THE FUTURE OF THE AUTOMOBILE

AN INTERNATIONAL PROGRAM

COORDINATED BY THE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

FEDERAL REPUBLIC OF GERMANY
FRANCE
ITALY
JAPAN
SWEDEN
UNITED KINGDOM
UNITED STATES OF AMERICA

Future of the Automobile Program
ALAN A. ALTSHULER, CO-DIRECTOR
DANIEL ROOS, CO-DIRECTOR
MARTIN L. ANDERSON, EXECUTIVE OFFICER

BUILDING E40-359
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE, MASSACHUSETTS 02139
(617) 253-8540
TELEX: 921 473 MIT CAM

STRUCTURE OF THE WESTERN EUROPEAN AND JAPANESE AUTOMOTIVE INDUSTRY

DTRS-57-80-C-00011

FINAL REPORT

Future of the Automobile Program
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

December 1983

CENTER FOR TRANSPORTATION STUDIES

CENTER FOR INTERNATIONAL STUDIES

TABLE OF CONTENTS

Table of Contents (con't)

PREFACE

NATURE AND SCOPE OF RESEARCH

This contract, DTRS-57-80-C-00011, essentially called for a one-year study into the European motor vehicle industry, and an updating of previous work in the area of Japanese industry strategy. It was conducted by various members of the MIT Future of the Automobile Program, and is based in large part on extensive discussions with industrial, academic, governmental, and labor representatives of the various subject industries. The bulk of these discussions took place at several annual international forums sponsored by the MIT program, which provided extremely useful information beyond the customary industry statistics and industrial reports. The ground rules of these forums specified that all discussions were off the record, and not for direct citation, but the background discussions among members of the program have been referenced in their general form here. When the following text refers to "respondents" or "sources" the discussion material from these forums is the subject matter at hand.

The most important element of this research, with regard to its scope and the resulting output, is its exploratory nature. It was explicitly recognized at the outset of work, that the contractual research would be covering extremely broad ground, and in many cases would involve research of a nature never performed before in the United States. Despite five years of enhanced public attention being focused towards the international motor vehicle industry, suprisingly little work has been produced in a comprehensive form in the United States concerning the industry of the European region.

In addition, there are very few common definitions of industrial statistics across nations, and since the European industry is comprised of a number of nations, very few comprehensive reconciliations of national data have been peformed. For example, while there are European wide industrial statistics, very few are kept in a form similar to the defective, but at least consistent, SIC codes in the United States and the MITI industrial census in Japan. American research into the European industry has also been thwarted by very strong barriers of language, in that data on the European industry exists in at least five different major languages. These language barriers also compound the problems of national differences in statistical reporting. At the outset, we knew that there existed no comprehensive statistics on the European industrial structure published in the English language, and that therefore a large portion of our research would involve exploratory forays into the data maintained in the different languages.

A further complication, which limited research to an exploratory level, was represented in the different accounting standards of the various European nations. The laws regarding business structure, and financial reporting, are all different according to the various national industries, and although the OECD has made great strides in international reporting criteria since the middle 1970s, the basic financial information is not directly comparable in its raw form.

Therefore, research under this contract was explicitly recognized to be on a "best efforts" basis within each of the various task categories.

In essence we were asked to constantly perform "cost/benefit" assessment of our research effort to sense whether additional effort in each category would be worth the potential results. This is explicitly recognized in the reporting of the following deliverables.

As a result of this exploratory focus, a number of our research efforts have left questions unanswered, owing to the resource limitations of the contract. Fo example, it was deemed cost effective to translate the basic market statistics, concerning vehicle sales from the French, German, and Italian language data bases. Although this translation was expensive and tedious, the results were considered fundamental to analysis of the industry. But, it was not felt worthwhile to translate the various consulting and academic research reports which we discovered during our European efforts, because this would involved several tens of thousands of dollars in translation costs, to discover only single-issue results, which were not fundamental to the comprehensive nature of this contract.

We feel that future researchers, with more specific research tasks, or a broader resource base could obtain good results by extending this research into several areas.

First, a more comprehensive translation of OEM and supplier annual reports, from their native languages would reveal additional significant details on the company structures of the European members. For a number of companies in the European region, we were unable to find historical series of annual reports translated to the English language. However, it is possible to obtain such data in libraries in their native language. Translation costs for even one year's annual report for a single company can range upward of $500.00, but for those researchers who are vitally interested in the details of company structure, such costs might not remain a barrier to comprehensive time series data gathering.

In addition, we feel additional benefit could be obtained by translating the many single issue reports published by the various trade associations for both OEM producers and suppliers, in the various European nations. Having obtained several of these in the English language, we concluded that they contained useful details especially concerning broader industry structure and the interaction of industry with government, but that further translation of details would not be cost effective with the goals of this contract. We feel that such extensive translation might prove useful, however, for researchers interested in the details of the supplier industries in Europe.

In addition, we feel that substantive results could be obtained by a very labor intensive process of complete reconciliation among the various accounting standards of the nations in Europe. We have obtained usable results in reconciliation, by employing various general descriptions of national accounting practices, such as those contained in the Price-Waterhouse pamphlets on the various nations of the world, but we explicitly recognize that such general reconciliations can only go so far. For those interested in a more detailed analysis of company performance, it would be required to obtain, for the various nations, documents similar to the SEC and FASB publications on accounting standards. We did obtain broad assistance from various OECD documents, which attempt to point out matters of reconciliation, but the accounting choices available to single companies have a far greater latitude, and are much more specific, than those points of reconciliation noted by international economic analyses.

Owing to the exploratory nature of this contract, the purpose of the following report is not to provide comprehensive book-like text on the European industry, but to attempt, nevertheless, a comprehensive assessment fitted to the limitations of exploratory research. We have organized this deliverable in sections in order to provide both some general sense of the European industry, but also to allow explicit presentation of data of varying degrees of detail.

It is cautioned that the use of data and statistics contained in this deliverable still requires reconciliation on the part of subsequent researchers, because we have left most of the data in its raw state. For example, government statistical series do not reconcile for many nations the differences between "production" of finished units and "assembly" of finished units. For this reason, different sources will often appear to show different amounts of output for each national industry. This problem is further compounded by the varying procedures for reporting knockdown kits, reporting procedures which differ not only by nation but by company, or by divisions within the same company. For example, some statistics will include the shipment of a knockdown kit as "production" in one country while that unit will also be included in the "production" or "assembly" statistics of the receiving European nation. Similar reporting discrepancies apply to the national measurements of "hours worked" on the part of the labor force. Some data sets obviously include break time as work time, while others, particularly the German statistics, explicitly exclude such time not at the assembly line. We have been unable to find cost effective means of reconciling the various data reportings, and therefore have left the data in its raw state, so as not to distort the conclusions of the analysis.

Readers of this report are also cautioned that considerable care must be expended with regard to exchange rate conversions of the financial data. We have explicitly avoided the temptation to translate the various international currencies back to dollars, for several reasons. First of all, such a translation would be mistaken in economic terms because many of these producers never sell their product in dollars, so a conversion of their economic statistics to dollars would either over- or understate the true purchasing power embodied in the sales system. We have not used techniques of "purchasing power parity", because we believe this method is too theoretical for use in industrial analysis. For example, to define this "international purchasing power" one must first define a base year of "parity". While such definitions may be applicable in broad comparisons of general economic statistics among countries, they represent grave problems in the analysis of companies, whose operations change radically every year with regard to incoming and outgoing currencies in the industrial system. Within the confines of the European region, it is probably appropriate to use such "market basket" measures as the ECU or the "snake", but even such measures contain distortions, and do little to solve comparisons of the European region to other producing areas of the world.

For this reason, although some statistics have been converted to dollars for convenience, in most instances we have illustrated financial matters in the natural currency of reporting. This will allow subsequent analysis to properly reconcile the various currencies for the specific question of each research effort.

OVERVIEW OF THE EUROPEAN AUTO INDUSTRY

Europe in Relation to the World

The European motor vehicle market is one of the largest and wealthiest in the world, and by many definitions is considered larger than that in North America. As is shown in Table 1, the European markets comprise about a third of the world's sales and production volume.

It should be noted that although we shall use the term "European" to describe this portion of the world's industry, there is really no such thing as the European market, or the "European" industry. Depending upon one's definitions, this area of the world could be considered as a dozen different national markets, or as a combination of several "supra national" markets in the European Community and other larger political entities or associations. For example, the various national and supra national compositions can be seen in Table 2. This overlay of political entities is important, because each of the national or supra national entities has rules and regulations regarding trade, tarriffs, labor practices, taxation, and many other commercial influences which are important factors for industry. And unlike the industrial structure within the United States, there are often no smooth reconcilitations of legal differences among states. So, although "European" references shall be used for convenience in this document, it should be kept in mind that the fragmentation in the European sphere is paramount.

Table 1 indicates the size of the various European markets, and total western Europe, in comparison to the rest of the world. Note that until recently, the combined European markets were smaller than the US market, but that in 1980, European markets retained their size, while the US market shrank beneath them. Several of the newer forecasts suggest this pattern may hold for several years, as American consumers adjust to new economic circumstances, and as structural unemployment in the US works its way through the industrial system.

Notice several things about this pattern of markets. First, the European share of world markets has remained fairly steady, while the US registrations declined steadily. This seems to indicate some differential in economic trends between the US and Europe. Notice also that the unit patterns in Europe, while cyclical are much steadier than the demand patterns in the US. It has been speculated that the US has used a much more "boomto-bust" industrial strategy, which has the tendency to expand volume rapidly during good economic times, but to retrench much more severely in bad times.

(Many discussants in the MIT program felt that both industry and government actors in the European markets tried to keep the wide "American style" swings from occuring in Europe, via subtle adjustments in credit, advertising, marketing practices, and new model introductions.)

Notice in addition that despite the often bleak stories which circulate about the "collapsing British industry" or the "poor economic times in Italy", or other media descriptions in the popular press, the distribution of <u>sales</u> and <u>consumption</u> is relatively stable among the various European countries. Now, the production bases in the various nations are not fairing so well as the sales patterns are, but the Europeans do not face the situation in America, of four years of almost record depressed sales, plus an extremely slow and possibly fragile recovery.

Such rather steady demand patterns, indicate some long term potential for distressed industries, say those in Britain, to reconfigure their production bases in such a way as to re-grow. This is especially true if the home country producers team up with the importers who are sucessfully entering the home country market.

All of these factors serve to make the European markets quite different from those in the US and other areas. Market cycles of only about 10% amplitude (not 30%), rough stability among the various markets, few rapidly rising nearby markets -- all combine to form a basis of relative stability within the "European" motor vehicle market.

According to most of the published information available, forecasters expect the European situation in the world, and the particular relationships of market countries within Europe to remain rather steady over the next ten to twenty years.

For example, in Table 3 are shown the official OECD projections for automotive demand around the world over the next 17 years. Notice that this economic body feels European demand will attain a systemically higher position than that in the US, although it does postulate a North American recovery, and a larger North American market size until the end of the century. Under no circumstances, either in this forecast, or in some of the explanatory material accompanying it, does the OECD postulate a mature and <u>shrinking</u> demand in Europe. In most of the recent international forecasts, for example, US growth rates are projected to be considerably lower than those held for Europe.

It is to be expected that much of the European growth will occur in the rapidly developing "sister-states" to the European community. As Greece, Spain, Portugal, and others build their infrastructures, it can be expected that they will add swiftly to their vehicle populations. But the fundamental growth projections continue favorable to the advanced economies within Europe, since much of this demand will be serviced by component exports from the developed European nations.

Digging deeper, we can see the fundamental reasons for this. Note in Tables 4 and 5, the patterns of car ownership per 1,000 population, and new car purchases per 1,000 population. (For reference, the US vehicle ownership rate is generally calculated above 500 cars per 1,000 population. Total vehicle holdings can be calculated above 600.) Even among the heavily industrialized nations, there are no vehicle saturation rates approaching those of the US. While one should not expect European holdings to reach US levels, owing to the very different transportation infrastructure and the different land use patterns in the European countryside, it is reasonable to expect some increase in vehicle holdings. It should not be considered that the European market has reached long term saturation levels. Vehicle holdings will almost certainly increase should any significant additions be made to the European road network.

So, fundamentally, even the advanced nations can increase per capita vehicle holdings, without reaching the density patterns of the US, and there is considerable room for growth in the less industrialized nations of the European area. Note in the OECD projections that even though growth <u>rates</u> will be much higher in other parts of the world, the western European markets are projected to be collectively the largest demand block for automobiles in the world at the turn of the century.

It is clear, then, that the European consumers will be sought in large numbers by the world's motor vehicle producers well into the next century, and that this area of the industrialized world will have a major role to play in trends now affecting the global motor vehicle industry. It is instructive to consider the European markets and industry in a more detailed fashion.

Markets for Finished Vehicles

Consumer tastes in Europe are perhaps even more fragmented than the overlapping political entities, owing to the rich diversity of culture, and the lack of market-homogenizing forces (language, television or other common media, worker movement) compared to the US and other major markets like Japan. This is one of the fundamental reasons that the European industry allowed so many different vehicle types and companies to appear and flourish while commerce in America concentrated in several large producers.

It is hard to describe the diversity of vehicle types in Europe to one who has never seen them. On the one hand you see items like the Citroen 2CV, a small car whose design might be thought to be 50 years old by many, and the odd three-wheeled Reliant in Britain. On the other hand, one sees "show" cars, or "one-off" specialty cars, or home-assembled kit cars of extremely modern design -- employing technology which has never seen the streets in the US. (Many of the items would not be able to pass the rather rigid regulatory tests of nations like the US.)

Whole fleets of micro-mini cars populate streets in Italy and France, while large sedans occupy the German autobahns, at speeds upward of 180 kilometers per hour. It is clear that nothing like the consumer homogeneity in the US exists in Europe. One more objective indicater of this would be the number of enthusiast magazines, and the variety of legal aftermarket speed and sport conversion equipment which is sold to the "average" consumer in many European markets. (Many of the magazines are weekly issues.)

Add to this cultural diversity the fact that the most powerful auto making and auto buying nations have relatively open trade among them, and the possibilities for product choice far outrank anything seen elsewhere in the world. (This is in terms of truly different product types; the Americans have a considerably inflated number of car "models" all derived from several homogenous product types.)

Compounding the complexity of consumer taste is the overlay of vehicle taxation, fuel taxation, dealership policy, technology regulation in nonmember states, and road worthiness certification. Even among members of the Community, differences in vehicle taxation abound; value added taxes, widely used in Europe, are different among states. Registration costs and capitive dealership practises can radically change the prices of the same car sold in several nations. Fuel costs vary among nations by a factor of two, given the different taxation policies. Some cars in some nations can run until they rust, but in other nations, rigid "safety" inspections remove clunkers from the road early. Technology varies considerably, and with little consistency in regulation; for example, French cars are required to have yellow headlights -- although no one gave us the same answer as to why this is the case, not even official sources.

The main effect of such diversity, in industrial terms, is a great volatility <u>within</u> market segments, considerable random pressure on economies of scale in the factory, significant risk in selling to many different consumers spread through several nations, and a novel approach which has created an industry of semi-specialty producers -- quite different from the mass producers in America.

Some of the major product segment differences can be seen in Figures 1 and 2, where representative countries from around the world are broken into a global segmentation pattern according to car size and characteristics. Notice the very high penetration of small vehicles in France and Italy, a small car penetration even greater than in Japan, and see the extreme contrast of all nations to the US product position. Perhaps the easiest way to sense the European product range is to compare the German pattern to that in nearby Italy and France. The gas price differences between Germany and Italy explain part of that product variation, but since the fuel prices are not that different between France and West Germany, the segment differences shown here are likely to be from "cultural" factors. (See Figure 3.)

It is also interesting to note in these two charts that after two oil shocks, the American market was obviously greatly shifted, but the European segments remained fairly consistent -- losing at the largest end, but not being seriously distrupted in the middle segments.

In a global sense, this long-time pattern indicates that the European market is fairly well insulated from energy shocks, and that it will always be leading the US market in the energy efficiency dimension.

The lead held by European product design is important not so much for competitive measures of European market penetration in the United

States, but for the fact that many of the new vehicle designs introduced in North America over the next two decades should follow design patterns that we see in Europe much earlier. For example, in Figure 2 notice the high concentration of "light" and "medium" vehicles in the European mix. In the eyes of US consumers these appear to be subcompacts and compacts, but for consumers in the other two-thirds of the world, such car types are the mainstay of the vehicle fleets and represent their versions of mid-size and larger cars. The vehicle designs in these segements have been derived specifically by European and Japanese companies to provide large amounts of carrying capacity, their version of the family sedan, in vehicles which are nevertheless quite small in exterior dimensions and very fuel efficient. For example, cars like the BMW 3 series, the Volkswagan Passat, and the various Volvo and Saab products are considered by the Europeans to be their large cars. In the case of the most energy efficient markets, those in Italy and France, these cars really define the high end of the scale in terms of vehicle size. European consumers, whose family compositions are not that radically different from those in the United States, find these cars quite suitable for family travel, carrying vacation loads, and even application as taxi cabs and fleet vehicles. It is not uncommon to see these vehicles towing the European equivalent of house trailers called "caravans".

This should clearly demonstrate that family consumers outside the United States, can live with a mix of vehicles considerably lighter than those produced for family applications in the United States. It should also serve to indicate that European producers, who are responding to these European consumer tastes should remain in the forefront on technology which allows a high degree of utility and carrying capacity in relatively small vehicles. As a result, one can look towards the European market segments as advance indicators of the car types which are likely to be imported or designed in North America over the next twenty years.

This leadership in efficient product design is further confirmed by some of the basic economic information available on the European market. For example, Figure 3 reveals that the real fuel prices in France and West Germany have tended to match those in Japan for the past twenty years, and have considerably outstripped the fuel prices in the United States. Since more of these fuel price differentials are the result of higher taxes in Europe, and since the governments of Europe are clearly dedicated toward reducing petroleum consumption, one can conclude that such energy policies will continue in the future. In essence, this means that the European consuming and producing infrastructures will continuously be responding to fuel prices systematically higher than those in the United States, which should reinforce the advancements in product design outside the United States.

In addition, in Figure 4 one can see the differences in driving patterns among several of the world's consuming groups. It is interesting to note that the consumers in West Germany and in France tend to drive fewer kilometers per car compared to consumers in the United States. This also indicates a fundamental difference in consumer tastes, which should be reflected in the European mix on a consistent basis. Note that although the West Germans tend to drive almost as much on a per car basis as US consumers, the vehicle holdings in Germany are considerably less than those in the United States, so the aggregate amount of driving and therefore fuel consumption, will be lower on a national basis.

This figure, in revealing the differences between German and French drivers, also points out some of the fundamental vehicle use differences within the European sphere. It is clear that the French consumers have a different type of driving pattern, which may influence their radically different mix of cars. Such differences are partially explained when one notices the rather striking differences in road networks in France and in West Germany. West Germany has a highway network much more analogous to that in the United States, while the French system makes much greater use of smaller secondary roads and complex urban road systems. Again, these fundamental demographic and economic patterns underlie the fragmentation in European markets with regard to consumer taste.

In summary then, it can be concluded that the differences in consumer taste among the European countries are the result of fundamental cultural and infrastructure differences, which will not disappear within short periods of time. It is therefore logical to project that the fragmentation of consumer demand in Europe will remain a factor in the market for at least the next two decades. As a result, one can expect European producers to consistently have a broader range of vehicle types available, even as pressure from international competition forces these producers to seek increasing economies of scale.

The conflict between fragmented markets and the requirement for high scale production are likely to be solved by a general splitting apart of vehicle bodies from drive trains. One should expect the European producers to joint venture more heavily on high volume componentry, such as engines, while they should continue to fragment the various body styles available on a given platform. Perhaps the best prototype for this arrangement is the joint ventured V6 engine shared by Peugeot, Renault and Volvo. Here we have an example of a high volume engine which serves many different body styles among several companies and nations. If properly handled, the European producer responses which balance fragmented consumer demand and high volume factories, should allow the Europeans a greater amount of skill in handling global challenges. It has often been asserted by members of the Program that European producers, because of this unique strategic requirement, will be better able to match global product changes coming from the Japanese, while American producers will lag behind in the reconciliation of high volume plants and multiplying low volume consumer market segments. This may not prove to be the case, especially if US producers can bring products to the US from their overseas divisions, but the current trend is clearly in this direction.

Producer Fragmentation in Europe

As mentioned above, the fragmented consumer markets in Europe have led to a fragmented producer structure in Europe, when compared to the more homogenous structure in the United States. For example, Table 6 reveals the fundamental producing structure in Europe, calculated on a share of total production basis. The most striking conclusion from this table is the relative balance in the various production sites. Unlike the United States where the centralized production "nation" of Detroit holds more than 70% of the North American region's production volume, the production shares in Europe are much more equally allocated to the various member nations.

Notice the two-tiered structure. On the upper tier, the production bases of West Germany and France are in rough balance, with a combined European share of roughly 50% allocated between the two nations. Notice that the Germans have obtained additional dominance between 1974 and 1981, largely owed to the reduction in production facilities now contained underneath the PSA umbrella, but also notice that the French have managed to maintain a production share roughly comparable in scale to the Germans. Notice on the second tier that although the shares of production among Italy, Spain, U.K., and the smaller nations have shifted quite substantially, the various production sites remain in relatively close balance. This table indicates the demise of the U.K. industry since 1974, but also indicates that the loss of U.K. share has not been returned to other <u>single</u> dominent producers. The forecasters, in this case A.T. Kearney,suggest that this roughly balanced two-tiered structure should continue throughout at least the next decade.

The importance of this fragmented producer structure is that it implies no European producing nation or company will run away with dominent market shares in Europe. This observation is further confirmed by analysis of company-by-company performance, which also indicates a rough balance among the major players, with the big producers Volkswagen, Renault, Ford of Europe, and perhaps soon Opel-GM constantly changing lead in terms of production and sales volume. This producer fragmentation further indicates that no single product design or production technique should attain oligopolistic power in any market segment, and that one should expect the European market to be consistently generating creative patterns of product design and production organization.

It should also be noted that the concept of nationalism remains strong in the European sphere. Tables 7-11 show clearly that the home producers generally maintain the highest market share in their home countries. German and French home dominence are the clearest in this Table 7, but it should also be noted that the two countries most subjected to industrial decline and import penetration, Italy and the U.K., have been able to maintain a high nationally dominent share. Recent evidence indicates that the U.K. may actually be gaining in this area. Declining U.K. home share was largely a function of the collapse of British-Leyland, and the disintegration of the General Motors operations. However, after a period of rationalization, the Vauxhall operation under General Motors has been achieving significant market success on its home territory, which may indicate that a rationalized production structure, which integrates the U.K. with other European nations, can recapture significant portions of U.K. home sales.

Table 7 also indicates some of the interweaving of the various European markets and production bases. For example, notice the relatively consistent pattern of export penetration among the various European producers. For example, despite some losses in non-European export sales, the French have been able to maintain a fairly healthy share within the German market. This pattern is replicated by the even weaker producers from Italy and the U.K. It can be expected then that the producer strategies among European companies will be to maintain as much as possible their home country shares while continuing to cultivate their inter-European export shares. (Fiat's and BL's recovery plans, for example, heavily depend upon such a pattern.)

Again, this indicates that the European industry will have a much higher degree of cross fertilization, joint ventures, and inter-breeding, when compared to the more homogenous structure in the United States. Most of the European respondents in our Program have indicated that this crossfertilization is a potential strength of the European producers. In essence, the greater intensity of inter-European competition combined with laws which let them collaborate, should allow these producers a certain degree of innovation which may be useful in global markets. To the extent that European producers can remain capable of serving multiple consumer tastes, this capability should extrapolate to some success in international markets, even against the Japanese.

Some of this European potential is indicated in Table 12, which shows the car export patterns from various European locations to markets around the world. This table indicates both the European dependence upon export sales and some of the international success of the traditional exporters such as France and Germany. Notice that on the criterion of export revenues, even the smallest European operations compare favorably to the efforts of the United States. Notice especially the relative success of European exporters to the non-OECD world. Owing to a tradition of survival through exports, the European producer nations, although experiencing problems recently, have obtained at least a serviceable export network into what might be termed the "Third World".

One can expect the European producers to defend this international market approach quite heavily during the next several decades, as it is their future life-blood. For example, even though Volkswagen misjudged its earlier attempts to penetrate the North American product base, it has recently expended considerable resources to adjust to the earlier mistakes in order to maintain a true multi-national presence. In addition, even though Fiat has essentially exited the North American markets, it is clear the company is retrenching in such a way that leaves room for further repenetration of international markets should their financial situation at home stabilize. It is also evident from the various joint ventures being entered by European producers with Japanese producers, that the European producers wish to use whatever means possible to remain viably placed international competitors. In essence, the formerly highly nationalistic producers are willing to bargain with the Japanese competitors who threatened them, giving up some of the pure nationalism in order to remain major players in a swiftly globalizing market.

European Component Markets

The fragmented pattern of production and cross national shipping within the European finished units market has created a correspondingly unique structure of the European motor vehicle components market. In the United States most concepts of the motor vehicle industry focus on the production and delivery of finished cars. Owing to its greater national fragmentation, the European concept has been quite different for several decades. The Europeans have long recognized that the car industry is merely an organizer of about 25 major sub-industries, whose parts just happen to end up in consumers' hands as a finished car. Also, the practice of the single producer having many assembly plants in the various European nations has lead to a geographical uncoupling of component production and vehicle assembly. A single national industry, say the German industry, has therefore taken on a unique structure in Europe. The German industry consists of final assembly plants in Germany making cars for home sale plus export, component plants in Germany making components for German-owned assembly plants in other countries, and component plants in Germany selling components outside of Germany to non-German producers and the various after-markets around the world. In essence, this means the entire "integration chain" from the mine to the show room is not conceived of as a complete whole, but as various sub-industries producing components for markets located all around the world. Perhaps the clearest illustration of this pattern is to be found in the German statistics concerning the component slice of the industry. It appears that almost half of the employment in the German component industry is supported by export sales of components, not all of which end up in German cars.

Table 13 provides an overall summary of the main component business in Europe. Notice that while the shares of component production in this table roughly correlate with the ranking of finished unit production by these various countries, they by no means match up identically with final output. For example, notice that West Germany has approximately 33% of European component production, but 35% of European finished unit production. Notice the even larger discrepancy between components and finished vehicles in the other countries. For example, France produces approximately 27% of European finished vehicles, but only about 19% of European total components. Similar comparisons in other countries confirm the pattern; the component production in the various nations is not totally dedicated to vehicle production in those nations, but represents further evidence of the cross-national flows of the European motor business. The discrepancies between finished unit production and component production indicate that German cars use componentry from other countries, that French cars use a greater proportion of componentry from other countries, and that in general the overall European production system does not consist of fully integrated national industries, despite the residual nationalism of European politics.

Table 14 shows the total output of motor components production in various European nations in both 1973 and 1979. It should be clear from these data that the component industries represent sizable industrial bases for these various countries. It is also clear that despite shifts in relative share among the various nations, the size of the components industries within each of the nations is relatively stable or growing. The most notable exception to this can be seen in the United Kingdom, where the collapse of the indigenous car industry has clearly filtered down through the componentry base. We have been unable to find comprehensive statistics on export and import flows, but the U.K. example probably shows a much higher degree of component importation from other European nations.

Discussions with various members of the MIT Program confirm this pattern. It is the consensus among the various member industries that the cross border integration of the component industry is increasing and not decreasing. It was also very often noted that this interdependence of the component business in Europe has lent the European infrastructure an international strength. For example, the European industry has pushed forward several world class component producers, such as the Bosch group, which have taken advantage of the international component purchases to build very strong international component operations, some of the few in the world capable of meeting the rising power of the Japanese componentry base. It also appears to be a consensus that the weakest spot in the componentry industry resides in the U.K., followed closely by portions of the French componentry business. It was commonly asserted that both areas faced major rationalization programs if they were to remain competitive in the international arena. It is now evident that formerly dominent U.K. component companies have been forced to seek cooperative arrangements with German, Japanese, and American component operations. Should these weak partners be capable of joining an international network of co-production, it is highly likely that they will be able to rebuild the component industries. We have been told, for example, that companies like the Jaguar operation in Britain have gained major advances in technology and in quality by farming out portions of production to strong component industries in other European countries. These new gains in technology and quality have allowed somewhat of a turnaround at the British car companies, an early indication that joining international trends can have benefits at home.

For these reasons, we have noted very little of the extreme American-style political rhetoric concerning "outsourcing" in Europe. We can speculate that because European companies, work forces, and governments have seen many of the benefits of international collaboration, they do not so strongly adopt an "us-against-them" perception as the international business changes. There have been highly publicized political reactions, especially in the U.K. and France, to the importation of various finished units, but beneath this surface there appears to be much less objection to the multinational sourcing patterns on componentry so evident in Europe, compared to the political battles in the U.S.

This perspective is probably reinforced in Europe owing to the success of the industry in various nations where imported finished units have generated a component business. For example, it is clear that countries like Austria, Belgium, and other smaller states have been able to generate production and employment through componentry production for vehicles whose final assembly or powertrain production occurs in other nations. We conclude, therefore, that European government policies, labor strategies, and producer strategies will more comprehensively recognize the value of multiple country sourcing patterns, while the U.S. perspective should lag considerably behind this.

These benefits can be seen even more clearly in Table 15, which shows the export patterns of motor components among various European countries in 1978. Notice that even the smaller countries without an indigenous integrated industry have been able to generate production value, and therefore employment, in servicing the OEM producers in other nations. This table should make very clear the degree of interdependence created among the European nations owing to the unique structure of the motor components industry. These numbers may appear small from the American perspective, but they represent significant contributions to the manufacturing economies of the various small nations.

It is also clear that individual producers in Europe have been able to use this pan-European component structure to rationalize themselves against the vagaries of individual market segments within Europe and to gain power against other producers, such as the Japanese, in international markets. Perhaps the clearest example of this is the rationalization of European operations performed by Ford of Europe during the 1970s. Before this rationalization, Ford was largely a "multidomestic" producer, with separated national production sites. During the 1970s however, Ford redeployed its production assets in such a way that multinational component sources provided parts to final assembly operations all over Europe. The result has been the creation of a much stronger multinational entity (one which "bailed out" the US division during the last recession) with a greater capability to address competitive challenges from countries like Japan. In addition, it appears clear that Ford has demonstrated to the various European populations that is an active participant in all of their societies. Although the point is debatable, it could be argued that Ford has somewhat limited its political exposure to nationalist tendencies which periodically rise and fall within Europe. In a commercial sense, Ford is capable of addressing the calls by many nations for employment, by small adjustments among its various well placed component operations.

We have noted several major new trends in the European component business. For example, when the major producers in Europe, such as Volkswagen and Renault, awakened to the early signs of the Japanese threat in the middle 1970s, they began to realize they would require higher economies of scale on certain component items, if they were to be able to withstand pressures from the emerging low-cost Japanese producers. This has led to some of the joint ventures mentioned earlier, but should advance even broader forms of cooperation during the next two decades. For example, it has been speculated that European OEM producers might collaborate much more completely on "standard" components which do not lend propriatary competitive advantages to individual producers. For example, items such as alternators and starter motors, do not distinguish producers products in the eyes of consumers, but can provide swift cost savings if produced in extremely high volume.

Under arrangements such as the above, two or more car companies might join together their purchases of these standard components which would then allow the component producers to make these parts in double or triple the normal volume, with considerably lower development and operating cost per unit. The effect of this would be to allow the two car companies to continue competing with their finished product but to obtain cost reductions on several key standard components. Such linkages, by presenting much higher volume to the European component producers would also serve to lower their costs in competition with component makers in Japan and the U.S., thereby maintaining the international viability of major portions of the European component strength.

