COMMISSION OF THE EUROPEAN COMMUNITIES

A STUDY OF THE EVOLUTION OF CONCENTRATION IN THE MANUFACTURE AND SUPPLY OF TYRES, SPARKING PLUGS, AND MOTOR-VEHICLE ACCUMULATORS FOR THE UNITED KINGDOM

September 1977

In 1970 the Commission initiated a research programme on the evolution of concentration and competition in several sectors and markets of manufacturing industries in the different Member States (textile, paper, pharmaceutical and photographic products, cycles and motorcycles, agricultural machinery, office machinery, textile machinery, civil engineering equipment, hoisting and handling equipment, electronic and audio equipment, radio and television receivers, domestic electrical appliances, food and drink manufacturing industries).

The aims, criteria and principal results of this research are set out in the document "Methodology of concentration analysis applied to the study of industries and markets". (ref. 8756 – English version), September 1976.

This particular volume presents the results of the research concerning the evolution of concentration and competition in the industries supplying certain components for motor vehicles in the United Kingdom:

- tyres,
- sparking plugs,
- accumulators.

It deals with trends in the industries, structural changes and various indices for assessing concentration for several categories of product markets. It considers also the statistical significance between, first of all, profitability and size of enterprise and, secondly, the proportionate growth of large and small firms.

Similar volumes concerning the tyre industry are also published for other Member States (France, Germany, Italy).

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A Report prepared for the
Directorate-General for Competition
of the
COMMISSION OF THE EUROPEAN COMMUNITIES
by
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PREFACE

The present volume is part of a series of sectoral studies on the evolution of concentration in the member states of the European Community.

These reports were compiled by the different national Institutes and experts, engaged by the Commission to effect the study programme in question.

Regarding the specific and general interest of these reports and the responsibility taken by the Commission with regard to the European Parliament, they are published wholly in the original version.

The Commission refrains from commenting, only stating that the responsibility for the data and opinions appearing in the reports, rests solely with the Institute or the expert who is the author.

Other reports on the sectoral programme will be published by the Commission as soon as they are received.

The Commission will also publish a series of documents and tables of syntheses, allowing for international comparisons on the evolution of concentration in the different member states of the Community.

INTRODUCTION AND ACKNOWLEDGEMENTS

This report describes an investigation into competition in the supply of certain components for motor vehicles:- tyres, sparking plugs, and accumulators. The study was commissioned by the Directorate for Competition of the commission of the European Communities, and is one of a series of studies undertaken by the Cranfield School of Management and other institutions throughout the European Economic Community.

For the quantitative analysis, the commission specified a number of indices, which were described in detail in the first report prepared by Cranfield in this series, concerned with the United Kingdom Paper Industry. A summary explanation appears in Appendix A to this report.

The author would like to thank colleagues at the Cranfield School of Management who have assisted in this investigation, particularly Elaine Battison, the full-time research assistant until August 1977. The School also wishes to record its appreciation of assistance given by the British Rubber Manufacturers Association, and by three motor manufacturers and some of the companies supplying the three products.

SUMMARY OF REPORT

SUMMARY OF SECTION 1. GENERAL INTRODUCTION

The market for vehicle components consists of two distinct segments - "original equipment" (OE) and replacement. Within the OE market there is bilateral negotiation of contracts between each of a small number of vehicle producers and each of a small number of suppliers of each component. In the replacement market there are very many ultimate customers many of whom know little about the components and are influenced by recommendations of dealers and by advertising. For some products there is a captive element in the replacement segment. The replacement market generally offers greater profits than the OE sector.

In terms of volume, the replacement demand for tyres is about 2.5 times as great as OE demand. For batteries the ratio is about 2.25 and for spark plugs a figure of 8.0 is estimated. If these ratios were calculated for sales turnover, they would be considerably higher.

The U.K. motor industry is less vertically integrated than those in other countries and over half of the OE sales of components is derived from only ten companies. The three products studied in this report are supplied by separate groups of large companies with multinational interests.

About 37 per cent of the motor industry's output is exported and exports were nearly double the value of imports of motor products in 1976, though imports have increased at a much faster rate than exports in recent years. Parts and accessories accounted for 46 per cent of total exports of motor products in 1976, compared with 30 per cent in 1964; in contrast completed passenger cars continue to be the main element of imports. The trends in trade have adversely affected the U.K. original equipment market for tyres, batteries and spark plugs.

In examining the OE demand for components of passenger cars, we explain the inherent volatility of new registrations. Superimposed upon the fluctuations in sales has been a downward trend reflecting the increased penetration of imports and the decline in car exports.

The replacement demand for certain car components is negatively related to new car demand. Sales of batteries and tyres are mainly for vehicles aged at least two years old. A period of economic hardship can lead to postponement of vehicle scrappage which may benefit replacement demand for components.

There have been substantial changes in the stock, utilisation and patterns of replacement of goods vehicles over the past few years, in spite of the continuing stable relationship between tonne-kilometres of freight and Gross Domestic Product. One of the most significant changes is the use of larger vehicles, which has led to lower utilisation of smaller vehicles, extended lives and a lower total of new registrations. Lorries with unladed weight of 8 long tons (1018 kilograms) or more accounted for 59 per cent of freight movement in 1975 compared with 19 per cent in 1968. Despite a recovery in exports, from a low figure in 1972, total production

od goods vehicles has declined annually from 1969 (443,000) to 1976 (339,000).

The annual utilisation of goods vehicles is about 60 per cent greater than that of cars (the 1975 averages were 13,800 km. for cars and 22,100 km. for goods vehicles). For tyres replacement sales for goods vehicles are a particularly important market segment.

SUMMARY OF SECTION II, TYRES

The total market for tyres was static for much of the period surveyed. Total production of new car and commercial vehicle tyres fell annually from 1972 to 1975, in the replacement market this was due to slow growth in car ownership, to a decline in average distances travelled per car and to progressive adoption of radial tyres with longer life. Radial tyres plus the switch to larger vehicles for longer distance work explain a static replacement demand for commercial vehicle tyres. For both commercial vehicles and private cars original equipment demand has contracted partly because of a decline in vehicle production since 1972 and partly because more car tyres are being supplied from overseas sources to complement c.k.d. exports.

In terms of constant (1975) purchasing power, the total value of sales of tyres fell from £491 millions in 1968 to £449 millions in 1972 and the 1975 figure was £445 millions. The decline in the real value of sales shows that the fall in volume was not compensated by an increase in the prices of tyres in relation to the prices of all goods and services. Although the ex-factory prices of radial tyres are now over 20% higher than those of corresponding cross-ply tyres, the average life of radials is approximately double that of cross-ply tyres.

A large growth in imports and exports partly reflects intra-European movements by multinational companies. By 1975 European countries received 70 per cent of exports and supplied 88 per cent of imports. Competitive imports (that is supplied by companies other than members of the six large tyre companies with production units in Britain) accounted for about 15 per cent of new car tyres bought in the U.K. replacement market in 1975 and about the same proportion of new commercial vehicle tyres.

Direct exports of car tyres represented 25 per cent of U.K. production in 1975, having increased annually from 1972 to 1975 and almost recovered their 1970 volume. Most of these tyres (75 per cent by volume and 84 per cent by value) are exported to European countries and the leading export markets are countries to which British vehicle parts are sent for final assembly. Such countries, especially Sweden, were also important markets for goods vehicle tyres, exports of which rose sharply both in volume and average value in 1975. Direct exports accounted for 7 per cent by volume and 34 per cent by value of the total output of commercial vehicle tyres in 1975.

In 1968 there were seven companies manufacturing new vehicle tyres in the United Kingdom; with the financial merging of the tyre activities of Dunlop and Pirelli, the number fell to six. There are about 70 companies engaged in the retreading of used tyres; most of them are too small to be included in official statistics. Retreaded tyres represented about 28 per cent of replacement tyres on cars in 1975 but the proportion had fallen. For commercial vehicles, retreads were more significant - 38 per cent in 1973 and 42 per cent in 1975. About 35 per cent of all retreads are supplied by the major manufacturers. On page 30 we have listed some competitive disadvantages faced by independent retreaders, which have led to downward pressure on prices.

Manufacture-owned outlets supplied 35 per cent of all tyre sales to final customers in the replacement market in 1975. A further 30 per cent were supplied by independent dealers, some of whom had contractual arrangements with manufacturers. The number of independent distributors is large and competition in the retail distribution of tyres is intense.

In the replacement market the competition extends also to manufacturers. Car tyres are a volume product:- six size - categories account for 75 per cent of all tyres sold and 25 per cent are of a single-size. Brand loyalty is low. Competition has taken the form of quality improvement (which has led to longer product-life and lower sales), advertising, multiple-branding and price-cutting. Advertising, in terms of constant purchasing power, was 37 per cent lower in 1974 than in the previous year but there have been recent indications of a recovery, Even in 1976 advertising expenditure by all tyre manufacturers amounted (in terms of constant purchasing power) to only 52 per cent of the 1969 figure. In 1976 advertising amounted to about 22 pence per tyre, or about 3 per cent of the ex-factory price. Multiple-branding is used as a method of market segmentation and perhaps also as a defence against imports. In the absence of detailed empirical work into the structure of prices, the degree of price competition is hard to determine. The size of discounts offered at some outlets suggests that part of these discounts must be borne by manufacturers.

Estimates of market shares in 1972, 1975 and 1976 replacement sales of new tyres show gains by Michelin and an unstable pattern for other producers. Four companies (Dunlop-Pirelli, Goodyear, Michelin and Firestone) achieved 79 per cent of replacement sales in 1972 and 84 per cent in 1976.

The original equipment market for tyres is volatile partly because of interruptions in vehicle production and also because of the very low level of inventories held by vehicle manufacturers: for most individual size/specification they use two (but only two) sources. Certain links between individual vehicle manufacturers and tyre producers continue to be reflected in the OE market - Leylandwith Dunlop, Ford with the American suppliers etc. Although there is no evidence of collusion, proposals for increases in prices, which are bilaterally negotiated, appear to coincide and differences in prices are very small.

From our own discussions and the results of other surveys, we estimate that Dunlop, Goodyear and Firestone together supplied 76 per cent of the OE tyres for cars and commercial vehicles in 1975. The ex-factory price of a tyre sold for replacement is estimated to be about 1.5 times the OE price.

The most of the financial analysis and all of the concentration tables are confined to the larger firms, though the performance of three retreading companies is examined. There are three levels world-wide and all activities world-wide.

The analysis for all U.K. activities shows that even within the six major companies, a group of three (Dunlop/Pirelli, Goodyear and Michelin) formed a distinct oligopoly group, in 1974 and 1975. In the latter year they obtained 82 per cent of the combined sales of the six firms. The Linda index, which is used to define this group, also shows that in each year there was a discontinuity in the distribution of profits,

Analysis of profitability is distorted by questions of transfer-pricing relating to subsidiaries of overseas parents. Consolidated accounts for world-wide activities of Michelin were first published in 1975 and only for that year is a complete comparison possible. Ratios for other companies in remaining years are presented in the tables.

The examination of "dynamism" within the U.K. activities reveals increased instability towards the end of the survey period. This appears to be due to resurgence of advertising to which not all companies had joined. Over the entire period 1969-75 the growth of Michelin's share of industry turnover is the most notable feature.

From the application of the standard statistical measures prescribed by the Commission to world-wide activities, it is clear that the British company Avon cannot be regarded as a member of the multinational oligopoly. The analysis also shows that net profits and net cash flow were more strongly concentrated than sales turnover and capital stock variables, a conclusion which corresponds with the results of most of this series of studies initiated by the Commission.

SUMMARY OF SECTION III. SPARKING PLUGS

Apart from certain specialist producers, there are now only three manufacturers of sparking plugs in the United Kingdom - the Champion Sparking Plug Company, A.C. Delco (General Motors) and Ford. Each is a subsidiary of a U.S. parent. A.C. Delco supplies plugs to its fellow General Motors subsidiary, Vauxhall, and the OE requirements of the Ford Motor Company are supplied by its own sparking plug division. Champion is the sole supplier to British Leyland and Chrysler.

Total U.K. production of sparking plugs is estimated to have risen from 94 millions in 1968 to 112 millions in 1973, but with the decline of car and small van production, output fell back to about 94-95 millions in 1974 and 1975.

Foreign trade in plugs is quite large in relation to production, partly because of shipments by the three major manufacturers, who tend to organise their activities on a "pan-European" basis. Competitive imports, mainly from Germany, Japan and France accounted for about 11 per cent of the U.K. market in 1975.

The ratio of replacement to OE demand for sparking plugs was about 8 to 1 in 1973 and about 10.5 to 1 in 1975. The OE market is effectively tied with exclusive dealing arrangements betweeen vehicle manufacturers and suppliers of sparking plugs. We estimate that Champion held 66 per cent of the OE market in 1975, Ford 26 per cent and A.C. Delco 8 per cent.

Competition in the replacement market is influenced by links between manufacturers and major outlets. Customer loyalty is believed to be low and advertising is negligible. Our estimates of market shares in the replacement sector are as follows (%):-

Champion 65, Ford 13, A.C. Delca 12, Bosch 6, and other importers 4.

SUMMARY OF SECTION IV. BATTERIES (ACCUMULATORS)

Revenue from the sale of batteries has fallen in real terms since 1973. This is mainly because of improved product life: the number of accumulators sold per 100 vehicles at least two years old fell from 43 in 1973 to 33 in 1976.

The total market may be divided into three main segments:- (i) original equipment, for which "premium" or high quality batteries are supplied, 94 per cent of them by Lucas and Chloride; (ii) the "traditional" replacement market where premium and "second-line" batteries (the latter have less exacting specifications) are supplied via garages by the four members of the British Battery Makers Society (Lucas, Chloride, Haddon-Oldham and Crompton-Parkinson) and (iii) the "own label" market where batteries of varying qualities and specifications are sold by distributors under their own brand-names.

The third sector has grown in recent years; there are mahy brand-names and a large number of suppliers. These are believed to include not only the major battery companies but also local producers often with only a handful of employees. Some of the batteries in this third sector are sold at prices much lower than those of batteries sold via traditional outlets.

Foreign trade in batteries is very small. In 1976 less than 9 per cent of U.K. production volume was exported and imports amounted to less than 6 per cent of batteries sold in this country.

Original equipment accounts for 25 to 30 per cent of all motor vehicle batteries sold. This sector of the market is dominated by Lucas and Chloride, with over 90 per cent of all sales. Some traditional supply patterns, e.g. between Leyland and Lucas and between Ford and Chloride continue.

In the replacement sector, the multiplicity of outlets and of brand-names is described in some detail in the report. Advertising is negligible and brand-loyalty very low. Estimates of market share must be inexact because it is not possible to identify the suppliers of certain brands.

We estimate that Chloride and Lucas shared 94 per cent of the OE market in 1975, probably with about 42 and 52 per cent respectively. In the replacement market our estimates of market share (%) are Chloride 35, Lucas 17, Haddon-Oldham 13, Crompton-Parkinson 10, others (including importers) 25.

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GENERAL INTRODUCTION

A. THE TOTAL MARKET FOR VEHICLE COMPONENTS IN THE UNITED KINGDOM.

For the three products examined in this report, as for most motor vehicle components, there exist two distinct market segments:- original equipment and replacement. In selling components for use on new vehicles ("original equipment" or OE), a small number of large companies is normally competing for orders from the few major vehicle manufacturers in the United Kingdom. In terms of economic theory, an oligopoly faces an oligopsony. This results in competitive negotiations, shrouded in commercial security, and in the establishment of 'certain' regular buying patterns, the reasons for which are not easy to discern. A general survey of the dealings between component manufacturers and vehicle products suggests that some of these established links have become accepted by the industry because they reduce uncertainty and create some stability within the original equipment market.

The sale of components for the replacement on existing vehicles of products which are worn out or damaged is very different from the sale of the same products as original equipment:-

1. There is a very large number of ultimate customers, in contrast with the dominance of four major vehicle manufacturers in the OE sector. There are thousands of intermediaries between the component manufacturers and vehicle users.

2. Most of these final customers know little about the technical properties of the product and in most cases rely on the advice of motor repairers and distributors. Advertising influencies the market for some products and, especially where safety is involved, surveys have revealed fairly low price-sensitivity.

3. With some products there is a "captive" element in the replacement market. Even when this is not necessary for technical reasons, the customer tends to replace certain components with the same branded product which was used for original equipment. This may be because the vehicle is serviced by the dealer who sold it to him or because of uncertainty about possible substitutes.

4. These first three features make the replacement segment of the market more profitable than the original equipment segment. This has led to (i) the establishment of companies who sell only to the replacement segment (these were described as "pirates" by the large oligopolists);(ii) the production, by all major component manufacturers, of replacement parts for vehicles for which they do not sell the corresponding OE part - this includes vehicles imported into the United Kingdom and even non-British vehicles in overseas markets; (iii) the establishment by three of the vehicle manufacturers of wholesale distribution under their own brand-names of components and accessories[1] purchased from component suppliers.

B. THE RELATIVE SIZE OF THE REPLACEMENT AND ORIGINAL EQUIPMENT MARKETS.

The comparative size of the two segments of the market depends upon the life of the vehicles, the distances they travel, the rate at which the component deteriorates, the risk of damage to the component and the number of vehicles registered. The importance of these factors varies between components.

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1 The word "accessories" is used to describe something which is normally added to the vehicle and is not an essential compenent. The words "components" and "parts" are used here synonymously although they may have different connotations in every day use.

1. TYRES

The average new cross-ply passenger car tyre may be expected to cover about 22,000 km before requiring replacement and the average new radial-ply tyre about 45,000 km. The share of radials in the total market was 62 per cent in 1973 and 69 per cent in 1974, so that the mean tyre life in 1974 would be about 38,000 km. In 1974 the 14.3 million cars and car-derived vans in the U.K. covered a total distance of about 195,000 million km, indicating a replacement requirement of (195/38 times four) about 20.5 million tyres. This expected figure was remarkably close to the actual figure[1].

The original equipment market for passenger car and van tyres may be somewhat less than five times the number of cars and small vans produced in the country (that is in 1974, 5 times 1.627 millions = 8.134 millions). This is because the production figures include cars exported in unassembled form (327,000 cars in 1974 representing 58 per cent of cars exported); tyres fitted to such vehicles are often purchased from overseas sources, including firms affiliated to the main U.K. tyre producers.

For tyres, the ratio of total U.K. replacement sales to OE sales is therefore about 5 to 2 in terms of volume. Because of the higher prices of tyres sold for replacement their relative importance in terms of sales turnover is even greater. With commercial vehicles, undertaking greater distances, the ratio is almost certainly more pronounced.

2. BATTERIES (accumulators)

The life of a battery is influenced partly by age and partly by its use and care in its maintenance. Battery

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1 Source of data on vehicle numbers and kilometres travelled: Department of Enviroment. The actual figures of tyre sales are shown on page 19 below.

deterioration is not strongly related to vehicle mileage as such.

Over the past few years this life has been extended by technical improvements in the battery itself, e.g. the use of polypropylene casing instead of rubber and in alternators, giving better charging; other factors which may have been important are the relaxation of rules for the lighting of parked cars and a series of mild, comparatively fog-free winters. The effects of these changes are hard to quantify even for companies within the industry.

Foreign trade in batteries is fairly small and most of the vehicles exported in unassembled form will have batteries from overseas suppliers. Original equipment sales are, therefore, likely to be equal approximately[1] to the sum of U.K. cars and commercial vehicle production less unassembled exports. In 1974 this total was 1.8 millions and with the total sales of batteries in the United Kingdom at about 5.9 millions, this suggests a replacement market of 4.1 millions. With a total vehicle stock of 15.9 million cars and commercial vehicles, this indicates an average life per battery of about 3 years 10 months[2].

As with tyres, the replacement market is more than double the size of the OE market for accumlators. In terms of volume the current ratio is about 9 : 4; in terms of sales value, the ratio is much higher.

3. SPARKING PLUGS

Sparking plugs are normally replaced after about 19,000

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1 This calculation ignores the use of two batteries by very large commercial vehicles.

2 The estimate of the replacement market is almost identical with one reached independently by the Economist Intelligence Unit Ltd. (Ref 1.)

kilometres. With about 15 million petrol-driven cars and vans in use in 1974, with an average distance travelled of about 14,300 kilometres, this suggests a replacement market of about 50,000 plugs (assuming an average of about 450 plugs per 100 vehicles). A further 6-7,000 may be added for plugs used in motor-cycles, motor-mowers, agricultural vehicles etc.

The original equipment market is proportional to the number of vehicles produced, less most of the unassembled units exported. For petrol driven vehicles in 1974 this total was about 1.5 million vehicles, or about 6.8 million plugs.[1]

In the case of sparking plugs, this calculation suggests that the replacement market is approximately eight times as large as the original equipment market, in volume terms. The OE market is regarded as important by the principal manufacturers of sparking plugs because there is likely to be some brand loyalty, especially during the first year of a vehicle's life when the validity of guarantees relating to the ignition equipment is considered. Because plugs are a fairly minor cost item, the customer may feel it wise to replace plugs with identical brands to avoid more significant problems.

4. SUMMARY OF SECTION

For the three products considered in this study the United Kingdom replacement segment of the market is much larger than the original equipment segment. Apart from the value of any contribution to fixed expenses achieved by selling at prices greater than marginal costs, one of the main motives for manufacturer to sell to the vehicle builders is the entry that this gives to the more profitable replacement sector.

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1 These estimates are consistent with those of the E.I.U. and of one of the spark plug manufacturers.

C. THE STRUCTURE OF THE U.K. MOTOR INDUSTRY

TABLE 1.1 ANALYSIS OF GROSS OUTPUT 1974

(a) ANALYSIS BY PRODUCT	£ Millions	Percentage of Total
Passenger cars: Home sales	1,325	38.0
Exports	420	12.1
Commercial Vehicles: Home sales	385	11.0
Exports	230	6.6
Parts and Accessories (other than those included in vehicles shown above)		
Home sales	445	12.8
Exports	680	19.5
	3,485	100

(b) ANALYSIS BY SOURCE OF ADDED VALUE		
By vehicle manufacturers	745	21.4
By component producers[1]	625	17.9
By organisations outside the motor industry	2,115	60.7
	3,485	100

Source: Central Policy Review Staff (Ref.2).

This table shows the importance to the motor industry of parts and accessories (other than those incorporated in complete vehicles). These accounted for over 32 per cent of total industry sales in 1974 and for over 51 per cent of industry exports. The significance of foreign trade for components in general and for tyres, batteries and sparking plugs in particular is discussed in Section D.

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1 Component producers include all enterprises with no vehicle manufacturing capacity but with establishments devoted primarily to motor vehicle components.

In contrast to those in other countries, the British motor industry has little vertical integration. Whereas value added by the vehicle manufacturers accounted for only 30 per cent of sales, the corresponding proportion for German verhicle builders was around 47 per cent[1]. A distinctive feature of the U.K. motor industry is the existence of large component manufacturing groups. Although there are over 2,000 companies within the component sector, ten of these account for over half of the total value of the OE market for components[2].

In the production of tyres, batteries and sparking plugs, large firms with multinational interests predominate and only these large companies are involved in the OE segment. These are as follows:-

Tyres:- Dunlop, Pirelli, Michelin, Avon, Firestone, Goodyear, Uniroyal.

Batteries:- Chloride and Lucas.

Sparking plugs:- Champion (the only source for Leyland and Chrysler), A.C. Delco (the only supplier to fellow GM subsidiary, Vauxhall Motors Ltd) Autolite (sole supplier to and division of Ford).

D. FOREIGN TRADE

Table 2 shows the composition of U.K. trade in 1964 and in each of the five latest years for which data are available, 1972 to 1976.

