EXTERNAL TERMS OF TRADE OF THE FEDERAL REPUBLIC OF GERMANY USING DIFFERING METHODS OF DEFLATION*

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This paper deals with the influence of differing methods of deflation on the international terms of trade of the Federal Republic of Germany. The question to be discussed is what indices seem best suited for the deflation of exports and imports in national accounts. It will be shown that the use of alternative price indices for deflating exports and imports leads to considerable differences of the results at constant prices and so in terms of trade. In addition, terms of trade are presented by groups of countries.

INTRODUCTION

External terms of trade are defined as the relation of export price indices to import price indices. They indicate to what extent the "real" exchange ratio of a country has changed as compared with the other countries with which it engages in foreign trade, between some base year and a current year. If the export prices rise more rapidly than the import prices, this is considered an "improvement" of the exchange relation. This means that the exporting country can import more goods than in the relevant base year for the same volume of exports.

For exports and imports of goods and services, it is possible to compute differing price indices. Depending on what price indices are used as a basis, the terms of trade can take very different values. This paper therefore deals at first with questions concerning the computation of price indices of foreign trade. The method to be used for the computation of price indices depends largely on the purpose for which they are required. In this paper, problems concerning the deflation of exports and imports in national accounts are discussed.

In the scope of the last revision of the national accounts of the Federal Republic of Germany, which was brought to a conclusion in 1977 [1], the question arose anew as to which price indices should be used for the deflation of exports and imports in order to obtain values at constant prices. Extensive test computations were made for commodity exports and imports. It was found that the results depend essentially on the price indices used and on the degree of aggregation employed for carrying out the deflation.

In what follows, we discuss the considerations taken into account in selecting the deflation method for exports and imports in national accounts. The results of the analyses carried out will be presented, and it will be shown how alternative deflation methods affect the development of the terms of trade.

The analyses and test computations for deflating exports and imports were made from foreign trade statistics established by the Federal Statistical Office.

Exports and imports comprise the merchandise trade of the Federal Republic of Germany with other countries except merchandise trade with the German Democratic Republic. Service transactions are also excluded. References to exports and imports in what follows, unless otherwise stated, are subject to these limitations.

Selection of Suitable Deflator Price Indices

In determining which price indices should be used for the deflation in national accounts, two aspects are of prime importance: What price indices are actually available and do they show the desired properties which deflator price indices should have? Deflator price indices should meet the general requirements made of price indices, such as an appropriate set of weights, absence of bias, etc.[1] In particular, price indices to be used for deflation in national accounts should meet the following conditions:

—Price indices should measure the pure price development only. Changes in the selling price of a commodity due to other factors, for instance quality changes, are attributed in national accounts to the quantity component (volume).
—In order to show the volume development over longer periods of time by figures which are comparable from year to year, volume indices of the Laspeyres type should be employed in national accounts. In other words, the quantities of each year are to be valued by the prices of a fixed base year. Thus for the deflation of value data Paasche price indices are required (which involves the disadvantage that, strictly speaking, the price indices are comparable only with the base year).
—The price indices should reflect to the greatest extent possible the price development of the value data to be deflated. This implies that they
   —are representative of the commodities concerned,
   —refer to the same period of time as the values to be deflated, and
   —correctly cover the price development within a year where the presentation covers periods of less than a full year.

At the Federal Statistical Office, two types of indices are available for the deflation of foreign trade: Unit value indices derived from the foreign trade statistics according to the Paasche formula, and price indices derived from statistics of prices of exported and imported commodities, according to the Laspeyres formula. We need to consider which of these indices are best suited to meet the requirements stated above.

The unit value indices are determined by dividing exports/imports at current prices by the corresponding values at constant prices (volume data). For the computation of exports and imports at constant prices, the volumes of exports and imports (in quantity units, for example tons) in the reference year are multiplied in the most detailed breakdown of the German commodity classification for foreign trade statistics (approx. 8,000 positions) by the corresponding unit values in the base year.[2] The relation between value data at current prices and the volume data

[1]See for example United Nations [2], p. 20f.
[2]See Schlüter [3], p. 84.

yields Paasche indices which, however, are based on unit values, not on pure prices.

The unit value indices meet the above requirements with one notable exception: they do not measure only pure price changes, but are also influenced by a number of other determinants, including[3]

—changes in the composition of the most detailed commodity groups (shifts in product mix),
—changes in the quality of products of the same kind,
—shifts between countries of destination and origin,
—changes in marketing stages,
—changes in transport costs due to changing transport methods and routes,
—modifications of the terms of payment and delivery.

These factors can have the effect that over time the unit value indices—especially for individual commodity groups—often show implausible values. This drawback has a particular impact if the price deflators are needed in a very detailed breakdown by commodity groups. Moreover, unit value indices have drawbacks if price indices are needed for periods of less than a full year. If, for instance, short boots and top boots of a specific material are included in one commodity item, the unit value index shows a strong seasonal price increase when particularly large quantities of top boots are imported or exported, and a price decline when the proportion of the cheaper short boots increases, even though the prices for top boots and short boots remain constant.

In addition to the unit value indices, the Federal Statistical Office publishes Laspeyres price indices for exports and imports on a monthly basis. The indices of foreign trade prices, within the general framework of price statistics, are computed on the basis of 2,000 commodity groups (the smallest weighting units in each index) covering altogether roughly 10,500 individual commodity prices [4]. The Laspeyres price indices are based on frontier-crossing values (exports f.o.b., imports c.i.f.). The prices are ascertained at the time the contract is concluded. The price indices are computed on a monthly basis and are published in a very detailed breakdown by commodity groups and economic branches. The annual indices are computed as an unweighted arithmetic mean of the twelve monthly indices.

