

Tradable and non-tradable prices in the United Kingdom and the European Community

Rates of inflation tend to vary among sectors of the economy. In the United Kingdom, annual retail price inflation has, on average, been some two percentage points lower in the goods sector than in the services sector since the early 1980s. This gap, which largely reflects differing rates of productivity growth and the effects of overseas competition, has widened since 1990. This article⁽¹⁾ analyses the UK data on retail price inflation in the goods and services sectors, and attempts to explain their behaviour. It also briefly outlines the experience in other EC countries.

The main points are:

- *Since late 1990, the difference between goods and services sector inflation has increased, with goods price inflation slowing much more sharply than services price inflation.*
- *Much of the underlying divergence reflects continuing faster productivity gains in manufacturing.*
- *But unusually heavy price discounting in the 'sales' has been an important factor, together with overseas competition which has generated significant downward pressure on tradable prices, reflecting the strong exchange rate associated with ERM membership.*
- *Sectoral inflation rates have diverged in many other EC countries over the last decade, especially in Italy and Spain, but less so in Germany and France than in the United Kingdom.*

Introduction

Differing inflation rates in the goods and services sectors are often ascribed to the greater degree of competition in the goods sector and to other factors such as differences in productivity growth, the extent to which prices are subject to government control and changes in consumer preferences. Inflexible labour markets, reflected in high average rates of unemployment, and public corporations which dominate important industries and which face limited competition, are also features of many EC countries. These structural factors may tend to reduce price flexibility and the responsiveness to disinflationary policies, especially in the services sector. But it seems unlikely that on their own they are sufficiently powerful to cause a large gap between sectoral inflation rates. The evidence from the United Kingdom and other major European economies suggests that significant divergence is most likely to occur when domestic inflationary pressures are strong, but tradable prices are constrained by foreign competition. So periods of poor or deteriorating international competitiveness have often been associated with large divergences in sectoral prices.

It may be no coincidence therefore that those ERM currencies which had a level of competitiveness which may have concerned the markets and which depreciated in mid-September 1992, had substantial divergences between inflation rates in the tradable and non-tradable sectors.

If these divergences were solely close proxies for international competitiveness they would mainly be of interest for the information which they convey on the inflation process itself. But they have an additional significance in that price-based indicators of international competitiveness can mask the changes in internal relative prices which may be forced on producers of tradable goods and services to maintain market shares. These changes may encourage resources to move away from the tradable sector.

The RPI data on goods and services are first presented and then analysed. Their relationship with other macroeconomic variables and the results of econometric work designed to explain their behaviour are then discussed. Finally, the experience in other major EC countries is briefly outlined to put UK developments in their context.

Tradable and non-tradable prices in the United Kingdom

The terms 'tradable' and 'non-sheltered', and 'non-tradable' and 'sheltered' can be used synonymously, although for clarity 'tradable' and 'non-tradable' are preferred here. Like the parallel concept of market contestability used in the industrial organisation literature, tradability is essentially a potential concept—is the good or service capable of being traded given market conditions? It thus relates to such economic concepts as market structure and to characteristics

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such as transport and selling costs rather than physical attributes. In principle at least, tradable and non-tradable correspond only broadly to goods and services.

For practical purposes the RPI provides the best source of data on tradable and non-tradable prices. Of the other sources, the producer price index covers only the manufacturing sector, while value-added deflators are available at a broad level of disaggregation and on an annual basis only.⁽¹⁾ By using detailed RPI sub-indices it is possible to construct some alternative definitions of tradable and non-tradable prices within the framework of the RPI. These are set out in Table A.

Table A
Alternative definitions of tradable and non-tradable prices in the RPI^(a)

Goods and services		Services	
Goods		Services	
Seasonal food	22	Catering	47
Non-seasonal food	130	Housing repairs	9
Alcoholic drink	80	Leisure services	32
Tobacco	36	Household services	48
Household goods	77	Personal services	12
Clothing, footwear	59	Motor vehicle maintenance	21
Chemists' goods	17	Vehicle tax and insurance	22
Purchase of motor vehicles	67	Fares and other travel costs	20
Petrol	33	Fuel and light	47
Leisure goods	47	Rent	35
DIY materials	16	Water charges	9
Total weight in index	584	Total weight in index	302
	<i>65.9</i>		<i>34.1</i>
Set A			
Tradable	As goods but excludes seasonal foods and excise tax on alcoholic drink and tobacco.		
Total weight in index			531
			<i>67.3</i>
Non-tradable	As services but excludes rent and water charges.		
Total weight in index			258
			<i>32.7</i>
Set B			
Tradable	As goods but excludes all food, drink and tobacco.		
Total weight in index			316
			<i>40.0</i>
Non-tradable	As services but includes alcoholic drink and tobacco excluding tax and non-seasonal foods; excludes rent and water charges.		
Total weight in index			473
			<i>60.0</i>

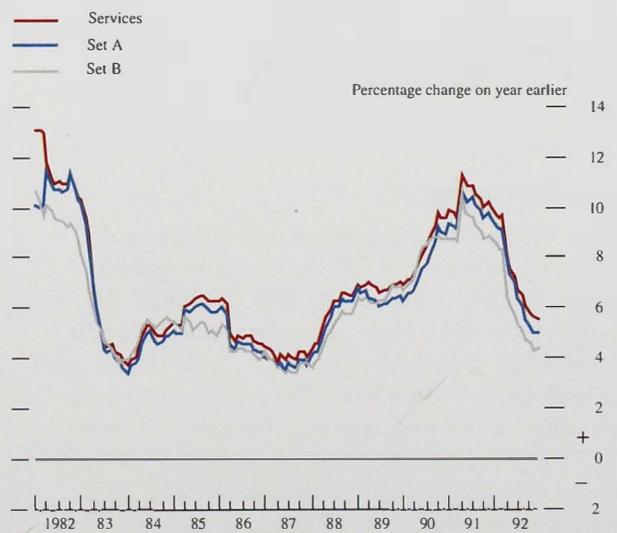
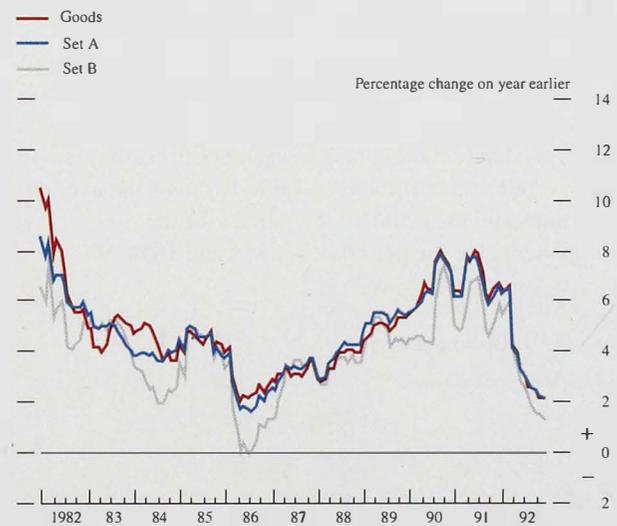
(a) Figures are the weights per 1,000 in 1992; figures in italics are percentages of goods and services or tradable and non-tradable prices.

