Bank of England

Discussion Paper No.16

The determination of UK manufactured import prices

by

I.D.Bond

March 1981

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Introduction[1]

1 This study investigates the determinants of UK manufactured import prices and in particular focuses on the relative influences of domestic and foreign prices in their formation. Considerable controversy exists about the latter. It is often assumed that the United Kingdom is unable to influence the prices of imported goods; in other words, the domestic price weight in an equation explaining UK import prices should be zero, in line with the 'law of one price'. On the other hand, there is evidence to the contrary; for example, Llewellyn (1974), and Llewellyn and Pesaran (1976) estimated the domestic price weight to be 40% in an equation explaining the deflator for imports of goods and services. At a micro level too, Isard (1977) has found evidence on US and West German manufactured goods prices suggesting that at the level of the most disaggregated groupings for which such prices are readily available, the law of one price does not hold. Work carried out in the Bank lends some support to this view that domestic prices are important, and is exemplified by the Bank model equation, where domestic prices have a 25% weight in the determination of the dollar UVI for imports of Standard International Trade Classification (SITC) sections 7+8+9 (UMM$). This support for at least some domestic price weight is, however, by no means conclusive.

2 The subject of import price determination is important for several reasons. First, it is central to the issue of the impact of an exchange rate change on domestic prices and costs, competitiveness, and the current account of the balance of payments because it is widely agreed that it is through changes in import prices that an exchange rate change first makes itself felt.[2] Other things being equal, the more an exchange rate change results in offsetting domestic

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[1] I am grateful to R N Brown, P A Bull, L A Dicks-Mireaux, C A Enoch, M Panić and I D Saville for helpful comments on a previous version of this paper.

[2] See Brown et al. (1980) for a survey of this literature.

price and cost changes, the less will competitiveness and the current account be influenced by the exchange rate; a high foreign price influence on import prices is a necessary requirement for this to occur. Second, a number of studies [1] have concluded that the influence of foreign prices in the determination of manufactured export prices is about 50%, while others have either assumed or estimated the corresponding weight for manufactured import prices to be unity.[2] Such extreme asymmetry is difficult to rationalise, suggesting as it does wide differences between the types of goods exported and imported, and casts doubt on one or other result.

3 This study, therefore, attempts to answer the following questions:

(i) what are the relative weights of domestic and foreign prices in import price determination, and have they changed over time;

(ii) what are the lags involved; and

(iii) does a change in the exchange rate have effects different from a change in domestic prices?

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[1] See, for example, Ormerod (1979), Bank of England (1979) and HM Treasury (1979).

[2] See, for example, London Business School (1980), National Institute of Economic and Social Research (1979), and Deppler and Ripley (1978).

Theory and model

The model

4 The chain of transactions from the production of a good in a foreign country to its eventual purchase by a UK consumer can be thought of as involving three agents: the foreign producer, the UK importer and the retailer. These agents need not be separate: the retailer could import direct, for example, or the foreign producer could set up his own importing subsidiary and sell his own product in the United Kingdom (car manufacturers are an obvious instance of this). It helps, however, to think of the process in these three stages when considering how prices are set.

(i) The retailer

5 The retailer will obtain his stocks from many sources: from wholesalers, importers, direct from manufacturers and so on. There would seem to be no clear reason why he should have any particular influence on the price he pays the importer which he could not also have on the price he pays for the goods from any other source. The importer can therefore compete against the wholesale prices charged by UK producers; this being the case, inclusion of wholesale selling prices as the measure of UK domestic prices allows us to disregard the behaviour of the retailer - he has no special effect on import prices which is not adequately reflected in UK wholesale prices.

(ii) The UK importer

6 The UK importer is the intermediary between the foreign producer and the UK market. For this agent to exist there must be some difference between the price at which he buys (the import price) and sells (the wholesale price); this provides the income to cover the costs of his intermediation and generates the profits which keep him in the business.

7 The margin between the importer's buying and selling prices is potentially important in import price determination, for if it is

not a simple percentage of the buying price it implies that he can influence the price at which the foreign producer exports to the United Kingdom. The importer might, for instance, be able to bid down the foreign producer's price and so earn greater profits on his intermediation; this profit margin might therefore fluctuate with the changing conditions in the world economy.

8 In this paper, a simplifying assumption is made: the importer is regarded as a perfect competitor, with the margin between his buying and selling prices reflecting the (low) costs of intermediation and some minimum profit margin. Two arguments can be used to justify this. First, barriers to entry into the importing business are low, as no great amount of physical investment is required; in addition, economies of scale - once the initial experience is acquired - are likely to be slight, in that the time and money tied up in any one transaction will not depend on the number of transactions carried out. Second, both the retailer and - more probably - the foreign producer may be much larger than the importer, and both have an interest in making the importer's margins as low as possible. Any excess profit on his part will encourage either party to acquire the necessary trading expertise themselves; once acquired, such expertise can be maintained without cost. In short, none of the conditions usually associated with imperfect competition are present.

(iii) The foreign producer

9 The foreign producer's decision can be expressed in a fairly simple form: can he adjust his prices to suit the particular circumstances of the United Kingdom, or is he constrained in some way to set the same prices in the United Kingdom as in other markets? The circumstances in which such discrimination between markets may be possible are discussed below; at this stage, we need only note that this formulation conveniently sidesteps any discussion of the foreign producer's costs. Implicitly, the average price at which he sells to the rest of the world is assumed to reflect his costs and profit margin, the last of which is assumed to be large enough to permit the necessary flexibility for UK import prices to diverge from world levels. We therefore avoid the need to explain the foreign producer's general price-setting behaviour, and can concentrate on just one specific aspect of it: can he discriminate between the United Kingdom

and other markets by giving some weight to UK prices in his price quotes?

10 Expressing the model in terms of the three agents involved, and adding the assumption of perfect competition in the importing business, the foreign producer naturally becomes the focus of attention. This being so, it is sensible to consider the problem from the foreign producer's point of view rather than as the importer sees it. While an importer might think primarily in sterling terms, converting foreign currency quotes into sterling and comparing them with UK wholesale prices, the foreign producer is much more likely to think in foreign currency terms, probably in US dollars. In order to capture this, all equations have been estimated in dollar terms.

11 Two details must, for completeness, be added here; both relate to domestic prices. First, as we are considering pricing from the foreign producer's point of view, 'domestic prices' ought not to be thought of as those prices faced by domestic producers in the United Kingdom; the fact that foreign producers face tariff barriers, which in effect change domestic prices as perceived from abroad, must also be taken into consideration. If a tariff at rate t is levied on goods as they enter the United Kingdom, the foreign producer must consider the effect of this on the UK selling price of his product. For example, if he wants to compete with a UK domestic price of P_o, his border price P_1 must reflect the fact that an amount $t.P_1$ will be added to it. If the UK selling price is to be P_o, the border price must be $P_o/(1+t)$; it is this tariff-adjusted domestic price against which the foreign producer is really competing. Changes in tariffs should have the same effect on his pricing behaviour as changes in UK domestic prices, but of course in the opposite direction.

12 The second detail to be added is homogeneity. It is often suggested that the sum of the domestic and foreign price weights in a model of this sort should be unity. This so-called homogeneity constraint is based on the proposition that if world and domestic prices of the goods in question rise by, say, 10%, then import prices should also rise by 10%. Though this would undoubtedly be correct for true price indices, it need not be true at an aggregate level.

For aggregate indices (unit value indices in this case), the homogeneity constraint should only be imposed if the composition of the domestic, foreign and import price series is identical; any compositional differences - which certainly exist in practice - introduce the possibility that the homogeneity constraint need not be satisfied precisely.

Factors affecting the foreign producer's pricing behaviour

13 If all firms were perfectly competitive, there would be a single world price for each good which would reflect the minimum average costs of the marginal producer. Divergences between world, import and domestic prices would be the result of compositional differences between these aggregates; relative movements would be caused by substitution effects, reflecting well-known index number problems.