The foreign trade price indices, as against the unit value indices, have the decisive advantage that they measure in principle pure price changes only. The other demands upon deflator price indices mentioned above are not fully met by the Laspeyres price indices. For this among other reasons, unit value indices were used up to the last revision in 1977 for the deflation of exports and imports in the national accounts of the Federal Republic of Germany. This seemed justifiable so long as only total exports and imports were deflated and so long as no quarterly price indices were needed. For the new computation of input–output tables at constant prices now envisaged, however, exports and imports are to be presented in a more detailed commodity breakdown at constant prices. Moreover, the national accounts are now also presented on a quarterly basis [5]. The

[3]See Rostin [4], p. 393.

disadvantages of the unit value indices would in these circumstances have had their full impact. Therefore, since the 1977 revision of the national accounts, exports and imports have been deflated by price indices.[4]

The Laspeyres price indices, however, are not used for the deflation of total exports and imports; the approach consists, rather, in reweighting the elementary price series in a detailed breakdown, in order to compute deflator price indices based on the Paasche formula. For the calculation of deflator price indices, the following points are important:

—The elementary prices are reweighted by the exports and imports of each commodity in the current year, in order to get Paasche price indices. The approximately 2,000 price series for the commodity groups on which the Laspeyres indices are based are in this process allocated to weights based on the 8,000 items of goods of the German commodity classification for foreign trade statistics. As the 2,000 available price series had to be allocated to the 8,000 items of the commodity classification there were some difficulties in selecting price representatives for all commodities. The price indices obtained by that reweighting are sometimes referred to as "Paascheized" price indices. In view of the great detail in the reweighting of the basic price data, it seems justifiable, however, to call these indices Paasche price indices for exports and imports.
—The price indices for exports and imports—unlike the commodity flows which, in accordance with the concepts of the national accounts, are covered at the time of crossing the border—refer to the time of the conclusion of the contract. This discrepancy is tentatively taken care of by introducing an average time lag between price indices and recorded values, the lag being based on a special survey of the time between the contract conclusion and border crossing.
—To improve the accuracy of the representation of the price development within the year, average quarterly price relatives are aggregated by using quarterly weights, to form quarterly price indices. The yearly indices are obtained by dividing the sum of the quarterly results at current prices by the corresponding values at constant prices.

As will be shown in greater detail in the next section (see Table 2), the "Paascheizing" procedure is quantitatively the most important of the modifications mentioned. The differences in the price development resulting from weighting the prices by the pattern in the base year (Laspeyres), or by that in the current year (Paasche), are also referred to as the Paasche effect. For the users of all price indices it is a familiar fact that the price development shown by Laspeyres indices generally exceeds that shown by Paasche indices. This can be explained primarily by the reaction of the purchasers to price changes, inasmuch as they normally tend to buy smaller quantities of commodities that have been subject to above-average price increases. This negative correlation between price and quantity changes has the consequence that commodities for which the prices increased more than the average have less weight in the current year than in the base year. There seems to be good evidence that the computed Paasche effect is greater, the deeper is the breakdown used for "Paascheizing". This assumption

[4]See G. Hamer and others [1], p. 223.

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was confirmed by "Paascheizing" on a relatively rough breakdown using only 86 commodity groups.

Price Development in Foreign Trade According to Different Indices

This section presents the price development for exports and imports, based on the alternative indices which can be drawn upon for deflating foreign trade. As described above, they are

—Paasche indices of unit values computed in foreign trade statistics,
—Laspeyres price indices for foreign trade, computed from price statistics,
—Paasche price indices for foreign trade, computed for deflation purposes,
—roughly "Paascheized" price indices for foreign trade, computed for testing purposes.

As can be seen from Figure 1, the price development of the four indices over the period covered mostly shows a specific relationship: the Paasche price indices fall between the Laspeyres price indices and the unit value indices, the "Paascheized" price indices between the Laspeyres and the Paasche price indices.

Only in 1971 and 1972 are the Paasche and the "Paascheized" price indices both slightly higher than the Laspeyres price indices (see also Table 1). Because
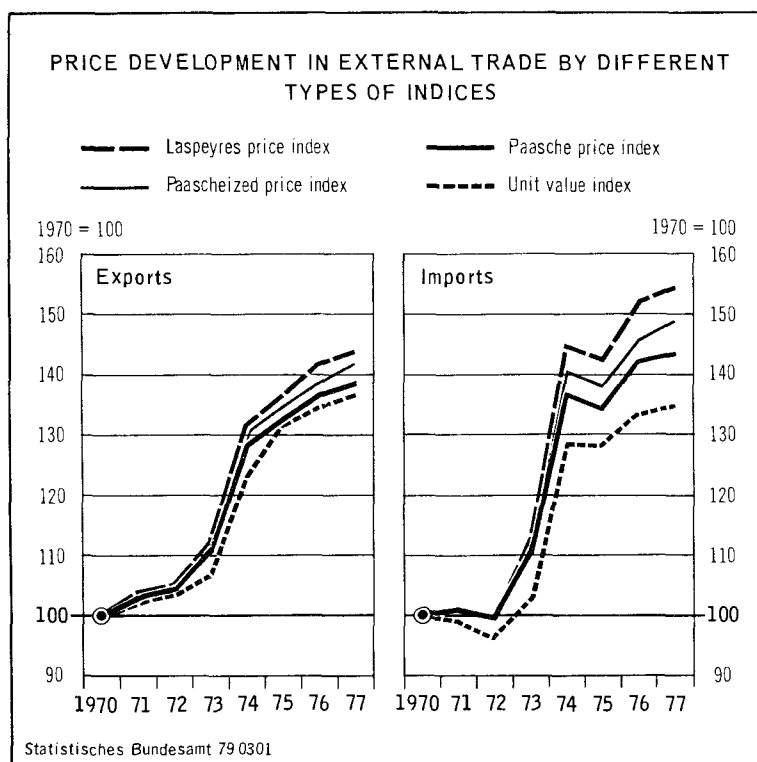