The 'goods and services' definition classifies the sub-components of the RPI according to physical characteristics. The coverage is almost the same as that of the RPI excluding mortgage interest payments and rates and the community charge.⁽²⁾ The classification shown under Set A attempts to focus on underlying prices by excluding the main items which are subject to administrative or seasonal effects. This reduces the coverage by a further eleven percentage points. In other respects the classification of the

RPI sub-components is the same as in the 'goods and services' definition. Set B treats non-seasonal food, alcoholic drink and tobacco as non-tradable, a judgement based on import penetration well below the average for manufacturing.⁽³⁾ Under classification A tradables account for 67% of the total, whereas under definition B they account for 40%. These series have been calculated back to 1974.

The effect of these changes in coverage and definition on inflation rates over the last ten years or so can be seen in Charts 1(a) and (b). In Chart 1(a) the alternative measures of tradables are shown, and in Chart 1(b) non-tradables. Comparing the goods line in Chart 1(a), and the services line in Chart 1(b), with Set A illustrates how differences in

Charts 1a and 1b
Alternative measures of tradable and non-tradable price inflation



See Table A for definitions.

(1) Direct comparisons of the RPI with other price indices, eg producer prices, are liable to be misleading because of the different methods of construction. The RPI is a chain-linked Laspeyres, with annual re-weighting; producer prices indices are also Laspeyres but re-weighted every five years.
 (2) Personal articles have also been omitted since the series only starts in 1987.
 (3) The following figures give imports as a percentage of home demand for 1988, the last year for which these figures were available:

Food	Drink	Tobacco	(Food, drink, tobacco)	Total manufacturing
16	26	7	(16)	35

Source: Business Monitor MQ12.

coverage affect sectoral inflation rates; and comparing lines A and B shows the effect of altering the boundary between tradables and non-tradables. Generally, removing the tax and seasonal components leaves the rate of inflation virtually unchanged in the tradable sector but reduces it a little in the non-tradable sector. Comparison of Sets A and B shows that for much of the period inflation in the tradable sector is lower when food, alcoholic drink and tobacco are excluded as in Set B.

The divergence between tradable and non-tradable prices is brought out clearly in Chart 2, which shows the respective sectoral rates of inflation since 1982 alongside the corresponding aggregate. All the definitions highlight the tendency for inflation rates in the non-tradable sector to be above those in the tradable sector. Only in 1983 was the reverse the case.

Despite a lower average rate of inflation the tradable sector has a slightly greater dispersion among the individual sub-components than the non-tradable sector. Thus in ten of the sixteen years from 1976 to 1991 the standard deviation was higher for tradables than non-tradables. However, there was also a tendency for dispersion within both sectors to rise with the overall rate of inflation. Table B shows the average inflation rates and the standard deviations for the sub-components for the periods 1975-83 and 1984-92.

Table B
Average inflation rates^(a)

Average annual percentage increase

	Tradable	Non-tradable	Total
1975-83	12.5 (4.7)	15.6 (4.5)	13.4 (5.3)
1984-92	4.5 (2.7)	6.1 (2.3)	5.0 (2.8)
1975-92	8.5 (3.7)	10.9 (3.4)	9.2 (4.0)

(a) Figures in brackets are the averages of the annual standard deviations of the 10 tradable and 9 non-tradable sub-components shown in Table C for the period 1975-83 and 1984-92.

Recent developments

As Chart 3 shows, the gap between non-tradable and tradable price inflation has followed a regular pattern, peaking in 1980-81, 1982, 1984, 1986, 1988 and 1991-92, that is about every two years. These movements appear unrelated to the general economic cycle, which had a much longer periodicity in the 1980s. The gap has often been largest when the real exchange rate is at a peak, as was the case in 1980-81, 1988 and 1991-92. In 1986 it was associated with the fall in oil prices, which had a disproportionate effect on tradable prices.

The divergence between goods and services price inflation in 1992 was, at about 3-4 percentage points, rather above that in 1986 and 1988, but below the 1982 level. It does not therefore appear to be out of line with the experience of the previous ten years, as Chart 3 shows. For the other classifications the same broadly applies.