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1 Estimate by author based on data published by Verband der Deutschen Automobilindustrie: Tatsachen und Zahlen and also an analysis of company accounts for an earlier research project.

2 C.P.R.S. (Ref. 2), page 7.

TABLE I.2 U.K. TRADE IN PRODUCTS OF THE MOTOR INDUSTRY

(Wider definition than in Table I-1)

	1964	1972	1973	1974	1975	1976
EXPORTS (£m.f.o.b.)						
Cars and taxis:						
assembled	174.4	213.5	234.4	270.6	315.3	454.7
unassembled	81.2	116.4	138.3	147.9	167.9	176.3
Goods Vehicles complete		114.7	131.0	168.0	297.0	375.9
chassis	126.5	17.1	31.9	14.9	24.2	26.4
Other commercial vehicles		43.3	51.2	67.1	107.4	145.9
Parts & Accessories	224.3	576.8	703.2	859.4	1151.5	1503.8
Tractors, Dumpers and other products	136.3	237.3	278.7	348.3	531.4	596.5
TOTAL EXPORTS	742.7	1319.1	1568.7	1876.2	2594.7	3279.5
IMPORTS (£m.c.i.f.)						
Cars and taxis:						
assembled	27.1	324.3	436.9	355.0	513.8	871.0
unassembled		0.1	-	0.1	0.2	15.4
Commercial vehicles	2.2	39.0	53.7	91.1	90.1	122.7
Parts & Accessories	13.0	169.4	224.6	301.6	359.6	552.1
Other products	15.9	29.6	49.3	70.0	126.4	110.2
TOTAL IMPORTS	58.2	562.4	764.5	817.8	1090.9	1671.4

Source: SMMT and Overseas Trade Accounts.

From the data in this table it can be calculated that, whereas in 1964 parts and accessories accounted for 30 per cent of total U.K. exports of motor industry products, by 1976 the proportion was nearly 46 per cent. This has been due partly to the transfer to overseas sources of purchases of parts for British vehicles assembled overseas. When the ratio of the U.K. content of such vehicles to their complete ex-factory value falls below 50%, the vehicle is no longer included in the "unassembled vehicles category" and the components exported from the United Kingdom are classified as parts and accessories. Among "unassembled vehicles"

included in the count, the U.K. content has fallen significantly, Within the 1601-2,200cc category, for example, in 1965 the value of the unassembled car exported was over 70 per cent of the corresponding value of the completed vehicle; by 1975 this ratio had fallen to 61 per cent.

While completed "passenger cars" represented under 14 per cent of U.K. motor industry exports in 1976 (and only 12 per cent in 1975), they continue to be the main element of imports, 52 per cent in 1976. The assembly of foreign vehicles in this country is confined to the recently introduced arrangements for the Chrysler Alpine.

The trends in trade have adversely affected the U.K. OE market for tyres, batteries and spark plugs. These products are usually among the first items to be supplied from sources in or near the country of assembly when vehicles are exported from the U.K. in unassembled form. The OE sector has also been reduced by the increased penetration by imported cars and commercial vehicles (nearly all in completed form) of the United Kingdom market.

E. COMPONENTS FOR PASSENGER CARS - ORIGINAL EQUIPMENT

1. NEW REGISTRATIONS OF PASSENGER CARS

Figure I shows new registrations of passenger cars in each year from 1960 to 1975. The volatile nature of demand can be explained partly by major changes in the economic environment:- alternation of expansionary and restrictive policies by governments in the 1960's which tended to control demand for consumer durables as a means of regulating the economy; the rapid growth of the U.K. economy in 1972-3 and the effects of recession after the rise in oil prices. Purchases of new cars are likely always to be highly sensitive to changes in aggregate income because of the "stock adjustment effect"[1]. Current research by the present author has shown that new registrations (Q) are related to personal disposable income (Y) and the ratio of an index of new car prices to the overall index of retail prices (P) by the following equation (which relates to Great Britain):-

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1 The theoretical basis of this concept was set out in a paper by Stone and Rowe in Econometrica 1958. See also C StJ.O'Herlihy: The Demand for Cars in Great Britain, Applied Statistics 1965.

$$Q = 959 + 0.034\ (Y + 4\ \Delta Y) - 10.48P \qquad R^2 = 0.927$$
$$(365)\ (0.004) \qquad\qquad (2.48) \qquad DW = 2.12$$

Estimates predicted by the equation are shown alongside actual new registrations for 1960 to 1975 in Figure I. (At end of section)

Forecasts of new registrations in any future year are inevitably hazardous. Most[1] new cars are purchased to replace existing vehicles which are then transferred to new owners. Postponement of replacement during a recession leads to a potentially larger demand in a subsequent year; above-normal replacement leads to a rejuvenated car stock and so to a lower level of subsequent demand. Although the stock-adjustment model takes this feature into account, it requires prediction of year-by-year changes in economic activity. New car registrations and consequent OE demand for components will remain very difficult to predict.

2. U.K. PRODUCTION OF PASSENGER CARS

Because of the increased penetration of the U.K. market by importers (14 per cent in 1970, 33 per cent in 1975 and 45 per cent in 1976) and the decline in exports of vehicles, annual production of cars has only once (1972) exceeded its 1964 level:-

TABLE 1.3 PRODUCTION OF PASSENGER CARS IN THE U.K.

(Department of Industry)

YEAR	No. of cars produced (000's)	YEAR	No. of cars produced (000's)
1960	1353	1969	1717
1961	1004	1970	1641
1962	1250	1971	1742
1963	1608	1972	1921
1964	1867	1973	1747
1965	1772	1974	1534
1966	1604	1975	1268
1967	1552	1976	1333
1968	1815		

1 The Motor Transactions Survey of 1971 showed that the proportion was then 92 %. With the greater current level of motorisation, the proportion is almost certainly higher.

For producers of certain components, the demand from the OE sector is overstated in Table 1.3. because the production figures include incomplete vehicles exported overseas in unassembled form. Tyres, spark plugs and batteries may not be included in all of these unassembled vehicle units.

F. COMPONENTS FOR PASSENGER CARS - REPLACEMENT DEMAND

In section B we listed some of the factors which influence the replacement demand for the three component products. These will be examined in further detail in Sections II to IV. It is clear that replacement demand will not be proportional to the total number of cars in use, nor to the total distance covered by passenger cars. For tyres (especially with the growing importance of radials) and batteries, replacement during the first two years of a car's life is exceptional. Table 4 shows the number of passenger cars in use in Great Britain[1] in September of each year annually from 1961 to 1976 and also the number aged two years and over. These data are shown graphically in Figure II.

TABLE 1.4 PASSENGER CARS IN USE IN GREAT BRITAIN 1961-76

	Grand total	of which at least 2 years old
1961	5,979	4,379
1962	6,556	5,154
1963	7,375	5,670
1964	8,247	6,112
1965	8,917	6,589
1966	9,513	7,242
1967	10,303	8,169
1968	10,816	8,660
1969	11,227	9,063

1 Great Britain is used instead of the United Kingdon because of incomplete data for Northern Ireland. The total numbers of cars licensed for use in Northern Ireland were (thousands):-
1961 : 135 1971 : 299 1976 : 316

	Grand total	of which at least 2 years old
1970	11,515	9,436
1971	12,062	9,801
1972	12,717	9,892
1973	13,497	10,166
1974	13,639	10,637
1975	13,747	11,251
1976	14,029	11,703

It is interesting to compare the growth of cars aged two years and over with new registrations. For example, 1972 and 1973 were boom years in new car demand but the effect of earlier replacement of existing cars and, through changes in the second-hand market, of a higher rate of scrappage, was to reduce almost to zero the growth in the number of cars aged two years and over. By contrast, 1975 was the lowest for new car sales since 1970 but there was an abnormally large growth in the number of cars aged two years or more. This compensating variation between OE and replacement demand for passenger cars means that a recession in the motor industry does not necessarily affect all component producers adversely.

G. GOODS VEHICLES

There is a fairly close relationship between tonne-kilometres of freight carried by road and Gross Domestic Product. For 1962 to 1976 there was an income-elasticity of about 1.4 (see note 1) Although this relationship has remained valid over the 15 year period, there have been significant changes in the stock, utilisation and patterns of replacement of goods vehicles.

Table 1.5 shows tonne-kilometres carried by vehicles in different weight categories during the calendar year 1973, 1975 (the first was a year of prosperity, until the last few weeks; the second a year of recession) and compares these data with the results of a Ministry of Transport survey covering the twelve months ended May 1968.

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1 $\text{Log}_e(\text{Tonne-kilometres}) = 1.44(\text{Log}_e\text{GDP}) - 10.95$ $R^2 = 0.95$
(0.09) (0.96) DW = 0.72

or $\Delta \text{Log}_e(\text{Tonne-kilometres}) = 1.35(\Delta \text{Log}_e \text{GDP})$ $R^2 = 0.62$
(0.29) DW = 1.91

TABLE 1.5 ANALYSIS OF FREIGHT TRANSPORT BY ROAD (GREAT BRITAIN)

	Net unladen weight of vehicle (in long tons 1)				
OVER	-	3	5	8	ALL
NOT OVER	3	5	8	-	VEHICLES
1967-8					
Tonne-km. (10^9)	8.3	28.2	27.0	14.4	77.9
No. of vehicles (10^3)	1116	273	99	34	1522
Tonne-km. per vehicle (10^3)	7.4	103	273	424	51.1
1973					
Tonne-km.	18.9		27.3	44.7	90.9
No. of vehicles	1240	192	143	85	1660
Tonne-km. per vehicle	13.2		191	526	54.8
1975					
Tonne-km.	5.6	9.7	22.5	54.0	91.8
No. of vehicles	1311	162	134	96	1703
Tonne-km. per vehicle	4.3	60	168	562	53.9

Source: Department of Transport (Transport Statistics 1975)

Department of Environment (Highway Statistics 1971 and 1973).

This table reveals a number of changes in the pattern of road transport. The most significant of these is the use of larger vehicles for all but the shortest of journeys. Lorries with unladen weight of over 8 tons accounted for under 19 per cent of freight movement (in tonne-km.) in 1967-8; by 1975 this proportion had increased to nearly 59 per cent. The table reveals lower utilisation of smaller vehicles, which has led to extended lives and to fewer new registrations, except in the smallest category.

1 One long ton = 1.018 metric tons ("tonnes").

TABLE 1.6 NEW REGISTRATIONS IN GREAT BRITAIN OF GENERAL GOODS VEHICLES 1965-75 (000's).

OVER	1½	3	5	8	Total over 1½ tons	Grand
NOT OVER	3	5	8	-	1½ tons	or less Total
1965	23.5	35.4	18.4		77.3	144.1 221.4
1966	22.3	35.7	24.1		82.1	138.0 220.1
1967	19.2	28.4	29.2		76.8	137.9 214.7
1968	19.6	28.0	61.8		81.4	143.6 225.0
1969	21.6	30.5	36.3		88.4	145.8 234.2
1970	18.9	25.1	23.7	13.1	80.8	150.8 231.6
1971	18.4	19.4	19.1	12.8	69.7	160.5 230.2
1972	22.2	15.9	18.0	14.0	70.1	192.0 262.1
1973	28.0	14.8	18.3	16.7	77.8	206.0 283.8
1974	24.3	10.6	12.0	16.5	63.4	165.6 229.0
1975	22.5	12.4	12.5	13.8	61.2	150.4 211.6
1976	17.0	14.7	11.9	15.5	59.1	149.3 208.4

Source: Department of Transport and SMMT.

In terms of numbers, smaller vehicles (of 1½ tons or less) now account for over 70 per cent of new registrations. In terms of numbers of batteries this means that they dominate the home-based OE market (some large vehicles have two batteries). For tyres this dominance is less important because larger vehicles have larger tyres and may have six, eight or more wheels.

The historic preference (encouraged by licensing restrictions) for the medium-size goods vehicles in Britain placed U.K. manufacturers at a disadvantage, since the pattern of demand overseas included greater proportions of larger vehicles for long-distance transport and of small vans for local work. Exports of goods vehicles (mostly assembled) amounted to £402 millions in 1976, 12 per cent of all motor industry exports and over seven times the value of imports, which were mainly of car-derived vans.

Total production of goods vehicles is shown in Table 1.7

TABLE 1.7 U.K. PRODUCTION OF GOODS VEHICLES 1965-76 (000's)

	Allocated by manufacturers for Home Sales	Exports	Total	Car-derived vans included in total
1965	271.5	165.7	437.2	123.1
1966	250.4	164.0	414.4	103.1
1967	237.3	129.6	366.9	105.1
1968	250.3	140.3	390.6	97.4
1969	273.0	179.5	442.5	114.8
1970	256.5	177.8	434.3	110.5
1971	255.7	174.0	429.7	113.6
1972	258.6	119.4	378.0	112.4
1973	246.1	140.1	386.2	100.7
1974	220.6	148.3	368.9	92.6
1975	181.3	163.7	345.0	80.5
1976	170.4	168.5	338.9	82.1

Source: Department of Industry (via SMMT)

Goods vehicles generally have shorter lives than passenger cars; the average life is around 7 years compared with about 10½. In the seven years 1970 -6 the new goods vehicle registrations in Great Britain were on average equivalent to 14.8% of the number of goods vehicles in use; for passenger cars, the corresponding proportion was 10.3%. During their shorter lives, goods vehicles cover a greater distance:-

	Average km. per year (000's)			
	1970	1973	1974	1975
Cars	13.8	14.2	13.6	13.8
Goods vehicles	22.8	23.8	22.4	22.1

These figures imply that the average car completes about 150,000 km before scrappage; the average goods vehicle, in its shorter life, about 165,000 km.

For tyres, goods vehicles replacement is one of the most substantial market segments, especially in terms of value. For batteries, of which the life is only partly affected by use, this segment is probably less important. Most goods vehicles (other than the smaller petrol-driven vans and pick-up vehicles) use compression ignition, so that this market is much less important for manufacturers of spark plugs.

H. BUSES AND COACH OPERATORS

Bus and coach operators are also significant users of tyres, because of the high utilisation and long life of public service vehicles. Of the 79,600 buses and coaches[1] in use in Great Britain in 1975, 63 per cent were at least five years old. Average distance travelled was over 43,000 km, more than three times the distance covered by cars. The decline in public transport is reflected in the dwindling proportion of total vehicle-kilometres of road traffic which were accounted for by buses and coaches: 1.47% in 1975 compared with 2.40% in 1965.

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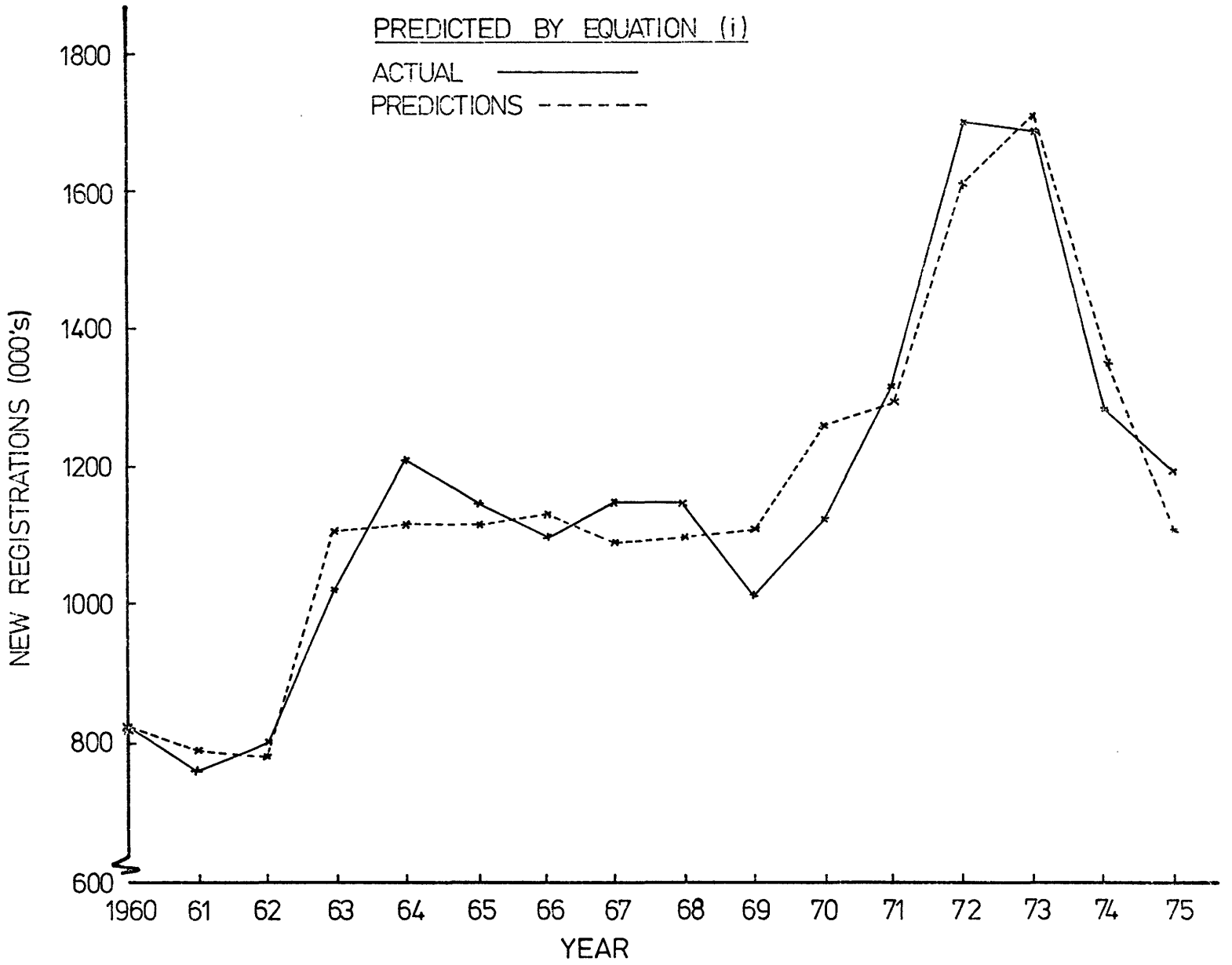
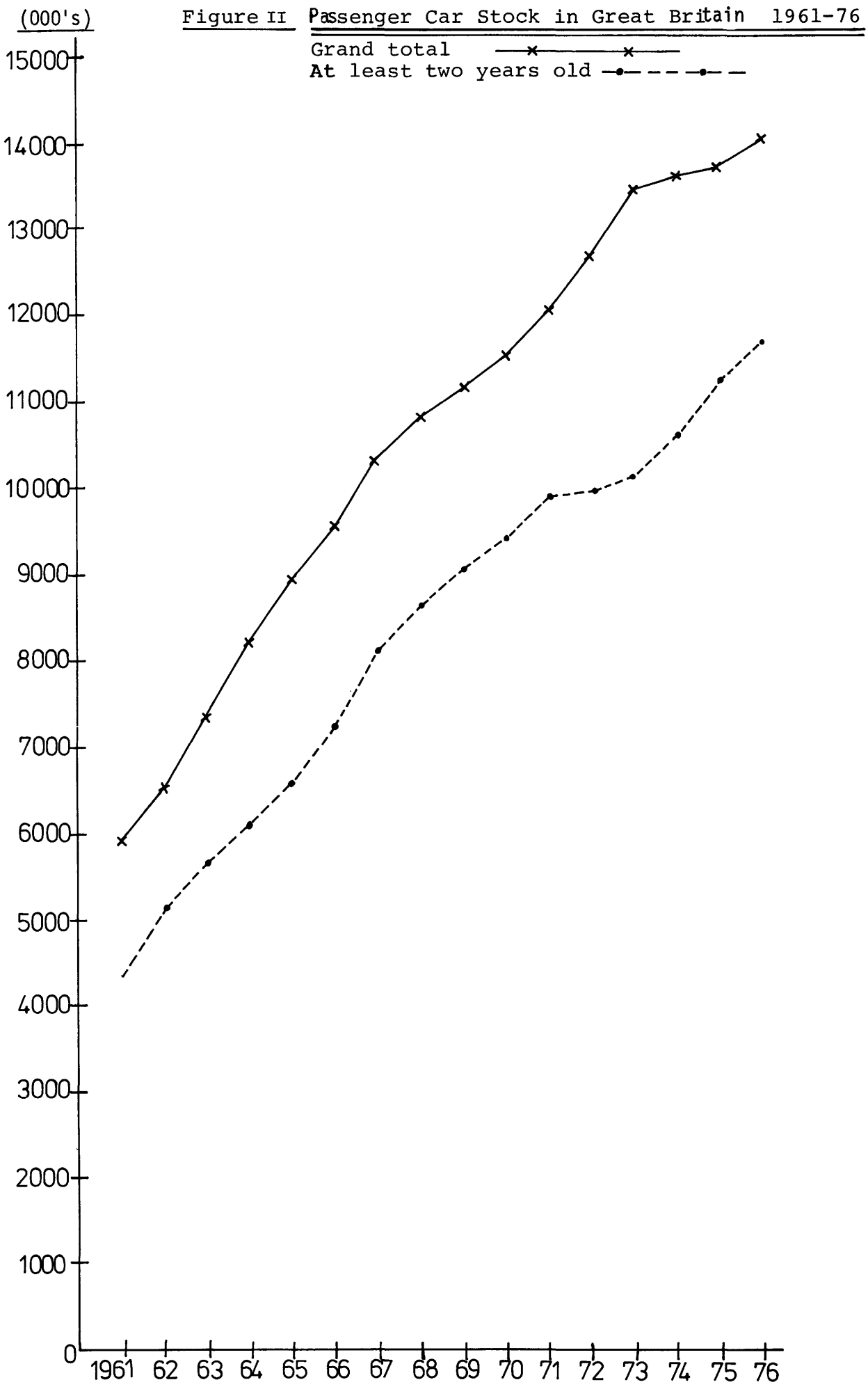
1 Excluding public service vehicles with 8 seats or less. (source: Department of Transport)

FIGURE I : U.K. CAR REGISTRATIONS COMPARED WITH ESTIMATES




(000's)
Figure II Passenger Car Stock in Great Britain 1961-76
Grand total
At least two years old
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1961 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76

II. TYRES

A. ANALYSIS OF TOTAL MARKET

Tyre manufacturing is dominated by a small number of large multinational companies. This oligopolistic structure is probably the reason for a high degree of commercial secrecy within the industry. Because of this, there are discrepancies in the estimates of tyre production between data published by the Business Statistics Office and those collected by the British Rubber Manufacturers Association and published by the International Rubber Study Group. These discrepancies are greatest between estimates of production of remoulded tyres.

The B.S.O. figures for the number and value of tyres produced in the United Kingdom in recent years are shown in Tables II.1 and II.2.

TABLE II.1 NUMBERS OF TYRES PRODUCED IN THE UNITED KINGDOM

	Thousands				
NEW TYRES	1968	1972	1973	1974	1975
Car & Van cross-ply	18426	13028	9528	7592	6166
Car & Van radial	6234	14813	17125	16675	17464
Commercial vehicle	3928	3701	3798	3575	3555
New car & CV tyres	28588	31542	30451	27842	27185
RETREADED TYRES					
Car and van	n.a.	7270	6867	5584	5759
Commercial vehicles	800	936	1097	988	1031
Retreaded car & CV Tyres	n.a.	8206	7964	6572	6790
TYRE TUBES					
Car and van	6232	5190	4694	3830	4519
Commercial vehicles	n.a.	2482	2641	2448	2490
Car and CV Tubes	n.a.	7672	7335	6278	7009

Sources: 1968: Census of Production
1972-5: Business Monitor Services.