Such concepts are still in the drafting stage, so it is difficult to tell whether component joint ventures of this magnitude will really get off the ground. Opinions of the European observers appear divided on this subject. Some argue that product specialty will remain strong enough that single interchangable components cannot be designed for several companies. Others argue that this may be the case now, but given a longer term common design goal, future vehicle generations could be designed for interchangeability of parts among the European producers.

On another front the signals appear quite positive. Owing to the several decades of fuel efficiency requirements in European markets, major European component producers have obtained superiority in producing components for small, fast, but efficient automobiles. In many respects these companies are more advanced than their counterparts in

America. As a result, American car companies now faced with the requirement for rapid small car introductions, have come to the European producers to take advantage of their existing technology. In many of these circumstances the European component makers have begun shipment of parts directly to America, but have also begun to establish production operations in America to service their new clients from an American base. This will generally have benefits on both sides of the ocean. American car companies will be able to rapidly take advantage of the existing European experience, especially in items like fuel system technology. On the other side of the Atlantic, these new contracts will serve to strengthen the European companies, shielding them from some of the Japanese onslaught and providing them with international flexibility, the benefits of which will accrue to workers in Europe.

It is the opinion of many analysts within the Program, that the unique European structure of cross national rationalization is likely to become the model for global industry structure during the next two decades. The economic and energy shocks which have removed the supremacy of formally dominent American producers, can be considered analogous to the competitive shocks experienced by European producers during the 1960s and 1970s. The international penetration of markets by the Japanese can be considered analogous to the invasion of nationalistic European markets by other European countries, also during the 1960s and 1970s. It is the consensus of most analysts in the program that the global industry will respond to these transitional forces much in the way that the European national producers responded to similar dynamics within Europe. The result should be a global decoupling of assembly from component production and a series of joint ventures or other business linkages which allow global companies to compete and cooperate at the same time. No matter the success or failure of individual European companies, their development of strategies of simultaneous cooperation and competition, may serve as a model to the rest of the world, as it seeks a new global equilibrium in the motor vehicle industry.

Table 1-3

PROJECTED AUTO DEMAND: OECD, MILLION

	1979	1985	1990	2000
North America	11.6	12.4	12.5	13.4
Latin America	1.8	2.5	3.3	5.4
Western Europe	10.3	11.2	11.8	13.6
Asia	4.4	6.2	7.0	8.7
Africa	.5	.8	1.0	1.4
Eastern Europe	2.0	2.1	2.6	3.9
TOTAL WORLD	30.5	35.2	38.1	46.6

Source: OECD

Table 1-4

EUROPEAN CAR OWNERSHIP PATTERNS: CARS PER 1000 POPULATION

	Austria	Belgium	Denmark	France	Germany	U.K.	Italy	Spain	Sweden
1970	161	213	218	254	230	213	190	70	285
1971	178	222	232	261	247	222	209	82	291
1972	195	234	242	269	260	233	229	94	303
1973	205	245	249	278	275	247	244	109	308
1974	217	256	250	286	280	249	258	122	323
1975	229	267	257	290	289	252	270	135	337
1976	243	279	265	301	308	257	284	149	350
1977	261	292	271	315	326	264	290	164	346
1978	272	302	276	327	346	273	300	178	345
1979	285	312	278	338	367	284	301	190	346
1980	299	320	271	350	377	294	309	202	347

Table 1-6

SHARE OF WEST EUROPE VEHICLE PRODUCTION
ACTUAL AND PROJECTED

	1974	1981	Est. 1990
W. Germany	.27	.35	.34
France	.27	.27	.25
Italy	.15	.13	.12
Spain	.07	.09	.12
U.K.	.17	.11	.10
Sweden, Belgium, Netherlands	.06	.06	.06

Source: OE Supplier Prospects in West Europe during the 1980's; AT Kearny.

Table 1-7

EUROPE CAR MARKET SHARES (PERCENT): BY NATION OF PRODUCER, 1981

	Market Nation			
Producer Nation	Germany	France	Italy	U.K.
Germany	72.8	16.4	16.2	17.2
U.S.A.	.1	.0	.1	.1
U.K.	.7	1.2	1.3	48.1
Spain	1.9	.0	2.2	4.0
France	8.6	71.9	19.9	9.2
Italy	4.7	6.0	59.1	4.5
Japan	10.0	2.5	.1	11.0
Sweden	.4	.2	1.0	2.0
Others	.8	1.8	.1	3.9
	100.0	100.0	100.0	100.0

Table 1-8

SALES PATTERNS IN U.K.: BY NATION OF PRODUCER

Producer	1981	Share %	1980	Share %
Germany	255,903	.172	247,708	.164
U.S.A.	1,063	.001	1,215	.001
U.K.	712,780	.480	713,658	.471
Spain	59,318	.040	69,542	.046
France	137,237	.092	165,163	.109
Italy	66,638	.045	59,442	.039
Japan	163,105	.110	180,190	.119
Sweden	30,244	.020	29,638	.020
Others	58,334	.039	47,205	.031
	1,484,622	1.000	1,513,761	1.000

Table 1-9

SALES PATTERNS IN FRANCE: BY NATION OF PRODUCER

Producer	1981	Share %	1980	Share %
Germany	299,606	.163	226,964	.121
U.S.A.	748	.000	1,110	.001
U.K.	22,497	.012	25,667	.014
Spain	9	.000	306	.000
France	1,318,323	.719	1,440,475	.769
Italy	110,668	.060	97,986	.052
Japan	46,761	.025	54,897	.029
Sweden	3,597	.002	2,847	.002
Others	32,617	.018	22,950	.012
	1,834,826	1.000	1,873,202	1.000

Table 1-10

SALES PATTERNS IN WEST GERMANY: BY NATION OF PRODUCER

Producer	1981	Share %	1980	Share %
Germany	1,697,357	.728	1,745,875	.720
U.S.A.	2,801	.001	7,673	.003
U.K.	15,412	.007	12,732	.005
Spain	43,447	.019	41,497	.017
France	200,168	.086	228,240	.094
Italy	109,003	.047	103,560	.043
Japan	233,116	.100	251,990	.104
Sweden	9,684	.004	11,135	.005
Others	19,347	.008	23,485	.010
	1,330,335	1.000	1,426,187	1.000

Table 1-11

SALES PATTERNS IN ITALY: BY NATION OF PRODUCER

Producer	1981	Share %	1980	Share %
Germany	292,240	.162	206,220	.135
U.S.A.	1,080	.001	680	.000
U.K.	24,100	.013	21,223	.014
Spain	40,000	.022	57,852	.038
France	358,800	.199	329,036	.215
Italy	1,068,080	.591	895,085	.585
Japan	1,820	.001	2,102	.001
Sweden	17,335	.010	10,851	.007
Others	2,269	.001	7,439	.005
	1,805,724	1.000	1,530,488	1.000

Table 1-12

EUROPEAN CAR EXPORT PATTERNS: 1981
(Million U.S. Dollars)

TO:	U.S.	EEC	ALL OECD	NON-OECD	WORLD
FROM:					
BLEU	3	3,726	4,104	78	4,182
France	314	3,141	4,024	1,498	5,523
Germany	2,665	7,402	12,631	1,066	13,697
Italy	139	900	1,306	312	1,619
U.K.	299	553	1,006	769	1,774
Other EEC	1	388	470	29	499
U.S.	0	93	3,353	673	4,026
Canada	4,211	8	4,224	327	4,551

Table 1-13

EUROPE MARKETS FOR VEHICLE COMPONENTS (OE ONLY): VALUE SHARE OF ALL EUROPEAN COMPONENT CONSUMPTION

By Country:	Percent	By type:	Percent
W. Germany	33	Eng, major, etc.	34
France	19	Raw Material	28
U.K.	16	Systems (e.g., elec.)	18
Spain	11	Trim	20
Italy	10		
Others	11		
	100		100

Source: AT Kearny; OE Supplier Prospects, 1981.

Table 1-14

PRODUCTION OF "MOTOR COMPONENTS" IN EUROPE
(In U.S. $ million, 1973 $)

	1973	1979
Belgium	266.1	509.4
Denmark	31.9	43.7
France	3,603.2	5,294.9
W. Germany	4,268.8	6,222.3
Italy	826.4	N/A
Netherlands	56.8	50.2
Sweden	656.2	731.1
U.K.	3,257.7	2,839.8

Source: Market Studies

Table 1-15

EUROPEAN "MOTOR COMPONENTS" EXPORT PATTERNS
1978

FROM: \ TO:	Denmark	France	Germany	U.K.	Italy	Netherlands	Sweden	Spain	Belgium	U.S.
Belgium (1)	N.A.	4592.8	5093.5	3474.0	272.0	4165.6	293.1	N.A.	-	2276.5
Denmark (2)	-	3.3	57.5	43.8	1.8	19.3	97.4	34.5	6.9	3.1
France (3)	67.9	-	2999.7	917.1	1265.1	353.4	193.3	1569.7	2246.1	913.6
Germany (4)	173.7	1639.5	-	778.1	706.7	626.1	577.7	148.2	1373.4	999.5
Italy (5)	11.120	261.9	213.6	59.5	-	26.7	N.A.	50.0	42.5	95.9
Sweden (6)	254.9	88.9	151.3	133.7	33.6	77.6	-	N.A.	499.6	70.5

(1) Million Belgian Francs
(2) Million Danish Krona
(3) Million French Francs
(4) Million Deutschmarks
(5) Billion Italian Lire
(6) Million Swedish Krona

Table 1-16

JAPANESE PENETRATION OF EUROPE'S CAR MARKETS: PERCENT

	1975	1976	1977	1978	1979	1980	1981
Norway	28.3	28.3	25.4	20.4	24.2	39.1	37.9
Finland	20.8	21.9	21.8	20.4	23.9	36.3	33.0
Ireland	.0	11.5	15.5	21.8	25.4	31.1	29.6
Switzerland	8.4	5.8	12.1	12.6	16.0	23.2	26.9
Austria	5.4	6.0	5.7	7.0	12.4	19.2	25.4
Belgium	16.5	18.0	19.3	17.9	18.0	24.7	24.7
Netherlands	15.5	16.8	19.8	19.0	19.6	25.7	24.4
Denmark	14.7	16.5	17.1	13.7	18.0	30.9	24.2
Sweden	6.5	8.2	10.4	9.7	10.0	12.1	13.7
Portugal	20.5	16.1	15.2	17.6	7.9	7.5	11.9
U.K.	9.0	9.4	10.6	11.0	10.8	11.9	11.0
W. Germany	1.7	1.9	2.5	3.7	5.6	10.4	10.0
France	1.5	2.7	2.6	1.8	2.2	2.9	2.6
Italy	.0	.1	.1	.1	.1	.1	.1

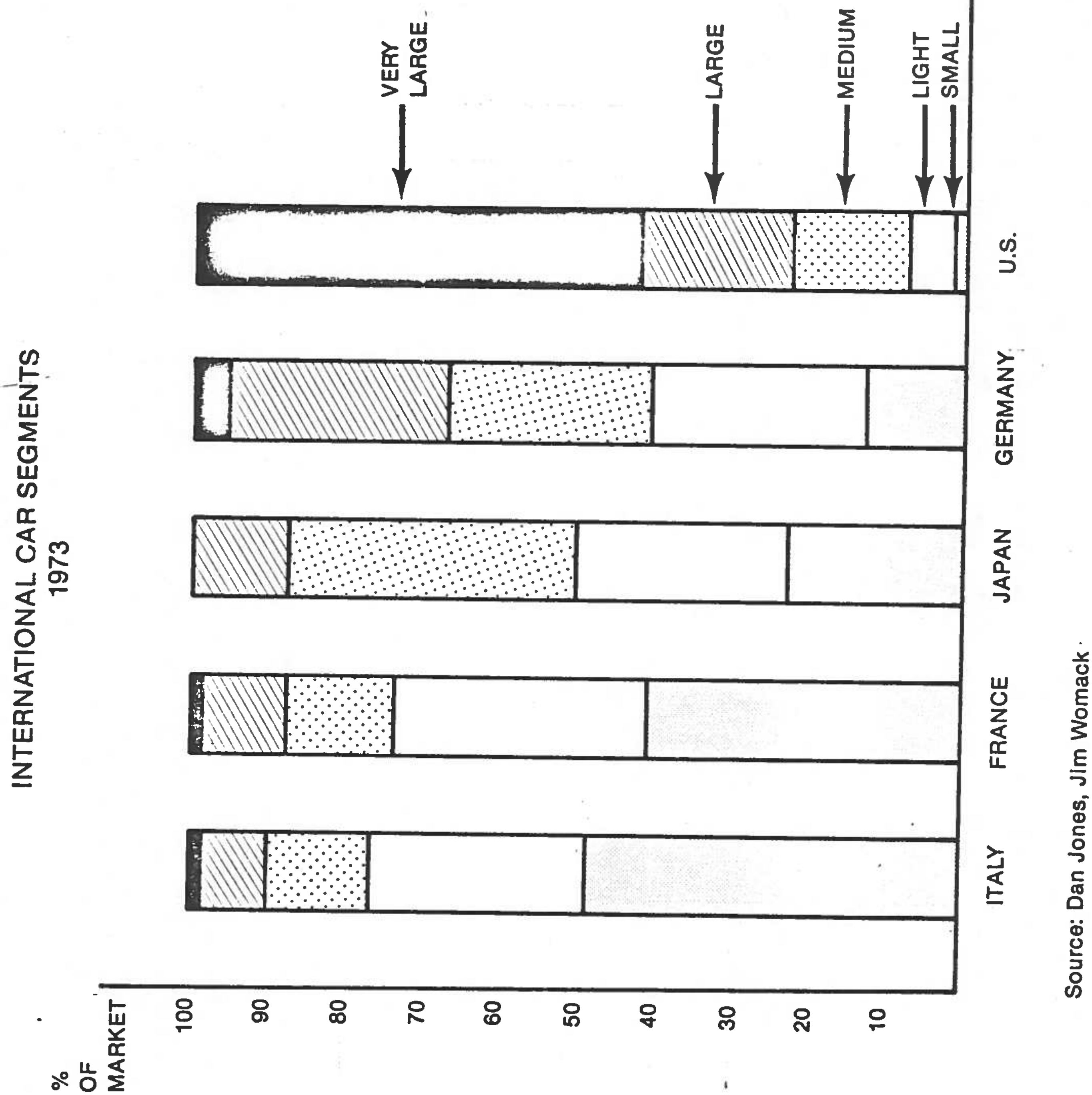
Table 1-17

MEDIAN CAR ENGINE SIZE: LITERS

Austria	1980	1.39
Belgium	1978	1.54
France	1977	1.20
Germany	1980	1.53
U.K.	1980	1.42
Italy	1976	.95

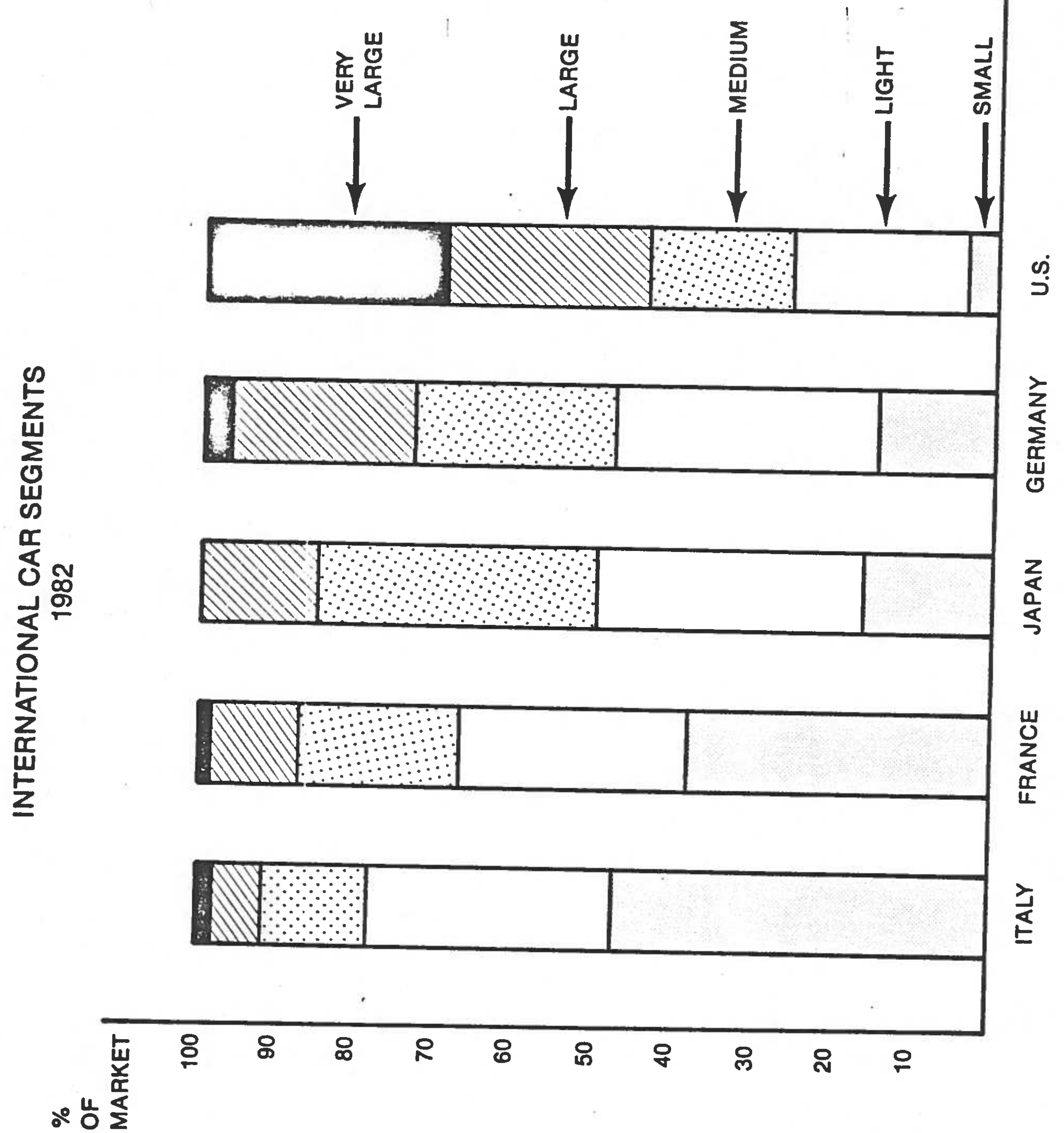
Source: Tanner.

Figure 1-1



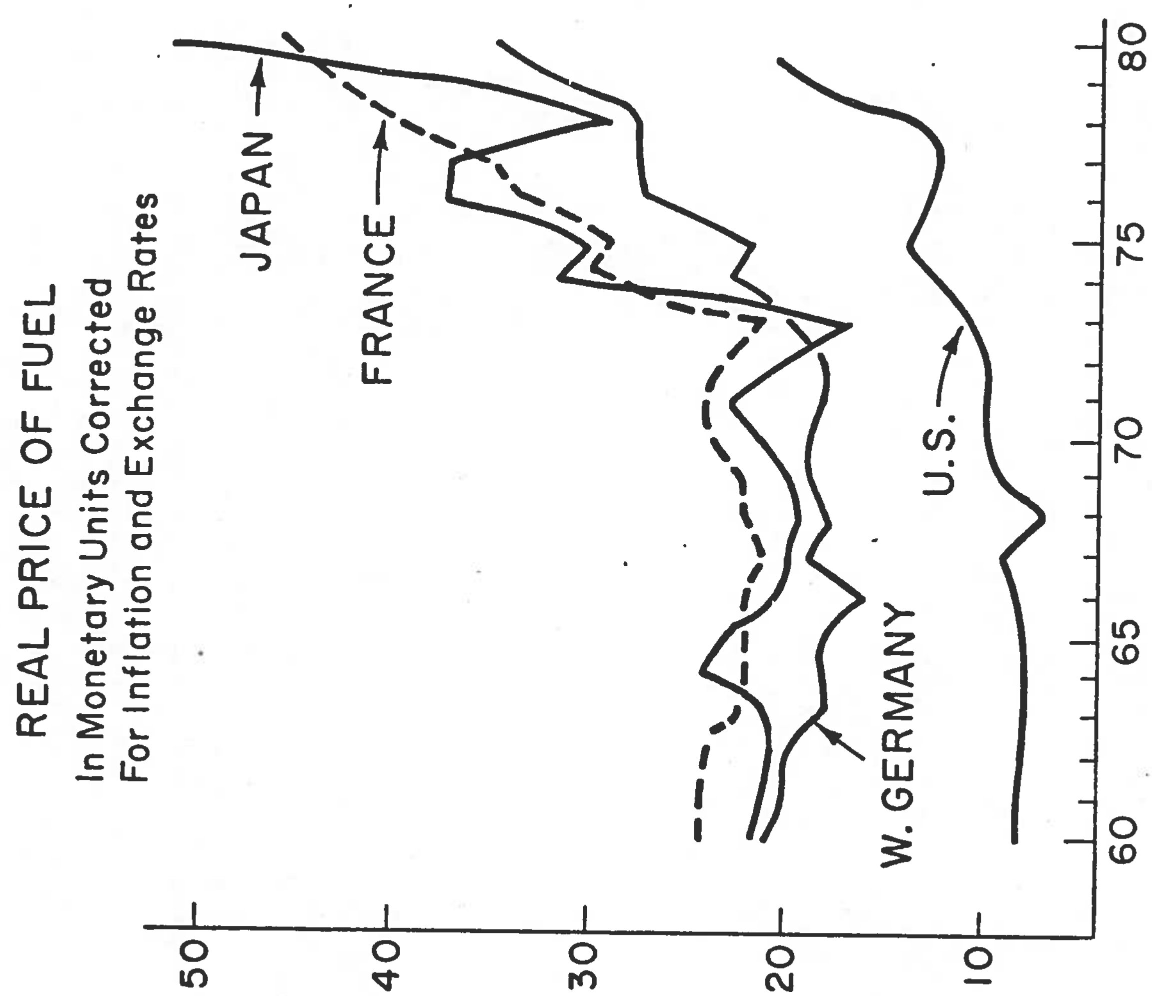
Source: Dan Jones, Jim Womack

Figure 1-2



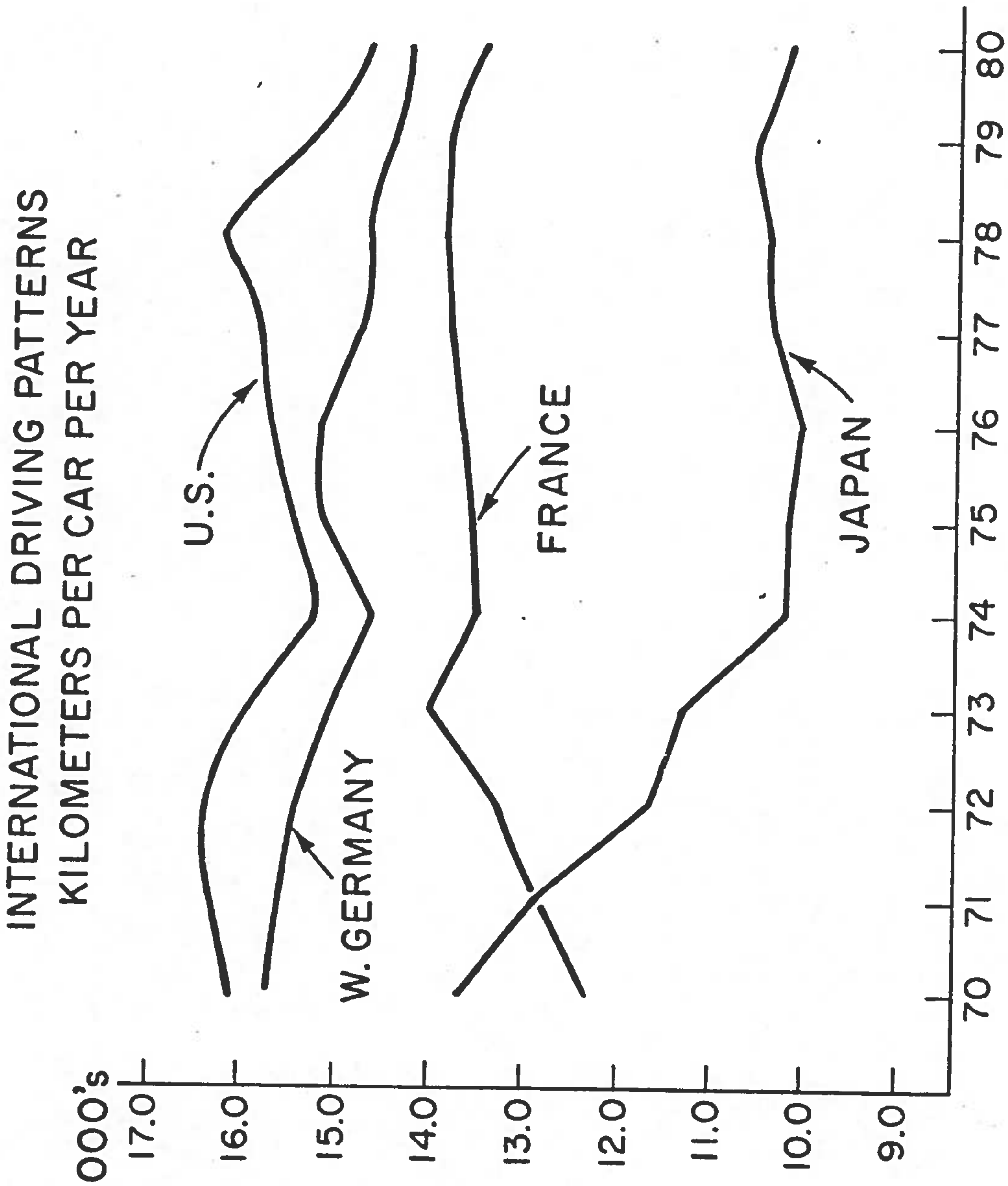
Source: Dan Jones, Jim Womack

Figure 1-3



REAL PRICE OF FUEL
In Monetary Units Corrected
For Inflation and Exchange Rates
JAPAN
FRANCE
W. GERMANY
U.S.
50
40
30
20
10
60
65
70
75
80

Figure 1-4


INTERNATIONAL DRIVING PATTERNS
KILOMETERS PER CAR PER YEAR
000's
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
9.0
70
71
72
73
74
75
76
77
78
79
80
U.S.
W. GERMANY
FRANCE
JAPAN

THE REGULATORY ENVIRONMENT IN EUROPE

Introduction

Task 5 of this contract called for research into a relatively specific regulatory question. It was worded as follows, "the research should answer the question if regulations calling for incremental or rather minor changes are required to be incorporated in specific years, while those calling for major changes are required to be incorporated only when new models are introduced." The answer to this question proved remarkedly simple, but the researchers were left with a much more difficult task, uncovered while answering this question, of reconciling the tremendous conceptual differences in regulation on both sides of the Atlantic. The research question in Task 5 contains a uniquely American assumption that the process of regulation around the world in similar to that in North America. However, when we first approached our European sources on this topic, their initial reaction was an inability to answer the question, because the European ideas concerning regulation are so radically different. We received many responses, many almost humorous in nature, concerning the idea that the European industry follows the "model years" structure imposed by American producers on American consumers and reinforced by American regulators. There was almost complete consensus among the European industry, government, labor, and academic sources that the model year, in its extreme sense, was a uniquely American invention designed to foster premature obsolence, in such a way as to pump up vehicle sales.

After further discussions and investigation of the European literature, we began to focus on the additional and more fundamental differences in American and European assumptions, sparked by discussions on regulations, but which relate to much broader socio-cultural phenomena. As it turns out, our question concerning regulation prompted much deeper investigation on our part, and much more philosophical responses from our various sources, relating to the vast differences in culture, the concept of industry as a social element, the role of government as a representative of "the people", and of appropriate forms of international relations among countries.

We feel that an appropriate treatment of all of these topics is well beyond the scope and resources of the contract, but we found the material uncovered to be so interesting that it was felt useful to provide discussion under the task 5 work element. For this reason, we shall address the specific Task 5 question relatively briefly, and provide some discussion of the broader, and we feel more important, issues provoked by our original questions.

Offical Timing of European Regulatory Introduction

In essence, because there is no such thing as a comprehensive, legally binding "model year" across Europe, most of the relevent regulatory statutes are not issued according to model year definitions common in America. Most national respondents in Europe indicated that within each nation it was rare to find regulatory proceedings similar to those in the United States. To oversimplify, there exists no exact equivalent of the various regulatory players in the United States.

There are no direct equivalents for "third party" regulatory agencies. There are no directly analogous organizations of "consumer advocates". Nor are there any direct legislative and administrative analogues for enabling legislation, advanced notice of proposed rule making, rule making, and enforcement.

At the national level, we were informed that if a nation did intend to regulate in a fashion somewhat analogous to the United States, the regulation would simply say that all cars produced after a certain date must meet the regulation. We found no evidence of the highly legalistic model year structure which would separate between incremental or major changes or draw distinctions between cars whose design occurred before or after a certain calendar date.

In essence, we were consistently told, and found no evidence to the contrary, that the entire conceptual structure of the question in Task 5 had no application in the European sphere. The technical answer is therefore simple. Regulation, to the extent that such exists, is simply performed on a legislative date basis.

The Broader European Regulatory Environment

All of the above does not mean that Europeans are unconcerned with undesirable side effects of the automobile, or that they make no attempt to correct for "externalities", or that there have been no attempts to increase the efficiency, reliability, safety performance, or social beneficence of the automobile. All of our respondents who had difficulties with the structure of the Task 5 question, made it very clear that major European efforts had been underway for decades to achieve the performance benefits which American seek through the legalistic regulatory structure. We were informed consistently, however, that the European efforts were extremely different in nature and were reflective of the very different societies within Europe.

A quick reading of the legislative histories in the various countries and of the European Commission indicate that over the past several decades European bodies have indeed instituted a number of standards for improvement of motor vehicles, which might be considered analogous to American regulations. But, in our broader discussions we were consistently informed that the process leading up to these standards did not directly resemble the American regulatory process. In general, when technology became available for improvement, or social externalities became severe enough to require remedy, a general consultative process would begin among member of the government and industry whose daily job is was to remain in constant contact with each other. We were consistently informed that the various ministries and agencies involved with the auto industries did not have fleeting and advesarial relationships with members of the industry, but considered themselves to be the liaison points between commerical and social influences in the economy, to the extent that they are separated. This of course varies distinctly among the different nations according to their various forms of government, but it is safe to say that the European national procedures are much closer to each other collectively than to that in the United States.

As a result, members of the industry and of government agencies would have been discussing various "regulatory" topics well before they reached the level of social issues. For example, discussions on issues of fuel consumption were commonplace long before the oil shocks of the 1970s and long before any thoughts of performance goals or innovation targets became public discussion. Likewise, discussions concerning motor vehicle emissions have been underway as a matter of course for at least as long as those issues have been discussed in the United States, that is, since the early 1960s. The result of this is not some magic form of consensus, because it is clear there have been often violent disagreements among the various parties in the system, but it is clear that the mutual education process among various industrial and government players is a matter of long term evolution, not sudden legislative adversity.

Because of this fundamental social communication process, the various interested parties would have been well informed of the abilities and limitations, both technological and political of their counterparts in the commerical or political sectors. As a result, it was our impression that the enactment of standards occured at negotiating tables in which many complex issues could be brought to light openly. It is the observation of Program researchers and our European sources that the regulatory process in the United States would not allow such complex reconciliation of various interests. In essence, most international respondents suggested that regultory issues in the United States would tend to be winnowed down to "binary" discussions.

