AN INDUSTRY APPROACH TO UNDERSTANDING EXPORT PERFORMANCE: STYLISED FACTS AND EMPIRICAL ESTIMATION

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Documentos Ocasionales
N.º 0503
BANCO DE **ESPAÑA**

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ISSN: 1696-2222 (print)
ISSN: 1696-2230 (on line)
Depósito legal: M.41644-2005
Imprenta del Banco de España

Abstract

This note investigates whether industry-specific characteristics are important determinants of the demand and supply of exports in the euro area, the United Kingdom and the United States. It has two parts: (i) an analysis of the dataset and a discussion of the differences across countries and industries; and (ii) the econometric estimation of the long-run elasticities obtained from a supply and demand model for each industry, using an error correction model with quarterly data since 1991.

Export volume growth since the early 1990s is found to have been higher in the euro area than the United Kingdom and the United States for most industries, with the exception –particularly in the United Kingdom– of those industries classified as high technology. Export price inflation in domestic currency in high technology industries has remained low over the period in all three regions, while it has increased in low and medium technology industries. The dataset also suggests that the slowing pattern of world trade seen over 2001 is due exclusively to reduced trade in 'Office Machinery and Computers' and other 'Information and Communication Technology' (ICT) industries.

World export markets have moved in a similar manner in all three areas, although the United Kingdom's export market has not grown as quickly as that of either the United States or euro area. This is because the United Kingdom trades proportionally less with areas such as Eastern Europe and Latin America, which have experienced the strongest import growth over the sample.

Export market shares have fallen across industries and countries, especially in low and medium technology sectors. The euro area is the best performing country, reflecting the gain in competitiveness facilitated by the depreciation of the euro, while the United Kingdom and the United States have lost competitiveness in most industries. Overall the econometric results show that on the demand side the industrial composition of a region's exports does not appear to be a major factor behind the price elasticity of exports; at least at our level of disaggregation.

In terms of export supply, we find that the elasticity of export prices with respect to domestic costs is lower in the United Kingdom than elsewhere, suggesting that in the United Kingdom export prices are predominantly set using 'Local Currency Pricing'. In contrast, the United States and, to a lesser extent, the euro area pass-through more of the changes in domestic costs onto export prices. This is confirmed by the estimation results across industries for each economic area.

1 Introduction

A significant proportion of euro area income is generated by exports; in fact, the share of manufacturing exports in GDP has increased sharply from around 10 pp in the nineties. Beyond its quantitative importance, the analysis of exports and their determinants may help to understand the external sector influence on the euro area. For instance, the export sensitiveness to the exchange rate plays a very significant role in assessing the impact of the recent appreciation of the euro on economic activity. However, the limitations in data availability make it more difficult to analyse export performance in depth. The aim of this paper is to assess the exporting sector by industry and across countries in the euro area, the United Kingdom and the United States.

Exchange rates have moved substantially over the 1990s. The euro area effective exchange rate appreciated by 13% between 1990 and 1998 with big cycle movements around that trend; after this it underwent a depreciation before appreciating once more at the end of 2000. In the United Kingdom the effective exchange rate has suffered two substantial movements: a 5% depreciation in the fourth quarter of 1992 reflecting the exit from the ERM; and a steep 10% appreciation between 1996 and 1998 (it has remained broadly unchanged since then). In the United States, after a broadly stable period up to 1995, the effective exchange rate appreciated gradually by 16% up to 2002.

From an aggregate perspective Buisán, Farrant and Sebastiá (2005) concluded that the euro area behaves differently to a relatively closed economy as the United States and to a more open and smaller one as the United Kingdom. Table 1 below shows the elasticity of demand and supply for the euro area, the United Kingdom and the United States based on OECD data taken from the former work.

Table 1: Aggregate demand and supply elasticities

	Demand elasticities		Supply elasticities	
	Relative prices	Income	Foreign prices	Domestic costs
Euro area	-0.8	0.7	0.3	0.8
United Kingdom	-1.0	0.9	0.6	0.4
United States	-0.5	1.0	0.0	1.0

The results show that the price elasticity of export demand is higher in the United Kingdom than in the United States, while in the euro area it appears to be in between the United Kingdom or the United States.[1] It is likely that differences in price elasticities are a reflection of the extent to which a country competes through prices rather than through non-price factors. Export demand moves one-to-one with changes in world income in the United States and only by slightly less in the United Kingdom. By contrast the income elasticity of demand for exports for the euro area is somewhat lower.

On the supply side, the results show that United Kingdom export prices are mainly set according to competitors export prices (local currency pricing). The elasticity of export prices with respect to domestic costs is much higher in the United States than elsewhere,

1. Statistical tests on the equality of coefficients across countries show that the euro area price elasticity could be equal to both the United Kingdom and the United States.

suggesting that the United States passes through more of the changes in domestic costs onto export prices in domestic currency (producer currency pricing). The euro area appears to be in between the United States and the United Kingdom cases. This confirms the suggestion that the relative weight given to competitors' export prices varies positively with the elasticity of demand: smaller more open economies appear to base their prices on competitors' export prices, possibly reflecting the relative size and pricing power of the domestic industry relative to its competitors.

To explain these findings we turn to industry-level data, and examine whether the aggregate result is caused by industrial structures and specialisation patterns or whether industries nationwide simply share common characteristics. To do this we estimate export equations for 12 different industries in the euro area, the United Kingdom and the United States. However, a part of the work consists of a discussion of the differences in the variables that are used to proxy export determinants.

The note is structured as follows: Section 2 explains the theoretical background behind the export determinants; Section 3 describes the dataset and discusses the stylised facts across industries and across countries; Section 4 presents the estimated export elasticities by industry; based on these Section 5 summarises why aggregated results differ across countries; and Section 6 concludes.

2 Model and results of the aggregate estimation

This section introduces the theoretical determinants of export demand and supply, which will help us to analyse our dataset and to understand the implications of different patterns in the data. Our approach to the estimation of exports is based on an earlier paper, Buisán, Farrant and Sebastiá (2005), which uses aggregated manufactures data. In that paper domestic export volumes are allowed to influence export prices through the estimation of the demand and supply of exports as a system: thus volumes and prices are determined simultaneously.

2.1 Export demand determinants

The amount of exports of country i demanded by the rest of the world (Xd) depends on: export prices denominated in national/ domestic currency, Px; on the price of goods produced in the rest of the world in domestic currency, P*/e, where e is the nominal effective exchange rate (and an appreciation of the domestic currency means a rise in e); and on the rest of the world's income in domestic currency, Y*/e. A log-linear demand function can then be written as:

$$x^d = \alpha_0 + \alpha_1 (px - (p^*-e)) + \alpha_2(y^*- e) \quad (1)$$

where $\alpha_1 < 0$ and $\alpha_2 > 0$

Economic theory suggests that α_1 ought to be less than zero, or, in other words, that an increase in country i's export prices relative to its competitors' export prices should lead to a fall in export demand. We also expect α_2 to be positive and close to 1: most of the empirical studies of export demand find that the income elasticities are close to unity [Goldstein and Khan (1985)]. However, there are likely to be differences across industries and countries.

– We would expect that the price elasticity will be lower in those industries which offer opportunities for product differentiation, either through the use of technology or through quality or brand image.

– It is also possible that the greater the proportion of trade that goes to countries that are geographically and culturally close will, insofar as it reflects a possibly more sustainable trade relationship and capitalises on lower frictional costs such as transport, communication and transaction costs, tend to lower the price elasticity of export demand.

– We might also expect that the price elasticity of export demand will be related to the relative size of the domestic industry in respect to its competitors.

2.2 Export supply determinants

The supply of exports of country i to the rest of the world depends on the export price, Px, plus any mark-up that exporters can obtain, μ, and on the production costs of the exporter, C.[2] A log-linear supply function, where export prices are the dependent variable, can then be written as:

$$px = \alpha_0 + \alpha_1 x + \alpha_2 c + \alpha_3 \mu \quad (2)$$

where $\alpha_1>0$, and $\alpha_2=1$, in order to fulfil the static homogeneity condition and $\alpha_3>0$.

2. This comes from solving the firm's profit maximization problem subject to a Cobb-Douglas production function.

The mark-up depends inversely on the elasticity of demand, and in our case we restrict it to depend on the relative export price [that is, px relative to the export price of foreigners' goods (p*-e)]. Replacing μ and rearranging, we obtain

$$px = \beta_0 + \beta_1 x + \beta_2 c + (1 - \beta_2)(p^* - e) \qquad (3)$$

where $\beta_1 = \alpha_1/1+ \alpha_3$, $\beta_2 = 1/1+\alpha_3$, and $\beta_2 > 0$.

As noted in Goldstein and Khan (1985), in a "mark-up" export price equation there seems to be a consistent pattern in the relative size of the coefficients of domestic costs and foreign competitors' prices:

– Smaller more open economies appear to base their prices on competitors' export prices; conversely, larger less-open countries apparently use domestic factor costs or prices as the main determinant for changing export prices.

– The coefficient β_2 may also reflect the degree to which exporters price in domestic currency (PCP) or in the local currency of the markets to which they sell into (LCP). If $\beta_2 = 1$, then exporters prices will not be affected by movements in the exchange rate as their prices are set in line with unit labour costs. In this case exporters are likely to price in domestic currency. If $\beta_2 = 0$, then exporters have no market power; they price their exports in line with their competitors and are likely to price in the currency of the market they are selling into.

3 Dataset and Stylised facts

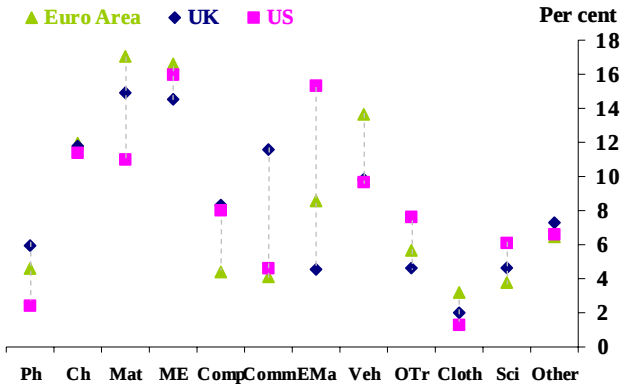
3.1 Variables

We start by dividing the dataset into 12 manufacturing industries chosen by importance and share in overall manufacturing exports (Table 2).[3] The second column points to the acronyms we will use in the rest of the charts and tables in this note. The third column refers to the technological content according to the OECD classification;[4] 'H' stands for 'high technological intensity' measured based on R&D expenditure while 'M' and 'L' stand for 'medium technological intensity' and 'low technological intensity' respectively.

Table 2: Sector classification

1	Ph	H	Medicinal & Pharmaceutical
2	Ch	M	Other Chemicals
3	Mat	L	Material Manufactures
4	Me	M	Mechanical Engineering
5	Comp	H	Office Machinery & Computers
6	Comm	H	Radio, TV & Communications
7	EMa	M	Electrical Machinery etc
8	Veh	M	Motor Vehicles
9	OTr	H	Other Transport Equipment
10	Cloth	L	Clothing and Footwear
11	Sci	H	Scientific and Photographic Apps
12	Other	L	Other Manufactured Articles

Chart 1: Shares of industries in total exports of manufactures: euro area, United Kingdom and United States.



3. We follow primarily the SITC classification and construct and match the data aggregating across categories as explained in Annex 1. All relevant variables are I(1).

4. See OECD classification on technological intensity: http://www1.oecd.org/publications/e-book/92-2003-04-1-7294/.

Chart 1 plots the relative weight of the sectors in the three countries. Export volumes and prices were obtained from the relevant national statistical offices and aggregated to our chosen industries. There are some similarities between the United Kingdom, the United States and euro area: 'Mechanical Engineering', 'Material Manufactures' and 'Chemicals' represent a large share of total exports, while 'Clothing and Footwear' has a low share in each country. However, there are also large differences: 'Electrical Machinery' exports are around 15% of total United States exports but are below 5% in the United Kingdom; 'Motor Vehicles' exports are 14% of euro area exports but only represent 9% of United Kingdom and United States exports; and 'Radio, TV and Communication Equipment' accounts for 12% of United Kingdom exports but only around 4% in the euro area and the United States.

The remainder of this section will describe the behaviour of each of the variables identified in Section 2 as determinants of export demand and supply.

Export volume growth (Chart 2) has been particularly strong in most of the sectors classified by the OECD as 'high technology', growing by over 200% in the euro area and the United Kingdom between 1992 and 2002. The dataset also suggests that the slowing pattern of world trade seen over 2001 is due exclusively to reduced trade in 'Office Machinery and Computers' and other so-called ICT products.

'Electrical Machinery', classified as medium technological intensity, has also grown strongly in the United States and the euro area. In some cases strong growth appears to be related to low or negative price inflation over the period (see Chart 3).