Figure 1

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TABLE 1

PRICE DEVELOPMENT IN EXTERNAL TRADE BY DIFFERENT TYPES OF INDICES

	Exports				Imports			
Year	Laspeyres	Paascheized	Paasche	Unit Value	Laspeyres	Paascheized	Paasche	Unit Value
				1970 = 100				
1971	103.4	103.2	103.2	102.5	100.4	100.8	100.7	99.0
1972	105.5	105.1	104.9	103.2	99.8	99.9	100.0	96.5
1973	112.3	111.3	110.9	106.8	112.6	111.0	110.1	102.7
1974	131.4	130.5	128.4	122.8	144.8	140.1	136.7	128.7
1975	136.5	134.6	132.6	131.7	142.3	138.0	134.2	128.6
1976	141.7	138.6	136.7	134.3	151.8	145.8	142.1	133.1
1977	143.6	141.6*	138.5	136.4	154.1	148.9*	143.4	134.9

*Due to changes in classification not fully comparable.

only minor price movements for imports were registered during those years, the small deviation in the other direction may, in our opinion, also be attributed to inaccuracies in the computation (e.g. the above-mentioned difficulties with the allocation of price representatives to individual commodity positions). The distances between the various indices, as can be seen from Figure 1, are considerably greater for import prices than for export prices. This, as will be demonstrated in the following section, is of great importance as far as the different price indices imply a differing development of the terms of trade.

The difference between the Laspeyres and the Paasche price indices shown in Table 1 is not exclusively a consequence of the Paasche effect. The difference is also influenced by the use of quarterly weights instead of annual weights and by the time lag introduced into the price data. For the years 1975 to 1977, it was possible to separate the three influencing factors, Paasche effect, quarterly weighting and time lag. The difference between the Laspeyres and the Paasche price indices in question is primarily caused by the Paasche effect (see Table 2),

TABLE 2

CAUSES OF LASPEYRES–PAASCHE DEVIATIONS IN PRICE INDICES FOR THE EXTERNAL TRADE OF THE FEDERAL REPUBLIC OF GERMANY IN PERCENT OF THE PAASCHE PRICE INDEX

	Causes of the Deviations	1975	1976	1977
Exports	Quarterly weighting	0.0	0.0	0.1
	Time lag	−0.1	0.0	−0.1
	Paasche effect*	3.0	3.7	3.7
	Total	2.9	3.7	3.7
Imports	Quarterly weighting	0.1	0.2	0.2
	Time lag	0.1	0.2	−0.2
	Paasche effect*	5.8	6.4	7.5
	Total	6.0	6.8	7.5

*Calculated as residual.

while the introduction of quarterly weights and the time lag were of less importance during the years analysed. The estimates of the Paasche effect can however provide only approximate information, because they have been ascertained as a residual. The three influencing factors will be briefly commented upon.

As mentioned already, the annual Laspeyres price indices are obtained by the aggregation of unweighted annual average prices with annual weights (or as the unweighted average of monthly indices), without regard to the fact that seasonal goods are predominantly imported and exported within a period of a few months and then often at relatively low prices. If unweighted annual average prices are used for the computation of annual indices, the results will be different from those obtained by computation on the basis of quarterly average prices with quarterly weighting. For the national accounts, quarterly price indices are needed. In the Federal Republic of Germany, seasonal goods have a greater weight only for imports.

The time lag between contract conclusion and border crossing is of particular importance for those commodities which display greater seasonal price fluctuations. As expected, the time adjustment for price data has led to greater deviations in the quarterly than in the yearly indices, the reason being that the price development of one month has a greater weight for the quarter than for the year. This explains why the time adjustment is of greater importance only for the computation of quarterly price indices. It is desirable that the time lags should reflect "conjunctural" and other changes in the time interval between contract conclusion and border crossing. For this, however, the necessary data are lacking, so that the correction performed can be considered only as a first step in the right direction.

The roughly "Paascheized" indices are approximately located in the middle between the Laspeyres and the Paasche indices. The cause of the deviation between the Paasche and the Laspeyres price indices is, as mentioned already, the predominantly negative correlation between quantity and price changes in foreign trade. This negative correlation generally affects the difference between the Laspeyres and the Paasche price indices the more strongly, the more disaggregated the reweighting.[5] This rule is confirmed by the data resulting from the comparative computations performed (see Table 3). Because the roughly "Paascheized" indices do not provide additional information for the analysis of the terms of trade, they are omitted from the following comparisons.

In conclusion, we may offer a few remarks about possible causes for the deviation of the unit value indices from the Paasche price indices.[6] As shown in Figure 1, the unit value indices both for exports and for imports, during the period 1971 to 1977, are well below the Paasche price indices (see also Table 4).

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[5] On the basis of price indices for the U.S.A. and the United Kingdom, Horner [6] and Coleman [7] have investigated this phenomenon. They refer to a negative correlation between quantity and price changes *between* different commodity groups and *within* individual commodity groups. In the case of rough "Paascheizing", only the negative correlation between the commodity groups can have the result of a Paasche effect, while in the case of "Paascheizing" in a detailed breakdown, the negative correlation within the commodity groups causes an additional effect.

[6] The deviations between the Laspeyres price indices and the Paasche unit value indices have also been the subject of comments by Bergmann [8], p. 831.