14 For many goods, however, some degree of monopoly power can be exercised by producers. This power may be of the traditional form, exercised by a producer with sole rights to an essential resource or technique; or it may arise through less obvious forms of exclusion such as those created by a combination of product differentiation and economies of scale. Between the extremes of pure monopoly and perfect competition will lie the whole range of imperfectly competitive markets where selling prices will be determined not by a producer's competitive prices but by his costs and chosen profit margin. However, even these conditions will not permit firms to discriminate between markets, unless they can prevent their product from being sold by others to a different market. It is only if such arbitrage is prevented, or indeed if a degree of market separation already exists (perhaps because consumer preferences differ between markets), that there is scope for the prices of products to differ between markets and so for foreign producers to take into account in their pricing behaviour the prices set in the UK market by UK producers; such separation clearly does exist, especially in the case of finished goods, where examples of widely differing prices for identical products in different countries are well known (cars are an obvious example).

15 There are thus two distinct types of imperfect competition: one which results from the organisation of the industry, independent

of the particular characteristics of the product being sold; and the other resulting from the sort of product being sold independent of the organisation of the industry. The market for any product can be imperfectly competitive if collusive or monopolistic forces are exerted by the firms which sell the product; whereas the markets for some products - notably those which are characterised by high value-added and product differentiation - will tend to be imperfectly competitive whatever the market structure. We would therefore expect that it will be in these latter markets (typical of finished manufactures) that domestic prices will be most important, for it is here that the products themselves tend to make the markets non-competitive even without assistance from the structure of the industry, and therefore where the possibilities for market segmentation are greatest. For goods such as basic materials and primary commodities, on the other hand, domestic prices will only be of importance if domestic producers have monopoly power in world markets; this is unlikely to be the case for any UK firms, and would anyway conflict with the need to import in the first place.

Impact of the exchange rate

16 So far, domestic prices have been understood as being in dollars. To a foreign exporter, however, UK prices can be thought of as comprising PD£, the sterling domestic price, and ER, the sterling/dollar exchange rate (PD$ = PD£/ER). An important consideration resulting from this is the possible distinction between changes in sterling domestic prices and changes in the exchange rate. In the long run, it would be irrational for these foreign suppliers to react differently to similar changes in these two elements of PD$, but in the short run such differences are not only possible but even likely. At least three reasons can be suggested for this:

(i) Information - for foreign producers to acquire information about domestic prices would require considerable effort and expense. The exchange rate, on the other hand, is observable continuously and at negligible cost. So though foreign suppliers will occasionally sample domestic prices to revise their information on PD£, this will be carried out less regularly and thoroughly than their exchange rate intelligence. This implies that, in the short run, changes in ER may impinge much more immediately on PD$ than changes in PD£.

(ii) Contracts - these are likely to be tied in some way to the exchange rate, and would probably be quoted as a fixed basic sterling price (possibly with adjustments for changes in ER between contract and delivery[1]). This would ensure for the foreign supplier at least a degree of security in his dollar receipts (though the adjustment is unlikely to be such as in effect to fix the price in dollar terms). Again, exchange rate effects would feed through more quickly than domestic price effects, as the latter could only be taken into account when contracts were renegotiated.

(iii) Variability - foreign suppliers might regard the exchange rate as being subject to random disturbances and thus not respond quickly to changes in the rate. Other things being equal [i.e. ignoring the effect under (i) above], this would tend to increase the short-run response of foreign exporters to domestic prices relative to their response to the exchange rate.

All these possible effects would suggest that it is unwise to constrain the short-run response of import prices to changes in PD£ and ER to be the same, though the long-run constraint should perhaps be imposed.

17 It is evident from the above that these exchange-rate considerations introduce the subject of invoicing policy. Though logically separable from pricing policy as such, the two cannot be entirely independent; for example, it would be odd for a foreign supplier to give no weight to UK domestic prices in his pricing policy and yet to denominate his contracts in sterling, thus exposing himself to unnecessary exchange rate risk. This is not to say that this could not happen - indeed, there are possible reasons for such behaviour - but rather that such a pair of policies would not imply the same view about demand elasticities, part of the basis for any rational pricing policy.

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[1] To the extent that contracts are covered in the foreign exchange market rather than in the contract itself, this will not affect the price of goods traded under existing arrangements.

Data sources

Import prices

18 All import prices have been obtained from the Department of Trade. Unit value indices (base-weighted prices) reflecting 1975 import patterns are employed; these are not seasonally adjusted. Series which include the so-called erratic items[1] have been used.

Import tariffs

19 There are two possible ways to measure tariff rates by SITC section. On the one hand, it would be possible to obtain data on tariff rates for individual tariff headings, and then - taking account of exemptions and other special arrangements - combine these rates using appropriate trade weights. On the other, receipts of tariff revenue could be measured and divided by the appropriate trade flows. Given the multiplicity of tariff rates and exempted categories of trade, the second of these methods is simpler, and is followed here.

20 Average revenue incidence figures (revenue collected as a proportion of the value of imports) are available in the annual reports of the HM Customs and Excise on an SITC(R) basis[2] since the fiscal year 1966/67, but before that date are only available on a tariff chapter basis at two-digit level. For the period prior to 1966, these tariff chapter data have been aggregated in a way consistent with the later figures using tariff classification information at four-digit level, thus taking into account the fact that many tariff chapters, though mainly associated with a single SITC section, are also represented in others. From information at the four-digit level, a proportion of each of these 'split' chapters has been assigned to its correct SITC section, the proportion being determined by the shares of revenue going to the SITC sections in 1965.[3] This

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[1] Ships, North Sea production installations, aircraft and precious stones.

[2] The revised SITC, recently superseded by SITC (Rev 2).

[3] The data used in these calculations were obtained from HM Customs and Excise (1965).

obviates the necessity for aggregating at the four-digit level for every year, but of course introduces the possibility of error in that the proportions may have changed over time. Categories representing only a small amount of revenue (generally, less than £0.05 million in 1965) have been ignored; and the aggregations employed follow the SITC(R) classification as it applied in 1977. Because only annual data are available, quarterly series have been obtained by interpolation.

21 This aggregation has been carried out for the whole period 1959-77, so for the sub-period 1966-67 to 1973-74 - where data by SITC section on a fiscal year basis are also available - it is possible to assess the accuracy of the procedure. Table A below records the mean differences between the calculated SITC section receipts and their recorded values for the eight years of overlap. As can be seen, the degree of accuracy is reasonable.

Table A

Aggregation errors 1966-67 to 1973-74

£ million

SITC	Mean duties received	Mean error(a)	
			Per cent
5	23.5	+0.0	+0.1
6	54.3	-0.1	-0.1
7	110.8	-0.5	-0.6
8	44.5	+1.1	+3.1
5 + 6	77.8	-0.0	-0.0
7 + 8	155.3	+0.6	+0.5
5 to 8	233.1	+0.6	+0.4

(a) Calculated less recorded.

22 The errors reflect not only errors in the proportions used in the allocation of split chapters, but also the omission of those which were ignored because of their small contribution (the former is particularly serious for SITC 8, the latter for SITC 6). Both these errors tend to be reduced by aggregation; for if a chapter is split between SITC 7 and SITC 8, say, and either the proportion of the split is wrong or the tariff chapter is so poorly represented in one of the sections that it is ignored there and included entirely in the other, the chapter is automatically correctly allocated when the two SITC sections are combined.

Domestic prices

23 Domestic prices have been measured by the Central Statistical Office (CSO) wholesale selling price index for manufacturing output, both including and excluding food, drink and tobacco. This is a 1975-based unit-value index, and is not seasonally adjusted; it is based on order prices rather than on delivery prices. An attempt has also been made to construct wholesale selling price indices for finished and semi-manufactures separately, these being more appropriate for some of the regressions. CSO data readily available were used, with rescaled 1963-based values being employed for the period prior to 1968. For finished manufactures, the indices for engineering (SIC[1] Orders VII to XII) and clothing and footwear (SIC Order XV) were combined, using 1975 import values of SITC 7 (machinery and transport equipment) and SITC 84+85 (clothing and footwear) as weights. Though this is a somewhat crude proxy for the required domestic price variable, it is the best that can be constructed simply. For semi-manufactures, the indices for chemicals (SIC Order V), paper (MLH[2] 481-4), steel (MLH 311+312), timber (SIC Order XVII) and textiles (SIC Order XIII) were combined, again using appropriate import weights.