Chart 2: Change in export volumes in local currency (92-02)

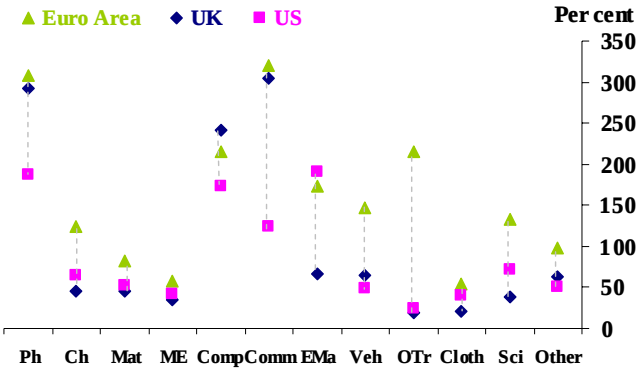
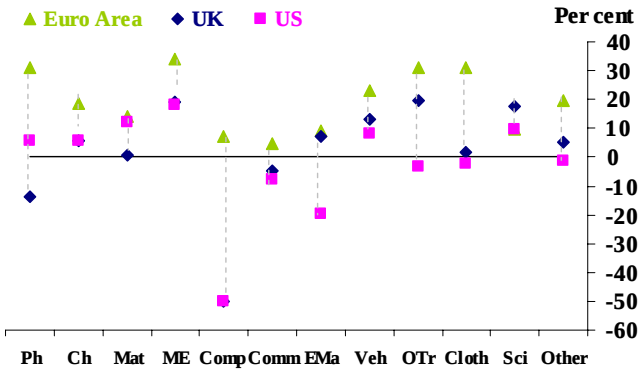


Chart 3: Change in export prices in local currency (92-02)



In the United Kingdom and the United States the low and medium technology sectors have grown at a more moderate pace, around 50 percent over the period, while export price inflation in these sectors has been positive but moderate below an annual average of 2%. But in the euro area export growth in these sectors has been uniformly stronger and has been accompanied by higher export price inflation than in the other two countries. The combination of increasing export volumes and prices may have been facilitated by the depreciation of the euro over this period: exporters have passed part of the depreciation into lower export prices in foreign currency, allowing for some increases in domestic currency export prices without offsetting the positive effect of the depreciation on export volumes.

World export prices reflect the price domestic exporters face in the markets where they compete with other producers. These will differ by industry depending upon the export price developments in each sector and each country, and on which countries are the main exporters of each industry to the world. Table 3 presents the main suppliers of world exports by industry, with the main two exporters of each industry marked in red italics. When creating world export prices for the United Kingdom, the United States and euro area, we excluded the exports of the region in question to obtain the aggregation weights.

Table 3: Exports to the world. Percentage contribution by industry and country (Source: OECD)

	Ph	Ch	Mat	ME	Comp	Comm	EMa	Veh	OTr	Cloth	Sci	Other
Canada	1.48	4.45	7.97	4.03	2.89	3.75	2.48	14.33	5.89	1.20	2.03	4.36
China	2.80	3.29	7.97	2.07	6.39	9.31	5.27	1.11	1.75	*30.69*	4.31	12.87
Denmark	4.16	1.07	1.31	1.83	0.62	1.31	0.68	0.34	1.09	1.54	1.24	2.51
Euro area	*33.37*	*34.08*	*30.88*	*26.93*	18.49	14.21	18.92	*29.81*	*20.92*	21.04	17.63	*23.39*
Hong Kong	1.64	3.79	7.21	2.50	7.69	13.01	8.72	0.81	0.37	*24.72*	9.67	15.12
Hungary	0.61	0.52	0.63	0.67	0.96	1.13	0.81	0.43	0.12	1.29	0.20	0.53
Japan	3.62	10.88	11.24	20.16	*22.77*	*23.09*	*25.27*	*26.48*	11.81	0.54	*20.51*	6.06
Poland	0.38	0.66	1.63	0.55	0.04	0.41	0.58	0.55	1.19	1.93	0.13	1.38
Sweden	5.18	1.31	4.16	3.00	0.69	5.99	1.55	2.61	1.31	0.45	1.65	1.99
Switzerland	15.20	5.07	3.13	4.38	0.68	0.64	2.07	0.27	0.89	0.74	8.49	3.71
Turkey	0.19	0.37	1.72	0.23	0.02	0.42	0.35	0.29	0.34	5.11	0.04	0.40
United Kingdom	15.33	10.97	8.48	9.57	11.79	9.12	7.13	6.64	11.16	4.30	8.87	8.74
United States	*16.05*	*23.53*	*13.67*	*24.07*	*26.97*	*17.61*	*26.18*	16.33	*43.14*	6.46	*25.26*	*18.93*

Across industries, the euro area, the United States and Japan are the main suppliers to the world. The euro area is among the top two exporters in 7 out of the 12 sectors, while the United States is outside the top two only in 'Vehicles' and 'Clothing and Footwear'. 'Clothing and Footwear' is dominated by exports from China and Hong Kong: these countries are also important 'Other Manufactures' exporters. The United Kingdom is not among the top two suppliers in any industry but has an important share of world exports in 'Medical and Pharmaceutical', 'Other Chemicals', 'Office Machinery and Computers' and 'Other Transport'.

Chart 4: Change in world export prices in local currency (91-02)

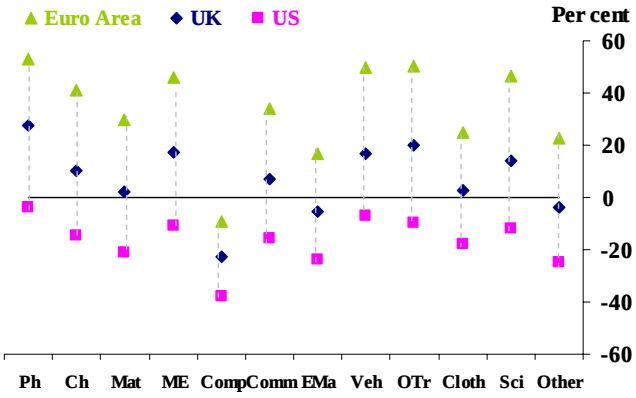
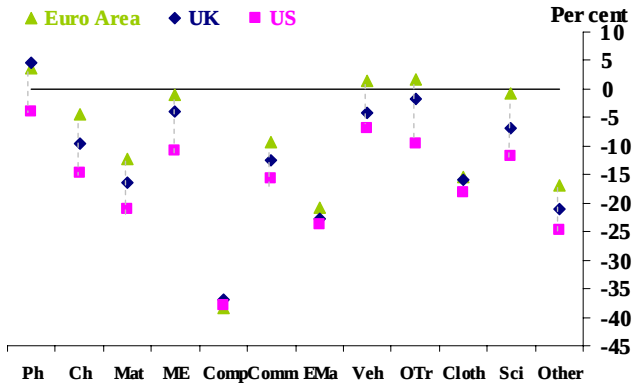


Chart 5: Change in world export prices in dollars (average 91-02)

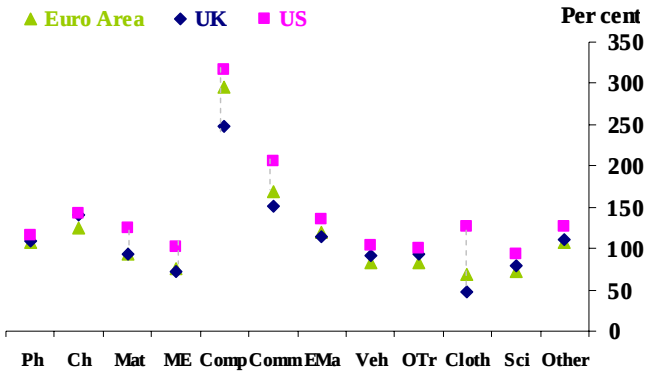


Average export price growth in local currency has been very different across countries (Chart 4), which is largely the result of effective exchange rate developments. As such, the average change in export prices in dollars (Chart 5) has been closer in the three areas, but changes in the euro area competitors' prices remain higher in most industries.

The foreign demand variable is proxied by the world's manufacturing imports by industry.[5] Chart 6 shows that world export markets have moved in a similar manner in all three areas, with the United Kingdom markets lagging slightly behind. Differences in the foreign demand variable between the United Kingdom, the United States and euro area can be explained by two factors: the different main trading partners of each of the countries (in 2000) by industry and the import growth of these countries over the period under study. These are shown in Tables 4.1–4.4, with the largest trading partners by industry highlighted in red italics.

5. An interesting feature of this series is that the slowing pattern of world trade seen over 2001 is due exclusively to falling trade in 'Office Machinery and Computers' and other so-called ICT products.

Chart 6: Change in world export markets in local currency (91-02)



The main trading partner for the United Kingdom is Western Europe, which is the destination for over 60% of total United Kingdom exports. In contrast, the export markets of the United States and euro area are more widely diversified, with larger shares of the United States exports going to Latin America and euro area exports to Eastern Europe. Table 4.4 shows that average annual growth in imports has been strongest in Latin America and Eastern Europe, explaining the relatively moderate growth of United Kingdom export markets over the period.

There are also large differences in export destinations across industries. Most notably, low technology industries tend to export a larger share to developing economies than high technology industries: around 6% of United Kingdom 'Textile' and 'Clothing' exports are to Africa, in comparison with the average United Kingdom export share across industries to Africa of 2.4%. Furthermore, 47% of the United States 'Textile' exports and 79% of 'Clothing' exports are to Latin America while the average the United States total export share to Latin America across industry is only 22%. Finally, 33% of euro area 'Textile' exports and 20% of 'Clothing' exports are to Eastern Europe, in comparison with the average export share across industries of below 15%.

Table 4: Destination of exports in 2000 (Source: WTO)

Table 4.1: Destination of United Kingdom exports							
United Kingdom	North America	Latin America	Western Europe	Eastern Europe	Africa	Middle East	Asia
Iron and steel	12.7	1.6	*69.7*	2.1	2.5	3.0	8.3
Chemicals	17.4	2.5	*60.4*	3.1	2.3	3.2	11.1
Other semi-manufactures	11.7	1.0	*63.7*	2.2	2.4	6.0	12.9
Automotive products	15.4	1.8	*73.0*	1.8	1.4	1.1	5.4
Office and telecom equipment	12.2	0.6	*70.1*	2.8	1.9	2.5	10.0
Machinery & transport equipment	19.8	1.9	*55.1*	3.0	2.9	4.6	12.7
Textiles	9.3	1.2	*59.7*	8.4	6.2	3.1	12.2
Clothing	5.6	0.5	*69.4*	4.9	6.6	5.3	7.8
Other consumer goods	24.7	1.5	*53.1*	2.8	2.3	4.1	11.6
as %age of Trade with the World	16.5	1.5	62.4	2.8	2.4	3.5	10.7

Table 4.2: Destination of the United States exports							
United States	North America	Latin America	Western Europe	Eastern Europe	Africa	Middle East	Asia
Iron and steel	*50.4*	25.8	11.3	0.6	1.0	1.0	10.0
Chemicals	19.7	20.9	*29.5*	0.6	1.1	1.3	26.9
Other semi-manufactures	*34.6*	26.6	16.0	0.5	0.8	4.4	17.1
Automotive products	*57.5*	22.7	9.7	0.2	0.6	2.1	7.1
Office and telecom equipment	14.9	19.7	21.7	0.6	0.5	1.5	*41.2*
Machinery & transport equipment	19.2	19.7	*28.8*	1.0	2.1	3.4	25.7
Textiles	26.0	*47.4*	12.7	0.5	0.6	1.3	11.6
Clothing	8.8	*78.5*	4.4	0.1	0.2	0.7	7.3
Other consumer goods	21.3	17.9	*29.4*	0.6	0.7	1.8	28.2
as %age of Trade with the World	23.9	21.7	23.6	0.7	1.1	2.3	26.6

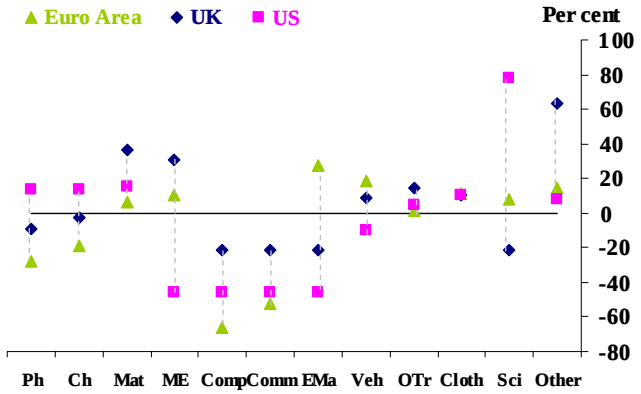
Table 4.3: Destination of euro area exports							
Euro area	North America	Latin America	Western Europe	Eastern Europe	Africa	Middle East	Asia
Iron and steel	*24.4*	5.3	32.5	14.4	5.9	5.6	12.0
Chemicals	24.2	5.9	*31.9*	11.3	4.9	4.2	17.6
Other semi-manufactures	19.2	4.6	*30.4*	14.8	4.7	8.2	18.2
Automotive products	23.3	5.0	*41.7*	11.3	4.4	3.8	10.4
Office and telecom equipment	13.4	3.5	*36.9*	11.8	4.6	3.6	26.2
Machinery & transport equipment	*26.8*	7.9	22.8	12.6	5.8	5.3	18.7
Textiles	11.8	2.9	*30.4*	27.3	12.3	3.0	12.4
Clothing	17.1	2.5	*40.4*	16.0	4.2	5.0	14.8
Other consumer goods	24.9	4.6	*33.4*	12.1	3.6	4.6	16.9
As %age of Trade with the World	22.4	5.5	31.5	12.9	5.1	4.9	17.7