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TABLE 3

LASPEYRES–PAASCHE DEVIATIONS IN PRICE INDICES FOR EXTERNAL TRADE IN PERCENT OF THE PAASCHE PRICE INDEX

	Level of Rebasing	1971	1972	1973	1974	1975	1976	1977
Exports	2,000	0.2	0.6	1.3	2.3	2.9	3.7	3.7
	86	0.2	0.4	0.9	0.7	1.4	2.2	1.4*
Imports	2,000	−0.3	−0.2	2.3	5.9	6.0	6.8	7.5
	86	−0.4	−0.1	1.4	3.4	3.1	4.1	3.5*

*Because of changes in classification not fully comparable.

Deviations between the two indices are to be expected on account of the differing methods of calculation and in view of the great number of influencing factors mentioned above. This however does not explain the fact that the unit value indices, over the entire period under observation, were lower than the Paasche price indices. A possible cause for this could be the Paasche effect, since the unit value indices are computed in considerably greater detail (approx. 8,000 types of commodities) than the Paasche price indices (approx. 2,000 price series). This assumption, however, is again contradicted by the fact that the distance between the two indices reached its maximum in 1973/74 and then maintained this level on the import side, while on the export side, from 1975 onwards, it even showed a clear decline. A certain influence may also be attributable to the monthly weighting for the unit value indices as against the quarterly weighting for the computed Paasche price indices. If, in the case of seasonal goods, low prices during certain months coincide with high import and export volumes, this leads, in comparison with the computation performed with annual average weights, to a lower index position, which finds a still clearer expression if the weighting is performed on a monthly rather than on a quarterly basis. It may be assumed, however, that much like the quarterly weighting (see Table 2), the monthly weighting does not exert a great influence on the development of the annual price indices. The basic causes for the differing trends of unit value indices must of course be sought in the factors mentioned above, on account of which unit values can change even if all individual prices remain constant. A quantification of these factors, which do not lend themselves to easy statistical coverage, could not be realized in the test computations performed. The potential influence of quality improvements upon the development of the unit value indices for exports and imports is dealt with in the following section.

TABLE 4

DEVIATION OF THE UNIT VALUE INDEX FROM THE PAASCHE PRICE INDEX IN PERCENT OF THE PAASCHE PRICE INDEX

Year	1971	1972	1973	1974	1975	1976	1977
Exports	−0.7	−1.6	−3.7	−4.4	−0.7	−1.8	−1.5
Imports	−1.7	−3.5	−6.7	−5.9	−4.2	−6.3	−5.9

Terms of Trade Based on Different Price Indices

The international terms of trade display changes affecting the real exchange rate of the exports of a country by comparison with its imports. They are defined by the ratio of export price indices to import price indices. In what follows we show differences in the development of the Federal Republic's terms of trade, depending on whether they are computed on the basis of Laspeyres price indices, Paasche price indices or unit value indices.

The results of the comparative computations presented in Figure 2 show that the terms of trade of the Federal Republic, from 1971, follow a rather similar course whichever of the indices is used. They show a clear upward move in 1971

TERMS OF TRADE AND TERMS OF TRADE EFFECT IN EXTERNAL
TRADE USING ALTERNATIVE PRICE INDICES

Laspeyres price index
Paasche price index
Unit value index

1970 = 100   Billion DM

Terms of trade   Terms of trade effect
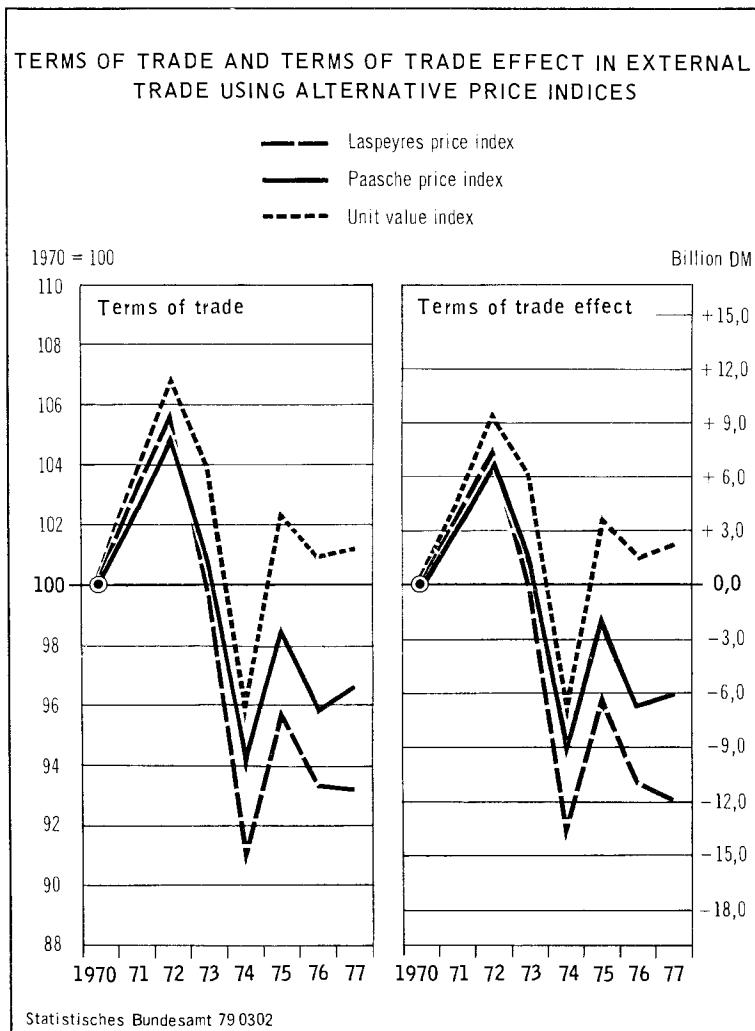
Statistisches Bundesamt 79 0302

Figure 2

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and 1972, followed by a drastic decline in 1973 and 1974—mainly on account of rising prices for petroleum and other raw materials—and then show again some improvement during the following years. But the extent of the changes since 1974 depends heavily on the kind of price indices used. From the point of view of the Federal Republic, the most favourable development of the terms of trade is displayed by the unit value indices, while the most unfavourable development is shown by the Laspeyres price indices. It is particularly conspicuous that the terms of trade based on unit value indices were lower than in the base year only in 1974, while those computed from price indices, from 1974 on, run below the level of the base year.

