0.68	0.78	0.54	0.94	0.85	0.61	0.92	0.79
Spain	1.79	0.81	1.93	1.01	2.58	1.10	0.80	1.19	1.33
Sweden	2.18	2.12	2.19	0.92	3.09	1.55	1.85	1.46	2.89
Switzerland	2.69	4.84	2.39	1.37	3.11	2.69	4.55	2.12	3.13
United Kingdom	8.94	7.25	9.17	5.93	11.48	6.76	6.76	6.76	8.82
United States	44.49	52.61	43.37	68.31	25.61	57.52	55.12	58.26	8.00
Relative weight in total competitiveness (in percent)	100.0	12.2	87.8	36.5	51.3				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2k. Netherlands

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	1.42	1.02	1.58	1.35	1.84	1.24	0.97	1.62	2.69
Belgium	10.72	17.60	8.04	10.63	5.14	17.97	16.33	20.27	8.51
Canada	0.86	1.06	0.78	0.34	1.29	0.91	1.26	0.41	2.14
Denmark	1.19	1.17	1.20	1.23	1.17	1.36	1.01	1.85	1.48
Finland	0.95	1.09	0.90	0.65	1.17	0.79	0.73	0.87	1.26
France	12.63	8.08	14.40	15.17	13.54	10.22	8.23	13.03	13.59
Germany, Fed. Rep. of	30.96	37.18	28.54	35.21	21.06	32.97	35.16	29.90	20.18
Ireland	0.49	0.44	0.51	0.32	0.73	0.60	0.55	0.67	0.97
Italy	6.90	4.60	7.80	7.81	7.79	5.51	4.81	6.50	9.81
Japan	4.97	3.00	5.73	0.97	11.08	2.97	4.56	0.71	6.35
Netherlands	0	0	0	0	0	0	0	0	0
Norway	1.06	0.85	1.13	0.81	1.50	1.10	0.85	1.45	1.04
Spain	1.61	1.02	1.84	1.97	1.68	1.33	1.04	1.73	1.84
Sweden	2.56	2.87	2.44	2.15	2.76	2.56	2.48	2.68	3.52
Switzerland	2.65	1.78	2.98	2.66	3.35	2.17	1.84	2.63	4.22
United Kingdom	10.86	10.05	11.17	12.30	9.92	10.93	10.83	11.08	9.08
United States	10.17	8.19	10.93	6.43	15.98	7.38	9.35	4.61	10.23
Relative weight in total competitiveness (in percent)	100.0	28.0	72.0	27.2	36.0				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2ℓ. Norway

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	1.78	1.68	1.83	1.07	2.40	1.44	1.70	0.95	2.31
Belgium	3.38	2.89	3.67	1.61	5.22	3.12	3.68	2.08	7.65
Canada	1.41	0.27	2.08	1.28	2.68	0.61	0.29	1.19	2.80
Denmark	5.90	8.74	4.25	7.20	2.03	8.83	8.22	9.96	2.63
Finland	4.45	5.53	3.82	3.56	4.01	4.63	5.03	3.90	3.09
France	6.66	3.79	8.33	5.98	10.11	4.37	4.24	4.62	9.59
Germany, Fed. Rep. of	15.93	19.07	14.10	11.47	16.08	19.18	19.80	18.05	20.98
Ireland	0.34	0.33	0.35	0.41	0.31	0.41	0.29	0.61	1.03
Italy	3.77	2.75	4.36	3.91	4.70	2.79	2.88	2.64	7.24
Japan	7.47	5.26	8.75	2.99	13.09	3.79	4.87	1.81	7.00
Netherlands	4.81	3.82	5.38	4.00	6.43	5.17	4.37	6.66	5.62
Norway	0	0	0	0	0	0	0	0	0
Spain	1.33	0.61	1.75	1.35	2.05	0.78	0.65	1.02	1.33
Sweden	17.65	27.27	12.05	21.44	4.97	23.60	24.62	21.73	4.58
Switzerland	2.32	2.27	2.34	2.52	2.21	2.19	2.29	1.99	3.63
United Kingdom	13.00	10.33	14.56	20.28	10.24	12.96	11.35	15.93	9.07
United States	9.81	5.39	12.38	10.93	13.48	6.12	5.73	6.84	10.52
Relative weight in total competitiveness (in percent)	100.0	36.8	63.2	27.2	36.0				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2m. Spain

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	1.11	0.94	1.20	0.47	1.72	0.77	0.89	0.59	1.99
Belgium	3.75	3.94	3.64	2.04	4.80	4.36	4.39	4.31	10.12
Canada	1.18	0.59	1.49	0.93	1.90	0.80	0.55	1.14	3.42
Denmark	0.67	0.63	0.69	0.48	0.84	0.74	0.66	0.85	1.12
Finland	0.85	0.82	0.87	0.61	1.05	0.73	0.70	0.76	0.95
France	21.26	22.70	20.48	33.41	11.17	24.83	21.01	29.88	9.44
Germany, Fed. Rep. of	19.23	23.17	17.10	17.95	16.49	20.08	22.36	17.08	22.49
Ireland	0.38	0.45	0.34	0.26	0.40	0.55	0.45	0.69	0.86
Italy	12.56	12.19	12.76	13.94	11.91	12.56	12.11	13.15	9.35
Japan	8.39	4.94	10.26	1.69	16.43	3.69	5.38	1.45	7.13
Netherlands	3.51	4.68	2.88	2.28	3.31	4.68	4.45	4.99	6.07
Norway	0.64	0.50	0.71	0.39	0.94	0.58	0.47	0.73	0.81
Spain	0	0	0	0	0	0	0	0	0
Sweden	1.88	2.15	1.73	0.99	2.27	1.79	2.18	1.26	2.95
Switzerland	2.51	3.02	2.23	2.42	2.08	3.07	3.40	2.63	3.90
United Kingdom	9.58	8.30	10.27	10.92	9.80	9.70	8.84	10.82	8.42
United States	12.51	10.97	13.34	11.20	14.89	11.08	12.14	9.67	10.17
Relative weight in total competitiveness (in percent)	100.0	35.1	64.9	27.2	37.7				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2n. Sweden

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	2.07	2.29	1.97	1.88	2.06	2.11	2.25	1.97	2.20
Belgium	3.25	3.60	3.10	1.78	4.36	4.07	4.06	4.09	7.72
Canada	1.39	0.64	1.70	1.31	2.07	1.24	0.71	1.77	3.33
Denmark	5.47	8.10	4.39	6.99	1.91	8.48	7.55	9.41	2.34
Finland	6.63	10.13	5.18	7.27	3.19	9.17	9.24	9.11	1.74
France	8.29	6.72	8.94	8.83	9.05	6.81	6.57	7.05	9.67
Germany, Fed. Rep. of	22.26	27.12	20.26	18.69	21.75	20.99	26.95	15.04	22.02
Ireland	0.36	0.44	0.33	0.25	0.40	0.59	0.48	0.71	0.92
Italy	5.46	3.81	6.15	5.69	6.58	4.20	3.92	4.47	7.32
Japan	7.07	3.72	8.45	2.43	14.19	2.87	4.14	1.60	7.68
Netherlands	3.87	4.24	3.72	3.52	3.91	5.00	4.34	5.65	5.72
Norway	5.86	6.61	5.55	9.65	1.64	9.77	6.33	13.21	1.37
Spain	1.30	0.64	1.58	1.51	1.64	0.99	0.60	1.37	1.45
Sweden	0	0	0	0	0	0	0	0	0
Switzerland	2.80	2.71	2.83	3.27	2.42	3.02	2.99	3.06	3.56
United Kingdom	12.43	12.28	12.50	14.96	10.15	12.70	12.39	13.00	9.43
United States	11.48	6.95	13.36	11.98	14.66	7.99	7.48	8.50	10.35
Relative weight in total competitiveness (in percent)	100.0	29.2	70.8	34.5	36.3				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2o. Switzerland