Table 4.4: Average annual growth in imports by world region							
Average annual growth in nominal imports (1990-2002)	North America	Latin America	Western Europe	Eastern Europe	Africa	Middle East	Asia
Iron and steel	4.6	6.3	5.6	10.1	3.1	4.9	5.5
Chemicals	10.5	8.6	8.8	10.1	4.3	5.9	7.7
Other semi-manufactures	7.0	9.1	5.5	13.8	3.2	5.1	5.9
Automotive products	6.7	11.5	6.9	16.3	3.4	9.7	5.9
Office and telecom equipment	8.1	11.9	8.1	12.6	6.0	9.2	14.0
Machinery & transport equipment	7.0	6.9	6.5	5.5	2.6	5.2	7.0
Textiles	6.7	12.2	1.9	10.5	5.3	4.5	5.0
Clothing	7.5	11.2	4.0	8.9	9.0	7.2	7.6
Other consumer goods	6.7	8.9	5.0	9.1	4.1	5.7	6.7

On the supply side the additional variable is unit labour cost. These are constructed using employment compensation and value added data for each industry in each country. As seen in Annex 3, there are large differences in unit labour costs across industries. Here we plot the change in unit labour costs by industry and country over the period. Because some data was not available we had to proxy several industries by the category a step above in the classification. For example, in the United States, the unit labour cost of the aggregate 'Machinery and Equipment' sector is used as a proxy for sectors 4–7, which explains why the average annual growth in these sectors is identical.

Chart 7 shows that there are large differences in unit labour costs, across both countries and industries, with no obvious patterns emerging. In general, unit labour costs in the 'high' and 'medium' technology sectors have fallen in most of the countries while there have been small increases in costs in the other sectors. Unit labour costs together with competitors' export prices determine export prices in our export supply set up; which one dominates in each of the economies under study is discussed in the next section.

Chart 7: Change in unit labour costs in local currency (91-02)

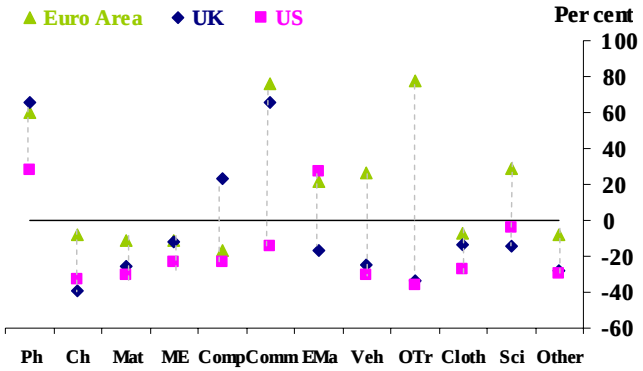


3.2 Demand relationship variables

These four variables –export volumes and prices, competitors' export prices and foreign demand– determine export demand as explained in Section 2.1. We combine them in order to obtain the *export market share and relative export prices*.

Chart 8 shows the change in export market shares, defined here as the volume of manufacturing exports divided by the foreign demand volume,[6] between 1991 and 2001 for the three areas considered and for each manufacturing industry. A large number of industries in the United Kingdom, the United States and euro area show a loss of export market share. By country, the main loser is the United States: it has experienced a loss in export market share in ten of the twelve industries considered and only in 'Electrical Machinery' does it outperforms the other two countries. The United Kingdom follows a similar pattern, although it has gained market share in three high technology industries. The euro area has gained export market share in six of the twelve industries.

Chart 8: Change in export market share (91-01)



By industry, all three areas have experienced falling market shares in the low or medium technology industries, such as 'Material Manufactures', 'Mechanical Engineering', 'Clothing and Footwear' and 'Other Manufactured Articles'. It is possible that these traditional activities are subject to greater competitive pressures from the recently industrialised countries, which have a comparative advantage in terms of labour costs. In contrast, the three areas show increasing market shares in 'Medical/Pharmaceutical' and the United States and the euro area in 'Electrical Machinery', while the United Kingdom and the euro area have also increased their shares of the 'Radio, TV and Communications Equipment' market. It is worth noting that most of these sectors have a medium to high technological requirement. The United Kingdom also outperforms in 'Office Machinery and Computers'[7] and the euro area shows relatively strong growth in 'Motor Vehicles', 'Other Transport' and 'Scientific and Photographic Appliances'.

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6. Annex 2 shows the behaviour of export share since 1991 and portrays the path followed by competitiveness for each country and industry considered.

7. As we have already mentioned, the UK gained export market shares in all high technology industries except 'Scientific and Photographic Appliances'.

Chart 9: Change in export competitiveness (91-01)

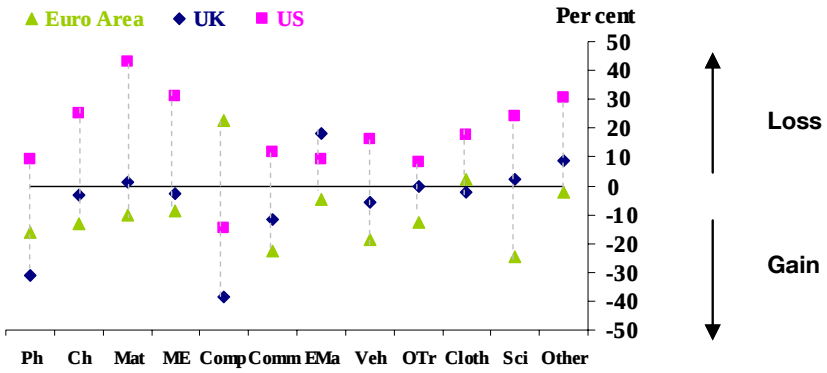

Chart 8 shows average changes in the real exchange rate (ratio of export prices to competitors' export prices in domestic currency) over the last decade. The United States recorded a loss in competitiveness in most industries.[8] In contrast, euro area competitiveness has improved in most industries. It should be noted that the dollar appreciated over the nineties and that the euro area witnessed a significant depreciation of its currency which partly offset the higher increase in its export prices relative to its competitors' export prices. The United Kingdom appears to be in-between the euro area and the United States. In some industries, despite maintaining competitiveness, the United Kingdom has suffered a loss in market share.

3.3 Supply relationship variables

As explained in section 2.2 apart from the quantities exported, export prices, unit labour costs and foreign export prices determine the supply equation. One way to present it is as the relationships between the mark-up (the difference between export prices and unit labour costs) and the real exchange rate. The mark up depends inversely on the elasticity of demand, and in our case we restrict it to depend on the relative export price or competitiveness variable [that is, px relative to the export price of foreigners' goods (p*-e)] .[9]

Chart 10 plots the mark-up change as the difference between the export prices and unit labour costs in the nineties for the three areas considered. The mark-up in the euro area outperforms the United States and the United Kingdom ones during the period considered. Moreover nearly all of the euro area industries have experienced a mark-up widening while in the United States only in half of them the mark up growth is positive and in the United Kingdom the mark-up is close to zero or slightly negative but in 'Scientific Appliances'.

The reason behind the higher mark-up growth in the euro area is twofold. First, as chart 6 shows, unit labour costs in the euro area have grown less that in the two other areas considered. This phenomenon happens in the second part of the nineties when despite the

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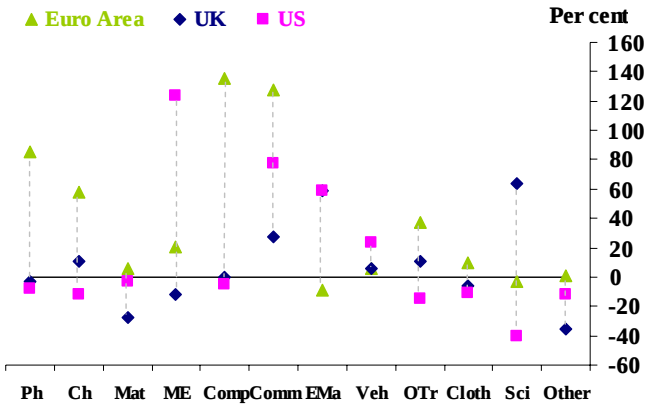
8. An increase of the real exchange rate, defined as the ratio of domestic export prices to foreign export prices (in the same currency), means a loss of competitiveness because domestic export prices grow faster than competitors' export prices.

9. Annex 3 contains the charts showing export prices, foreign export prices and unit labour costs by industry and for the three areas during the period under analysis. This is useful to understand the price setting behaviour of each industry: i.e., to what extent export prices follow competitors export prices or unit labour costs.

lower productivity gains in the euro area, the wage moderation resulted in lower unit labour costs. Second, euro area export prices have grown more than in the United Kingdom and the United States as the depreciation of the euro during the period considered allowed exporters to increase the local currency price of their exports.

Chart 10: Change in mark-ups (91-01)



The comparison between the United States and the United Kingdom stresses the fact that the more subdued unit labour cost increases in some industries in the former has been translated into a higher mark-up.

In summary, the trends in manufacturing exports in the three countries over the period 1991-2001 can be largely explained by developments in price competitiveness, given that export market growth has been broadly similar in the three countries (Chart 6). Moreover, it seems there is an inverse relationship between mark-up and the inverse elasticity proxy –the competitiveness variable– showing that price strategies might be relevant for the price setting behaviour. However, price competitiveness alone does not explain export performance in every industry in our sample: other factors, such as competition through differentiation, may explain divergences in export growth among the three countries for the same industry. These may also lead to differences in the response of exports and export prices to supply determinants such as different pricing strategies –this is discussed in the next section using the estimation results.

4 Estimation results

Having analysed the dataset and the determinants of export demand and supply, we now turn to the results of the empirical estimation. We use the model outlined in Section 2 and estimate equations (1) and (3) simultaneously using the 'Seemingly Unrelated Estimation' (SURE) methodology.[10] The estimation was performed by means of an error correction mechanism model using quarterly data since the early 1990s.

Following Montagna et al. (1995) we also test whether it is appropriate to include a measure of potential capacity ('vapot') in our equations.[11] This captures the fact that the level of productive capacity in the economy may positively influence export supply. In summary, the model we will estimate is:

$$x = \alpha_0 + \alpha_1 (px - (p^*-e)) + \alpha_2(y^*- e)$$

$$px = \beta_0 + \beta_1 x + \beta_2 c + (1 - \beta_2) (p^*-e) + \beta_3 * vapot$$

In Annex 4 we present the complete results of the supply and demand system estimations[12] for the three countries and for the twelve industries considered. These specifications differ mainly on the basis of the short term variables. However, in the case of the United Kingdom an additional distinction had to be made as more than half of the estimated price elasticities of demand were not significant when using the relative price variable (real exchange rate).[13]

4.1 Demand elasticities

Table 5 and Chart 11 depict relative export prices and foreign demand elasticities for each industry in each country. In Table 5 not available estimates reflect non significant coefficients.

Explaining the differences in the price elasticities across industries and countries is difficult as we do not have a complete set of estimates. In Section 2.1 it was suggested that the price elasticity will be lower in industries that offer opportunities for product differentiation or those with a large export market size. However, there does not appear to be any evidence that this is the case in any of the three countries under consideration here. For example, elasticities are not generally any lower in those industries with higher technological requirements. The results for the 'Medical and Pharmaceutical' and 'Clothing and Footwear' industries are not significant. This might be linked to the specific characteristics of these industries; it is possible that the demand for the 'Medical and Pharmaceutical' sector is not closely related to price and income determinants, and depends instead on the budget constraints of national health systems and other considerations. The problems in obtaining a well specified demand for the exports of 'Clothing and Footwear' may be related to the diversity of products available, both in terms of quality and use.

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10. We have compared our results with those obtained estimating using 'Full Information Maximum Likelihood'. They are generally similar although the significance of the coefficients tends to be higher when using SURE. This is explained by the higher degrees if freedom needed when using FIML as it calculates the whole matrix of variances and co-variances, while SURE only needs the main diagonal.

11. As a proxy for this we use the HP filtered value added volumes as in the STAN OECD dataset.

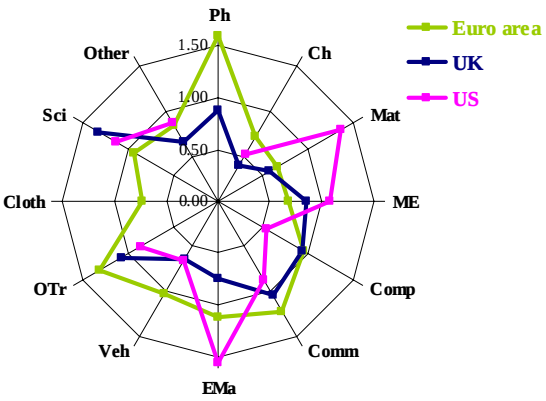
12. The equations presented have been estimated using the maximum likelihood method and the statistical program E-Views.