TABLE II.2 ANALYSIS OF REVENUE FROM SALE OF TYRES (U.K)

(£000's)

	1968	1972	1973	1974	1975
NEW TYRES (COVERS)					
Car & Van cross-ply	57,858	51,038	41,093	41,309	38,608
radial-ply	23,505	72,505	85,638	105,068	138,505
Commercial vehicle	66,040	88,816	97,746	120,512	153,958
Others (mainly tractor earthmover etc.)	25,383	31,351	35,366	44,018	52,342
TOTAL NEW TYRES	202,786	243,710	260,143	310,907	383,414
RETREADED TYRES					
Car & Van	12,619	17,510	15,685	14,980	16,797
Commercial vehicle	8,006	12,658	15,021	17,715	23,000
Other	1,855	3,098	3,332	4,118	4,867
TOTAL RETREADED TYRES	22,480	33,266	34,038	36,813	44,664
Tyre tubes	9,796	9,517	10,031	11,977	16,016
Solid tyres	2,252	1,275	972	1,929	1,245
TOTAL SALES	240,099	287,768	305,184	361,626	445,339
Index of total at constant purchasing power[1]	100	91	89	91	91

Sources: As for Table II.1

The expression of total sales revenue from tyre manufacture in 1975 purchasing power shows that the tyre industry had been static since 1972 and that the real value of sales turnover was 9 per cent lower than in 1968.

Further analysis of Tables II.1 and II.2 requires a breakdown

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1 This is the total sales figure adjusted by the general Index of Retail Prices (for all items of consumption). The result is an estimate of the real income generated by tyre production.

of production in each category into direct exports and domestic demand and of domestic demand into original equipment and replacement sales.

1. U.K. SALES OF TYRES FOR CARS

Data for complete analysis from government sources are available only for 1973 to 1975. These are analysed in table II.3.

TABLE II.3 ANALYSIS OF SALES OF CAR TYRES 1973-5

000's OF TYRES	1973	1974	1975
NEW TYRES: U.K. manufacturers sales	26,653	24,267	23,630
(less) Direct exports	-5,220	-5,423	-5,986
(less) Estimated OE demands	-9,285	-8,181	-6,786
New U.K. tyres for replacement	12,148	10,663	10,858
(add) Imports	+3,754	+4,265	+3,864
Total replacement sales of new tyres	15,902	14,928	14,722
RETREADED TYRES: U.K. manufacturers sales	6,867	5,584	5,759
(less) Exports	- 183	- 268	- 101
(add) Imports	+ 173	+ 297	+ 134
Total U.K. market for retreaded tyres	6,857	5,613	5,792
Total U.K. replacement market	22,759	20,541	20,514
Retreads as % of total	30.1	27.3	28.2

Sources: Business Monitor and Overseas Trade Accounts.

Discussions with vehicle manufacturers revealed that they rarely use imported tyres and it has been assumed in Table II.3 that all imported tyres go to the replacement sector (although it would not affect our estimate of the size of that sector if the imports were added higher in the table). The estimate of OE demand is equal to (five times output of cars and car-derived vans) plus (four times output of three-wheeled vehicles). This may be a slight over-estimate because

the car and van production figures include unassembled vehicles exported overseas; some of these units may not include tyres.

The estimates of replacement demand are close to those produced by other research groups. For years before 1972 it is necessary to rely on sales statistics collected by the British Rubber Manufacturers Association which tend to be lower than official statistics to varying degrees[1]. For this reason and because of less complete breakdown of trade figures, only broad estimates can be given of OE and replacement demand.

TABLE II.4 BROAD ESTIMATES OF ORIGINAL EQUIPMENT AND REPLACEMENT MARKET FOR CAR TYRES 1968-75 (inc. imports) - millions of tyres

		Replacement		
	OE	NEW	REMOULDS	TOTAL
1968	10	14	8	32
1969	9	15	7	31
1970	9	14	7	30
1971	9	15	8	32
1972	10	15	7	32
1973*	9.3	15.9	6.9	32.1
1974*	8.2	14.9	5.6	28.7
1975*	6.8	14.7	5.8	27.3

* Figures for these years are more reliable than earlier estimates (see Table II.3)

The reasons for the variations in OE demand were discussed in Section 1. The static nature of replacement demand has been due to a number of concurrent developments:-

(i) Legislation introduced making it an offence to use tyres without a minimum tread depth of 1cm. This factor would cause earlier replacement.

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1 The BSO was unable, for reasons of commercial security, to discuss reasons for this discrepancy.

(ii) A levelling out of car ownership, especially since 1973. The compulsory testing of older cars, combined with the rising costs of vehicle maintenance and repair, appears to have led to earlier scrappage. In the period 1970-5 the number of cars in use which were at least two years old rose by 1.81 millions,or 19 per cent. In the previous five years the growth had been 2.85 millions, or 43 per cent.

(iii) The progressive adoption of radial-ply instead of cross-ply tyres has reduced the rate of tyre replacement. The average life of a radial tyre is between 40-45,000 km., approximately double that of a cross-ply tyre. The relative importance of radials in the two market segments can be derived from the B.R.M.A. figures:-

TABLE II.5 RADIAL TYRES AS PERCENTAGE OF SALES OF NEW TYRES BY U.K. MANUFACTURERS.

	OE	REPLACEMENT
1971	42	47
1972	58	50
1973	77	52
1974	87	58
1975	91	66
1976	91	72

Source: B.R.M.A. (Rubber Statistical Bulletin of IRSG).

The ex-factory price of a radial tyre is higher than that of a cross-ply tyre but the difference is insufficient to compensate for the longer tyre life:-

TABLE II.6 IMPLIED EX-FACTORY PRICES OF CAR TYRES (£).

	Cross-ply	Radials	Ratio Radials/Cross-ply
1973	4-31	5-00	1-16
1974	5-44	6-30	1-16
1975	6-26	7.93	1.27

Source: Derived from Tables II.1 and II.2.

The increase in the relative price of radial tyres in 1975 probably reflects increasing competition in the market for cross-ply tyres from imported sources.

(iv) A fourth reason for the static nature of replacement sales of tyres, in spite of growing car ownership, is a recent drop in average distance travelled per car, In 1975 this was 13,800 km. compared with 14,300 km. in 1972. This decrease is due partly to increased petrol prices but may also reflect the lower average distances covered by cars in households with two or more cars.

The static nature of the replacement market for car tyres is a major factor in the decline of sales revenue in the tyre industry (measured in constant purchasing power). Whereas in 1968 203 tyres were replaced on every 100 cars in use, by 1975 this number had fallen to 149.

2. THE U.K. COMMERCIAL VEHICLE MARKET

Table II.2 showed the importance to the tyre industry of commercial vehicles. Commercial vehicle tyres (including retreads) accounted for 31 per cent of sales value in 1968 and nearly 40 per cent in 1975, compared with 39 and 44 per cent respectively for car tyres. In numbers of tyres, commercial vehicles accounted for only 13 per cent of sales in 1975. The contrast is explained mainly by the difference in size and specifcation. Marginal costs and, therefore, the basis for bilateral price negotiations are much higher than in the case of car tyres produced in large volumes.

In Section I we indicated that although the average life of a goods vehicle was shorter than that of a passenger car, the total distance travelled before scrappage was, on average, about 10 per cent greater. Table II.7 shows an estimated breakdown of original equipment and replacement demand for commercial vehicle tyres in the period 1968-76:-

TABLE II.7 BREAKDOWN OF COMMERCIAL VEHICLE TYRE MARKET IN U.K. 1968-1975.

	Original Equipment	Replacement New	Remoulds	Total
1968	1,700	1,200	800	3,700
1972	1,022	1,870	936	3,828
1973	885	1,806	1,097	3,788
1974	914	1,726	1,054	3,694
1975	1,156	1,587	1,154	3,897

Sources: Business Statistics Office and
British Rubber Manufacturers Association.

The decline of the OE market for commercial vehicle tyres occurred after 1971. After a boom of four years, U.K. production of goods vehicles (excluding car-derived vans) fell by 16 per cent in between 1971 and 1972. The decline was concentrated in the export markets and, particularly, amoung the medium-size trucks which then were the heavier products of the volume producers of commercial vehicles.

From Table II.7 and the earlier Table II.4 it can be calculated that over the three years 1973-5 original equipment purchases represented 27.6 per cent of total demand for car tyres and 26 per cent of demand for commercial vehicle tyres.

3. DIRECT TRADE

(a) GENERAL

The dominant position of multinational companies, which ship tyres between countries according to current demand and production conditions, makes it difficult to interpret trading patterns. All four of the vehicle manufacturers in the United Kingdom are increasingly organising their activities on the basis of European integration. The tyre manufacturers with U.K. Plants are increasing exports and imports.

TABLE II.8 VALUE OF TRADE IN ALL RUBBER TYRES AND TUBES (£m)

	IMPORTS	EXPORTS
1968	14.6	33.4
1969	13.5	38.8
1970	13.4	52.5
1971	15.0	54.6
1972	25.3	52.5
1973	26.0	68.4
1974	48.3	86.4
1975	56.6	130.7

Source: Overseas Trade Accounts

Most of the growth since 1971 has been associated with intra-European trade. In 1971 Continental Europe received 61 per cent of exports and supplied 89 per cent of imports measured in sterling value. By 1975 the first proportion had risen to 70 per cent, the second remained virtually unchanged. With the rest of the E.E.C. there was a trade surplus in tyre products of £8.4 millions in 1975.

(b) DIRECT IMPORTS AND THE U.K. MARKET-PASSENGER CARS

Discussions with the major vehicle manufacturers revealed that none of these buys tyres from overseas for use on passenger cars and purchases for commercial vehicles are confined to exceptional and specific requirements. Some of the tyres purchased from the major domestic suppliers are imported from those suppliers'overseas plants. Data from B.R.M.A. make it possible to isolate these transfers from competitive imports:-

TABLE II.9 IMPORTS OF NEW CAR TYRES 1971-6

	Total volume (000's)	By BRMA Members	Competitive
1971	2,455	728	1,727
1972	3,501	1,482	2,019
1973	3,754	1,766	1,988
1974	4,265	2,129	2,136
1975	3,864	1,577	2,287

Sources: Customs and Excise. B.R.M.A.

These data show that the main growth in imports in recent years occurred in 1975 although there has been some increase since 1976 in imports from competitive sources. Some imports from Eastern European countries are providing cross-ply tyres at low prices: the withdrawal of some British producers from the cross-ply market has left a gap which these imports can fill. The age-profile of the U.K. car stock remains rather older than those of other European countries, especially France and Germany. Owners of older cars doing moderate distances at relatively low speeds are unlikely to re-equip these vehicles with radial tyres which would outlive them.

Several research inquiries have shown that owners of newer foreign-built cars tend to replace tyres with those supplied by British producers. The fact that these producers are, with only one exception,simply U.K. branches of multinational companies, makes direct importing unlikely on any significant scale.

Even in 1975 competitive imports accounted for only 11.8 per cent of the total purchases of tyres by U.K. car owners; when retreads are excluded this ratio rises to 15.5 per cent.

(c) DIRECT IMPORTS - COMMERCIAL VEHICLE TYRES

Direct imports of tyres for trucks show a very similar pattern:-

TABLE II.10 IMPORTS OF NEW GOODS VEHICLE TYRES 1971-5

	Total Volume	By BRMA members	Competitive
1971	128	24	104
1972	116	47	69
1973	202	93	109
1974	331	82	247
1975	281	32	249

Sources: Customs and Excise. B.R.M.A.

Although the 249,000 tyres imported from competitive sources represented 9.1 per cent of all tyres purchased in replacement market and 15.7 per cent of all new tyres (almost identical to the car position), these tyres tended again to be at the lower end of the market. The average value of an imported tyre was £33.20 compared with the average value of exported tyres of £40.45.

(d) DIRECT EXPORTS

A breakdown of tyre exports into those for cars and those for commercial vehicles is available in official statistics only for 1969 onwards.

TABLE II.11 EXPORTS OF NEW CAR AND COMMERCIAL VEHICLE TYRES 1969-75.

	Numbers (000's)		Value (£000)	
	Car	Commercial	Car	Commercial
1969	3,511	704	13,663	12,914
1970	5,997	794	23,777	14,281
1971	5,776	1,095	24,741	21,817
1972	4,456	925	20,031	19,220
1973	5,220	1,233	25,600	25,043
1974	5,423	1,004	34,154	26,343
1975	5,986	1,315	42,259	53,196

Source: Overseas Trade Statistics (Customs & Excise).

The large increase in the value of commercial vehicle tyre exports in 1975 reflects the 31 per cent increase in volume, the effect of price inflation and (one must conclude) a high proportion among the additional exports of larger, more expensive tyres, Sweden was the largest single national export market in 1975. It took 20 per cent of all commercial vehicle tyres exported from the United Kingdom and accounted for nearly 24 per cent of export value. Many of these were probably used as original equipment on new trucks assembled in Sweden. 16 per cent of all commercial vehicles imported

into the United Kingdom in 1975 were Swedish-assembled but, because these were mainly large trucks, their value was over 40 per cent of that of all commercial vehicles imported.

Other large markets for commercial vehicle tyres (value exceeding £3 millions in 1975) are West Germany, Finland, the United States and Australia. European countries accounted for 73 per cent of the value of commercial vehicle tyres exported.

European countries also took the majority of car tyres exported from the United Kingdom - 75 per cent by volume and 84 per cent by value. Western Germany was the largest single market (possibly representing shipments by one of the multinational vehicle manufacturers) followed by Sweden, Australia, Turkey, Finland and Belgium. All of these are countries to which British vehicle parts are sent for final assembly by locally based companies, by subsidiaries of British Leyland or by subsidiaries of the three American vehicle manufacturers with plants in the United Kingdom.

In addition to car and commercial vehicle tyre casings, other tyre industry exports include tyres for tractors, earthmovers and construction vehicles (12.6 millions in 1975); tyres for aircraft and motor and pedal cycles (1.5 millions in total); innertubes (£5.0 millions in 1975), tyre flaps and solid tyres. Exports of these last items and of retreaded tyres were relatively insignificant.

B. THE STRUCTURE OF THE INDUSTRY

1. NUMBERS OF COMPANIES MANUFACTURING EACH PRODUCT WITHIN THE U.K.

The Business Statistics Office shows the number of separate enterprises producing each category as follows:-

TABLE II.12 NUMBERS OF FIRMS REPORTING TO B.S.O.

	1968	1973	1975
New car tyres: cross-ply	7	6	5
radials	7	6	6
New tyres for goods vehicles	7	6	6
Retreaded tyres: cars	16	18	20
goods vehicles	16	17	19
Inner tubes	7	6	7
Solid rubber tyres	15	8	7

As Table II.12 shows, there were only seven enterprises engaged in new tyre production in the U.K. (although the number of trading companies appeared to be higher because some enterprises had subsidiaries trading under separate names). These companies were:-

Avon Rubber Co. Ltd.,
Dunlop Holdings Ltd.,
Firestone Tyre and Rubber Ltd. (Subsidiary of U.S. Parent),
Goodyear Tyre and Rubber Company Ltd. " " " "
Michelin Tyre Company Ltd. (Subsidiary of French Parent),
Pirelli Ltd. (Subsidiary of Italian Parent)
Uniroyal Ltd. (Subsidiary of U.S. Parent).

As from the 1st January, 1971 Dunlop Holdings Ltd. merged most of its activities (including its principal tyre-making subsidiary, Dunlop Ltd.) in a union with Industrie Pirelli SpA. The union has a complex structure and for many trading purposes the Dunlop and Pirelli activities are separate - for example each has its own production and distribution facilities. From a financial standpoint, however, Dunlop Holdings Ltd. has a 51 per cent interest in the English company Pirelli Ltd. and a 49 per cent interest in Pirelli's other EEC activities. The Pirelli parent has a 49 per cent interest in Dunlop Ltd., and Pirelli Ltd. and a 51 per cent interest in its own activities elsewhere in the EEC. The arrangements for control of subsidiaries outside the European Economic Community are more complex.

The formation of the Dunlop-Pirelli Union in 1971 explains the decrease in the number of companies manufacturing new tyres, from seven to six. The official figures showed only five companies making cross-ply tyres in 1975 because of the withdrawal of Uniroyal from the production of cross-ply tyres. Some of the other multinational companies may also be curtailing U.K. production of cross-ply tyres and, while they still sell these, supplies are sometimes obtained from outside sources.

2. RETREADING (and remoulding)[1]

The retreading process does not require the use of large, indivisible items of capital equipment. Worn tyres are acquired from garages and distributors at low prices; the old tread is removed and the casing is scored for the subsequent addition of uncured rubber. The casing is then placed in a mould and the tread is applied under heat conditions.

The major tyre producers all sell retreaded tyres, though some of this work is sub-contracted to independents. Although the Business Statistics Office reported that 20 companies produced retreads in 1975 this does not include firms with no establishment employing 25 or more persons. The Retread Manufacturers Association has 25 members (these do not include the new tyre producers) and there are possibly as many as 50 other small companies engaged in retreading.

Retreaded tyres accounted for 30 per cent of replacement demand for car tyres in 1973; 27 per cent in 1974 and 28 per cent in 1975. For the commercial vehicle replacement market the proportions were rather higher:- 38 per cent in 1973 and 1974, and 42 per cent in 1975. The retreading of commercial vehicle tyres is more profitable than that of car tyres, because the principal element of cost in retreading is labour, which is little affected by the size of tyre.

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1 Retreading and remoulding are normally undertaken at different stages of one process. Retreading is the more common technical description but "remoulds" is the term more generally used. The terms are used interchangeably in this report.

About 35 per cent of all retreaded tyres are sold by the major producers of new tyres, partly under their own brand names and partly as "second-line" remoulds. The independent retreaders have to overcome a number of competitive disadvantages:-

(a) With increasing publicity devoted to road safety and the higher vehicle speeds, especially on motorways and dual carriageways, of which there were 3,864 kilometres in Great Britain in 1970 and 6,185 km in 1975, there is consumer resistance to retreaded tyres. The issue of a British Standard specification (Aul44) followed pressure by the Retread Manufacturers Association who were eager to improve the image of the product. An official representative of the R.M.A. expressed concern about the failure of the smaller non-member firms to comply with the standard, with resulting adverse publicity.

(b) The ownership by the main tyre manufacturers of many of the retail outlets, described in the next section, makes it difficult for independent retreaders to sell their own products (as opposed to sub-contract work). Some retreading companies have established their own outlets but, because these need to stock a wide product range, the economics of this forward integration are uncertain.

(c) Independent distributors are more likely to recommend new tyres to customers in doubt about remoulds, partly because of higher retail margins but also because of the publicity of major tyre companies who advise more restricted use of remoulds than that specified in the British Standard.

(d) The major tyre companies' own branded retreaded tyres are likely to be more acceptable than lesser known brands. They can also offer "second-line" remoulds in order to appeal to the price-conscious segment of the market. Such "second-line" products may be advertised by company-owned distributors at very low prices; the objective would then be to attract the motorist to the distributive outlet where he might be persuaded to purchase new tyres or branded remoulds.

For all these reasons, there is great downward pressure on the price of remoulds produced by independents. Their retail price is normally around 40 per cent of that of a new "first-line" tyre of the same dimension. The prospects for retreaded tyres are uncertain, expecially with the move to radial tyres. The remoulded radial tyre has not yet proved popular and the fact that a new radial tyre imposes much lower cost per kilometre travelled than the cross-ply tyre (see Table II.6) reduces the economic pressure for the purchase of remoulds. More stringent vehicle testing may lead to the scrappage of many of the older vehicles used for short distances at modest speeds, for which remoulds are most often purchased.

3. DISTRIBUTION OF TYRES TO THE REPLACEMENT MARKET

A survey of sales of passenger car tyres by type of outlet showed the following pattern in 1975:-

TABLE II.13 REPLACEMENT TYRE PURCHASES BY TYPE OF OUTLET, 1975

	%
Manufacturer owned outlets	35
Independent dealers	30
Garages, filling stations etc.	29
Other (chain stores, mail order etc.)	6

Source: E.I.U. (Ref 1)

The retail distributors of the manufacturers are as follows:-

	Estd. No. of outlets
Dunlop: National Tyre Service	450
Pirelli: Central Tyre Company	100
Goodyear: Tyre Services Holdings Ltd Kettering Motor Service Group Ltd. (and other smaller subsidiaries)	400
Firestone: Tyre and Auto Services Ltd. Ect.	240
Michelin: Associated Tyre Specialists Ltd.	360
Avon: Motorway Tyres and Accessories Ltd.	180

Sources: Company accounts, EIU and author's estimates.

One of the major manufacturing companies, Uniroyal, sold its outlets to Associated Tyre Specialists Ltd. (the Michelin subsidiary) in 1974, a decision which was linked to the withdrawal from cross-ply tyre production.

Outside the subsidiaries of the major tyre producers, there are few large distributors of tyres. Only one company, Kennings Ltd. a distributor of Leyland Cars, has a national network of tyre depots. Many of the independent dealers have fewer then ten outlets.

One major independent distributor is Esso Ltd., which acts as a factor for car components and accessories. Until about 1974, Esso obtained its tyres from Uniroyal Ltd. and, when that company withdrew from cross-ply production, Firestone and Goodyear became the main suppliers.

Partly because the customer is mobile, there is fairly intensive competition in tyre distribution. This has led, since the abandonment of resale price maintenance in the mid 1960's, to price-cutting and competitive advertising by retailers. It has also induced some of the manufacturer-owned distribution companies to reduce the number of outlets in order to minimise overheads and to remain competitive.

One of the interesting features revealed by a survey of Bedfordshire outlets is that the manufacturer-owned distributors do not emphasise their ties with that manufacturer's brands. Indeed most such outlets also stock the products of other manufacturers and, whilst the customer is invited to purchase tyres made by the parent company, competitive brands (including tyres at substantial discount) are occasionally advertised .

4. THE NATURE OF COMPETITION IN THE REPLACEMENT MARKET

The EIU reported that 73 per cent of all tyres sold in the United Kingdom were within six size-categories and that about 25 per cent were of one size. A number of research studies has shown that there is little brand loyalty among customers for replacement tyres. There is intensive competition among a small number of

manufacturers of a fairly standard product with static demand. There are three main product lines:- remoulded tyres, cross-ply tyres and radial tyres, with a further development in steel rather than textile-based radial tyres. Competition takes a number of forms:-

(a) Quality

We have already pointed out[1] that one of the reasons for the static replacement market for tyres is the greater use of radial tyres, which give the motorist approximately double the tyre-life of cross-ply tyres for an increase of about 30 per cent on price. Improvements in quality have occurred through competitive pressure and longer life has been advertised as an attribute of individual brands.

It is interesting to note the speech by the managing director of Dunlop Holdings Ltd. to the 1977 convention of the National Tyre Distributors Association[2], in which he suggested that research into production of tyres with increasingly long life should be curtailed. Car manufacturers and motorists were, in his view, satisfied with radial tyres lasting 57,000 to 65,000 kilometres. "Expense to make the tyre last longer is neither economic sense nor a customer requirement."

The need for and obstacles to agreement on product life among oligopoly producers of a semi-durable product are well documented.

(b) Advertising

Estimates of total expenditure on advertising by tyre producers are collected and published by Media Expenditure Analysis Ltd (MEAL). Data for each of the years 1972 to 1976 are shown in Table II.14:-

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1 On page 21 above.