For example, the American practice of using cost/benefit evaluation procedures was viewed as rather narrow and limiting, when confronting such multi-faceted social issues. The idea that some things should be <u>totally</u> costs, and some things should be <u>totally</u> benefits, to be parceled out on opposite sides of an extremely strict equation, was simply anathema to European government and industry members who were used to working with much more complex multinationalism, intricate trading patterns, and pluralistic societies. With few exceptions, European respondents from all walks of life suggested that the process of regulation in the United States is one which gradually winnows down to a public relations campaign which divides up "good guys" and "bad guys" in media arguments, adversarial regulatory hearings, and in legislative arguments at the Congress.

This is extremely difficult to articulate, but several sources seemed to enunciate a common conception that lies atthe root of the different procedures on both sides of the Atlantic. One speaker at a Program conference seemed to echo the broader sentiment. In paraphrase he said, "you Americans look at us Europeans and say we are adept at performing "industrial policy" or "cooperative regulatory policy" as if these were some form of abstractions which could be separated from the industry and society at large. What you do not realize is the simple fact that we view our industries <u>as</u> our society, and as an integral part of our society along with our government and academic institutions. We do not therefore have separate "industrial policies" which can be applied <u>to</u> our industries <u>by</u> our governments." He went on to say, again in paraphrase, that, "we Europeans do not have the broad spaces of geography separating elements of our society or the legal structures which allow us to conceive of highly distinct adversarial players in our cultures." He suggested that what Americans think of as industrial policy or regulatory policy are merely integral activities of European societies which have faced much larger pressures such as those of war and the rise and fall of many industries and cultures.

This last point was especially consistently articulated by the various repondents in our analysis. We often heard statements which suggested that in comparison to the threat of invasion by the Eastern powers, or in comparison to the economic destruction which would occur if smaller countries lost entire industries, matters such as bumper damagability standards, or increasing strict emissions controls, took on much less social significance.

As outside observers, our perhaps incorrect impression was that the European "social consciousness" had much larger concerns than those relating to the technology of automobiles on the ground in a regulatory sense. Several researchers even commented that the "hierarchy of needs" social theories could apply to the European approach to regulation. This argument would assert that societies who did not have to worry about providing fundamental economic well-being to their consumers, or who did not have to immediately worry about loss of their entire nation in the event of war, would have the "luxury" of worrying about the incremental performance of several of their industries.

This does not at all suggest that the European community is one big happy family, or that there are no grave concerns about automotive safety in Europe, and it may seem out of place to discuss these philosophical matters in a technical research discussion concerning regulatory procedure. However, the response to our rather technical questions was so overwhelming consistent and so emotionally charged, that we feel it reveals fundamental perspectives on the entire process of international motor vehicle regulation.

The Concept of Vehicle Safety in Europe

On a more technical vein, it is also clear that the definition of "safety" is very different in Europe compared to the United States. Most of the regulatory work in the United States is concerned with the issue of "passive" safety. To oversimplify, regulations have as their primary goal minimizing damage to travellers once a car has incurred a collision. In all the European nations, respondents indicated a much greater interest in "active" safety, that is the performance of a vehicle which could prevent its incurring a collision. It is overwhelmingly clear that the "average" European driver has a very different sense of how a vehicle should perform and what determines the "safety" of a vehicle. It is an immediate given that very few Europeans feel they require a car as large as American cars in order to be safe. Had they imputed such a high correlation between "large" and "safe" it is clear they would have allocated economic resources in such a way as to produce a much higher proportion of American-sized cars in the fleet. It is clear, for example, that they could have maintained high fuel efficiency by demanding cars with very low horsepower yet a large body structure. However it is collectively clear to the analysts that Europeans in general are not amenable to such performance reductions, and that even if they do feel "large equals safe" they have chosen to allocate consumer resources in other directions.

It is also abundently clear that the articles in European automotive media include large amounts of discussion concerning the active safety handling characteristics of the various cars tested. Although we have clearly not performed statistical research on this, it is also clear that the general European automotive consciousness does not flow towards vehicles which can be driven into a wall relatively safely at 50 km per hour, but towards vehicles which can be driven quickly on winding mountain roads, in dense urban traffic, and on the autobahns in excess of 120 km with a great degree of driver control and accident avoidence capability.

This demand for active safety is extensively reflected in producer product design. European producers recognize that European consumers can distinguish among subtle differences in the handling and controllability of various products, and invest considerable engineering and capital resources in fine-tuning the active safety handling characteristics of their new models. An unscientific perhaps, but still instructive, confirmation of this occured in our observations at various test tracks around Europe where small economy cars were driven to their limits at extremely high speeds on banked race tracks and at what appeared to be "imprudent" speeds on the "off-road" portions of the test facilities. Also, in those European publications which did review American products delivered to Europe, a number of negative evaluations were noted concerning the potential handling safety hazards in the highly prized "boulevard ride" demanded by American drivers. Additional confirmation of the active safety approach is found in the nature of new technologies introduced in Europe over the past several decades. For example, disc brake systems, superior shock absorbers, adhesive tire compounds, and new antiskid brake systems have evolved extensively in Europe because these items are highly saleable to a consuming public concerned with active safety.

Consumer vs. Producer Regulation

Another fundamental difference in European standard setting compared to that in the States concerns the several types of regulation promulgated within Europe. Generally speaking, regulations in the United States have tended to focus exclusivly on the producers of motor vehicles. For example, almost all of the safety regulations have mandated specific product changes at the producer level, or have prohibited the sale of vehicles not fitting certain regulatory characteristics.

There are almost no American regulations which focus on the behavior of consumers in the areas of safety, emissions, and fuel conservation.

In Europe, the situation is almost directly the opposite. It is clear that European policies in all three areas are directed first at the consumers, as the actors most responsible for emissions, safety, and fuel consumption, and only after such consumer policies are in place does the policy attention focus on the producers of motor vehicles. The clearest example is the European approach to safety and "crash worthiness". Unlike American safety regulations whose intention is to structure the vehicle so as to protect the consumer in a crash despite his or her actions, European regulations focus primarily on consumer actions. Perhaps most visible among these policies is the mandatory seatbelt use law which exists in most European countries. It is as evident to the Europeans as to the Americans that the swiftest and most cost effective means of reducing injuries and fatalities is a wider use of seatbelts. But the European philosophy is to place the liability on the persons responsible for seatbelt use, that is the drivers and passengers. There is considerable debate as to whether such seatbelt usage regulations actually work, but despite these debates the regulatory intention is clear. Literature we discovered in our research efforts provided no clear statistical evidence on the effects of such regulation, but a number of respondents indicated that enforcement did take place, and indeed some program researchers witnessed first hand single cases of enforcement by European police. The policy focus, however, is clearly on the consumer's behavior, not on the producer's product line.

In the area of fuel consumption policy, it is also clear that the European philosophy places direct responsibility in consumers' hands, via rather high gasoline taxes and in some countries tax structures designed to promote sales of smaller vehicles. There have been very few legalistic attempts to improve fuel efficiency via producer regulation such as the CAFE regulation in the United States. Consumption taxes on fuel are extremely strong signals to the consumers of fuel that excess consumption is not a socially desirable action. It is the judgement of program researchers that this policy is much more effective at reducing fuel consumption than policies such as those promulgated in the United States which ignore, for the most part, the fuel consuming behavior of drivers.

For example, while the U.S. CAFE regulation has essentially caused a rift between the consuming behavior of drivers and the mandatory production requirements of producers, the European policies focused on consumers have meant that consumers demanded fuel efficient vehicles which producers have then been readily capable of producing, in such a way as to keep the consumer behavior and the producer behavior in line with each other. Some of the broader fundamental effects of this go beyond the fuel conservation effects, and include relatively minor disruptions of the European industry base during the two oil shocks. By fostering policies which align the tastes of consumers and the production capacity of producers, the European economies suffered few of the shocks like those in America as consumers swung rapidly to small cars first, then back to large cars, then back to small cars, and then back to large cars. The European mix of vehicles indeed was influenced by the new oil shocks, but they never experienced the vast discontinuities between consumer demand and production capacity.

A number of our European respondents were quite vocal about what they viewed as misguided US energy policies employed during the 1970s. Their greatest consternation focused on the Energy Policy and Conservation Act of the middle 1970s, which in effect told consumers that gasoline would remain cheap (via price controls) but which also told producers they would have to force out a mix of increasingly smaller cars. Europeans viewed this as misguided because it produced a "binge" of fuel consuming behavior between 1975 and 1978 in the U.S., which the Europeans contend had international ramifications. European respondents asserted that as Americans consumed large quantities of petroleum fuel, they affected the supply and demand balance at the global level, which the Europeans feel helped to bolster the power of the OPEC cartel, which affects all of the other fuel consuming nations. In our most recent discussions, various European energy watchers expressed concern at the early signs that Americans would again begin to increase their consumption of motor petroleum. Although they feel the current world energy situation is better than it was in 1978, they do believe that rapid increases in driving and fuel consumption in the United States could reduce the so-called "oil glut" and once again stiffen the OPEC pricing policies. Although European opinion is by no means unanimous, the majority of program respondents felt that gasoline taxation in the United States would serve a positive international purpose.

Another area of European consumer regulation bears mention. Although it has received relatively little attention in the United States, "noise pollution" is a major issue in many European countries. Again, regulations to control noise pollution are focussed primarily on consumers. In many localities in Europe, it is illegal to use a vehicle horn as a warning device. Noise controlled areas in most European cities are well posted with warning signs, and Europeans respondents indicated that there was a fairly high degree of noise control enforcement.

In summary then, the European philosophy of consumer regulation is abundently clear. The European concept argues that it is the tens of millions of drivers who consume fuel, pollute the atmosphere and get involved in traffic accidents. Therefore, they feel the most logical approach to reducing these undesirable side effects of motorization is to go directly to the source of the problem, not to use the much less direct approach of regulating the production output of the motor vehicle industry. This is not at all to say that European policy makers are unconcerned with the actions of motor companies, but it does suggest a rational approach to problem solving by attacking problems directly at the source. Although it was impossible to fully document our impressions of the success of this strategy, it did seem apparent to us as outside observers that this comprehensive approach to social problem solving created considerably less adversity as compared to the United States, and seems to have advoided much of the "wagon circling" behavior so prevelent among auto producers, government agencies, and consumer interest groups in the United States. It is our impression from interviews with management at most of the of the European auto companies that they felt much less isolated from their societies, and therefore much more willing and capable of adapting to demands for changes within the society.

The Structure of Regulatory Policy in Europe

It is well beyond the resources of the research project to fully document all of the technicalities of European regulation. But we do feel it is important to discuss in a very general fashion the overall structure of the European regulatory environment. It should be cautioned that the following description is extremely general, overly simplistic, and perhaps not technically or legally precise in all areas. Part of the reason for this lack of precision is owed to the fact that European regulatory behavior, to the extent it exists, is generally done in a very private fashion, compared to the highly public regulatory arena in the United States. This is another place where we noted distinct differences in attitudes between Americans and Europeans.

Probably because of the adversarial relationships which built in the U.S. during the 1960s, and the sense that American industry would conspire to thwart the "public interest" if it was allowed to negotiate in private with the government, regulatory proceedings in the United States have been extremely public and have often been handled with extremely tight legal controls on interaction between government and industry participants. Most Europeans, no matter their affiliation, feel that for many of the issues facing society, such publicity is counterproductive because it tends to remove flexibility from the system and tends to make technical issues susceptible to political sloganism. Even those Europeans who feel regulatory action is required in Europe, comment often humorously on what they see as the often moralistic drama of the open regulatory process in the United States. They feel that in many cases the requirement to stake out public relations positions in an openly adversarial relationship inhibits the kind of social change which is the intent of the various regulations. Many respondents felt, for example, that if the United States government had been better able to accomodate some of the short term interests of the industry, and if the regultory proceedings had not required legal battles on <u>minor</u> points of regulation, that many of the technical advances in vehicle safety and emissions performance, or fuel efficiency, would have been more rapidly introduced to the vehicle population.

Owing to these rather deep seated assumptions about the appropriate role of government and industry, most European regulatory efforts seem to have achieved a balance between public and private discussion and negotiation. In general, as mentioned earlier, there appears to be a very extensive private consultation process among the various social players well in advance of any regulatory moves or technical specification requirements.

The problem for outside researchers, then, is that one finds in Europe very little of the public docket material which is available in the United States, and one discovers that even the regulations themselves are written in fairly general fashion, in order to allow flexibility of application in the event of changing social conditions. In most of our research into European regulations, we were forced to rely upon general discussions with persons who had been involved in the regulatory process, or who are currently involved in enforcement. While these discussions were extremely profitable, we discovered that there is often no body of documentation to either confirm or deny the statements of discussants. Although some of the things we were told in discussions represented conflicting statements, by and large the information provided by various sources (industrial, academic, and governmental) were remarkedly consistent.

The discussion which follows represents our best synthesis of things we were told, but it should again be cautioned that many items here are subjective and may not be agreed to by all members of the European community.

In general, there is a regulatory hierarchy in the European region which closely correlates to the various government and supra-government bodies in the European region. The primary regulatory activity affecting motor vehicles occurs at the national level, within the context of national law. For members of the European community, there is a broader supra-national regulatory structure at the level of the Common Market and the European Commission. In addition, there appeared to be a set of much less formal "regulatory activities" concerning the Common Marekt member states and geographically proximate non-member states. In addition, there appears to be a form of activity which might be termed "regulatory" with regard to products produced in Europe but exported to nations with strong regulatory structures, such as the United States. We shall break the following discussion into those four areas.

National Regulation

Each of the European countries has a variety of regulations related to the technical specifications of vehicles. Most of these are not directly analogous to American federal regulations in areas such as safety and emissions. The primary goal of these national regulations appears to be provision for vehicle consistency and minimum levels of road worthiness on behalf of consumers.

According to observations made by European respondents, the primary national regulation pertains to what is called "type certification". This is a conceptually straightforward set of regulations, whose structure and administration varies by country, but whose theme is common among the European countries. In essence, under type certification programs, the producer of motor vehicles is required to prove to the nation in question that a model line or car type meets the minimum engineering requirements mandated by that particular nation. When a new vehicle is introduced by a producer it must submit sample vehicles to the government in question, or to the certifing institution which in some countries is not a part of the government. (For example, in Germany the certification process is performed by a private sector institution which might be thought of as a set of regional SAE-type organizations, which is neither a commerical nor a government agency. In this case, the government accepts the judgement and the standards embodied in this unique institution.) The certifying organization then examines the sample vehicle to insure that it meets the minimum requirements of road worthiness and performance. At that point the vehicle model, or car type, is said to have been a certifiable type. From that point forward, again with national variations, as the producer seeks to sell multiple copies of that vehicle type in the country in question, each delivered vehicle must obtain a type certification which indicates that indeed the vehicle delivered is identical to the class or type that has been certified. In many respects this process is analogous in structure to the engine family classification used by the United States EPA to determine the fuel efficiency of corporate fleets or the certification of emission control equipment.

Although this type certification process is relatively straightforward in concept, a number of respondents indicated it was quite common for the procedure to be used for essentially political purposes. We have absolutely no confirming documentation on this, but it was commonly asserted that various European nations would use the threat of changing type certifications or of denying certification, in order to negotiate with producer companies in areas such as trade flows, employment creation, or economic participation in the market country. For example, it was asserted by several parties that type certification was used as a political lever by some European nations in order to force negotiations with Japanese companies in the trading arena. Again, it must be emphasized that we found no documentry proof of such activity, but the assertion was so commonly made that we do believe it must contain at least a grain of truth.

Whether through type certification or other statutory regulation, various European nations have imposed differing product specification standards on vehicles sold in their country. For example, as mentioned earlier, vehicles used in France are required to have yellow headlights. A strict reading of the law suggests that even vehicles in transit through France must be supplied with yellow headlight filters while on the road. However, direct observation by members of the program in regions of France bordering other nations showed conclusively that large numbers of out-of-country cars were driving in France without yellow headlights or retrofit filters. This leads us to conclude that, as in many other areas, a degree of tolerance and flexibility surrounds many of the European legalities. Various other regulations on vehicle specification appear to operate. For example, we have noted differences in regulations concerning lighting dimensions, headrests in vehicles, seatbelt installation requirements, instrumentation labeling, and requirements pertaining to left hand versus right hand drive cars.

We were informed that various general safety requirements in vehicle design were applicable in several European nations. We were unable to obtain any extensive documentation concerning regulatory performance standards, but general discussions with product engineers suggested that some goverments have strong concerns in the area of active safety, and in the reliability of safety related systems, such as brake systems. We were simply unable, given the resources of the contract, to visit locations where such information is recorded or to obtain English language translations of European safety testing procedures. Our German respondents indicated that company engineers quite regularly shared safety testing information with various agencies and other engineering institutions, but we were unable to investigate the formality of this process, owing to resource constraints.

Regulation at the European Community Level

Since the inception of the European Community supra-governmental structure, varieties of regulations have been instituted with regard to the motor vehicle. Contract resources did not allow complete documentation or investigation of these areas, but lists of the regulations are obtainable from the European Community. Discussion here will center on the broader structure of regulation at this level.

For several decades the various member nations in the European Community have been trying to rationalize a number of vehicle standards across the entire community. In essence, negotiations have proceeded on a fairly regular basis among producers, national governments, and the European Commission. The general objective of such regulatory rationalization is to gradually to bring the member states up to the de facto standards of emissions control and other vehicle attributes now established by the United States and Japan. This is by no means an easy task, given the diversity of national policies among the member states, and the overriding European requirement that government intervention not impede market freedom within the Community or cause international competitive problems for the vitally important motor vehicle industry in Europe. As was mentioned earlier, European government policy explicitly considers the economic, competitive, and employment consequences of various actions it takes with regard to major industries. Virtually all of the literature concerning public policy in Europe including Commission documents, national social agendas, and technical documents contain significant analyses of adverse impacts of socially desirable legislation. It appears to the outside observer that the European public policy institutions are far more keenly aware of disruptions and dislocations which can be inadvertently created by even one well-intentioned piece of legislation. Although there appears to be no formal technical mechanism such as cost-benefit analysis, which is used to balance the legitimately competing concerns affected by regulation, it appears that an informal consideration of inadvertent policy effects is firmly ensconced in the European policy making sphere.

At the level of European-wide regulation, then, the problem of cross national regulation becomes one of balancing the different economic and technical positions of the various member states. For example, the Commission would be unable or unwilling, to enact legistion which might be neutral for most member states but which would severely affect the industry of one of the major member nations. For example, a European wide bumper crash worthiness standard would affect the production bases in Germany and in France in very different fashions, owing to the greater percentage of "micro cars" being produced in France. It appears to the outside observer, therefore, that an overriding consideration in European wide regulation is to avoid unbalanced effects within the European region.

It is extremely difficult to express the subtleties of this problem, but perhaps the best way to express it is in an overly simplistic fashion. The easiest way to think of European wide regulation in general is that it seeks to establish "minimum acceptable" performance requirements, not the "maximum feasible" requirement specified in US regulations. In essence, this is a lowest common denominator approach, where regulations are set across Europe in such a way as to minimize disruption for the least capable economy or country. This is vastly different from the regulatory process in the United States which has chosen a "technology forcing" path requiring all producers to reach a higher level of technology than that which currently exists, according to the standards set by third party regulatory agencies.

Hypothetically then, if Europeans wished to set a bumper crash worthiness standard, and found that the Germans could comply with a 5 mile per hour standard, but the French or some other country would only be able to achieve a 2 mile per hour standard without seriously disrupting the industry, then the European standard would be set at 2 miles per hour. Many Americans would feel that this encourages the kind of conspiratorial foot dragging alledged to have occured in the U.S. industry during the 1960s, but many Europeans would argue that there is no sense in dropping a brick on your left foot to avoid dropping one on your right. Again, this seems to go back to the general European philosophy mentioned earlier in this document, which holds that European societies try to comprehensively balance a wide range of social issues assessing social priorities in a more comprehensive fashion.

In addition, we have been told that European-wide regulation is structured in such a way that individual nations cannot use national regulation as a means for advancing the competitiveness of its industry over others in Europe. We have been unable to find any documentation on the topic, but a number of respondents have reported a quite consistent pattern. Various discussants asserted that there would be difficulties at the European Community level if one member state decided to set regulatory standards for its producers in such a way as to gain a technological advantage over other producers. For example, suppose the Germans decided to insitute a 35 mile per hour barrier crash standard as a criterion for sales of cars in Germany, hoping that their producers would be able to comply with such a standard while others could not. It would essentially act as a barrier to entry for member states selling micro or mini cars in Germany. Such a standard setting would not only act as a trade restraint, but could serve to strengthen the technology of one member state at the expense of others. We were told by various discussants that such circumstances would quickly provoke reaction at the European Community level, at least along political lines if not along legal ones. In essence, the European Community philosophy seems to say that all Europeans in the community should remain roughly in the same ocean if not all in the same boat.

This element of mutual understanding does create problems, especially with regard to vehicle emissions controls. It was our observation that the Europeans collectively wished to obtain much greater control over vehicle emissions, in order to obtain the general benefits of clean air. However, because of the varying capabilities of producers among the nations, and because of the undesirable interaction between emissions controls and fuel efficiency, the requirement for regulatory harmonization among member states acts as an impediment to the introduction of technology already on the ground in the United States and Japan. In interviews with various groups in Europe, it was clear to us that all the European players, companies included, desire greater achievements in emissions controls, and would be amenable to standard setting if it could meet the compliance test of fairness among member states.

For example, the growing body of scientific evidence concerning the damage of ambient lead levels, has led to much greater attention to the potential of lead free fuel in Europe. At this point, it is our observation that lead-free fuel is virtually non-existent, but that its introduction is probably generally desired among Europeans. The problem is that the use of lead free fuels would require significant retooling of the European infrastructure, could possibly degrade the highly prized performance and fuel efficiency in European engines, and might cause severe competitive problems for several European producers who would not be financially capable of retooling entire engine lines. It is our sense, then, that the various member states will have to come to grips with what will be a building social issue over the next several years. If past experience can be used as a gauge, one might expect extensive analysis of the differential competitive effects fostered by the wide spread introduction of lead free fuels. It is also likely that a set of regulatory standards and perhaps "industrial policies" will be constructed in such a way as to obtain the broader social benefits of lead free air without seriously disrupting the European motor vehicle infrastructure.

It is interesting to note that Europeans in general have no problem understanding that an alledgedly "neutral" performance regulation will nonetheless have far from neutral effects on various member producers, depending upon their position vis-a-vis the standard. This kind of debate arose in the United States in the late 1970s and centered primarily upon the question of whether Chrysler had been "unfairly" affected by the various performance regulations set in the United States. This issue was hotly contested in the United States with various actors lining up on both sides of the issue. It is our observation that such a debate would never reach this level of intensity in Europe, because the various member states have a long history of confronting the realities of differences among their individual producers. It has been empirically demonstrated a number of times within the European region that companies are not all the same, with regard to technological capabilities, financial resources, economies of scale, vehicle mix, or geographical sales patterns. Many European respondents view the debate on this issue in the United States as largely a theoretical exercise, or a venture in political rhetoric among adversarial parties. Again, it cannot be too strongly emphasized that the European regulatory philosophy has embedded within it a strong consciousness of the differing capabilities of the various producers and member states.

Regulatory Relations Outside the Community

Although a certain degree of harmony appears to have been achieved among members of the European Common Market, a number of non-member states are obviously free to choose their own paths. It appears that several points of conflict are building between non-members and member states, concerning the issues of motor vehicle regulation. Recent activity in Switzerland, for example, appears capable of provoking some very broad issues.

Quite recently Switzerland instituted a set of rather stringent emission control requirements without regard for the cabability of various EC member states. No matter what political observations can be made concerning this, it is clear this is a radical action which will have far reaching effects. The immediate effect of the Swiss regulations is to eliminate entire product lines from the Swiss market. This action has suddenly prohibited the sales of some cars produced by companies in Germany, France and Italy among others. The Swiss market is quite small in European terms, so the economic effect of this for the various producers could not be considered devastating. However, the independent Swiss action appears capable of focusing much larger arguments within the European community. Some observers suggest that this independent action could provoke more rapid advances in regulation within the community, by essentially polarizing the most technically and least technically capable producers.

We have been told, but could not confirm, that the Swiss move did not occur in a vacuum. It has been asserted that there was considerable informal consultation between the Swiss and other European states, with regard to the importance of the move. We have also been told that such a move might provoke various forms of international negotiation, which some might call retaliation.

It is impossible to confirm what are essentially off-the-record private international negotitions, but it does appear clear that members of the Common Market do have some institutions of informal interchange with geographically close non-member states. It is very clear, for example, that nations such as the U.K. quite regularly negotiate with nations such as Spain, Greece and Portugal. It is also clear that Sweden, another neutral party, is acutely aware of its relationship to the larger European region. Given that a country such as Sweden is highly dependent for economic well-being on its exports to other European nations, it is quite logical to see that they would not blindly exercise their political independence in matters affecting the motor vehicle industry.

The point of these observations is not that there exists some formal mechanism for regulatory interaction across the entire European region, but that it is clear that there is a broader European identification extending beyond the Common Market. This does appear to carry with it a rather informal mechanism whereby member and non-member states can attempt to settle their various differences.

Informal Procedures with Regard to Exports

Since the European motor vehicle producers are generally quite dependent upon exports to nations whose regulatory structures differ from those in Europe, it is clear that they face a class of problems in meeting regulatory requirements on smaller portions of their product line. We did not perform extensive research into this area, but we did participate in discussions which at least deserve mention here. It appears that the European producer companies have devised quite informal mechanisms such as joint research collaboration, and common purchasing patterns which allow them to access the required technology to maintain their exports to highly regulated markets. Perhaps the best case of this would be the various joint ventures on engine technology which have allowed several small producers to share the development costs of emission control equipment. In addition, it is also clear that several government agencies, trade associations, and producer research groups have thoroughly investigated the regulatory performance requirements in other nations, and have helped devised commercial systems to minimize their impact on European export sales.

This is not exactly a matter of public policy, or of regulatory policy, except with regard to the area of anti-trust. It is quite clear to us that the commerical producers of motor vehicles are allowed, and possibly encouraged, to interact among each other in such a way as to minimize the damaging effects of offshore regulation on the European production base. This is in marked contrast to the policy of the United States. In the U.S. such joint efforts have been specifically prohibited among American producers by the legalism, often termed the "California Consent Decree" of the late 1960s, which mandated completely independent research and development operations on emissions controls among American producers. Such specific prohibition of collaboration would not receive very high favor in Europe, and it appears that general European anti-trust policy actually encourages the opposite. In effect one might call the European policy a "cartelization" of " socially desirable equipment production." In essence this philosophy allows collaboration so that the regulated equipment does not become a barrier to entry or a wedge which would increase the competitive disparity among producers. We suspect that similar collaboration will be encouraged as the Europeans seek to reduce the emissions of their vehicles in general, or to force other technical changes into the motor vehicle industry.

In summary then, our fundamental conclusion is that comparing regulatory structures in the United States and in Europe is like comparing apples and oranges. The basic philosophical tenets on both sides of the ocean are so vastly different, and the European industry structure so unique, that direct comparison should not be attempted. Although there are problems and benefits to each of these approaches, it was a common consensus at many of our seminars that existing U.S. policies would stand to benefit greatly by making use of some of the lessons learned among the Europeans as they have attempted to address problems stemming from motorization.

DATA AND ASSESSMENT: MAJOR WEST EUROPEAN AUTO PRODUCERS

The following discussion concerns the major West European automotive producers and it includes both data and discussion on each of the major producers. Discussion shall focus heavily on the major producers, and will not contain comprehensive assessment of some of the smaller producers. After research commenced on the project, it became evident that many of the smaller producers were poorly represented in documentation concerning the European industry. This occurs because of several reasons. A number of the smaller producers in Europe are essentially sub-contractors to larger producers, and or privately owned corporations, therefore, they have little requirement for publication of company results. In addition, for other producers, such as Alfa Romeo, their role as small regional companies, often with complicated ownership patterns, means that very little information is available on them in the English language. It felt that translation of these somewhat spotty documents pertaining to these companies would not be cost effective, because their position was not fundamental to the description of the overall European industry. Owing to the unique structure within Europe, assessment of the five or six major producers, reveals about 90% of the information available on the total region. In addition, as is mentioned elsewhere in this document, many of the industrial relationships among companies are private, and are not subject to public reporting.

Before proceeding with company-specific analysis, several general discussions are in order, concerning the functional analysis contained within each company section of the deliverable.

Product Plans

We have noted a distinct difference in reporting company product plans between the United States and Europe. In general, it was quite easy to obtain information on near term product plans of the various European companies, say on various vehicles within a year or two prior to their introduction. However, for a variety of reasons, it was much more difficult to obtain public information on production plans extending five or more years into the future. In the United States, owing to recent reporting requirements of various regulatory agencies, and because of a common practice of intensive press reporting, it is generally easier to find broad product plan statements in the public record from the various American car companies. In Europe, the only public information concerning product plans this far into the future relates to the show cars often delivered to the auto shows by the European car companies. Such show cars are very often only design exercises, but upon careful examination one can discern at least the product type trends being followed by the various national producers.

Another cross-ocean difference made it difficult to discern future European car plans. In the United States, owing to the arms-length relationship between car companies and tooling producers, announcements of tooling buys tend to be relatively public. In Europe, where the common practice is a much more private relationship among car companies and tooling makers, it was nearly impossible to find analogous announcements of tooling purchases. In many circumstances, such as the case with Fiat, Renault, and Volkswagen, the major tool making divisions are internal to the car companies, and produce almost no external announcements concerning tooling acquisitions. As a result, this useful indicator of future production directions is simply lacking in the European sphere. As a result, one should consider our discussions of product and production plans of the European producers to be speculative in some cases, and largely based upon past behavior and current trends as exhibited at the various auto shows.

Production Capacity

It is important to understand that production capacity should be defined in two ways: the "quantity" of capacity, and the "quality" of capacity. It is also very important to understand that capacity is a very flexible and volitile concept. While each machine may have a capacity in terms of its overall speed, such large combinations of machinery as represented by auto companies are much more flexible in the degree to which they can exceed "rated capacity". In addition, a company's "capacity" can be changed radically by the mix of cars produced using the same form of machinery. At any given point it may be an engine line or a transmission line or an assembly line which is the constraint on the overall production, and shifting cars in the mix or changing outsourcing patterns can allow certain of the constraints to become irrelevant, thereby increasing or decreasing effective capacity. In addition within Europe the strong current drive towards flexible machinery produces another situation. Given the new types of production tooling, a manufacturer can change the amount of his effective output with relatively small changes in tooling, compared to history. In addition, the sharing of engines, drive lines and other key componentry between companies in Europe means that a potentially constrained producer could easily get access to another component elsewhere, thereby raising his effective capacity compared to the tooling that he owns himself. Because of all these complexities, it is difficult to define capacity in any absolute sense, especially when one is interested in projecting from a current estimate to estimates three to five years from now. Therefore, in this report we have made no attempt to construct an essentially temporary and artificial estimates of current European production capacity. Suffice it to say effective European production capacity should not be very much different from its peak levels in the past. However, it is clear that the nature of this capacity and its ability to respond to differential shifts in markets is becoming quite flexible and radically different from history.

We are concentrating however on the quality of European capacity. That is, new developments in the flexibility of individual producers, new tooling investments. In essence, we are focussing on the strategic attributes of capacity, the dynamic quality rather than the static quantitative estimate.

Financial Strength

Much of this project consisted of gathering the rather diffuse financial information available on European companies, and attempting to draw common grounds of comparison with other multinational producers. This effort has been only partially successful for several reasons.

First, financial records for several key players, namely Fiat, Peugeot, BL, Saab, Volvo are not easily compared to other producers. This is because the companies are eigher highly diversified away from autos, or because they have been radically restructured several times during the past decade, making their accounts quite inconsistent over time. At best it was felt only general financial observations could be made with regard to these producers.