13. Further investigations showed that demand for exports in some UK industries seem to react to the nominal exchange rate faced by the industry. One interpretation of this fact is that exporters are pricing in line with competitors' export prices, thus reacting only to nominal exchange rate movements. We will discuss this further below but results for the UK should thus be viewed with caution, particularly when comparing across countries.

Table 5: Estimated demand: elasticity of relative export price

Sectors	Euro area	United Kingdom	United States
Medicinal And Pharmaceutical Products	nd	-2.2	nd
Other Chemicals	-1.4	nd	nd
Material Manufactures	-0.8	-0.22	-1.9
Mechanical Engineering	-0.8	nd	-1.3
Office Machinery & Computers	-1.0	-0.5	-2.5
Radio, TV & Communications Equipment	-1.3	-1.9	nd
Electrical Machinery etc	-1.1	nd	-1.1
Motor Vehicles	-0.7	nd	-1.4
Other Transport Equipment	-2.4	nd	Nd
Clothing and Footwear	-0.9	nd	Nd
Scientific and Photographic Apps	-1.0	-1.4	-0.5
Other Manufactured Articles	-0.9	-0.4	-1.0

Chart 11: Demand: elasticity of foreign demand



As chart 11 shows, the foreign income elasticity of demand, measured by the export markets coefficient, is in most cases around one: changes in external income have a high impact on the volume of exports. The income elasticity of demand appears to be higher in those industries which have experienced a gain in market share over the period under consideration (Chart 8).[14] Among the three countries considered, the United Kingdom has the lowest income demand elasticities, which may be caused by the relative difficulties experienced by the United Kingdom in maintaining its export market shares after the steep appreciation of sterling in 1996.

14. With the exception of "Material Manufactures" in the United States.

4.2 Supply elasticities

The estimates of the supply relationship are easier to interpret across countries and industries than the demand relationship.

A feature of most of the industries is that there does not seem to be a significant role for export volumes in the long-run determination of export supply. As shown in Table 6, only two industries in the euro area and the United States, and one in the United Kingdom, have a positive sloping supply curve. In the other industries the price elasticity of supply is infinite. These results appear to validate the estimation of a model in which the amount exported is determined solely on a single export demand equation, as they support the assumption of an infinitely elastic supply curve. Additionally, in a quarter of euro area industries, and in four United Kingdom industries, potential output is significant and improves the supply specification.

Table 6: Inclusion of export volumes and potential value added in the supply equation

Sectors	Euro area	United Kingdom	United States
Medicinal And Pharmaceutical Products		Potential VA	
Other Chemicals		Potential VA	Volume
Material Manufactures	Volume		
Mechanical Engineering			
Office Machinery & Computers		Potential VA	
Radio, TV & Communications Equipment			Volume
Electrical Machinery etc	Potential VA		
Motor Vehicles	Potential VA		
Other Transport Equipment		Potential VA	
Clothing and Footwear	Potential VA		
Scientific and Photographic Apps		Volume	
Other Manufactured Articles	Volume		

Charts 12 and 13 plot the coefficients of foreign export prices and unit labour costs in the export price equation. The coefficient of competitors' export prices in the supply relationship is higher in the United Kingdom than in the other two areas (Chart 12) in most industries. Thus competitors' prices, expressed in national currency, strongly affect domestic export prices in the long run in the United Kingdom. The elasticity of foreign export prices is above 0.5 in every United Kingdom industry, and is 1 in more than half. This is consistent with the United Kingdom being a small and open economy: United Kingdom exporters have little market power pricing their exports in line with their competitors' prices using the currency of the market they are selling into ('Local Currency Pricing' or LCP).

Chart 12: Supply: Elasticity of foreign export prices

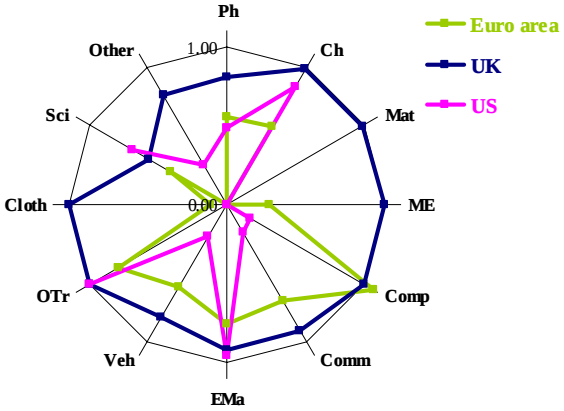
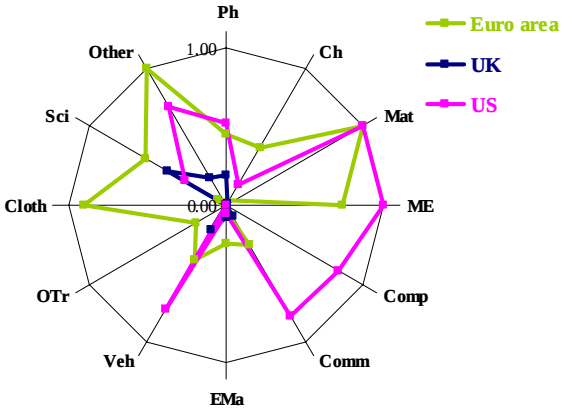


Chart 13: Supply: Elasticity of domestic unit labour costs



Turning to the other two countries, euro area exporters take slightly more account of foreign export prices than the United States exporters when setting export prices. However, domestic costs have an important role in determining export prices in industries such as 'Material Manufactures', 'Mechanical Engineering', 'Clothing and Footwear', 'Scientific and Photographic' and 'Other Manufactures' (Chart 13). The main differences between the euro area and the United States in export price setting behaviour can be seen in the high technology sectors. In the United States, prices in the 'Office Machinery and Computers' and 'Radio, TV and Communications Equipment' industries are set according to domestic unit labour costs. On the other hand, prices in these industries in the euro area are heavily influenced by foreign export prices.

4.3 ECM coefficients

Charts 14 and 15 present the ECM coefficients for the demand and supply equation respectively.

Chart 14: ECM coefficients: demand

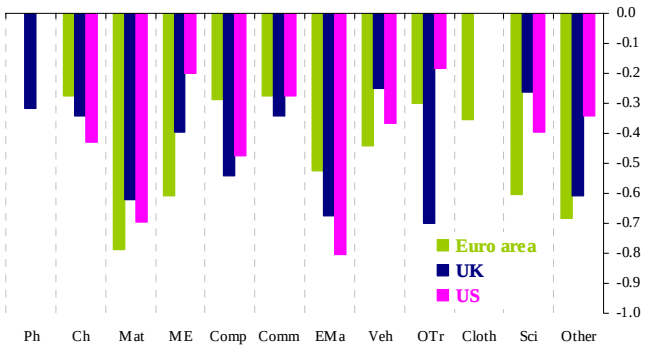
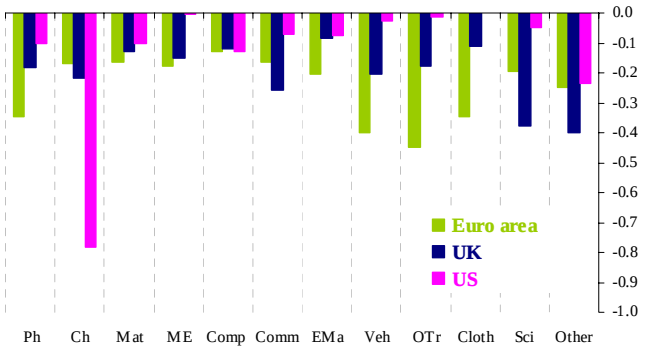


Chart 15: ECM coefficients: supply



The rate of adjustment to a disequilibrium in demand, measured by the error correction mechanism coefficient in the demand equation, is very quick –around 0.3 in most of the cases. This is far higher than that of the supply adjustment coefficient, which is consistent with the presence of higher adjustment costs (information and menu cost) in the latter.

5 Explaining the differences across countries

We can aggregate the results by industry weighting them by the industry shares of total exports. The resulting elasticities are reported in Table 7 below. It should be noted that the sample period for the aggregated estimation as reported in Table 1 starts in 1975 for the United Kingdom and the United States and in 1989 for the euro area. However the industry specific estimations only start in the early 1990s for the three areas under analysis.

On the demand side we get a conflicting picture on the price elasticities; the high price elasticity in the United States sits at odds with that obtained in the aggregated estimation. Explaining the differences in these elasticities is difficult as we do not have a complete set of estimates; we only obtain significant estimates for 7 industries in the United States and 6 industries in the United Kingdom. The elasticity in the euro area where we get better overall results is closer to that obtained in the aggregated exercise.

The income elasticity and the supply equation elasticities are more in line; both the euro area and the United Kingdom have an income elasticity below 1 which might indicate some loss in market share not related to movements in relative export prices. This seems to contrast with the euro area having gained market share in a large number of industries, however it has lost markets shares in large industries accounting for over half of total exports.

On the supply side the United States and the euro area foreign price and domestic cost elasticity from the disaggregated model look closer to each other, while confirming the aggregated results the United Kingdom sets export prices more in line with competitors' export prices than the other two economies.

Table 7: Disaggregated elasticities weighted by industry share and aggregated elasticities (in parenthesis)

	Demand elasticities		Supply elasticities	
	Relative prices	Income	Foreign prices	Domestic costs
Euro area	-1.0 (-0.8)	0.8 (0.7)	0.4 (0.3)	0.6 (0.8)
United Kingdom	-1.0 (-1.0)	0.8 (0.9)	0.9 (0.6)	0.1 (0.4)
United States	-1.4 (-0.5)	1.0 (1.0)	0.4 (0.0)	0.6 (1.0)

The differences in these aggregate elasticities across countries may be caused by: (i) differences in the competitive structure and industrial composition of exports in the three areas; or (ii) differences in the economies themselves which are common across industries. One way to investigate whether industry- or country-specific effects dominate is to look at how certain factors affect elasticities, which can be achieved through the use of rank correlations. These calculate indices that reflect correlations between characteristics once they are ordained, for example from largest to smallest. These stand between 0 –when there is no correlation– and 1, when the ranking of the two characteristics is the same. Table 8 presents the Spearman rank correlations of each country's price elasticities of demand with: industry technological content, and market size.

Table 8: Rank correlation results[15]

	United Kingdom	United States	Euro area
Rank correlation with the industry's technological content			
Price elasticity	0.54	0.21	0.32
Foreign export price elasticity	-0.21	0.11	0.68**
Cost Elasticity	0.27	-0.18	-0.67**
Income Elasticity	0.63**	-0.02	0.66**
Rank correlation with the industry's market size			
Price elasticity	0.83*	-0.07	-0.40
Foreign export price elasticity	0.18	0.48	-0.37
Cost Elasticity	-0.10	-0.51*	0.42
Income Elasticity	0.41	-0.01	-0.34

**indicates significance at the 5% level using two-tailed test.

* indicates significance at the 10% level using two-tailed test.

Most of these correlations are statistically insignificant and do not provide a great deal of support for the argument that differences in elasticities across countries arise as a result of differences in industrial composition.

(i) Across countries, the only industry factor common to at least 2 countries is the significant positive correlation between technological content and the income elasticity of export demand in the United Kingdom and euro area. This indicates that high technology industries have gained or maintained market share (after discounting relative export price effects) more than those industries with lower technological requirements. There are no clear relationships between export demand and supply elasticities and market size, with most of the correlations statistically insignificant. Overall, there is no homogenous picture relating the technological requirement of an industry or its market size to the pricing behaviour of the exporter.

(ii) Turning to country-specific issues, Table 8 shows that market size is positively correlated with price elasticity in the United Kingdom. At face value this is another counter-intuitive result; however, it may be the case that even a relatively large market share for United Kingdom industries does not guarantee sufficient market power to dictate prices in international markets and these United Kingdom industries could be subject to large competitive price pressures. In the euro area and the United States this relationship is insignificant.

Technological content is positively correlated with foreign export price elasticity, and negatively correlated with cost elasticity, in the euro area. It would appear that even large countries need to take competitors' export prices into account in those industries that are highly exposed to international trade, such as those with a high technological content. Finally in the United States the cost elasticity is negatively related to market

15. We also tried to combine technology and market size to check whether this could give us better and more significant correlations; however the results did not improve.

size (at the 10% level), which again sounds counterintuitive. But the United States is within the two main producers for the world in 10 out of 12 industries; thus there are no really "small-size" industries.[16]

Overall, country characteristics seem to dominate. This is in line with Charts 12 and 13, which show a strong positive relation between export prices and competitors' export prices across most United Kingdom industries, with the majority of industrial export prices in the United States moving in line with domestic industry costs. Table 3 supports this conclusion as the large United States market shares in world exports in most industries would suggest a higher degree of pricing power and the ability to pass-through exchange rate movements to exports prices in foreign currency.