2 Summarised, with longer quotations in SMMT: Motor Industry News Digest, June 1977.

TABLE II.14 EXPENDITURE ON ADVERTISING OF TYRES 1972-6 (Press & TV)

	(£000's)				
	1972	1973	1974	1975	1976
Avon Tyres	4	42	NIL	33	14
Motorway Tyres	24	55	31	29	12
Dunlop Tyres[1]	624	527	356	889	965
National Tyre Service	79	68	69	152	167
Firestone Tyres	287	319	432	229	333
Albany Tyre Service	44	25	9	10	11
Goodyear Tyres	431	435	410	415	720
Tyre Service (Great Britain)	23	41	86	49	88
Michelin Tyres	372	532	364	458	474
Associated Tyre Specialists	78	134	72	89	120
Pirelli Tyres	104	154	121	53	256
Uniroyal	240	317	6	22	10
All others	445	388	247	174	275
TOTAL TYRE ADVERTISING	2,755	3,037	2,203	2,602	3,445

Source: MEAL digests.

Over the years since 1969 the value of advertising expenditure had tended to fall in real terms:-

TABLE II.15 ADVERTISING EXPENDITURE 1969-76.

	Advertising Expenditure (£000's)		
	Current Prices	Index at Constant Purchasing Power	No. of replacement car tyres sold (est. in millions)
1969	2,914	100	14
1970	2,158	70	15
1971	2,737	81	14
1972	2,755	76	15.1
1973	3,037	77	15.9
1974	2,203	48	14.9
1975	2,602	46	14.7
1976	3,445	53	15.7(prov)

1 Including subsidiary companies other than the Pirelli group.

Most of the advertising relates to new car tyres for replacement and in 1973 this was equivalent to about 20 pence per tyre sold, or about 3 to 4 per cent of the wholesale price.

There is some evidence in Table II.15 to suggest that advertising has a positive income-elasticity:- in the depression years of 1974 and 1975 advertising expenditure on tyres fell, by over 37 per cent in inflation-adjusted terms.

Table II.14 also shows how the largest enterprises dominated advertising. Including its distributive outlets, the share of each firm in the total was as shown in Table II.16. Some of the brands shown in "others" were produced by the large companies (for example Kelly-Springfield tyres are produced by Goodyear and Esso tyres were produced by Uniroyal until 1974 after which supplies were obtained from Firestone and Goodyear).

TABLE II.16 SHARES OF TOTAL ADVERTISING 1972-6

	1972	1973	1974	1975	1976
Dunlop-Pirelli	29.3	24.7	24.8	42.0	40.3
Firestone	12.0	11.3	20.0	9.2	10.0
Goodyear	16.5	15.6	22.5	17.8	23.5
Michelin	16.3	21.9	19.8	21.0	17.2
Uniroyal	8.7	10.4	0.3	0.8	0.3
Avon	0.9	3.2	1.4	2.4	0.8
Total of above	83.7	87.1	88.3	93.2	92.1
Others	16.3	12.9	11.7	6.8	7.9
	100	100	100	100	100

(c) Brand Names in the Distributive Market

Multiple brands are a feature of competition within an oligopolistic group and their existence may act as a barrier to outside firms. "Second-line" new tyres represent an attempt by manufacturers to segment the market into the price-inelastic segment which remains loyal to well-advertised brand-names and the more

price-conscious segment. Because tyres are a "concern" product (a burst tyre may mean death), loyalty to established brands is probably high but research surveys show that there is little loyalty to a single brand. The effect of advertising and "concern" is, more probably, to create preference for any one of the well-recognised brands. This would explain marked differences between retail prices of first and second-line brands.

Some examples of second-line brands are listed here:- Each of the major companies also sells tyres under its own name.

Dunlop:	India, India Remoulds, John Bull, Regent Remoulds (Dunlop Remoulds are also sold).
Firestone:	Dayton.
Goodyear:	Lee, Kelly-Springfield.
Avon:	Henley.
Michelin:	Bergougnan.
Uniroyal:	Esso (until 1974), now radial tyres under distributors' labels.

(d) Price Competition in Replacement Market.

Previous research surveys have revealed relatively little about price competition in the tyre industry. Before 1965 there were price agreements among major manufacturers which were facilitated by resale price maintenance. With the abandonment of resale price maintenance and the diversity of channels of distribution, price and quota-fixing agreements would be difficult to sustain. Retail prices for identical brands vary by as much as 30-40 per cent between outlets and, while the margin for brokers and retailers combined might represent about 40 per cent of the full retail price, it is difficult to believe that manufacturers are not also offering discounts to brokers.

There is some need for further research into price structure but this requires empirical work on a scale beyond the current investigation.

5. MARKET SHARES IN THE REPLACEMENT SEGMENT

Most of the market surveys conducted commercially have been concerned with the car replacement - a survey of commercial vehicle market shares would be more difficult. One of the difficulties in interpretation of survey findings is the assignment of second-line brands to residual categories. In our own estimates we have tried to combine data from two surveys:-

TABLE II.17. ESTIMATES OF MARKET SHARE (new tyres, car replacement)

	1972	1975	1976
Dunlop Pirelli	28	28	26
Goodyear	25	19	23
Michelin	14	19	20
Firestone	12	10	11
Uniroyal	8	7	3
Avon	5	5	4
Others (mainly imports)	8	12	13
	100	100	100

Notes

(i) The table understates the Uniroyal market share in 1976 because the ending of the Esso contract was followed by supply to other distributors.

(ii) It is important to emphasise that all brands are included in the estimates for each manufacturer. Although Michelin is regarded in some quarters (e.g. by EIU) as market leader, when the Dunlop and Pirelli figures are merged and "second-line" brands included this is no longer the case.

6. THE ORIGINAL EQUIPMENT MARKET

Discussions with the major vehicle manufacturers and the trade association of the tyre manufacturers revealed the following feautures :

(a) All vehicle manufacturers keep very low inventories of tyres with a maximum of about three days' production requirements, except when supply difficulties are envisaged (for a specific size or type of tyre). Tyres are delivered daily from local depots of the tyre companies; schedules of expected requirements are issued by the vehicle manufacturers for a few months ahead but these do not represent a commitment to the tyre producer and are revised continually. This means that the vehicle manufacturer transfers to the tyre manufacturer the costs associated with variations in production, which result not only from variations in demand for particular vehicles but also from interruptions in supplies of other components or in facility for delivery.

(b) Dunlop Ltd. may have a slight advantage over its tyre-producing competitors through its near-monopoly of wheel production for volume cars, other than those of Ford. (Ford has its own wheel-producing subsidiary.) Dunlop fits tyres supplied by competitors, as ordered by the vehicle manufacturers purchasing the wheels. Wheels for some Leyland Cars (mainly outside the former Austin-Morris division) are made by Rubery Owen Ltd. and wheels for commercial vehicles are made by Guest Keen and Nettlefold Ltd. Although none of those interviewed had perceived any competitive advantage for Dunlop, it is difficult to believe that this could not exist under conditions of high demand for wheels.

(c) Dual sourcing of tyres is now the norm for all the vehicle manufacturers. Until 1970 Dunlop was the sole supplier to the Austin-Morris division of British Leyland and it remains the dominant supplier but like the other manufacturers, Leyland buys each size of tyre from at least two sources. All three of the vehicle manufacturers interviewed consult all six of the main tyre producers at least once a year and negotiate prices and volumes. In practice, some trading patterns tend to be fairly constant.

British Leyland obtains 87 per cent of its tyres from

three suppliers and Dunlop remains the largest supplier.

Ford and Vauxhall probably obtain most of their requirements from Firestone, Goodyear and Uniroyal. Vauxhall normally uses only two suppliers for any one tyre size.

Chrysler buys from all six main suppliers.

(d) Although tyre prices are bilaterally negotiated, tyre producers tend to ask for price increases of similar proportions at round about the same time of each year. Under the current U.K. system of price control, the Price Commission gives permission to each manufacturer for an average price increase. This means that some common adjustment of prices is possible. There is no evidence of price collusion, either overt or tacit, but the price-leadership which Dunlop has occupied in the replacement sector may also occur, at least intermittently, in the OE sector. On standard, high volume, tyres price-differences between suppliers are generally less than one per cent.

Estimated Shares of the OE Market (by volume) 1975

These estimates are based on those of the EIU (Ref 1) and the results of our own discussions:-

	Per cent of all tyres (car and C.V.)
Dunlop	27
Goodyear	25
Firestone	24
Michelin	11
Uniroyal	8
Avon	5

7. RELATIVE PROFITABILITY OF OE AND REPLACEMENT MARKET

We have secured some statistics on which it is possible to base estimates of average price of tyres sold to the OE and replacement markets in each of the years 1972 to 1976.

The prices are those of manufacturers and do not include taxes or margins paid to distributors. Calculations suggest that for a new radial tyre the average price received by manufacturers on sales to the replacement market in 1975 was about £9.50 and on sales to the OE sector about £6.50. Where the manufacturer controls the distributive outlet additional income will, of course, be earned.

C. FINANCIAL ANALYSIS AND CONCENTRATION TABLES

In the analysis of concentration, based on the methodology prescribed by the Commission of the European Communities, it has been necessary to consider (1) the sharp dividing line between the large companies manufacturing new tyres as well as remoulds and the much greater number of small enterprises engaged in retreading and (2) the multi-national nature of the large tyre manufacturers.

Because of (1) we have confined the Tables of Concentration to the large firms and refer to the smaller retreading companies only in the written text. Because of (2) we have omitted certain variables which have clearly been distorted by differing accounting policies of the multi-national groups in their treatment of United Kingdom activities. The variables used and activities covered are at three levels:-

(1) All Activities in the United Kingdom: for each of the six groups (Avon, Dunlop-Pirelli, Firestone, Goodyear, Michelin and Uniroyal) tyres are believed to be the majo. U.K. product but a detailed breakdown of turnover is not available in every case. For this reason, U.K. activities include the tyre companies' other products manufactured in this country.

01 Sales Turnover - no difficulties here: data are taken straight from company accounts.

02 Employment - data are from company accounts. There are problems of interpretation because where the company's head office is in the U.K. (Avon and Dunlop), the ratio of employees to U.K. sales is higher than in the U.K. subsidiaries of foreign - based companies. This is because of administrative staff with world-wide responsibilities, who in turn require more supporting staff.

03 Wages-Bill - similar comments apply.

04 Net Profits before tax - although this variable is used in the analysis, there are some doubts about the reliability of figures for subsidiary companies (e.g. the U.K. branches of multi-nationals). Differences between methods of allocation of parent company overheads and of accounting for depreciation may distort comparisons. Profit figures generally have overstated financial performance in recent years because of rapid inflation. The use of historic cost accounting means that depreciation is understated and time-lags between payments and receipts are not allowed for. Not all companies are equally affected especially in an industry where the timing of rubber purchases is important.

11 Advertising Expenditure - this is included as an additional variable because data were available, and advertising is an important aspect of competition in this industry. The data are based on MEAL surveys (see above p. 33) but there are some important limitations. For example, when a manufacturer sells much of his output under the brand-name of a distributor, it is possible that he may contribute to the advertising costs. No allowance has been made for this.

Variable 08 (Exports) is excluded from the analysis because for multi-national companies this concept has little meaning.

Variables 05 (cash flow), 06 (capital expenditure), 07 (equity capital), 09 (net cash flow) and 10 (net assets) are excluded because neither Dunlop nor Avon publishes separate figures for these variables for the United Kingdom.

(2) Tyres World-Wide

Five of the six companies published a breakdown of world-wide turnover and profits by product groups for each of the years 1969-75. These figures are used in the analysis.

(3) All Activities World-Wide

The Michelin group published consolidated accounts for the first time during the survey period for the year 1975. Complete Tables of Concentration have been prepared only for that year. These relate to the following variables:-

01 Sales Turnover
04 Net profits before tax
05 Gross cash flow (=04 plus depreciation)
06 Gross capital expenditure
07 Equity (own capital)
09 Net cash flow (05 - tax)
10 Net assets (equity plus long-term borrowing)

1. COMMENTS ON TABLES OF CONCENTRATION

TABLE 1. relates to U.K. activities and shows the evolution of total industry of each of the five variables. Because of rapid inflation over the six-year period (94 per cent increase in retail prices) we have also prepared Table 1(a) which shows all the totals in terms of 1975 purchasing power. (Industry sales, so adjusted, are not expressed in volume terms but in terms of a constant monetary unit.)

Over the six years sales turnover of the sample of companies rose in constant purchasing power (c.p.p.) terms by 14 per cent.

The largest increase occurred in 1974 and reflects a large relative increase in the average price of tyres, which in turn was due to a sharp increase in the price of rubber (the sterling price doubled between the first quarter of 1973 and the first quarter of 1974). The subsequent fall in the price of rubber benefited the tyre producers and led to a substantial improvement in profits (51 per cent in money terms, 31 per cent in c.p.p. terms). This appears to demonstrate the effectiveness of an outside lever on prices within an oligopoly - a kind of "ratchet" effect. As will be shown later, the recovery in profits was not experienced by all companies.

The sharp drop in advertising expenditure (46 per cent in c.p.p. terms) is typical of many industries over the past few years. Advertising expenditure has been fairly volatile in this industry and no stable pattern, usually expected in oligopolistic industries, has emerged.

TABLE 2. shows the values of certain summary indices of concentration for each variable in each of the seven years. Variables 02 and 03 (employment and wages-bill) were generally more concentrated than sales turnover but this was due to the inclusion in the case of Dunlop, the largestsingle firm, of all employees in the U.K., including those with responsibility for overseas activities. In 1971, after the merger with Pirelli, Dunlop's sales turnover was 48 per cent of that of the six firms combined while it accounted for about 56 per cent of employment; in 1975 the figures were 44 and 53 per cent.

Except in 1970 and 1971, profits were consistently more concentrated than sales turnover. This evidence needs to be treated with some care because the profits figures for U.K. activities are affected by decisions on the allocation of joint costs etc. which are in turn influenced by considerations of comparative taxation.

The concentration indices all show little change in the degree of concentration of sales turnover over the seven years, though the merger of Pirelli's tyre interest with Dunlop in 1971 is reflected

by a discrete change in all three indices in that year.

TABLE 3. shows concentration ratios (C_2 and C_4) together with Linda indices (L_2 , L_4 , Ln*h and Ln*m). Definitions of these indices and a guide to their interpretation has been provided by Linda (in Ref. 3). These are summarised in Appendix A.

For sales turnover the concentration ratios increased in 1971 with the Dunlop-Pirelli merger and also showed an increase in 1975. The Linda index suggest that in 1974 and 1975 the three largest enterprises formed a distinct oligopolistic group within the sample of six firms.

These three (Dunlop, Michelin, and Goodyear) achieved 82 per cent of total turnover in 1975: Goodyear's share was 14.6 per cent, while the next largest company (Avon) held less than seven per cent.

Net profits appear more concentrated than turnover in each year but, because of differences in rankings, this needs to be interpreted carefully (even C_4 does not refer to the same four firms for turnover and net profits in 1969, 1970, 1974 or 1975). Since net profit is a residual and a more volatile variable than turnover, greater concentration in any one year must be expected.

The minimum values of Linda index show that in every year except 1975, there was a smaller grouping within the oligopoly which comprised firms making greater profits. Dunlop and Michelin were members of this group throughout: In 1975 the absence of a minimum value of the Linda index (a continuously rising Linda curve) occurred because these two firms achieved profits much greater than those of any competitors - Dunlop obtained 39 per cent and Michelin 54 per cent of all profits earned within the industry.

Advertising expenditure by each firm was also highly variable. Although it appears to be highly concentrated with a smaller group of heavy advertisers within the oligopoly, the composition of this group changed from one year to the next.

Because of the distortion caused by inclusion of British based companies along with U.K. subsidiaries of foreign companies, interpretation of the concentration ratios and Linda coefficients for employment and wages bill is difficult.

TABLE 4. is a summary of the Linda indices for this sample. The coefficient LS (known as an Index of Synthesis) summarises the degree of inequality within the oligopoly group of n*m firms. Two main features emerge from this table:-

(i) For employment and wages bill the values of LS are consistently higher than those for turnover (01) and profits (04). This is because of the distortion already described.

(ii) For sales turnover the value of LS is greater than for profits except in 1974. (In 1975 the minimum of the Linda curve for profits was at its first point, so that LS = Ln*m = Ln*h = 0.702, but this value is not shown because it does not satisfy Linda's own definition of n*m.)[1] The principal reasons for the lower values of LS when applied to profits is that the largest firm (Dunlop) reported a lower profit margin on U.K. sales than the group average in every year except 1974 (see Table 5).

TABLE 5. shows profitability ratios. Because of the doubt surrounding the comparability of the U.K. profits figures the ratios have been calculated for world-wide activities also. Some of the results call for comment:

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1 See R. Linda: Methodology of Concentration Analysis applied to the Study of Industries and Markets, p.19)

Comparison of the ranking of companies by U.K. and world-wide profit margins (net profits over sales) illustrates some of the difficulties in interpretation of subsidiary figures. Rankings are compared in Table II.19 below:-

TABLE II.19. RANKING OF FIRMS BY PROFIT MARGINS (R1)

	1969	1970	1971	1972	1973	1974	1975
No. of firms for which margin calculated	5	5	5	5	5	5	6
Avon: U.K.	4	3	3	1	1	4	6
World-wide	5	4	4	4	4	5	6
Dunlop: U.K.	3	5	5	2	2	2	3
World-wide	3	3	3	3	3	3	3
Firestone: U.K.	2	2	2	4	5	5	5
World-wide	2	2	1	1	1	1	1
Goodyear: U.K.	1	1	1	3	3	3	4
World-wide	1	1	2	2	2	2	2
Michelin: U.K.	-	-	-	-	-	-	1
World-wide	-	-	-	-	-	-	4
Uniroyal: U.K.	5	4	4	5	4	1	2
World-wide	4	5	5	5	5	4	5

NB Michelin has been excluded from this table until 1975 because consolidated accounts for the Michelin group were first produced in that year. The company's U.K. profit margin was better in each year until 1973 than any other firm in the sample.

R2, R3, R4 Table 5 also shows net profits before tax in relation to equity and gross cash flow (net profits before tax plus depreciation) in relation to sales and equity again for all activities world-wide.

On page 3 of Table 5 we have shown two additional ratios, net cash flow (profits after tax plus depreciation) as a percentage of sales (R5) and of equity (R6). In the author's own view, it is

with net cash flow that the multi-national company is most likely to be concerned in relating financial strategy to taxation conditions in different countries. Net cash flow as a proportion of equity shows how the enterprise is using shareholders' investment to generate additional funds. Table II.20 shows how the ranking of the six companies varied according to the six alternative ratios (applied to world-wide activities) in 1975:-

TABLE II.20. RANKING OF SIX COMPANIES ACCORDING TO FINANCIAL PERFORMANCE WORLD-WIDE IN 1975.

	R1	R2	R3	R4	R5	R6
Avon	6	6	6	6	6	6
Dunlop	3	4	4	4	4	4
Firestone	1	3	2	3	2	3
Goodyear	2	1	3	2	3	2
Michelin	4	2	1	1	1	1
Uniroyal	5	5	5	5	5	5

$$R1 = \frac{\text{Net profits before tax}}{\text{Sales turnover}} \qquad R2 = \frac{\text{Net profits before tax}}{\text{Equity}}$$

$$R3 = \frac{\text{Gross cash flow}}{\text{Sales turnover}} \qquad R4 = \frac{\text{Gross cash flow}}{\text{Equity}}$$

$$R5 = \frac{\text{Net cash flow}}{\text{Sales turnover}} \qquad R6 = \frac{\text{Net cash flow}}{\text{Equity}}$$

TABLE II.20. shows that in 1975 the two U.K. based firms were ranked fourth (on five out of six criteria) and sixth in financial performance. However, a closer look at the previous years shown in the six parts of Table 5 shows that the pattern has not been consistent over the seven years.

TABLE 6. is a recent addition to the Tables of Concentration as presented by the Commission. It shows the absolute changes between successive years in each company's share of the total value of each of variable x for company i then :

$S_i = x_i/\Sigma x_i$ where s_i is the share of company i

and $d_i = (S_i)_{t+1} - (S_i)_t$ where t indicates year.

The index of dynamism (d) = $\frac{100\ \Sigma\ di}{2}$

Advertising expenditure was excluded from Table 6 because its volatility might partly be explained by variations in arrangements between certain manufacturers and distributors who sold tyres under their own brand names (e.g. ESSO was a heavy advertiser and until recently sold Uniroyal tyres, Kennings sell a large number of John Bull tyres made for them by Dunlop).

As might be expected with a residual figure, the shares of net profits were much less stable than those of the other variables (sales turnover, exployment and wages bill). The mean of indicies of dynamism for each variable over the six companies were:-

01 Sales turnover	1.98
02 Employment	1.88
03 Wages bill	2.25
04 Net profits before tax	25.98

No single major factor appears to explain the changes in the degree of stability within the industry. The increased "dynamism" at the end of the survey period appears to reflect more aggressive advertising by Michelin. While advertising by Avon and Uniroyal was negligible in 1975, that of Firestone and its distributive subsidiaries was over 40 per cent down on 1974 in £ terms and that of Goodyear was down by about 7 per cent. Meanwhile Michelin increased advertising by about 23 per cent. Later in 1975, Dunlop launched a heavy advertising campaign so that in the year as a whole its expenditure was more than double that of 1974 (see Table II.14). The Dunlop marketing drive continued until 1976 but information on its effects is not available.

TABLE 6(a) shows the percentage shares on which Table 6 is based. It is summarised in Table II.21, which compares "market shares" in 1969 and 1975.

TABLE II.21. SHARES OF COMBINED U.K. TURNOVER 1969 and 1975.

	(Percentages) 1969	1975	Change
Avon	8.16	6.95	-1.21
Dunlop/Pirelli	48.03	43.51	-4.52
Firestone	7.36	6.06	-1.30
Goodyear	15.69	14.58	-1.11
Michelin	15.52	24.18	+8.66
Uniroyal	5.24	4.72	-0.52

The increase in the market share of Michelin at the expense of all the other companies was a continuing process. Michelin's share of combined U.K. turnover increased every year during the survey period.

Michelin's strength in the U.K. market is even greater than these figures suggest:-

(i) The company is much less strongly represented in the less profitable OE sector than in the replacement market.

(ii) The Michelin figures do not include the sales of Kléber or Semperit tyres imported into the United Kingdom from France and Austria respectively. These two brands accounted for about 5 per cent of the U.K. replacement market in 1975. The Michelin parent company has a 30.9 per cent participation in the Swiss holding company which controls the Semperit and Kléber Colombes subsidiaires.[1]

TABLE 7. shows the main indices prescribed by the Commission applied to six variables for all activities world-wide in 1975. One clear feature is that the smallest company does not form part of the world-wide oligopoly - Avon is primarily a United Kingdom company. Another feature is that variable 04 (net profits before tax) is

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1 Report of C.G.E. Michelin 1975, page 52 (published only in French)

more concentrated than other variables. The value of LS shows greater inequality of profits than of any other variable. Net cash flow is, in our view, a more comparable measure of financial performance. This also was more concentrated than sales turnover and, in most respects, than the two capital stock variables (equity and net assets).

TABLE 8 shows the basic data used in the calculation reported in Table 7.

At the end of the Tables of Concentration are presented two of the Commissions three matrices of oligopolistic interdependence (Matrix 1 and Matrix 3) for United Kingdom and two more matrices (Matrix 1 and Matrix 2) for the world-wide activities.

For U.K. activities, Matrix 1 shows that the degree of inequality among firms was greatest in 1970 with respect to advertising expenditure and least with respect to profits. Because variables 02 and 03 (employment and wages bill) are distorted by the inclusion of both U.K. and overseas-based companies, the comparative ranking of net profits (04) and sales turnover (01) are of greatest interest. In 1970 and 1972 there was greater inequality of sales turnover than of net profits, in 1974 the position was reversed - inequality of profits was much more pronounced. The rankings according to Ln*h and LS are identical for each year.