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	3.84	4.36	3.47	5.36	1.64	4.84	3.86	6.39	2.43
Belgium	4.57	4.91	4.33	1.36	7.19	5.36	5.96	4.41	8.89
Canada	0.69	0.36	0.91	0.80	1.03	0.65	0.34	1.14	3.79
Denmark	0.94	0.77	1.06	0.96	1.16	1.01	0.64	1.59	1.42
Finland	0.69	0.59	0.76	0.74	0.78	0.73	0.48	1.13	1.20
France	11.59	11.21	11.86	14.35	9.45	11.86	11.18	12.95	11.32
Germany, Fed. Rep. of	28.74	31.47	26.82	32.48	21.35	29.23	29.95	28.10	20.15
Ireland	0.27	0.19	0.33	0.12	0.54	0.21	0.17	0.27	0.84
Italy	9.57	9.66	9.51	10.97	8.11	9.45	9.06	10.06	9.16
Japan	6.62	2.99	9.17	5.03	13.16	3.72	3.67	3.79	7.87
Netherlands	3.04	2.82	3.20	1.98	4.37	3.16	2.59	4.04	6.47
Norway	0.58	0.42	0.70	0.73	0.67	0.68	0.35	1.19	1.03
Spain	1.32	0.84	1.65	1.93	1.38	1.27	0.76	2.07	1.81
Sweden	2.13	2.08	2.16	2.09	2.23	2.26	1.86	2.88	3.37
Switzerland	0	0	0	0	0	0	0	0	0
United Kingdom	13.68	18.44	10.34	7.77	12.82	16.24	20.61	9.32	7.87
United States	11.73	8.88	13.72	13.32	14.11	9.35	8.51	10.67	10.82
Relative weight in total competitiveness (in percent)	100.0	41.2	58.8	28.9	29.9				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2p. United Kingdom

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	1.24	1.20	1.25	1.00	1.42	1.10	1.14	1.07	2.27
Belgium	5.25	7.38	4.22	2.54	5.34	8.38	8.14	8.62	8.17
Canada	1.90	2.09	1.81	2.03	1.67	2.38	2.15	2.62	4.87
Denmark	1.45	1.69	1.33	1.60	1.15	1.95	1.61	2.29	1.52
Finland	1.45	2.08	1.15	1.42	0.96	1.90	2.07	1.73	1.28
France	11.75	11.46	11.90	13.94	10.54	11.07	11.39	10.75	10.78
Germany, Fed. Rep. of	20.01	21.90	19.10	17.23	20.34	17.04	20.38	13.66	23.53
Ireland	2.42	3.68	1.81	4.01	0.35	5.74	3.72	7.80	0.47
Italy	7.66	7.48	7.75	8.28	7.40	6.93	7.47	6.40	7.84
Japan	8.83	6.58	9.91	3.23	14.35	4.44	6.76	2.09	8.71
Netherlands	5.00	6.63	4.21	4.80	3.82	7.57	6.33	8.84	5.43
Norway	1.31	1.72	1.12	1.43	0.92	1.90	1.63	2.18	1.00
Spain	2.02	1.93	2.06	2.28	1.92	1.90	1.82	1.99	1.52
Sweden	3.79	4.84	3.28	4.06	2.77	4.51	4.59	4.42	3.46
Switzerland	5.48	2.77	6.79	11.30	3.79	7.72	3.41	12.10	3.05
United Kingdom	0	0	0	0	0	0	0	0	0
United States	20.44	16.58	22.29	20.84	23.26	15.44	17.39	13.45	10.92
Relative weight in total competitiveness (in percent)	100.0	32.5	67.5	27.0	40.5				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Calculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

Table 2q. United States

	Competitiveness Weights 1/					Aggregate Trade Weights 2/			
	Total	Import	Total export	Bilateral export	Third market export	Combined bilateral import and export	Bilateral import	Bilateral export	Third market export
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	0.73	0.37	1.00	0.40	1.38	0.41	0.38	0.46	2.16
Belgium	2.83	2.03	3.44	2.45	4.07	3.68	2.23	5.39	8.54
Canada	18.73	27.53	12.15	27.62	2.23	30.72	27.20	34.86	1.38
Denmark	0.65	0.49	0.77	0.37	1.03	0.57	0.49	0.67	1.41
Finland	0.54	0.40	0.65	0.39	0.81	0.44	0.41	0.48	1.25
France	8.31	4.72	11.01	9.40	12.04	5.84	4.59	7.32	11.31
Germany, Fed. Rep. of	14.50	11.97	16.40	11.67	19.42	10.83	11.93	9.53	20.96
Ireland	0.49	0.40	0.57	0.45	0.64	0.64	0.40	0.93	1.09
Italy	5.60	3.81	6.94	5.44	7.91	4.03	3.98	4.08	7.26
Japan	25.86	33.86	19.86	16.66	21.92	23.56	33.80	11.49	6.37
Netherlands	2.75	1.55	3.66	2.78	4.22	3.19	1.53	5.14	4.85
Norway	0.58	0.41	0.71	0.53	0.83	0.56	0.41	0.74	0.91
Spain	1.55	0.88	2.05	2.14	2.00	1.36	0.94	1.84	1.44
Sweden	2.06	1.73	2.30	1.63	2.73	1.77	1.74	1.80	2.98
Switzerland	2.76	2.12	3.25	3.87	2.85	2.77	2.26	3.37	3.26
United Kingdom	12.02	7.72	15.25	14.20	15.92	9.62	7.70	11.89	8.44
United States	0	0	0	0	0	0	0	0	0
Relative weight in total competitiveness (in percent)	100.0	42.8	57.2	22.3	34.8				

1/ Calculated using disaggregated trade data and internal trade estimates for 143 manufactured products for the year 1980.
2/ Caiculated using total trade in manufactures (excluding internal trade estimates) for the year 1980.