Chart 2
Tradable and non-tradable price inflation

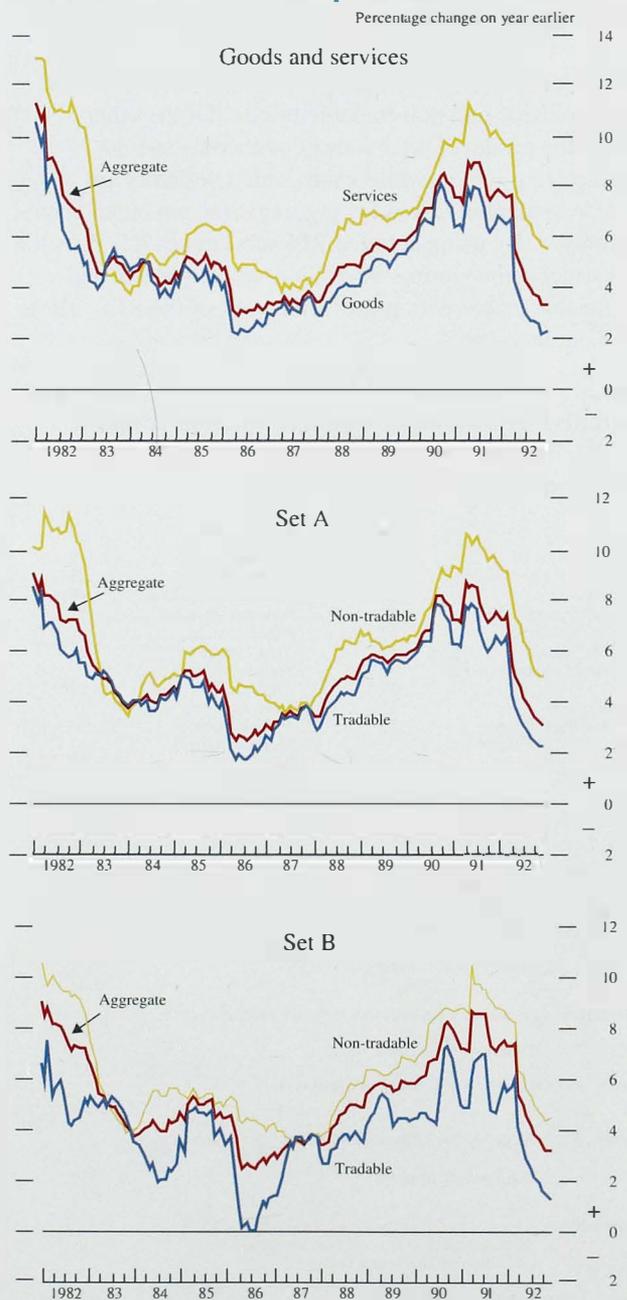
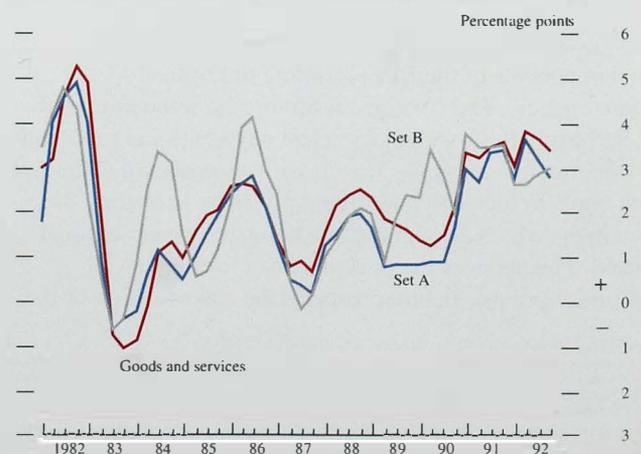


Chart 3
Differences in tradable and non-tradable inflation^(a)



(a) Difference measured as non-tradable inflation rate minus tradable inflation rate.

To help understand how the change in relative prices has come about since 1989 or 1990, when the gaps in inflation rates were last at a low level, it is helpful to look at the behaviour of individual sub-components of the RPI. This is done in Table C and Chart 4.

Table C
Sub-indices of the RPI: inflation rates

	December 1989	December 1990	December 1991	June 1992	December 1992
Percentage changes on year earlier					
Tradables(a)					
Non-seasonal food	7.2	6.5	4.4	3.1	2.7
Alcoholic drink excluding tax	7.9	12.4	11.0	4.6	4.1
Tobacco less tax	4.4	9.0	18.2	8.1	8.0
Household goods	4.0	5.6	6.4	2.6	2.1
Clothing/footwear	4.9	4.8	2.8	0.3	-1.1
Motor vehicle purchase	0.2	3.7	7.8	6.6	-1.6
Petrol	7.2	13.8	6.7	1.2	6.5
Leisure goods	4.8	4.6	4.1	2.6	1.5
Chemists' goods	8.1	9.5	8.8	6.2	4.9
DIY materials	5.9	9.5	9.7	—	2.4
Tradable total(a)	5.5	7.1	6.6	3.3	2.2
Non-tradables(a)					
Vehicle tax and insurance	5.9	5.7	15.3	20.8	15.3
Catering	6.9	9.4	9.4	5.7	5.2
Fuel and light	5.7	9.5	6.2	2.1	-0.5
Household services	5.9	7.6	7.3	5.9	3.8
Housing repairs	7.4	8.8	10.3	5.5	3.0
Motor vehicle maintenance	6.7	12.1	11.5	8.0	6.0
Fares, travel costs	6.8	7.8	9.4	6.2	5.5
Leisure services	6.0	9.5	11.6	8.1	5.9
Personal services	11.9	9.7	14.3	11.3	8.7
Non-tradable total(a)	6.5	8.9	9.6	7.0	5.0
Total tradable plus non-tradable	5.8	7.7	7.5	4.5	3.1
All items	7.7	9.3	4.5	3.9	2.6

(a) Set A definition.