Foreign prices

24 All foreign prices have been taken from the Monthly Bulletin of Statistics published by the United Nations. The basic foreign price variable is the quarterly series for exports of manufactures (SITC 5 to 8) of 'developed areas to developed and developing areas'; as far as can be ascertained, this aggregated series is constructed from UVI. It does, however, present something of a problem, because its coverage makes it not entirely suitable for use with separate finished and semi-manufactures equations. When used in this context, an adjustment has been made, making use of the (annual) data on SITC 5, 7 and 6+8 available from the same source; the derivation of, and rationale for, this adjustment are discussed in the appropriate part of the next section.

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[1] Standard Industrial Classification.

[2] Minimum List Heading.

Results

25 The results reported in this study are from equations of the 'flexible partial adjustment' type made popular by Hendry and others,[1] in part because it was found that ordinary levels or differenced equations (with all variables in logs) were entirely unsatisfactory, giving very low Durbin-Watson statistics. This sort of equation can intuitively be thought of in two parts: one in first differences, reflecting impact effects, and one in lagged levels, modelling the long-run equilibrium. In an equation such as:

$$\Delta A = \alpha \Delta B_o - \beta_o A_{-1} + \beta_1 B_{-1}$$

α represents the impact effect, and β_1/β_o the eventual equilibrium effect, of the independent variable B; β_o is the speed of adjustment to equilibrium.

Dollar UVI for imports of finished manufactures (SITC 7+8)

26 The first stage of estimation concentrated on a basic equation in which the import UVI was related to foreign and domestic manufactures prices. Constraining the response of import prices to exchange rate movements to be the same as their response to changes in domestic prices gave the coefficients in the following equation:

$$\begin{aligned} \Delta U78\$ = {} & \underset{(3.0)}{0.02} + \underset{(4.9)}{0.53}\ \Delta PF\$ + \underset{(5.2)}{0.41}\ \Delta PD\$ \\ & - \underset{(2.5)}{0.24}\ U78\$_{-1} + \underset{(1.6)}{0.11}\ PF\$_{-1} + \underset{(2.8)}{0.15}\ PD\$_{-1} \end{aligned} \qquad (1)$$

$\bar{R}^2 = 0.737$
SE = 0.016
$e_{-1} = 0.03$ (0.1) Estimation period 1963Q4-1978Q4
t statistics are in brackets beneath coefficient estimates.

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[1] Hendry and Mizon (1978); Davidson et al.(1978).

Where: U = import unit value index (78 refers to SITC 7+8);

PF = world price of manufactured exports;

PD = domestic selling price of manufactures (net of taxes);

e_{-1} = lagged error term.[1]

As can be seen, all the coefficients are significantly different from zero and have the expected signs. The domestic price weight is surprisingly high, at 63.3%; and the sum of the foreign and domestic price weights in the long run is well above unity, at 1.099.

27 Retaining the same price variables, the first modification was to relax both the short-run and long-run constraints imposed to ensure that domestic prices and the exchange rate have identical effects. In other words, PD$ was separated into its components PD£ and ER (the £/$ exchange rate) both in first differences and in lagged levels. We would expect, as before, a positive coefficient on PD£; but ER should have a negative coefficient because PD$ equals PD£/ER. This resulted in the following equation:

$$\begin{aligned}\Delta U78\$ = {} & \underset{(4.2)}{0.04} + \underset{(5.8)}{0.59}\,\Delta PF\$ - \underset{(1.5)}{0.39}\,\Delta PD£ - \underset{(5.2)}{0.40}\,\Delta ER \\ & - \underset{(4.0)}{0.41}\,U78\$_{-1} + \underset{(3.6)}{0.33}\,PF\$_{-1} + \underset{(1.3)}{0.10}\,PD£_{-1} - \underset{(1.3)}{0.08}\,ER_{-1} \qquad (2)\end{aligned}$$

$\bar{R}^2 = 0.785$
SE = 0.014
$e_{-1} = 0.11$ (0.4) Estimation period 1963Q4-1978Q4.

28 One notable feature of this equation is that the short-run coefficient on domestic prices is perversely signed; this, if true, implies that the short-run response of import prices to the exchange rate is different from their response to domestic prices: remembering to change the sign, the coefficient on ΔPD£ is significantly different from that on ΔER. The long-run coefficients are, however, not significantly different; this is what we would expect, and

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[1] Durbin-Watson statistics are misleading for this form of equation; the coefficient and t statistic on the lagged error terms are therefore quoted. It should be noted that the other coefficients were obtained <u>without</u> the inclusion of this term.

justifies the imposition of the long-run constraint. It should also be noted that equation 2 implies a much lower equilibrium weight on domestic prices: it has been reduced to 25.0%, under half that obtained with both constraints imposed.

29 The main difficulty which emerged was finding realistic ΔPD£ and lagged-levels coefficients. The coefficient on ΔPF$ was consistently about 0.6, and that on ΔER about -0.4, with no longer differences Δ_n (where Δ_n is the change between now and n periods ago) being significant. Both these coefficients are eminently plausible. Sensible coefficients on Δ_2PD£ (i.e., $PD£_o - PD£_{-2}$) could be found, but any other term in ΔPD£ was either totally insignificant or wrongly signed; however, the plausible Δ_2PD£ coefficients were invariably accompanied by insignificant $PF\$_{-1}$ and an unrealistically high domestic price weight in the long run. With a constant included, Δ_2PD£ ceased to have the correct properties. The speed of adjustment (the coefficient on $U78\$_{-1}$) was typically around 40% per quarter, and the long-run domestic price weight in the region of 30%.

30 The failure of the search to identify any impact effect of domestic prices on the import UVI is reflected in the following equation:

$$\Delta U78\$ = \underset{(5.9)}{0.03} + \underset{(5.4)}{0.52}\ \Delta PF\$ - \underset{(6.5)}{0.46}\ \Delta ER$$

$$- \underset{(3.5)}{0.30}\ U78\$_{-1} + \underset{(3.6)}{0.22}\ PF\$_{-1} + \underset{(2.1)}{0.11}\ PD\$_{-1} \qquad (3)$$

$\bar{R}^2 = 0.777$
$SE = 0.015$
$e_{-1} = 0.07\ (0.3)$ Estimation period 1963Q4-1978Q4.

The removal of the short-run exchange rate/domestic price constraint in this preferred equation results in a long-run domestic price weight of 35.0%, slightly over half that of equation 1; and the sum of the foreign and domestic price weights is closer to unity, at 1.084. Tis suggests that the constraint invalidly imposed in equation 1 introduces a sizable bias to the domestic price weight.

It should be noted that the other coefficients are little changed, and that the fit of the equation is improved.

31 So far, no attempt has been made to improve the specification of the variables in the equation. As has already been pointed out, the coverage of both price variables is manufactures as a whole (not finished manufactures alone); furthermore, account ought also to be taken of UK import tariffs, and the weighting of the foreign countries' export UVIs to construct the foreign price variable. The points are discussed below.

32 The world trade price variable used so far has been the published United Nations series referred to in paragraph 24, which weights together - using world trade shares - the UVI series for exports of manufactures (SITC 5 to 8) for the main developed countries.[1] It would clearly be more appropriate to use a series constructed with UK import weights, for then the individual country series will be weighted according to their importance in UK import prices. There are two possible weighting patterns which could be used. The most obvious would be 1975 import shares, because all the other series are 1975-weighted. However, these weights are not necessarily ideal, because the UK import price series uses constant goods weights but, implicitly, current country weights; there is thus an argument for using current import shares - in other words changing the country weights over time.