16. Although the results are not presented here, we have examined the correlation between elasticity and openness, measured by each industry's propensity to export. Again, these results were inconclusive and failed to provide support for either the argument that differences in elasticities are caused by industry- or country-specific factors.

6 Conclusions

This article has analysed the manufactured goods export market for the euro area, the United Kingdom and the United States disaggregated by industries through both: (i) a descriptive analysis of the data; and (ii) econometric estimation of the long-run elasticities obtained from a supply and demand model for each industry, using an error correction model with quarterly data since the early 1990s.

The differences between the three areas in terms of export behaviour are significant.

– Demand behaviour by industry in recent years has been influenced by the evolution of the exchange rate: the depreciation of the euro has boosted competitiveness and increased market shares. In the case of the United Kingdom and the United States, the appreciation of their currencies is reflected by poorly performing export industries, except in the case of most high technology industries.

– In terms of export supply, we find that the elasticity of export prices with respect to domestic costs is lower in the United Kingdom than elsewhere, suggesting that in the United Kingdom export prices are predominantly set using 'Local Currency Pricing'. In contrast, the United States and, to a lesser extent, the euro area pass-through more of the changes in domestic costs onto export prices.

The results are less clear when considering common characteristics across industries.

– We are not able to classify the price elasticity of demand according to technological requirements: for example, low technology products such as 'Clothing and Footwear' or 'Material Manufactures' do not have the relatively high price elasticities that might be expected. Overall, country characteristics seem to dominate. In particular, there is a strong positive relation between export prices and competitors' export prices across most United Kingdom industries and, in the United States, the majority of industrial export prices move in line with domestic industry costs. And the euro area lies in between.

– Nevertheless, there are some common patterns. The three countries have lost market share in most of the industries which belong to the 'low' or 'medium' technology group and, in contrast, the three areas show positive growth in the export markets shares of some of the higher technology industries. This is also the case for the income elasticity of demand, where there is a positive relationship between export market share gain and foreign demand elasticity.

In summary, the relationship between relative export prices and market share is not always clear. As discussed in Chart 7 and later in the Section 4.1, this may indicate that other factors are at work in determining export behaviour, such as the ability to differentiate products. However, we are not able to conclude which industries offer more opportunities for differentiation, as the significance and sign of the coefficients can not be easily allocated into category groups. This might mean our disaggregation level is not detailed enough to draw this inference.

Other findings are:

– In terms of export shares, industries such as 'Mechanical Engineering' and 'Material Manufactures' represent a large proportion of total exports in all three areas, while 'Clothing and Footwear' is only around or below 3%. But there are also differences across countries: 'Electrical Machinery' exports are around 15% of total United States exports while they are below 5% in the United Kingdom; 'Motor Vehicles' exports are 14% of total

euro area exports compared to 9% of United Kingdom and United States exports; and 'Radio, TV and Communication Equipment' accounts for 12% of United Kingdom exports but only for around 4% in the euro area and the United States.

– Export volume growth (Chart 3) has been particularly strong in most of the sectors classified by the OECD as 'high technology'. The relationship between technology and export volume growth is particularly strong in the euro area and the United Kingdom, where the growth over the period has been over 200%. In some cases the growth in export volumes appear to be related to average negative price inflation over the period. The dataset also suggests that the slowing pattern of world trade seen over 2001 is due exclusively to reduced trade in 'Office Machinery and Computers' and other so-called ICT products.

– World export markets have moved in a similar manner in all three areas, although the United Kingdom's export market has not grown as quickly as that of either the United States or euro area. This variable depends on both the main trading partners of each of the countries by industry and their import growth over the period under study. The United Kingdom trades proportionally less with areas such as Eastern Europe and Latin America, which have experienced the strongest import growth over the sample.

REFERENCES

BUISÁN, A., K. FARRANT and M. SEBASTIÁ-BARRIEL (2005). *An export supply-demand model for the euro area, UK and US: a comparative analysis,* Bank of England Working Paper, forthcoming.

GOLDSTEIN, M., and M. S. KHAN (1985). "Income and Price Effects in Foreign Trade", in R. W. Jones and P. B. Kenen (eds.), *Handbook of International Economics,* Vol. II. Elsevier, pp. 1041-1105.

MONTAGNA, C., V. A. MUSCATELLI and A. STEVENSON (1995). "Modelling Aggregate manufactured exports for some Asian newly industrialized economies", *Review of Economics and Statistics,* 77, pp. 147-155.

Annex 1: Sector classification and data sources

1 Sector Classification

Manufacture aggregate data are split in 12 sectors. All raw data we obtained were mainly disaggregated using the SITC and SIC classifications but the foreign wealth variable was disaggregated into broad sectors by the WTO. The correspondence between our 12 sectors and the SITC, SIC and WTO classifications is as follows:

Sector	SITC Code	ISIC Code	WTO Sector
1.Medicinal And Pharmaceutical Products	54	2423	Chemicals
2.Other Chemicals	51-53, 55-59	24 less 2423	chemicals
3. Material Manufactures	6	17, 20, 21-22, 25, 26, 27-28	Iron & Steel, Other Semi-Manufactures, Textiles
4. Mechanical Engineering	71-74	29	Other Semi-Manufactures
5. Office Machinery & Computers	75	30	Office & Telecom Equipment
6. Radio, TV & Communications Equipment	76	32	Office & Telecom Equipment
7. Electrical Machinery etc	77	31	Other Semi-Manufactures
8. Motor Vehicles	78	34	Automotive Products
9. Other Transport Equipment	79	35	Other Machinery and Transport Equipment
10. Clothing and Footwear	84-85	18-19	Clothing
11. Scientific and Photographic Apps	87-88	33	Other Consumer Goods
12. Other Manufactured Articles	81-83, 89	36-37	Other Consumer Goods
Used for:	Export Volumes Export Prices World Export Prices	Unit Labour Costs Value Added	Foreign Wealth

A possible problem here is that SITC is a product classification, but ISIC is an activity classification, so we are not always comparing like with like.

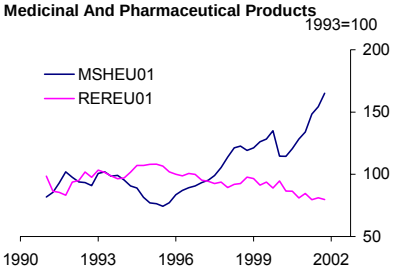
2 Data Sources

	Euro area	United Kingdom	United States
Export volumes	Comext	UK Office for National Statistics	US Census Bureau
Export prices	Comext	UK Office for National Statistics	Bureau of Labour Studies
World export prices	OECD International Trade by Commodity Statistics database and Local Statistical Offices		
World export weights	OECD International Trade by Commodity Statistics database		
World export markets	World Trade Organisation		
Unit labour costs	OECD STAN Industrial Structural Analysis		
	OECD STAN Industrial Structural Analysis		

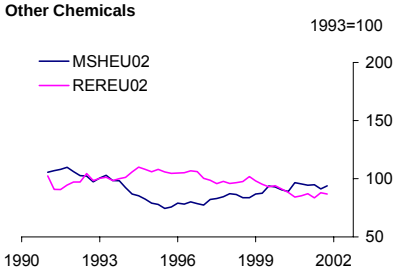
Annex 2

Euro area MARKET SHARE (MSH) AND REAL EXCHANGE RATE IN LOCAL CURRENCY (RER)

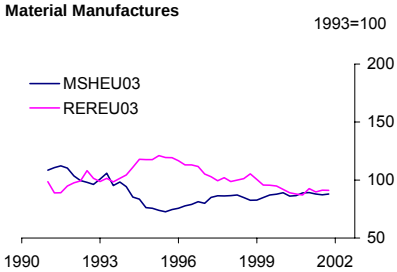
Medicinal And Pharmaceutical Products



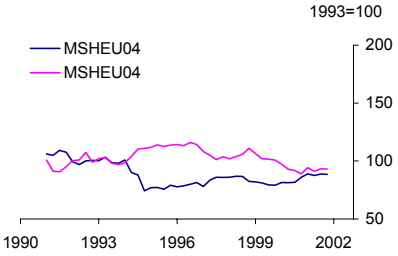
Other Chemicals



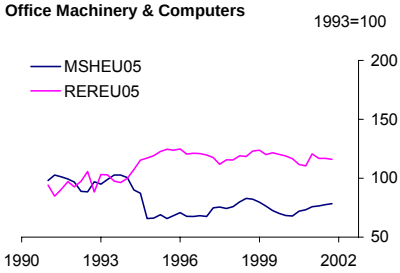
Material Manufactures



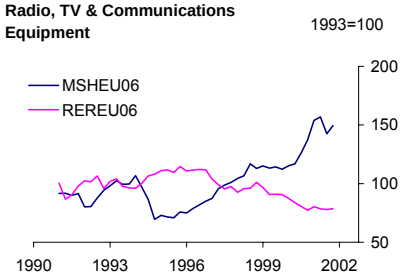
Mechanical Engineering



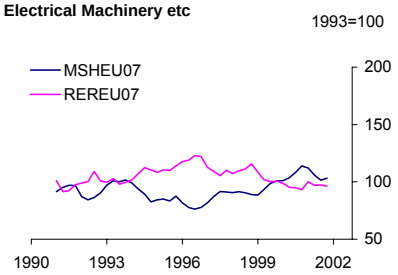
Office Machinery & Computers



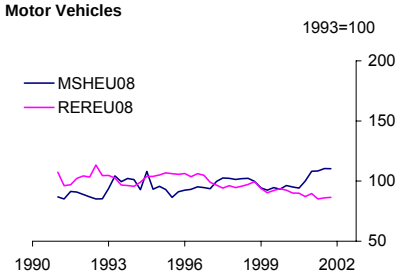
Radio, TV & Communications Equipment



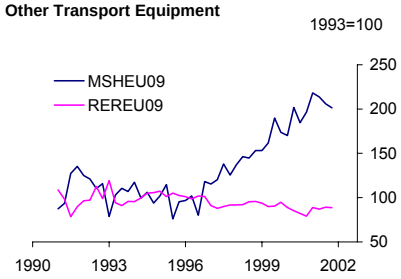
Electrical Machinery etc



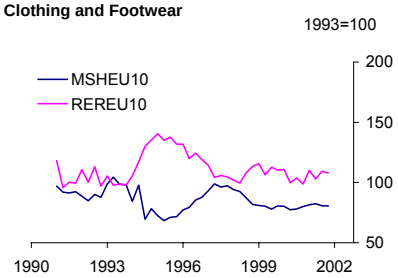
Motor Vehicles



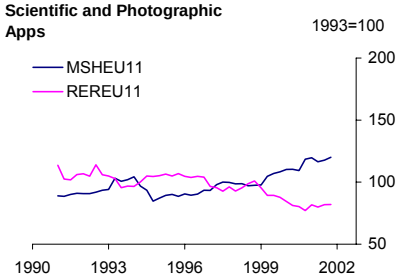
Other Transport Equipment



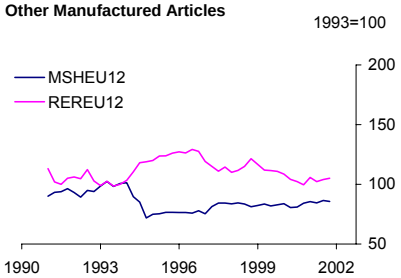
Clothing and Footwear



Scientific and Photographic Apps

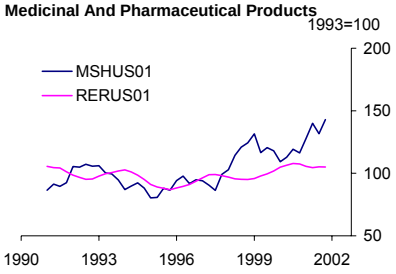


Other Manufactured Articles

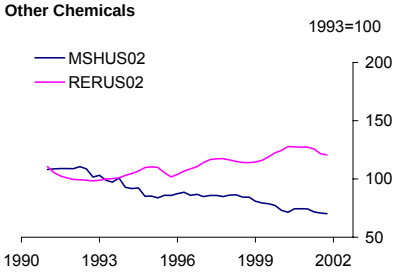


US: MARKET SHARE (MSH) AND REAL EXCHANGE RATE IN LOCAL CURRENCY (RER)