CHART 4

AUSTRIA

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

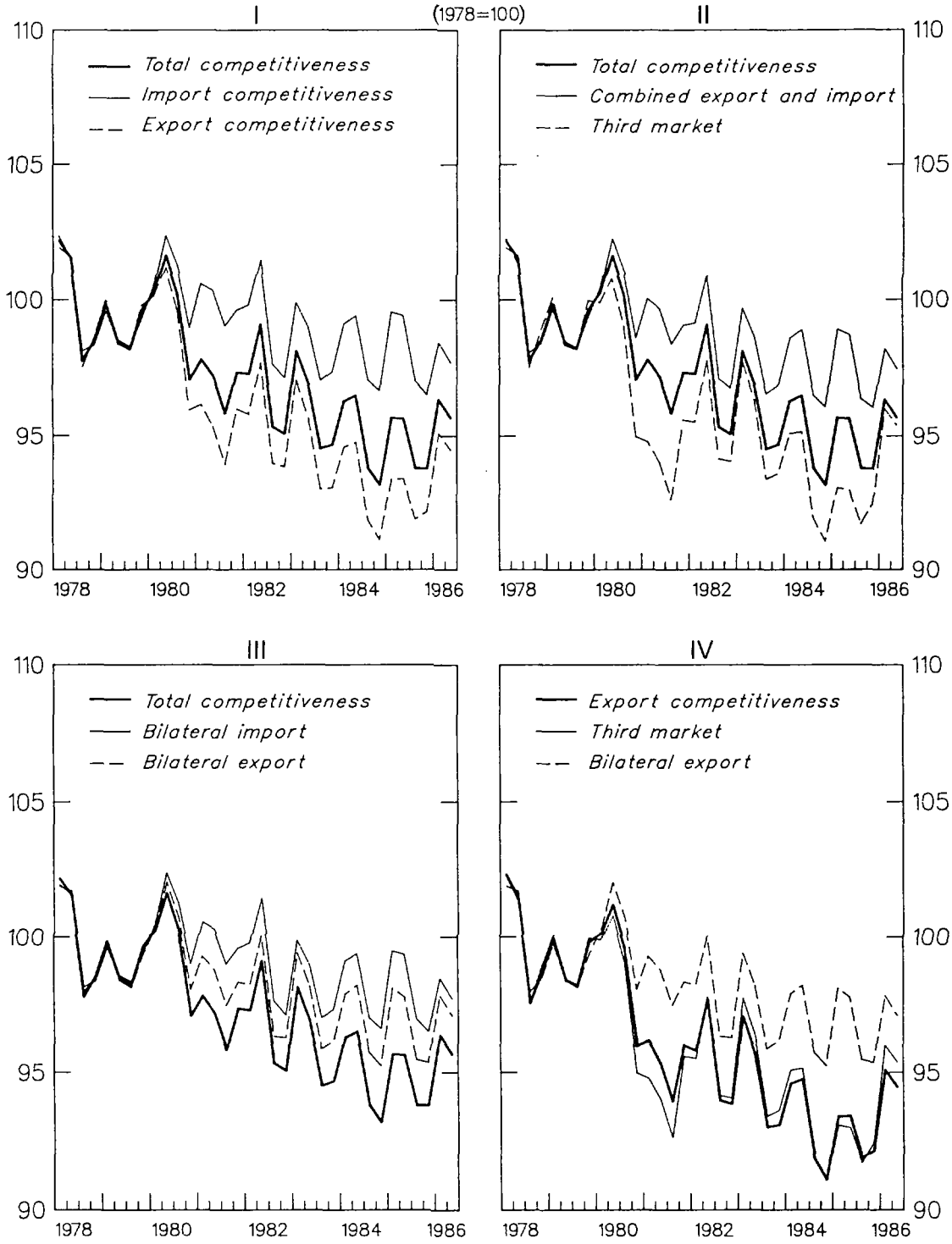


CHART 5

BELGIUM

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

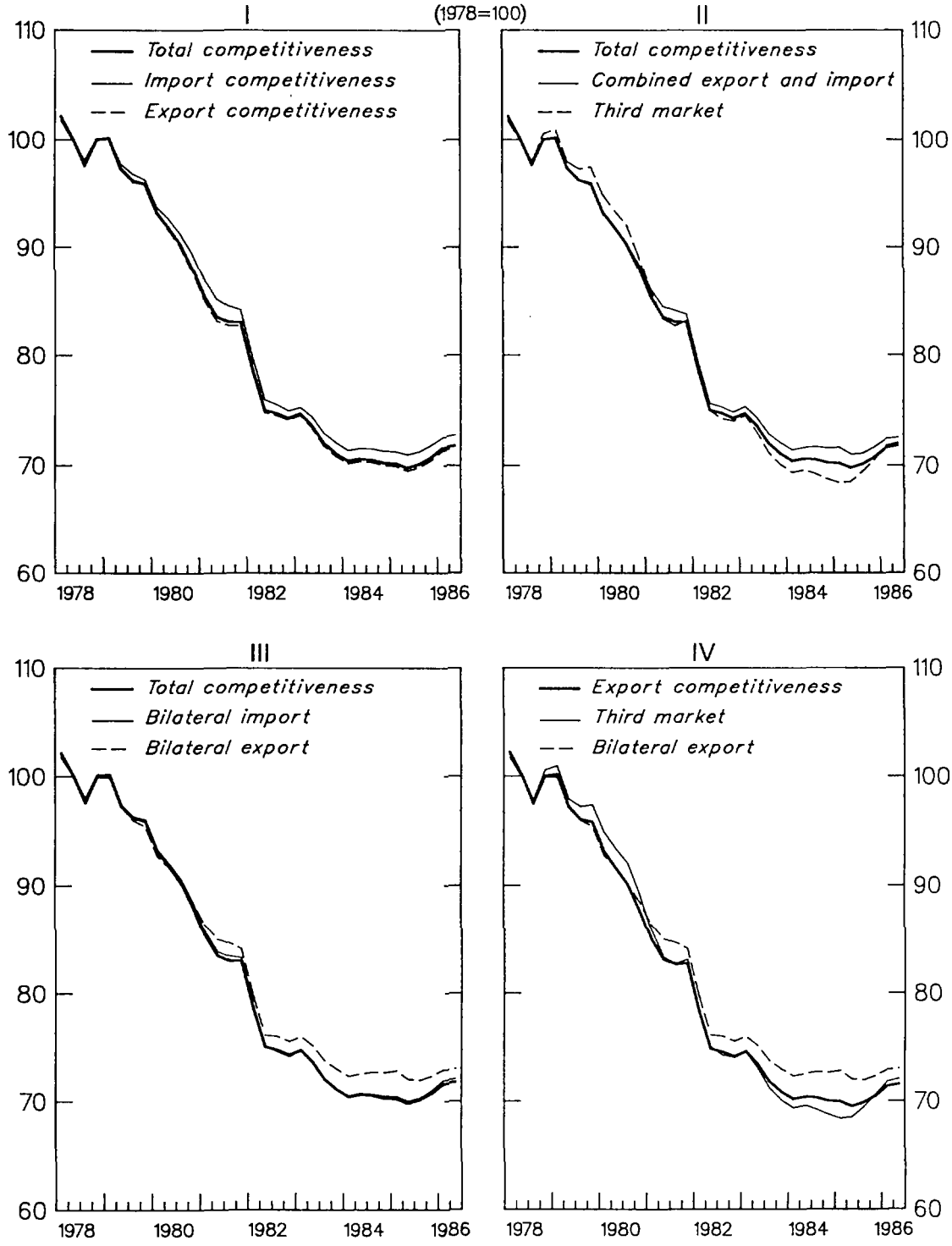


CHART 6

CANADA

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

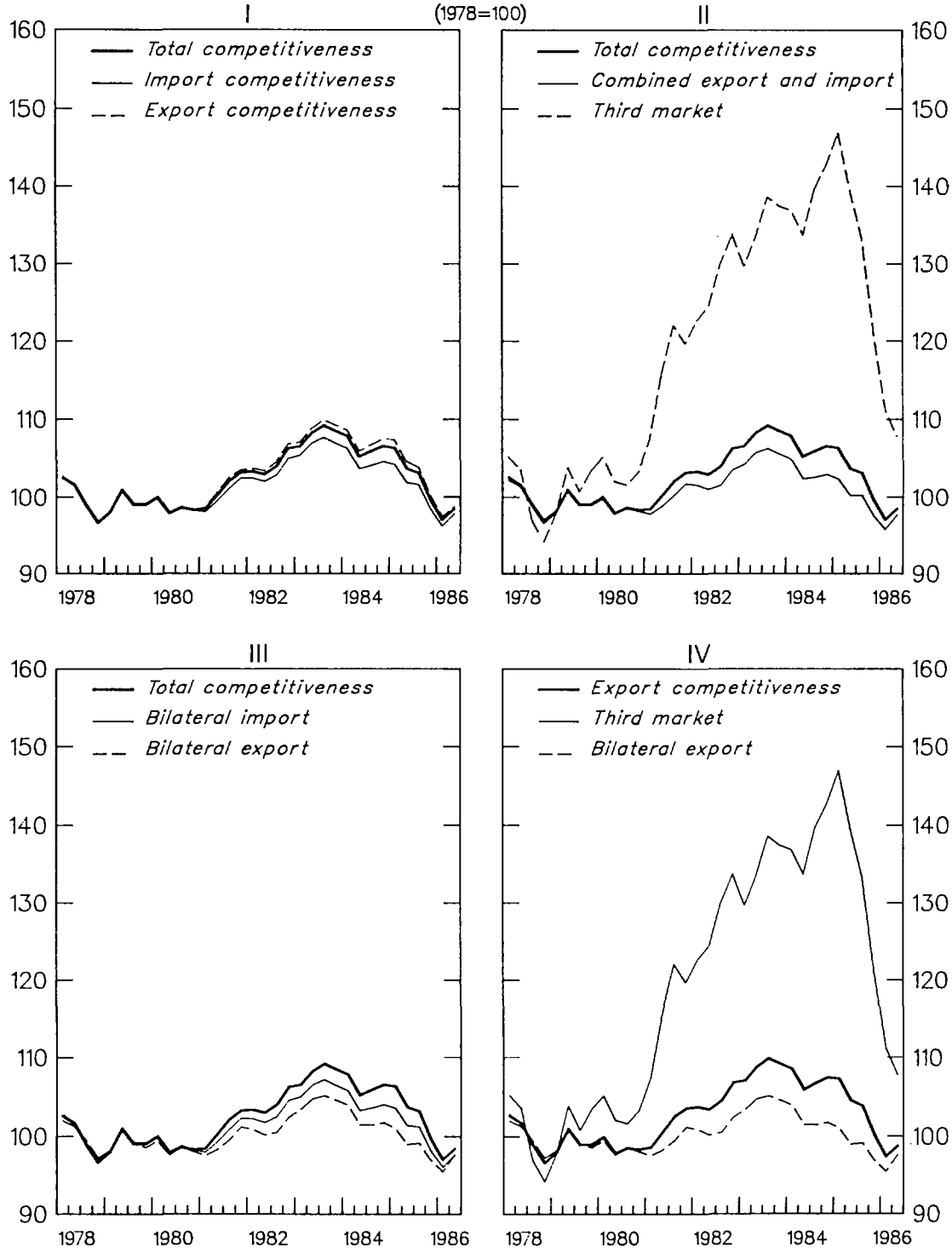