Chart 4
Tradable and non-tradable RPI

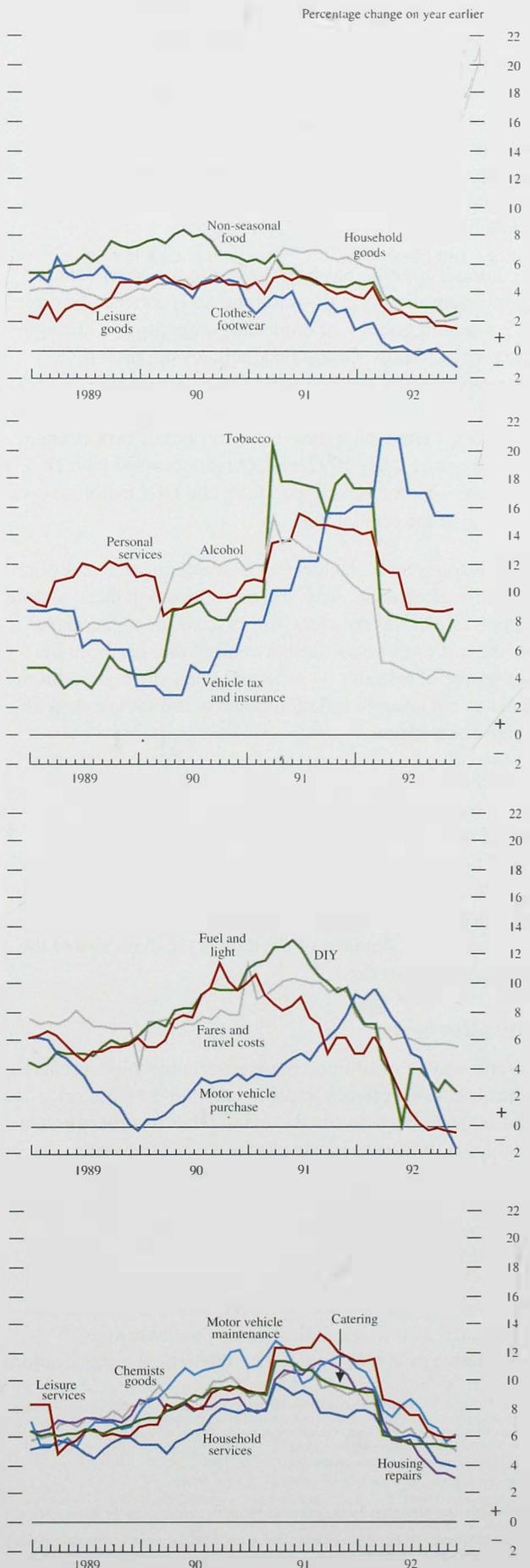


Chart 4 shows recent inflation rates for the individual price series, grouped into four categories:

- (i) below average inflation throughout: household goods (includes electrical goods), leisure goods (consumer electronics), clothing and footwear, non-seasonal foods;
- (ii) strong early contribution to the rise in aggregate inflation, and lagging the inflation slowdown from early 1991: alcoholic drink, tobacco (both inclusive and exclusive of tax), vehicle tax and insurance and personal services. Petrol prices (not shown) also rose sharply at the end of 1990;
- (iii) lagging the rise in aggregate inflation, peaking at or above the average in late 1990 and early 1991 and strong subsequent disinflation: motor vehicle purchase (proxied by used car prices), DIY materials, fuel and light, fares and travel costs;
- (iv) lagging the rise in aggregate inflation, limited disinflation in 1991 and 1992: leisure services (TV licences, entertainment, etc); household services (includes postage, telephones, fees and subscriptions), catering, and chemists' goods.

It is noticeable that in groups (ii) and (iv), where inflation has been fastest to rise and slowest to abate, foreign competition tends to be limited. In group (iv) the services sectors predominate. In some of these, where domestic competition is strong—catering, personal services (hairdressing etc) and motor vehicle maintenance—productivity growth is thought to be below average. In other components of groups (ii) and (iv), either domestic supply is concentrated—household services such as postage, telephones, tobacco—or prices are administered—TV and vehicle licences.

By contrast, inflation has been lowest in group (i), where import penetration is high—clothing and footwear, leisure and household goods—or domestic competition is strong—non-seasonal foods. Group (iii) includes important sub-components of the RPI where retail prices are influenced by the regulators of privatised industries (fuel and light, fares). Here there have been substantial reductions, especially since early 1992, reflecting depressed market conditions—motor vehicle purchase and DIY materials—or the action of the regulators.

Other sector-specific factors, for example income and price elasticities of demand, may also be reflected in these sectoral inflation rates. Nevertheless, this discussion suggests that over the last three years foreign competition has been the most powerful restraint on inflation: domestic competition alone has not brought inflation down to the same extent as foreign competition.

The RPI data show, then, that inflation in the non-tradable sectors has on average been higher than for tradables for most of the time since 1974; that over the last two years disinflation in the tradable sector has been more rapid, albeit from a lower level; and that there is a cyclical pattern to the differences in inflation rates between the two sectors. Explaining these features of the data is the main aim of the following three sections.

Causality tests

A useful way of examining the inter-relationships, especially in the short run, between tradable and non-tradable price inflation and also between these and other macroeconomic variables is the Granger causality test.⁽¹⁾ These were conducted on tradable and non-tradable prices separately, and also on a specially constructed variable, the price wedge, which measures their relative price as the price of non-tradables less tradables.⁽²⁾

The choice of which macroeconomic variables should be investigated as possible influences on tradable and non-tradable prices was guided by theoretical considerations

Table D
Granger causality tests

	Tradable prices	Non-tradable prices	Price wedge
(i) Non-tradable prices	X	—	X
(ii) Tradable prices	—	§	§
(iii) Whole economy average earnings	NT	§	§
(iv) Manufacturing earnings	X	NT	NT
(v) Whole economy productivity	NT	§	NT(a)
(vi) Manufacturing productivity	X	NT	NT(a)
(vii) Non-manufacturing productivity	NT	X	NT(a)
(viii) Unit labour costs in manufacturing	§	§	‡
(ix) Input prices	§	§	X
(x) Import prices of non-oil goods	‡	§	X
(xi) Import prices of manufactures	X	X	X
(xii) Capacity utilisation (residual measure)(b)	NT	§	‡
(xiii) Capacity utilisation (CBI measure)	§	X	§
(xiv) Competitiveness(c)	X	X	X
(xv) Effective exchange rate	X	X	X
(xvi) Sterling/DM exchange rate	X	X	X
(xvii) Real short-term interest rates	‡	X	X
(xviii) Nominal short-term interest rates	X	§	X
(xix) PSBR ratio	X	X	X

Key:

NT denotes not tested.

§ Granger-causes at 95% level.

‡ Granger-causes at 90% level.

X Does not Granger-cause.

(a) For the price wedge the difference in productivity growth between non-manufacturing and manufacturing productivity was tested and found not to Granger-cause the price wedge.

(b) Taken as the difference between trend and actual GDP.

(c) Measured by relative unit labour costs.

Set B definition; estimation period 1975–91.

and earlier work with aggregate retail prices, Rowlett (1988) for example. For non-tradable prices, labour costs, input prices of materials and fuels and import prices represent the main cost elements determining prices; capacity utilisation and variables reflecting policy such as interest rates and the PSBR ratio may also have an influence on the size of the mark-up over costs. Conceptually, the same variables may influence tradable prices, but variables which relate specifically to the manufacturing sector were investigated where possible. The exchange rate, international competitiveness and competing import prices were also expected to Granger-cause tradable prices.