33 Unfortunately, there is no a priori reason why one of these options is to be preferred over the other. 1975 import weights are in error to the extent to which import shares have changed over time. Current import weights, on the other hand, are in error to the extent to which the goods weights in the individual country series differ; for if they do, then changes in the country weights will inevitably change the implicit goods weights in the aggregate series. For this reason, both series have been employed, though only results using the latter are reported for the present; the differences between the two sets of results will be discussed later.

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[1] Belgium/Luxembourg, France, West Germany, Italy and the Netherlands; Canada, Japan, Sweden, Switzerland and the United States.

34 Table B below shows the 'current import' weights which have been used, and the share of the ten countries in UK manufactured imports from all sources in each of the years chosen. The most noticeable general trend is the shift towards trade with EEC countries; in addition, the share of the United Kingdom's manufactured imports coming from Japan increases particularly markedly, and that from the United States and Canada falls strongly. The figure for Switzerland is distorted by the large amount of trade in precious stones inevitably included in the total.

Table B

Manufactured import weights

Per cent

	1963	1965	1968	1970	1973	1975	1978
Belgium/Luxembourg	5.73	6.16	5.25	5.16	5.81	7.43	8.05
France	8.31	7.80	7.70	7.57	10.40	11.85	12.65
West Germany	17.60	16.25	16.25	16.48	20.61	19.58	21.55
Italy	6.30	5.45	5.80	5.57	6.23	7.07	8.15
Netherlands	7.74	7.00	7.33	7.83	7.76	8.87	7.69
Canada	14.02	12.28	9.83	11.31	5.75	4.48	2.70
Japan	2.47	3.06	3.21	3.51	6.78	7.04	6.52
Sweden	6.46	6.92	7.19	7.79	7.99	6.90	5.52
Switzerland	5.39	5.26	5.75	6.18	9.45	7.72	11.15
United States	25.98	29.32	31.68	28.60	19.22	19.06	16.02
Share of these imports in total	66.8	65.6	64.6	66.3	68.2	71.2	72.8

The share of total manufactured imports represented by these countries is currently about 70%; though this coverage is perhaps a little low, lack of data prevents the inclusion of other countries.

35 Substitution of the reweighted foreign price variable gives the following equation:

$$\Delta U78\$ = \underset{(6.1)}{0.03} + \underset{(5.7)}{0.54}\Delta PFA\$ - \underset{(7.2)}{0.47}\Delta ER - \underset{(4.0)}{0.38}U78\$_{-1} + \underset{(4.2)}{0.26}PFA\$_{-1} + \underset{(2.7)}{0.14}PD\$_{-1} \qquad (4)$$

$\bar{R}^2 = 0.786$
SE = 0.014
$e_{-1} = 0.11\ (0.4)$ Estimation period 1963Q4-1978Q4
where PFA = current import-weighted foreign prices.

The domestic price weight is two percentage points higher than in equation 3, at 37.0%; and the sum of the foreign and domestic price weights is a little closer to unity, at 1.073. Though these changes are not large, they do improve the fit of the equation marginally; and the speed of adjustment is increased by nearly a quarter.

36 Potentially more important than this weighting problem is the correction required for the commodity coverage of the foreign price variable. As was pointed out in paragraph 24, no quarterly price series is available for trade in finished manufactures with a coverage comparable to the United Nations series for SITC 5 to 8; in order therefore to proxy foreign prices for SITC 7+8 some form of approximation is required.

37 The expedient adopted here is to make use of the (annual) country data on export UVI for SITC 5, 7 and 6+8 published by the United Nations. From these, we can construct proxies for SITC 5+6 and 7+8, namely P'56 and P'78 respectively: in weighting together SITC 5 and 6 for example, SITC 6+8 can - with the strong assumption that there is no difference between the export UVI of SITC 6 and 8 - be used in place of SITC 6. Quarterly series are then obtained by interpolation. These proxies are not, however, used as they stand; rather, an attempt is made to minimise the error such crude series would introduce by using them to construct an adjustment for PF. To do this, it is presumed that the ratio between P'56 and P'78 is related to the ratio between the corresponding true foreign price series:

$$\left(\frac{PF56}{PF78}\right) = \beta\left(\frac{P'56}{P'78}\right)^{\gamma}$$

Using this relationship, and the UVI identity

$$PF \equiv \alpha PF78+(1-\alpha)PF56$$

(where α is the share of finished manufactured exports in all manufactured exports in 1975, the base year) a reduced form can be derived in which $\frac{P'56}{P'78}$ is the appropriate adjustment (see Appendix 1);

under the two assumptions used in the derivation - both of which seem fairly weak, given the relative magnitudes of P'56 and P'78 - this adjustment term, ADJ, is in levels, not logs.

38 From the reduced form, prior information can be obtained on the expected coefficient on ADJ. It depends largely on two things: the coefficient on the foreign price term and the share α of finished manufactures in foreign exports of all manufactures; assuming β and γ in the expression above to be unity, it reduces to $-b(1-\alpha).[1/(\alpha+(1-\alpha)\ \overline{\overline{ADJ}})]$. $\overline{\overline{ADJ}}$, the mean value of ADJ, is about 1.007 for the estimation period; the value of α in 1975 for OECD countries was 0.59; and b is the coefficient on foreign prices. The coefficient should therefore be about -0.40b, or a little over one third of the coefficient on foreign prices (with the opposite sign).

39 The inclusion of ADJ in both first differences and in lagged levels in equation 4 was not wholly satisfactory, in that the coefficient on the first difference term ΔADJ was wrongly signed (but not significant). This is however not surprising: because ADJ has been interpolated from annual data, its quarterly movements are not particularly meaningful and certainly could not be expected to pick up short-term divergences between movements in semi-manufactures prices and finished manufactures prices. Omitting this term had little effect beyond increasing the coefficient on PF$ slightly, and gave the following equation:

$$\begin{aligned}\Delta U78\$ = {} & 0.11 + 0.53\Delta PFA\$ - 0.45\Delta ER \\ & (3.0)\ \ (5.7)\qquad\ \ (6.6)\end{aligned}$$

$$\begin{aligned}& -0.48U78\$_{-1} + 0.35PFA\$_{-1} - 0.08ADJ_{-1} + 0.14PD\$ \\ & (4.4)\qquad\ \ (4.3)\qquad\ \ (2.2)\qquad\ \ (2.7)\end{aligned} \qquad (5)$$

$\bar{R}^2 = 0.782$
$SE = 0.014$
$e_{-1} = 0.11\ (0.4)$ Estimation period 1963Q4-1978Q1.

The coefficient on ADJ_{-1} is significant and correctly signed; though it is somewhat lower than expected, at -0.23b.

40 Two points are worthy of note in this improved equation. First, the sum of the foreign and domestic price weights is yet closer to unity, at 1.027; and second, the domestic price weight itself is, at 29.1%, some eight percentage points lower than before the inclusion of ADJ. The former feature is particularly encouraging, as it suggests that this is a better specification of the foreign price variable.

41 The final point to consider is the domestic price variable. As noted in paragraph 23, a proxy for domestic wholesale selling prices of finished manufactures was constructed, weighting together (with 1975 imports values as weights) CSO series for engineering and for clothing and footwear. Substitution of this for the 'all manufactures' domestic price variable, to reflect more closely the price of competing domestic goods, produces little change from equation 5, increasing the long-run domestic price weight by only one percentage point. The further adjustment for tariff effects however made more difference, raising the weight to 31.1% and lowering still further the sum of the long-run domestic and foreign price weights, to 1.014. Though tariffs were not significant when separated from the domestic price variable, it was felt that their inclusion - constrained to have the same long-run coefficient as domestic prices - could be justified on theoretical grounds (see above); again, the use of an interpolated series may be partly responsible for the problem. The following equation records the final results:

$$\Delta U78\$ = \underset{(2.2)}{0.08} + \underset{(5.9)}{0.52}\Delta PFA\$ - \underset{(6.6)}{0.47}\Delta ER$$

$$- \underset{(4.1)}{0.42}U78\$_{-1} + \underset{(3.7)}{0.30}PFA\$_{-1} - \underset{(1.3)}{0.05}ADJ_{-1} + \underset{(2.4)}{0.13}PD4\$_{-1} \qquad (6)$$

$\bar{R}^2 = 0.775$
SE = 0.014
$e_{-1} = 0.05$ (0.2) Estimation period 1963Q3-1978Q1
where PD4 = domestic prices adjusted for UK import tariffs.