Matrix 2 is omitted because of absence of an equity variable relating to U.K. activities.

Matrix 3 summarises the ranking of rates of growth of each company's share of turnover and combined net profits. The absence of rank correlation is clear from the scatter in the tables, though this was more pronounced in 1970-1 (when the company with the lowest growth of sales had the highest growth of profits) than in the two subsequent comparisons. In 1974-5 the correlation between sales - and profit - growth, was more in evidence; company B (Michelin) had the fastest growth of both sales-share and profits-share and company A (Dunlop) the least growth.

For World-wide activities in 1975 Matrix 1 shows that profits are more highly concentrated on the basis of LS than is any other variable and have the lowest'score'. This finding is consistent with other results reported by Linda[1]. Matrix 2(a) shows comparative performance using net profits before tax as the criterion while 2(b) takes net cash flow. For reasons already explained, we believe that net cash flow more closely corresponds with the objectives of multi-national companies. Of the two U.K.-based companies, the Dunlop-Pirelli union ranks fourth and Avon sixth, Goodyear and Firestone headed the 1975 performance ranking but on the basis of net cash flow, Michelin was a clear leader.

The Financial Performance of Retreading Companies

The difference in scale of operations between the six major tyre manufacturers and even the largest of the retreading companies led to the exclusion of the retreaders from the concentration tables. The results of the three largest retreading companies over the survey period are compared in Table II.22 on the next page with the average for the major tyre manufacturers.

The results for the smallest company, Homerton, appear to be typical of those of the large number of small retreading concerns. The decline in the real value of sales turnover reflects both the declining importance of retreaded tyres and also the downward pressure on their prices. The high return on equity, in relation to the low profit margin, results from the absence of vertical integration - value added is small in relation to sales - and low levels of capitalisation (retreading is a labour-intensive process). In interpretation of the profits figures, it is important to recall that these are net of directors' remuneration. In the case of family-owned businesses the major shareholders may prefer to take salaries rather than dividends.

The results for all three companies follow a similar pattern. The Watts Tyre and Rubber Company is a subsidiary of Watts of Lydney Ltd.

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1 See"Methodology of Concentration Analysis...." page 43.

TABLE II.22. FINANCIAL RESULTS OF THREE LARGEST RETREADING COMPANIES

	Ondura Ltd.	Hometon Tyre & Rubber Co.Ltd.	Watts Tyre & Rubber Co.Ltd.	Average of major cos. in tyre industry
1974 Sales turnover (£000)	3,558	1,505	4,552	
Sales turnover (Index at constant purchasing power with 1969 = 100)				
1969	100	100	100	100
1970	119.5	93.8	109.0	106.2
1971	107.4	87.9	110.1	110.2
1972	102.5	80.9	105.1	107.9
1973	95.0	76.6	113.6	111.6
1974	103.7	70.5	131.0	117.8
Net Profits as % of (a) sales and (b) equity				
1969 (a)	7.0	4.4	6.1	4.4
(b)	27.0	71.4	13.2*	n.a.
1970 (a)	11.0	1.0	4.0	3.9
(b)	44.1	14.5	10.8*	n.a.
1971 (a)	9.8	1.6	7.4	4.7
(b)	34.4	16.2	17.0*	n.a.
1972 (a)	-0.5	2.1	3.5	4.0
(b)	-1.8	19.1	13.4*	n.a.
1973 (a)	-8.3	-2.5	0.5	2.8
(b)	-40.2	-26.1	9.2*	n.a.
1974 (a)	1.7	0.4	2.4	3.4
(b)	9.3	4.5	18.4*	n.a.

* Figures refer to all activities of parent company (tyres 57% of sales).

with a 1974 turnover of over £8 millions (tyres £4.5 millions). This company, which also acts as a tyre distributor, appears to have been consistently more successful than Homerton and, except in 1970 and 1971, reported better results than Ondura.

Supplementary Comparison of Replacement and OE Markets

After the analysis of concentration in the total supply of tyres using the financial variables we include a further table (No.9 on page 77). This shows the values of concentration measures derived from the market share estimates for the two distinct markets. For replacement, the Linda analysis shows growth of an oligopoly of three firms much more equal in strength in 1975 and (especially) in 1976 than in 1972. These three firms were Michelin, Pirelli and Goodyear.

In the original equipment sector the Linda analysis also shows a three-firm oligopoly though in this case the companies are Dunlop, Goodyear and Firestone.

TABLE II - 23 ECONOMIC STRUCTURE OF FIRMS IN THE SAMPLE

	TURNOVER ($m.)			PROFIT BEFORE TAX ($m.)		
	Total	Tyres World-Wide	U.K. All Products	Total	Tyres World-Wide	U.K. All Products
1970						
Avon	103.1	74.6	89.9	3.32	1.65	3.19
Dunlop/Pirelli	2303	1182	485	79.6	39.6	18.42
Firestone	2335	1910	79.7	170.6	124.7	3.48
Goodyear	3194	2650	181.7	236.0	208.8	10.82
Michelin	*		174.0	*		12.84
Uniroyal	1556	869	68.6	37.2	19.7	2.24
1972						
Avon	116.7	88.1	104.8	5.03	2.97	5.52
Dunlop/Pirelli	2747	1461	744.8	96.3	34.6	22.7
Firestone	2691	2198	96.3	250.0	190.9	0.75
Goodyear	4072	1383	81.1	354.5	323	2.40
Michelin	*		233.0	*		17.54
Uniroyal	1800	1028	79.7	75.8	38.7	0.77
1973						
Avon	135.5	96.7	116.0	5.02	2.92	4.39
Dunlop/Pirelli	3275	1698	814.6	160.6	53.7	22.1
Firestone	3155	2535	98.1	285.4	211.6	0.02
Goodyear	4675	3975	223.9	328.8	286.0	3.29
Michelin	*		283.4	*		12.84
Uniroyal	2084	1216	86.7	73.6	33.3	2.33
1975						
Avon	159.7	122.2	139.4	-1.12	0.49	-1.24
Dunlop/Pirelli	3982	2102	1025	153.3	61.6	36.9
Firestone	3939	3015	54.7	231.1	157	-2.97
Goodyear	5453	4526	292.6	316.9	244	0.20
Michelin	2902	n.a.	485.3	147.0	n.a.	52.4
Uniroyal	2188	1265	94.8	38.2	20.4	6.37

* Michelin accounts not published in consolidated form until 1975

Sources: Accounts of companies registered in USA, UK, France and Italy.

TABLES OF CONCENTRATION

TABLE 1. EVOLUTION OF THE TOTAL FIGURES FOR THE SAMPLE OF ENTERPRISES

Industry: Tyres (UK activities) Institute: Cranfield School of Management

	Sales turnover (01)			Employees (02)		
Year	No. of firms	£ millions	Index 1969=100	No. of firms	Number	Index 1969=100
1969	7	408.4	100	7	98,700	100
1970	7	462.2	113	7	104,300	106
1971	6	524.8	129	6	100,600	102
1972	6	549.2	134	6	96,200	97
1973	6	615.4	151	6	96,300	98
1974	6	753.3	184	6	96,300	98
1975	6	903.2	221	6	93,000	94

	Wages-Bill (03)			Net Profits before Tax (04)*		
Year	No. of firms	£ millions	Index 1969=100	No. of firms	£ millions	Index 1969=100
1969	7	129.8	100	5	18.98	100
1970	7	141.8	109	7	17.86	94
1971	6	153.4	118	6	24.87	131
1972	6	164.3	126	6	21.77	115
1973	6	184.6	142	6	17.00	90
1974	6	211.1	163	5	25.76	136
1975	6	259.7	200	5	43.33	228

Advertising Expenditure (11)			
Year	No. of firms	£ millions	Index 1969=100
1969	7	2.262	100
1970	7	1.304	58
1971	6	1.873	83
1972	6	2.351	104
1973	6	2.649	117
1974	6	1.963	87
1975	6	2.428	107

*Only profits are included in this total (i.e. losses are omitted). The sum totals for all firms of profits and losses in each year were (£m):-

1969: 18.09 1973: 17.00
1970: 17.86 1974: 25.46
1971: 24.87 1975: 40.35
1972: 21.77

VALUES OF VARIABLES IN TERMS OF 1975 PURCHASING POWER

TABLE 1 (a)

(All data in Table 1 adjusted by the Index of Retail Prices, with 1975 = 1)

YEAR	Sales Turnover		Wages-Bill		Advertising Exp.	
	£m	Index	£m	Index	£m	Index
1969	794.2	100	248.7	100	4.525	100
1970	844.0	106	255.8	103	2.381	53
1971	875.1	110	255.8	103	3.123	69
1972	857.1	108	256.4	103	3.669	81
1973	886.2	112	265.8	107	3.815	84
1974	935.7	118	262.2	105	2.438	54
1975	903.2	114	259.7	104	2.428	54

YEAR	Net Profits (excluding losses)		Net Profits (including losses)	
	£m	Index	£m	Index
1969	36.90	100	35.17	100
1970	32.61	88	32.61	93
1971	41.47	112	41.47	118
1972	33.98	92	33.98	97
1973	24.48	66	24.48	70
1974	31.99	87	31.62	90
1975	43.33	117	40.35	115

EVOLUTION OF CONCENTRATION

TABLE 2
Page 1

Country: United Kingdom
Institute: Cranfield School of Management - Bedford
Sector: Tyres - Economic Activity Units
Variables (UK activities only): 01 - Turnover 02 - Employees
03 - Wages Bill 04 - Net Profits
11 - Advertising Expenditure

All variables except 02 in £ millions.

	No. of firms	Mean	Coeff. of Variation	Gini	Herfindahl-Hirschman	Entropy
YEAR 1969						
01	7	58.34	0.873	0.410	251.7	- 71.4
02	7	14,740	1.179	0.502	341.4	- 63.1
03	7	18.27	1.158	0.500	334.5	- 63.6
04	5	3.80	0.722	0.405	304.3	- 57.0
11	7	0.332	1.016	0.486	290.3	- 66.3
YEAR 1970						
01	7	66.03	0.806	0.381	235.8	- 73.1
02	7	14,900	1.144	0.503	329.8	- 63.8
03	7	20.01	1.115	0.495	320.3	- 64.6
04	7	2.68	0.699	0.375	212.8	- 73.5
11	7	0.175	1.306	0.606	386.4	- 54.2
YEAR 1971						
01	6	87.46	0.878	0.414	295.2	- 64.3
02	6	16,800	1.080	0.501	361.1	- 58.0
03	6	25.56	1.052	0.485	351.0	- 59.1
04	6	4.33	0.606	0.337	227.8	- 69.3
11	6	0.312	0.938	0.512	313.2	- 57.2
YEAR 1972						
01	6	91.5	0.857	0.410	289.2	- 64.8
02	6	16,000	1.046	0.496	349.1	- 58.8
03	6	27.4	1.024	0.479	341.5	- 59.8
04	6	3.63	0.985	0.523	328.2	- 56.3
11	6	0.392	0.612	0.339	229.2	- 68.3

EVOLUTION OF CONCENTRATION

TABLE 2
Page 2

Country: United Kingdom
Institute: Cranfield School of Management - Bedford
Sector: Tyres - Economic Activity Units
Variables (UK activities only): 01 - Turnover 02 - Employees
03 - Wages Bill 04 - Net Profits
11 - Advertising Expenditure

	No. of firms	Mean	Coeff. of Variation	Gini	Herfindahl-Hirschman	Entropy
YEAR 1973						
01	6	102.6	0.849	0.413	286.7	- 64.8
02	6	16,050	1.040	0.490	346.9	- 59.1
03	6	30.8	1.014	0.478	337.9	- 60.0
04	6	2.83	0.995	0.533	331.6	- 55.0
11	6	0.442	0.498	0.279	208.0	- 71.8
YEAR 1974						
01	6	125.5	0.836	0.410	283.1	- 65.0
02	6	16,050	1.038	0.486	346.3	- 59.3
03	6	35.2	0.996	0.478	331.9	- 60.3
04	5	5.15	0.932	0.416	373.6	- 55.0
11	6	0.327	0.676	0.348	242.9	- 63.3
YEAR 1975						
01	6	150.5	0.824	0.427	279.8	- 64.5
02	6	15,500	1.017	0.491	338.9	- 59.4
03	6	43.3	0.977	0.485	325.7	- 60.2
04	4	10.83	0.896	0.487	450.6	- 38.7
11	6	0.405	0.897	0.483	300.7	- 59.7

LINDA INDICES (L) AND CONCENTRATION RATIOS (CR) TABLE 3
Page 1

Sector: Tyres (UK activities)

	L and CR for N* =		Maximum and Minimum Values of L				
	2	4	Size of sample	Maximum N*h	Maximum L	1st Minimum N*m	1st Minimum L
Variable 01 - Sales Turnover							
1969 L	1.373	0.734	7	2	1.373	7	0.530
CR	58.8	82.5					
1970 L	1.243	0.702	7	2	1.243	7	0.472
CR	57.0	80.8					
1971 L	1.446	0.827	6	2	1.446	6	0.635
CR	64.7	87.5					
1972 L	1.333	0.825	6	2	1.336	6	0.623
CR	64.8	87.2					
1973 L	1.237	0.814	6	2	1.237	6	0.633
CR	65.3	88.8					
1974 L	1.176	0.811	6	2	1.176	3	0.811
CR	65.3	87.7					
1975 L	0.900	0.829	6	2	0.900	5	0.761
CR	72.3	89.2					
Variable 02 - Employment							
1969 L	1.980	1.015	7	2	1.980	7	0.838
CR	68.6	86.6					
1970 L	1.757	0.989	7	2	1.757	7	0.744
CR	68.5	86.8					
1971 L	1.632	1.007	6	2	1.632	6	0.917
CR	72.7	91.6					
1972 L	1.463	0.989	6	2	1.463	6	0.910
CR	72.6	91.6					
1973 L	1.505	0.970	6	2	1.505	6	0.884
CR	71.9	91.3					
1974 L	1.510	0.963	6	2	1.510	6	0.870
CR	71.9	90.9					
1975 L	1.362	0.950	6	2	1.362	5	0.896
CR	72.0	91.7					

LINDA INDICES (L) AND CONCENTRATION RATIOS (CR) TABLE 3
Page 2

	L and CR for N* = 2	L and CR for N* = 4	Maximum and minimum values of L: Size of sample	Maximum N*h	Maximum L	1st Minimum N*m	1st Minimum L
Variable 03 - Wages Bill							
1969 L	1.963	0.987	7	2	1.963	7	0.683
CR	67.7	86.7					
1970 L	1.738	0.950	7	2	1.738	7	0.725
CR	67.1	86.7					
1971 L	1.726	0.957	6	2	1.726	6	0.863
CR	70.6	91.0					
1972 L	1.576	0.968	6	2	1.576	5	0.846
CR	70.6	90.4					
1973 L	1.570	0.938	6	2	1.570	6	0.849
CR	70.0	90.7					
1974 L	1.411	0.937	6	2	1.411	5	0.852
CR	70.6	90.8					
1975 L	1.157	0.959	6	2	1.157	3	0.886
CR	72.3	91.4					
Variable 04 - Net Profits Before Tax							
1969 L	0.638	0.751	7 /	2	0.638	3	0.596
CR	72.2	98.0					
1970 L	0.584	0.542	7	2	0.585	3	0.380
CR	52.9	84.6					
1971 L	0.576	0.530	6	2	0.577	3	0.457
CR	58.1	87.9					
1972 L	0.659	0.840	6	3	0.919	4	0.840
CR	77.9	97.2					
1973 L	0.652	0.860	6	3	0.893	4	0.860
CR	78.3	97.7					
1974 L	2.036	0.895	5	2	2.036	5	0.777
CR	71.0	93.0					
1975 L	0.702	14.49	4	4	14.491	No value	
CR	93.1	100.0					

LINDA INDICES (L) AND CONCENTRATION RATIOS (CR) TABLE 3
Page 3

	L and CR for N* =		Maximum and minimum values of L				
			Size of sample	Maximum		1st Minimum	
	2	4		N*h	L	N*m	L
Variable 11 - Expenditure on Advertising							
1969 L	1.453	0.732	7	2	1.453	4	0.732
CR	63.9	89.0					
1970 L	1.839	0.905	7	2	1.839	4	0.905
CR	73.7	95.6					
1971 L	0.739	0.717	6	3	0.757	4	0.717
CR	73.8	97.9					
1972 L	0.815	0.413	6	2	0.815	5	0.413
CR	55.4	88.6					
1973 L	0.562	0.423	6	2	0.562	5	0.360
CR	53.4	84.4					
1974 L	0.550	0.291	6	2	0.550	4	0.291
CR	53.1	98.1					
1975 L	1.000	0.658	6	2	1.000	3	0.655
CR	67.6	96.5					

STRUCTURE OF LINDA CURVES (TYRES - U.K. ACTIVITIES) TABLE 3 (bis)
Page 1

	N*	01-Sales Turnover	02 Employment	03 Wages-Bill	04 Net Profits	11 Advertising
1969	2	1.373	1.980	1.963	0.638	1.453
	3	0.776	1.347	1.226	0.596	0.842
	4	0.734	1.015	0.987	0.751	0.732
	5	0.626	0.944	0.908	1.270	0.811
	6	0.589	0.838	0.828		0.805
	7	0.530	0.728	0.730		0.760
1970	2	1.243	1.757	1.738	0.585	1.839
	3	0.726	1.236	1.108	0.380	1.214
	4	0.702	0.989	0.950	0.542	0.905
	5	0.609	0.906	0.875	0.514	1.013
	6	0.537	0.817	0.802	0.520	2.619
	7	0.472	0.743	0.725	0.547	5.024
1971	2	1.446	1.632	1.726	0.577	0.739
	3	0.863	1.206	1.121	0.457	0.757
	4	0.827	1.007	0.957	0.530	0.717
	5	0.714	0.975	0.897	0.501	1.305
	6	0.635	0.917	0.863	0.560	3.409
1972	2	1.333	1.463	1.576	0.659	0.815
	3	0.850	1.130	1.085	0.919	0.526
	4	0.825	0.989	0.967	0.840	0.444
	5	0.702	0.943	0.846	1.609	0.413
	6	0.623	0.910	0.850	1.696	0.950
1973	2	1.237	1.505	1.570	0.652	0.562
	3	0.827	1.129	1.037	0.893	0.466
	4	0.814	0.970	0.938	0.860	0.422
	5	0.721	0.917	0.849	1.258	0.359
	6	0.633	0.884	0.849	12.686	0.491

STRUCTURE OF LINDA CURVES (TYRES - U.K. ACTIVITIES) TABLE 3 (bis)
Page 2

	N*	01-Sales Turnover	02 Employment	03 Wages-Bill	04 Net Profits	11 Advertising
1974	2	1.176	1.510	1.411	2.036	0.550
	3	0.8106	1.175	1.013	1.222	0.390
	4	0.8114	0.963	0.937	0.895	0.291
	5	0.715	0.887	0.852	0.777	1.044
	6	0.628	0.870	0.857		3.285
1975	2	0.900	1.362	1.157	0.702	1.000
	3	0.761	1.057	0.897	1.572	0.655
	4	0.829	0.950	0.959	14.491	0.658
	5	0.747	0.896	0.886		1.033
	6	0.696	0.924	0.900		1.687

SUMMARY OF LINDA INDICES TABLE 4

	01 Sales Turnover	02 Employment	03 Wages Bill	04 Net Profits	11 Advertising
1969 N*m	7	7	7	3	4
LN*m	0.530	0.728	0.730	0.596	0.732
LS	0.771	1.142	1.107	0.617	1.009
1970 N*m	7	7	7	3	4
LN*m	0.472	0.743	0.725	0.380	0.905
LS	0.715	1.075	1.033	0.482	1.319
1971 N*m	6	6	6	3	4
LN*m	0.635	0.917	0.863	0.457	0.717
LS	0.897	1.147	1.113	0.517	0.738
1972 N*m	6	6	5	4	4
LN*m	0.623	0.910	0.846	0.840	0.413
LS	0.867	1.087	1.118	0.816	0.550
1973 N*m	6	6	6	4	5
LN*m	0.633	0.884	0.849	0.860	0.359
LS	0.846	1.081	1.050	0.802	0.452
1974 N*m	3	6	5	4	4
LN*m	0.811	0.870	0.852	0.777	0.291
LS	0.994	1.081	1.053	1.483	0.410
1975 N*m	3	5	5	No value (curve rises throughout)	3
LN*m	0.761	0.896	0.886		0.655
LS	0.831	1.066	0.997		0.828

PROFITABILITY RATIOS

TABLE 5
Page 1

R1: Profit margin = $\frac{\text{Net profit before tax}}{\text{Sales turnover}} \times 100$

	1969	1970	1971	1972	1973	1974	1975
(a) All activities in the U.K.							
Avon	1.13	3.55	6.03	4.33	4.14	3.18	-0.9
Dunlop*	4.36	2.43	3.20	3.72	2.63	4.26	4.27
Firestone	4.65	4.38	5.74	0.77	0.03	-0.62	-5.43
Goodyear	5.46	5.96	6.68	2.96	1.47	3.22	0.07
Michelin	9.50	7.38	8.03	7.53	5.00	2.11	10.79
Uniroyal	-3.12	3.26	3.69	0.96	1.10	5.95	6.73
Pirelli	-1.04	0.74	INCLUDED WITH DUNLOP				
OVERALL AVERAGE+	4.43	3.86	4.74	3.96	2.76	3.38	4.47
(b) All activities world-wide.							
Avon	1.23	3.22	4.97	4.31	4.19	3.03	-0.7
Dunlop*	5.54	4.98	6.51	6.27	4.76	4.95	5.12
Firestone	9.48	7.31	9.06	9.29	9.05	7.39	6.15
Goodyear	9.30	7.32	8.86	8.71	7.03	5.41	5.81
Michelin	NOT AVAILABLE UNTIL 1975 -						5.07
Uniroyal	5.25	2.39	4.27	4.21	3.53	3.33	1.75
(c) Tyres world-wide.							
Avon		3.01	7.4	4.53	2.8	2.08	-0.6
Dunlop*		5.43	7.22	6.69	4.68	4.11	5.07
Firestone		5.36	8.61	8.69	8.32	5.74	5.17
Goodyear		7.84	9.59	9.33	7.2	5.1	5.39
Uniroyal		2.11	4.52	3.46	2.06	1.1	1.3

* Includes all tyre interest of Pirelli from 1971 onwards.

\+ Total of net profits and losses combined turnover.

TABLE 5
Page 2

Further profitability ratios relating to all activities, world-wide.

R2: Net return on equity = $\frac{\text{Net profits before tax}}{\text{Total equity ("own capital")}} \times 100$

	1969	1970	1971	1972	1973	1974	1975
Avon	3.31	10.22	16.4	14.43	15.22	13.81	-3.79
Dunlop*	15.98	15.45	14.1	15.66	12.33	13.11	14.56
Firestone	20.31	15.4	19.07	19.97	21.03	18.69	14.98
Goodyear	23.79	17.62	22.24	22.61	19.84	16.45	17.45
Michelin							5.07
Uniroyal	15.42	6.9	12.71	12.96	12.15	12.25	6.10
R3: Gross cash flow in relation to sales = $\frac{\text{Net profits before tax + depreciation}}{\text{Sales turnover}} \times 100$							
Avon	4.72	6.32	8.04	7.44	7.24	5.64	1.86
Dunlop*	8.99	8.5	10.14	10.14	8.60	8.39	8.3
Firestone	13.44	10.76	13.12	13.21	12.84	11.1	10.24
Goodyear	12.75	11.13	12.5	12.29	10.38	8.68	9.14
Michelin							12.47
Uniroyal	8.34	5.64	7.4	7.31	6.39	6.15	4.90
R4: Gross cash flow in relation to equity = $\frac{\text{Net profits before tax + depreciation}}{\text{Total equity("own capital")}} \times 100$							
Avon	12.72	20.03	26.53	24.87	26.27	25.76	10.09
Dunlop*	25.94	26.37	21.96	25.31	22.28	22.21	23.58
Firestone	28.78	22.67	27.62	28.39	29.85	28.06	24.95
Goodyear	32.61	26.78	31.39	31.92	29.3	26.4	27.44
Michelin							38.32
Uniroyal	24.5	16.26	22.05	22.48	21.97	22.63	17.11

* Includes all tyre interests of Pirelli from 1971 onwards.