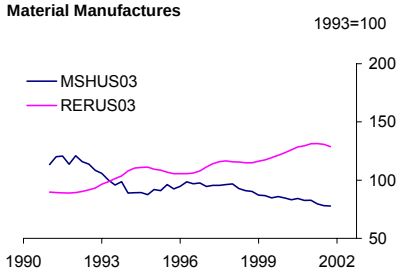
Medicinal And Pharmaceutical Products



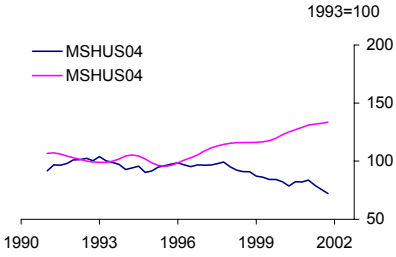
Other Chemicals



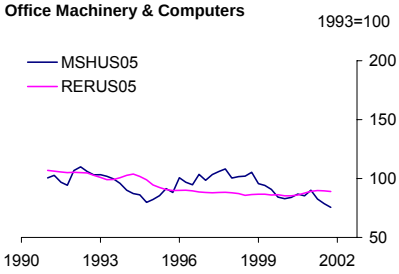
Material Manufactures



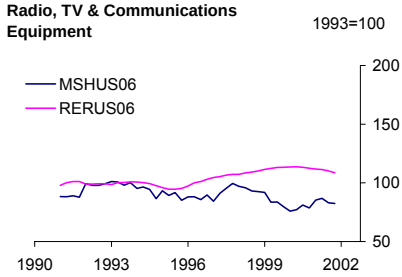
Mechanical Engineering



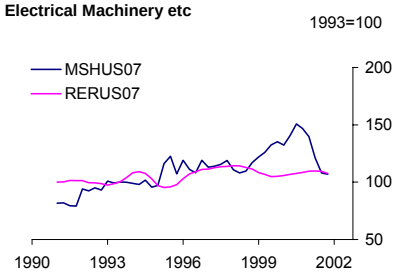
Office Machinery & Computers



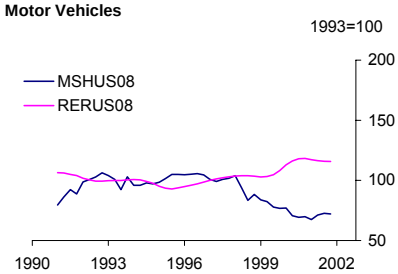
Radio, TV & Communications Equipment



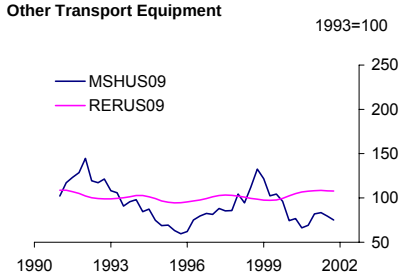
Electrical Machinery etc



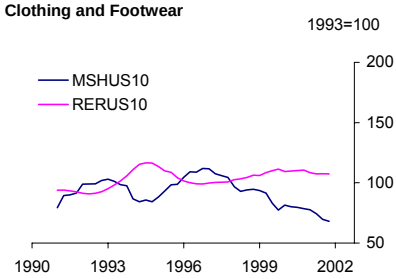
Motor Vehicles



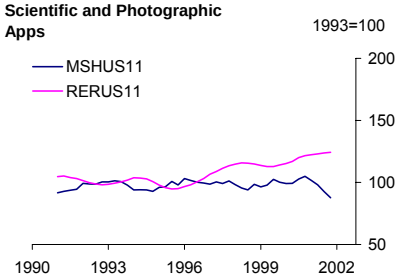
Other Transport Equipment



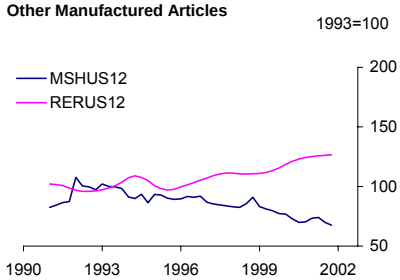
Clothing and Footwear



Scientific and Photographic Apps

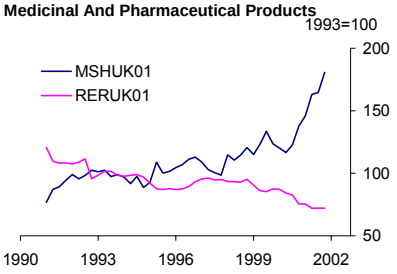


Other Manufactured Articles

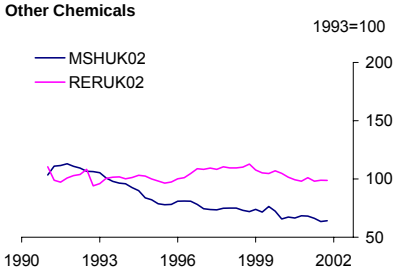


UK: MARKET SHARE (MSH) AND REAL EXCHANGE RATE IN LOCAL CURRENCY (RER)