42 For completeness, equation 6 has also been run in two other forms. As noted in paragraph 33, variable country weights for the foreign price variable are not necessarily correct; a 1975 import-weighted version has therefore been tried, with results

broadly similar to those just quoted. For comparison, two key coefficients are compared in Table C.

Table C

Comparison of coefficients obtained with different foreign price variables

	Price weights		
	Domestic	Foreign	Sum
Variable weights	31.1%	71.5%	1.014
1975 weights	25.7%	74.3%	1.000

Though some slight differences are apparent, there is unfortunately no *a priori* means of deciding which version of the foreign price variable is to be preferred.

43 In addition, an alternative form of ADJ has been used. Rather than constructing proxies for PF56 and PF78 from published data for other industrial countries, as was done above, UK export UVIs have been used. These have the advantage that they are available on a quarterly basis, but suffer two disadvantages: first, UK exports in these categories may not be typical of world exports, either in composition or in price; and second, the ratio between the two may be related to UK domestic prices, because domestic prices may have a different weight in the determination of each. Despite these potentially serious shortcomings, it was felt worthwhile to make use of this proxy; and it was found that the coefficients on both ΔADJ and ADJ_{-1} were closer to their expected values, with the domestic price weights somewhat lower than before. These results are summarised in Table D.

Dollar UVI for imports of all manufactures (SITC 5 to 8)

44 The results reported above for finished manufactures, though fairly satisfactory, are not conclusive evidence for a domestic price weight in the region of 20%-30%. The failure of ADJ (based on foreign prices) to provide a satisfactory correction for the misspecification of the foreign price variable - and the extent to which ADJ lowers the domestic price weight - suggest the possibility of misspecification in equation 6. The UK export UVI version of ADJ, and the lower estimated domestic price weight its inclusion

Table D

Comparison of coefficients obtained with alternative form of ADJ and the different foreign price variables

	Price weights			ADJ coefficient/foreign price coefficient	
	Domestic	Foreign	Sum	Short run	Long run
Variable weights	23.8%	75.7%	0.995	-0.41	-0.36
1975 weights	20.2%	78.8%	0.990	-0.43	-0.41

brings about, reinforces this impression. As a check on this result, it seemed advisable to test for the existence of a significant domestic price weight in an equation for all manufactures, where the specification problem associated with the foreign price variable will not arise.

45 In 1975, the UK imported finished manufactures were valued at £6,906 million, and semi-manufactures at £6,059 million. The weight of the import UVI for finished manufactures in the import UVI for all manufactures is therefore 53.3%; so even if it were the case that domestic prices had no effect at all on semi-manufactured import prices, one would still expect to find a domestic price weight above 10% in an 'all manufactures' equation. Anything substantially less than this would cast serious doubt on the results of the previous section.

46 An equation for all manufactures (SITC 5 to 8) was therefore estimated, following closely the form of equation 6. Domestic wholesale selling prices of manufactures (excluding food, drink and tobacco), corrected for tariffs, were used as the domestic price variable; and the foreign price variable was the 'variable country weights' version described earlier. The following equation records the results:

$$\Delta U58\$ = \underset{(1.3)}{0.01} + \underset{(7.7)}{0.72}\,\Delta PFA\$ - \underset{(6.6)}{0.42}\,\Delta ER + \underset{(1.6)}{0.26}\,\Delta PD4£$$

$$- \underset{(2.3)}{0.42}U58\$_{-1} + \underset{(2.5)}{0.36}PFA\$_{-1} + \underset{(0.7)}{0.04}PD4\$_{-1} + \underset{(1.5)}{0.38}e_{-1} \qquad (7)$$

$\bar{R}^2 = 0.845$
SE = 0.012

Estimation period 1963Q3-1978Q4.

This equation gives a long-run weight of 10.7% to domestic prices,and the sum of the domestic and foreign price weights is 0.970; removal of the lagged error term however reduces the domestic price weight to only 2.5%.[1] This would be consistent with the estimated weight of domestic prices in import prices of finished goods only if the import prices of semi-manufactures are almost wholly foreign determined. It is interesting to note that, contrary to the finished manufactures results, the weight given in the short run to domestic prices is not significantly different from that given to the exchange rate.

47 There are, however, several problems with this equation which reduce the weight which can be placed upon it. The first is that the standard error on the long-run domestic price coefficient is such that it is not possible to distinguish between alternative hypothesis about this long-run influence.[2] The second, and more worrying, problem is that though the lagged error term is barely significant, its inclusion increases the domestic price weight from only 2.5%. In other words, it is only the inclusion of an insignificant lagged error term which gives a result conceivably consistent with a domestic price weight of 20% to 25% on finished manufactured import prices. Both these problems pointed strongly to the advisability of completing the picture by looking at semi-manufactures.

Dollar UVI for imports of semi-manufactures (SITC 5+6)

48 Only a domestic price weight close to zero on semi-manufactures would be consistent with the results obtained so far in this paper. Once again, therefore, the form of equation estimated was similar to those already encountered. A proxy for domestic wholesale selling prices of semi-manufactures, corrected for tariffs, was used (see paragraph 19); the expected coefficient on ADJ is now +0.40 times the foreign price coefficient (it would be the same as before if we redefined ADJ as P'78/P'56). The following equation records the results obtained:

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[1] Substitution of the original world export weighted version of the foreign price variable for the variable country weights results in a long-run domestic price weight of only 0.6%, with a t value of 0.03.

[2] It should be noted that the standard error on the domestic price weight (i.e. the SE on $\frac{0.04}{0.42}$) is even lower - see Wickens (1978).

$$\Delta U56\$ = \underset{(1.8)}{-0.09} + \underset{(4.6)}{0.58}\,\Delta PFA\$ + \underset{(6.0)}{0.84}\,\Delta ADJ - \underset{(4.8)}{0.40}\,\Delta ER + \underset{(2.4)}{0.43}\,\Delta PD4£$$

$$\underset{(3.3)}{-0.24}U56\$_{-1} + \underset{(3.2)}{0.24}PFA\$_{-1} + \underset{(1.8)}{0.09}ADJ_{-1} - \underset{(0.3)}{0.01}PD4\$_{-1} \qquad (8)$$

$\bar{R}^2 = 0.824$
SE = 0.015
$e_{-1} = 0.26(1.3)$ Estimation period 1963Q3-1977Q4.

As with equation 7, the short-run coefficients on the exchange rate and on domestic prices are not significantly different; and though the coefficient on ΔADJ is much larger than expected, the removal of the term has no significant effect on the domestic price weight, which remains indistinguishable from zero. This accords well with a priori expectations, and completes a consistent picture of manufactured import price setting.

Changes over time in the domestic price weight

49 It is possible that the weight of domestic prices in import price determination has been changing in recent years. In addition, the exchange rate regime has changed significantly during the period; this may well have influenced the way in which prices are set, at least in the short run. It is therefore worth investigating the possibility that the same relationship has not operated throughout the period 1963-78. These changes are not easy to investigate though, because a change in any one of the coefficients in the equation may well imply effects on others. For example, a change in the foreign price coefficient would be expected to affect the coefficient on ADJ; and a change in the impact effect of the exchange rate might be accompanied by a change in the long-run domestic price coefficient if it reflects a different perception of the sensitivity of sales in the United Kingdom to domestic prices. Clearly, the data may not be able to distinguish between the many complex types of change which might have occurred; we will therefore restrict attention in the first instance to one simple possibility, that price setting behaviour in the fixed exchange rate period prior to 1972Q3 differs from that in the subsequent flexible exchange rate regime.