Second, international differences in accounting, financial reporting, and financial organization mean that it is as yet still impossible to bring all international producers to a common set of definitions with regard to financial strength.

For example, using traditional "American" ratio analysis, one finds German companies with both very high debt levels, and also very high "working capital" levels. This results from different definitions of "working capital", and a different financial system which allows production use of high levels of long term external capital.

For the purposes of this document, selected financial line items for several companies were chosen to illustrate general financial performance. It is vitally important to emphasize that these data should <u>not</u> be compared <u>across</u> companies, but should be used to judge a company's performance over time within its own accounts.

General conclusions are as follows.

German producers are the most financially strong companies in Europe. They have followed a consistent pattern of high investment in new products and production technology, which provides consistently high gross product cash flows. Net operating cash flows for these companies are consistently thin, reflecting the fact that they immediately reinvest incoming cash in new products and tooling, keeping the companies quite up to date. Both VW and BMW have faced serious financing requirements, but their long-term performance is still quite substantial.

Renault and PSA split the French industry. Renault is generally sound on a long term basis, but has current problems in commercial vehicles and in car product conversion. PSA faces serious problems of consolidation (largely of the former Chrysler assets) and internalization, and its financial fundamentals should remain under pressure for several years.

European divisions of Ford and GM are currently quite strong, and some feel may be headed for a period of pre-eminance in the European industry. Ford suffers operating inefficiencies in Britain, but is a strong performer overall.

Saab and Volvo have recently become strong financial performers via diversification and successful upscale positioning of their motor vehicle products. It is instructive that they have achieved this success, despite having home markets open to Japanese competition, with high rates of import penetration. Researchers on the project believe this indicates the type of competition which can be successful in light of the new Japanese global position.

Fiat and Alfa Romeo both remain under financial pressure, but both have made successful recovery moves. Via ventures with Saab and Nissan, Alfa appears ready to broaden both product offerings and geographical deployment. Fiat has successfully retrenched, and appears capable of marshalling increased financial performance from a smaller volume base. Both companies still face significant risks.

Financial and operating data summaries are appended to this section of the report.

COMPANY SPECIFIC DATA AND ANALYSIS

FORD OF EUROPE

Although Ford of Europe is reported in the Ford international annual reports as an integrated operation, in practice it should be considered a largely distinct operation integrated only in equity and management reporting terms. In recent months during the middle of 1983, the Ford European operations have collectively taken the lead in Europe-wide car sales. Such volume leadership is often a fleeting thing in Europe, so these recent sales patterns only serve to indicate that Ford of Europe is generally near the top among European producers, not that it is the dominent European operation. The legal structure of Ford is extremely complex, but it can be boiled down to essentially two operations, Fordwerke in Germany and Ford U.K. stationed in Great Britain. Together, these operations span the Ford production system in Europe, and comprise the two most powerful financial centers of Ford in Europe. Ford's European headquarters are actually maintained in the United Kingdom, so technically the German operation reports to it, but most European respondents felt that the management of the various organizations remains fairly close and integrated.

The collective economic power of Ford of Europe should not be underestimated. During the near depression of the North American market from 1980 through 1982, it is clear that Ford European operations provided several billion dollars of financial assistance to the North American operation. Given this infusion of European financial resources, the North American operation was capable of sustaining the economic blow, and of retrenching in such a way as to produce its recent financial improvement as car sales rose in North America. It has long been clear to international observers, and is demonstrated in tables at the end of this section, that Ford's international networks during the 1970s have gained supremacy within the Ford worldwide family. In fact, in recent years, Ford has employed more workers outside of the United States than it has employed inside the United States. While the data are not as clear on this issue, it appears that the greatest amount of Ford's profitability and financial strength now lies outside the U.S. car and truck divisions. In essence, the Ford European network holds many of the cards in the future of Ford as a global entity. It can be expected, then, that Ford will do everything in its power to remain strong within Europe and to transfuse many of the European strengths to other portions of the globe.

Product Mix and Product Plans

The European operations of Ford provide a "full line" product mix in the European sense. The various divisions make use of a four platform strategy with derivatives for varying national tastes. (Some observers call this a three-platform product line, with the larger vehicles being conceived of as derivatives of a common platform.) At the low end the Ford line is represented by the Fiesta, a car which had been imported to the United States for some period of time, but whose importation has now been discontinued. This product is roughly the same size as a number of the small cars in Italy, France, and Japan, being slightly larger than the pre-1984 Honda Civic. As is the common practice within Europe, Ford presents the Fiesta in a number of performance configurations ranging from an econobox model to a powerful and sporty small car. A newly designed Fiesta will be introduced shortly in Europe, but the product design is relatively similar to its historical antecedent, being changed primarily through reskinning of sheet metal. The product change on the Fiesta can be considered roughly analogous to the level of change on the current Volkswagen Golf, or Rabbit, in that it retains the basic boxiness of the vehicle, but rounds off corners in the current trend of European "aerodynamic" styling.

Immediately above the Fiesta line, Ford presents its European Escort version. This Escort, while roughly the same size and configuration as that in the United States, is by no means a similar vehicle. The body styling on the European Escort is far more linear, in the European tradition, and the range of performance options available is broader than that available in the United States. The Escort is expected to be a major bread-and-butter model for Ford during the remainder of the decade, and one can expect its major design attributes to remain steady during the 1980s. One should expect a major re-skinning of the product within several years, probably again following the aerodynamic trend so pronounced in the Sierra line of Ford products. The combined sales of the European Escort and the American Escort has lead Ford to advertise the Escort line as the most popular selling car line in the world, outstripping the Toyota Corolla which previously held this position.

Above the Escort line, Ford produces a now expanding range of Sierra products, a radically new car design introduced in 1982. Although the body of this product is radical in terms of styling, the running gear and engine family has been essentially carried over from previous Ford products in this size segement. This has left the Sierra with an extremely wide range of engine sizes, which, assuming the styling sells well, should serve this product line into the early 1990s.

Above the Sierra, which is a mid- to large European model, lies the even larger Granada series produced by Ford. In its current configuration, it is a relatively old design, and Ford has been doing the advanced design work on its replacement for quite some time. Introduction of the new Granada model should occur shortly, certainly before 1986, although we have been unable to find spy photos or advance announcements of its design. We suspect that the new Granada will follow the current Ford trend towards aerodynamic styling, and we suspect it will carry with it many of the styling attributes in the more advanced "Probe" series of show cars displayed by Ford at auto shows around the world. In the Granada line, Ford presents a product to European consumers which represents perhaps the lowest end of the luxury scale of cars in Europe. The Granada is said to compete directly against the smaller BMW, Mercedes, and Rover series cars, in that it is a relatively large vehicle with a high degree of interior appointments, and a significant luxury options load. Ford has been recently trying to shuck off its "stodgy" image in Europe, and it might be expected to continue this in the new Granada replacement. If this is the case, one might expect a level of power train options designed to make this car competitive with the truly grand touring cars of Europe.

Although it has not been explicitly the focus of this research, it must be mentioned that Ford has a significant presence in the truck market within Europe. Truck sales are not as dominent in the sales mix, as they are in the United States, but Ford has introduced over the years a number of very successful vans and light and medium duty trucks. The Ford "Transit" line of vans is currently under revision, and one can expect its new models to more closely match up with the light Japanese vans recently introduced with great success to the European market.

Financial Strength

As was mentioned earlier, Ford of Europe is extremely strong financially and has proven itself capable of supporting even the North American cash deficits on top of its own internal financing requirements. Many observers have noted that much of Ford's European financial strength is derived from a structure of inherently high prices in the British market, which allows producers within Europe to build cars efficiently out on the continent and sell them at relatively high prices to British consumers. It was assumed that with the revision of this pricing structure, Ford's European financial success might face some pressure. Although we do not have 1983 financial results available, it appears that any such changes have not been overwhelming.

At this point, Ford of Europe appears to be left alone to perform its own required investments without great fiscal drag in terms of cash drains from North America. It is the judgement of the analysts that North American operations have been left to "sink or swim" and that Ford of Europe is allowed to enjoy its current strong position. Given recent unit sales increases, the European operations should remain financially strong throughout the decade.

Tables at the end of this section provide financial summary data on the Fordwerke operations. Such data can be used as general indicators of Ford's financial performance in Europe, since these will be largely integrated with the U.K. operations. It is clear to most industry observers that Ford operations in the U.K. are not nearly as efficient as those in Germany or in Belgium, and therefore that production costs in the U.K. are probably out of line. Ford has recently instituted major automation in the

United Kingdom operations, which should serve to enhance production efficiency in this location. However, given the continuing potential for labor unrest in the United Kingdom, the outcome of this automation program is yet to be realized. It has been noted that Ford could radically improve its European financial performance by eliminating many of its operations within the United Kingdom, but such eliminations carry with them great political risk, which could far outweigh any gains in European-wide production efficiency. Therefore, one can expect Ford to continue its U.K. presence, and that such operations will represent somewhat of a "drag" on the European situation.

Production Capacity

Ford of Europe's production capacity is essentially split between the Continent and the United Kingdom. This split is more than geographic, because the apparent efficiency of the two geographic regions is markedly disparate. Ford's major production centers are several big plant complexes in the U.K. and several in Belgium, France and Germany. The latter three are so close, in U.S. terms, as to be practically considered one production belt. Ford is initiating moves in Spain and possibly in Portugal over the long term, but the outcome is much less certain than other production plans at this point. Ford has recently introduced a new model called the Sierra, with production capacity both in the U.K. and in Belgium. This production capacity is extremely flexible given that it contains several hundred new robots for a variety of functions. And the Sierra can make use of four to six different types of engines, meaning it can draw from a variety of engine lines with few constraints. The current problem is that production processes in the U.K. are hampering effective output. Most observers suggest that much of the U.K. output of the new Sierra and older models is essentially labor-intensive fabrication achieved with difficulty. Observers indicate similar problems with the component lines made by Ford in the U.K., even though these are now running fairly well after several years of launch. Ford's operatons at Genk, Saarlouis, and Cologne are reputed to be considerable more efficient and capable of building above rated capacity. It is possible that over the long term revolutionary shifts could occur in Ford's European deployment. For example, a number of observers say they would not be surprised to see Ford close many of its U.K. operatons, possibly following the Vauxhall strategy of KD production. Ford appears committed to a presence in the U.K., but certainly could face some production realignment in its existing plants.

VOLKSWAGEN

Product Mix and Product Plans

As was the case with most international motor companies, starting in the late 1960's Volkswagen engaged in a variety of mergers and acquisitions which expanded the basic product scope of the company, in international terms. In addition to various small acquisitions of capacity in a number of offshore production sites, Volkswagen became fully integrated with the Audi operations. During the 1970's, Volkswagen major product activities included resolution of the long-run Beetle, finding its successor, and broadening its product lines into the upper segments of the international markets, via the Audi group.

The Volkswagen product rationalization occurred in two major steps. First, during the middle 1970's the company introduced a variety of front engine, front wheel drive platforms which gradually superceded the old Beetle product line. Then during the later 1970's Volkwagen moved upward, spinning off higher scale derivatives of the basic Rabbit and Dasher lines, and redoing the entire Audi product slate. As of late 1982, Volkswagen had begun yet a third major product introduction program, largely designed to bring the product line of the late 1970's up to the most advanced technical levels, and create a number of specialty variants derived from the basic high volume platforms.

Although the product line of Volkswagen worldwide is still fairly complex, including models produced only in some offshore or export markets, the Volkswagen product line can be roughly described as a four-platform mix. At the low end of the mix is the Volkswagen Polo model and its various derivatives. The Polo is similar to its larger brother, the Golf or Rabbit, and appears in many respects to simply be a scaled down Golf platform. It is sold in a variety of configurations, allowing it a great amount of utility in various European market segments. For example, one model resembles a small station wagon, and gives this rather small product a "van-like" usefulness. The Polo also comes with a variety of drive train options from very fast and sporty, to extremely fuel efficient.

One step up from the Polo line is the Golf model, known as the Rabbit in North America. One should consider this product line to also include the Jetta, which is essentially only Golf with a boot. While the Polo has been recently redesigned and can be expected to remain in its existing form for a number of years, the Golf, having first been designed in 1973, is about to undergo a major refurbishing. Final product photographs have finally become available in late summer 1983, and it is clear that Volkswagen is following its historic incremental change strategy. The new Golf model, despite a number of significant changes in technology and body construction, appears at first glance to be very similar to the old model.

The major differences include a rather significant gain in interior volume and carrying capacity, and general upgrading of drive line and control technology. Volkswagen has consistently indicated that they do not like the "planned obsolesence" strategy often employed by other international car companies. They feel that Volkswagen role is to provide steady product improvements for their customer base, without devaluing the Volkswagen cars already in customers' hands. There is generally wide disagreement internationally on the success of this strategy, although it does appear that Volkswagen will remain with this strategy, perhaps with a lower but less cyclical volume base.

The next step up in the Volkswagen product line is represented by the car line which is called the Passat and Santana in Europe, and the Quantum in North America. This is a front-drive model considerably larger and more luxurious than the Golf model, a product which is targeted towards the mid- to large end of sales in Europe, and the growing fuel efficient mid-size segments in North America. It is also the model currently under joint production development in the arrangement between Volkswagen and Nissan.

Although the two products are meant to be distinct, the Volkswagen Passat line is extremely similar in product concept to the Audi 80, known in the United States as the Audi 4000. There are differences in structure and trim between these two cars, but they share a number of components and are often indistinguishable upon first glance. Volkswagen has used the Passat and Audi 80 lines to push upward into what might be called the "mid-luxury" segement of international markets. These product lines carry standard trim in their downscaled European versions, but are sold in international markets as low brand luxury cars. For example, the Dasher, the predecessor to the Passat, once commanded prices in the $5,000 range in

North America, but now in its turbo diesel version approaches $15,000. The Audi 80 model has likewise been pushed up often into the $15,000+ range.

The Volkswagen lineup is rounded out at the top end by the Audi 100 series, known as the Audi 5000 in North America. Although similar in general shape and line to the Passat and Audi 80 models, the 5000 is noticably larger and generally more powerful. It has recently been redesigned in what might be considered a state-of-the-art application of aerodynamic body technology, yielding an extremely distinct and seemingly advanced product. Volkswagen claims to have the lowest drag coefficient on this car of any passenger car produced in normal production in the world. With the introduction of this product, Volkswagen has clearly signaled its intention to move upscale into territory formerly occupied by Mercedes-Benz and BMW. This model also perhaps best represents the overall German strategy with regard to the Japanese rise in international markets. Most observers feel the Germans intend to capitalize on their long engineering tradition, by producing a distinctly "Teutonic" set of vehicles, of "understated technical sophistication".

It remains to be seen what kind of international volume such a specialty strategy can maintain, especially given recent Japanese forays into relatively sophisticated but cheaper large cars.

One should also mention that although Volkswagen has very little historical tradition in producing trucks beyond the generally well accepted van, it has recently acquired interests in medium and heavy truck production, through acquisition or joint ventures. Most observers do not feel that Volkswagen will become a premier truck producer, but that it will form one facet of an increasingly internationally joint-ventured truck industry.

With regard to future plans, Volkswagen should not be expected to bring out any radically different new platforms. However, it is expected that the company will continue the trend towards advanced aerodynamic styling and an increasingly technological sophistication of its drive lines. It also appears that Volkswagen intends to proliferate its recently introduced four-wheel drive passenger car technology down through the rest of its product line. This is a common trend acros a number of European producers at this point. Volkswagen's first entry in this category was the high sport, high luxury Audi Quattro. In this product Volkswagen combined a high grade of luxury interior, extremely powerful engines, and a performance oriented four-wheel drive configuration. Audi has recently introduced this configuration one step down in the product line, and many observes expect a similar layout to soon be offered in other Volkswagen products.

(It should be noted that Fiat may have opened more ground for such a product strategy, through the introduction of its new four-wheel drive Panda model. The Panda is generally considered a low scale utilitarian small car, but Fiat's introduction of four-wheel drive performance may open new opportunities in this product segment, generally.)

When considered in its entirety, the Volkswagon product line appears capable of sustaining the company through most international market changes of the coming decade. Volkswagen, however, is being threatened by Japanese products in a number of its offshore market areas. In the United States, Volkswagen has lost its position as a low cost auto supplier and must reposition itself as a more upscale producer, capable of delivering significant value despite higher prices. In a number of its markets in developing nations, Volkswagen is facing the full force of Japanese low cost utilitaritan products. It seems apparent that Volkswagen is dedicated to meeting this competition, because as other producers around the world being to drop their capital spending on new products, Volkswagen suggests it will enter a period of increased capital spending.

Capacity Issues

If the company is successful in this regard it should be able to generate sufficient financial results while avoiding a bloody battle in the low end of the market. If such upscale positioning does not work for Volkswagen group, and prices cannot be pushed pushed into the Mercedes-Benz range, then Volkswagen faces an even more urgent requirement to cut production cost and thereby maintain financial strength. Volkswagen has indicated it will try to come out with extremely advanced engines and drive lines. As mentioned earlier in this report, Volkswagen is completely refitting its German production capacity. It also faces extremely difficult decisions with regard to capacity in North America, Mexico and Brazil. We have no special indication of how these decisions are likely to move. It is clear however that senior Volkswagen management is currently traveling around the world assessing the situation in these areas. Capacity decisions of this nature are obviously quite sensitive to political moves such as the recent attempt at local content in the United States. The most likely guess of various observers is that Volkswagen will seek to maintain a presence in a number of offshore markets, while still pulling back some excess capacity there to reduce the amount of exposure in these volatile areas.

Volkswagen is clearly in a stage of evolutionary progress. While the company has used essentially the same production facilities since the 1930s, they have expanded throughout Germany in component plants, and throughout the world in both componentry and assembly. At this point extremely large investments will be taking place in their home facilities, leading to what we judge to be perhaps the most efficient and flexible production technology available. The VW Wolfsburg works are unique in their pattern of layout and in their organization of work. It is clear that Volkswagen has many unique concepts of production flow, and that they are improving upon the existing processes rapidly. While VW does not appear to be adding new brick and mortar, productivity gains obtained with the new process tooling should allow an effective expansion of production capacity depending upon the size of the work force employed.

Financial Strength

Volkswagen is in a state of financial disruption. U.S. and Brazilian production operations have fallen off far more powerfully than would be indicated in the financial statements (offshore results are covered by profitable German exports). Sales within Germany have fallen to a certain extent and have also been squeezed on the profit margins. Sales elsewhere in Europe have generally been strong though, and the company appears to be stabilizing what could have been a crisis situation. Economy measures are being instituted across the board in all divisions, in all countries. As mentioned earlier, there is a significant investment program in new tooling and products taking place; this has not stopped, and appears to be within the reach of current VW financial strength. A disturbing trend however is the increasing inefficiency of labor, measured in net terms. VW has obtained significant improvements in production efficiency, but workers have obtained even larger gains in time off and breaks, cancelling out the gains in efficiency and raising the costs. This will be a tricky financial situation for VW to solve.

It should be expected that VW will finance its pending product lines well; that the company will move "upscale" around the world, getting higher unit profit margins; and that it will therefore recover and prosper financially, barring global economic recession.

RENAULT

Production Mix and Plans

As discussed earlier Renault is a full-line producer of vehicles, with an increasingly multinational flavor. The one remarkable thing to an American analyst is the amount of "antiquated" products that Renault sells in its European markets. Some of the old models like the R4 appear almost to be pre-World War II design, but they sell extremely well for their utilitarian characteristics. As mentioned above Renault will be rationalizing its plants and converting its product lines almost completely during the next five to seven years. The R9, or Alliance as its known in the U.S., presumably represents the new Renault style of sophisticated handling and technology which is just short of state of the art design. It is assumed that the R5, an aging design, will receive such treatment shortly. It is also clear that the R20 and 30 Series, the larger cars, will have to be revamped if they are to compete against the advancing products of Germany and Japan. This product redesign program should produce changes in Renault's offshore operations, depending upon its success in those markets. However it appears that Renault will be subjected to continued French nationalist presures to abstain from outsourcing.

Production Capacity

Renault's production capacity appears to be bearing the fruits of a ten-year rationalization and investment program. Like Fiat, Renault produces its own production technology, and it has installed considerable amounts of robots and new tooling in a large number of its plants. As is typical of the European producers, Renault's production falls into large complexes, larger than those in the United States. Through integration of the component production and assembly within these complexes, Renault appears to be making great strides in production efficiency. As with the other companies, this production efficiency gain can increase capacity without the necessity of adding new plants. However, as mentioned above, it is also quite flexible so it is not clear what Renault's "flat-out" capacity is. Renault is also the second clear example of the European-based producer investing offshore through its American Motors penetration of the U.S. Given the need to achieve high scale economies in component production these offshore facilities similar to those at Volkswagen are redefining the meaning of European capacity.

Financial Strength

Renault's financial position can be described simply: it is quite successful in cars, and not very successful in other vehicles and non-automotive products. If the sales pattern of the new American Motors/Renault Alliance car continues, Renault's financial situation should improve greatly. The current strength of the dollar against the franc, and the pricing of the car in the United States should yield good financial returns to the Renault organization. At home Renault is riding a similar success on a couple of European models, but it faces reorganization in industrial vehicles and in some other industrial product areas. It has stated an intention to go outside for financing, which would assumedly include some additional national contributions but this capital is needed for long term purposes, not for any short term cash crisis. Renault's significant financial problem in cars appears to be its "requirement" to buy componentry within France. France's suppliers are not well rationalized, which produces generally higher cost, which could also affect Renault's financial performance. It is the judgement of the analyst that Renault is well positioned in most areas, and should remain a significant global force. Most observers expect that Renault will gain possibly 200,000 or more units of North American sales, and that new products will keep it strong in Europe.

FIAT

Product Mix & Plans

Fiat is also in the middle of a five-year new product introduction series. The first move was actually a light one in the redesign of the Strada vehicle. Fiat has recently hit the market with a brand new platform beneath the Strada, called the Type One. The car is actually competing in the Opel Corsa class although it appears to be designed for a broader range of product applications in that market segment. The car will have three engine options ranging from extreme economy to super performance. It should be able to outscore the Corsa on most performance attributes, and to the casual observer it appears to have greater interior room and utility. Somewhat unique in the Fiat lineup is the Panda car, a larger and boxy minicar with a very high utilitarian content. For example the seats can be removed and washed in a washing machine, and they can be adjusted so the entire inside of the car becomes a bed for camping. This Panda vehicle represents a long tradition of utilitarian uniqueness in the Fiat product line, and one should expect this to continue into the future. Above these smaller cars Fiat has two large car platforms which are still of older design. The overall Fiat product strategy requires that these two cars be updated through fundamental body and technology changes over the next several years. Judging from both the product strategy and the new technology in the plant, it is clear that Fiat would like to expand production volume, now that is has completed this retrenchment. However such moves will be quite difficult, given the fact that this is the desire of most European producers. Recognizing this difficulty, Fiat appears ready to engage in joint ventures on componentry with a variety of other companies in Europe. It should be noted that the Fiat group consists of many divisions making non-automotive products, many of which are very strong performers. Therefore one cannot simply conceive a Fiat as a car company.

Production Capacity

Fiat has also recently undergone a drastic retrenching in terms of production capacity and labor force. The automotive labor force at Fiat has essentially been reduced by more than 25% during the past couple of years, and plant consolidations have followed a similar pattern. It is interesting that Fiat's capacity consolidations almost appear invisible from the outside. This is because Fiat has some of the largest plant complexes in the world, and consolidations are simply taking place within very large buildings. Combined with brand new product lines which will be phased in over the next five years, this production capacity decrease appears to allow Fiat a newly revitalized strategic position. As is well known, Fiat uses its own production process technology, which is extremely flexible. Based upon limited analysis, it appears to us that Fiat could easily expand capacity within any six month period without significant tooling investments, owing simply to rearrangements in flexible production tooling.

Financial Strength

As with British Leyland, the accounts for Fiat are very difficult to interpret. Fiat Auto is part of a large conglomerate grouping which receives a variety of subsidies and assistance under Italian law. As a result, the financial accounts of the company include a number of special provisions and unique forms of accounting, which are very difficult to interpret and to compare to other countries. It is clear, though, that the financial situation of Fiat had been extremely poor and now has improved quite rapidly. The company has evidently achieved a turn around over the last two years, not only in production but in financial strength. As to the future extent of this strength, it appears the company can make money near its current unit volume, but world-wide expansion in the next two years seems out of the question owing to low financial reserves. The company is a significant force in production process technology, and could gain financially from the sale of its robots and its production methods. However, it is not clear how large a market for these products will arise. Again, this is another recently stabilized company with a somewhat uncertain future and a strong management. The new strategy will tell everything.

GM of EUROPE (OPEL and VAUXHALL)

OPEL

Product Mix & Plans

GM is also a full line producer in the European context. It strives through Opel to run models from four basic platforms and their derivatives.

At this point Opel is in transition from old designs to new, therefore it is holding in production more platforms than it normally would. The new marque important for Opel is the Corsa model being produced in Spain. This represents a new front wheel drive move into the low end of the market, a market segment of heavy competition, including pressure from the Japanese, the French, the British and the Italians. Opel seems to follow the General Motors strategy of picking the average car for the market segment, rather than trying to redefine or lead market segments. Observers therefore expect good performance in terms of sales volume but no significant changes in the market serviced by Opel. The Corsa is actually a follow-on to the recently introduced Kadett model. The Kadett model appears to be the old world-car concept "sub-J" car, which was to have been produced in several other nations also but which has now been farmed out to Japanese subsidiaries. The company has tried to achieve a very strong "family" appearance among the different platforms. To some observers this has resulted in an overly strong conformity among the products, however others consider the family image to be very important for the often asserted loyal consumer base attributed to Opel customers. Opel indicates no intention of radical change from this typically GM style product mix, and therefore we would also expect no radical shifts in terms of production capacity. It should be noted that Opel, like other General Motors divisions, is obtaining componentry from around the world, but this should not shift Opel's German production significantly.

Production Capacity

Most of Opel's production capacity is concentrated in West Germany with the exception of the new plants (actually GM parent) located in Spain producing the Corsa model. It is difficult to project Opel's true production capacity, because it now receives so much from General Motors international operations. For example, engines and transmissions are generally thought to be the constraints on the production of a car line given that assembly plants are relatively flexible operations. Opel is now capable of getting engines and transmissions from any of General Motors international operations, including the new Japanese sources of supply. It is quite clear to us that Opel is used to accepting components from a variety of different areas, so it seems feasible that Opel could become part of the worldwide network. It is also evident that Opel is investing heavily in its new facilities, probably representing a significant portion of General Motors off-shore investment which has been rapidly rising over the past two years. Completely new facilities for painting, stamping, engine assembly, and welding have been deployed within the past 18 months. No one appeared to be sensing an increase in absolute production capacity, but it is clear that the company is feeling more optimistic than General Motors parent in North American operations are.

Vauxhall operations in the U.K. have recently been integrated with others in Europe. Essentially GM has made the U.K. operations a stage for assembly of components made elsewhere. For example, several of its recent successful product lines are produced from knocked-down kits made on the Continent. This strategy appears capable of good results.

Financial Strength

It is difficult to separate Opel's financial strength from that of General Motors, but several things are clear. Opel has been fundamentally profitable, helped by a tremendously loyal consumer base in Europe. In addition, General Motors of North America has not really pulled funds in from Opel, and in fact has increased investment via Opelwerke in Europe.

Opel's new model, the Corsa, should be at least a successful product line which should continue the present strength of the Opel operation.

VAUXHALL

Product Mix and Plans

Vauxhall products are essentially the same as Opel with cosmetic sheet and trim differences. One item in the Vauxhall product line is notable. The Cavalier model, the British J-car, has been extremely successful, both with the average motorist and with some of the sports-minded auto press. This appears an extreme contrast to the comparative early failure of J-car models in the U.S. Observers have indicated the same kind of problems of U.S. versus European finish and design on essentially the same vehicle, as that noted in the Ford Escort case. Apparently the European Cavalier has no radical difference from the U.S. J-car, however the tightness of shifting, the tuning of suspension and the evident quality levels are all asserted to be better in the European versions. It is asssumed that the Vauxhall product mix will follow Opel.

Production Capacity

Many of Vauxhall's sales are really the sales of units made by Opel in Germany. Vauxhall has essentially become a small British manufacturer, and a rather significant assembler of knock-down kits made in Germany. Vauxhall indeed owes Britain a certain amount of content, but it is not clear that full blown production operations will remain over the next ten to twenty years. The major British question concerns the truck operations of General Motors currently centered in the U.K. operations. It is clear there is alot of truck activity occuring between these operations and

Isuzu, but it is not clear what this means for production capacity of the British unit of General Motors.

Financial Strength

It is even more difficult to separate the Vauxhall operation from the others within General Motors, because the company appears to be almost a "shell" corporation. Preliminary analysis indicated that, considered as a British company, it is not very strong but if considered as a marketing arm for Opel and GM it appears to be in a stronger position. More detail is required to assess the financial condition. It should be also noted that much of production in Britain is a political process, given the fact that it is not very desirable for anybody to invest there in existing auto facilities for natural reasons.

PEUGEOT (PSA)

Product Mix and Plans

The product mix and production plans of the PSA group are undergoing severe change at the moment, indicating a rationalization plan which should take ten years to complete. PSA is trying to combine the product lines of what were formerly three competing car companies. This is a very difficult task, which requires balancing the need for product standardization on one hand and the need to maintain buyer loyalty on the other. Taken as a whole the PSA operation is a full-line producer, covering all market niches with the exception of the smallest minicar lines. The company also covers a range of product imagery, from the staid luxurious Peugeot models, to the technologically advanced if often "bizzare" (by American standards) Citroen models. The Talbot identity at this point seems quite mixed, making the product line a likely candidate for excision. While the rationalization program at home will occupy most of the energies of the PSA group, it should be remembered that PSA managed a largely successful international sales program in market areas outside of North America. At this point however PSA is experiencing extreme pressure from Japanese competition in those market areas, even though not in France, and it will have to take measures to respond to this. Further work is required to define the potentials open to PSA, since assessment of their product plans from outside the company requires a series of scenario projections. It is the opinion of the analysts at present that Peugeot will follow a three-platform strategy, Citroen a four-platform strategy, with Talbot borrowing from each.

Production Capacity

The PSA group is currently trying to digest the production capacity acquired in several of their mergers. Peugeot and Citroen, the first partners, are seeking some joint economies which would allow condensation of production capacity. The major problem centers on digestion of the Talbot group obtained from Chrysler. This is not simply a problem of production capacity, but rather one of marketing combined with production. It is not yet clear what model lines should be kept alive, and until this decision is made it is not clear how the production should be organized around it. However, PSA is taking great strides to winnow down excess capacity on componentry, and to make considerably greater use of suppliers although this may be a temporary phenomenon. PSA is also constrained by the typical French phenonmenon of nationalism. PSA has essentially been "ordered" to obtain significant amounts of componentry in France. The French government would disagree with this characterization, however, most producers speak quite openly in these terms.

Financial Strength

The companies of Peugeot and Citroen within the PSA group appear to be relatively sound financially. It is the observation of the analyst however, that the Talbot facility recently brought inside represents a financial drag on the entire system. Peugeot/Citroen's financial strength depends, therefore, not just upon selling new car models but upon sucessfully retrenching an overcapacitized and obsolete production system of three former companies. It is the judgement of the analyst that the Peugeot product line will have good potential for multinational success, and that the Citroen product line remains strong within Europe. However, to achieve financial stability the Talbot operations will have to be retrenched significantly. This rationalization program could take as along as five to ten years, and during the time frame the financial performance of the company should improve markedly.