TABLE 5
Page 3

Further profitability ratios relating to all activities, worldwide.

R5: Net cash flow in relation to sales = $\frac{\text{Net profits after tax + depreciation}}{\text{sales turnover}} \times 100$

	1969	1970	1971	1972	1973	1974	1975
Avon	4.4	5.03	6.23	6.24	5.37	4.06	2.06
Dunlop*	6.4	5.88	7.0	7.26	6.0	5.64	5.49
Firestone	9.07	7.42	8.63	8.96	9.02	7.89	7.7
Goodyear	8.27	7.76	8.17	8.31	7.13	6.02	6.29
Michelin							10.68
Uniroyal	6.1	4.83	5.7	5.69	5.14	4.7	4.21
R6: Net cash clow in relation to equity = $\frac{\text{Net profit after tax + depreciation}}{\text{Total equity}} \times 100$							
Avon	11.86	15.95	20.56	20.88	19.49	18.51	11.17
Dunlop*	18.46	18.26	15.17	18.13	15.54	14.93	15.6
Firestone	19.43	15.64	18.16	19.27	20.97	19.96	18.75
Goodyear	21.16	18.66	20.51	21.59	20.11	18.31	18.89
Michelin							32.82
Uniroyal	17.92	13.92	16.98	17.5	17.69	17.28	14.69

* Includes all tyre interests of Pirelli from 1971 onwards.

PATTERN OF GROWTH OF FIRMS WITHIN THE SAMPLE TABLE 6

(Tyre companies - U.K. activities)

	Absolute change in % shares			
	01 Sales Turnover	02 Employees	03 Wages-Bill	04 Net Profits
1969-70				
Avon	-0.05	-0.30	-0.24	+5.10
Dunlop	-2.43	-1.44	-1.83	-16.11
Firestone	-0.18	+0.15	-0.91	-4.02
Goodyear	+0.68	+0.62	+0.85	-10.69
Michelin	+0.17	+1.34	+1.25	-7.74
Uniroyal	+0.95	-0.66	-0.20	+28.49
Pirelli	+0.85	+0.29	+1.08	+4.97
Index of Dynamism	2.66	2.40	3.18	38.56
1970-1				
Avon	-0.36	-0.04	+0.35	+2.34
Dunlop (of Dunlop+Pirelli)	+1.61	-2.82	-2.61	+1.77
Firestone	-0.35	+0.36	+1.02	+4.57
Goodyear	-1.29	+0.58	+0.36	+12.63
Michelin	+0.92	+1.89	+0.86	+2.97
Uniroyal	-0.52	+0.03	-0.01	-24.27
Index of Dynamism	2.52	2.86	2.61	24.27
1971-2				
Avon	-0.12	-0.26	-0.47	-1.08
Dunlop	-0.94	-1.60	-1.21	+13.15
Firestone	+0.18	+0.22	+0.79	-6.55
Goodyear	-0.31	+0.36	-0.05	-9.34
Michelin	+1.07	+1.43	+1.13	+6.62
Uniroyal	+0.13	-0.15	-0.20	-2.82
Index of Dynamism	1.37	2.01	1.93	19.78

PATTERN OF GROWTH OF FIRMS WITHIN THE SAMPLE

TABLE 6
Page 2

	01 Sales Turnover	02 Employees	03 Wages-Bill	04 Net Profits
1972-3				
Avon	+0.02	+0.25	+0.13	+3.13
Dunlop	-0.64	-0.10	-0.47	+0.04
Firestone	-0.51	+0.19	-0.31	-1.31
Goodyear	+0.07	+0.11	+0.71	-3.12
Michelin	+1.11	-0.56	-0.08	+0.39
Uniroyal	-0.05	+0.11	+0.02	+0.87
Index of Dynamism	1.20	0.66	0.86	4.43
1973-4				
Avon	-0.11	+0.35	-0.17	-4.46
Dunlop	-0.68	+0.02	-0.99	+12.69
Firestone	+0.06	+0.37	-0.08	-0.06
Goodyear	+0.02	-0.66	-0.23	+6.09
Michelin	+0.68	-0.05	+1.55	-21.96
Uniroyal	+0.01	-0.02	-0.09	+7.72
Index of Dynamism	0.78	0.74	1.55	26.49
1974-5				
Avon	-0.59	-0.53	-0.49	-7.02
Dunlop	-2.29	-1.32	-1.65	-18.21
Firestone	-0.50	-0.26	-0.37	0.00
Goodyear	-0.28	+1.15	-0.62	-13.78
Michelin	+4.71	+1.46	+3.35	+42.38
Uniroyal	-1.04	-0.51	-0.22	-3.38
Index of Dynamism	4.71	2.62	3.35	42.38

U.K. ACTIVITIES OF TYRE COMPANIES
% DISTRIBUTION OF EACH VARIABLE BY ENTERPRISES

TABLE 6(a)

	01	02	03	04
1969				
Avon	8.16	8.14	7.85	1.99
Dunlop	43.10	54.76	53.95	40.47
Firestone	7.36	4.16	5.14	7.37
Goodyear	15.69	9.89	11.18	18.42
Michelin	15.52	13.83	13.75	31.74
Uniroyal	5.24	4.33	3.97	0
Pirelli	4.93	4.89	4.18	0
1970				
Avon	8.11	7.84	7.61	7.09
Dunlop	40.67	53.32	52.12	24.36
Firestone	7.18	4.31	4.23	3.35
Goodyear	16.37	10.51	12.03	7.73
Michelin	15.69	15.17	15.00	24.00
Uniroyal	6.19	3.67	3.77	28.49
Pirelli	5.78	5.18	5.26	4.97
1971				
Avon	7.75	7.80	7.96	9.43
Dunlop/Pirelli	48.06	55.68	54.77	31.10
Firestone	6.83	4.67	5.25	7.92
Goodyear	15.08	11.09	12.39	20.36
Michelin	16.61	17.06	15.86	26.97
Uniroyal	5.67	3.70	3.77	4.23

U.K. ACTIVITIES OF TYRE COMPANIES
% DISTRIBUTION OF EACH VARIABLE BY ENTERPRISES

TABLE 6(a)
Page 2

	01	02	03	04
1972				
Avon	7.63	7.54	7.49	8.35
Dunlop	47.12	54.08	53.56	44.25
Firestone	7.01	4.89	6.04	1.37
Goodyear	14.77	11.45	12.34	11.02
Michelin	17.68	18.49	16.99	33.59
Uniroyal	5.80	3.55	3.57	1.41
1973				
Avon	7.65	7.79	7.62	11.48
Dunlop	46.48	53.98	53.09	44.29
Firestone	6.50	5.08	5.73	0.06
Goodyear	14.84	11.56	13.07	7.90
Michelin	18.79	17.93	16.91	33.98
Uniroyal	5.75	3.66	3.59	2.28
1974				
Avon	7.54	8.14	7.45	7.02
Dunlop	45.80	54.00	52.10	56.98
Firestone	6.56	5.45	5.65	0
Goodyear	14.86	10.90	12.84	13.99
Michelin	19.47	17.88	18.46	12.02
Uniroyal	5.76	3.64	3.50	10.00
1975				
Avon	6.95	7.61	6.96	0
Dunlop	43.51	52.68	50.45	38.77
Firestone	6.06	5.19	5.28	0
Goodyear	14.58	12.05	12.22	0.21
Michelin	24.18	19.34	21.81	54.40
Uniroyal	4.72	3.13	3.28	6.62

TABLES OF CONCENTRATION TABLE 7

Analysis of World-Wide Figures for Sample of Enterprises 1975

Industry: Tyres
Unit: Millions of U.S. dollars

Institute: Cranfield School of Management

Figures refer to world-wide turnover of the six firms producing tyres in the United Kingdom.

	01 Turnover	04 Net Profits	05 Cash Flow	07 Own Capital	09 Net Cash Flow	10 Net Assets
Total	18,624	887	1,613	5,856	1,203	12,217
Mean	3,104	177.3	268.8	976	200.5	2,036
Coeff. of Variation	0.535	0.524	0.629	0.597	0.618	0.531
Gini	0.294	0.289	0.352	0.332	0.343	0.283
Herf-Hirschman	214.3	255.0	232.6	226.0	230.2	213.6
Entropy	- 69.5	-63.2	-66.2	- 67.9	- 66.7	- 68.8
Concentration ratios						
N = 1	0.293	0.357	0.309	0.310	0.285	0.256
2	0.507	0.618	0.547	0.571	0.543	0.495
3	0.718	0.791	0.771	0.732	0.783	0.703
4	0.874	0.957	0.932	0.888	0.921	0.898
5	0.991	1.000	0.998	0.995	0.997	0.997
6	1.000		1.000	1.000	1.000	1.000
Linda coefficients						
N = 2	0.685	0.685	0.650	0.594	0.554	0.536
3	0.429	0.573	0.426	0.540	0.380	0.390
4	0.369	0.434	0.376	0.415	0.390	0.302
5	0.343	0.637	0.469	0.388	0.442	0.337
6	1.109		4.121	1.702	2.896	2.265
LS	0.456	0.564	0.484	0.484	0.467	0.409

TABLE 8 WORLD WIDE ACTIVITIES OF TYRE PRODUCERS

FINANCIAL DATA FOR YEAR 1975
(Financial year ended in period 1st July 1974 to 30th June 1975)

Variable	Avon	Dunlop & Pirelli	Firestone	Goodyear	Michelin	Uniroyal
		(millions of U.S. dollars)				
01 Turnover	160	3982	3939	5453	2902	2188
04 Net Profits	- 1	153	231	317	147	38
05 Cash Flow	3	259	384	499	362	107
07 Equity	30	911	1529	1816	944	626
09 Net cash flow	3	166	289	343	310	92
10 Net assets	42	2537	2918	2387	3187	1205

Source: Company accounts.

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE

Tyre industry :- UK Activities

(Matrix No. 2 omitted - see p.50 of text)

Matrix No. 1 Oligopolistic Inequality 1970

		Ranking 1	1	2	3	4	5
Ranking		Variable	11	02	03	01	04
II	Variable	LS/Ln*h	1.839	1.757	1.738	1.243	0.585
1	11	1.319	2				
2	02	1.075		4			
3	03	1.033			6		
4	01	0.715				8	
5	04	0.482					10
			1972				
		Ranking 1	1	2	3	4	5
Ranking		Variable	03	02	01	04	11
II	Variable	LS/Ln*h	1.576	1.463	1.333	0.919	0.815
1	03	1.118	2				
2	02	1.087		4			
3	01	0.867			6		
4	04	0.816				8	
5	11	0.550					10
			1974				
		Ranking 1	1	2	3	4	5
Ranking		Variable	04	02	03	01	11
II	Variable	LS/Ln*h	2.036	1.510	1.411	1.176	0.550
1	04	1.483	2				
2	02	1.081		4			
3	03	1.053			6		
4	01	0.994				8	
5	11	0.410					10

01 = Sales Turnover
02 = Employees
03 = Wages Bill
04 = Net Profits Before Tax
11 = Advertising expenditure

MATRIX NO.3 - COMPARATIVE GROWTH RATES

(see next page for definitions)

4c \ 1c	Rank	Company	4c
	1	C	12.63
	2	E	4.57
	3	B	2.97
	4	D	2.34
	5	A	1.77
	6	F	-24.27

1970-1						
Rank	1	2	3	4	5	6
Company	A	B	E	D	F	C
1c	1.61	0.92	-0.35	-0.36	-0.52	-1.29
1x / 4x	47	16	7	8	6	16
8						7
3			5			
24		5				
7				8		
29	6					
29					11	

4c \ 1c	Rank	Company	4c
	1	D	3.13
	2	F	0.87
	3	B	0.39
	4	A	0.04
	5	E	-1.31
	6	C	-3.12

1972-3						
Rank	1	2	3	4	5	6
Company	B	C	D	F	E	A
1c	1.11	0.07	0.02	-0. 5	-0.51	-0.64
1x / 4x	18	15	7	6	7	47
8			4			
2				6		
34	4					
44						10
1					10	
11		8				

4c \ 1c	Rank	Company	4ci
	1	B	42.38
	2	E	0.00
	3	F	-3.38
	4	D	-7.02
	5	C	-13.78
	6	A	-18.21

1974-5						
Rank	1	2	3	4	5	6
Company	B	C	E	D	F	A
1ci	4.71	-0.28	-0.50	-0.59	-1.04	-2.29
1x / 4x	24	15	6	7	5	43
54	2					
0			5			
7					8	
0				8		
0		7				
39						12

1c = Growth (croissance) of share of sales turnover (market share)

4c = Growth (croissance) of share of net profits

1x = Share of sales turnover in the first of the two years

4x = Share of the net profits in the first of the two years

Companies (ranked in order of 1971 sales turnover)

A - Dunlop/Pirelli

B - Michelin

C - Goodyear

D - Avon

E - Firestone

F - Uniroyal

The terms used are those of R. Linda. (Reference 3)

MATRICES OF OLIGOPOLISTIC INTERDEPENDENCE
World-wide Activities of Tyre Companies with Major Shares of U.K. Market - 1975

Matrix No. 1 Oligopolistic Inequality

Ranking		Ranking I	1	2	3	4	5	6
		Variable	01	04	05	07	09	10
II	Variable	LS/Lh*h	0.685	0.685	0.650	0.594	0.554	0.536
1	04	0.564		3				
2	07	0.484				6		
3	05	0.484			6			
4	09	0.467					9	
5	01	0.456	6					
6	10	0.409						12

(Rankings are based on unrounded values)

Matrix No. 2 (a) Comparative Performance (using net profits before tax)

2r \ 1r			Rank	1	2	3	4	5	6
			Firm	C	A	B	D	E	F
			1r	6.2	5.8	5.1	5.1	1.8	-0.7
Rank	Firm	2r	7x \ 1x	3939	5453	3982	2902	2188	160
1	A	17.4	1816		3				
2	D	15.6	944				6		
3	C	15.0	1528	4					
4	B	14.6	911			7			
5	E	6.1	626					10	
6	F	-3.8	30						12

Notes: 1r = net profits before tax as % of sales turnover
2r = net profits before tax as % of equity
1x = absolute value of sales turnover in 1975 ($\$10^6$)
7x = absolute value of equity in 1975 ($\$10^6$)
The identity of firms is given on the next page.

MATRIX 2 (b) - COMPARATIVE PERFORMANCE (USING NET CASH FLOW AFTER TAX)

6r / 5r			Rank	1	2	3	4	5	6
			Firm	D	C	A	B	E	F
			5r	10.7	7.7	6.3	5.5	4.2	2.06
Rank	Firm	6r	7x \ 1x	2902	3939	5453	3982	2188	160
1	D	32.8	944	2					
2	A	18.9	1816			5			
3	C	18.7	1528		5				
4	B	15.6	911				8		
5	E	14.7	626					10	
6	F	11.2	30						12

Firms are coded in descending order of sales turnover in 1975:

A = Goodyear
B = Dunlop/Pirelli Union
C = Firestone
D = Michelin
E = Uniroyal
F = Avon

$$5r = \frac{\text{Net profits after tax + depreciation}}{\text{Sales turnover}}$$

$$6r = \frac{\text{Net profits after tax + depreciation}}{\text{Total equity}}$$

TABLES OF CONCENTRATION - TABLE 9 (SUPPLEMENTARY TABLE)

APPLICATION OF CONCENTRATION MEASURES TO MARKET SEGMENTS

(Based on market shares shown on pages 37 and 39 of text)

1. Replacement Market

		1972		1975		1976	
N* (sample)		6		6		6	
N (Estd. total number of suppliers - see Note)		14		18		19	
Coefficient of variation		1.26		1.43		1.53	
Gini coefficient		0.611		0.636		0.649	
Herfindahl-Hirschman		185		169		176	
Entropy		- 84.8		- 91.5			
Concent.ratios and Linda indices	n*	CR	L	CR	L	CR	L
	2	53	0.560	47	0.737	49	0.565
	3	67	0.555	66	0.452	69	0.406
	4	79	0.462	76	0.464	80	0.426
	5	87	0.447	83	0.465	84	0.598
	6	92	0.470	88	0.470	87	0.662
LS	$\hat{n}$		0.506		0.595		0.486

Note:- the percentage of the market held by the N-N* firms was estimated. The assumption that this was shared by firms each holding 1% was consistent with the market structure and was used to estimate N and for the calculations of V, G, H and E.

2. Original equipment (1975 only) N = N* = 6

Coefficient of Variation = 0.533 Gini coefficient = 0.290
Herfindahl-Hirschman = 214 Entropy index = 71.1

Concentration ratios and Linda indices

n* =	2	3	4	5	6
CR	52	76	87	95	100
L	0.540	0.364	0.428	0.439	0.476

III. SPARKING PLUGS

A. Analysis of Total Market

The production of sparking plugs in the United Kingdom is now more concentrated than that of tyres. The 1968 Census of Production listed six manufacturers. Lucas have since withdrawn from the production of sparking plugs, and two smaller producers were combined within Smiths Industries Ltd. which subsequently withdrew from the U.K. market. Thus there are now only three major suppliers - the Champion Sparking Plug Company, Autolite (a division of Ford) and A.C.Delco (a subsidiary of General Motors.

Data on production of sparking plugs are rather limited: the Business Statistics Office figures relate only to the value of turnover. From the evidence of the 1968 Census of Production, published trade figures, estimates received from within the motor industry and the E.I.U. report (1), we have derived the following estimates of volume:-

Table III-1 Volume of Production,Exports and Imports of Spark Plugs

Millions of units

	U.K.production	Exports	Imports	U.K.Sales*
1968	94.3	37.4 *	na	na
1972	102.1	45.1	7.6	64.6
1973	112.1	57.4	12.6	67.3
1974	94.5 *	50.9	20.6	64.2
1975	94.4 *	40.6	8.7	62.5

Notes: U.K. sales = U.K. production - exports + imports

* estimated, not published.

Total revenue derived from the sale of sparking plugs at current prices and in terms of 1975 purchasing power is shown in Table III-2.

Table III-2. Total value of sales of Sparking Plugs

Sales Value £000's

Year	Current prices	At 1975 purchasing power	Estimated average price (new pence)*
1968	10,517	21,741	11.2
1973	18,339	26,420	16.4
1974	19,031	23,631	20.1
1975	24,437	24,437	25.9

* Derived by dividing sales revenue at current prices by the total production estimate shown in Table III-1.

These tables show that the recession in the motor industry had a greater effect on the volume of sparking plugs sold than on sales revenue: between 1973-5 the volume fell by 15.8 per cent but the "real" value of sales revenue by only 6.8 per cent. This is because the decline was mainly in the less profitable OE and direct export markets. Unlike the corresponding market for tyres, replacement demand for sparking plugs has not been reduced by any major extension of product life and has risen in proportion to the number of cars and light goods vehicles in use.

Sales of sparking plugs can be divided into three categories:- sales to vehicle manufacturers in the U.K. (OE), sales to overseas buyers (who may include overseas vehicle manufacturers) and sales to the U.K. replacement market.

An attempt to estimate the prices obtained by manufacturers for sales to each of these segments was not successful because of insufficient information about the margins of intermediaries. The average price per plug exported in 1975 was 18p so that the average per plug sold at home was 31.5p but it was not possible to separate the two domestic segments.

B. Foreign Trade

Interpretation of the foreign trade statistics is complicated by the multinational structure of the three major companies in Britain. The largest producer is the Champion Sparking Plug Co. Ltd., which is a subsidiary of the U.S. company with the same name,with other subsidiaries elsewhere in Europe. The other two producers, Autolite and A.C. Delco Ltd. are parts of the Ford and General Motors companies. Marketing and distribution of sparking plugs by General Motors (Europe) are organised on a European basis - the company is the market leader in France and replacement plugs for French-built cars are imported into the U.K. The Ford company's approach is believed to be similar.The large volume of international trade partly reflects shipments by the big companies.

B. Foreign Trade (Cont'd)

One British manufacturer, Smiths Industries Ltd., makes sparking plugs for export only under the KLG brand. Most of these are special purpose plugs and the quantities are small in comparison with shipments by the three largest producers. This company is a large exporter of plant and equipment for the manufacture of sparking plugs.

A recent development has been the growth of competitive imports but, because of shipments by Champion, Ford and General Motors this is difficult to quantify. From discussions within the industry, we believe that competitive imports may have reached a peak in 1974 from which there has been some decline because of surplus supply of sparking plugs within the U.K.

Table III-3 shows the volume and value of trade in sparking plugs annually from 1972 to 1975 (data for before 1972 are incomplete):-

Table III-3. Trade in Sparking Plugs 1972-5

		1972	1973	1974	1975
Exports	million units	45.08	57.39	50.89	40.57
	£000	5830	8200	8060	7386
Imports	million units	7.56	12.60	20.61	8.72
	£000	877	1803	3187	1553

Source: Overseas Trade Statistics

The destinations of exports show the importance of overseas assembly of U.K.-designed vehicles and the "pan-European" operations of the large producers. In 1975 over 58% of total volume (59% in value) went to Europe, the largest consignment (15% of total exports) went to Belgium, where Leyland, Ford and General Motors have assembly plants linked with U.K. manufacturing units. Other European countries importing large volume from the U.K. were the Netherlands, Germany and Sweden. Outside Europe countries taking more than 2% of total exports (800,000 plugs) were Canada, Nigeria, the U.S.A., Algeria and Iran.

B. Foreign Trade (Cont'd)

A breakdown of the origins of imports is not published but it is know n that the major sources of competitive imports are Germany (Bosch), Japan (NGK) and France (Marechal).Total competitive imports in 1975 amounted to about 11 per cent of the U.K. replacement demand for plugs or about 6.3 million units. It is not possible to determine how much of the contraction of imports between 1974 and 1975 was due to changes in the pattern of shipments by the three main companies with U.K.plants and how much was due to a decline in competitive imports.

In Europe as a whole the relative strengths of the major producers differ from those in the United Kingdom, which are described in the rest of this section. General Motors, Bosch and Champion are the three largest companies but share less than 50% of the total market. The French firm Marechal has been increasing supply and the Japanese company NGK has also gained a growing share of the market.

C. The Original Equipment Market

Vauxhall buys exclusively from A.C. Delco (General Motors) and Ford from Autolite. Champion is the sole supplier to Leyland and Chrysler.

Because of the capital-intensive nature of sparking-plug production, with high investment in expensive plant and equipment, pricing raises interesting issues. Marginal costs are relatively low and the prospect of some brand-loyalty in the replacement sector encourages sparking plug manufacturers to seek OE sales. Both the Champion company and overseas suppliers have attempted to sell to Vauxhall or Ford offering plugs at "give-away" prices. We understand that transfer-pricing within General Motors and Ford is based on standard rather than marginal costs.

Stock levels of sparking plugs held by vehicle manufacturers average about one week's requirements. This is partly because supplies can fairly easily be obtained from intermediaries in the replacement market in an emergency.