The results of these tests are summarised in Table D, where the variables listed on the left hand side may Granger-cause those referred to in the column headings. Listed below are some of the more important results.

- There is evidence that tradable prices Granger-cause non-tradable prices. This is an interesting result since it suggests that UK domestic inflation is influenced by shocks transmitted from overseas via tradable prices, at least in the short run.
- The prices of imports of non-oil goods and producer input prices were found to Granger-cause tradable prices, as

(1) The essential idea is to regress a particular variable, for example non-tradable prices, on lagged values of itself and another possibly causal variable, for example tradable prices. A further equation is then estimated with this second variable replacing the first as the dependent variable. The second variable 'Granger-causes' the first when it is significant in the first regression, but the first variable is insignificant in the second equation. Where each is significant in both equations Granger-causality is not established, Granger and Newbold (1977).

For present purposes equations of the form:

$$\Delta x = k + \Delta x_{-1} + \dots + \Delta x_{-4} + \Delta y_{-1} + \dots + \Delta y_{-4}$$

were estimated, where Δx is a price series and Δy is a potential causal variable. Quarterly data were used and the regressors were specified in first differences to reduce the likelihood of spurious results owing to common trends. Tests for the exclusion of the Δy s were then conducted. Where the exclusion restriction was significant the regression was re-estimated with Δy as the dependent variable.

(2) This is defined as the log of non-tradable prices minus the log of tradable prices expressed as an index with 1974=100. If, for example, this has a value of 110 in 1985, this would be the result of non-tradable prices being 10 per cent above tradable prices. The annual percentage change in this index is shown as the solid line in Chart 3.

expected, but also non-tradable prices. This may suggest that inflation shocks from overseas from oil and other commodity prices are being reflected here. Import prices of manufactures, international competitiveness as measured by relative unit labour costs, and the exchange rate were found not to Granger-cause tradable prices.

- As expected, labour cost variables were found to Granger-cause all three price variables.
- Capacity utilisation variables, the CBI measure for tradables and a residual from trend for non-tradables, were found to Granger-cause tradable and non-tradable prices and the price wedge.
- Of the policy variables tested, nominal short rates were found to Granger-cause non-tradable prices only, while real interest rates Granger-caused tradable prices only.

These results are generally in line with expectations; but the failure of competing import prices and competitiveness to cause tradable prices is surprising. The results of the analysis discussed in the next section shed some light on why this is.

Estimation results

Separate econometric equations for tradable and non-tradable prices and the price wedge were estimated so as to establish their long-run determinants and to see whether the systematic divergences between the two sectors could be adequately explained by macroeconomic variables.

The basic underlying assumption is that prices are determined as a mark-up over the costs of labour and bought-in materials. This mark-up is assumed to vary with the degree of competitive pressure, both from overseas, as reflected in the price of competing imports or competitiveness, and in the domestic market, as reflected in capacity utilisation and the tightness of monetary policy (interest rates). A two-stage estimation procedure was adopted, with the residuals from first stage estimates of the long-run cointegrating vector used as an error correction term in the second stage dynamic equation. Details of preferred equations estimated over the period 1976 to 1991 with quarterly data are given in the annex. Estimates using Set B data are reported, but broadly similar ones were obtained with Set A.

A number of alternative cointegrating vectors and dynamic equations were estimated for each of the three price variables. For both tradable and non-tradable prices, wage costs were found to be an important determinant in the long run, with a coefficient close to unity for non-tradables and between 0.5 and 0.9 for tradables. Prices of bought-in materials and fuels were also found to have a long-run effect in both sectors. In addition competing import prices or competitiveness (relative unit labour costs) cointegrate with tradable prices. Capacity utilisation, but not real interest rates, was found to have significant dynamic effects on

tradable prices, but this was more difficult to establish in estimates of non-tradable prices.

The estimated long-run cointegrating vectors for the price wedge showed that the difference in productivity growth between the non-manufacturing and manufacturing sectors—proxying productivity in non-tradable and tradable sectors—had a positive effect with a coefficient of about 0.1. Earlier studies have explained the large differences in prices in the tradable and non-tradable sectors in fast growing countries mainly in terms of sectoral productivity growth rates, see Falvey and Gemmell (1991).

It is clear, however, that there are also other important influences at work in the United Kingdom. The estimates imply that a deterioration in UK competitiveness, or a reduction in competing import prices, increases the price wedge in the long run, as downward pressure is placed on tradable prices relative to non-tradables. Lower input prices, such as might be expected to accompany a rise in the exchange rate, also raise the price wedge. A tendency for the price wedge to rise with either average earnings or total retail prices was also found, providing further confirmation of weaker competitive pressures in the non-tradable sector.

One implication of these estimates is that the United Kingdom's membership of the ERM, in so far as it led to an exchange rate higher than it would otherwise have been, may have contributed to the rise in the price wedge over the last two years, by restraining the growth of input prices and by placing upward pressure on competitiveness. It may also be inferred on the basis of past experience that the recent fall in the exchange rate will raise prices of inputs and competing imports and improve competitiveness compared with what they would otherwise have been. Together with the reduction in real interest rates, these factors will tend over time to reduce the price wedge.

Forecast tests

The preferred equations for each of the price variables were re-estimated to the beginning of 1990 and used to forecast to the second quarter of 1992, using actual values of the explanatory variables. In all cases the equations failed formal prediction tests. The forecast errors for the price wedge show that it grew by more than would be expected on the basis of earlier experience. One possible explanation of this result is that the United Kingdom's membership of the ERM, by leading price-setters to expect that the exchange rate would remain fixed, caused a change in behaviour in the tradable sector, with prices being set lower than they would otherwise have been.