50 The role of the exchange rate in import price determination was discussed in general terms in paragraphs 16 and 17. The considerations outlined there suggest that flexible exchange rates might lead to different pricing behavour, or at least result in changes to invoicing policy: the prospect of greater movements in the exchange rate, and increased uncertainty about dollar receipts if prices were to be fixed in sterling, should be taken into account by foreign exporters. Separating the two periods might additionally throw some light on other factors, for example the speed of response in the 1970s, and the long-run sensitivity of import prices to domestic prices. As far as the exchange rate is concerned, invoicing considerations might lead one to expect a lower coefficient on ΔER: with greater variability of ER, it is to be expected - given that little attention is apparently paid to UK domestic prices - that the burden of exchange rate uncertainty would be shifted away from foreign exporters by an increased tendency to denominate contracts in dollars. This would lower the extent to which their dollar prices (and therefore receipts) were changed by short-term exchange rate fluctuations.

51 The two equations below record the results of this simple split period test. Finished manufactures were chosen, as it was there that the support for a positive domestic price weight was strongest for the period as a whole.

$$\Delta U78\$ = \underset{(1.8)}{0.21} + \underset{(0.0)}{0.01}\ \Delta PFA\$ - \underset{(3.6)}{0.51}\ \Delta ER$$

$$- \underset{(3.5)}{0.56} U78\$_{-1} + \underset{(3.1)}{0.33} PFA\$_{-1} - \underset{(1.5)}{0.29} ADJ_{-1} + \underset{(0.4)}{0.04} PD4\$_{-1} \qquad (9a)$$

$\bar{R}^2 = 0.487$
SE = 0.014
$e_{-1} = 0.06\ (0.2)$ Estimation period 1963Q3-1972Q2.

$$\Delta U78\$ = \underset{(3.4)}{0.24} + \underset{(6.6)}{0.70}\ \Delta PFA\$ - \underset{(5.8)}{0.43}\ \Delta ER$$

$$- \underset{(4.1)}{0.70} U78\$_{-1} + \underset{(3.4)}{0.44} PFA\$_{-1} - \underset{(2.9)}{0.20} ADJ_{-1} + \underset{(3.7)}{0.29} PD4\$_{-1} \qquad (9b)$$

$\bar{R}^2 = 0.919$
SE = 0.011 Estimation period 1963Q3-1972Q1

Equation 9a is not particularly satisfactory, and could probably be improved upon; however, it can be compared easily with equation 9b in this form. The latter exhibits a long-run domestic price weight of 41.1%, and a sum of long-run price weights of 1.050; the coefficient on ADJ_{-1} is very close to its expected value at -0.45 times the foreign price coefficient. As anticipated, dollar import prices are less sensitive to short-run exchange rate changes in the floating rate period, though not significantly so (this implies that sterling import prices are correspondingly more sensitive). Also noticeable is the much larger immediate effect of foreign prices on UK import prices in the recent period; this, too, is not unexpected. A Chow test of the hypothesis that the relationship has indeed changed between the two periods was carried out and an F statistic of 2.32 was obtained. This is just significant at the 5% level (the critical value is 2.23), confirming that the relationship has not operated unchanged throughout the period. Chart A (on page 31) gives visual confirmation of this: it shows the tracking performance of the three equations for the finished manufactures import UVI. The equations for the part periods broken at 1972Q2/Q3 do seem to perform better than the full period equation, particularly since the 1967 devaluation.

52 This evidence that changes have occurred in pricing behaviour over the period examined, and in particular that the weight given to domestic prices has been higher in the post-1973 world of floating exchange rates than before then, suggests that a further simple test to see whether or not this weight has increased steadily over the period would be useful. Two hypotheses were tested. First, that the ratio of the long-run domestic price weight, a, to its foreign counterpart, b, was a linear function of time: $a/b = K_o+K_1T$; second, that the long-run domestic price weight was linearly dependent on time: $a = L_o+L_1T$. In both cases, the sum of the coefficients on the lagged levels of foreign and domestic prices was constrained to be constant, and the coefficient, c, on the lagged adjustment factor ADJ_{-1} was constrained to follow the same path as that on lagged foreign prices: $c = M_o b$.

53 Surprisingly, maximum likelihood estimates of K_1 and L_1 were found to be completely insignificant, both for the full period and

also for the shorter periods 1969Q1 to 1978Q1 and 1972Q3 to 1978Q1; only over the most recent period was any suggestion of such an effect found, and then it was if anything in the direction opposite to that anticipated, i.e. towards giving a lower weight to domestic prices by 1978 than in 1973. This suggests both that the move towards giving substantial weight to domestic prices was not continuous throughout the full period examined, and also that the long-run domestic price weight of 40% evident in equation 9b does not conceal a steady increase during the last six years. Though a sharp change is unlikely to have occurred, a more plausible explanation to fit this evidence is that a relatively rapid adjustment to a substantial weight occurred during the period, probably in the early 1970s.