CHART 7

DENMARK

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

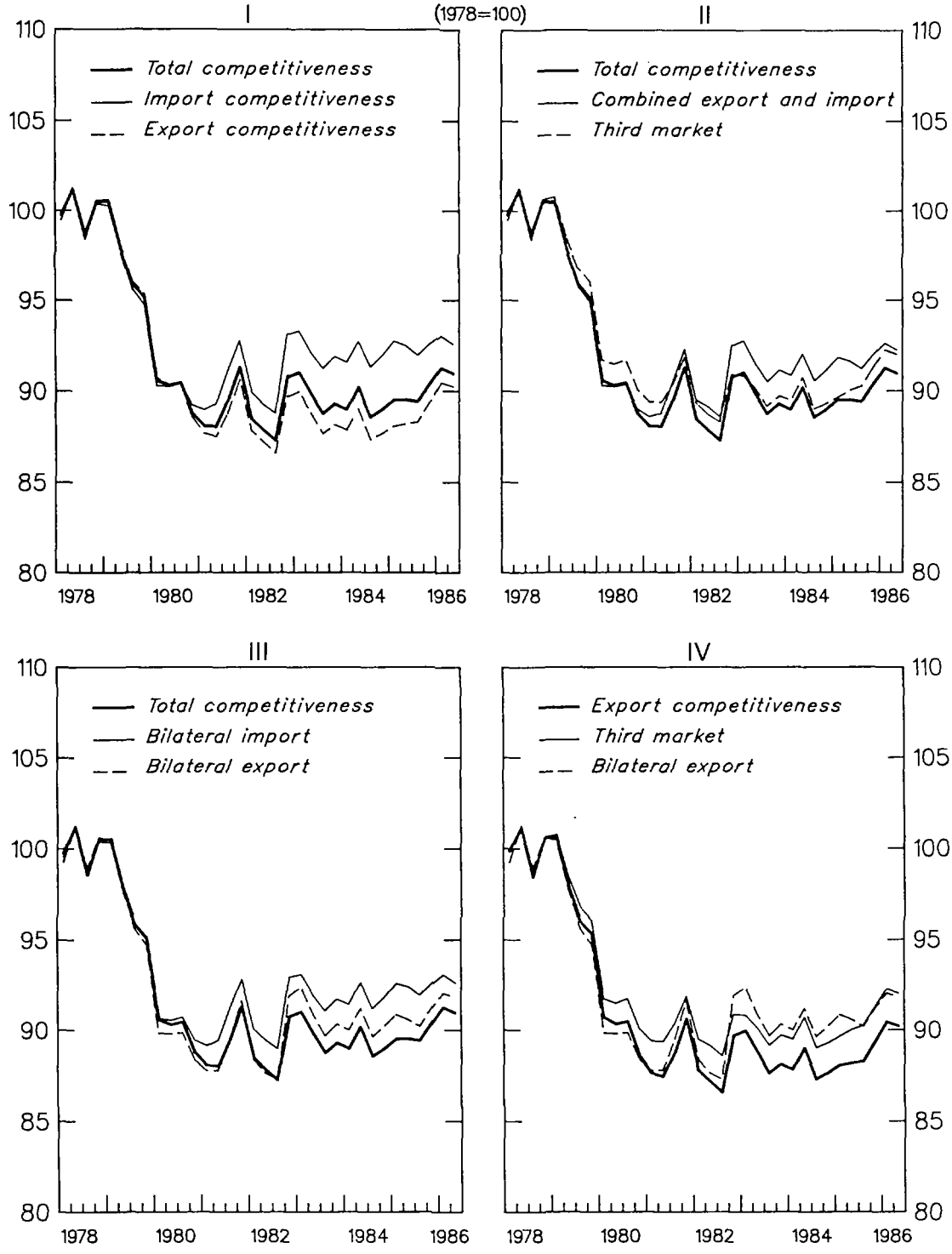


CHART 8

FINLAND

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

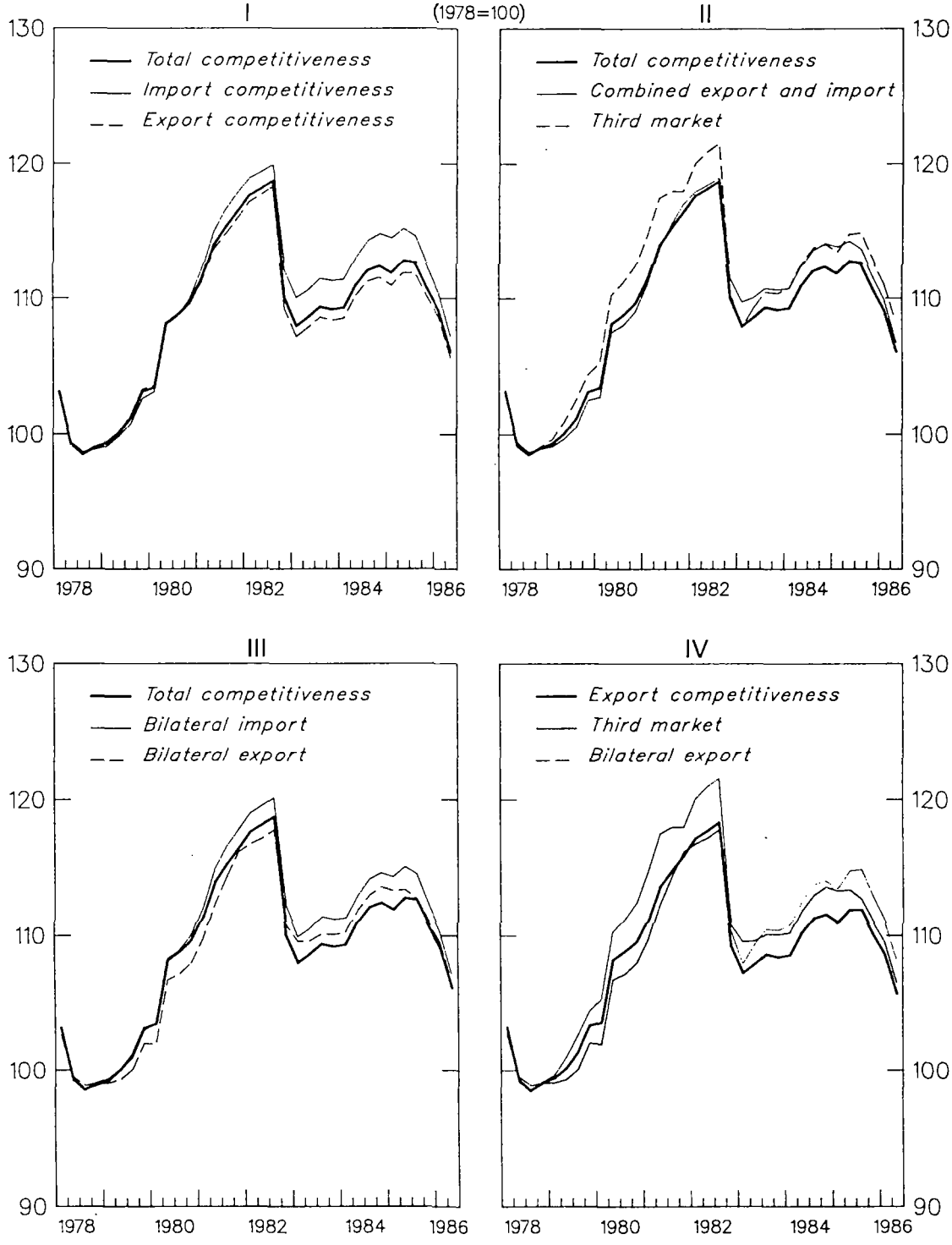


CHART 9

FRANCE

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