The relations between alternative estimates of the terms of trade are quite the reverse of the relations between the price indices. The strongest price development as against the base year (see Figure 1) is shown by the Laspeyres price indices, followed by the Paasche price indices and then by the unit value indices. The development of the terms of trade depends essentially on the differences between the development of the export prices and that of the import prices, not on the extent of the price increases. During the period reviewed, these differences in the development of the export and import prices were most marked for the Laspeyres price indices and least for the unit value indices. This raises the question of why the different kinds of indices reveal such differing results in the development of export against import prices. From the statistical material available, it was not possible to find a clear answer to this interesting question. One must rely rather on theoretical considerations.[7] From the differing trends in the terms of trade of the Laspeyres against the Paasche price indices it may be suggested that German importers, after 1970, were able to react to price changes in a more flexible manner than foreign buyers of German goods. This may be because the kinds of goods imported made it easier for German entrepreneurs to switch over to similar goods with smaller price increases. Also the great efforts by German enterprises to increase exports after the 1975 recession could have played a role, inasmuch as they prevented a decline of exports even in the face of above-average increases in export prices. Both these reasons contributed to the fact that, in the Federal Republic of Germany, the Paasche effect was greater for import prices than for export prices.

A possible reason for the more "favourable" development of the terms of trade based on unit value indices, as compared with those derived from Paasche price indices, could be the effect of quality changes. As shown above, in unit value indices, quality improvements are to some extent included in the "price" component. Especially for technically advanced products, quality improvements are of great importance. A comparison of Paasche price indices with unit value indices for foreign trade of the Federal Republic of Germany by commodity groups reveals that for structural engineering products, electrical goods, shaped steel products, office machinery and electronic data processing systems, the unit value indices show a stronger increase than the corresponding Paasche price

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[7]Hansen [9] explains the observation that the terms of trade computed on the basis of Paasche price indices are higher than those computed with Laspeyres price indices by reference to the size of the country under review in relation to the rest of the world, and by referring to the theory of biases in the case of Laspeyres and Paasche price indices.

indices. For machinery and road vehicles, the unit value indices move approximately with the Paasche price indices. Since the technically advanced products represent a greater proportion of German exports (1977 = 47.5 percent[8]) than of German imports (1977 = 18.5 percent[8]), it can be assumed that this is why the unit value index for exports is overrated in comparison with the one for imports (respectively the unit value index for exports understates the "true" price rise less than that for imports). Thus terms of trade based on unit values yield a more favourable picture of the development of the terms of trade than Paasche price indices.[9]

Terms of Trade Effect and Gross National Product Using Alternative Deflators

In the national accounts of the Federal Republic of Germany, as already mentioned, exports and imports are now deflated by Paasche price indices. The results of the national accounts therefore incorporate terms of trade based on the Paasche concept. In the following section we shall examine how the balance between exports and imports and the gross national product at constant prices is influenced by the choice between Laspeyres price indices and unit value indices.

If exports and imports are deflated with differing price indices, it will affect the absolute level of the balance between exports and imports of goods and services, and consequently also the gross national product at constant prices. Table 5 indicates in column 1 the balance between exports and imports when the exports and imports of goods are deflated by Paasche price indices, as used in the current computation of the national product. Column 2 indicates the corresponding values as deflated by the Laspeyres price indices, while column 3 shows the same values deflated by the unit value indices. The values deflated by unit value indices range in all years below those deflated by Paasche price indices, while the values deflated by Laspeyres price indices are clearly above the latter. The computation of the gross national product at constant prices at the Federal Statistical Office is based on the values in column 1. If the values from column 2 or 3 were used instead, the annual change in the gross national product would in most years vary only to a minor extent (see Table 5, columns 4 to 6). In individual years, however, differences in the annual growth rates of the gross national product in real terms could well amount to approximately half of one percent.

The next step is to analyse the influence of differing deflators on the so-called terms of trade effects, a measure designed to quantify the impact of changes in the terms of trade on foreign trade and on the national product, respectively. If the export prices of a country, for instance, show a more rapid rise than the import prices, the country will be in a position to import more goods for the same export volume than in the base year. This increase (or decrease) in goods available to a national economy, brought about by the shifting of price relations, is referred to as

[8]See Statistisches Bundesamt [10], pp. 46–49.

[9]The results of statistical comparisons of Saunders [11] sustain the hypothesis that quality improvements of German exports are higher than quality improvements of imports. Saunders compared the unit values of exports with the unit values of imports of technically advanced products. He found that export unit values exceed the import unit values and that the medians of export/import unit value ratios increase from 1963 to 1975.