DAIMLER-BENZ

Product Mix and Plans

Although extremely complex in numerical designation, the Mercedes-Benz product line is fairly stable, consisting of four major platform clusters. The most interesting new development is the introduction of the "Mini-Mercedes," the 190 Series. This will bring the Mercedes-Benz car divisions into areas of competition they erstwhile eschewed. This 190 Series will therefore be moving directly against BMW and new upscale Japanese competition. It is important to realize that Daimler Benz considers itself a prime truckmaker, as well as a maker of automobiles. Therefore strategic emphasis within the company will probably remain heavily on the truck and equipment divisions. A number of observers expect Daimler to associate multinationally with other producers in componentry on heavy vehicles. Given the inherent strength of the company, a variety of future possibilities exist in terms of both product and production expansion. Daimler has always been a rather conservative company, striving to control its growth so as to not experience "boom and bust" effects. However, continued success in existing products could promote a steadily increasing growth pattern.

Production Capacity

Our analysis of Mercedes' production capacity has been limited by the lack of available data. The company tends not to be very open about its production capacity, although it is clear that the company is changing exisiting tooling and adding new facilities outside of the Stuttgart area. Persistent rumors exist concerning some combination of Daimler's offshore truck business with other multinational producers. However, none of this has been translated into any form of production capacity at this time. New data should be forthcoming concerning the small 190 model recently introduced to the German market. This is Mercedes' first recent attempt at producing a small car, and it should be interesting to see whether the labor content or other production data change owing to this introduction.

Financial Strength

This company is simply the richest car company in the world for its size. It is borrowing more heavily, however it should be able to pay this back quite well. No one seems to be worrying about Mercedes Benz' financial strength, and our research does not contradict this position.

BMW

Product Mix and Plans

The BMW product line consists of the 3, 5, 6 and 7 Series cars. We expect little change in the general strategy of the company with regard to its product mix. BMW tends to have some of the most technologically advanced engines and drive lines available in high volume production cars, and it has been very successful in occupying this position. Company data do suggest some attempt at expansion, as mentioned above, but it is not clear how significant this will be.

Production Capacity

At this point we have essentially no new analysis of BMW's capacity, beyond public statements in the media. We assume the company will continue to follow its low volume speciality car production strategy seeking high returns at low volume. The company is beginning to branch out in terms of geographical location, especially within Europe, but it is not clear what this means for world wide strategies.

Financial Strength

BMW has had investment problems recently but has sustained a high investment program which now appears to bring sound results. Although we found no extensive data on this, we assume that BMW has quite good access to financial resources, and that it will be able to retain its premium product technology via reinvestment.

SAAB

Product Mix and Plans

The Saab 900 Series, formerly the 99, is reaching the fifteen-year-old point. This could signal an entirely new platform concept later in the 1980's from the company, which would assumedly be phased in as the 9 Series was phased out. Saab's performance positioning in export markets serves them quite well, and they should have little trouble expanding production above the 100,000 unit mark.

Production Capacity

In terms of production capacity, it appears that Saab will remain relatively stable, as it has in the past. The company is quite successful financially at its level of production and although it appears to be changing componentry purchases, it does not appear to be altering its overall strategy. Any major moves are likely to concern its linkage with Lancia (Fiat).

Financial Strength

Saab's financial strength comes not so much from the car company but from the organization of Saab-Scania, producer of aircraft and other similar technology. Saab had once been the financial drag on the Saab-Scania operation, however in recent years Saab cars have come to be very profitable and quite successful. The kind of financial success obtained by car companies like Saab generally leads their corporate officers into new strategic areas.

BRITISH LEYLAND

Product Mix and Product Plans

During the 1970's, the British Leyland product line was extremely complex, owing to the retrenchment of the company. Over its history British Leyland has evolved out of a number of independent car companies, and during the rationalization period of the 1970's the main focus of the company was to sell the older products as long as they would last, but also to produce a more integrated comprehensive product line, befitting a modern international auto company. British Leyland has just about completed its product rationalization program, and should be emerging within two or three years with a set of products designed to serve the company into the early 1990's. It should be cautioned that the company is still undergoing rationalization, for example, it has recently created a separate Austin-Rover Group, and has differentiated the Jaguar operations, and the truck operations. We were informed that the current organizational structure was intended to be "permanent" but we must realistically expect additional reorganization. In addition, it is the policy of the British goverment to begin the "privatization" of the company; that is, to gradually reduce the goverment ownership and control of the corporation, by selling its revitalized pieces to the private sector.

It is expected that the Jaguar operations will be the first to be privatized. Once Jaguar had been reorganized as a separate unit within the company, and forced to behave as a small innovative car company, it gained great strides in rationlization, efficiency, sales and financial performance. Until several years ago Jaguar had a widespread reputation for producing sophisticated but unreliable products. As a result, the company's well designed products nevertheless began losing sales to competing car makers, most notably those in Sweden and Germany. One of the first actions in the turnaround process was an all out effort to improve the reliability and quality of the Jaguar product. To this end, Jaguar management enforced very strong quality control criteria in the plant, and broke away from traditional suppliers to find component makers who would produce at a higher quality level. As a result, the perceived reliability of Jaguar cars radically improved, and sales moved upward quite healthily. Jaguar was helped in this effort, no doubt, by the gradual retrenchment in the traditionally high British labor cost. As is mentioned elsewhere in this document during the early 1970's, Britain, as did other nations, paid a premium over the average manufacturing wage to its automotive industries. With the overall demise of the British industry, our sources indicate that this premium has greatly diminished, and has left Britain with a factor cost position considerably lower than the United States and possibly Germany.

The rationalization program in the other British Leyland divisions consisted primarily of eliminating antiquated car designs, stemming from the early 1960's, and replacing them with modern up-to-date car platforms capable of competing with the Germans and Japanese. Although there had been several earlier attempts to upgrade several model lines, such as the Princess, the first real effort in this direction is represented by the British Mini-Metro. This product is a completely new chassis and body design, similar in overall dimensions to the Honda Civic, the Renault 5, the VW Polo, and the small cars from Fiat. Although the investment in this production was extremely heavy, largely financed from the British Treasury, cost savings were obtained by used of older engine and drive line componentry. Sales of the Mini-Metro in both the British and Continental markets have been quite good and have set up hopeful thoughts for eventual recovery of the British Leyland operation. The current British Leyland range of products can be divided into five approximate product categories. At the low end is the Mini-Metro and some of its derivatives. The next step up is generally represented by the joint ventured product, the Honda Acclaim. Above this product line, British Leyland has several older designs now being phased out and a new product called the Maestro, which can be considered essentially a stretched Mini. Above this, "mid-size" Maestro, British Leyland serves the market with a group of considerably larger cars in the Rover line. These cars are generally presented in luxury trim, and are comparable in size to the vehicles like the larger Volvos and Saabs, the Audi product line, and the Renault R30s series.

At the very top of the product line, in terms of international sales, are the luxury sport Jaguar models. Jaguar is represented by essentially two car lines, the XJ series and the S series. These models, in their international trim, are extremely luxurious and generally quite fast. Recently the S series has been tested in the enthusiast press along with some of the other fastest cars in the world.

This now fairly wide range of products has given British Leyland considerable breathing room and affords them the opportunity of creating a new image for themselves in international markets. It appears the company is attempting to use the successful Jaguar, and perhaps the Rover models, as a "image umbrella" to convey higher status downward throughout the product line. Judging from early reports in the enthusiast press, and in the early sales returns, this overall strategy appears to be working.

Special note must be made of the unique role of the Honda in the British Leyland product portfolio. The existing Acclaim model, and the new

XX model under development, are essentially joint-ventured product lines, not a direct marketing pass through from Honda through British Leyland dealers. The intention of this linkage is two-fold. First, it is intended to broaden the British Leyland product line, both in terms of car size and in terms of design advancement. Second, the joint production exercise was intended to transfer valuable production process techniques into the antiquated British Leyland system. Most sources indicate that this strategy appears to be successful. Barring minor political complications, primarily from France and Italy, with regard to export sales of the joint ventured product, the sales potential of this product line appears strong. In addition, respondents at British Leyland indicate they have obtained substantial improvements in production process techniques, which should be applicable to the othesuccess of British Leyland management efforts to refurbish the United Kingdom production base.

While one should not look for a merger or greatly expanded legal joining of these two companies, one must assume that the relationship between British Leyland and Honda shall continue. Given Honda's unrelenting pace of new product development, the results should be extremely interesting. One should note the variety of new products of Honda design now coming to the international markets, particularly those introduced in the fall of 1983 at the Frankfurt auto show, and at other European shows. Given both the success of the existing BL-Honda relationship, and the clear international intentions of the Honda motor company, one must assume that over the following 5 to 10 years a number of these Honda products could become available through joint production with British Leyland.

Production Capacity

British Leyland has essentially reached a point of 2/3 capacity reduction from its previous historical peak. It is evident to us that additional retrenching is going on, but it is not clear this means reduced final output. BL is now introducing the second of its new "survival" models, an upscale version of a stretched mini-Metro. The company has just been regrouped in terms of marketing and name plate affiliation, which should begin to separate production facilities into dedicated product line units. The result of this in terms of capacity should be a number of plant closings, shifting labor force and consolidation of production behind newer high volume production lines.

Financial Strength

It is extremely difficult to diagnose the financial condition of British Leyland primarily because the company has been in such tumultuous reconstruction that its accounts are not consistent from year to year. Preliminary analysis indicates the company has achieved a form of stability, but this is compared to past operations, not compared to other world car companies. It is the judgement of the analyst that British Leyland will not receive large amounts of new government money, therefore British Leyland will probably have to live with its current investment and production technology. This means constructing a company which can live off the finances generated essentially by two product lines, the Metro and its big brother, and a now rather successful Jaguar group. Our preliminary analysis suggests the company can survive the decade in this form, but only if it continues to build on its current association with Honda. Most observers suggest that Honda has not contributed sugnificantly in terms of finances, but has contributed in terms of design work and production pro-

VOLVO

Product Mix and Product Plan

It should be noted that the Volvo "product line" is now much broader than simply motor vehicles, owing to the diversification strategy pursued by Volvo during the past several years. Although a number of its attempts to link up with other companies were aborted, largely owing to political considerations, Volvo has established itself at the group level as a diversified manufacturing, financial and service company. This diversification should lend indirect power to Volvo's position as a motor vehicle producer.

Considered globally, Volvo is essentially a three-platform producer. At the low end of its international product portfolio, Volvo produces the 3 series, a model derived from earlier DAF models, a company which Volvo essentially took over. Volvo produces several versions of the 3 series, with common body styles yet fairly divergent drive lines. This product is distinctive in that in its low end configuration it is one of the few models in the world with a continuously variable transmission (CVT). This technology is a direct holdover from the old DAF, which for decades used such a transmission, often referred to as a "rubber band" transmission. Higher end configurations of the 3 series use a conventional drive line technology. This model is produced largely on the Continent and is not widely exported to Volvo's well cultivated export markets. Since the current model is relatively antiquated, it is expected that Volvo will introduce a successor with little of the holdover DAF technology, sometime during the decade. Depending upon events in international markets, Volvo might use this smaller product to supplement its product lines in export markets such as North America.

The bread and butter of the Volvo product line is the current embodiment of the old Volvo 140 series introduced in the late 1960's, now known as the 240 series. This is a relatively large car, surpassed in Europe only by the larger Mercedes and other small volume product lines. It is produced in a wide range of configurations ranging from a relatively utilitarian family configuration in Sweden, to sophisticated turbo models with high levels of luxury trim in export markets. Volvo's product positioning strategy makes heavy use of the concepts of safety and durability. And it is this model which has done so much to enhance such image positioning in the minds of consumers. Volvo has followed an incremental improvement strategy on this car model, very similar to that used by Volkswagen. Such a strategy employs relatively small improvements on a vehicle whose basic configuration does not change for many years. Although Volvo has announced its new 760 series (see below) as the Volvo for the 1980's and 1990's, it is not clear that the 240 series will be eliminated. Most observers expect various forms of revision to continue on this product line during the decade.

In 1982, Volvo developed its new 760 series, the first model to have a distinctly different body shell from the main line products since the late 1960's. In overall product configuration, the 760 series is markedly similar to the new front wheel drive GM A-bodies introduced in America at roughly the same time. In fact, some observers have noted that with this product Volvo is attempting to take a market position directly above the A-cars in terms of luxuries. In essence, given the trim specifications of this car one might almost call it a "Cadillac substitute" which GM has not yet produced in A-body front wheel drive configuration. In other markets, most notably Europe, the Volvo 760 series is positioned directly in line with the smaller size luxury products coming from BMW, Mercedes-Benz, Saab, Audi and Peugeot. We have not yet received model specific sales figures on the car in various markets, but most indications are that it is selling successfully. It should be noted that at least in the North American market this product line extends Volvo's upscale pricing even farther, with prices in dealers lots often exceeding $23,000. Following the trend among medium sized and specialty producers, Volvo has outsourced the engine on this product to Volkswagen. In essence, Volvo is using an Audi engine in a turbo diesal configuration. In other portions of the 760 series Volvo makes use of the V-6 engine, coming from its long standing joint venture in engine production with Renault and Peugeot. The 760 is therefore an embodiment of the current European trend towards simultaneous cooperation and competition among European region companies (see Introduction).

In earlier summer 1983, Volvo revealed its prototype for a radically new product design. Based upon extensive assessment of international market segments and energy trends, Volvo seems to have decided that it needs a world class small vehicle which will be able to run well into the 1990's. The prototype vehicle announced in the summer, is a relatively small car which represents somewhat of an "oddity" in that it is primarily intended for two-passenger use with its rear seat facing backward in the car. Volvo also has departed from traditional body construction in this model by including as one of its main structural members a very large "beam" placed laterally in the car between the front and back seat. The current configuration of this prototype is also set to make extensive sue of new lightweight drive train and body material, such as magnesium and plastic. If this prototype is an accurate indicator of Volvo's production plans, it seems clear that Volvo expects to remain in the upscale end of each of the world's car size classes, emphasizing premium construction, safety in small vehicles and a high level of luxury. This appears to be a continuation of the "niche strategy" which has kept Volvo out of head-to-head direct competition with the major producers in Japan and the United States.

It should also be emphasized that Volvo has a very strong presence in the international medium in heavy-duty truck market. Even in the United States, the truck market is not made up of integrated producers, but of various producers of componentry who sell to several dozen key producers responsible for the basic design of the truck. Volvo holds a position not only as a supplier but as a product designer. It is also clearly taking an international production position through acquisition of truck facilities in North America and in other markets. It should also be noted that Volvo has announced a small joint venture with Hino, a Toyota affiliate in Japan, for regional production of truck products.

If Volvo's overall product strategy works, Volvo should retain its position as one of the most high volume of "specialty" products in the world. After some loss of competitive performance in the early 1970's, Volvo has rebounded strongly and has remained a profitable producer, even during the second oil shock and the economic distress of the past four years. Preliminary results from 1983 indicate even further advances in Volvo's profitability and although it is difficult to differentiate the car division from other operations, it appears that the Volvo product line is doing extremely well.

Production Capacity

Volvo is also successful at this point, but it also appears to desire some forms of expansion. It is already a multi-site production company via its acquisition of the Dutch facility several years ago. Like Saab it is affiliating with certain Japanese companies through component purchases. It has also just recently displaced Volkswagen as the main non-Japanese importer to the United States. These successes could provoke some form of capacity expansion, but this requires further research.

Financial Strength

Like Saab, Volvo has experienced financial success in the past two years. Many people thought the company would go downhill after the failed merger attempt several years ago, however, the car operations have come back extremely well, obtaining almost Mercedes-Benz like positioning in a number of the world's richest markets. Further analysis is required to assess the long term position of Volvo, but at this point it appears to be one of the strongest in terms of financial positioning.

I. European Production Patterns

- By country
- By company
- By model class

Table 3-1

WESTERN EUROPE - PRODUCTION ('000)

W.Germany & Belgium	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Small	142	95	55	8	22	159	281	408	345	403	318	196	
Light	1662	1593	1335	1296	977	751	1089	998	1068	1043	1249	1384	
Medium	849	1238	997	1342	1013	868	1222	1240	1162	1199	860	904	
Large	931	849	1194	1087	857	966	1140	1331	1490	1469	1171	1213	
Total	3584	3775	3581	3733	2869	2988	3832	3977	4065	4114	3598	3697	
France													
Small	1115	1094	1215	1271	1442	1259	1263	1341	1154	1137	1157	1088	
Light	591	786	878	934	736	667	741	794	795	733	579	456	
Medium	294	273	299	299	216	216	411	374	571	767	750	652	
Large	244	312	324	358	293	395	557	570	591	584	452	415	
Total	2244	2465	2716	2862	2687	2537	2972	3079	3111	3221	2938	2611	
UK													
Small			266	263	196	139	173	252	226	172	206	286	
Light			469	389	376	351	395	366	351	332	294	262	
Medium			974	901	798	649	620	584	517	454	386	305	
Large			203	192	165	134	145	125	128	114	70	100	
Total	1643	1744	1912	1745	1535	1273	1333	1327	1222	1072	956	953	888
Italy													
Small	871	759	758	853	806	606	625	660	655	530	531	492	
Light	364	441	553	512	420	303	330	334	349	491	485	464	
Medium	477	465	288	299	260	317	360	286	345	323	297	210	
Large	8	35	133	159	144	123	155	160	159	137	133	90	
Total	1720	1700	1732	1823	1630	1349	1470	1440	1508	1481	1446	1256	
Sweden & Netherlands													
Small	67	78	87	95	70	61	41	25	15	14	9	-	
Light	-	-	-	-	-	-	33	30	49	76	72	78	
Medium	-	-	-	-	-	-	-	-	-	-	-	-	
Large	279	287	318	341	327	316	317	235	255	297	236	258	
Total	346	365	405	436	397	377	391	290	319	387	317	336	

Source: Dan Jones, SPRU, 1983.

Table 3-2

FORD - PRODUCTION IN W. EUROPE ('000)

W.Germany, Belgium	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	
Small	-	-	-	-	-	-	84	167	150	203	157	78		
Light	201	157	124	156	78	217	160	96	90	83	135	278		
Medium	385	544	388	424	285	261	359	377	355	346	215	234		
Large	55	42	164	116	61	117	168	188	235	175	86	97		
Total	641	743	676	696	424	595	771	828	810	807	593	687		
UK														
Small	-	-	-	-	-	-	8	60	39	14	34	52		
Light	157	128	190	147	139	156	188	178	132	186	157	150		
Medium	275	223	311	270	224	162	173	169	152	201	184	140		
Large	19	17	37	36	21	16	14	-	-	-	-	-		
Total	451	368	538	453	384	334	383	407	323	401	375	342	307	
Spain														
Small	-	-	-	-	-	-	18	213	261	227	260	248		
Light	-	-	-	-	-	-	-	-	-	-	-	-		
Total	-	-	-	-	-	-	18	213	261	227	260	248		
W.Europe														
Small	-	-	-	-	-	-	110	440	450	444	451	378		
Light	358	285	314	303	217	373	348	274	222	269	292	428		
Medium	660	767	699	694	509	423	532	546	507	547	399	374		
Large	74	59	201	152	82	133	182	188	235	175	86	97		
Total	1092	1111	1214	1149	808	929	1172	1448	1394	1435	1228	1277		
Selected Models														
Fiesta	-	-	-	-	-	-	110	440	450	444	451	378		
Escort	358	285	314	303	217	373	348	274	222	269	292	428		
Cortina	255	435	501	461	325	322	431	454	418	461	357	340		(also Taunus)
Capri	239	210	198	233	184	101	101	92	69	86	42	34		
Sierra	-	-	-	-	-	-	-	-	-	-	-	-		
Granada	-	-	201	152	82	133	182	188	235	175	86	97		(also Consul)

Small	Fiesta
Light	Escort
Medium	Cortina, Taunus, Capri , 12M, 15M, 17M, Corsair
Large	Granada, Consul, 20M, Zephyr, Zodiac

Source: Dan Jones, SPRU, 1983.

Table 3-3

GENERAL MOTORS - OPEL - VAUXHALL - PRODUCTION IN W. EUROPE ('000)

W.Germany	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	
Small	-	-	-	-	-	-	-	-	-	-	-	-	-	
Light	396	319	268	266	257	244	313	311	296	293	418	414		
Medium	110	278	288	340	155	226	405	393	353	347	204	242		
Large	306	235	315	262	166	186	201	218	304	320	165	154		
Total	812	832	871	868	578	656	919	922	953	960	787	810		
UK														
Small	-	-	-	-	-	-	-	-	-	-	-	-		
Light			138	105	111	90	101	81	76	59	55	70		
Medium			42	31	25	9	8	10	7	-	-	-		
Large			4	2	1	-	-	2	1	-	-	-		
Total	178	199	184	138	137	99	109	93	84	59	55	70	113	
Spain														
Small	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	
W.Europe														
Small	-	-	-	-	-	-	-	-	-	-	-	-	-	
Light			406	371	368	334	414	392	372	352	473	484		
Medium			330	371	180	235	413	403	360	347	204	242		
Large			319	264	167	186	201	220	305	320	165	154		
Total	990	1031	1055	1006	715	755	1028	1015	1037	1019	842	880		
Selected Models														
Kadett	396	319	268	266	257	278	373	374	357	344	473	484		(also Chevette,
Ascona	24	118	166	192	107	168	287	310	289	288	170	222		(also Cavalier)
Manta	55	145	103	127	49	58	118	82	64	59	34	22		
Rekord	261	210	271	220	140	167	180	196	265	250	136	123		(also Carlton)

Light	Kadett, Viva, Chevette, Magnum, Firenza, Astra
Medium	Ascona, Manta, Cavalier, GT, Victor, VX490
Large	Rekord, Commodore, Admiral, Diplomat, Senator, Monza, Ventora, Cresta, Viscount, Carlton, Viceroy, Royale.

Source: Dan Jones, SPRU, 1983.

Table 3-4

VOLKSWAGEN-AUDI-PRODUCTION IN W. EUROPE ('000)

W.Germany	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	
Small	142	95	55	8	22	159	197	241	195	200	161	118		
Light	1065	1117	943	874	642	534	616	591	682	667	696	692		
Medium	354	416	321	578	573	381	458	470	474	506	441	428		
Large	114	113	194	166	95	87	92	195	198	177	122	143		
Total	1675	1741	1513	1626	1332	1161	1463	1497	1549	1550	1420	1381		
Selected Models														
Polo	-	-	-	-	22	159	197	241	195	200	161	118		(also Derby)
Beetle	1009	1046	907	874	433	112	86	33	19	20	1	-		
Golf	-	-	-	-	190	420	529	557	662	644	692	689		(also Jetta)
1600	310	309	220	120	28	-	-	-	-	-	-	-		(also 412)
Passat	-	-	-	116	313	197	229	193	243	182	154	203		(also Santana)
Audi 80	-	-	38	236	172	118	150	191	142	237	224	178		
Audi 100	102	110	162	159	94	86	90	195	198	177	122	141		(also 200)

Small	Polo, Derby, Audi 50, Prinz 600, 1000, 1200.
Light	Beetle, Golf, Jetta, Audi 60, 75,
Medium	1600, 412, K70, Passat, Scirocco, Santana, 914, Audi 80, 90.
Large	Audi 100, 200, RO80, Quatro.

Source: Dan Jones, SPRU, 1983.

Table 3-5

RENAULT - PRODUCTION IN W. EUROPE ('000)

France	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Small	565	522	541	535	681	616	625	650	630	635	729	596	
Light	184	230	275	323	325	250	332	400	267	266	230	221	
Medium	196	194	234	243	168	154	155	97	222	391	428	399	
Large	1	1	1	1	1	23	107	113	123	112	105	79	
Total	946	947	1051	1102	1175	1043	1219	1260	1242	1404	1492	1295	
Spain													
Small											228		
Light											66		
Medium											49		
Large											-		
Total	88	101	126	166	167	193	202	224	235	275	343	269	
W.Europe													
Small											957		
Light											296		
Medium											477		
Large											105		
Total	1034	1048	1177	1268	1342	1236	1421	1484	1477	1679	1835	1564	
Selected Models (production in France - Spain to be added later)													
R4	263	257	242	198	241	213	215	232	237	231	209	161	
R5	-	-	116	208	303	299	316	345	344	372	520	435	
R6	174	201	176	126	137	104	94	73	49	32	-	-	
R12	184	230	275	323	325	250	274	209	123	69	28	13	
R14	-	-	-	-	-	-	58	191	144	198	202	134	
R9	-	-	-	-	-	-	-	-	-	-	-	74	
R16	196	182	176	174	127	120	108	79	50	22	-	-	
R18	-	-	-	-	-	-	-	-	155	367	352	343	

Small	R4, R5, R6, R8, R10
Light	R12, R14, R9, R11,
Medium	R15, R16, R17, R18, Fuego
Large	R20, R30, R Alpine

Source: Dan Jones, Spru, 1983.

Table 3-6

PEUGEOT - CITROEN - TALBOT - PRODUCTION IN W. EUROPE ('000)

France	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Small	550	572	674	736	761	643	638	691	524	502	428	492	
Light	407	556	603	611	411	417	409	394	528	467	349	235	
Medium	98	79	65	56	48	62	256	277	349	376	322	253	
Large	243	311	323	357	292	372	450	457	468	472	347	336	
Total	1298	1518	1665	1760	1512	1494	1753	1819	1869	1817	1446	1316	
UK													
Small			16	18	20	8	-	-	-	-	-	-	
Light			-	-	-	-	-	9	58	46	41	19	
Medium			248	248	242	219	145	160	138	57	84	98	
Large			-	-	-	-	-	-	-	-	-	-	
Total	217	282	264	266	262	227	145	169	196	103	125	117	56
Spain													
Small										104	83	64	
Light										51	32	50	
Medium										39	26	14	
Large										39	38	35	
Total	64	66	105	139	146	159	191	204	205	233	196	163	
W.Europe													
Small										606	511	556	
Light										564	422	304	
Medium										472	432	365	
Large										511	385	371	
Total	1579	1866	2034	2045	1920	1880	2089	2192	2270	2153	1767	1596	
Selected Models													
Peugeot 104	-	-	17	102	138	115	156	188	179	138	136	143	
Peugeot 204	162	169	161	122	98	88	45	-	-	-	-	-	
Peugeot 304	126	129	145	169	96	93	134	149	62	23	3	-	
Peugeot 205	-	-	-	-	-	-	-	-	-	-	-	-	
Peugeot 404	98	79	65	56	45	16	11	10	6	-	-	-	
Peugeot 305	-	-	-	-	-	-	-	10	170	246	197	180	
Peugeot 504	118	157	185	206	214	239	274	293	299	230	130	123	
Peugeot 505	-	-	-	-	-	-	-	-	-	94	129	116	

Source: Dan Jones, SPRU, 1983.

Table 3-6 (con't)

PEUGEOT - CITROEN - TALBOT - PRODUCTION IN W. EUROPE (continued ...)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	
Citroen 2CV	97	100	122	113	147	106	119	116	98	89	83	85		
Citroen Dyane	96	92	106	90	124	108	110	103	86	61	50	37		(also Meha
Citroen Visa	-	-	-	-	-	-	-	-	31	155	118	179		
Citroen Ami	112	88	82	87	57	47	38	32	16	-	-	-		
Citroen GS	13	157	196	216	151	188	230	245	258	222	187	135		
Citroen BX	-	-	-	-	-	-	-	-	-	-	-	-		
Citroen DS	104	84	92	97	40	1	-	-	-	-	-	-		
Citroen CX.	-	-	-	-	12	97	113	112	131	122	76	74		
Simca 1000	109	105	112	111	77	71	61	49	15	-	-	-		
Simca 1100	137	187	238	231	217	193	151	142	39	28	19	5		
Talbot Samba	-	-	-	-	-	-	-	-	-	-	-	18		
Simca 1301/1501	106	100	101	104	66	47	-	-	-	-	-	-		
Talbot Horizon	-	-	-	-	-	-	-	-	208	222	159	100		
Talbot Alpine	-	-	-	-	-	47	244	258	160	114	117	68		(also 1307 1510, So

Small	104, 2CV, Dyane, Mehari, Visa, LN, LNA, Ami, Simca 1000, Simca 1100, Samba, Imp.
Light	204, 304, GS, 1301/1501, Horizon, Sunbeam
Medium	404, 305, 1307/8/9, 1510, Alpine, Solara, Matra, Avenger, Hunter, Sceptre, Rapier
Large	504, 505, 604, DS, SM, CX, 160, 2 litres, Tagora

Source: Dan Jones, SPRU, 1983.

Table 3-7

FIAT - LANCIA - AUTOBIANCHI - PRODUCTION IN W. EUROPE ('000)

Italy	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	
Small	820	697	696	795	746	573	612	622	614	490	491	469		
Light	364	441	532	433	320	210	237	236	243	394	382	364		
Medium	369	366	238	255	215	283	338	260	286	264	240	155		
Large	6	8	57	74	78	58	67	81	102	82	70	45		
Total	1559	1512	1523	1557	1359	1124	1254	1199	1245	1230	1183	1033		
Selected Models														
500	439	351	195	66	47	25	-	-	-	-	-	-		(and 600)
126	-	-	15	260	214	164	176	205	168	127	14	-		
Panda	-	-	-	-	-	-	-	-	-	11	160	191		
850	280	95	22	11	7	6	6	-	-	-	-	-		
127	-	162	351	343	368	306	306	334	352	260	234	197		
Uno	-	-	-	-	-	-	-	-	-	-	-	-		
128	323	395	496	417	306	204	214	225	135	51	25	-		
Ritmo	-	-	-	-	-	-	-	-	109	336	300	314		(and Strada)
125	121	99	21	-	-	-	-	-	-	-	-	-		
124	238	190	217	214	146	25	12	14	16	19	15	6		(and 124 Sport
131	-	-	-	-	20	202	251	167	205	174	159	117		(and Mirafiori

Small 500, 600, 850, 900, A112, 126, 127, Panda.
Light 128, Ritmo, Strada, Fulvia, Delta.
Medium 124, 125, 131, Mirafiori, X19, Flavia, Beta.
Large 130, 132, Argenta, Gamma.

Source: Dan Jones, SPRU, 1983.

Table 3-8

BL - PRODUCTION IN W. EUROPE ('000)

UK	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	
Small			248	243	174	130	162	190	186	157	171	234		
Light			141	140	123	105	106	98	85	41	41	23		
Medium			373	350	309	259	294	245	220	196	118	67		
Large			154	143	133	111	126	118	120	109	66	89		
Total	789	887	916	876	739	605	688	651	611	503	396	413	405	
Selected Models														
Mini			228	221	174	130	162	190	186	157	138	68		
Metro	-	-	-	-	-	-	-	-	-	-	33	166		
1100			121	69	23	6	-	-	-	-	-	-		(also 1300)
Allegro			-	51	100	98	106	98	85	41	41	23		
Maestro	-	-	-	-	-	-	-	-	-	-	-	-		
Marina			148	149	152	118	113	91	82	91	56	55		(also Ital)

Small — Mini, Metro

Light — Allegro, 1100, 1300

Medium — Marina, Ital, Maxi, MGB, MGC, Midget, Triumph 1500, Dolomite, Spitfire, TR6, TR7.

Large — Princess, Ambassador, 1800, 2200, Triumph 2000, 2500, Stag, Rover 2000, 2200, 2300, 2600, 3500, Jaguar XJ6, XJ12, XJS, Range Rover.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
BL Authi Spain	19	31	34	43	31	15	-	-	-	-	-	-

Source: Dan Jones, SPRU, 1983.