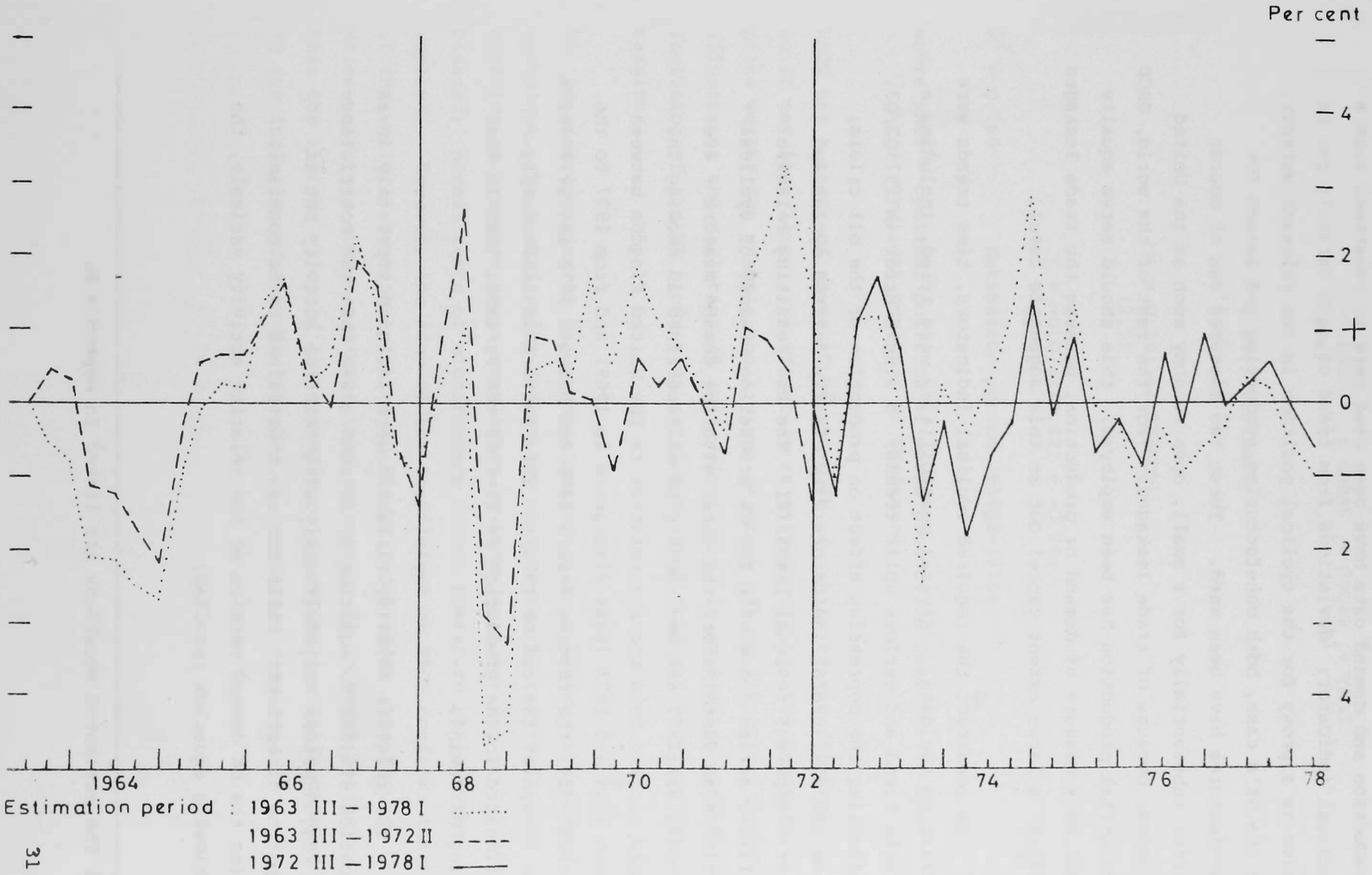
Effects of market conditions

54 None of the equations estimated so far has taken any account of the possibility that market conditions may influence pricing behaviour. This is a difficult possibility to handle, and brings to the surface a problem faced by any model of pricing by firms in imperfectly competitive markets, that pricing decisions cannot correctly be considered separately from quantity decisions: if market conditions affect pricing, this can only be because of some corresponding decision taken on intended sales volume. Single equation estimation techniques are thus somewhat inappropriate for establishing the existence of the possible effect on pricing of market conditions.

55 Nevertheless, it seemed worthwhile to carry out a test of the simple hypothesis that the weight given to UK domestic prices by foreign producers when setting their prices for the UK market might depend on the cyclical position of the United Kingdom relative to the rest of the world. If the UK market is buoyant relative to the rest of the world, foreign producers might be expected to give more weight to UK prices than on average; in other words, they might discriminate more strongly between their typical world prices and their UK prices, in order to extract as much as possible from the relatively buoyant market. Conversely, if world markets are booming relative to the United Kingdom, the foreign producers might have less interest in discriminating between the United Kingdom and other markets: they should be able to secure adequate sales without paying undue attention to inter-market discrimination.

Chart A

Errors in UM78



56 In order to test this suggestion, a variable reflecting conditions in world markets relative to those in the United Kingdom is needed. Production and demand data have been used here to construct such a cyclical indicator: deviations from trend of each variable can be taken as a proxy for the cyclical position in the relevant markets. In the UK's case, both manufacturing production and demand for manufactures have been used. These two measures can of course differ substantially for a small, open economy such as the United Kingdom, because of trade leakages. For the rest of the world, OECD industrial production has been employed; this should serve equally well as a measure of demand or production, because the trade leakages will to a large extent cancel out at this aggregate level.

57 To construct the required cyclical indicators, time trends were fitted to the data. Several possibilities were tried, including a single trend and various split trends; a single break in 1973Q2/Q3, reflecting the depressing effect on production of the oil crisis, gave the most useful indicators with clearly defined cycles and little apparent residual trend.[1] The two resulting relative activity series - one with the UK production measure of cyclical position as denominator, the other with the demand measure - are broadly similar, and can roughly be characterised as showing the world to have been booming relative to the United Kingdom between about 1966 and 1973 (peak divergence in 1969) and from 1977 to the present day, the reverse before 1966 and between 1973 and 1976 (with the trough at the end of 1974). This pattern is less sharply delineated in the production version of the variable than in that using UK demand.

58 The relative activity variables were included separately in an equation similar to equation 9, in such a way that the coefficients on lagged prices varied linearly with relative activity but in opposite directions; their sum was constrained to be constant. Using the UK demand version of the relative activity variable, the following equation resulted:

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[1] The estimated equations are listed in Appendix B.

$$\Delta U78\$ = \underset{(2.7)}{0.11} + \underset{(5.7)}{0.53}\,\Delta PFA\$ - \underset{(6.9)}{0.47}\,\Delta ER$$

$$\underset{(4.4)}{-0.46}U78\$_{-1} + \alpha PFA\$_{-1} + \beta PD4\$_{-1} + \gamma ADJ_{-1}$$

$$\alpha = \underset{(4.0)}{0.32}(1 + \underset{(1.5)}{1.95}RACT)$$

$$\beta = \underset{(2.5)}{0.14}(1 - 4.37RACT)$$

$$\gamma = \underset{(1.8)}{-0.07}(\alpha/0.32) = -0.24\alpha \qquad (10)$$

$\bar{R}^2 = 0.786$ Estimation period 1964Q2-1978Q1

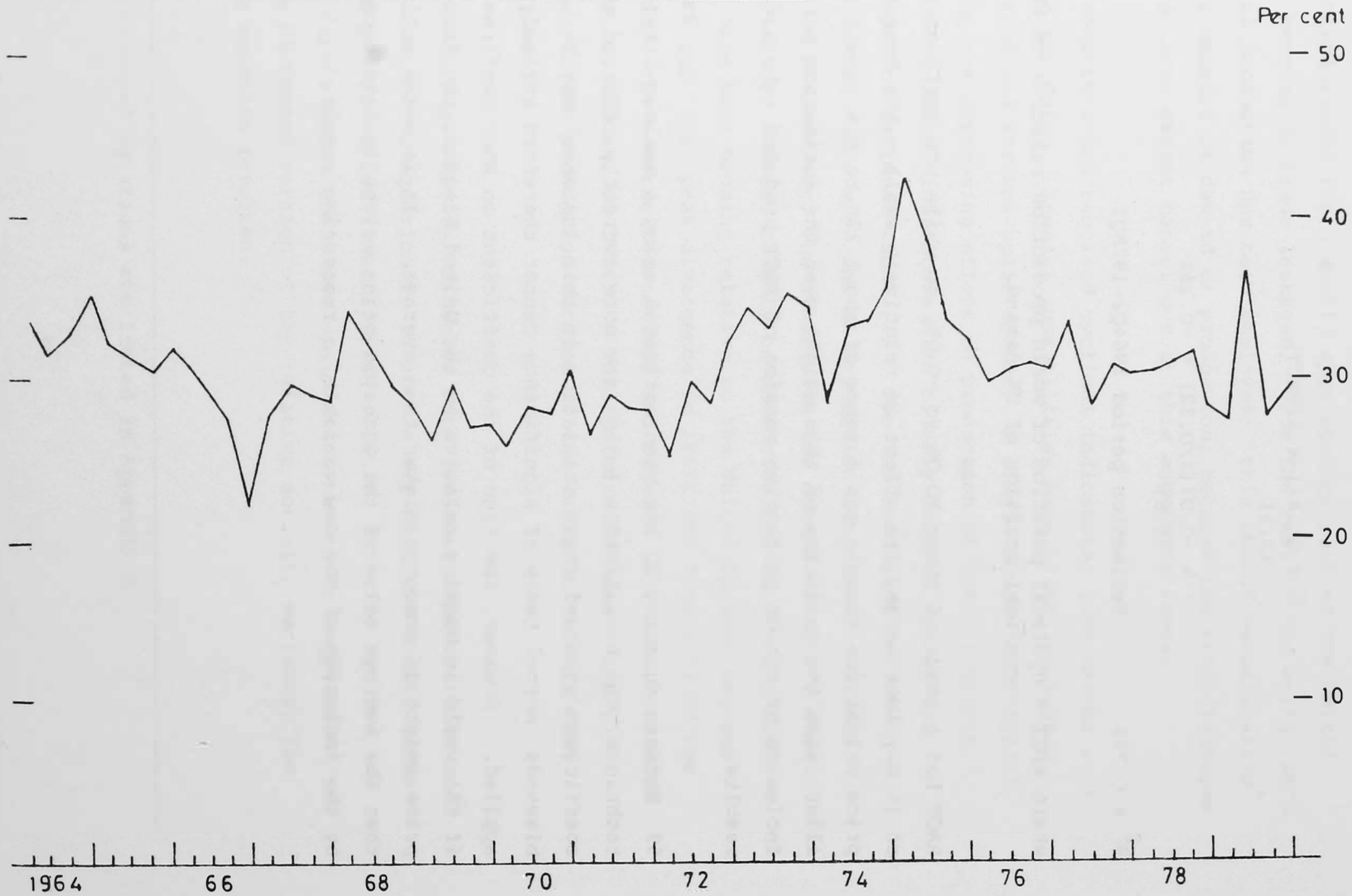
where RACT = cyclical position of world production relative to the cyclical position of UK demand.