TABLE 5

EXPORTS LESS IMPORTS OF GOODS AND SERVICES IN CONSTANT PRICES AND GROWTH
RATES OF THE REAL GROSS NATIONAL PRODUCT

	Exports Less Imports			Gross National Product		
	Deflated by Alternative Indices $(1970 = 100)$ [1]			With Exports Less Imports Deflated by Alternative Indices [1]		
	Paasche	Laspeyres	Unit Value	Paasche	Laspeyres	Unit Value
	Billion DM			Annual changes in %		
Year	1	2	3	4	5	6
1971	11.2	10.5	10.0	3.3	3.2	3.2
1972	11.1	10.1	8.9	3.6	3.6	3.5
1973	25.9	26.9	22.7	4.9	5.2	4.8
1974	42.6	45.8	42.7	0.4	0.6	0.8
1975	23.8	26.8	19.0	−1.9	−1.9	−2.5
1976	27.2	30.5	20.2	5.1	5.1	4.8
1977	26.4	30.7	19.3	2.6	2.7	2.6

[1]Alternative deflator indices are applied only to exports and imports of merchandise.

the terms of trade effect. With the traditional computation of exports less imports of goods and services and of the gross national product at constant prices, these effects are disregarded: exports and imports are deflated by specific Paasche price indices. Thus the price structure of the base year is invariably drawn upon for all other years, implying no changes in price relations over time. The development of the national product in real terms, taking into account the influence of changes in the terms of trade, is, however, important for dealing with various problems of economic policy.

In line with the increased rate of price rises in foreign trade, methods for quantifying terms of trade effects have in recent years aroused growing interest.[10] In the Federal Republic, too, the measuring of this effect has, among other things, gained in importance in connexion with income policy. Thus, for example, the Council of Economic Advisers uses the terms of trade effect in estimating what rate of wage increase would not affect the level of production costs. If the cost level is to be kept from rising, nominal wages must not be increased by more than the percentage increase of real national output per man-hour, adjusted inter alia for terms of trade effects.[11] In 1974, for example, it had become necessary to reduce the increase of productivity available for the domestic increase in real income by 2.1 percent since the strong price increases of imports made it necessary to ship considerably more domestic goods abroad than in the previous year.

The different suggestions for measuring terms of trade effects all amount to measuring them as the difference between exports and imports deflated by a

[10]The OECD [12] has recently submitted a document in which the various methods for measuring terms of trade effects are outlined.
[11]See Council of Economic Advisers [13], No. 141.

common price index and exports and imports each deflated by special export and import price indices. Thus:

$$T = \frac{X - M}{P} - \left(\frac{X}{P(X)} - \frac{M}{P(M)} \right), \text{ where}$$

T:Terms of trade effect
X:Exports at current prices
M:Imports at current prices
P:Common deflator
$P(X)$:Export price index
$P(M)$:Import price index.

The various computation methods for the quantification of terms of trade effects differ mainly in the definition of the common deflator. In the OECD paper "Effects of terms of trade" [12], the following suggestions are made with respect to the common deflator: Import price index (Geary 1), export price index, provided exports are higher than imports, and import price index if the reverse applies (Burge and Geary), arithmetic mean derived from the export and import price index (Geary 2), price index of the gross national product at market prices (Stuvel), price index of the gross national product at factor cost (Godley and Cripps), price index of final consumption and gross fixed capital formation (SNA), and a price index for the total of exports and imports (Courbis and Kurabayashi).

Table 6 shows the results of the terms of trade effects for the foreign trade of the Federal Republic of Germany, always with reference to the base year 1970. For the deflation of exports and imports by special deflators, the different price indices described in detail in the first part of this paper have been used. In all years, the arithmetic mean derived from the export and the import price index (Geary 2) has been employed as the common deflator for exports and imports. The first three columns of Table 6 indicate the terms of trade effects in terms of absolute values at 1970 prices, while in columns 4 to 6 these values are expressed as percentages of the gross national product at 1970 prices. The results clearly indicate how strongly the terms of trade effects depend upon the price indices used for special deflators. From 1973 onwards, the computed effects not only differ considerably in their level, but (with the exception of 1974) even with regard to sign.

As can be seen from columns 4 to 6 of Table 6, the terms of trade effects amount to up to 2 percent of the gross national product.

It should be pointed out that the terms of trade effects apply only to a comparison with the chosen base year. The level, as well as even the plus or minus sign, of this effect may change if a different base year is selected. If the year 1974, for example, were to be used as the base year for the Federal Republic of Germany, the years from 1975 onwards would show positive instead of negative effects. In addition to the definition of the common deflator, it is very important which special price indices are employed for the deflation of exports and imports. As shown below, differing special price indices may exert a much stronger influence on the terms of trade effects than the alternative common deflators. The results clearly show that—because the results depend so much on the selected base year and on the method used for the deflation of exports and imports—an

TABLE 6

TERMS OF TRADE EFFECTS AT 1970 PRICES USING ALTERNATIVE INDICES FOR DEFLAT-
ING EXPORTS AND IMPORTS[1]

	Paasche	Laspeyres	Unit Value	Paasche	Laspeyres	Unit Value
	Billion DM			% of Gross National Product[2]		
Year	1	2	3	4	5	6
1971	3.0	3.7	4.3	0.4	0.5	0.6
1972	6.5	7.5	9.4	0.9	1.0	1.3
1973	1.1	−0.3	6.1	0.1	0.0	0.8
1974	−9.7	−14.6	−7.5	−1.3	−1.9	−1.0
1975	−1.8	−6.1	3.7	−0.2	−0.8	0.5
1976	−6.6	−11.0	1.4	−0.8	−1.4	0.2
1977	−6.1	−11.9	2.2	−0.8	−1.5	0.3

[1]The calculation is based on formula Geary 2; see Geary [15], p. 8.
[2]Gross national product at 1970 prices; see Statistisches Bundesamt [16], p. 44.

economic interpretation of the computed terms of trade effects should be attempted only with great caution.

To analyse how far the terms of trade effects depend on alternative common deflators, test computations were also performed. For the deflation of exports and imports by special deflators, Paasche price indices were used. As common deflators, the following price indices, listed in the sequence of the columns in Table 7, were taken as a basis:

—Index of import prices
—Index of export prices
—Arithmetic mean of export and import price indices
—Price index of the total of exports and imports
—Price index of final consumption and gross fixed capital formation
—Price index of the gross national product at market prices.