But particularly large negative forecast errors were found for tradable prices in the first quarters of both 1991 and 1992. An examination of seasonal factors in the data shows that there was exceptionally strong discounting by retailers of household goods and clothing and footwear in the January 'sales' in those years, large enough to affect the total

Table E
CPI inflation in non-tradable and tradable sectors:^(a) OECD data

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Average
Germany													
Non-tradable	4.2	6.1	6.0	4.6	2.3	2.9	2.5	1.9	3.0	2.5	2.7	3.2	3.5
Tradable	6.3	6.3	3.7	3.1	2.3	2.1	-0.8	0.9	1.1	2.8	2.1	3.4	2.8
All-items	5.6	6.3	5.3	3.3	2.4	2.2	-0.1	0.2	1.3	2.8	2.7	3.5	3.0
France													
Non-tradable	12.8	13.1	11.3	10.8	6.3	5.6	4.2	5.5	4.2	3.0	3.2	3.6	7.0
Tradable	13.1	10.4	9.9	8.8	7.4	5.3	6.6	3.9	2.5	2.2	1.7	2.6	6.2
All-items	13.5	13.3	12.0	9.5	7.7	5.8	2.6	3.3	2.7	3.5	3.4	3.1	6.7
Italy													
Non-tradable	20.6	21.9	18.2	15.6	12.1	11.5	11.9	6.4	6.9	8.1	5.4	7.1	12.2
Tradable	26.7	17.2	16.8	13.1	10.1	8.5	4.4	5.1	5.1	5.2	5.9	5.7	10.3
All-items	21.2	19.5	16.5	14.7	10.8	9.2	5.8	2.6	3.3	2.7	3.5	3.4	3.1
Spain													
Non-tradable	17.2	15.5	16.1	13.3	11.0	9.3	11.3	7.7	7.7	9.0	9.1	10.2	11.0
Tradable ^(b)	—	14.0	13.6	12.7	10.2	8.5	7.4	5.4	5.0	5.8	6.0	6.2	8.9
All-items	15.6	14.5	14.4	12.2	11.3	8.8	8.8	5.3	4.8	6.8	6.7	5.9	9.6

Source: OECD.

(a) Non-tradable sector is CPI for services less rents; tradable sector is CPI for goods less food, fuel and light. The all-items CPI includes food etc and is therefore not equal to the weighted sum of the goods and services definitions used here.

(b) Tradable sector CPI is goods less fuel and light.

tradable price series.⁽¹⁾ This is in addition to any effects that may have resulted from UK membership of the ERM.

European experience

The main European countries have also experienced trend changes in the relative price of tradables and non-tradables, but in a way which differs interestingly between countries. Germany and France have seen only a small divergence since 1980, while Spain and, in particular, Italy have seen a substantial trend change in relative prices. The United Kingdom represents an intermediate case.

Detailed disaggregated consumer price data are not readily available for the main European countries. However, the OECD provides disaggregated national CPIs on a quarterly basis, derived from national sources. From these the component 'all goods less food, fuel and electricity' has been constructed and used as an indicator of traded goods prices.⁽²⁾ Non-tradable prices are proxied by the component 'services less rents'. These data are presented in Chart 5 (page 87) in levels terms, and in Table E and Chart 6 (page 88) in inflation rate terms.

Some points to emerge from Table E and the associated charts are:

- There was a steady rise between 1986 and 1991 in the inflation rate in the tradable sector in *Germany*. This occurred despite the real appreciation of the deutschmark which, other things being equal, would have led to a fall in the relative price of tradables. In 1992 inflation in the non-tradable sector moved ahead sharply, reflecting its relative buoyancy.
- The data for *France* suggest that falling inflation in the tradable sector after 1986 was associated with a smaller, lagged reduction in inflation in the non-tradable sector.
- Since 1986 inflation in the tradable sector in *Italy* has remained between 5% and 6%. This appears to have

been sufficient to put some downward pressure on inflation in the non-tradable sector, which fell sharply in 1987, but has since averaged about 7%.

- In *Spain*, before 1986 there was little change in relative prices. Since 1987 a gradual rise in inflation in the non-tradable sector has occurred, while inflation in the tradable sector has remained relatively subdued at around 5% to 6%.

These data suggest that changes in inflation rates in the tradable sector have a strong influence on inflation in the non-tradable sector; while the absolute size of the gap may be less important. Granger causality tests confirm this. For Germany, France and Italy price inflation of 'goods less fuel' was found to Granger-cause services prices inflation for the period 1979–91 and, in Germany and Italy, for the whole period from the mid-1960s. Only for Spain was no such causality found, probably reflecting the absence of any trend change in relative prices before about 1985. These results suggest that, as in the United Kingdom, international competitiveness and other external influences on tradable prices have affected non-tradable prices, and hence have an important influence on the overall level of domestic prices. Moreover, this appears to be the case whether exchange rates are floating, as in the second half of the 1970s, or more fixed as under the ERM from 1987.

In practice, the importance of these external influences depends on the degree to which domestic inflationary pressures are out of line with those in competitor countries, and the strength of the links between tradable and non-tradable prices. An analysis of these relationships in Melliss (forthcoming) suggests that those countries where the divergence between non-tradable and tradable prices has been greatest over the last ten years (Italy and Spain) have also seen a loss of competitiveness as measured by relative unit labour costs. Furthermore, these countries have placed considerable emphasis on tight monetary policy coupled with ERM membership to encourage inflation convergence.

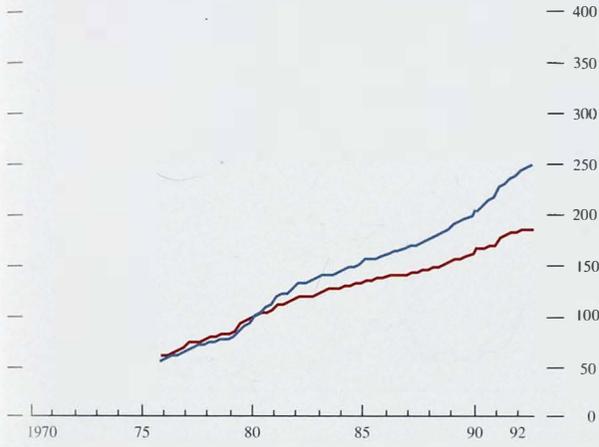
(1) The VAT rise in April 1991 appears to have reduced the price wedge in the 1991Q2.

(2) The OECD publish indices for the CPI for all goods less food and CPI for fuel separately. The further disaggregation used here has been calculated using 1985 weights.