RACT has a range of about +0.06 to -0.09, so while the coefficient on it may look large, its effect is relatively small - the domestic price weight for example has a range of about 23% to 41% (Chart B illustrates the variation of this weight over the estimation period). Inclusion of the UK production version of RACT produced very similar results.

59 Because equation 10 has been estimated using a maximum likelihood technique, the t statistics (which are more correctly referred to as coefficient/standard error statistics in this instance) may be biassed; normal tests of significance cannot therefore strictly be applied. However, the sign of the coefficient on RACT confirms that if the world is booming relative to the United Kingdom, the foreign price weight is somewhat higher than average. It is worth noting that the average value of the domestic price weight is little changed by the inclusion of the new variable, a reassuring result.

Chart B

Domestic price weight in UM78$ with relative activity effect



Conclusions

60 The evidence presented in the preceding section suggests that UK import prices, for finished manufacturers at least, are not determined wholly by foreign prices. This evidence is perhaps less strong than might have been expected, given the results of the micro studies noted in the introduction, and probably reflects - at least in part - the effects of aggregation[1] and the associated difficulty of obtaining appropriate price data. This appears to have been true only since the early 1970s, following the abandonment of a fixed exchange rate regime, and coincides with the general acceleration of inflation at the time. There is no conclusive evidence that the weight given to domestic prices has changed over the last few years.

61 The magnitude of the domestic price weight is difficult to establish precisely, in part because the specification of the price variables (in particular, of foreign prices) affects it. However, a weight in the region of 40% for the period 1972 to 1977 can be regarded as a central estimate for finished manufactures; while the short-run effect of the exchange rate differs from that of domestic prices, their eventual long-run effects are not statistically separable. In contrast, no weight appears to be given to domestic prices by foreign exporters when they set prices on semi-manufactures for the UK market.

62 The tracking record over the last two years of an equation for manufactured import prices reflecting these results was discussed in Bond and Brown (1980). This revealed that, though the equation explained a fair proportion of the rise in prices over the period, there was evidence of growing underprediction since the end of 1978; subsequent revisions to relevant world price data, however, have largely eliminated this underprediction. It was pointed out that the exclusion of the long-run domestic price weight resulted in a

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[1] It is possible to construct examples in which the law of one price holds at an aggregate level but not at the level of individual commodities, and vice versa, depending on the match between the composition of the foreign, import and domestic price aggregates.

poorer explanation of the data, and that the gap between the preferred equation and this variant was widening. Though lack of data prevents examination of the recent tracking record of an equation for finished manufactures alone, these results are encouraging, and add further support to the argument that domestic prices do have some influence on UK import prices.

63 The implications of these results can perhaps most relevantly be expressed in terms of the impact they suggest of an exchange rate change on the current account. As was noted in the introduction, a substantial foreign price influence on import prices is a necessary requirement for price competitiveness and the current account to be little affected by the exchange rate; in addition, the more will the exchange rate be able to help to control the rate of inflation, because import prices will adjust by the same amount as the exchange rate. Though a 40% domestic price weight on finished manufactured import prices alone does little to weaken the standard law of one price conclusions with regard to inflation (finished manufactures, after all, comprise only one third of total imports of goods), it does imply that price competitiveness - if only the finished manufactures component - and the current account can indeed be directly affected by the exchange rate.

Appendix 1

Correction of foreign price variable for use in U78$ equation

$$PF58 \equiv \alpha PF78 + (1 - \alpha)PF56 \tag{A1}$$

$$\frac{PF56}{PF78} = \beta\left(\frac{P'56}{P'78}\right)^{\gamma} \tag{A2}$$

$$UM78\$ = \delta PF78^{b}.(\ldots)^{d} \tag{A3}$$

From (2): $PF56 = \beta PF78(.)^{\gamma}$

So (1): $PF58 = \alpha PF78 + (1 - \alpha)\ PF78(.)^{\gamma}$

$= \alpha PF78[1 + A(.)^{\gamma}]$

where $A = \beta\left(\frac{1 - \alpha}{\alpha}\right)$

Thus: $PF78 = \alpha^{-1}.PF58\ [1 + B]^{-1}$

where $B = A(.)^{\gamma}$

So (3): $UM78\$ = \delta\alpha^{-b}.PF78^{b}[1 + B]^{-b}.(\ldots)^{d}$

$= \delta\alpha^{-b}.PF58^{b}[1 + B' + B - B']^{-b}.(\ldots)^{d}$ (A4)

where B' is a typical value of B

$$= \delta\alpha^{-b}.(1 + B')^{-b}.PF58^{b}\left[1 + \frac{B - B'}{1 + B'}\right]^{-b}.(\ldots)^{d}$$

Now assume that $\frac{B - B'}{1 + B'}$ is small, and take logs:

$$\ln UM78\$ = \ln\delta - b\ln\alpha - b\ln(1 + B') + b\ln PF58 - b\frac{B - B'}{1 + B'} + d\ln(\ldots)$$

$$= K + b\ln PF58 - b\left[\frac{A}{1 + B'}\right](.)^{\gamma} + d\ln(\ldots) \tag{A5}$$

But: $(.)^{\gamma} = \left[1 + \left(\frac{P'56}{P'78} - 1\right)\right]^{\gamma}$

Assuming that $\frac{P'56}{P'78} - 1$ is small, we therefore have:

$$(.)^{\gamma} = (1 - \gamma) + \gamma\left(\frac{P'56}{P'78}\right) \qquad \text{(A6)}$$

So: $\ln UM78\$ = K + b\ln PF58$

$$- \frac{bA.(1 - \gamma)}{(1 + B')}$$

$$- \left(\frac{bA.\gamma}{1 + B'}\right)\left(\frac{P'56}{P'78}\right)$$

$$+ d\ln(...)$$

$$= a + b\ln PF58 + c\left(\frac{P'56}{P'78}\right) + d\ln(...)$$

$$\text{where } c = -b\left[\frac{(1 - \alpha)\beta\gamma}{\alpha(1 + B')}\right]$$

In the equations above: PF : foreign export unit value index;

P' : proxy for PF; and

UM : UK import unit value index.

Appendix 2

Cyclical deviations of production and demand from trend

The selected equations used to calculate cyclical deviations from trend were as follows.

For the world

$$\ln WIP = \underset{(417.1)}{4.07} + \underset{(38.9)}{0.0137}\ T1 - \underset{(9.9)}{0.0083}\ T2 \qquad (B1)$$

SE = 0.033 Estimation period 1963Q1-1980Q1.

Where WIP = OECD industrial production (1975=100);

T1 = time trend starting in 1963Q1;

T2 = time trend starting in 1973Q3.

For the UK

$$\ln MPRO = \underset{(931.9)}{8.53} + \underset{(21.1)}{0.0070}\ T1 - \underset{(10.5)}{0.0082}\ T2 \qquad (B2)$$

SE = 0.031 Estimation period 1963Q1-1980Q1.

Where MPRO = manufacturing production (£ millions, 1975 prices).

$$\ln MND = \underset{(805.4)}{8.96} + \underset{(22.2)}{0.0086}\ T1 - \underset{(6.8)}{0.0057}\ T2 \qquad (B3)$$

SE = 0.031 Estimation period 1964Q1-1980Q2.

Where MND = demand for manufactures (£ millions, 1975 prices).

Deviations from trend are defined as, for example:

$$DWIP \equiv EXP\ (\ln WIP - 4.07 - 0.0137\ T1 + 0.0083\ T2)$$

and so are based on unity. The relative deviation from trend variable RACT is defined as:

$$RACT \equiv \left(\frac{DWIP}{DMND}\right) - 1$$

and so is zero when the world and the United Kingdom are equally distant from trend.

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