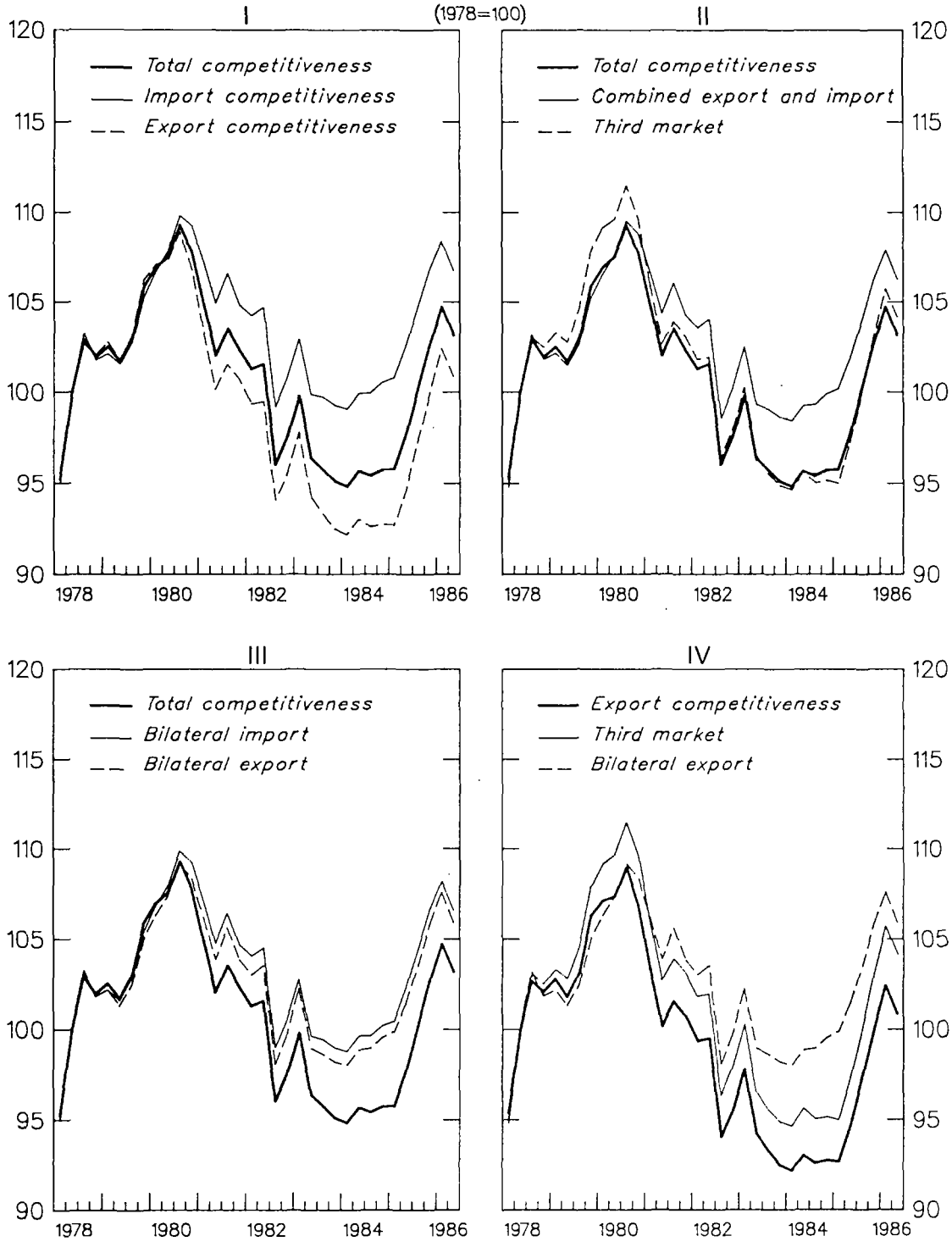


CHART 10

IRELAND

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

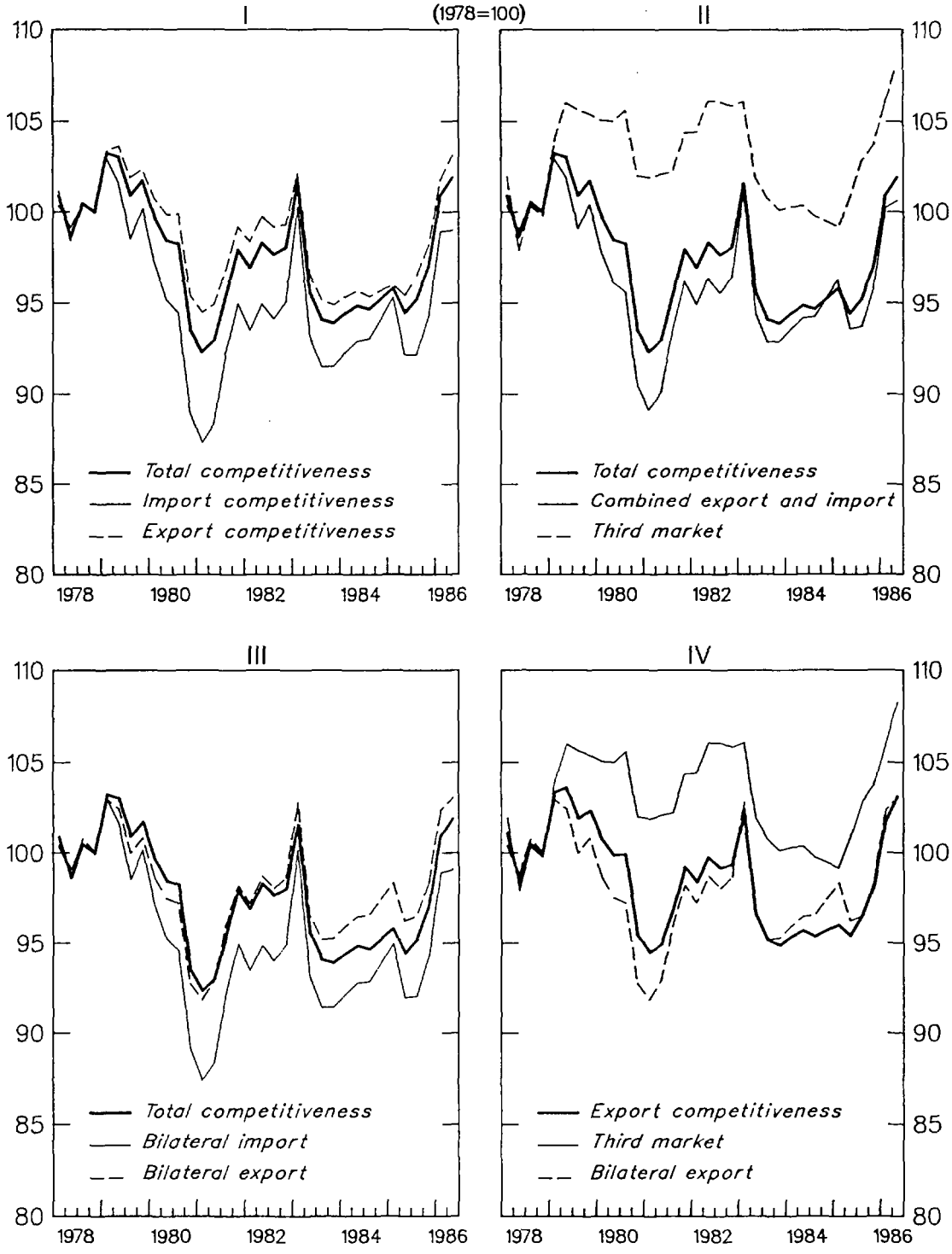


CHART 11

ITALY

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

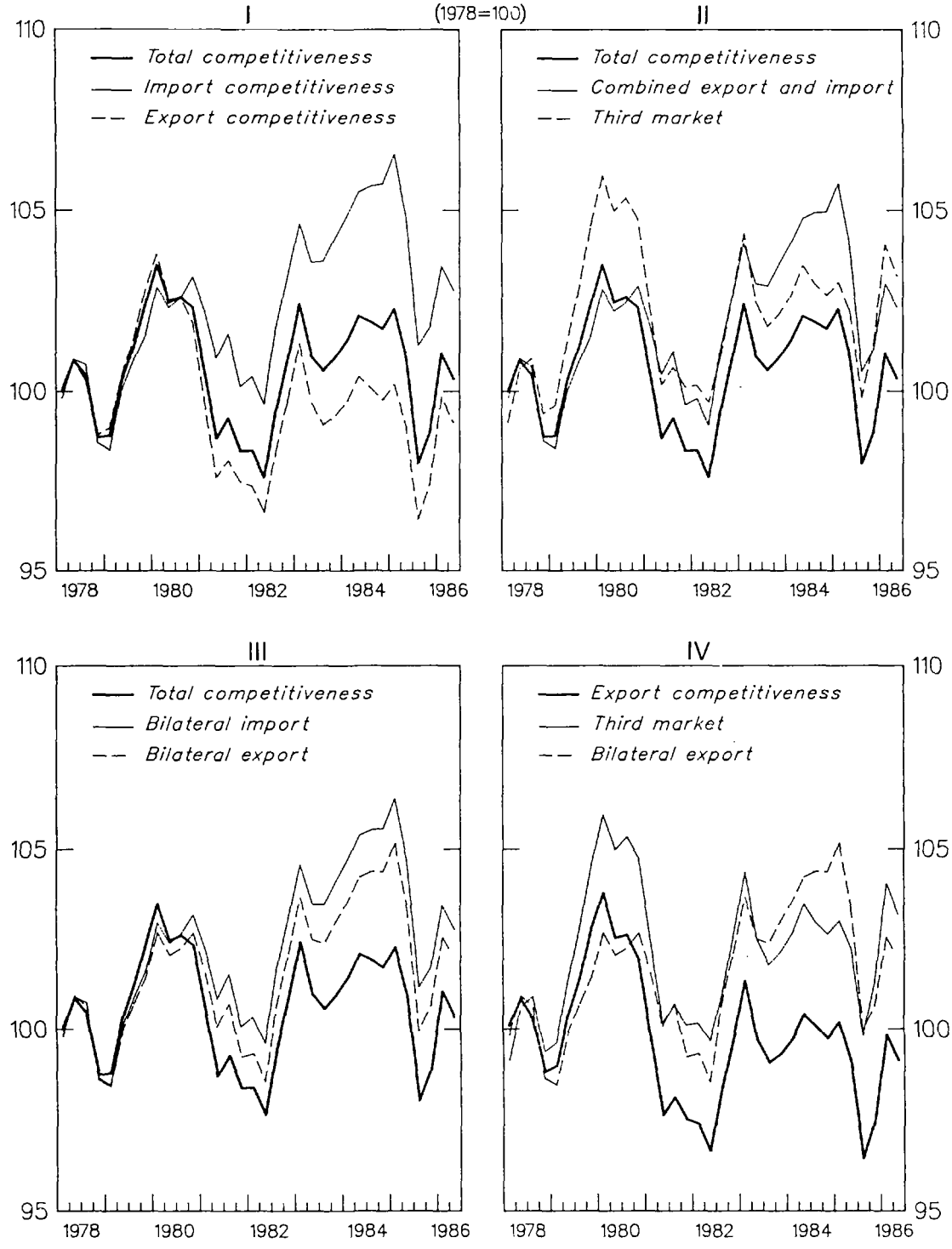


CHART 12

JAPAN

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1980=100)