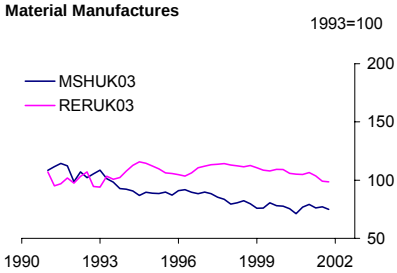
Medicinal And Pharmaceutical Products



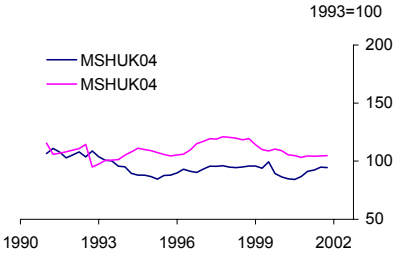
Other Chemicals



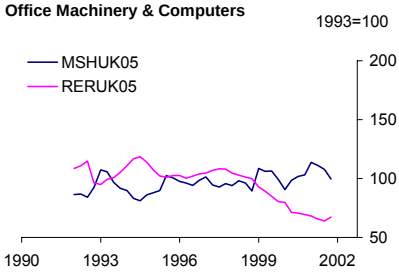
Material Manufactures



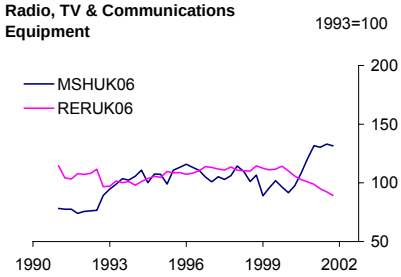
Mechanical Engineering



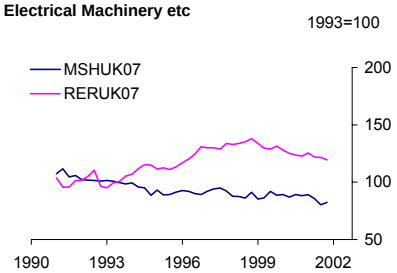
Office Machinery & Computers



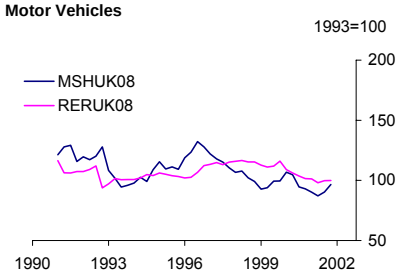
Radio, TV & Communications Equipment



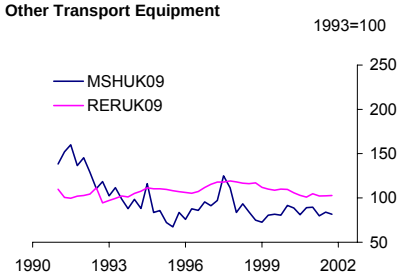
Electrical Machinery etc



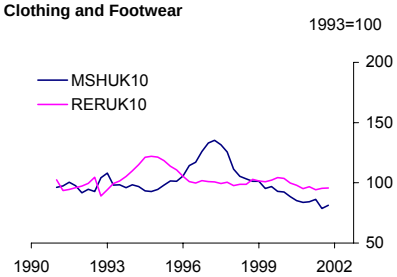
Motor Vehicles



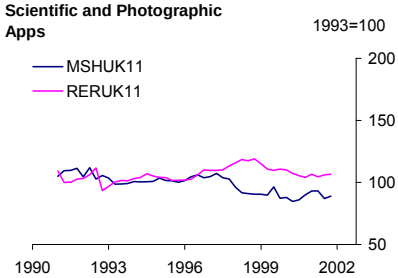
Other Transport Equipment



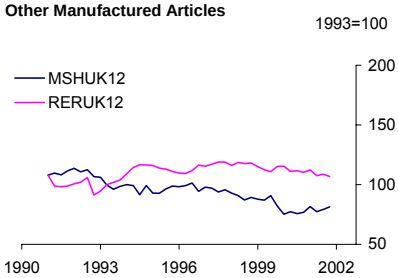
Clothing and Footwear



Scientific and Photographic Apps

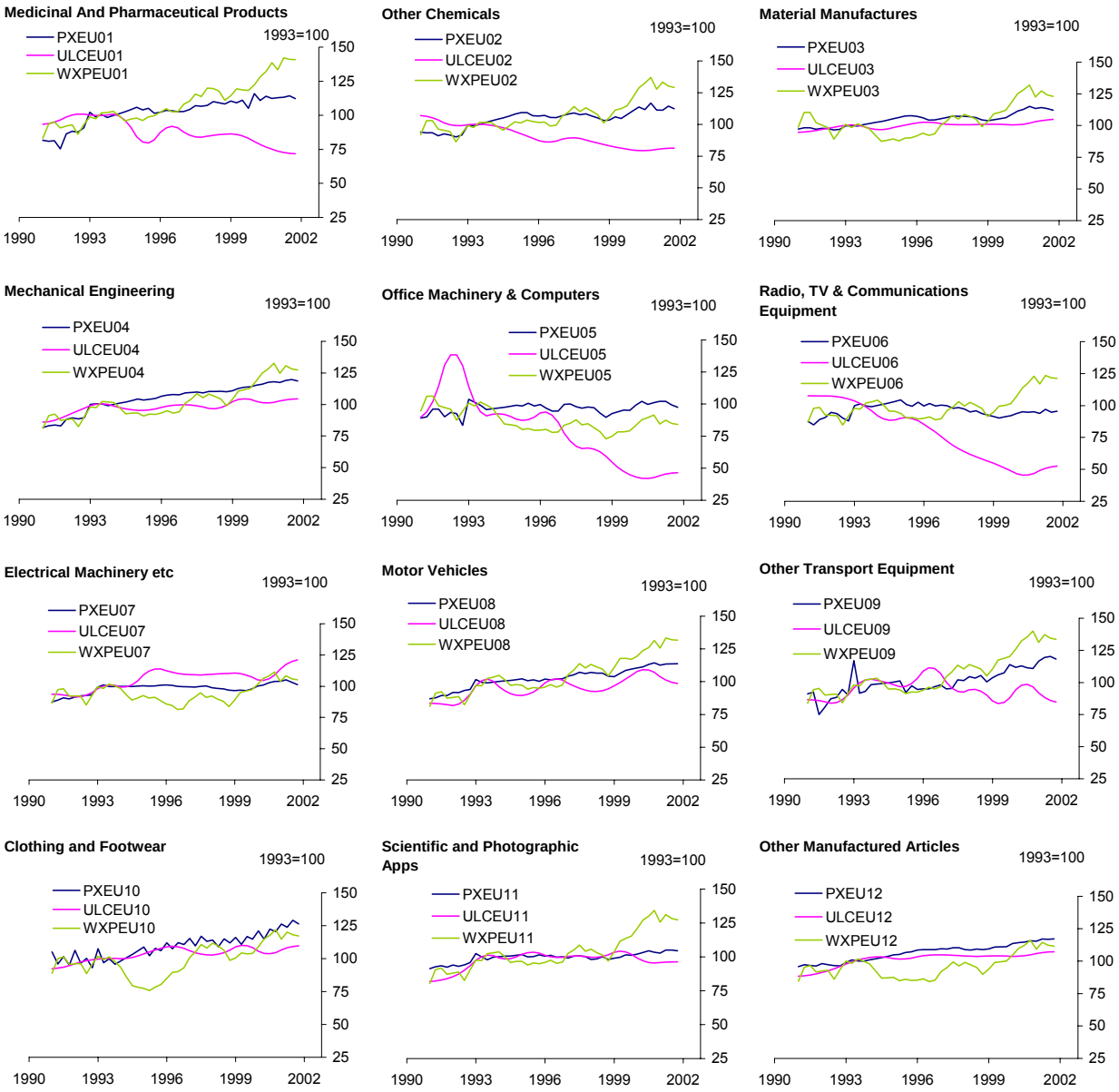


Other Manufactured Articles



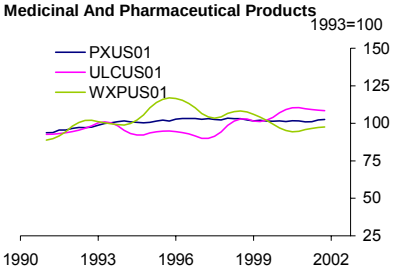
Annex 3

Euro area: EXPORT PRICES (PX), UNIT LABOUR COSTS (ULC) AND FOREIGN EXPORT PRICES (WXP) IN LOCAL CURRENCY

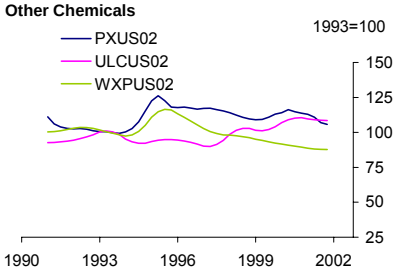


US: EXPORT PRICES (PX), UNIT LABOUR COSTS (ULC) AND FOREIGN EXPORT PRICES (WXP) IN LOCAL CURRENCY

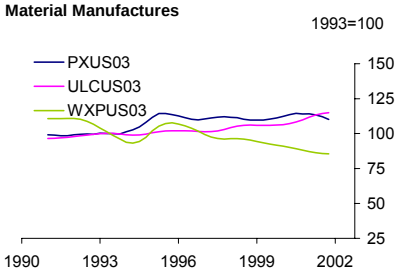
Medicinal And Pharmaceutical Products



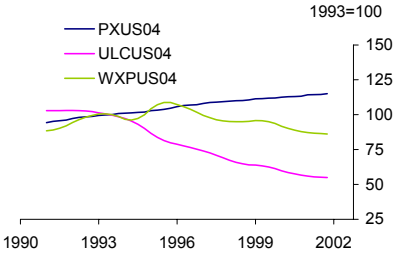
Other Chemicals



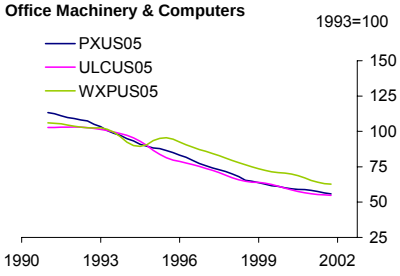
Material Manufactures



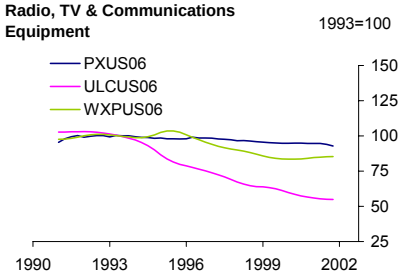
Mechanical Engineering



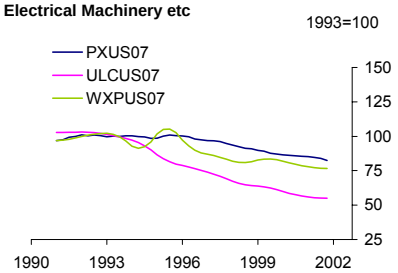
Office Machinery & Computers



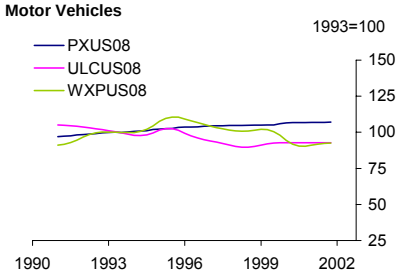
Radio, TV & Communications Equipment



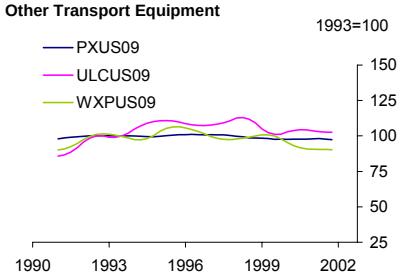
Electrical Machinery etc



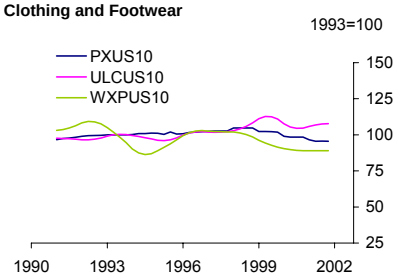
Motor Vehicles



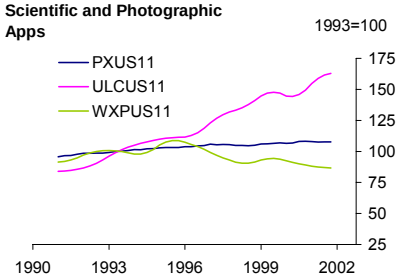
Other Transport Equipment



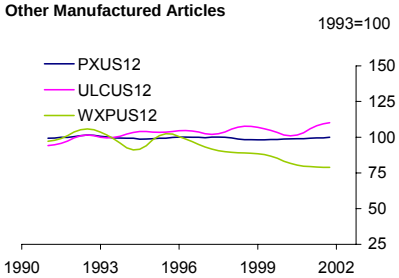
Clothing and Footwear



Scientific and Photographic Apps

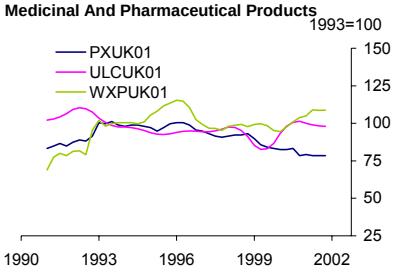


Other Manufactured Articles

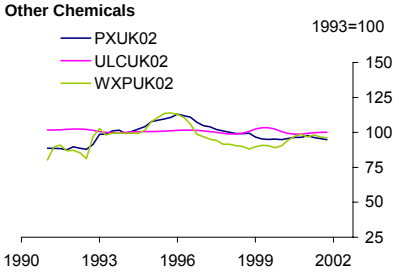


UK: EXPORT PRICES (PX), UNIT LABOUR COSTS (ULC) AND FOREIGN EXPORT PRICES (WXP) IN LOCAL CURRENCY

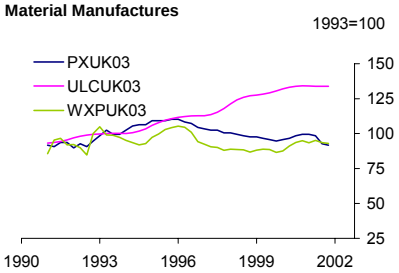
Medicinal And Pharmaceutical Products



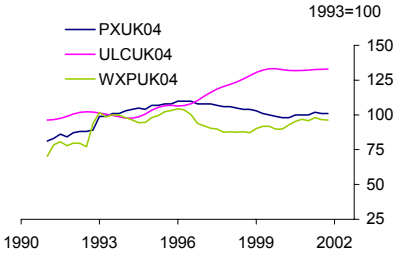
Other Chemicals



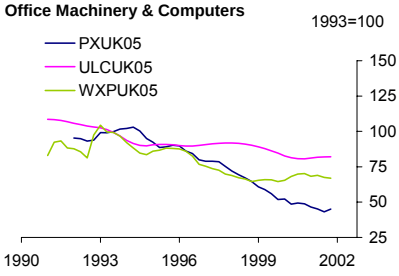
Material Manufactures



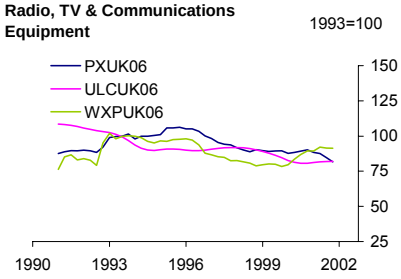
Mechanical Engineering



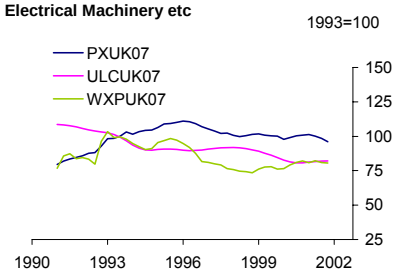
Office Machinery & Computers



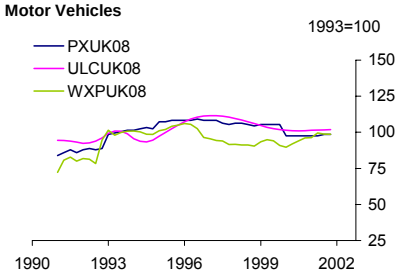
Radio, TV & Communications Equipment



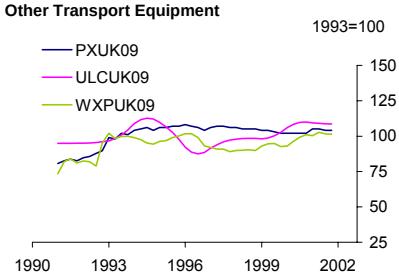
Electrical Machinery etc



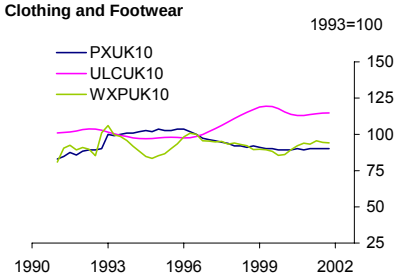
Motor Vehicles



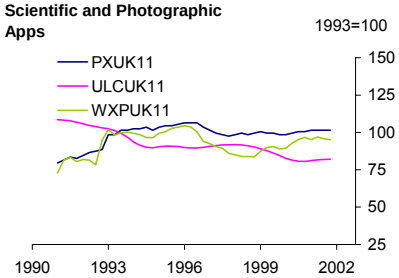
Other Transport Equipment



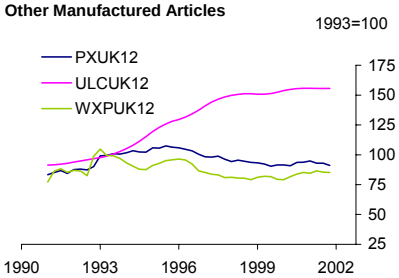
Clothing and Footwear



Scientific and Photographic Apps



Other Manufactured Articles



Annex 4: Estimation Results

EURO AREA SAMPLE PERIOD 1991:1 2002:4

	1		2		3 (t)		4		5 (a)		6 (a)		7		8		9		10		11		12 (t))	
	Medicinal/ Pharmaceutical		**Other Chemicals**		**Material Manufactures*^**		**Mechanical Engineering**		**Office Machinery & Computers^**		**Radio, TV & Communications Equipment***		**Electrical Machinery etc**		**Motor Vehicles*+**		**Other Transport Equipment+**		**Clothing and Footwear**		**Scientific/ Photographic Apps***		**Other Manufactured Articles**	
	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats
Demand																								
DX(-1)	-0,07	-0,44	0,02	0,15	0,11	0,92	-0,06	-0,49	-0,07	-0,46	0,11	0,81	0,48	4,44	-0,07	-0,48	-0,43	-3,34	-0,43	-3,36	0,07	0,56	0,17	1,21
DPX(-4) or DWMT	0,21	1,26	-0,25	-1,24	-0,53	-1,53	0,43	1,78	0,47	2,14	0,53	2,02	0,28	0,77	0,07	0,15	0,13	0,50	-0,30	-2,37	0,10	0,43	-0,84	-1,46
DER	-0,23	-1,56	-0,12	-1,13	-0,18	-2,10	-0,11	-0,96	-0,29	-1,66	-0,33	-1,61	-0,29	-2,82	0,09	0,54	-0,20	-0,41	-0,12	-0,68	-0,27	-2,49	-0,28	-2,25
ECM	-0,06	-1,06	-0,28	-2,67	-0,79	-5,79	-0,61	-5,17	-0,29	-2,79	-0,27	-2,81	-0,53	-5,45	-0,44	-3,35	-0,30	-2,64	-0,35	-2,51	-0,61	-4,84	-0,68	-4,83
PX/WPX-ER(-1)	-3,49	-1,48	-1,40	-5,67	-0,76	-16,12	-0,75	-7,27	-1,00	-2,33	-1,31	-3,49	-1,09	-9,66	-0,68	-1,87	-2,37	-2,60	-0,85	-3,54	-1,04	-8,20	-0,86	-9,07
WMT-WPX(-1)	1,58	2,96	0,71	11,57	0,66	36,73	0,67	16,95	0,96	10,75	1,21	12,19	1,11	41,08	1,01	9,27	1,30	4,17	0,73	6,90	0,92	14,92	0,84	30,46
Supply																								
DPX(-1)	-0,31	-3,25	-0,05	-0,47	0,46	3,13	0,02	0,16	-0,31	-2,85	-0,18	-1,37	0,15	1,00	-0,12	-1,01	-0,27	-1,95	-0,59	-4,44	-0,06	-0,40	0,03	0,19
DULC	-0,32	-1,72	-0,04	-0,14	-	-	0,11	0,41	-0,28	-2,83	-0,14	-0,68	0,00	0,03	0,25	2,22	0,23	0,79	0,48	0,91	0,58	2,89	0,00	0,00
DULC(-4)	-0,24	-1,16	-0,21	-0,68	-0,42	-1,48	-0,21	-0,66	-	-	-	-	-0,20	-1,40	-0,30	-1,28	-0,13	-0,41	-0,10	-0,15	0,31	1,88	-0,45	-1,60
DWPX-ER	0,34	3,34	0,38	5,44	-	-	0,23	3,28	0,40	3,05	0,15	1,48	0,15	3,28	0,23	3,59	0,24	1,17	0,02	0,15	0,13	2,31	0,00	0,00
ECM	-0,35	-4,30	-0,17	-2,58	-0,16	-2,14	-0,18	-2,35	-0,13	-2,04	-0,17	-2,47	-0,21	-2,12	-0,40	-2,85	-0,45	-2,45	-0,35	-1,72	-0,20	-2,07	-0,25	-2,94
X(-1)	-	-	-	-	0,13	2,39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,09	3,30
ULC(-1)	0,45	-	0,43	-	1,00	-	0,74	-	-0,06	-	0,30	-	0,25	-	0,40	-	0,22	-	0,90	6,73	0,59	-	1,00	-
WPX(-1)	0,55	9,70	0,57	5,67	0,00	-	0,26	1,81	1,06	7,79	0,70	8,85	0,75	4,37	0,60	3,35	0,78	6,40	0,10	-	0,41	3,06	0,00	-
VAPOT(-1)	-	-	-	-	-	-	-	-	-	-	-	-	-1,02	-3,91	-0,34	-2,54	-	-	-0,42	-2,46	-	-	-	-
Correlations																								
Contemporaneous	-0,29		-0,18		0,07		-0,36		-0,56		-0,26		-0,13		-0,09		-0,56		0,21		-0,46		-0,16	
orden 1 (pvalue)	0,54	0,46	0,71	0,08	0,65	0,06	0,88	0,87	0,94	0,43	0,85	0,93	0,35	0,12	0,66	0,19	0,27	0,26	0,56	0,48	0,93	0,58	0,73	0,33
orden 4(pvalue)	0,17	0,37	0,05	0,41	0,82	0,88	0,41	0,16	0,82	0,40	0,88	0,07	0,51	0,54	0,34	0,09	0,55	0,86	0,54	0,50	0,73	0,75	0,53	0,96

Notes

Green means significant at the 10% level while red means significant at the 5% level.