C. The Original Equipment Market (Cont'd)

Fluctuations in orders create problems for sparking plug manufacturers but these are less serious than those of tyre manufacturers because there is less product variety and stocking is easier.

In estimating the size of the United Kingdom OE market, we have included as petrol-driven vehicles (and therefore using sparking-plugs) all cars (ignoring a small number of diesel taxis produced by Leyland), car-derived commercial vehicles and other goods vehicles with gross vehicle weight of less than three tons. The total number of commercial vehicles included varied from 200 - 253,000. Cars and goods vehicles exported in unassembled form were excluded.

Assuming an average of 450 plugs per 100 vehicles we estimate OE demand as follows:-

Table III-4. Original Equipment Sales of Sparking Plugs

1968	8.3	(million units)
1972	8.46	"
1973	7.43	"
1974	6.84	"
1975	5.37	"

Market shares in the original equipment market can be estimated from those of the four major producers of petrol-driven vehicles in the United Kingdom. In both 1968 and 1975 these four made 99.4 per cent of all cars produced in the U.K. The distribution among the big four of sales of car-derived vans and other petrol-driven commercial vehicles or of cars exported without sparking plugs but included in the production figures cannot be determined with any accuracy. Unless these distributions are very markedly different from that of total car production, any distortion resulting from the use of the latter to indicate purchases of sparking plugs will be slight.

C. The Original Equipment Market (Cont'd)

Table III-5. Shares of O.E. Market (Percentages)

	Champion (Leyland & Chrysler)	Autolite (Ford)	A.C. Delco (Vauxhall)
1971	67.4	21.1	11.5
1972	61.8	28.6	9.6
1973	65.8	26.2	8.0
1974	65.8	25.2	9.0
1975	66.0	26.2	7.8

Source: SMMT (annual copies of the Motor Industry in Great Britain)

D. The replacement Market

Vehicle manufacturers normally recommend replacement of sparking plugs after 12,000 miles (19,200 kilometres) or twelve months of use, whichevever occurs first. Some postponement of servicing occurs, especially when vehicles have not been intensively used. Sales of plugs tend to vary between about 3.5 to 4.2 per vehicle in use, whereas rigorous adherence to the above recommendation would imply a minimum of around 4.5 plugs per vehicle.

The rapid increases in vehicle servicing charges in recent years has led many car owners to undertake much of their own maintenance, including the comparatively simple task of replacement of sparking plugs. This has affected the pattern of distribution: outlets such as accessory shops, petrol filling stations and chain stores have gained sales at the expense of garages and other vehicle repairers.

There are a number of links between the plug manufacturers, intermediaries and ultimate outlets which affect competition in the replacement sector of the market.

Champion as the sole supplier to Leyland and Chrysler has its plugs distributed via the distributor/dealer network of those companies under the brand names Unipart and Mopar. (Chrysler also distributes Champion plugs with the Champion brand name). Lucas, having withdrawn from manufacture several years ago, distributes Champion plugs under the Lucas name.

D. The replacement market (Cont'd)

Esso and Shell/BP rely upon Champion for supplies for sale, under the oil companies' names, at filling stations. Many of the Champion plugs distributed in packaging bearing other brand-names are marked themselves with the word "Champion", which may encourage consumer loyalty.

A.C.Delco plugs are distributed via the Vauxhall dealer/distributor network and are therefore normally fitted to cars and vans serviced by Vauxhall dealers.

Autolite plugs are distributed in the same way by Ford and are also sold under the Motorcraft label, which Ford uses as a medium for selling spare parts for Ford and other cars. Motorcraft products are sold under a special arrangement with the Texaco oil company on the forecourts of its filling stations.

It is difficult to measure "brand loyalty" in the case of sparking plugs because the ultimate customer does not always make the brand choice. The first two services of new cars at which plugs are changed are usually undertaken under warranty by a dealer authorised by the vehicle manufacturer. This means that the sparking plugs for a Vauxhall will normally come from A.C.Delco, for a Ford from Autolite and for a Leyland or Chrysler car from Champion but there is no certainty about this. After this the degree of loyalty diminishes as the customer can buy any of a number of well-known brands. Much depends upon the outlet he chooses.

Prices vary comparatively little between the well-advertised brands and advertising competition is largely confined to technical journals, point-of-sale advertising and occasional press advertising. Expenditure on advertising by all companies in 1975 amounted to £103,100, which is about 0.5% of the total value of retail sales, excluding tax.

D. The replacement market (Cont'd)

The growth in the proportion of imported cars in use in the U.K. has reduced the predictability of market shares. It has probably increased the potential penetration of the U K market by overseas suppliers of sparking plugs, especially by Bosch of Germany and NGK of Japan. On the other hand, all the domestic producers and the distributors selling "own label" products supply sparking plugs for imported vehicles.

The total size of the replacement market was estimated by the E.I.U. (1) and their estimates correspond closely with our own desk calculations. From 1972 to 1975 these estimates were as follows:-

Table III-6. Sales of Sparking Plugs for Replacement

1972	56.1 million units
1973	58.9 "
1974	57.3 "
1975	57.1 "

Estimates of market share are very difficult to derive. Even direct market surveys are hindered by the fact that many motorists do not know what plugs are fitted to their cars - even if they purchased them from a chain store themselves. Estimates by the EIU (1) do not correspond exactly to those of a manufacturer with whom the problem was discussed. A compromise estimate suggests that in 1975 the shares of the replacement market were as follows:-

Table III-7. Shares of Replacement Sales 1975

Champion	65	(These estimates are only very
Autolite	13	approximate)
A.C.Delco	12	
Bosch	6	
Other imports	4	

E. Financial Statistics

Only the Champion Sparking Plug Co.Ltd. publishes financial data relating to sparking plugs - necessarily because it is a single-product enterprise. In 1975 its sales turnover was £15.72 millions or 64 per cent of total sales of sparking plugs by producers in the U.K. Of the total £4.66 millions was derived from export sales, leaving £11.06 millions as turnover from U.K. sales. This

E. Financial Statistics (Cont'd)

represented about 60 per cent of the total sales revenue derived by U.K. and overseas manufacturers from sales to the U.K. market, slightly lower than its estimated share of the market volume might suggest. This confirms a comment made to us by two people from within the motor industry that Champion is charging lower prices to Leyland and Chrysler for OE and for sale via their dealer networks than corresponding transfer prices of Autolite and A.C. Delco.

Table III-8. Champion's Turnover Record 1968 and 1973-5.

	1968	1973	1974	1975
Total turnover (£m)	7.18	11.55	12.94	15.72
% of U.K. producers	68	73	68	64
Export turnover (£m)	2.06	4.97	4.94	4.66
U.K.Sales (£m)	5.12	6.58	8.00	11.06
U.K. Sales revenue as % of total of all suppliers	n.a.	56	58	60

Sources: Company accounts and Tables III-2 and III-3 above.

Since Champion is a subsidiary of an overseas company it is difficult to interpret its financial performance because much depends upon the principles adopted for transfer pricing and for allocation of indirect expenses.

F. Statistical Summary of Concentration.

Absence of financial data prevents the computation of tables of concentration for this sub-sector. The indices prescribed by the Commission have been applied to the data in Tables III-5 and III-7 with the following results:-

Table III-9. Concentration Indices applied to Market Shares (measured in volume) 1975

	OE	Replacement
Coefficient of variation	0.729	1.138
Gini coefficient	0.388	0.516
Herfindahl-Hirschman	510	459
Entropy index	- 35.8	- 47.7

Linda coefficients (L) and Concentration Ratios (CR)

n* =	L	CR	L	CR
2	1.26	92	2.50	78
3	1.63	100	1.41	90
4	-		1.30	96
5	-		1.24	100
LS	1.45		1.61	

Comments.

For the OE market the Linda index suggests a duopoly: the largest firm had 66 per cent of the market and the second largest 26.2 per cent, leaving the third with 7.8 per cent. Because of exclusive trading by each of the vehicle manufacturers the analysis cannot be used to describe competition in this sector - there is none at present.

In the replacement market the coefficients emphasise the predominance of Champion whose share of the market is nearly five times that of its nearest competitor.

IV. BATTERIES (ACCUMULATORS)

A. INTRODUCTION

In 1968 the Census of Production revealed that there were 16 enterprises employing 25 or more people and producing accumulators for motor vehicle starting, lighting and ignition. By 1976 the number had fallen to 10 partly because of mergers and partly because some companies had withdrawn from this activity. In addition to the firms included in the official statistics there is a larger number of very small enterprises which produce accumulators, sometimes reconditioned, on a small scale.

There are three grades of battery available for purchase by the motorist:-

i) The "first-line" batteries produced also for the original equipment market and designed to specifications laid down by the vehicle manufacturers. These normally carry a two year "guarantee". The retail price of such batteries in 1975 varied (according to outlet and specification) from about £13 to £25. The manufacture of this grade of battery is almost entirely confined to the small group of large companies (now only four in number) who together form the British Battery Makers Society (B.B.M.S.)

ii) Economy or "second-line" batteries also produced by the B.B.M.S. Companies to counter competition from non-members. These batteries are designed for normal use under British driving conditions but do not meet the extremes of use implied by the specification of "first-line" batteries.

Most of these batteries are sold with a one year guarantee. Their retail price in 1975 varied from about £8 to £13.

iii) Low price batteries produced by local manufacturers, sometimes using materials from discarded batteries, which are purchased as scrap. These batteries are distributed under the retailers brand names and varied in price in 1975 from £5 to £10.

B. ANALYSIS OF TOTAL MARKET

Table IV-1 shows the total number of batteries for motor vehicles sold by U.K. manufacturers, the number exported and imported and an estimated breakdown of the total U.K. market into original equipment and replacement.

TABLE IV-1 Volume of Batteries Produced and Traded in 1968-76

(thousands)

		1968	1973	1974	1975	1976
U.K. manufacturers output	(i)	6200	7050	6120	5570	6140
Exports	(ii)	280	390	400	550	540
Imports	(iii)	50	270	250	250	330
U.K. domestic sales (i) - (ii) + (iii)		5970	6930	5970	5270	5930
O.E. Sales		2060	1980	1770	1540	1600
Residual		3910	4950	4200	3730	4330

Source: Business Statistics Office, Overseas Trade Statistics.

Stocking of batteries, sometimes in a dry state for long periods, by intermediaries between the manufacture and the final customer means that the'residual' figure does not exactly represent replacement demand but comparison with other estimates suggests that the approximation is satisfactorily close.

Estimates of original equipment sales have been devised by subtracting from the sum of all vehicles produced in the United Kingdom 60% of the number of cars and goods vehicles exported in assembled form, because the batteries for such vehicles are more usually supplied from within the country of assembly. An allowance has been made for the use of dual batteries in some of the largest goods vehicles.

The value of battery sales by U.K. manufacturers is also published by the Business Statistics Office but it is not possible to divide the total figure into revenue from OE sales and that from the replacement market. Sales revenue figures are contained in Table IV-2 , in which the data are also shown in terms of constant 1976 purchasing power.

TABLE IV-2 VALUE OF MANUFACTURERS SALES OF MOTOR VEHICLE ACCUMULATORS 1968-76

	£m current prices	Index of Value at constant purchasing power
1968	25,591	100.0
1973	39,338	108.3
1974	46,953	111.5
1975	48.181	92.1
1976	62,105	102.5

Source: Census of Production 1968
Business Statistics Office (1973-6)

Note that data refers to establishments with at least 25 employees, except that for 1976 this lower limit was increased to 50. The B.S.O. has stated that the effect on coverage is minimal; it estimates the percentage of total production covered to be about 97 per cent (1).

It is rather difficult to interpret annual changes in sales of batteries because of changes in stock levels of intermediaries- accumulators may be stored in a dry state for long periods.

The number of cars and commercial vehicles in use which were at least two years of age from 11.52 millions in 1973 to 13.3 millions in 1976, so that the number of replacement batteries sold per 100 such vehicles appears on the evidence of Table IV-1 to have fallen from 43 to 33. Since destocking appears to have occurred in 1975, this evidence suggests longer battery life. Among reasons for this may be the (a) use of better materials in battery construction, including the predominance of polypropylene instead of hard rubber cases; (b) the use of better systems of charging and improved performance of alternators; (c) a series of comparatively mild winters with little freezing fog or snow.

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1 Business Monitor PQ.369.2, 1st qtr. 1977 - page 2.

Research into the life of batteries is made difficult by the frequent trading of motor vehicles. A substantial proportion of vehicles-owners did not purchase their present batteries and many of those who did are unlikely to recall the date of purchase.

Although there has been a decline in the market for batteries, supply has become rather inelastic and a possible shortage was mentioned in our discussions with motor company buyers and a major battery manufacturer. Excess capacity exists in the sense that capital is under-utilised but expansion of production might mean extra shifts and recruitment of labour. Uncertainty surrounding the life of batteries and the size of the replacement market may deter producers from taking such steps, which might be difficult to reverse.

C. Foreign Trade

Because of their low value to weight ratio and because of their construction, it is not economic to transport batteries over long distances except where this is justified by unusual specifications combined with economies of scale in production. This explains the comparatively small volume of international trade - export volume amounted to under 9 per cent of U.K. production in 1976 and imports to only 5.6 per cent of batteries sold in this country

The principal destination of exports in 1975 were within Europe, especially the Netherlands, Ireland, Germany and Belguim. Some of these shipments, especially to the Low Countries, are believed to be associated with assembly in the destination countries of vehicles supplied in knocked-down form from the U.K. The same reason accounts for shipments to Iran, the Gulf States and Saudi Arabia, Libya, South Africa and Zaire, which are among the major non-European destinations.

Imports are also mainly from Europe; about half of the total comes from Germany and France. These include purchases by one of the multinational vehicle companies of a small part of its total battery requirements.

D. The Original Equipment Market

Although there are no financial ties between the battery producers and the vehicle manufacturers, a pattern of supply has been established, whereby each of the vehicle companies relies on one or at most two suppliers.

For British Leyland, Lucas Batteries Limited is the dominant supplier. It is part of Lucas Industries Limited with annual sales of over £300 millions of electrical equipment for motor vehicles and aircraft. Until fairly recently Lucas was the sole supplier to the former Austin-Morris division of British Leyland which was the volume-car section of the motor company. Our own enquiries suggest that Lucas continues to supply over 85 per cent of the total battery requirements of Leyland, the rest are obtained from Chloride Limited.

Ford (of Great Britain) bought all its batteries until the early 1970's from Chloride but has now organised its material sourcing on a European basis. Although Chloride remains the dominant supplier (perhaps over 70%), imports from continental suppliers and purchases from Lucas have increased in recent years.

Vauxhall purchases from both Lucas and Chloride but not from any other supplier. A policy of "dual sourcing" means that batteries from both suppliers are fitted to each range of cars.

Chrysler also "dual sources" its battery supplies but Lucas and Chloride account for over 90% of purchases. Occasional purchases have been made from Oldham (see below) and Chrysler has also imported batteries from Canada, from a company then contemplating the establishment of a manufacturing subsidiary in the United Kingdom.

Our analysis of the OE market indicates that in 1975 Lucas and Chloride shared about 94 per cent of this market. Of this Lucas probably accounted for 50 to 54 per cent and Chloride for 40 to 44 per cent, but these are only tentative estimates based on discussions within the motor industry

Although sales of batteries for original equipment yield less profit than those to the replacement sector, the competitive pressure on prices in the latter sector and the virtual duopoly in OE sales mean that the price differential is smaller than in other European countries. We understand that in Germany prices of batteries for original equipment are much lower than the corresponding prices in the U.K. and are less than U.K. standard costs of manufacture. Marginal-cost pricing of OE sales in Germany is possible because retail prices for replacement are over three times the average U.K. level.

It is not clear why the traditional ties between Lucas and Leyland and between Chloride and Ford should continue. The motor manufacturers face greater risks of interruption of supplies and the battery makers are more vulnerable to changes in policy on the part of the vehicle manufacturers. The persistence of the arrangements seems to be part of a détente in competition between Lucas and Chloride.

E. Replacement Sales

1. The Companies Supplying this Sector

The major suppliers to the replacement market are:

Chloride Group Ltd.	(Total European sales of automotive products mainly batteries, in year ended 31st March, 1976 were £56 m.)
Carlton Industries Ltd.	(via its subsidiaries Oldham International Limited, acquired in 1972, and Tungstone Batteries Ltd., taken over in 1973: total sales of batteries in 1975 were around £20 millions.)
Lucas Industries Ltd.	(via the subsidiary Lucas Batteries Ltd., for which no sales turnover figures are published and estimation is impossible.)
Hawker Siddley Ltd.	(via its subsidiary Crompton-Parkinson Ltd., which does not publish separate figures for automotive battery sales.)

These four companies supply most of the premium batteries sold in the United Kingdom and also provide economy ranges. Together they form the British Battery Makers Society, which acts as a protective organisation but is prevented by the 1956 Restrictive Trade Practices Act from price fixing. The B.B.M.S. did not co-operate in this investigation, though one of the four member companies discussed with us, in broad terms, recent developments in this industry.

As well as these four companies, there are six other manufacturers with 50 or more employees (identified from B.S.O. information) and a large number of small firms. Most of these firms supply batteries for sale under the brand names of wholesalers or retailers and, since these brands are also supplied by the big four, it is difficult to measure their importance in the market.

2. Brands, consumer loyalty and advertising

The six major manufacturers' brands sold on the retail market are as follows:-

Chloride	:	Dagenite and Exide
Lucas	:	Lucas and Toplife
Carlton Industries	:	Oldham and Tungstone
Crompton	:	Own name.

Most of the batteries are sold under the brand name of the distributor. Among the most important are Blue Star sold at the premises of Blue Star garage chain; Esso (Voltpak) and the batteries sold by the specialist fitting stations, whose main product is tyres - ATS (Associated Tyre Services, a subsidiary of Michelin) and NTS (National Tyre Services - a subsidiary of Dunlop) are the most significant of these brands.

Two of the vehicle manufacturers have acted as factors for batteries as part of their "all-makes" wholesaling activities. British Leyland experimented with the sale of Lucas batteries under their Unipart scheme

but this practice has now been modified. Because of production problems for Lucas caused by dual labelling, Lucas batteries are now distributed by British Leyland via its accredited dealers under the Lucas name. Chrysler now sells second-line batteries from Chloride and Lucas as part of its Mopart range. Vauxhall is not involved in the wholesaling of batteries and Ford supplies only a limited range of mainly Chloride batteries for Ford cars, under the Ford name.

Imported batteries represented only a small proportion of the replacement market, foreign trade statistics suggests that this was less than 5 per cent. Although some foreign companies supply the British market (e.g. Bosch and Varta from Germany), some of the batteries concerned are produced on a sub-contract basis within the U.K. (by Chloride and Lucas respectively in the case of two firms).

A car battery is not a "concern" product - it does not affect the safety of a car: nor is it an "image" product. Only under extreme conditions is it likely to fail without warning and that failure is most probable in the early morning in the privacy of the motorist's garage. It is a fairly expensive item - a premium battery can cost over £20; it is an item on which many motorists are prepared to economise. Brand loyalty is low and the market is open to local producers of lower quality batteries who, with minimal overheads, are able to supply at a low price.

The main channels of distribution for batteries are:-

a) Wholesalers and "factors" who supply "traditional"garages and vehicle service stations with manufacturers' brands. Some of these wholesalers are agents for individual manufacturers. For example, Lucas has about 350 franchised agents for its automotive electrical products, out of which 140 are owned by the manufacturer. Chloride also has outlets which are either owned or controlled through exclusive dealing arrangements. The EIU (1) estimated that about 60 per cent of batteries were sold via vehicle repairers

who acquired them from independent or manufacturer-owned wholesalers. Chloride appears to be the leading company in sales via this channel of distribution.

b) Specialist fitting stations, many of whom buy straight from manufacturers, and sell under their own brand names. Blue Star Garages, ATS and NTS can be included in this category. The economies gained by elimination of intermediaries are at least partly passed on to the customer in lower prices. This channel of distribution has gained importance in the last few years and the EIU estimated that in 1975 25 per cent of batteries were sold by this route.

c) Sales via retail shops have also increased in recent years. Some battery producers (e.g. Lucas) have financial interest in retailing but most retail chains obtain batteries from a variety of sources.

This is a market for a "low-interest" product with a variety of channels of distribution and a very large number of brand-names, many of which cannot be directly linked with particular manufacturers. Advertising is much less significant in relation to sales than is the case in the distribution of tyres. Advertising has also been widely erratic. The MEAL data shows, for example, that Chloride spent £252,000 on advertising in 1976 compared with only £1,100 in 1975. Total advertising has varied as follows over the years since 1968:-

TABLE IV-3

PRESS & TELEVISION

ADVERTISING EXPENDITURE ON MOTOR VEHICLE ACCUMULATORS 1968-76

	Actual total (£000)	% of total battery sales	Index at constant purchasing power
1968	265.0	1.0	100
1969	150.3	n.a.	54
1970	396.4	n.a.	134
1971	309.5	n.a.	95
1972	224.8	n.a.	65
1973	113.2	0.3	30
1974	54.9	0.1	13
1975	20.1	0.0	4
1976	276.5	0.4	44

Source: MEAL and B.S.O.

One of the interesting features of advertising expenditure has been the high proportion of the total accounted for by distributors of brands other than those of the four BBMS members. These include firms selling cut-price batteries whose main objective in advertising has been to draw attention to their prices (e.g. Blue Star).

TABLE IV-4 TOTAL ADVERTISING EXPENDITURE BY COMPANIES 1968-76 (£000's)

	1968-72	1973-6
Chloride	531.5	348.0 (252m in 1976)
Lucas	175.4	1.6
Crompton	37.7	4.5
Oldham	63.0	nil
Tungstone	115.3	1.1
Blue Star	193.3	58.4
Other	229.8	51.1
TOTAL	1346.0	464.7

3. Market Shares

It is difficult to determine the sources of some of the batteries sold under the brand-names of non-manufacturers. This means that any estimates of manufacturers' shares of the replacement market can be only approximate. Such estimates are shown in Table IV-5. They are based on the results of the EIU survey (1) but have been slightly modified on the basis of our own discussions.

C CONCENTRATION RATIOS

Two of the major suppliers (Lucas and Crompton-Parkinson) do not release any information relating to their sales of batteries. Other companies publish figures which also include sales of other products and the activities of overseas subsidiaries.

It has proved impossible to derive any financial data and the only variables for which concentration indices can be calculated are the estimated shares of volume, in the OE and replacement sectors separately and combined.

TABLE IV-5 ESTIMATES OF MARKET SHARE 1975 (%)

	OE	Replacement	Combined
Chloride	42	35	37
Lucas	52	17	27
Haddon-Oldham	1	13	10
Crompton	0	10	7
Others	5	25	19

The results of the computations are shown in Table IV-6.

TABLE IV-6 CONCENTRATION INDICES - VOLUME OF SALES OF ACCUMULATORS (ESTIMATES FOR 1975)

	Original Equipment	Replacement	Combined
Coefficient of Variation (V)	1.30	1.83	2.11
Gini coefficient	0.63	0.65	0.70
Herfindahl-Hirschman index (H)	448	182	226
Entropy index (E)	-41.4	-97.6	-87.7

Concentration ratios and Linda indices

N* =	CR	L	CR	L	CR	L
2	94	0.619	52	1.029	64	0.685
3	96	4.311	65	0.722	74	0.867
4	98	3.574	75	0.588	81	0.818
5	99	3.923	77	0.972	82	1.752
	LS = 0.619		LS = 0.780		LS = 0.685	

In calculating these coefficients, we assumed that the maximum number of "other" suppliers to the OE market was three. The corresponding number for the replacement and combined analyses was 20. These assumptions do not affect the concentration ratios and Linda indices shown in the table but are reflected in the other coefficients. The variations in V, G, H, and E, are interesting to compare. The increase in the number of companies of very small size causes H and E to fall, because these coefficients are sensitive to the number of firms in the market, which indicates less concentration. The dispersion of company size has increased and, since G is related to dispersion, this index rises, indicating greater concentration.[1]

The Linda indices confirm that the total supply of batteries is dominated by two firms (Lucas and Chloride) but in the replacement market an oligopoly includes the four members of the British Battery Makers Society.