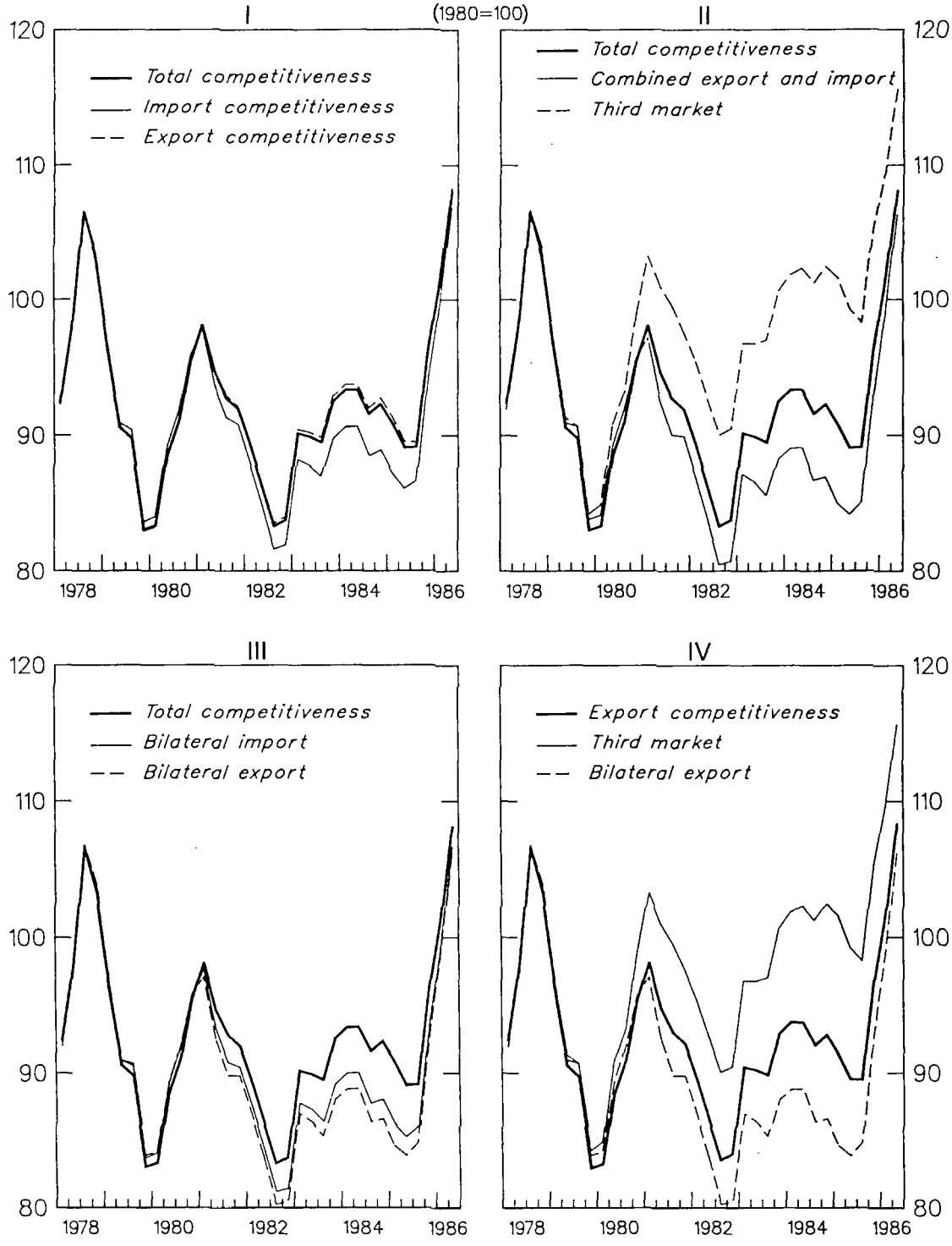


CHART 13

NETHERLANDS

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

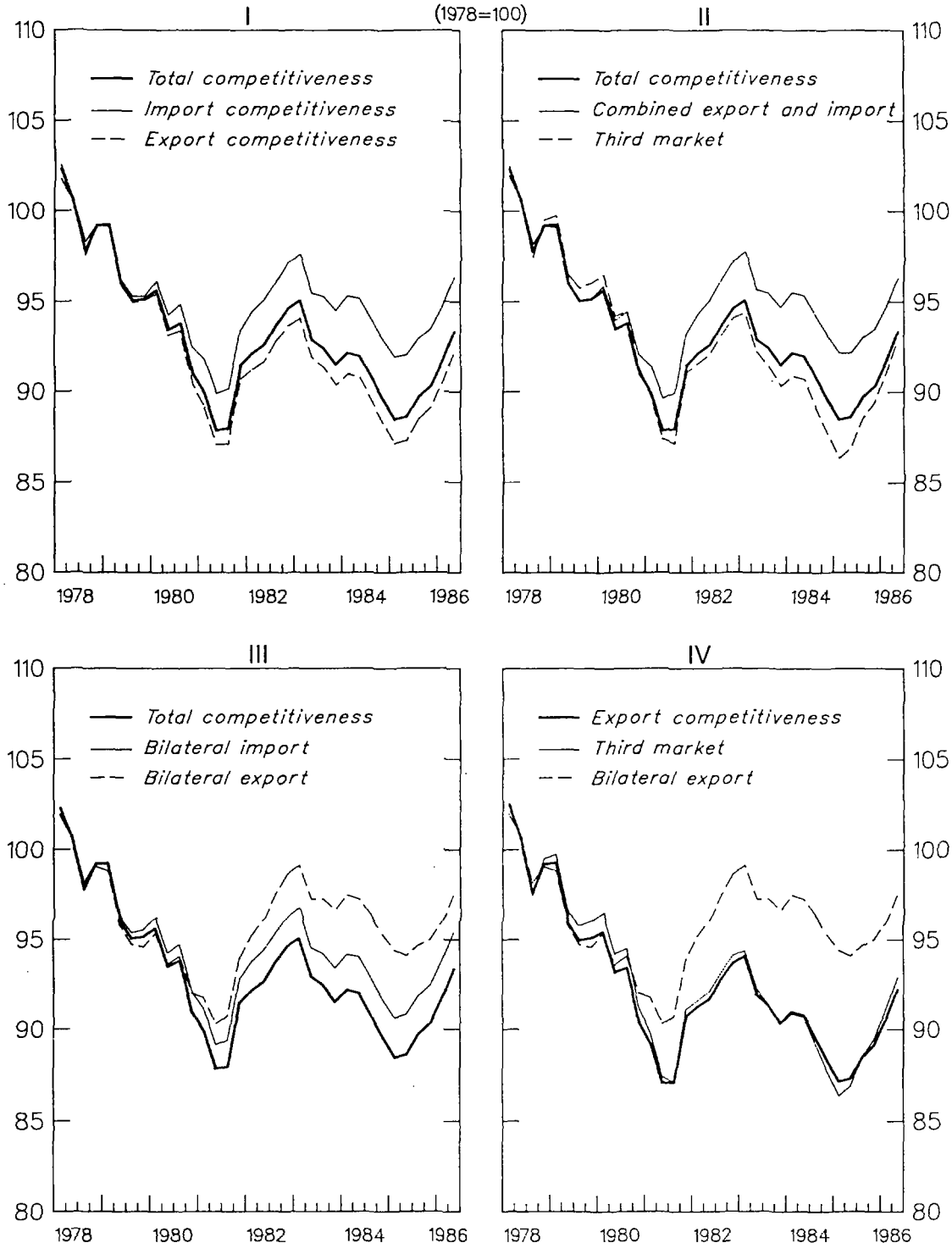


CHART 14

NORWAY

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

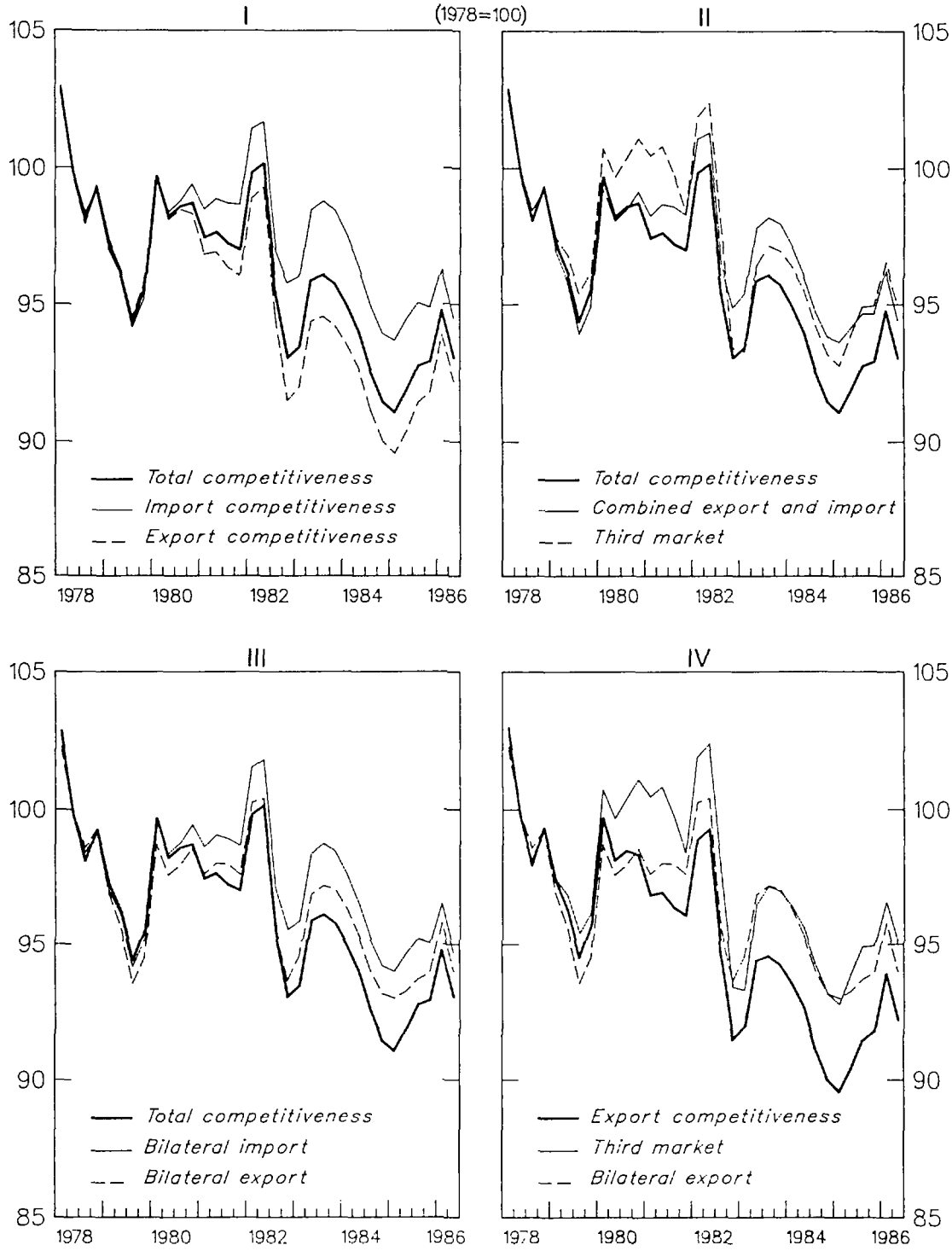


CHART 15

SPAIN

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

(1978=100)