Table 3-9

OTHER PRODUCERS - PRODUCTION IN W.EUROPE ('000)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	
Daimler Benz - W.Germany														
Large	280	284	324	332	340	350	378	409	404	433	439	449		
BMW - W.Germany														
Large	159	164	182	196	185	217	268	285	312	328	330	338		
3 series	-	-	-	-	-	43	131	167	183	189	206	229		
5 series	-	-	13	49	50	77	81	81	89	99	84	76		
Porsche - W.Germany														
Large	17	11	15	15	10	9	33	36	37	36	29	32		
Volvo - Sweden & the Netherlands														
Small	67	78	87	95	70	61	41	25	15	14	9	-		Daf
Light	-	-	-	-	-	-	33	30	49	76	72	78		Volvo 340
Medium	-	-	-	-	-	-	-	-	-	-	-	-		
Large	204	214	234	252	234	225	221	159	182	213	170	193		Volvo 240, 2[illegible]
Total	271	292	321	347	304	286	295	214	246	303	251	271		
Saab - Sweden														
Large	75	73	84	89	93	91	96	76	73	84	66	65		
Alfa Romeo - Italy														
Small	-	-	-	-	-	-	-	-	-	-	-	-		
Light	-	-	21	79	100	93	93	98	106	97	103	100		Alfasud
Medium	108	99	50	44	45	34	22	26	59	59	57	55		Giulia, Giul[illegible]
Large	-	24	70	82	63	63	86	77	55	52	60	42		Alfetta, 200[illegible]
Total	108	123	141	205	208	190	201	201	220	208	220	197		
Innocenti - Italy														
Small	51	62	62	58	60	33	13	38	41	40	40	23		

Source: Dan Jones, SPRU, 1983.

II. European Registration/Sales Patterns

- By country
- By company
- By model class

Table 3-10

WESTERN EUROPEAN REGISTRATIONS

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissan	Toyota	Honda	Mazda	Mitsub.	Suzuki	CMEA	Others	Total
1973																					
Small																					
Light																					
Medium																					
Large																					
Total																					
1978																					
Small																					
Light																					
Medium																					
Large																					
Total																					
1979																					
Small	-	360	203	-	-	698	522	550	-	130	14	-	96	56	37	-	-	1	33	150	2850
Light	355	213	509	-	-	249	488	282	92	69	68	-	103	60	-	79	41	-	115	10	2733
Medium	325	479	411	-	-	330	446	184	48	117	-	-	40	58	67	66	28	-	1	82	2682
Large	319	191	132	313	256	114	341	59	46	110	128	63	7	11	-	3	-	-	-	40	2133
Total	999	1243	1255	313	256	1391	1797	1075	186	426	210	63	246	185	104	148	69	1	149	282	10398
1980																					
Small	-	364	156	-	-	753	442	540	-	111	8	-	118	66	56	-	-	8	33	118	2773
Light	408	226	558	-	-	256	404	344	93	51	65	-	109	121	-	76	87	-	77	31	2906
Medium	237	402	349	-	-	348	353	162	48	112	-	-	51	66	86	83	24	-	1	41	2363
Large	217	108	107	324	247	110	260	47	41	70	113	54	7	11	-	5	-	-	-	28	1749
Total	862	1100	1170	324	247	1467	1459	1093	182	344	186	54	285	264	142	164	111	8	111	218	9791
1981																					
Small	-	356	135	-	-	705	465	679	-	186	3	-	100	63	54	-	-	12	32	79	2869
Light	436	411	622	-	-	201	311	380	85	36	71	-	93	96	-	107	66	-	93	44	3052
Medium	208	332	365	-	-	372	311	168	55	69	-	-	71	40	59	63	40	-	1	37	2191
Large	172	92	102	325	266	83	202	55	45	69	114	57	8	16	-	3	1	-	-	23	1633
Total	816	1191	1224	325	266	1361	1289	1282	185	360	188	57	272	215	113	173	107	12	126	183	9745
1982																					
Small																					
Light																					
Medium																					
Large																					
Total																					

Source: Daniel Jones, SPRU, 1983

Table 3-11

EEC REGISTRATIONS (1973 less Ireland)

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissen	Toyota	Honda	Mazda	Mitsub.	Suzuki	CMEA	Other	Total
1973																					
Small	-	-	1	-	-	473	652	681	-	143	76	-	25	13	9	-	-	-	42	24	2185
Light	314	228	399	-	-	198	500	336	64	100	-	8	49	40	-	19	-	-	15	5	2275
Medium	233	452	325	-	-	199	179	136	34	304	-	-	31	30	2	5	-	-	-	5	1935
Large	222	150	118	223	136	1	263	49	61	69	64	11	3	4	-	-	-	-	-	23	1397
Total	769	830	843	223	136	871	1594	1202	159	616	140	19	108	87	11	24	-	-	57	57	7792
1978																					
Small	-	271	176	-	-	545	480	553	-	117	15	-	49	23	47	-	-	-	23	57	2356
Light	323	208	375	-	-	221	376	176	84	79	39	-	85	56	-	57	26	-	89	5	2199
Medium	349	407	345	-	-	173	394	167	30	168	-	-	40	57	36	21	19	-	-	4	2210
Large	258	186	150	272	226	111	315	55	56	102	64	15	3	10	-	3	-	-	-	27	1853
Total	930	1072	1046	272	226	1050	1565	951	170	466	118	15	177	146	83	81	45	-	112	93	8618
1979																					
Small	-	272	187	-	-	552	452	526	-	124	13	-	73	46	33	-	-	1	25	68	2372
Light	317	203	446	-	-	206	430	260	86	68	47	-	89	43	-	59	34	-	100	6	2394
Medium	292	441	372	-	-	284	372	167	47	115	-	-	37	48	59	46	23	-	1	2	2306
Large	279	166	121	298	231	108	295	54	40	108	67	19	7	8	-	2	-	-	-	26	1829
Total	888	1082	1126	298	231	1150	1549	1007	173	415	127	19	206	145	92	107	57	1	126	102	8901
1980																					
Small	-	286	144	-	-	632	390	513	-	108	8	-	89	53	47	-	-	7	23	46	2346
Light	368	213	495	-	-	169	342	320	85	50	45	-	86	92	-	54	73	-	70	6	2458
Medium	212	367	313	-	-	310	313	153	44	110	-	-	40	50	73	60	21	-	1	1	2068
Large	184	87	96	305	221	100	213	45	38	67	56	15	6	8	-	3	-	-	-	20	1464
Total	764	953	1038	305	221	1211	1258	1031	167	335	109	15	221	203	120	117	94	7	94	73	8336
1981																					
Small	-	295	124	-	-	600	422	652	-	182	3	-	71	49	44	-	-	11	24	29	2506
Light	383	363	554	-	-	163	248	359	79	36	53	-	68	70	-	72	53	-	73	4	2578
Medium	184	297	330	-	-	304	275	158	52	68	-	-	55	30	47	40	34	-	1	1	1876
Large	147	74	90	300	236	79	165	50	41	66	58	21	6	12	-	2	-	-	-	18	1365
Total	714	1029	1098	300	236	1146	1110	1219	172	352	114	21	200	161	91	114	87	11	98	52	8325
1982																					
Small																					
Light																					
Medium																					
Large																					
Total																					

Source: Daniel Jones, SPRU, 1983

Table 3-12

WEST GERMANY REGISTRATIONS

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissan	Toyota	Honda	Mazda	Mitsub.	Suzuki	CMEA	Others	Total
1973																					
Small	-	-	-	-	-	91	71	49	-	10	15	-	3	3	2	-	-	-	-	7	251
Light	123	36	275	-	-	18	67	39	10	2	-	-	4	5	-	-	-	-	2	1	582
Medium	126	112	236	-	-	33	7	15	3	2	-	-	2	2	1	-	-	-	-	2	541
Large	172	81	70	176	91	-	33	10	4	1	11	1	-	-	-	-	-	-	-	7	657
Total	421	229	581	176	91	142	178	113	17	15	26	1	9	10	3	-	-	-	2	17	2031
1978																					
Small	-	80	117	-	-	67	41	21	-	4	3	-	3	5	6	-	-	-	2	3	352
Light	137	30	257	-	-	26	42	25	12	1	13	-	7	8	-	10	9	-	26	1	604
Medium	186	134	286	-	-	14	37	31	3	2	-	-	8	16	10	6	4	-	-	1	738
Large	200	115	116	221	155	15	43	15	11	4	14	2	1	3	-	1	-	-	-	12	928
Total	523	359	776	221	155	122	163	92	26	11	30	2	19	32	16	17	13	-	28	17	2622
1979																					
Small	-	92	114	-	-	64	30	22	-	3	2	-	8	10	8	-	-	-	2	5	360
Light	146	21	291	-	-	20	38	30	12	-	10	-	13	7	-	12	13	-	22	1	636
Medium	146	109	303	-	-	35	34	21	3	2	-	-	9	15	21	19	7	-	-	1	725
Large	191	79	90	243	154	12	34	11	8	5	13	3	2	2	-	1	-	-	-	15	863
Total	483	301	798	243	154	131	136	84	23	10	25	3	32	34	29	32	20	-	24	22	2584
1980																					
Small	-	86	89	-	-	62	32	34	-	2	2	-	21	16	13	-	-	5	3	-	365
Light	199	37	308	-	-	14	29	29	7	-	7	-	15	28	-	14	33	-	14	-	734
Medium	98	77	237	-	-	32	31	14	1	1	-	-	14	17	30	31	9	-	-	-	592
Large	117	41	69	249	139	6	24	9	7	4	9	2	2	2	-	2	-	-	-	11	693
Total	414	241	703	249	139	114	116	86	15	7	18	2	52	63	43	47	42	5	17	11	2384
1981																					
Small	-	73	73	-	-	54	34	44	-	2	-	-	18	19	15	-	-	4	2	2	340
Light	197	101	303	-	-	14	21	26	6	-	6	-	11	21	-	23	25	-	5	1	760
Medium	95	56	245	-	-	28	24	15	3	-	-	-	15	9	20	20	14	-	-	1	545
Large	88	36	57	239	134	5	20	7	4	3	8	3	1	3	-	1	-	-	-	11	620
Total	380	266	678	239	134	101	99	92	13	5	14	3	45	52	35	44	39	4	7	15	2265
1982																					
Small					-																
Light					-																
Medium					-																
Large					127																
Total					127	84	87														

Source: Daniel Jones, SPRU, 1983

Table 3-13

FRANCE REGISTRATIONS

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissan	Toyota	Honda	Mazda	Mitsub.	Suzuki	CMEA	Others	Total
1973																					
Small	-	-	-	-	-	263	374	43	-	17	10	-	2	-	1	-	-	-	7	6	723
Light	15	25	25	-	-	137	318	27	3	3	-	-	3	4	-	1	-	-	5	1	567
Medium	18	43	25	-	-	124	8	6	1	4	-	-	1	1	-	-	-	-	-	1	232
Large	8	8	7	14	10	1	158	4	5	2	5	-	-	-	-	-	-	-	-	2	224
Total	41	76	57	14	10	525	858	80	9	26	15	-	6	5	1	1	-	-	12	10	1746
1978																					
Small	-	42	9	-	-	329	288	24	-	15	1	-	4	3	2	-	-	-	2	11	730
Light	16	10	28	-	-	133	226	13	18	3	6	-	4	4	-	6	-	-	15	1	483
Medium	16	23	14	-	-	136	180	23	2	2	-	-	1	5	3	2	-	-	-	1	408
Large	11	11	6	13	15	67	181	4	7	3	3	-	-	-	-	1	-	-	-	2	324
Total	43	86	57	13	15	665	875	64	27	23	10	-	9	12	5	9	-	-	17	15	1945
1979																					
Small	-	39	13	-	-	331	292	21	-	16	1	-	7	5	2	-	-	-	2	14	743
Light	15	9	40	-	-	118	190	20	20	2	4	-	5	3	-	7	1	-	19	1	454
Medium	15	20	20	-	-	175	199	17	3	2	-	-	-	3	4	5	-	-	-	-	463
Large	7	11	7	12	15	67	175	4	6	6	4	-	1	-	-	-	-	-	-	1	316
Total	37	79	80	12	15	691	856	62	29	26	9	-	13	11	6	12	1	-	21	16	1976
1980																					
Small	-	31	14	-	-	387	232	29	-	14	-	-	10	3	4	-	-	-	3	5	732
Light	19	14	50	-	-	99	156	22	17	2	5	-	5	6	-	7	3	-	14	1	420
Medium	9	19	21	-	-	200	169	14	4	2	-	-	2	4	4	6	-	-	-	-	454
Large	6	4	8	14	17	73	128	3	4	4	3	-	1	-	-	-	-	-	-	1	266
Total	34	68	93	14	17	759	685	68	25	22	8	-	18	13	8	13	3	-	17	7	1872
1981																					
Small	-	34	13	-	-	354	259	38	-	16	-	-	7	2	4	-	-	-	5	3	735
Light	19	44	75	-	-	110	112	29	15	1	7	-	2	5	-	9	3	-	21	-	452
Medium	11	20	24	-	-	188	138	13	5	1	-	-	3	4	3	4	-	-	-	-	414
Large	5	3	10	16	25	61	98	3	5	3	3	-	2	-	-	-	-	-	-	-	234
Total	35	101	122	16	25	713	607	83	25	21	10	-	14	11	7	13	3	-	26	3	1835
1982																					
Small																					
Light																					
Medium																					
Large																					
Total						805	622														2056

Source: Daniel Jones, SPRU, 1983

Table 3-14

SPAIN & PORTUGAL REGISTRATIONS

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissan	Toyota	Honda	Mazda	Mitsub.	Suzuki	CMEA	Others	Seat	Total
1973																						
Small																						
Light																						
Medium																						
Large																						
Total																						
1978																						
Small																						
Light																						
Medium																						
Large																						
Total																						
1979																						
Small	-	67	-	-	-	121	50	8	-	3	-	-	-	-	-	-	-	-	-	1	81	331
Light	2	2	1	-	-	35	44	1	-	-	-	-	1	2	-	1	-	-	-	-	4	93
Medium	1	2	1	-	-	36	46	1	-	1	-	-	-	-	-	-	-	-	-	-	80	168
Large	1	-	-	2	1	-	22	-	-	-	1	-	-	-	-	-	-	-	-	1	13	41
Total	4	71	2	2	1	192	162	10	-	4	1	-	1	2	-	1	-	-	-	2	178	633
1980																						
Small	-	59	-	-	-	101	34	8	-	2	-	-	-	1	-	-	-	-	2	1	71	279
Light	4	8	3	-	-	78	37	1	1	1	1	-	1	-	-	-	-	-	1	1	24	161
Medium	-	2	3	-	-	33	24	1	-	1	-	-	-	-	-	-	-	-	-	-	40	104
Large	1	5	-	5	4	-	27	-	-	-	1	-	-	-	-	-	-	-	-	1	7	51
Total	5	74	6	5	4	212	122	10	1	4	2	-	1	1	-	-	-	-	3	3	142	595
1981																						
Small	-	43	2	-	-	90	28	8	-	2	-	-	-	2	-	-	-	-	2	-	50	227
Light	8	16	2	-	-	34	45	2	1	-	1	-	3	2	-	1	-	-	-	-	39	154
Medium	-	10	-	-	-	57	18	1	1	1	-	-	1	-	1	-	-	-	-	-	36	126
Large	1	4	1	5	5	-	22	-	-	1	1	-	-	-	-	-	-	-	-	-	2	42
Total	9	73	5	5	5	181	113	11	2	4	2	-	4	4	1	1	-	-	2	-	127	549
1982																						
Small																						
Light																						
Medium																						
Large																						
Total																						

Source: Daniel Jones, SPRU, 1983

Table 3-15

UK REGISTRATIONS

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissar	Toyota	Honda	Mazda	Mitsub.	Suzuki	CMEA	Other	Total
1973																					
Small	-	-	-	-	-	25	41	22	-	97	15	-	12	-	4	-	-	-	26	4	246
Light	104	114	31	-	-	22	25	17	1	89	-	5	27	8	-	6	-	-	-	1	450
Medium	41	222	19	-	-	20	144	9	-	282	-	-	19	9	1	2	-	-	-	1	769
Large	4	40	13	6	10	-	17	3	1	62	23	6	3	2	-	-	-	-	-	7	197
Total	149	376	63	6	10	67	227	51	2	530	38	11	61	19	5	8	-	-	26	13	1662
1978																					
Small	-	68	22	-	-	24	21	27	-	73	1	-	26	2	14	-	-	-	10	2	290
Light	74	115	14	-	-	26	24	19	10	62	5	-	53	10	-	8	9	-	21	-	450
Medium	74	172	16	-	-	8	106	31	1	154	-	-	23	14	5	5	1	-	-	-	610
Large	5	38	11	7	11	12	25	7	2	85	24	6	2	2	-	-	-	-	-	5	242
Total	153	393	63	7	11	70	176	84	13	374	30	6	104	28	19	13	10	-	31	7	1592
1979																					
Small	-	59	26	-	-	27	21	27	-	83	-	-	29	8	4	-	-	1	10	-	295
Light	63	132	20	-	-	24	76	22	9	60	11	-	51	9	-	12	5	-	29	-	523
Medium	58	243	20	-	-	29	69	25	4	105	-	-	23	11	14	6	6	-	-	-	613
Large	20	52	10	8	14	14	25	6	1	89	26	9	3	4	-	-	-	-	-	3	284
Total	141	486	76	8	14	94	191	80	14	337	37	9	106	32	18	18	11	1	39	3	1715
1980																					
Small	-	92	22	-	-	31	18	15	-	78	-	-	31	8	5	-	-	1	8	-	309
Light	68	122	24	-	-	15	56	18	7	40	17	-	47	14	-	7	7	-	18	1	461
Medium	49	222	16	-	-	34	53	17	2	104	-	-	15	11	18	8	3	-	-	-	552
Large	16	29	6	9	14	8	15	2	1	54	21	8	2	3	-	-	-	-	-	3	191
Total	133	465	68	9	14	88	142	52	10	276	38	8	95	36	23	15	10	1	26	4	1513
1981																					
Small	-	111	22	-	-	27	17	21	-	139	-	-	33	7	4	-	-	3	9	-	393
Light	78	141	35	-	-	9	43	19	5	28	24	-	35	9	-	10	6	-	20	-	462
Medium	29	182	15	-	-	32	42	20	2	66	-	-	21	7	12	5	5	-	-	-	438
Large	20	25	8	11	17	4	10	2	1	52	21	10	2	3	-	1	-	-	-	4	191
Total	127	459	80	11	17	72	112	62	8	285	45	10	91	26	16	16	11	3	29	4	1484
1982																					
Small	-	110		-	-				-	170	-	-				-	-	3	12		
Light		167		-	-						30	-						-	20		
Medium	100	168		-	-						1	-						-	-		
Large		29		12	23						22	9			-		-	-	-		
Total	182	474	92	12	23	64	100	49	9	277	52	9	96	32	16	15	9	3	22		1555

Source: Daniel Jones, SPRU, 1983

Table 3-16

ITALY REGISTRATIONS

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissan	Toyota	Honda	Mazda	Mitsu	Suzuki	CMEA	Other	Inn.	Total
1973																						
Small	-	-	-	-	-	54	73	536	-	1	4	-	-	-	-	-	-	-	3	2	46	719
Light	21	23	23	-	-	5	44	231	46	1	-	-	-	-	-	-	-	-	-	1	-	395
Medium	18	21	12	-	-	8	2	98	29	1	-	-	-	-	-	-	-	-	-	1	-	190
Large	8	3	16	10	11	-	15	25	49	2	2	-	-	-	-	-	-	-	-	4	-	145
Total	47	47	51	10	11	67	134	890	124	5	6	-	-	-	-	-	-	-	3	8	46	1449
1978																						
Small	-	51	7	-	-	75	73	452	-	2	-	-	-	-	-	-	-	-	3	2	28	693
Light	22	8	30	-	-	12	32	99	37	1	-	-	-	-	-	-	-	-	2	-	-	243
Medium	16	9	7	-	-	6	20	63	20	2	-	-	-	-	-	-	-	-	-	-	-	143
Large	13	-	1	10	18	3	12	20	30	1	4	-	-	-	-	-	-	-	-	3	-	115
Total	51	68	45	10	18	96	137	634	87	6	4	-	-	-	-	-	-	-	5	5	28	1194
1979																						
Small	-	54	13	-	-	82	60	435	-	8	-	-	-	-	-	-	-	-	3	2	33	690
Light	26	4	44	-	-	27	79	162	38	-	3	-	-	-	-	-	-	-	2	-	-	385
Medium	20	9	4	-	-	17	25	90	34	1	-	-	-	-	-	-	-	-	-	-	-	200
Large	9	4	2	11	22	3	14	26	22	1	5	-	-	-	-	-	-	-	-	3	-	122
Total	55	71	63	11	22	129	178	713	94	10	8	-	-	-	-	-	-	-	5	5	33	1397
1980																						
Small	-	52	5	-	-	107	70	420	-	4	-	-	-	-	1	-	-	-	3	3	30	695
Light	28	11	54	-	-	29	68	229	49	5	1	-	1	-	-	-	-	-	3	-	-	478
Medium	18	9	17	-	-	20	27	97	35	-	-	-	-	-	-	-	-	-	-	-	-	223
Large	8	2	4	12	26	4	13	27	24	2	10	-	-	-	-	-	-	-	-	2	-	134
Total	54	74	80	12	26	160	178	773	108	11	11	-	1	-	1	-	-	-	6	5	30	1530
1981																						
Small	-	46	4	-	-	125	74	527	-	15	-	-	-	-	-	-	-	-	-	-	21	812
Light	32	42	86	-	-	23	52	268	48	6	-	-	-	1	-	-	1	-	2	-	-	561
Medium	21	6	22	-	-	32	35	101	40	-	-	-	-	-	-	-	-	-	-	-	-	257
Large	11	2	8	16	35	4	14	34	29	3	16	2	-	-	-	-	-	-	-	2	-	176
Total	64	96	120	16	35	184	175	930	117	24	16	2	-	1	-	-	1	-	2	2	21	1806
1982																						
Small																						
Light																						
Medium																						
Large																						
Total																						

Source: Daniel Jones, SPRU, 1983

Table 3-17

BELGIUM, LUXEMBOURG, NETHERLANDS, DENMARK & IRELAND REGISTRATIONS (1973 less Ireland)

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissan	Toyota	Honda	Mazda	Mitsub.	Suzuki	CMEA	Others	Total
1973																					
Small	-	-	1	-	-	40	93	31	-	18	32	-	8	10	2	-	-	-	6	5	246
Light	51	30	45	-	-	16	46	22	4	5	-	3	15	23	-	12	-	-	8	1	281
Medium	30	54	33	-	-	14	18	8	1	15	-	-	9	18	-	3	-	-	-	-	203
Large	30	18	12	17	14	-	40	7	2	2	23	4	-	2	-	-	-	-	-	3	174
Total	111	102	91	17	14	70	197	68	7	40	55	7	32	53	2	15	-	-	14	9	904
1978																					
Small	-	30	21	-	-	50	57	29	-	23	10	-	16	13	25	-	-	-	6	11	291
Light	74	45	46	-	-	24	52	20	7	12	15	-	21	34	-	33	8	-	25	3	419
Medium	57	69	22	-	-	9	51	19	4	8	-	-	8	22	18	8	14	-	-	2	311
Large	29	22	16	21	27	14	54	9	6	9	19	7	-	5	-	1	-	-	-	5	244
Total	160	166	105	21	27	97	214	77	17	52	44	7	45	74	43	42	22	-	31	21	1265
1979																					
Small	-	28	21	-	-	48	49	21	-	14	10	-	29	23	19	-	-	-	8	14	284
Light	67	37	51	-	-	17	47	26	7	6	19	-	20	24	-	28	15	-	28	4	396
Medium	53	60	25	-	-	28	45	14	3	5	-	-	5	19	20	16	10	-	1	1	305
Large	52	20	12	24	26	12	47	7	3	7	19	7	1	2	-	1	-	-	-	4	244
Total	172	145	109	24	26	105	188	68	13	32	48	7	55	68	39	45	25	-	37	23	1229
1980																					
Small	-	25	14	-	-	45	38	15	-	10	6	-	27	26	24	-	-	1	6	8	245
Light	54	29	49	-	-	12	33	22	5	3	15	-	18	44	-	26	30	-	21	4	365
Medium	38	40	22	-	-	24	33	11	2	3	-	-	9	18	21	15	9	-	1	1	247
Large	37	11	9	21	25	9	33	4	2	3	13	5	1	3	-	1	-	-	-	3	180
Total	129	105	94	21	25	90	137	52	9	19	34	5	55	91	45	42	39	1	28	16	1037
1981																					
Small	-	31	12	-	-	40	38	22	-	10	3	-	13	21	21	-	-	4	8	3	226
Light	57	35	55	-	-	7	20	17	5	1	16	-	20	34	-	30	18	-	25	3	343
Medium	28	33	24	-	-	24	36	9	2	1	-	-	16	10	12	11	15	-	1	-	222
Large	23	8	7	18	25	5	23	4	2	5	10	6	1	6	-	-	-	-	-	1	144
Total	108	107	98	18	25	76	117	52	9	17	29	6	50	71	33	41	33	4	34	7	935
1982																					
Small																					
Light																					
Medium																					
Large																					
Total																					

Source: Daniel Jones, SPRU, 1983

Table 3-18

BELGIUM AND LUXEMBOURG REGISTRATIONS

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissan	Toyota	Honda	Mazda	Mitsub.	Suzuki	CMEA	Other	Total
1973																					
Small	-	-	1	-	-	17	32	11	-	6	9	-	3	5	1	-	-	-	2	1	88
Light	12	10	16	-	-	8	21	9	2	1	-	-	5	11	-	4	-	-	3	-	102
Medium	12	24	14	-	-	7	7	3	1	2	-	-	3	9	-	1	-	-	-	-	83
Large	13	9	3	9	7	-	22	2	1	1	9	1	-	1	-	-	-	-	-	1	79
Total	37	43	34	9	7	32	82	25	4	10	18	1	11	26	1	5	-	-	5	2	352
1978																					
Small	-	8	10	-	-	20	22	8	-	6	3	-	5	5	11	-	-	-	2	2	102
Light	13	12	15	-	-	8	16	7	2	3	4	-	5	11	-	8	3	-	13	1	121
Medium	16	19	19	-	-	5	17	7	1	2	-	-	3	9	8	3	4	-	-	1	105
Large	18	12	7	10	12	4	26	5	2	3	7	1	-	2	-	1	-	-	-	2	112
Total	47	51	42	10	12	37	81	27	5	14	14	1	13	27	19	12	7	-	15	6	440
1979																					
Small	-	9	10	-	-	21	21	7	-	4	2	-	6	8	8	-	-	-	3	3	102
Light	12	11	19	-	-	7	16	9	2	2	5	-	5	7	-	8	6	-	14	2	125
Medium	16	16	11	-	-	10	18	6	1	1	-	-	1	8	9	5	3	-	1	-	106
Large	24	11	6	11	12	5	21	4	1	3	7	1	1	-	-	1	-	-	-	2	110
Total	52	47	46	11	12	43	76	26	4	10	14	1	13	23	17	14	9	-	18	7	443
1980																					
Small	-	8	7	-	-	21	20	6	-	3	1	-	8	12	10	-	-	-	2	1	99
Light	12	9	22	-	-	5	14	9	2	1	4	-	5	18	-	7	12	-	11	2	133
Medium	13	13	12	-	-	9	15	5	1	1	-	-	3	7	8	5	3	-	1	-	96
Large	18	6	6	11	13	4	17	3	1	1	6	1	1	2	-	1	-	-	-	2	93
Total	43	36	47	11	13	39	66	23	4	6	11	1	17	39	18	13	15	-	14	5	421
1981																					
Small	-	10	5	-	-	18	18	9	-	3	-	-	-	9	10	-	-	1	2	1	86
Light	13	11	25	-	-	3	6	7	2	-	4	-	12	12	-	10	8	-	13	1	127
Medium	9	8	14	-	-	10	19	5	1	-	-	-	5	3	5	4	6	-	1	-	90
Large	10	4	4	9	11	3	11	2	1	2	4	1	1	4	-	-	-	-	-	1	68
Total	32	33	48	9	11	34	54	23	4	5	8	1	18	28	15	14	14	1	16	3	371
1982																					
Small																					
Light																					
Medium																					
Large																					
Total																					

Source: Daniel Jones, SPRU, 1983

Table 3-19

SWITZERLAND, AUSTRIA, SWEDEN, NORWAY & FINLAND REGISTRATIONS

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissan	Toyota	Honda	Mazda	Mitsub.	Suzuki	CMEA	Others	Total
1973																					
Small																					
Light																					
Medium																					
Large																					
Total																					
1978																					
Small																					
Light																					
Medium																					
Large																					
Total																					
1979																					
Small	-	21	16	-	-	25	20	16	-	3	1	-	23	10	4	-	-	-	8	-	147
Light	36	8	62	-	-	8	14	21	6	1	21	-	13	15	-	19	7	-	15	-	246
Medium	32	36	38	-	-	10	28	16	1	1	-	-	3	10	8	20	5	-	-	-	208
Large	39	25	11	13	24	6	24	5	6	2	60	44	-	3	-	1	-	-	-	-	263
Total	107	90	127	13	24	49	86	58	13	7	82	44	39	38	12	40	12	-	23	-	864
1980																					
Small	-	19	12	-	-	20	18	19	-	1	-	-	29	12	9	-	-	1	8	-	148
Light	36	5	70	-	-	9	25	23	7	-	19	-	22	29	-	22	14	-	6	-	287
Medium	25	33	33	-	-	5	16	8	4	1	-	-	11	16	13	23	3	-	-	-	191
Large	32	16	11	14	22	10	20	2	3	3	56	39	1	3	-	2	-	-	-	-	234
Total	93	73	126	14	22	44	79	52	14	5	75	39	63	60	22	47	17	1	14	-	860
1981																					
Small	-	18	9	-	-	15	15	19	-	2	-	-	29	12	10	-	-	1	6	-	136
Light	45	32	66	-	-	4	18	19	5	-	17	-	22	24	-	34	13	-	20	1	320
Medium	24	25	35	-	-	11	18	9	2	-	-	-	15	10	11	23	6	-	-	-	189
Large	24	14	11	20	25	4	15	5	4	2	55	36	2	4	-	1	1	-	-	3	226
Total	93	89	121	20	25	34	66	52	11	4	72	36	68	50	21	58	20	1	26	4	871
1982																					
Small																					
Light																					
Medium																					
Large																					
Total																					