(a) Dwmt in the demand equation instead of dpx(-4) and DWPX-ER(-1) instead DWPX-ER in the supply equation

(t) coeffcient contrained to 1 in the long-run supply equation because it was slightly higher.

US SAMPLE PERIOD 1991-2001

	1 (c)		2		3		4 (a)		5		6 (b)		7		8		9		10		11		12 (b)	
	Medicinal/ Pharmaceutical		**Other Chemicals**		**Material Manufactures**		**Mechanical Engineering**		**Office Machinery & Computers**		**Radio, TV & Communications Equipment***		**Electrical Machinery etc**		**Motor Vehicles**		**Other Transport Equipment**		**Clothing and Footwear**		**Scientific/ Photographic Apps**		**Other Manufactured Articles**	
	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats
Demand																								
DX(-1)	-0,36	-2,24	-0,06	-0,30	-0,08	-0,63	-0,03	-0,20	-0,02	-0,21	-0,12	-0,95	0,37	2,37	-0,20	-1,50	-0,10	-0,67	0,04	0,28	0,24	1,65	-0,13	-0,93
DPX(-4)	-0,29	-0,17	-0,18	-0,84	-1,40	-2,71	0,74	3,25	-0,99	-1,07	0,58	0,61	-0,24	-0,18	0,46	0,19	5,28	1,03	-0,96	-1,36	0,02	0,02	2,89	1,82
DWMT-WPX	-0,18	-0,58	0,40	1,41	-0,40	-1,24	0,00	0,00	0,39	1,75	0,72	4,07	1,85	4,14	0,46	1,58	-1,12	-1,51	0,28	1,27	0,81	3,36	0,85	2,93
ECM	-0,06	-0,67	-0,43	-2,15	-0,70	-4,95	-0,20	-2,38	-0,48	-4,52	-0,27	-2,44	-0,80	-4,63	-0,36	-3,55	-0,18	-2,27	-0,02	-0,29	-0,40	-2,84	-0,34	-2,10
PX/WPX-ER(-1)	0,35	0,10	0,17	0,52	-1,94	-6,94	-1,30	-2,89	-2,48	-5,10	-0,21	-0,34	-1,10	-4,12	-1,35	-3,56	0,51	0,22	5,35	0,24	-0,50	-1,76	-0,97	-2,06
WMT-WPX(-1)	2,20	1,35	0,52	5,76	1,36	12,50	1,08	6,45	0,53	7,18	0,88	9,46	1,55	30,61	0,66	5,58	0,87	1,83	-5,17	-0,24	1,12	12,65	0,87	6,35
Supply																								
DPX(-1)	-0,20	-1,31	1,13	7,29	0,34	2,40	0,43	3,58	0,35	2,49	-0,70	-4,64	0,04	0,25	-0,11	-0,73	0,56	6,59	-0,28	-1,72	-	-	-0,31	-0,95
DULC	-0,02	-0,40	-0,13	-0,82	-0,68	-4,00	-	-	0,22	1,62	1,25	8,38	-0,19	-2,03	0,10	2,26	0,02	1,13	-0,05	-0,35	0,10	1,38	-	-
DULC(-4)	-0,16	-1,94	-0,53	-2,42	-1,55	-5,49	-0,12	-3,36	0,00	-0,01	0,04	0,41	0,02	0,15	-0,13	-0,84	-	-	0,10	0,70	0,02	0,25	-	-
DWPX-ER	0,01	0,31			0,20	2,44	-	-	0,22	2,54	0,07	0,85	0,02	0,37	-0,04	-1,15	0,03	1,48	0,07	0,92	0,05	1,13	0,17	2,07
ECM	-0,10	-2,71	-0,78	-5,02	-0,10	-3,76	0,00	-2,24	-0,13	-2,46	0,07	2,53	-0,08	-4,12	-0,03	-2,99	-0,01	-1,74	0,05	1,02	-0,05	-1,67	0,24	4,01
X(-1)	-	-	0,42	19,76	-	-	-	-	-	-	0,48	4,54	-	-	-	-	-	-	-	-	-	-	-	-
ULC(-1)	0,52	6,68	0,14	4,64	1,00	-	1,00	-	0,83	6,01	0,80	2,75	0,05	-	0,76	3,85	0,00	-	1,75	1,52	0,30	4,44	0,72	13,39
WPX(-1)	0,48	-	0,86	-	0,00	-	0,00	-	0,17	-	0,20	-	0,95	8,7	0,24	-	1,00	-	-	-	0,70	-	0,28	-
VAPOT(-1)	-	-	-	-	-	-	-	-	-	-	0,48	4,54	-	-	-	-	-	-	-	-	-	-	-	-
Correlations																								
Contemporaneous	-0,38	-	0,19	-	-0,37	-	-0,01	-	0,13	-	-0,16	-	0,31	-	0,05	-	0,01	-	-0,37	-	0,09	-	-0,22	-
orden 1 (pvalue)	0,22	0,60	0,91	0,93	0,85	0,08	0,80	0,99	0,92	0,99	0,47	0,88	0,82	0,96	0,74	0,94	0,90	0,36	0,33	0,43	0,57	0,76	0,44	0,73
orden 4(pvalue)	0,10	0,72	0,30	0,33	0,76	0,68	0,71	0,33	0,19	0,24	0,19	0,19	0,87	0,16	0,93	0,07	0,97	0,83	0,83	0,23	0,76	0,95	0,72	0,83

Green means significant at the 10% level while red means significant at the 5% confidence interval.
(a) DPX(-4) instead of DPX (-1)
(b) The ECM coefficient of the supply curve is positive because de dependant variable is Dulc instead of Dpx.
(c) 1994-2001

UK SAMPLE PERIOD 1991-2001

	1		2		3		4		5		6		7		8		9		10		11		12	
	Medicinal/ Pharmaceutical		**Other Chemicals**		**Material Manufactures^**		**Mechanical Engineering**		**Office Machinery & Computers^(a)**		**Radio, TV & Communications Equipment^(b)**		**Electrical Machinery etc**		**Motor Vehicles^+**		**Other Transport Equipment+**		**Clothing and Footwear**		**Scientific/ Photographic Apps^+**		**Other Manufactured Articles**	
	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats	coeff	t-stats
Demand																								
DX(-1)	-0,26	-1,91	-0,11	-0,71	0,00	-0,01	-0,36	-3,04	0,02	0,18	-0,14	-0,97	-0,16	-1,07	0,24	1,68	-0,11	-0,71	-0,24	-1,68	-0,22	-1,26	-0,23	-1,86
DPX	-1,07	-2,69	-0,07	-0,31	0,87	2,71	0,07	0,28	-1,33	-3,07	-1,58	-2,70	-0,45	-0,99	-1,31	-2,95	1,67	1,37	0,92	2,55	0,36	1,01	-1,19	-4,81
DWMT-WXP	-0,78	-1,84	0,22	0,86	0,25	0,58	-0,35	-1,57	0,01	0,03	1,13	2,54	1,07	2,82	0,64	0,79	3,52	2,57	-0,23	-1,02	0,86	1,94	-0,79	-2,16
DWPX-ER	0,70	3,01	0,07	0,72	0,10	0,64	-0,15	-1,46	0,35	1,25	0,53	1,89	0,19	1,20	0,19	0,80	-0,02	-0,02	-0,03	-0,18	-0,24	-1,29	-0,38	-2,75
ECM	-0,32	-2,32	-0,34	-2,32	-0,62	-3,37	-0,40	-5,45	-0,54	-3,41	-0,34	-3,59	-0,68	-3,68	-0,25	-2,45	-0,70	-3,96	-0,03	-0,55	-0,26	-2,16	-0,61	-5,09
PX/WPX-ER(-1)	-2,19	-3,13	-0,14	-0,48			0,21	1,02	-0,47	-2,13	-1,90	-2,13	0,12	0,66	-0,09	-0,09	-0,33	-0,51	9,78	0,54				
NER(-1)					-0,22	-2,05															-1,43	-1,73	-0,35	-2,08
WMT-WPX(-1)	0,87	3,36	0,40	8,95	0,57	11,19	0,84	15,45	0,94	13,03	1,04	9,57	0,74	10,16	0,63	4,63	1,07	5,58	-1,97	-0,41	1,32	3,61	0,66	11,05
Supply																								
DPX(-1)	0,01	0,10	0,00	0,03	0,03	0,23	-0,35	-3,01	0,13	1,08	0,03	0,25	-0,06	-0,43	-0,04	-0,39	-0,26	-2,37	-0,03	-0,22	-0,20	-2,16	-0,05	-0,41
DULC	0,04	0,36	-0,43	-1,33			-	-	0,25	0,66	0,42	1,82	-0,04	-1,28	0,16	0,77	0,25	2,68	-0,54	-2,13	-0,01	-0,08	1,38	3,36
DWPX-ER	0,25	3,11	0,28	5,23	0,14	2,19	0,16	2,99	0,20	2,36	0,32	5,54	0,23	5,64	0,21	2,94	0,56	5,54	0,13	2,01	0,47	7,68	0,34	5,82
DWPX(-1)-ER(-1)	-	-	-	-	-	-	0,24	3,91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DX	-	-	-	-	0,21	3,57	0,03	0,37	-0,16	-3,63	-0,05	-1,47	0,08	1,65	-0,12	-2,64	-	-	0,17	2,67	-0,03	-0,48	-0,06	-1,07
DX(-1)	-0,01	-0,16	-0,01	-0,20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECM	-0,18	-2,87	-0,22	-3,99	-0,13	-2,28	-0,15	-3,66	-0,12	-2,68	-0,26	-4,55	-0,09	-4,53	-0,21	-2,51	-0,18	-4,41	-0,11	-3,04	-0,38	-7,07	-0,40	-4,68
x(-1)																					0,13	3,11		
WPX-ER(-1)	0,81	5,46	0,99	7,77	0,99	5,91	1,00		1,00		0,92	11,82	0,92	5,09	0,82	3,54	1,00	5,55	1,00		0,57	8,69	0,80	21,97
ULC(-1)	0,19		0,01		0,01		0,00		0,00		0,08		0,08		0,18		0,00		0,00		0,43		0,20	
VAPOT(-1)	-0,87	-4,70							-0,88	-4,17							-0,71	-2,93						
Correlations																								
Contemporaneous	-0,4		0,0		-0,6		-0,1		0,6		-0,1		0,2		0,5		0,1		-0,6		-0,2		0,0	
orden 1 (pvalue)	0,6	0,9	1,0	0,7	1,0	0,6	0,3	0,1	0,9	0,9	0,6	0,8	1,0	0,6	0,2	0,4	0,9	0,5	0,7	0,7	0,2	0,4	0,3	0,4
orden 4(pvalue)	0,6	0,8	0,3	0,9	1,0	1,0	0,4	0,0	0,6	0,8	0,3	0,7	0,2	0,4	0,4	0,7	0,9	0,3	0,1	0,9	0,0	0,4	0,3	0,4

Green means significant at the 10% level while red means significant at the 5% confidence interval.
+ SAMPLE STARTS IN 1993
^ SAMPLE FINISHES IN 2000
*Restricted to 1 as results were slightly above 1 and significant.
(a) We use VA instead of the HP filtered version.
(b) DPX(-1) and DWMT(-4)-WXP(-4) instead of DPX and DWMT-WXP in the demand equation

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