TABLE 7

TERMS OF TRADE EFFECTS[1] AT 1970 PRICES IN EXTERNAL TRADE USING ALTERNATIVE FORMULAE

	Formula according to:[2]					
Year	Geary 1	Burge and Geary	Geary 2	Courbis, Kurabayashi	SNA 2	Stuvel, Norway
	Billion DM					
1971	3.3	2.8	3.0	3.1	2.2	2.1
1972	6.9	6.0	6.5	6.3	4.6	4.4
1973	1.1	0.9	1.1	1.2	−1.5	−1.4
1974	−10.9	−8.4	−9.7	−9.5	−9.1	−8.6
1975	−2.0	−1.6	−1.8	−1.8	−2.8	−2.6
1976	−7.1	−6.2	−6.6	−6.6	−7.4	−7.1
1977	−6.7	−5.7	−6.1	−6.2	−7.7	−7.6

[1]Calculations are based on Paasche price indices, 1970 = 100.
[2]Geary 2, see Geary [15], p. 8; other formulae see OECD [12], p. 19.

The yearly changes of the terms of trade effects in Table 7 show only small differences. Changes in sign occur in 1973. The great differences of the results in Table 6, compared with the smaller differences of the results in Table 7, suggest that the choice of the common deflators is less important than the choice of the special price indices.

Terms of Trade in Foreign Trade by Groups of Trading Partners

The strong price changes of recent years in exports and imports have—as already shown—led to considerable shifts in the terms of trade. In addition to questions about which products have contributed most to the price changes, interest is centred particularly on the question of how prices and the terms of trade have developed with different groups of countries. In order to compute accurately price indices for groups of countries, it would be necessary to obtain data on exports and imports by groups of countries as weights, and also specific price data broken down by goods and countries of origin and destination. Price data in such great detail would require great effort and expenditure. At the Federal Statistical Office, Laspeyres price indices by groups of countries are therefore computed only for a breakdown between European Community members (EC) and all other countries.[12] The unit value indices are also published only in this regional breakdown.[13]

To compute price indices for more groups of countries, an improvised procedure was employed. As a weighting pattern, exports and imports in a breakdown by approx. 8,000 types of commodities per group of countries were available; but the same prices had to be used for every country. As already described, Paasche price indices by groups of countries were computed by allocating approximately 2,000 elementary price series for exports and imports to the roughly 8,000 types of commodities. Exports and imports of each commodity by groups of countries in the year concerned were deflated by the corresponding common price series; the totals at current and at constant prices per country group were used to obtain, by division, Paasche price indices by groups of countries. These price indices—although the export and import prices on which they are based are not broken down by countries of origin and destination—can be used as an approximation to original price indices by groups of countries; the implied assumption is that in view of the interdependence of prices and the interrelations of international markets, the prices of the same goods in all countries will be equal or will at least show a similar development.

Because of the great computational effort required, the price indices could be computed only for five groups of countries:

—Countries of the European Communities
—Other OECD countries
—Oil-exporting countries
—COMECON countries
—Other countries.

[12]The Federal Statistical Office intends to compute Laspeyres price indices for additional groups of countries.
[13]See Bergmann [14], p. 43.

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The proportionate shares of the five groups of countries in the foreign trade of the Federal Republic of Germany are shown in Table 8 on the basis of exports and imports at current prices in 1977.

TABLE 8

EXPORT AND IMPORT SHARES, 1977[1], IN CURRENT PRICES BY GROUPS OF COUNTRIES

	Exports	Imports
Groups of Countries	% of Total	
EC countries[2]	44.8	48.2
Other OECD countries[3]	28.8	24.3
Oil exporting countries[4]	9.2	10.0
COMECON countries[5]	5.7	4.5
Other countries	11.5	13.0
Total	100	100

[1]See Statistisches Bundesamt [10], pp. 42–43.
[2]As from 1971 including United Kingdom, Denmark, Ireland.
[3]Excl. EC countries.
[4]Algeria, Angola, Bahrain, Gabun, Iran, Iraq, Qatar, Kuwait, Libya, Nigeria, Oman, Saudi Arabia, Syria, Venezuela, United Arabian Emirates.
[5]Excl. Albania and German Demncratic Republic, including Cuba.

During the period 1970–77, the strong price fluctuations in exports and imports led to considerable changes in the terms of trade of the Federal Republic of Germany (see Figure 3). The price increases for oil and other raw materials since 1973/74 have had a marked impact upon the terms of trade of the entire foreign trade of the Federal Republic of Germany. It is true that the increases in import prices during 1971 and 1972 are more than compensated by rising export prices, but the fact remains that as a result of the massive price increases for oil from 1974 onwards, the terms of trade remain less favourable than in 1970 (see Table 9 and Figure 3).

TABLE 9

TERMS OF TRADE[1] IN EXTERNAL TRADE OF THE FEDERAL REPUBLIC OF GERMANY BY GROUPS OF COUNTRIES

Year	Total	EC Countries[2]	Other OECD Countries[3]	Oil Exporting Countries[4]	COMECON Countries[5]	Other Countries
			1970 = 100			
1971	103	102	104	85	101	110
1972	105	104	108	92	108	111
1973	101	101	106	80	97	102
1974	94	103	106	36	84	105
1975	99	103	109	40	88	118
1976	96	101	108	38	84	110
1977	97	101	109	38	88	102

[1]Calculation based on Paasche price indices.
[2-5]See footnotes of Table 8.