Source: Daniel Jones, SPRU, 1983

Table 3-20

NETHERLANDS REGISTRATIONS

	GM	Ford	VAG	D.Benz	BMW	Renault	PSA	Fiat	A.Romeo	BL	Volvo	Saab	Nissan	Toyota	Honda	Mazda	Mitsub.	Suzuki	CMEA	Other	Total
1973																					
Small	-	-	-	-	-	20	52	18	-	9	23	-	4	4	1	-	-	-	3	2	136
Light	33	15	17	-	-	7	25	10	2	1	-	-	8	11	-	6	-	-	3	-	138
Medium	16	23	12	-	-	6	6	4	-	4	-	-	5	8	-	1	-	-	-	-	85
Large	13	6	6	7	6	-	16	5	1	1	6	2	-	1	-	-	-	-	-	1	71
Total	62	44	35	7	6	33	99	37	3	15	29	2	17	24	1	7	-	-	6	3	430
1978																					
Small	-	13	7	-	-	25	28	14	-	9	6	-	9	6	13	-	-	-	1	2	133
Light	43	15	26	-	-	11	29	7	4	5	9	-	9	12	-	17	5	-	7	1	200
Medium	34	33	9	-	-	3	23	6	2	2	-	-	3	10	10	3	9	-	-	-	147
Large	8	7	7	10	13	9	25	3	3	5	8	3	-	2	-	-	-	-	-	2	105
Total	85	68	49	10	13	48	105	30	9	21	23	3	21	30	23	20	14	-	8	5	585
1979																					
Small	-	12	7	-	-	23	22	9	-	6	7	-	17	9	10	-	-	-	1	2	125
Light	37	13	28	-	-	9	24	10	3	2	12	-	9	10	-	11	8	-	9	2	187
Medium	31	30	11	-	-	12	21	4	2	2	-	-	2	8	11	8	7	-	-	-	149
Large	23	7	3	11	12	6	22	2	2	3	8	4	-	1	-	-	-	-	-	1	105
Total	91	62	49	11	12	50	89	25	7	13	27	4	28	28	21	19	15	-	10	5	566
1980																					
Small	-	9	4	-	-	20	16	6	-	3	5	-	13	6	13	-	-	1	1	2	99
Light	32	10	24	-	-	6	15	8	2	1	9	-	7	15	-	10	15	-	6	2	162
Medium	21	18	8	-	-	10	14	3	1	1	-	-	5	7	12	8	6	-	-	-	114
Large	16	4	2	9	11	4	14	1	1	2	5	3	-	1	-	-	-	-	-	1	74
Total	69	41	38	9	11	40	59	18	4	7	19	3	25	29	25	18	21	1	7	5	449
1981																					
Small	-	9	3	-	-	18	18	9	-	3	3	-	8	5	10	-	-	3	1	1	91
Light	30	13	25	-	-	3	12	5	2	1	9	-	4	10	-	12	9	-	7	2	144
Medium	15	15	8	-	-	9	12	1	1	-	-	-	6	4	7	5	9	-	-	-	92
Large	10	3	2	8	12	2	10	1	1	2	4	3	-	1	-	-	-	-	-	-	59
Total	55	40	38	8	12	32	52	16	4	6	16	3	18	20	17	17	18	3	8	3	386
1982																					
Small																					
Light																					
Medium																					
Large																					
Total																					

Source: Daniel Jones, SPRU, 1983

Table 3-21

WEST GERMANY: GROSS PRODUCTION VALUE PER UNIT
BY TYPE OF VEHICLE
(DM per unit)

	74	75	76	77	78	79	80	81
Passenger Cars	8,246	9,044	9,648	10,374	11,136	11,826	12,910	14,037
Station Wagons/Vans	7,481	8,502	9,253	9,928	11,170	12,380	13,374	13,899
Large Buses	62,500	73,842	76,950	110,944	137,467	141,000	144,529	157,765
Truck Tractor (Heavy)	58,105	75,944	79,588	84,550	98,733	101,150	101,360	118,031
Light, Medium Trucks	26,258	34,217	32,996	35,263	36,332	39,139	39,994	49,129

Source: Statistisches Bundesamt

III. Automotive Product Positions in the U.K. and West Germany

- Pricing
- Model type
- Company

Table 3-22

AUTO PRODUCT POSITIONS: AS SOLD IN BRITAIN, 1982

COMPANY Model (# in line)	Price Inc. VAT (£) low	Price Inc. VAT (£) high	Test MPG low	Test MPG high	Length (in.) low	Length (in.) high	# of Seats low	# of Seats high	Weight (cwt) low	Weight (cwt) high	Engine Size (cc) low	Engine Size (cc) high
AC CARS												
3000ME	11254	--	36		157.0	--	2	--	21	--	2993	--
ALFA ROMEO												
Alfasud (9)	4900	5800	26	30	156.6	--	4	--	17.4	17.6	1350	1490
Sprint Veloce	6350	--	26	--	158.3	--	4	--	17.5	--	1490	--
Giuletta (3)	6050	7250	21	27	165.7	--	4	--	18.0	21.6	1570	1962
Alfetta (3)	8000	10250	23	25	167.7	172.6	4	4/5	22.4	23.8	1962	2492
Alfa 6	12500	--	19	--	187.4	--	5	--	28.9	--	2492	--
ASTON MARTIN												
(V8) Volante	47500	--	14	--	183.0	--	2/4	--	33.9	--	5340	--
(V8) Saloon	39999	--	12	--	183.0	--	2/4	--	33.9	--	5340	--
Vantage Coupe	42499	--		--	183.0	--	2/4	--	33.9	--	5340	--
Lagonda	56500	--	12	--	208.0	--	4	--	40.6	--	5340	--
AUDI												
Audi 80 (4)	6063	--	23*	32*	172.9	--	4	--	17.8	20.0	1588	1921
Audi 100 (4)	7653	--	26*	28*	184.3	--	5	--	23.2	23.8	1986	2144
Audi 200 (2)	11684	--	*	20*	184.5	184.8	5	--	24.8	--	2144	--
Audi Coupe (2)	8391	--			171.2	--	4/5	--	20.0	--	1921	2144
Audi Quattro	17052	--	21	--	173.3	--	4/5	--	25.3	--	2144	--
AUSTIN-MORRIS												
Mini City	2899	--	40	--	120.3	--	4	--	12.1	--	998	--
Mayfair	3363	--	40	--	120.3	--	4	--	12.1	--	998	--
Metro (8)	3250	4995	33	39	134.0	--	4	--*	14.6*	15.8	998	1275
Ital (6)	3998	5199	27	31	171.0	172.5	4	--	17.7	19.4	1275	1695
Ambassador (5)	5335	7765	25*	*	179.3	--	5	--	23.7	24.7	1695	1995

*Some figures missing from sample.

-- means inapplicable. Blank means figure unavailable.

Table 3-22 (con't)

COMPANY / Model (# in line)	Price Inc. VAT (£) low	Price Inc. VAT (£) high	Test MPG low	Test MPG high	Length (in.) low	Length (in.) high	# of Seats low	# of Seats high	Weight (cwt) low	Weight (cwt) high	Engine Size (cc) low	Engine Size (cc) high
BENTLEY												
Mulsanne	55240	--			209.2	--	5	--	44.3	--	6750	--
Turbo	61743	--			209.2	--	5	--			6750	
Corniche Convertible	73168	--	15	--	203.5	--	5	--	46.4	--	6750	--
BMW												
3XX (3)	5950	8940	22	26	171.4	--	4	--	20.2	22.3	1766	2315
5XX (4)	7855	12775	23*	30*	181.9	--	4	--	22.8	26.0	1766	2788
7XX (3)	13765	17795	17	24	191.5	--	5	--	29.3	--	2788	3453
6XX (2)	17895	22950			187.0	--	4	--	27.1	28.1	2788	3430
BRISTOL												
4125.2 Conv-Saloon	35818	--			194.5	--	4	--	34.5	--	5900	--
53 Conv Beaufighter	38392	--			194.5	--	4	--	34.5	--	5900	--
6035.2	42421	--	16	--	193.0	--	4	--	35.3	--	5900	--
CATERHAM CARS												
Super Seven (2)	5534	5916			133.3	--	2	--	10.0	--	1599	--
CITRÖEN												
2CV (3)	2399	2882	49	--	150.8	--	4	--	11.5	--	602	--
VISA (3)	3097	3799	33	--	145.0	--	4	--	14.7	15.9	652	1124
GSA (5)	4370	5327	29*	32*	164.0	165	4/5	--	18.7	19.0	1299	--
CX (13)	7463	12372	21*	25*	181.0	194	5	8	24.2	28.8	1995	2500
COLT												
Colt (5) inc. Turbo	3999	5959	28*	33*	149.2	153.4	4	--	15.9	16.9	1244	1410
Tradia (3) "	5500	7500			168.5	--	4	--	18.3	19.2	1410	1597
Cordia (2) "	6650	7750			168.3	--	4	--	18.6	19.0	1597	--
Galant (5) "	5834	9379	22*	*	176.0	--	4	--	20.9	24.2	1597	1997
Sapporo (2) "	7884	10158	25*	*	178.2	--	4	--	24.0	24.6	1997	--
Starion "	11734	--	21	--	174.2	--	4	--	24.0	--	1997	--

*Some figures missing from sample.

Table 3-22 (con't)

COMPANY Model (# in line)	Price Inc. VAT (£)		Test MPG		Length (in.)		# of Seats		Weight (cwt)		Engine Size (cc)	
	low	high	low	high	low	high	low	high	low	high	low	high
DACIA												
Denem (6)	3190	4295			175.0	--	4	--	17.7	18.7	1289	--
DAIHATSU												
Domino	2950	--	39	--	125.8	--	2/2	--	11.0	--	620	--
Charade (3)	3399	3949	38	40	137.2	--	4/5	--	13.0		993	--
Charmant (3)	4349	5099	29*	*	163.4	165.4	4/5	--	17.0	17.0	1290	1588
DATSUN												
Cherry (6)	3697	4496			155.9	--	4	--	15.4	16.4	988	1488
Sunny (6)	3866	4696			167.5	--	5	--	15.5	16.8	1270	1488
Stanza (6)	4599	5870			166.3	168.5	4	--	18.3	19.4	1598	1809
Bluebird (3)	4966	5266	29*		171.3	173.2	4	--	21.3	22.0	1770	--
Laurel Six (2)	6167	6876	21*		182.5	--	4/5	--	22.3	22.8	1998	2393
280 (6)	8462	10871	19*	25*	170.9	189.6	2	7/8	23.7	28.2	2753	--
Patrol (4)	7987	9747			160.0	188.0	5	7	31.7	37.2	2753	3246
DE TOMASO												
Pantera GTS	17940	--	17	--	167.0	--	2	--	14.1	--	5763	--
Deauville	23471	--	14	--	191.0	--	4/5	--	16.6	--	5763	--
Longchamps	21827	--			177.0	--	2+2	--	16.1	--	5763	--
FERRARI												
308 (2)	21810	22699	20	--	166.5	--	2	--	26.1	26.7	2926	--
Mondial 8	25851	--			180.0	--	2+2	--	28.5	--	2926	--
400i	35300	--	14	--	189.0	--	4	--	37.0	--	4823	--
512BBi	41860	--			173.0		2	--	32.9	--	4942	--
FIAT												
126 (2)	2245	2426	51	52	120.2	--	4	--	11.6	--	652	--
Panda 1.0	3230	--	36		133.0	--	5	--	13.4	--	903	--
127 (4)	3270	4249	30*	36*	146.1	--	4	--	14.0	15.3	903	1301
Strada (6)	3845	5495	27*	28*	155.0	--	4	5	16.9	18.7	1301	1585
X1/9 1500	6345	--	29	--	156.0	--	2	--	18.0	--	1498	--
Mirafiori (inc. Super) (4)	4495	5245	23*	25*	166.0	168.0	4	5	20.1	21.3	1367	1500
Argenta	6345	--	23	--	175.1	--	5	--	23.2	--	1995	--

*Some figures missing from sample.

Table 3-22 (con't)

COMPANY Model (# in line)	Price Inc. VAT (£) low	Price Inc. VAT (£) high	Test MPG low	Test MPG high	Length (in.) low	Length (in.) high	# of Seats low	# of Seats high	Weight (cwt) low	Weight (cwt) high	Engine Size (cc) low	Engine Size (cc) high
FORD												
Popular (16)	3255	5150	30*	38*	143.6	--	4	--	13.7	15.2	957	1598
Escort (30)	3905	5750	28*	36*	156.3	--	4	--	15.0	17.5	1117	1597
Sierra (28)	N/A	N/A			173.0	176.8	5	--	19.5	23.5	1294	2304
Capri (7)	4949	8125	20	30	172.2	--	4	--	19.6	23.2	1593	2792
Granada (21)	6861*	12145*	19	24	183.3	188.9	5	--	24.8	27.8	1993	2792
FORD (USA/AUS)												
1300	2549	--			166.5	--	4	--	20.0	--	1300	--
1500 (2)	2799	3199	23	24	166.5	--	4	--	20.0	20.9	1481	--
Polonez	3699	--	28	--	168.0	--	4	--	22.4	--	1481	--
GENERAL MOTORS												
Buick Century	12381	--			189.0	--	5	--	23.8	--	2795	--
Monte Carlo	12600	--			200.0	--	5	--				
Chevrolet (inc. Caprice and Camaro) (4)	12511	13511			188.0	215.0	4	5/6	25.7	38.5	4995	5995
Fleetwood Broughham	23359	--			221.0	--	5	--	34.6	--	4100	--
HONDA												
Civic (3)	3845	4495	33	36	148.0	150.8	4	--	14.7	15.4	1335	--
Accord (4)	5190	6630	30	31	165.7	173.6	4	5	17.5	18.8	1602	--
Prelude (2)	5760	6490	32	--	161.0	--	2	2+2	18.1*	*	1602	--
Quintet	5320	--			161.8	--	4	--	17.6	--	1602	--
HYUNDAI												
Pony (8)	3177	3738			156.3	--	4	--	17.0	17.7	1238	1439
JAGUAR												
Daimler (5)	16910	26618	15	17	195.3	220.0	5	8	36.0	44.6	4235	5343
Juguar (4)	13831	19708	11	22	195.3	--	4	5	35.5	37.9	3442	5343

*Some figures missing from sample.

Table 3-22 (con't)

COMPANY Model (# in line)	Price Inc. VAT (£) low	Price Inc. VAT (£) high	Test MPG low	Test MPG high	Length (in.) low	Length (in.) high	# of Seats low	# of Seats high	Weight (cwt) low	Weight (cwt) high	Engine Size (cc) low	Engine Size (cc) high
JEEP												
Jeep (4)	8624	9371			153.1	--	2	4	33.4	36.9	2500	4229
Laredo (2)	9190	9774			153.1	--	2	4	36.9	--	4229	--
LADA												
1200 (2)	2499	2794	27	31	160.0	--	4/5	--	18.6	19.6	1198	--
1300	2758	--	25	--	160.0	--	4/5	--	19.5	--	1294	--
1500	3242	--			160.0	--	4/5	--	21.2	--	1452	--
1600	3292	--	27	--	160.0	--	4/5	--	20.2	--	1570	--
NIVA LHD	4570	--	29	--	151.0	--	4/5	--	22.6	--	1570	--
LAMBORGHINI												
Countach S	50800	--			163.0	--	2	--	29.0	--	4754	--
Jalpa P350	26840	--					2	--			3485	--
LAND ROVER												
88" SWB Land Rover (4)	8206	9657			142.6	--	7	--	30.0	30.8	2286	--
109" SWB Land Rover (6)	8650	9995			175.0	--	12	--	35.5	36.4	2286	3528
Range Rover Fleetline (3)	13200	14996	15	--	176.0	--	5	--	37.3	37.9	3528	--
LOTUS												
Elite 52.2	15775	--	25	--	175.5	--	4	--	22.0	--	2174	--
Eclat Excel	14896	--	25	--	172.3	--	2/4	--	22.3	--	2174	--
Esprit 53	13978	--	25	--	165.0	--	2	--	20.0	--	2174	--
Turbo	17472	--	20	--	165.0	--	2	--	24.0	--	2174	--
MASERATI												
Merak SS	18987	--	14	--	170.0	--	2+2	--	27.5	--	2965	--
Kyalami (3)	25998	29900	21*	*	181.5	--	4	--	34.4	--	4136	4930
Khamsin	29999	--	14	--	173.2	--	2+2	--	31.4	--	4930	--
MAZDA												
323 (7)	3999	5399	30*	31*	155.7	163.6	4	--	16.1	17.4	1071	1490
626 (3)	4799	6049			171.7	173.8	4	--	20.4	20.9	1586	1970
929 (2)	6349	9199	21*	*	170.0	180.0	2+2	4	20.6	23.4	1970	2292

*Some figures missing from sample.

Table 3-22 (con't)

COMPANY	Price Inc. VAT (£)		Test MPG		Length (in.)		# of Seats		Weight (cwt)		Engine Size (cc)	
Model (# in line)	low	high	low	high	low	high	low	high	low	high	low	high
MERCEDES-BENZ												
200 (2)	9130	9350	23*	*	186.0	--	5	--	26.6	28.9	1997	--
230 (3)	9985	11930			182.0	186.0	4	5	26.7	29.2	2299	--
240 (2)	9895	11040	30*	*	186.0	--	5	--	27.4	29.8	2399	--
250	10995	--	20	--	186.0	--	5	--	27.7	--	2525	--
280 (7)	12850	16930	18*	20*	155.3	195.7	2	5	29.0	38.5	2746	--
300 (4)	11400	14300	26*	*	155.3	186.0	5	--	28.5	38.8	2998	--
380 (4)	18800	28700			172.8	202.1	2	5	30.3	31.8	3839	--
500 (4)	21720	25569	15*	*	172.8	202.1	2	5	30.3	32.6	4973	--
MG												
Metro	4799*	*	36*	*	134.0	--	4	--	15.3	16.5	1275	--
MORGAN												
4/4 (4)	7245	8141	26	--	144.0	--	2	4	14.5	15.0	1584	1599
Plus 8	10496	--	22	--	146.0	--	2	--	16.3	--	3523	--
OPEL												
Manta (3)	5655	7213	28*	*	174.9	--	4	--			1796	--
Pekord (7)	6903	8596	27	31	181.0	182.0	4/5	--	22.0	25.4	1979	2260
Commodore Berlina (2)	9037	10139	21	--	185.0	--	4/5	--	24.8	--	2490	--
Senator (2)	11154	13748	20*	*	192.0	--	4/5	--	26.9	--	2968	--
Monza (2)	14402	14591	18*	*	187.3	--	4/5	--	27.1	--	2968	--
PANTHER												
Lima	6455	--	28	--	145.0	--	2	--	18.8	--	2279	--
Brooklands	29950	--			161.0	--	2	--	26.7	--	4235	--
DeVille	67275	--	13	--	204.0	--	4	--	38.7	--	5343	--

*Some figures missing from sample.

Table 3-22 (con't)

COMPANY Model (# in line)	Price Inc. VAT (£) low	Price Inc. VAT (£) high	Test MPG low	Test MPG high	Length (in.) low	Length (in.) high	# of Seats low	# of Seats high	Weight (cwt) low	Weight (cwt) high	Engine Size (cc) low	Engine Size (cc) high
PEUGEOT												
104 (6)	3599	4900	30*	40*	131.0	142.0	4	--	14.5	18.0	954	1360
305 (9)	4616	5880	28*	42*	166.7	--	4	--	18.7	19.6	1290	1548
505 (10)	7078*	9107*	24*	35*	180.3	192.9	4	8	23.8	27.8	1971	2498
604 (2)	11026	12026	19	26	185.5	--	5	--	29.0	--	2304	2664
PORSCHE												
924 (2)	9494	9993	22	--	165.8	--	2/4	--	21.8	--	1984	--
944 Lux.	13390	--	27	--	165.8	--	2/4	--	23.2	--	2479	--
911 (5)	17686	29250	18	22	168.9	--	2/4	--	22.0	23.5	2992	3300
928S	25551	--	16	--	175.0	--	2/4	--	29.4	--	4664	--
RELIANT												
Rialto (4)	3224	3724	50	--	134.0	--	4	--	8.6	--	848	--
Scimitar (2)	11790	12490	19*	*	174.5	--	4	--	24.9	--	2792	--
RENAULT												
R4	3424	--	35	--	144.0	--	4	--	14.1	--	1108	--
R5 (8)	3367	5752	29	40	137.7	--	4	--	14.4	17.1	845	1397
R9 (8)	4100	5688	31*	*	160.0	--	4	--	15.8	16.8	1108	1397
R14 (3)	4399	5296	29	35	158.0	--	4	--	17.0	--	1218	1360
Fuego (6)	5262	7995	24*	28*	171.0	--	2/4	--	19.8	21.2	1397	1995
R18 (13)	4709	7464	25*	38*	172.0	176.0	4/5	5	18.1	22.5	1397	2068
R20 (3)	7845	8409	23*	26*	178.0	--	5	--	24.7	24.8	1995	2165
R30	10820		20	--	178.0	--	5	--	26.0	--	2664	--
ROLLS-ROYCE												
Silver (Spirit, Spur)	55240	62778	14	--	207.5	211.5	5	--	44.2	--	6750	--
Corniche Convertible	73168	--	15	--	204.5	--	5	--	46.4	--	6750	--
Camargue	83122	--	15	--	203.5	--	4/5	--	45.8	--	6750	--

* Some figures missing from sample.

Table 3-22 (con't)

COMPANY Model (# in line)	Price Inc. VAT (£) low	Price Inc. VAT (£) high	Test MPG low	Test MPG high	Length (in.) low	Length (in.) high	# of Seats low	# of Seats high	Weight (cwt) low	Weight (cwt) high	Engine Size (cc) low	Engine Size (cc) high
ROVER												
2000	7750		24	--	185.0	--	5	--	25.7	--	1994	
2300 (2)	8290	9450	23	--	185.0	--	5	--	26.9	--	2350	
2400	10500	--			185.0	--	5	--	29.4	--	2393	
2600 (2)	9975	10790	21	--	185.0	--	5	--	27.3*	--	2597	
3500	12250	--	23	--	185.0	--	5	--	27.0	--	3528	
Vitesse	Not available				185.0	--	5	--	28.3	--	3528	
Vanden Plas	13900	--	20	--	185.0	--	5	--	27.6	--	3528	
SAAB												
99 (2)	5950	6435	28	--	176.0	--	5	--	22.0	--	1985	--
900 (11)	6995	12750	23*	24*	186.6	--	5	--	22.8	25.1	1985	--
SKODA												
Super Estelle	2299	3100	33	40	163.8	--	4	--	16.8	17.4	1046	1174
SUBARU												
1600	5083	--	30	--	163.4	--	4	--	18.5	--	1595	--
1800 (4)	4993	6488	27*	*	163.6	168.3	4	--	18.5	20.1	1781	--
SUZUKI												
Alto FX	2925	--	37	--	129.8	--	4	--	12.4	--	796	--
TALBOT												
Samba (6)	2994*	4766*	38*	40*	138.0	--	4	--	14.6*	15.6*	954	1361
Cabriolet					138.0	--	4	--			1361	--
Horizon (8)	4099*	6268*	28*	35*	155.9	156.7	4/5	--	18.6*	19.6*	1118	1905
Alpine (5)	4862*	6938*	29*	32*	170.0	--	4	--	20.6*	21.6*	1294	1592
Solara (3)	4656	6678*	30*	31*	173.0	--	4	--	20.1*	21.1*	1294	1592
Tagora	7551	11194	16	25	182.2	--	4	--	24.6	26.4	2155	--
Matra Rancho	6715	--	29	--	169.9	--	4	--	22.9	--	1442	--

*Some figures missing from sample.

Table 3-22 (con't)

COMPANY Model (# in line)	Price Inc. VAT (£) low	Price Inc. VAT (£) high	Test MPG low	Test MPG high	Length (in.) low	Length (in.) high	# of Seats low	# of Seats high	Weight (cwt) low	Weight (cwt) high	Engine Size (cc) low	Engine Size (cc) high
TOYOTA												
Starlet (3)	3715	4355	35*	*	147.8	--	4	--	13.6	14.7	993	1290
Tercel (2)	4562	4722			152.8	--	4	--	17.6	--	1290	--
Corolla (5)	4102	5249	27*	29*	162.2	164.4	4	--	16.9	18.7	1290	1588
Carina (2)	5358	5249	23	*	172.6	172.8	4/5	--	19.5	20.0	1588	--
Celica (3)	6604	9888	26*	--	170.6	181.9	4	--	22.4	24.9	1972	2759
Cressida (3)	6168	6759	28*	*	182.7	182.9	5	--	22.4	23.1	1972	2188
Crown	10733	--	22	--	191.3	--	5	--	28.6	--	2759	--
Land Cruiser Estate	11192		17	--	184.1	--	5	--	38.7	--	3980	--
TRIUMPH												
Acclaim (3)	4621	5742	36	--	161.2	--	4	--	16.0*	16.2*	1335	--
TVR												
Tasmin (5)	9885	14904	24	--	158.0	161.0	2	2+2	19.4	20.9	1998	2792
VAUXHALL												
Chevette (6)	3577	4135	32	36	155.2	164.9	4	--	16.4	17.4	1256	--
Astra (16)	4233	5867	32*	*	157.4	165.6	4	--	16.5*	19.8*	1196	1598
Cavalier (16)	4820	6933	28*	*	167.9	171.9	4	--	18.9	21.0	1297	1598
Carlton (2)	7031	7739	24	26	186.7	--	4/5	--	22.2	23.1	1979	--
Viceroy	9015	--	18	--	187.8	--	4/5	--	24.2	--	2490	--
Royale (2)	12257	12909	18*	*	187.3	192.0	4	4/5	28.2	28.3	2784	--
VOLKSWAGEN												
Polo (8)	3835	4840	33*	*	144.0	156.4	4	--	13.7	14.4	1043	1272
Golf (8)	4156	7990	29*	44*	150.2	--	4	--	14.7	15.9	1093	1780
Jetta (5)	4592	5789	29*	40*	165.0	--	4	--	15.4	16.0	1093	1588
Passat (5)	6169	7947	24*	26*	174.6	178.7	5	--	18.8	20.9	1588	1921
Scirocco (3)	5584	7643			159.4	--	4	--	16.8	17.6	1457	1780
Santana	7975	--			178.9	--	4	--	20.6	--	1921	--

* Some figures missing from sample.

Table 3-22 (con't)

COMPANY	Price Inc. VAT (£)		Test MPG		Length (in.)		# of Seats		Weight (cwt)		Engine Size (cc)	
Model (# in line)	low	high	low	high	low	high	low	high	low	high	low	high
VOLVO												
340 (4)	4796	5408	32	--	163.0	166.7	4	--	19.3	--	1397	--
360 (4)	5645	6548			169.3	--	4	--	21.2	22.2	1986	--
240 (8)	7340	10535	19*	24*	188.4	--	4	5	25.2	27.9	2127	2315
260	10846	--	18	--	188.4	--	5	--	28.6	--	2849	--
760	12041	--	19	--	188.5	--	5	--	26.1	--	2849	--
ZASTAVA												
Yugo	2699	3362			149.2	--	4	--	16.4	--	1116	1301

* Some figures missing from sample.

Table 3-23 **AUTO FEATURES - GERMANY**

COMPANY / Model (# in line)	PRICE (DM) low	PRICE (DM) high	ENGINE SIZE (ℓ) low	ENGINE SIZE (ℓ) high	# SEATS low	# SEATS high
ALFA ROMEO						
Alfausud (7)	14,590	17,490	1.3	1.5	4	--
Sprint Veloce	18,990		1.5	--	4	--
Giuletta Lusso (2)	19,990	22,350	1.6	2.0	4	--
Alfetta Lussa (2)	21,190	24,400	1.6	2.0	4	4/5
GTV Coupe (2)	26,500	32,990	2.0	2.5	4	
Alfa ¢	33,300	--	2.5	--	5	--
Spider 2000	25,990	--				
ALPINA						
C1	38,300	--	2.3	--		
B6	51,600	--	2.8	--		
B9	62,900	--	3.5	--		
ASTON MARTIN						
(V8) Saloon (2)	193,480	199,560	5.3	--	2/4	--
Vantage	209,380	--	5.3	--	2/4	--
Volante (2)	221,070	228,210	5.3	--	2/4	--
Lagonda	272-965	--	5.3	--	4	
AUDI NSU						
Audi 80 (4)	15.430	23.140	1.3	1.9	4	--
Audi 100 (5)	19,790	28,860	1.6	2.2	5	--
Audi 100 Avant (3)	23, 305	29,635		2.2		
Audi Coupe (3)	20,330	27,370	1.9	2.1	4/5	--
Audi Quattro, Coupe	59,655	--	2.1		4/5	--
BAUER						
BMW Hardt-Cabrio ($\binom{315-}{323}$) (9)	22,850	33,150				
BITTER						
Bitter SC-Coupe	79,000	--				
-Cabrio	115,000	--				

*Data is unreliable - specifically, the range could be greater than given.

-- means inapplicable. Blank means figure unavailable.