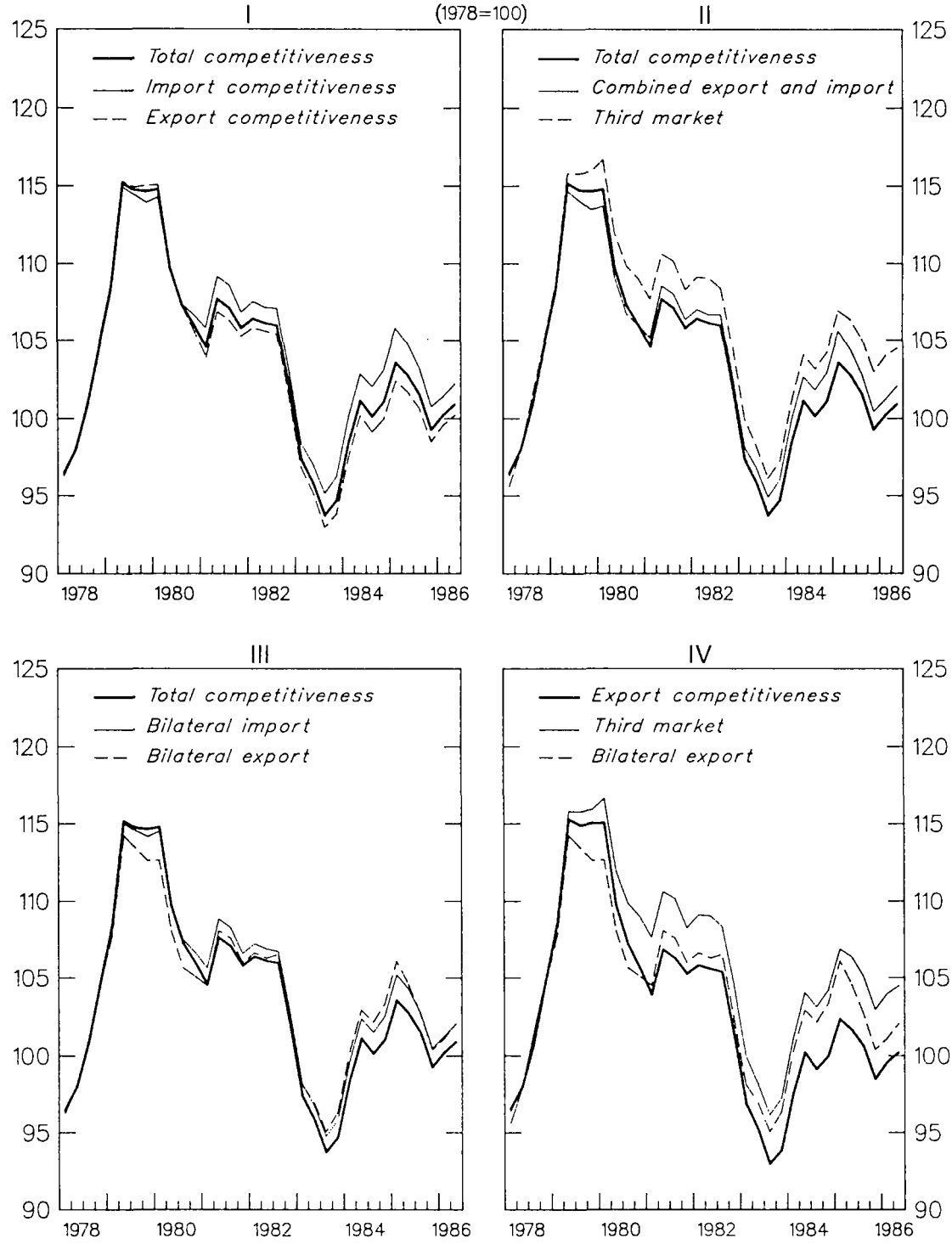


CHART 16

SWITZERLAND

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS

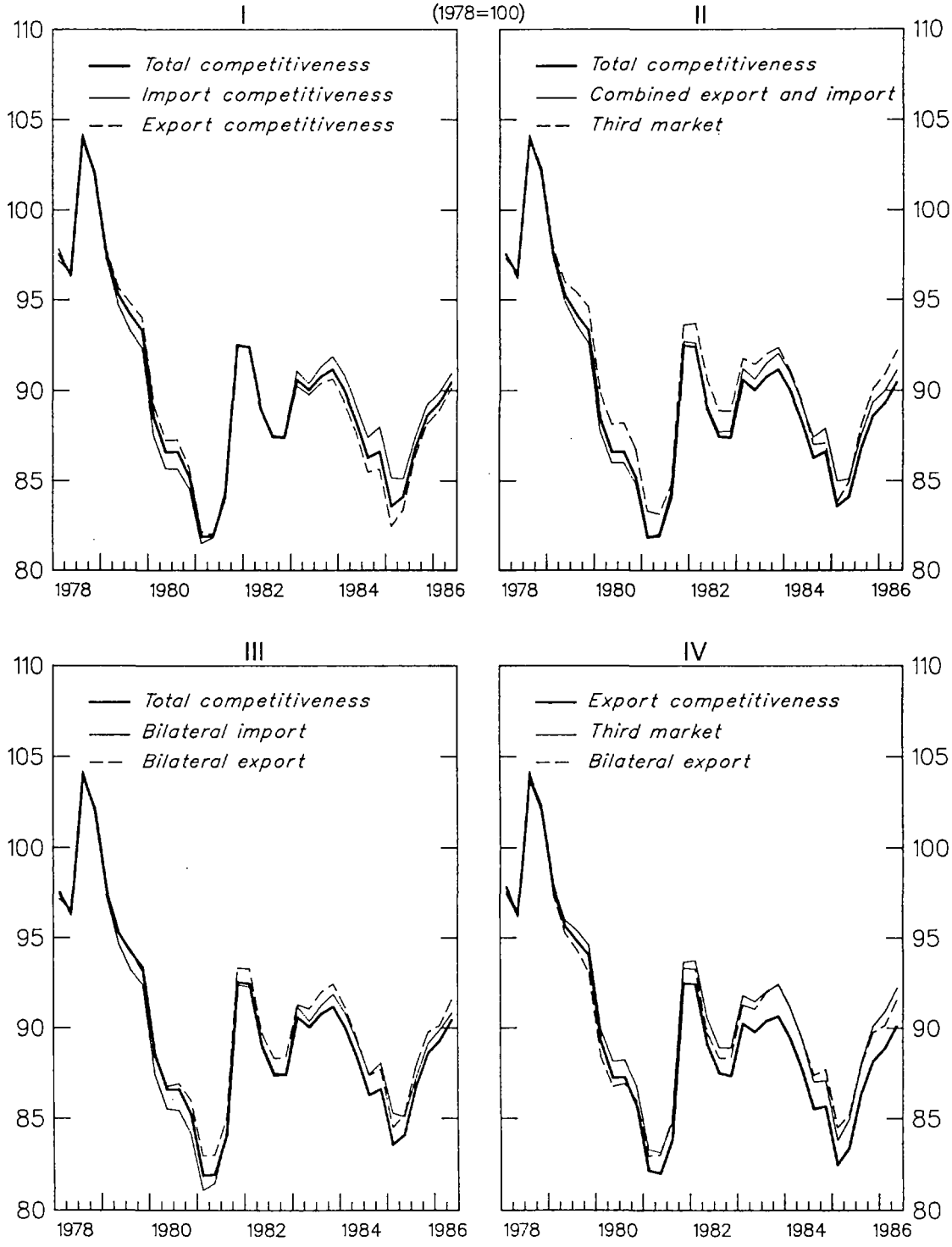
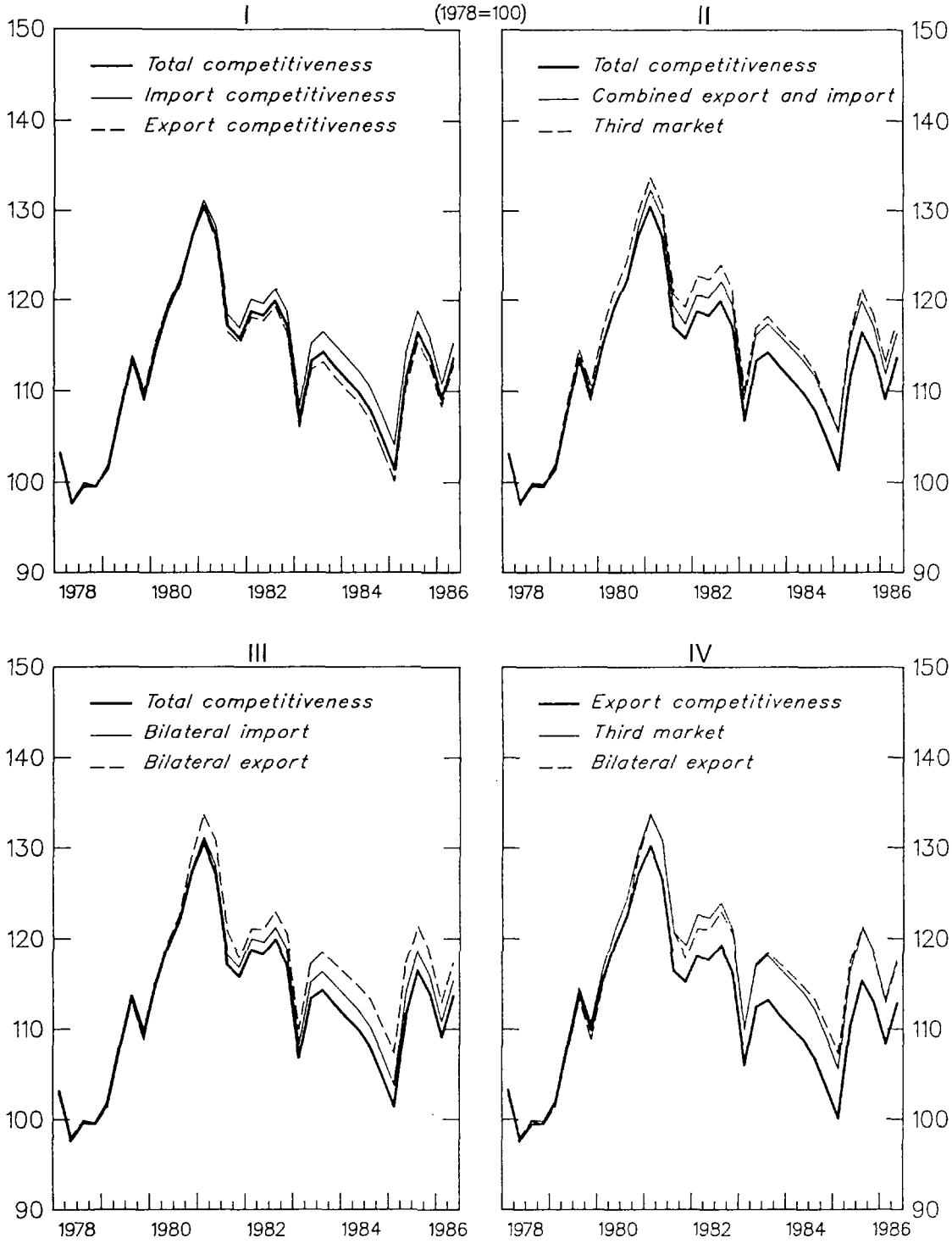


CHART 17

UNITED KINGDOM

REAL EFFECTIVE EXCHANGE RATE INDICES BASED ON WHOLESALE PRICES OF MANUFACTURED PRODUCTS



References

Allen, R.G.D., Mathematical Analysis for Economists, St. Martin's Press (New York, 1938), p. 504.

Armington, Paul S., "A Theory of Demand for Products Distinguished by Place of Production," Staff Papers, Vol. 16 (March 1969a), pp. 159-78.

_____, "The Geographic Pattern of Trade and the Effects of Price Changes," Staff Papers, Vol. 16 (July 1969b), pp. 179-99.

Artus, Jacques R. and Anne K. McGuirk, "A Revised Version of the Multilateral Exchange Rate Model," Staff Papers, Vol. 28 (June 1981), pp. 275-309.

Artus, Jacques R. and Rudolph R. Rhomberg, "A Multilateral Exchange Rate Model," Staff Papers, Vol. 20 (November 1973), pp. 591-611.