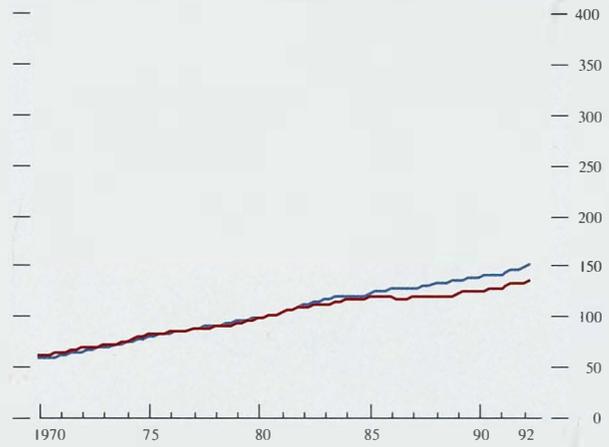
Chart 5
Consumer prices: goods and services

— Consumer price of goods 1980=100
— Consumer price of services 1980=100

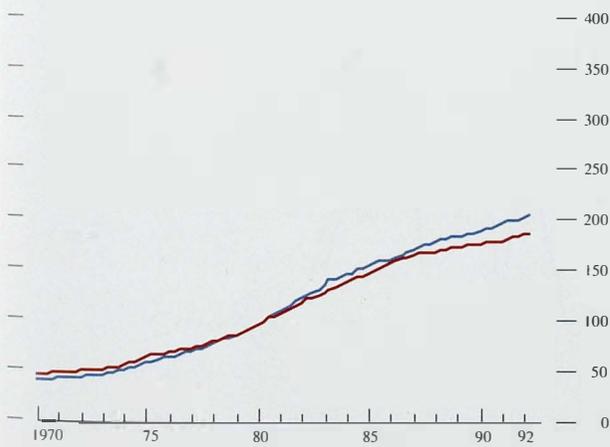
United Kingdom



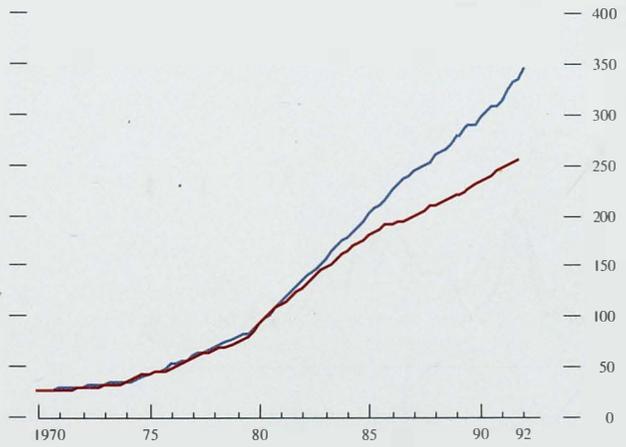
Germany



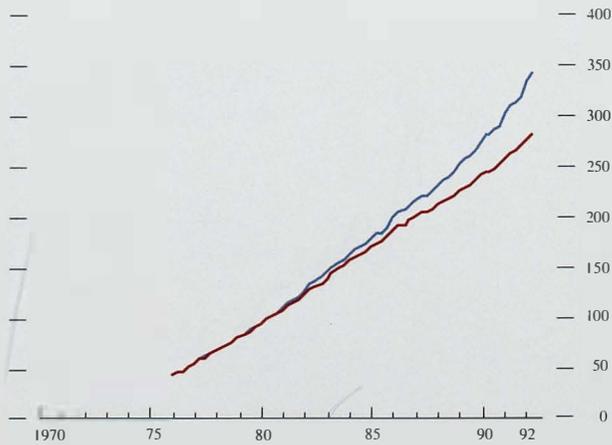
France



Italy



Spain



Sources: United Kingdom—see Table A for definition; other countries—OECD.
France, Germany and Italy—goods less food and fuel, services less total.
Spain—all items less food and fuel, services less rent.

Chart 6
Consumer price inflation: goods and services

— Percentage change in price of goods less food and fuel on year earlier
 — Percentage change in price of services less rent on year earlier



Sources: as for Chart 5.

By contrast, France, since about 1985, has seen little or no deterioration in competitiveness, only a slight divergence of non-tradable and tradable prices, and has relied on a tight overall stance of policy.

Conclusions

Data on retail and consumer prices show a systematic tendency for inflation rates to be on average higher in the non-tradable than tradable sectors in the United Kingdom, Italy, Spain and to a lesser extent France and Germany. In the United Kingdom, lower productivity growth in the non-tradable sector may account for about one third of the higher inflation rate, which on average has been about 2% higher since 1983. But other factors have also been important. In 1989, the difference in inflation rates in the tradable and non-tradable sectors was less than one percentage point, but by mid-1992 it had risen to three percentage points. Estimation results suggest that this was more than might have been expected on the basis of past experience.

The failure of any of the preferred equations, when re-estimated to early 1990, to forecast adequately through to the second quarter of 1992 may suggest some recent change in underlying behaviour. It may be no coincidence that this period coincides with UK membership of the ERM. A possible mechanism is that inflation expectations in the tradable sector have been influenced by ERM membership, so that inflation there has fallen faster than on the basis of previous relationships. But the research discussed here gives more support to another related possibility, in which retail prices of tradable goods have reacted more strongly to recessionary forces than prices in the non-tradable services sector.

Whether there was an exceptional ERM effect or not, now that the United Kingdom has left the mechanism the estimates imply that the improvement in competitiveness, the probable rise in input prices, together with the removal of any favourable price expectations effects from membership, will lead to a gradual convergence of tradable and non-tradable inflation rates.

Estimation results

The estimation strategy adopted was a cointegration approach. In this the long-run relationship between the price variable and its determinants was estimated using the Johansen maximum likelihood technique. Hall (1989), after first establishing that all the variables for consideration were of the same order of integration. Once a cointegrating vector consistent with theoretical priors was obtained a dynamic equation in first difference terms was estimated, with the residuals from the cointegrating vector used as an error correction term. The general form dynamic equation was:

$$\Delta p = k + \sum_{i=1}^n \alpha_i \Delta p_{-i} + \sum_{j=1}^k \sum_{i=0}^n \beta_{ji} \Delta x_{j,-i} + \gamma RES_{-(n+1)}$$

where p is the price variable and the x_j s are the explanatory variables included in the cointegrating vector. The error correction term was entered at lag $n+1$, the maximum lag on the dynamic terms plus one. In estimating the general models lags up to 2 quarters were considered. Only the preferred equations for the three price variables with definition B are detailed below. These were all estimated over the period 1976 Q3 to 1991 Q4. Further details of the estimation results are given in Melliss (forthcoming).