[1] For a fuller treatment of the mathematical properties of the indices see "A Study of the Evolution of Concentration in the U.K. Paper Industry", the first 'Cranfield' report in this series.

Appendix A Definitions and Basic Properties of Concentration Indices

In this explanation of the main indices specified by the Commission and used in this analysis the following notation is used:

N total number of firms in the industry;

x_i the value of a variable for Firm i, when firms are ranked in descending order with respect to that variable;

X the aggregate of the variable for the whole industry, that is,

$$\sum_{i=1}^{N} x_i$$

P_i the proportion of the aggregate accounted for by Firm i, that is,

$$\frac{x_i}{X}$$

μ the arithmetic mean value of the variable, that is, $\frac{X}{N}$

(a) Concentration Ratio

The concentration ratio for R firms within an industry is the fraction of the total value of the variable accounted for by the R largest firms ranked in descending order of that variable:-

$$\underset{(\%)}{CR} = \frac{100}{X} \sum_{i=1}^{R} x_i$$

Concentration ratios give only limited information about the structure of an industry. With different distributions of the variable, comparison of degrees of concentration between different sectors may depend on the number of firms chosen. In industry A the top five firms may account for 40 per cent of sales and the next five 30 per cent (giving a ten-firm CR of 70 per cent). In industry B the five largest firms may account for 50 per cent of sales and the next five 18 per cent (giving a ten-firm CR of 68 per cent).

(b) Coefficient of Variation

This is the standard deviation of the distribution of values of the variable as a proportion of the mean

$$V = \frac{1}{\mu}\sqrt{\frac{\Sigma(X_i-\mu)^2}{N-1}}$$

(c) The Gini Coefficient

This measure is based on the Lorenz curve. The Lorenz curve plots the percentage of total industry turnover on the vertical axis against percentage of firms cumulated from the smallest on the horizontal axis. Thus the curve is concave (degenerating into a straight line when all firms are of equal size). Where a variable other than turnover is used, the percentage of firms is cumulated from the firm with the smallest value of the variable under consideration.

The Gini Coefficient is defined (see Fig. 1) as:

$$\frac{\textit{Shaded Area}}{\textit{Area OXY}}$$

It ranges from 0 (all firms equal in size) to 1 (all output in the hands of a single firm). The following formula provides a method of calculation when the values of the variable are ranked in ascending order $(x_j;\ j+1 \text{ to } N)$

$$\frac{1}{NX} \sum_{j=1}^{N} (j-1)F_j - jF_{j-1}$$

$$F_j = \sum_{k=N-j+1}^{N} x_k$$

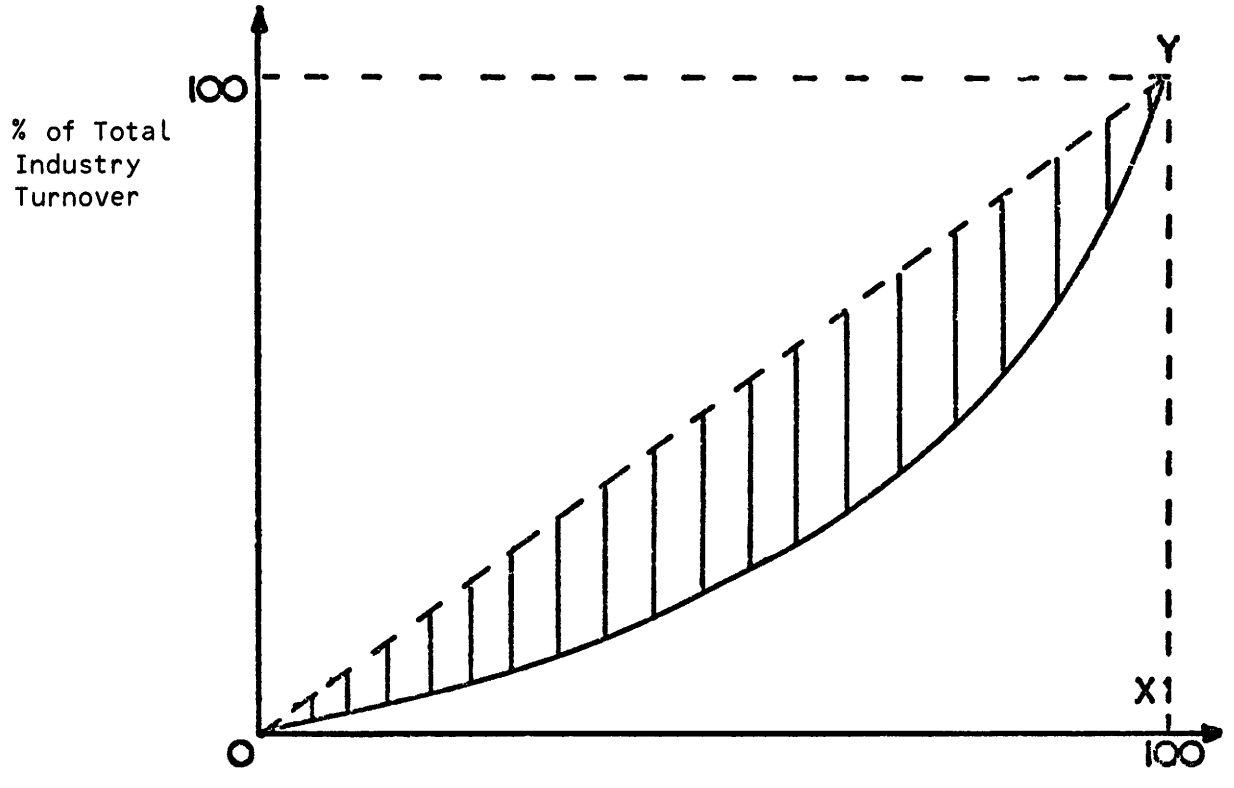

Fig. 1

(d) Herfindahl-Hirschmann Index

This was suggested by Herfindahl and is defined as the sum of the squares of the market shares, i.e.

$$\text{Herfindahl-Hirschmann Index} = \sum_{i=1}^{N} p_i^2$$

The index lies between $\frac{1}{N}$ and 1. Some authors prefer to define it as:

$$\text{H-H} = 1000 \sum_{i=1}^{N} p_i^2$$

i.e. to inflate its value by a multiple of 1000. This convention has been adopted by the Commission and is followed in this report.

The index is related to the coefficient of variation and in other publications by the Commission in this series has been defined accordingly:-

$$\text{H-H} = \frac{1000(V^2 + 1)}{N}$$

(e) Entropy

This is defined as:-

$$\text{Entropy Index, E} = - \sum_{i=1}^{N} p_i \log p_i$$

If one share is 1 and all others are 0, then $E=0$ and the degree of concentration is maximum. If all shares are equal $(=\frac{1}{N})$ then $E = - \log N$ and the degree of concentration is minimum for that value of N.

The entropy index, explained at some length in the Cranfield report on the paper industry, has the advantage over other measures of concentration that absolute changes in its value may be compared. For example if the Gini coefficient moves from 0.3 to 0.5 in one industry and from 0.7 to 0.9 in another, it cannot be concluded that concentration has increased to the same degree. With the entropy index, such a conclusion could be drawn. (10)

(f) Linda Index

Another measure of industrial concentration is given by Linda.

$$Q_i = \frac{K - i}{i} \cdot \frac{A_i}{1 - A_i}$$

where $A_i = \frac{1}{X} \cdot \sum_{j=1}^{i} x_j$ and values of x are in descending order.

K may be any number of firms from 2 to N. (Thus Q_i is the average share of the market held by the top i firms divided by the average share of the market held by the other $(K-i)$ firms included in the sample).

The Linda Index is defined as:

$$\frac{1}{K(K-1)} = \sum_{1}^{K-1} Q_i$$

(i.e. the Linda Index is $\frac{1}{K}$ x the average of the Q_is).

The Linda index is designed to measure the degree of inequality between the values of the variable included in a sub-sample of K units.

The Linda Index may also be used to define the boundary between oligopolists within an industry and the other firms. The boundary occurs when the value of $\frac{X_k}{X_{k+1}}$ is so large in relation to previous ratios that, in spite of

averaging, the Linda index rises. If the value of the Linda index (L) is greater for $(k+1)$ than for (k) then an "oligopolistic arena" of k firms may be identified.

Mathematically this critical point (k_m) may be defined as where

$$\frac{dL}{dk} = 0 \quad \text{and} \quad \frac{d^2L}{dk^2} > 0$$

A measure of "synthesis" (LS) is inclueded in the Tables of Concentration. This represents the mean value of the Linda indices from $k=2$ to $k=k_m$. LS is used in further statistical development of the analysis of concentration now being undertaken by the Commission.

The definition of k_m (N^*_m in the Tables of Concentration) on this basis differs from that used in earlier reports published by the Commission. This re-definition follows further analysis of the concepts underlying the Linda approach.

Appendix B Profile of Major Companies in the Three Sub-Sectors

This analysis is confined to United Kingdom companies and includes the following:-

Tyres: Dunlop Holdings Ltd.
Avon Rubber Co. Ltd.

Batteries: Lucas Industries Ltd.
Chloride Ltd.

The four other major suppliers of tyres are overseas-based (Firestone, Goodyear and Uniroyal in the U.S.A; Michelin in France). Analysis of financial data relating to world-wide activities has been included in Section II (pages 54 and 72). All the producers of sparking plugs are subsidiaries of U.S. parent companies.

DUNLOP HOLDINGS LTD.

Dunlop is one of the longest established rubber tyre producers in the world. In Section II we described how its share of the U.K. market tended to decline during the period 1969-75, although when the associated Pirelli activities are included, it remained the largest firm in both the OE and replacement markets.

The establishment of the Dunlop-Pirelli union in 1971 was a fairly complex arrangement:

Dunlop Ltd. (tyres and other products in the U.K. and Europe): 51% of equity held by Dunlop Holdings Ltd., 49% by Pirelli S.p.A.

Dunlop International Ltd. and other Dunlop companies operating outside Europe: 60% of equity held by Dunlop Holdings Ltd., 40% by Pirelli S.p.A.

Pirelli Ltd.(U.K.): 51% of equity owned by Dunlop Holdings Ltd. and 49% by Pirelli S.p.A.

Industrie Pirelli S.p.A.(Italy): On the formation of the Union in 1971 Dunlop Holdings acquired 49% of the equity of this company, compared with the holding by Pirelli S.p.A. of 51%. In 1972 Dunlop Holdings wrote down its holding in this company by transfer from retained earnings so that Dunlop shareholders are no longer responsible for any losses incurred and the Dunlop Holdings accounts no longer include a proportion of profits or losses attributable to Industrie Pirelli. Additional capital for Industrie Pirelli, to be subscribed by Pirelli S.p.A., will reduce the Dunlop Holdings share of equity to 30%.

Other Pirelli activities (outside the U.K. and Italy)
Dunlop Holdings equity share varies from 13 to 49 per cent and in most of the larger companies is 40 per cent or over.

Certain Dunlop subsidiaries, in India and Rhodesia, are excluded from the Dunlop-Pirelli Union.

Table B1 shows an analysis of sales of Dunlop Holdings Ltd. over the years 1971-5.

Table B1. Dunlop Holdings Ltd. Analysis of Sales Revenue by Product and Geographical Area of Operations - (£m)

	1971	1972	1973	1974	1975
By product					
Tyres	368	401	463	528	615
Industrial products	68	71	84	114	133
Consumer products	101	116	142	170	188
Engineering products	40	38	45	52	57
Supply group	8	10	16	24	22
	585	636	750	888	1015
By geographical area					
U.K.	252	259	286	345	393
Rest of Europe	137	154	188	233	265
N. & S. America	79	93	109	103	119
Africa	49	53	70	78	105
Asia & Australasia	68	77	97	129	133
Total sales revenue	585	636	750	888	1015

Tyres almost maintained their relative importance as a source of sales revenue for Dunlop (63 per cent of the total in 1971; 62 per cent in 1973; and 61 per cent in 1975). The United Kingdom accounted for 43 per cent of sales in 1971 and 39 per cent in 1975; sales in the American continents also declined relatively to those in Africa, Asia/Australasia and continental Europe.
Among Dunlop's consumer products, which contributed much to the growth of sales are foam products (bedding etc.), sports equipment and footwear.

Industrial products include textiles, wheels and vehicle suspensions and hosing.

Table B2 shows the sources of after-tax profits of Dunlop Holdings Ltd. and also relates these to equity capital.

Table B2. Dunlop Holdings Ltd. - Analysis of Profits by Product and Geographical Area (£m)

	1971	1972	1973	1974	1975
Profit before interest and tax (a) by product group					
Tyres	30.8	30.0	29.9	29.6	38
Industrial products	3.4	4.5	7.3	12.2	12
Consumer products	5.7	6.8	7.9	8.7	8
Engineering products	2.8	2.6	1.9	4.7	4
Supply group	1.4	0.7	2.3	4.8	3
Total	44.1	44.6	49.3	60.0	65
(b) by geographical area					
U.K.	10.8	12.9	11.7	21.7	21
Rest of Europe	11.4	8.6	7.0	5.5	7
N.&S. America	7.9	10.0	9.6	7.0	9
Africa	6.0	6.5	9.7	10.5	13
Asia and Australasia	8.0	6.6	11.3	15.3	15
Total	44.1	44.6	49.3	60.0	65.1
Add Income from minority holdings etc.	6.9	8.8	6.2	10.0	11.0
Deduct Interest	12.9	13.5	19.8	26.0	24.1
Net profit before tax	38.1	39.9	35.7	44.0	52.0
Deduct Taxation	18.3	18.3	19.6	24.4	28.5
Net profit after tax	19.7	21.6	16.1	19.6	23.5
Deduct Minority shareholders interests	8.1	8.2	6.3	9.5	8.5
Profit attributable to shareholders of Dunlop Holdings Ltd.	11.6	13.4	9.8	10.1	15.0
Previous line as % of shareholders' funds.	7.1	9.7	6.2	5.5	7.3

From Tables B1 and B2 are calculated the ratio of profits before interest and tax to total sales for each of Dunlop's product groups. These ratios are shown in Table B3.

Table B3. Dunlop Holdings Ltd. - Profit Margins by Product Group
Profits before interest and tax as % of sales turnover

	1971	1972	1973	1974	1975
Tyres	8.4	13.4	6.5	5.6	6.2
Other products	6.1	6.2	6.8	8.4	6.8
Total	7.5	7.0	6.6	6.8	6.4

Table B3 shows that other products became more profitable than tyres (Dunlop's major product) from 1973 onwards. The decline in profitability of the divisions other than tyres in 1975 may be explained by the trade recession; the partial recovery in the profitability of tyre manufacture may be explained by price increases. Although the profit margin per £ of sales of tyres increased in 1975 it is important to point out that in terms of constant purchasing power, tyre sales fell by 6 per cent between 1974 and 1975 and total profits from tyre sales remained almost unchanged.

AVON RUBBER COMPANY LTD.

Unlike Dunlop, Avon is primarily engaged in the U.K. market. As well as manufacturing tyres, Avon owns two distribution companies, Motorway Tyres and Accessories Ltd. and Motorway Tyres and Accessories (Scotland) Ltd. As well as Avon tyres and those sold under the brand name of another subsidiary Henley's Tyre and Rubber Co. Ltd., Motorway Tyres distributes tyres from outside suppliers. It also distributes batteries and other specialist products.

To facilitate comparison with Dunlop, whose accounts are presented in this way, we have combined the figures for tyre production and distribution in the following analysis of Avon's turnover and profits:-

Table B4. Avon Rubber Co. Ltd. - Analysis of Sales by Product and by Geographical Area (£m)

Products	1969	1971	1973	1974	1975	1976
U.K. Tyres	22.6	28.4	33.4	41.0	45.9	54.2
Other U.K. products	10.7	12.2	13.9	15.9	16.9	21.8
Overseas	3.2	5.8	6.0	7.3	9.1	11.8
	36.5	46.4	53.3	64.2	71.9	87.8

Overseas activities are concerned mainly with tyres. In 1969 total tyre-related sales turnover (i.e. tyre manufacture and distribution in the U.K. and overseas - a total of £25.8m) accounted for 71% of total company turnover; by 1976 the proportion had risen to 75%.

Besides tyres, the company's U.K. activities include the manufacture of rubber hoses and extrusions, sold mainly to the motor industry, and manufacture of domestic washing machines, dishwashers etc; a wide range of other products made from extruded rubber or polymers (from golf grips to diving suits and skirts for hovercraft); specialist medical components and inflatable dinghies.

The company's attempts to diversify activities during the past few years have been reflected in substantial increases in fixed assets but, because of the unfavourable economic conditions, the company's profits tended to fall until 1975. In 1976 there was a recovery:-

Table B5. Avon Rubber Co. Ltd. - Analysis of Profits
Analysis of net profit before tax (£000's)

Products	1969	1971	1973	1974	1975	1976
U.K. tyres	-247	2106	937	688	-780	285
Other U.K.	516	326	964	944	752	1734
Overseas	111	-142	255	250	57	412
Investment income	108	18	79	61	474	22
Total	449	2308	2235	1943	-503	2453
Less tax	116	840	996	1019	-144	1457
Net profit after tax	333	1468	1239	924	-359	996
Less minority interests	6	8	13	-4	21	55
Net profit attributable to equity holders.	327	1460	1226	928	-380	941
% of equity	2.5	11.1	8.6	6.8	-3.0	6.9

Table B5 shows that the decline in Avon's profits was concentrated in tyre production and distribution. The detailed analysis in the company's accounts shows that this occurred mainly in the production of remould tyres and in the development of the Avon safety wheel (which is included by the company in its tyre operations). These are activities into which new capital was injected in the early 1970's with a consequently high depreciation charge.

Because of the low profits and the need to finance fixed and working capital, the company's reserves fell from £9.15 millions in 1971 to £6.22 millions in 1975 but there was a rise to £7.03 millions in 1976. The equity capital of the company at the end of 1976 was £13.7 millions, compared with £13.1 millions in 1969.

LUCAS INDUSTRIES LTD.

Lucas Industries Ltd. (formerly Joseph Lucas Industries) is one of a small number of large companies in the United Kingdom which produce components for the motor industry but do not themselves manufacture vehicles (except experimental construction). The 1976 turnover of the company was £719 millions and the company employed nearly 64,000 people in the U.K. and another 14,700 were employed by overseas subsidiaries.

The Company does not publish a breakdown of its turnover in sufficient detail for identification of its battery-manufacturing activities. The following table (B6) is an analysis of sales turnover over the years 1970-76.

Table B6. Analysis of Sales Turnover - Lucas Industries Ltd.(£millions)

	Vehicle equipment	Other products	Total	Index of total at constant p.p.
1970	221	63	284	100
1971	245	75	320	103
1972	260	80	340	102
1973	308	91	399	110
1974	356	97	453	107
1975	456	114	570	109
1976	580	139	719	120

The last column of Table B6 shows that the growth of Lucas sales turnover receded only slightly in 1974 and 1975, and that a substantial expansion occurred in 1976 especially in the vehicle equipment section.

Lucas has also achieved a record of high profits over the survey period, as shown in Table B7 which contains certain financial ratios.

Table B7. Financial performance of Lucas Industries

	Net profits before interest and tax		Net profits after tax attributable to equity as % of equity
	% of net assets	% of sales	
1970	9.8	3.9	not comparable
1971	9.7	5.5	23.2
1972	11.4	7.4	30.6
1973	12.8	10.1	37.7
1974	8.9	4.7	20.9
1975	13.5	6.3	35.0
1976	17.2	7.3	55.8

The total value of reserves attributable to Lucas shareholders rose from £48.7 millions at the end of 1970 to £171.5 millions at the end of 1976 which, after adjustment for inflation, represents a growth of 66.6 per cent.

How far the very strong financial position of Lucas can be explained by its near-monopoly position in the supply of certain vehicle equipment (especially electrical components) cannot be determined, because no detailed breakdown of product profitability is published.

THE CHLORIDE GROUP LTD.

This company is believed to be the largest producer of rechargeable batteries in the world.[1] The company's European activities are split into four divisions:-

Automative which includes lead acid accumulators, all the company's dry batteries and the wholesaling of electrical products for motor vehicles.

Industrial which covers batteries for motive power and standby power.

Systems which includes standby power and portable lighting systems and security systems.

Plastics and Metals which includes lead recovery and refining, battery containers and plastic mouldings but also a number of diverse products - sanitary ware, bathroom fittings and precision engineering.

Overseas operations cover the manufacture of batteries for all purposes, including automotive.

Table B8 on the next page shows a breakdown of sales turnover and of profits over the four years 1972/3 to 1975/6 (to 31 March in the second year). Financial data for earlier years were analysed differently by the company.

The sales figures show a growth of 61 per cent in the real value of sales turnover between 1972/3 and 1974/5 with a slight recession in 1975/6, probably resulting from the trade recession in the world as a whole. The principal growth has occurred in Europe in products other than those linked with the motor-vehicle industry, that is batteries other than vehicle accumulators. The company's U.K. operations have grown less quickly than those overseas, and their contribution to group profits has declined.

The profit margin on European automotive sales was consistently lower than the average for other sales. One reason for the unusually low profit/sales ratio in 1974/5 was the degree of excess capacity resulting from the depressed market for motor-vehicle accumulators. The 1975/6 and 1976/7 figures appear to confirm that the profit margin on sales is very sensitive to capacity utilisation - sales of batteries recovered substantially in 1976.

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[1] EXTEL report on the company.

Table B8. Chloride Group Ltd. - Analysis of Sales and Profits by product and Geographical Area

(a) SALES (£m)	Year Ended 31 March			
	1973	1974	1975	1976
Europe: Automotive	29.7	34.7	47.8	56.0
Other	30.0	38.1	103.7	98.6
Non-European activities	29.4	52.1	72.8	60.6
Less intra-company sales etc.			-42.3	
Total sales turnover	89.1	124.9	182.0	215.2
Index at constant purch. power	100	128	161	154
U.K. companies as % of total	n.a.	50.0	49.4	44.9
(b) PROFITS (£000)				
Profits before interest and tax				
Europe: Automotive	1680	1630	1341	3325
Other	6727	7103	9616	6744
Non-European activities	3890	6680	8896	11344
Income from assocd. cos.	nil	353	897	1401
Total	12297	15766	20750	22814
Less Interest	849	2101	4523	3882
Net profit before tax	11448	13665	16227	18932
Less tax	4217	6520	7267	8659
Net profit after tax	7231	7145	8960	10273
Less minority interests	351	593	466	474
Profit after tax attributable to Chloride shareholders (A)	7970	6552	8494	9799
(A) as % of equity	19.9	14.8	15.0	14.7
% of (A) attributable to U.K. activities	n.a.	56.6	49.5	41.6

Table B9. Chloride Group Ltd. - Profits before interest and tax as percentage of sales

Financial Year	Automotive products in Europe	All other company activities
1972-3	5.65	17.9
1973-4	4.70	15.3
1974-5	2.81	13.8
1975-6	5.94	11.4
1976-7	5.40	13.3

Source: Company accounts.

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