Artus, Jacques R. and Susanna C. Sosa, "Relative Price Effects on Export Performance: The Case of Nonelectrical Machinery," Staff Papers, Vol. 25 (March 1978), pp. 25-47.

Deppler, Michael C., "Intercountry Cost and Price Comparisons," IMF, unpublished mimeo, 1979.

Goldstein, Morris and Mohsin S. Khan, "Income and Price Effects in Foreign Trade," Chapter 20 in: R.W. Jones and P.B. Kennen, eds., Handbook of International Trades, Volume 2, North-Holland (Amsterdam, 1985).

IMF, "Issues in the Assessment of the Exchange Rates of Industrial Countries," Occasional Paper No. 29, Washington, D.C., 1984.

Isard, Peter, "How far can we push the 'law of one price'?", American Economic Review, Vol. 67 (December 1977), pp. 942-48.

Leamer, Edward E. and Robert M. Stern, Quantitative International Economics (Boston, 1970), pp. 41-46.

Maciejewski, Eduard B., "Real Effective Exchange Rate Indices: A Re-Examinatio of the Major Conceptual and Methodological Issues," Staff Papers, Vol. 30 (September 1983), pp. 491-541.

Rhomberg, Rudolf R., "Indices of Effective Exchange Rates," Staff Papers, Vol. 23 (March 1976), pp. 88-112.