TERMS OF TRADE AND TERMS OF TRADE EFFECTS
BY GROUPS OF COUNTRIES

——— Total   •———• Oil exporting countries

— — EC countries   o———o COMECON countries

▪▪▪▪ Other OECD countries   ——— Other countries

1970 = 100   Billion DM

Terms of trade   Terms of trade effect

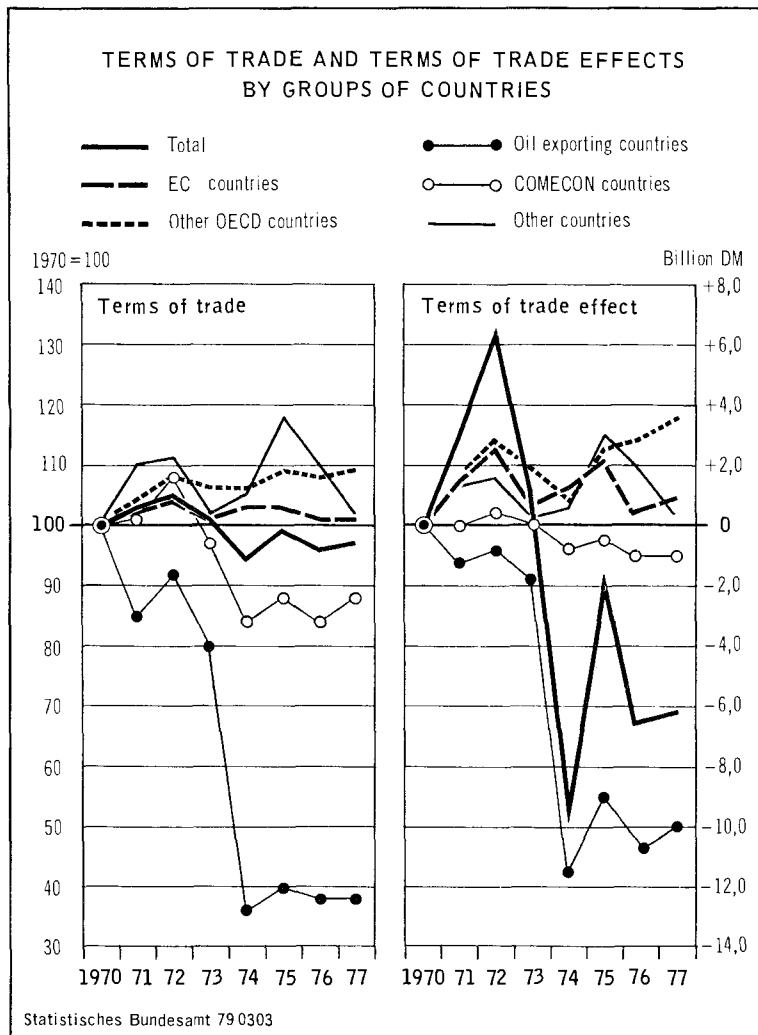Statistisches Bundesamt 79 0303

Figure 3

From 1973/74, the development of the terms of trade with the oil-exporting countries has played the dominant role. As early as 1971, the terms of trade index had already deteriorated to 85 (1970 = 100) on account of rising oil prices. In 1974, the index plunged to a low point of 36 and stood in 1977 at 38 (1977: export price index 143, import price index 373).

By comparison, terms of trade with the other groups of countries distinguished followed a steadier course during the years 1971 to 1977. The development of the terms of trade with EC countries shows the least changes over the entire period. The strong economic links between the EC countries obviously have a stabilizing effect on the terms of trade. With the OECD countries, other than EC countries, the Federal Republic was able to improve her position relative to 1970. Because of the devaluation of the dollar, trade with the U.S.A. was one

element in that improvement. Rising prices for oil from 1974 worsened the Federal Republic's terms of trade with COMECON countries. The terms of trade with the remaining group—mainly developing countries—between 1971 and 1977 are throughout higher than during the base year; the highest level was reached in 1975 (118), but in 1977 the terms of trade had fallen back to only 2 percent above the base year. The relatively strong fluctuations in the terms of trade with developing countries are due mainly to fluctuations of import prices, while the development of export prices follows a comparatively steady course.

The terms of trade between the Federal Republic of Germany and the various groups of countries presented in Figure 3 thus illustrate the changes to which the relative prices in the foreign trade of the Federal Republic of Germany have been subjected. In order to quantify the impact, terms of trade effects by groups of countries were computed for the years 1971 and 1977 in accordance with the formula Geary 2 (see Table 10 and Figure 3).

TABLE 10

TERMS OF TRADE EFFECTS[1] AT 1970 PRICES IN EXTERNAL TRADE OF THE FEDERAL REPUBLIC OF GERMANY BY GROUPS OF COUNTRIES

Year	Total	EC Countries[2]	Other OECD Countries[3]	Oil Exporting Countries[4]	COMECON Countries[5]	Other Countries
			Billion DM			
1971	3.0	1.5	1.5	−1.3	0.0	1.4
1972	6.5	2.5	2.8	−0.8	0.4	1.6
1973	1.1	0.7	1.9	−1.8	0.0	0.3
1974	−9.7	1.2	0.9	−11.5	−0.8	0.6
1975	−1.8	2.2	2.6	−9.0	−0.5	3.0
1976	−6.6	0.4	2.8	−10.8	−1.0	2.0
1977	−6.1	0.9	3.5	−10.0	−1.0	0.3

[1]Calculation based on Paasche price indices and according to formula Geary 2, see Geary [15], p. 8.
[2-5]See footnotes to Table 8.

On the whole, positive terms of trade effects compared with the base year were obtained up to 1973, but from 1974 onwards the balance became negative, even though the effects remained positive over the entire period in trade with three of the five groups of countries (EC countries, other OECD countries, other countries). The negative development of the terms of trade effects has essentially been caused by the strong rises in oil prices.

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