(i) Non-tradable prices

The preferred estimate of the cointegrating vector was:

$$\ln SH = 0.91 \ln ETDE - 1.29 \ln OPEW + 0.31 \ln PPI$$

where SH = non-tradable prices, $ETDE$ = whole economy average earnings, $OPEW$ = whole economy output per head and PPI = producer input prices and \ln denotes logarithms. A feature of this estimate is that the sum of the coefficients on the right hand side variables is -0.07. This is close to zero, indicating that in the long run non-tradable prices are homogeneous with respect to costs. It therefore accords well with theoretical priors. The preferred dynamic equation using the residuals from this cointegrating vector as an error correction term is shown below:

$$\Delta \ln SH = 0.40 + 0.45 \Delta \ln SH_{-1} - 0.27 \Delta \ln OPEW$$

(2.3) (5.9) (-3.2)

$$+ 0.25 \Delta \Delta \ln OPEW_{-1}$$

(4.4)

$$+ 0.15 \Delta \ln PPI_{-1} + 0.28 \Delta \ln ETDE_{-2} - 0.06 RES_{-3}$$

(5.6) (3.1) (-2.3)

$$\bar{R}^2 = 0.83; SE = 0.54\%; LM(4) = 2.6; X^2_1 = 1.2$$

where RES = residuals from the cointegrating vector, $LM(4)$ is a test for serial correlation, (critical 5% value = 7.81); X^2_1 tests for residual heteroscedasticity (critical 95% value = 3.82), figures in parenthesis are t statistics.

Dummy variables reflecting the increases in VAT rates in 1979 Q2 and 1991 Q4 were also included in the dynamic equation, and found to be highly significant. The dynamic equation is generally satisfactory in terms of its overall econometric performance. The standard error of about 0.5% is comparable with the standard error on aggregate retail price equations. It was re-estimated using instrumental variables, because of the possibility of simultaneous equation bias arising from the inclusion of a term in the current value of output per head. Individual parameter estimates were little changed, suggesting that simultaneity is not a serious problem with this estimate. However, the equation fails a test of predictability when re-estimated to 1990 Q2 and used to forecast to 1992 Q2.

(ii) Tradable prices

The preferred cointegrating vector and dynamic equation are set out below.

$$\ln NOSH = 0.47 \ln ULCM + 0.54 \ln PPI + 0.19 \ln UHMN - 0.05 \ln WPOS$$

where $NOSH$ = tradable prices, $ULCM$ = labour costs in manufacturing, $UHMN$ = price of imports of manufactures (excluding erratics) and $WPOS$ = world price of oil in sterling terms.

The corresponding dynamic equation is:

$$\Delta \ln NOSH = 0.05 + 0.22 \Delta \ln ULCM + 0.24 \Delta \ln ULCM_{-2}$$

(2.7) (4.5) (3.4)

$$+ 0.19 \Delta \ln PPI_{-1} + 0.22 \Delta \ln PPI_{-2}$$

(3.7) (3.9)

$$+ 0.13 \Delta \ln UHMN - 0.08 \Delta \Delta \ln UHMN_{-1}$$

(2.2) (-1.7)

$$- 0.024 \Delta \ln WPOS - 0.001 \Delta \Delta CBI_{-1} - 0.12 RES_{-3}$$

(-2.9) (-4.5) (-2.5)

$$\bar{R}^2 = 0.77; SE = 0.72\%; LM(4) = 2.8; X^2_1 = 0.6$$

The VAT dummy variables were again highly significant. The cointegrating equation does not meet the homogeneity criteria since the sum of the coefficients on the cost variables (unit labour costs and input prices) is less than unity.

As expected, competing import prices have a positive effect on tradable prices; the long-run elasticity of tradable prices with respect to these is 0.2. The oil price effect, although small and incorrectly signed, strengthens the error correction properties of the cointegrating vector. In statistical terms the equation is mostly satisfactory, although the Ramsey test for functional form (not reported) is significant at the 95% level, suggesting some mis-specification, and it fails the test for

predictive accuracy when re-estimated and used to forecast 1990 Q3 to 1992 Q2. The corresponding instrumental variable estimate has similar parameters, and is satisfactory on statistical grounds.

(iii) Price wedge

The preferred cointegrating vector and dynamic equation are set out below.

$$\ln PW = 0.10 \ln OPD + 0.25 \ln ETDE - 0.07 \ln UHMN \\ - 0.16 \ln PPI$$

$$\Delta \ln PW = 0.04 - 0.18 \Delta \ln PW_{-1} - 0.06 \Delta \ln PPI \\ (4.5) \quad (-1.6) \quad (-1.3)$$

$$- 0.10 \Delta \ln PPI_{-2} - 0.07 \Delta \ln UHMN_{-2} \\ (2.0) \quad (-1.2)$$

$$- 0.26 \Delta \ln ETDE_{-1} + 0.001 \Delta CBI_{-1} - 0.0005 CBI_{-2} \\ (-1.9) \quad (3.4) \quad (-1.8) \\ + 0.002 \Delta STIR - 0.17 RES_{-3} \\ (2.1) \quad (-4.2)$$

$$\bar{R}^2 = 0.46; SE = 0.69\%; LM(4) = 3.1; X^2_1 = 1.1$$

where PW = the price wedge, OPD = the difference in productivity between manufacturing and non-manufacturing, and $STIR$ = short-term nominal interest rates.

The VAT dummy variable for 1979 Q2 was highly significant, with a negative sign indicating that the effect on tradable prices was greater than on non-tradable prices. Overall the goodness of fit of this equation is lower than for the other two equations. But the results of the other statistical tests, with the exception of that for predictability, are satisfactory.

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