Table 3-23 (con't)

COMPANY	PRICE (DM)		ENGINE SIZE (ℓ)		# SEATS	
Model (# in line)	low	high	low	high	low	high
BMW						
315,316,318i,320,323i	17,150	26,250	1.8*	2.3*	4*	*
518,520i,525i,528i	22,700	35,150	1.8	2.8	4	--
728i,723i,735i,745i	39,350	61,250	2,8*	3.5*	5*	*
628Csi, 635 Csi	53,400	63,200	2.8	3.4	4	--
CITROEN						
2CV (2)	8,520	9,190	0.6*	--	4	--
LNA 11 (2)	9,990	10,850				
Acadiane (2)	9,990	no figures				
Visa (5)	9,950	14,200	0.7*	1.1*	4*	*
GSA (6)	12,990	15,090	1.3*	*	4/5*	*
CX (14)	22,690	30,490	2.0*	2.5*	5*	*
CLASSIC-CAR						
Bugatti (readymade)	25,600	26,800				
[(Bausatz-kit?)	6,850	7,850]				
Mercedes SS 1929	31,000	--				
[kit (?)	10,900	--]				
Gepard SS 100	35,000	--				
[kit (?)	12,900	--]				
Blower Phaeton	39,500	--				
[kit (?)	14,850	--]				
DAIHATSU						
Cuore (2)	8,226	8,491				
Charade	10,204	10,487	1.0	--	4/5	--
Charmant (2)	12,265	13,000	1.3	1.6	4/5	
FERRARI						
308 (2)	76,500	82,400	2.4	--	2	--
Mondial *	92,800	--	2.9	--	2+2	--
400 Inject.	123,000	--	4.8	--	4	--
512 BB	125,800		4.9	--	2	--

Table 3-23 (con't)

COMPANY	PRICE (DM)		ENGINE SIZE (ℓ)		# SEATS	
Model (# in line)	low	high	low	high	low	high
FIAT						
126 Red & Brown	8,500	--	0.7	--	4	--
Panda (3)	9,550	10,790	0.9	--	5	--
127 (3)	10,390	12,500				
Ritmo (7)	11,990	19,500				
131 (6)	13,990	19,200	1.4	2.5		
Argenta (3)	20,450	21,450	2.0	--	5	--
Ritmo Bertone	21,500	--				
Fiat Bertone (Z1/9)	21,390	--	1.5		2	--
Pininfarina Spider	24,950	--				
FORD						
Fiesta (5)	11,325	15,995				
Escort (8)	12,590	19,305	1.1*	1.6*	4	--
Taunus (6)	14,365	19,170				
Grandad (10)	18,950	31,690	2.0*	2.8*	5	--
Capri (4)	16,700	30,100	1.6*	2.8*	4	--
FORD USA						
Mustang (6)	28,305	34,750				
Mercury (3)	35,070	35,635				
GENERAL MOTORS						
Chevrolet models (3)	33,900	44,200				
Oldsmobile models (3)	35,800	41,500				
Buick models (2)	36,400	50,600				
HONDA						
Civic (5)	11,990	14,495	1.3*	*	4*	*
Accord (4)	15,995	18,995	1.6	--	4	5
Quintet	16,995	--	1.6	--	4	--
Prelude	17,895	--	1.6	--	2+2	--
LADA						
Nova (3)	8,285	9,765				
Lada (4)	9,995	10,995	1.2	1.5		

Table 3-23 (con't)

COMPANY Model (# in line)	PRICE (DM) low	PRICE (DM) high	ENGINE SIZE (ℓ) low	ENGINE SIZE (ℓ) high	# SEATS low	# SEATS high
LANCIA						
A112 (3)	10,350	12,400				
Delta (2)	15,490	16,990	1.3	1.5		
Trevi	21,800	--	2.0	--		
Lancia (2)	17,990	23,500	1.3	2.0		
HPE 2000 I.E.	22,500	--	2.0	--		
Gamma (2)	31.900	39,700	2.5	--		
LEYLAND						
Mini (6)	7,005	12,490				
Triumph (3)	13,990	15,850				
Rover (2)	26,950	34,750				
Jaguar (3)	56,550	68,150	4.2	5.3	4	5
Daimler (3)	63,470	83.100	4.2	5.3	5	--
LOTUS						
Eclat (2)	65,260	66,830	2.2	--	2/2	--
Esprit (2)	61,422	74,970	2.2	--	2	--
Elite	69,633	--	2.2	--	4	--
MASERATI						
Biturbo SS	40,000	00				
Merak SS 3000	78,371	--	3.0	--	2/2	--
Qualtroporte (2)	106,326	111,497	4.2	4.9		
MAZDA						
323 (7)	11,490	14,190	1.1	1.5	4	--
626 (4)	14,490	15,490	1.6	2.0	4*	*
929 (3)	16,840	18,840	2.0		2+2*	4
RX-7	26,990	--			4	--
MERCEDES						
200 (3)	25,996	28,962	2.0	--	5*	*
240 (3)	27,289	42,940	2.4	--	5*	*
300 (4)	30,465	45,302	3.0	--	5*	*
230 (3)	28,126	34,521	2.3	--	4	5
250 (2)	30,340	45,064	2.5	--	5*	
280 (7)	36,375	51,471	2.8	--	2	5
380 (4)	54,884	74,071	3.8	--	2	5
500 (4)	60,342	79,043	5.0	--	2	5

Table 3-23 (con't)

COMPANY	PRICE (DM)		ENGINE SIZE (ℓ)		# SEATS	
Model (# in line)	low	high	low	high	low	high
MITSUBISHI						
Colt (8)	11,690	16,500	1.2	1.4		
Lancer (4)	13,990	24,500	1.4	2.0		
Galant (7)	15,590	23,900	1.6	2.3		
Sapporo (4)	17,490	25,500	1.6	2.0		
Starion Turbo ECI	31,500	--				
MORGAN						
Morgan (4/4) (2)	31,480	34.710	1.6	--	2	4
Plus 8	45,550	--	3.5	--	2	--
NISSAN						
Cherry (4)	10,995	11,845				
Sunny (4)	12,994	13,995				
Stanza (3)	15,195	15,795				
Bluebird (5)	15,195	17,490				
Laurel (3)	16,895	21,095	2.0	2.8		
280 ZX, ZXT	30,595	32,495				
OPEL						
Kadett (12)	12,635	17,430				
Pirsch (2)	15,485	16,150	1.3*	*		
Ascona (5)	15,120	19,160	1.3	1.6		
Manta (6)	16.145	20,605	1.3	2.0	4	--
Rekord (12)	17,360	21,200	1.9	2.3	4/5*	*
Senator (5)	28,530	44,990	2.5	3.0	4/5*	*
Commodore (4)	21,314	23,830	2.5	--	4/5*	*
Monza (4)	29,820	34,325	2.5	3.0	4/5*	*
PEUGEOT						
104 (3)	9,990	13,990	1.0*	1.4*	4*	*
305 (6)	14,390	17,540	1.3*	1.5*	4*	*
505 (12)	18,790	26,950	2.0	2.5	4*	8*
604 (2)	34,850	35,050	2.3	2.7	5	--
504 (3)	33,240	41.020				

Table 3-23 (con't)

COMPANY Model (# in line)	PRICE (DM) low	PRICE (DM) high	ENGINE SIZE ( ) low	ENGINE SIZE ( ) high	# SEATS low	# SEATS high
PORSCHE						
924	31,480	13,990	1.0*	1.4*	4*	*
911 (4)	55,690	96,400	3.0	3.3	2/2	--
928S	79,950	--	4.7	--	2/2	--
944 (2)	40,430	42,030	2.5*	*	2/2	--
PUMA						
Puma (GTE, GTS) (2)	17,000	19,000			2	
RENAULT						
R4 (3)	8,990	10,700	1.1*	*	4*	*
R5 (9)	10,700	44,600	0.8*	1.4*	4*	*
R9 (10)	11,980	16,500	1.1*	1.4*	4*	*
R14 (3)	13,500	16,600	1.2	1.4	4*	*
R18 (14)	13,980	21,450	1.4*	2.1*	4/5*	5*
Fuego (5)	16,990	22,990	1/4*	2.0*	2/2	--
R20 (6)	20,899	27,100	2/0*	2.2*	5*	*
R30 (3)	31,200	31,500	2.7*	*	5*	*
Alpine A310 V6	42,400	--			2+2	
ROLLS-ROYCE						
Silver (Spirit, Spur) (2)	266,869	310,750	6.8	--	5	--
Corniche (Saloon, on V.) (2)	292,670	346,910	6.8	--	5	--
Camargue	416,970	--	6.8	--	4/5	--
Phantom V1	on inquiry					
SAAB						
99 (2-dr, 4-dr) (2)	19,250	19,950	2.0	--	5	--
900 (11)	21,900	35.150	2.0	--	5	--
SCHEIB						
Bugatti (Replica)	21,470	--				
[(kit	4,735	--]				
MG (replica)	25,900	28,900				
[(kit)	7,775	]				
Mercedes 5529	29,500	--				
[(kit)	9,882	]				
SKODA						
105 (3)	7,490	8,950	1.1	--	4	--
120 (3)	8,390	9,390	1.2	--	4	--

Table 3-23 (con't)

COMPANY	PRICE (DM)		ENGINE SIZE ( )		# SEATS	
Model (# in line)	low	high	low	high	low	high
SUBARU						
Turismo	17,400	--				
Sedan	17,900	--				
Station	18,900	--				
SuperStation	20,700	--				
SUZUKI						
Alto (3)	7,990	8,990	0.8*	*	4*	*
TALBOT						
Samba (3)	10,940	13,800	1.0	1/4	4	--
Horizon (5)	12,490	14,890	1.1	1.4	4/5	--
1510 (2)	17,790	18,590				
Solara (5)	14,290	19,590	1.3*	1.6*	4*	*
Tagora (4)	20,700	29,600	2.2*	*	4*	*
Matra (4)	20,200	26,900	1.4*	*	4*	*
TOYOTA						
Starlet (5)	10,990	13,090	1.0*	1.3*	4*	*
Corolla (7)	11,990	14,390	1.3*	1.6*	4*	*
Tercel (2)	12,290	12,690	1.3	--	4	--
Carina (2)	15,190	16,490	1.6	--	4/5	--
Celica (4)	16,990	22,890	2/8*	2.8*	4*	*
Cressida (5)	18,550	21,600	2.0*	2.2*	5*	*
Crown (3)	26,790	28,290	2.8*	*	5*	*
TVR						
Tasmir Cabriolet	49,000	--			2	--
VOLKSWAGEN						
1200L	9,895	--				
Polo (6)	11,790	14,120	1.0*	1.3*	4	--
Derby (6)	12,245	14,390				
Golf (11)	12,590	24,205	1.1	1.8*	4*	5*
Jetta (6)	13,905	16,080	1.1*	1.6*	4*	*
Scirocco (3)	17,415	20,370	1.5	1.8	4	--
Passat (12)	15,445	20,640	1.3	1.9	5*	*
Sanatana (4)	18,350	21,0555	1.9*	*	4*	*

Table 3-23 (con't)

COMPANY	PRICE (DM)		ENGINE SIZE ( )		# SEATS	
Model (# in line)	low	high	low	high	low	high
VOLVO						
343 (5)	14,480	17,650				
345 (3)	16,470	18,420				
244 (4)	23,000	30,550				
245 (3)	26,550	34,100				
264 (2)	32,200	36,900				
265	35,800	--				
760 GLE	35,250	--				

Table 3-24

FRENCH CAR MARKET

	Price (FF)	# Cylinders	Engine Size (cc) low	high
ALFA ROMEO				
Alfasud SC *	51120	4	1200	1500
Alfasud TI Quadrifoglio Verde *	59456	4	1300	1490
Alfasud Sprint Quadrifoglio Verde *	Not Given	4	1300	1490
Giulietta	60740	4	1300	1600
Giulietta	65492	4	1779	2000
Spider	Not Given	4	1600	1962
Alfa 6	98348	6	2492	
Alfetta	70288	4	1962	
Alfetta Turbo Diesel	83004	4	1995	
Alfetta Quadrifoglio Oro Injezione	Not Given	4	1962	2000
Alfetta GTV	Not Given	4	1962	
Alfetta Giv 6	Not Given	6	2492	
AMERICAN MOTORS				
Eagle SX/4	Not Imported	6	4229	
Eagle Station Wagon		6	4229	
Concord	Not Imported	6	4229	
Spirit *	Not Imported	6	2500	4229
Jeep Wagoneer Limited *	Not Imported	6	4229	
Jeep CJ5 Renegade *	Not Imported	4	2474	
ASTON MARTIN				
Vantage	Not Imported	8	5340	
Volante	Not Imported	8	5340	
Lagonda	Not Imported	8	5340	
AUDI				
80 C *	Not Given	4	1297	1600
80 CD *	81250	5	1600	1921
80 Quattro *	Not Given	5	2144	
80 CD Turbo Diesel *	80360	4	1588	
100 CC *	70482	4	1781	
100 CS *	90946	5	1921	
100 CD *	110768	5	2144	
Coupe GT *	84228	5	1800	2100
Quattro	201700	5	2144	

	Price (FF)	# Cylinders	Engine Size (cc) low	high
AUSTIN-MORRIS				
Mini 1000 HLE *	31788	4	988	
Metro *	32788	4	998	
Metro HLE *	39788	4	998	1300
Metro Vanden Plas *	Not Given	4	1275	
Metro MG Turbo	Not Given	4	1275	
Morris Ital SLX *	Not Given	4	1256	1700
Morris Maestro HLE *	Not Given	4	1275	
Morris Maestro Vanden Plas *	Not Given	4	1598	
Austin Ambassador HLS *	Not Given	4	1700	1994
AUTOBIANCHI				
A 112 Junior	33980	4	903	
A 112 LX *	40840	4	965	
A 112 Abarth	44052	4	1050	
BMW				
318i *	77984	4	1600	1766
320i	86956	6	1990	
323i	96152	6	2316	
518	79468	4	1766	
525i *	111076	6	2494	
528i	120760	6	2788	
635CSi *	250360	6	2800	3430
735i	205620	6	2800	3430
745i Turbo	238412	6	3430	
BRISTOL				
Britannia	Not Given	8	5900	
Brigand Turbo	Not Given	8	5900	
Beaufighter	Not Given	8	5900	
CRITOEN				
2 CV6 Special *	26756	2	602	
Dyane 6	32156	2	602	
LNA 11 RE *	36988	4	650	1124
Visa GT *	50324	4	650	1360
GSA X1	48424	4	1300	
GSA Pallas	51324	4	1300	
GSA Special Break *	48124	4	1300	
BX 16 TRS *	62724	4	1400	1580

	Price (FF)	# Cylinders	Engine Size (cc) low	high
CITROEN (cont'd)				
CX Pallas *	Not Given	4	1995	2500
CX GTi	97696	4	2347	
CX Prestige I	123296	4	2347	
CX D Limousine	80820	4	2499	
DAIHATSU				
Cuore L 60 *	Not Imported	2	500	2530
Charade Coupe *	Not Imported	3	986	
Charmant LE	Not Imported	4	1300	1577
DATSUN				
Cherry GL	42440	4	1261	
Sunny Limousine	Not Given	4	1477	
Sunny Coupe	Not Given	4	1477	
Sunny Break	Not Given	4	1477	
Stanza	Not Given	4	1585	
Bluebird Limousine *	50446	4	1758	2000
Laurel *	Not Given	6	2000	2800
280 ZX *	121328	6	2743	
Patrol Diesel	100776	6	3246	
DE TOMASO				
Deauville	Not Given	8	5763	
Longchamp GTS	Not Given	8	5763	
Pantera GT *	Not Given	8	5763	
FERRARI				
208 GTB Turbo *	Not Given	8	1991	
308 GTBi Quattrovalvole	Not Given	8	2927	
308 GTSi Quattrovalvole	Not Given	8	2927	
Mondial Quattrovalvole	Not Given	8	2927	
400 Automatic i	390896	12	4823	
BB 512 i	446896	12	4942	
FIAT				
126 Personal *	22938	2	652	
Panda 45 Super *	34088	4	650	903
127 Special	31238	4	903	
127 Super *	34988	4	903	1300

	Price (FF)	# Cylinders	Engine Size (cc) low	Engine Size (cc) high
FIAT (cont'd)				
127 Sport	42024	4	1301	
Uno 45 *	Not Given	4	903	
Uno Energy Saving	Not Given	4	903	
Uno 55S *	Not Given	4	1116	1300
128 CL	Not Given	4	1116	
Ritmo 60	37892	4	1116	
Ritmo Energy Saving	Not Given	4	1116	
Ritmo 85 Super *	50024	4	1300	1700
Ritmo 105 TC *	56138	4	1585	2000
131 Mirafiori CL *	Not Given	4	1300	1585
131 Supermirafiori TC *	55888	4	1300	1995
131 Supermirafiori Diesel *	59688	4	2445	
131 Break Super Diesel *	62338	4	2445	
Argenta i *	67052	4	1600	2500
FORD				
Fiesta L *	36458	4	1000	1117
Fiesta S *	43414	4	1117	
Fiesta XR2	50024	4	1598	
Escort GL *	Not Given	4	1117	1300
Escort XR3i	67256	4	1597	
Escort Break L *	Not Given	4	1597	
Sierra GL *	57164	4	1593	
Sierra GL Break *	65986	6	1998	
Sierra XR4 *	91530	6	2300	2792
Granada L Break *	69562	4	1600	2800
Granada Ghia *	95730	6	1600	2294
Granada Injection *	98210	6	2792	
Capri GT *	59048	4	1593	2000
Capri Ghia *	73216	6	2294	
Capri Injection	86340	6	2792	
Mercury LN7	Not Imported	4	1598	
Mercury Lynx RS *	Not Imported	4	1598	
Mercury Capri GS *	Not Imported	4	2301	
EXP	Not Imported	4	1598	
Mustang GLX Convertible *	Not Imported	4	2271	
Fairmont Futura *	Not Imported	4	2301	
GENERAL MOTORS				
Chevrolet Malibu	Not Imported	8	3800	5700
Chevrolet Corvette	Not Imported	8	5733	
Chevrolet Blazer	Not Imported	8	5012	6200
Pontiac Grand Prix *	Not Imported	6	3791	5700
Buick Regal Sport Coupe *	Not Imported	6	3791	5700
Cadillac Seville *	Not Given	8	2000	5700

Table 3-24 (con't)

	Price (FF)	# Cylinders	Engine Size (cc) low	high
HONDA				
Civic Limousine *	Not Given	4	1335	
Civic S	45292	4	1335	
Quintet Std *	46124	4	1602	
Accord *	60342	4	1602	
Accord Coupe Ex *	58842	4	1602	
Prelude	Not Given	4	1829	
INNOCENTI				
Cilindri S	36400	3	993	
Cilindri SE	42000	3	993	
Cilindri SL	40300	3	993	
JAGUAR				
Sovereign *	199764	6	3400	4235
Sovereign HE *	253992	12	5343	
XJ-S HE *	247992	12	5343	
LADA				
Break *	28724	4	1198	1500
Nova *	Not Given	4	1200	1294
Niva 5000	45388	4	1568	
LAMBORGHINI				
Jalpa P350	Not Given	8	3500	
Countach LP500	Not Given	12	4754	
LANCIA				
Delta *	59956	4	1300	1498
Delta GT *	Not Given	4	1300	1585
Beta Coupe *	68196	4	1350	1585
Prisma *	Not Given	4	1300	1585
Trevi IE	78532	4	1600	1995
Trevi Volumex VX	82952	4	1995	
HP Executive *	84652	4	1600	1995
Montecarlo	86148	4	1995	
Gamma	108824	4	2000	2484

Table 3-24 (con't)

	Price (FF)	# Cylinders	Engine Size (cc) low	high
LOTUS				
Eclat Excel	Not Given	4	2174	
Esprit S3	Not Given	4	2174	
Turbo Esprit	Not Given	4	2174	
MASERATI				
Biturbo	Not Given	6	1996	
Merak-SS *	Not Given	6	2000	4900
Quattroporte *	Not Given	4	4136	4900
MAZDA				
323 *	Not Given	4	1285	1500
323 Break	Not Given	4	1490	
323 GT *	Not Given	4	1100	1490
626 *	47424	4	1575	2000
626 Coupe *	54888	4	1600	1956
RX7	88796	2 Rotors	2 X 573	
929 L	55856	4	1970	
929 Coupe	80856	4	1970	
929 L Break	Not Given	4	1970	
MERCEDES-BENZ				
190	Not Given	4	1997	
190 E	Not Given	4	1997	
200	95528	4	1997	
230 E *	112048	4	2299	2500
230 CE *	Not Given	4	2299	2800
240 D *	101604	4	2000	3000
280 E *	139392	6	2746	
280 SE *	180128	6	2746	
300 TD *	133884	5	2000	2998
380 SEC Coupe	301880	8	3839	
500 SL *	261700	8	4973	
240 GD *	Not Given	4	2300	3000
MITSUBISHI				
Colt Turbo *	53850	4	1200	1400
Tredia GLS *	Not Given	4	1400	1597
Cordia Turbo *	Not Given	4	1597	
Starion Turbo *	Not Given	4	1400	1983
Galant Turbo *	82500	4	1600	2300
Sapporo Turbo *	Not Given	4	1983	

	Price (FF)	# Cylinders	Engine Size (cc) low	high
OPEL				
Corsa S *	30148	4	993	1300
Corsa TR Lusso *	34248	4	1196	
Kadett Break *	45407	4	1196	1600
Kadett SR *	52710	4	1297	
Kadett Berlina *	53445	4	1200	1598
Kadett Diesel *	57135	4	1598	
Ascona Berlina *	50250	4	1297	
Ascona De Luxe *	54365	4	1598	
Ascona SR	61249	4	1598	
Ascona Diesel *	59525	4	1598	1800
Manta *	Not Given	4	1297	
Manta GT/J *	Not Given	4	1800	1979
Manta GT/E *	69875	4	1979	
Rekord Berlina *	76871	4	1979	
Rekord Diesel Caravan Lusso *	93689	4	1800	2260
Rekord Diesel *	63811	4	2260	
Senator 3 *	93689	6	2000	3000
Monza Coupe E *	116027	6	2000	3000
PEUGEOT				
104 GL *	37688	4	954	1400
205 GL *	Not Given	4	1124	
205 GT *	Not Given	4	1360	
305 SR *	53924	4	1300	1900
305 Break GLD *	60392	4	1500	1905
504 Cabriolet *	90952	4	1971	
505 Break GR *	68752	4	1971	2500
505 STI *	78552	4	2000	2500
604 SRD Turbo *	106524	4	2304	2700
POLSKI/POLONEZ				
Polski Fiat 125P *	29796	4	1300	1481
Polonez *	36936	4	1481	
PORSCHE				
911 SC Cabriolet *	234900	6	2994	
911 SC Coupe *	202361	6	2994	
911 Turbo	378025	6	3299	
924	118900	4	1984	
928 S	317142	8	4664	
944	149381	4	2479	

Table 3-24 (con't)

	Price (FF)	# Cylinders	Engine Size (cc) low	Engine Size (cc) high
RELIANT				
Rialto GLS *	Not Imported	4	848	
Scimitar GTE	Not Imported	6	2792	
Scimitar GTC	Not Imported	6	2792	
RENAULT				
4 GTL *	33388	4	850	1108
5 GTL *	43788	4	845	1400
5 Alpine Turbo	59724	4	1397	
5 Turbo 2 *	92492	4	1397	
9 GTS	52724	4	1100	1397
14 TL	44692	4	1218	1400
18 TL *	49092	4	1397	
18 GTS *	59456	4	1647	2100
18 Turbo *	72024	4	1565	
18 Turbo Break	76324	4	1400	2100
Fuego GTS *	64856	4	1400	2000
Fuego Turbo Diesel *	87524	4	2068	
20 Turbo Diesel *	87254	4	2000	2200
30 TX *	95760	6	2100	2664
Alpine A310 V6 *	129860	6	2664	
ROLLS ROYCE				
Silver Spirit	841261	8	6750	
Silver Spur	982061	8	6750	
Camargue	1292248	8	6750	
Bentley Mulsanne	Not Given	8	6750	
Bentley Mulsanne Turbo	Not Given	8	6750	
Corniche *	Not Given	8	6750	
ROVER				
Rover	77888	4	1994	
Rover SD Turbo *	102446	4	2393	
Rover S *	91052	6	2597	
Vanden Plas	138840	8	3528	
Range Rover	130240	8	3528	
Land Rover *	Not Given	8	2300	3528
SAAB				
99 GL	Not Given	4	1985	
900 GL	Not Given	4	1985	
900 GLE	87280	4	1985	

Table 3-24 (con't)

	Price (FF)	# Cylinders	Engine Size (cc) low	high
SAAB (cont'd)				
900 GLS *	69588	4	1985	
900 Turbo *	101988	4	1985	
900 Turbo Special *	Not Given	4	1985	
SKODA				
105 S *	Not Given	4	1038	
Rapid Coupe	32492	4	1164	
120 GLS *	Not Given	4	1164	
SUBARU				
4WD	Not Imported	4	1781	
GL 4WD Break	Not Imported	4	1781	
Coupe 4WD	Not Imported	4	1781	
SUZUKI				
Cervo	Not Imported	3	543	
Alto FX *	Not Imported	3	796	
SJ 410	Not Imported	4	970	
TALBOT				
Samba GL *	39988	4	900	1200
Samba Cabriolet *	60392	4	1360	
Horizon GLS *	52124	4	1100	1442
Horizon EXD *	59824	4	1905	
Horizon Premium	56456	4	1592	
Solara SX *	63124	4	1300	1592
Matra Ranch N *	67956	4	1442	
Mantra Murena	90964	4	1600	2155
Tagora DT *	91824	4	2200	2600
Alpine LS *	Not Imported	4	1294	1600
Samba S *	Not Imported	4	1000	1360
Solara GLS *	Not Imported	4	1300	1592
TOYOTA				
Starlet *	Not GIven	4	993	
Tercel *	Not Given	4	1295	
Tercel Allrad	Not Given	4	1452	
Corolla *	45120	4	1300	1588
Carina	Not Given	4	1588	

	Price (FF)	# Cylinders	Engine Size (cc) low	high
TOYOTA (cont'd)				
Carina Break	Not Given	4	1588	
Cressida GLi 6	Not Given	6	1988	
Cressida DX Diesel *	Not Given	4	2188	
Camry *	Not Given	4	1832	
Celica Coupe GT *	73232	4	1600	1968
Celica Supra	116828	6	2759	
Land Cruiser Station Wagon Diesel *	Not Given	6	3980	4200
TRIUMPH				
Acclaim HL	44342	4	1335	
Acclaim HLS	47782	4	1335	
Acclaim CD	Not Given	4	1335	
TVR				
Tasmin Serie 2 *	Not Imported	6	2792	
Tasmin Cabriolet *	Not Imported	6	2000	2792
Tasmin Turbo	Not Imported	6	2792	
VAUXHALL				
Astra L *	Not Imported	4	1200	1600
Astra L Diesel Break	Not Imported	4	1300	1598
Chevette L *	Not Imported	4	1256	
Cavalier GL Hatchback *	Not Imported	4	1297	1600
Cavalier CD *	Not Imported	4	1796	
Cavalier SRi Hatchback *	Not Imported	4	1796	
Manta GTJ *	Not Imported	4	1796	
Carlton L Diesel	Not Imported	4	1800	2260
Carlton Diesel Break *	Not Imported	4	1800	2260
VOLKSWAGEN				
Polo CL *	Not Given	4	1000	1300
Polo Coupe GT *	Not Given	4	1100	1272
Derby GL *	Not Given	4	1000	1272
Maggiolino L	Not Given	4	1192	
Golf C *	44792	4	1093	1600
Golf Cabriolet GL *	73142	4	1457	1800
Golf GTD *	65460	4	1588	
Golf GTI	67588	4	1781	
Santana GL Turbo Diesel *	84560	4	1588	1900
Jetta GL *	Not Given	4	1100	1600

Table 3-24 (con't)

	Price (FF)	# Cylinders	Engine Size (cc) low	Engine Size (cc) high
VOLKSWAGEN (cont'd)				
Jetta Diesel CL *	Not Given	4	1588	
Scirocco GT *	72374	4	1500	1588
Scirocco GLI *	Not Given	4	1781	
Passat GL Break *	67156	4	1300	1900
Passat GL 5 *	78506	5	1300	1921
VOLVO				
340 GL	Not Given	4	1397	
360 GLS	Not Given	4	1986	
360 GTL	Not Given	4	1986	
240 GLE *	Not Given	4	1986	
240 GL D6 Break *	Not Given	6	2383	
240 Turbo Break	Not Given	4	1986	
240 Turbo	Not Given	4	1986	
760 GLE	129995	6	2849	
760 GLE Turbo Diesel	Not Given	6	2383	

IV. European Company Operation Data: Detail on Subsidiaries and Plants

Table 3-25

FIAT GROUP

		Empl.	Area ('000m2) Total	Covered
Italy	- Mirafiori (1939) Uno, Mirafiori, Argenta production	38600	2302	1150
	Engines			
	Gearboxes			
	- Lingotto (1921) 127, Lancia Beta production	9300	337	207
	- Rivalta (1962) Uno, Ritmo, Strada production		2713	571
	Suspensions			
	- Chivasso (1962) Lancia Beta, Gamma production	7100	1224	203
	- San Paolo (1906) Lancia Gamma assembly	1375		
	Engines			
	- Desio (1956) Panda, A112 assembly	4400	295	129
	- Cassino (1972) Ritmo, Strada assembly	900	2010	300
	- Termini Imeresi (1970) Panda assembly	2250	407	82
	- 6 machining plants	9030	3808	438
	- 59 component plants (incl. for CVs.)	35635		
	- 3 plants producing sports cars (Ferrari, Arbarth)	1755	170	79
Ireland	- Dublin (1952) 127, Strada assembly	300	51	11
Yugoslavia	- ZCZ (1954) Car production and assembly	11125	220	209
	Engines			
	- 12 component plants	8975		
Poland	- FSO (1951) 125P assembly	18300		441
	Engines			
	Axles			
	- FSM (1974) 126P production	34000		410
	Engines			
	Forges, foundry			
	- ZZN( ) Gearboxes	1025		33
	- 6 component plants	5426		147

Table 3-25 (con't)

			Empl.	Area ('000m²) Total	Covered
Portugal	-	Lisbon (1964) 127, Mirafiori, Ritmo assembly	450	95	24
Spain (SEAT)	-	Barcelona (1953) Car production	24000	1260	632
	-	Martorell (1975) Car assembly	1100	327	175
	-	Pamplona (1975) Panda, Beta assembly	1750	400	67

Source: Dan Jones, SPRU, 1983.

Table 3-26

VOLKSWAGEN AUDI GROUP

			Empl.	Area (000m^2)
Germany	-	Wolfsburg (1939) Golf, Jetta, Polo Derby production	56990	6750
	-	Hanover (1956) Engines and commercial vehicles	21760	
	-	Braunschweig (1938) Front axles	6355	
	-	Kassel (1958) Transmissions	16407	
	-	Emden (1964) Passat, Santana, Audi 80 production	8234	
	-	Salzgitter (1970) Engines	7170	
	-	Ingolstadt (1961)		
	-	Neckarsulm ( )		
Belgium	-	Brussels ( ) Golf, Passat assembly	4539	
Yugoslavia	-	TAS Sarajevo Golf Jetta assembly		

Source: Dan Jones, SPRU, 1983

Table 3-27

FORD OF EUROPE

			Empl.	Area ('000m^2)
UK	-	Dagenham (1931) Fiesta, Sierra production	24000	832
		Engines (1 m pa)		
		Foundry, forge		
	-	Halewood (1962) Escort production	13800	396
		Transmissions		
		Suspension components		
	-	Bridgend (1980) Engines (500,000 pa)		109
	-	8 component plants	8700	264
	-	3 CV and tractor plants	11500	354
Germany	-	Cologne (1932) Fiesta, Capri, Granada production	21000	1001
		Engines		
		Forgings, castings		
		Transmissions		
	-	Saarlouis (1967) Escort production	8300	351
	-	3 component plants		144
Belgium	-	Genk (1963) Sierra, Transit van production	11000	474
France	-	Bordeaux (1973) Gearboxes and transmissions	4200	147
Ireland	-	Cork (1919) Sierra assembly	900	46
Spain	-	Valencia (1976) Fiesta, Escort, production	9100	366
		Engines		
Portugal	-	Lisbon (1963) Sierra, Transit, Cargo assembly	950	22

Source: Dan Jones, SPRU, 1983

Table 3-28

PEUGEOT GROUP

			Empl.	Area ('000m^2)
France	-	Soucheau (1912) 305,505,604 production.	32200	
		Engines		
	-	Mulhouse (1961) 104,205 production	13500	
	-	Rennes (1961) Visa, GS, BX production	14300	
	-	Aulnay ( ) LNA, CX, Visa production	8000	
	-	Levallois ( ) 2CV production	4200	
		Engines		
	-	Crey ( ) Pickup and van assembly		
	-	Poissy (1939) Samba, Horizon, Solara, 1510 Alpine, Tagora production	18000	
		Engines		
	-	Lille ( ) Engines		
	-	Tremery ( ) Engines		
	-	5 Gearbox and transmission plants	9700	
	-	15 components plants	30100	
UK	-	Ryton ( ) Horizon, Alpine, Solara assembly, Hunter CKD		
	-	Stoke ( ) Engines		
Spain	-	Villaverde ( ) Solara, 1510, Samba, Horizon production		
		Engines		
	-	Vigot ( ) GS, Visa, Dyane P504 production		
	-	Orensay ( ) Engines		

Source: Dan Jones, SPRU, 1983.

V. European Performance Statistics

Table 3-29

VOLKSWAGEN A.G.: KEY STATISTICS

LABOR FORCE	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Wolfsburg	51,836	56,549	51,155	46,097	48,899	52,620	54,420	56,429	57,927	58,876
Hanover	26,259	26,504	21,605	16,867	17,347	17,397	18,820	20,512	22,110	21,383
Kassel	17,256	18,808	16,398	4,925	5,200	5,509	6,091	16,366	16,681	16,665
Salzglitter	7,145	9,387	9,069	13,732	13,884	14,321	14,908	7,365	7,252	7,433
Emden	7,321	7,578	7,299	6,111	6,507	7,357	7,457	8,244	8,338	9,341
Brunswick	6,535	6,961	6,001	5,294	5,585	6,097	6,680	6,500	6,458	6,373
Total	116,352	125,787	111,527	79,143	83,611	103,301	108,376	115,416	118,766	120,071
Labor cost (DM mil.)	~3,138	3,700	3,900	~3,594	4,291	~4,470	5,037	~5,610	6,534	6,545
Inventory (DM mil.)	1,016	1,455	1,428	1,184	1,403	1,483	1,631	2,015	2,259	2,013
Debt (DM mil.) with terms 4 years +	407.6	406.4	1,155.2	1,553.9	1,553.3	1,552.5	907	561.5	396	285
Equity	900	900	900	900	900	900	1,200	1,200	1,200	1,200

Table 3-30

VOLKSWAGEN SUBSIDIARY DATA

Assumption: 2000-hr. work week Sales (millions of DM), Sales (Units), Production (Units)

Subsidiary	Location *Main Office and/or plant	1972	1973	1974	1975	1976	1977	1978	1979	1980	1982
VOLKSWAGENWERK AG	Wolfsburg*										
Sales (DM mil.)	Hanover	10,399	11,563	11,219	11,370	16,914	19,837	22,383	25,180	24,257	26,402
Sales (units)	Brunswick	1,471,561	1,448,561	1,234,410	1,356,707	1,561,506	1,687,053	1,752,272	1,725,060	1,632,456	1,564,900
Production (units)	Kassel	1,483,350	1,524,029	1,239,698	-1,121,943	1,316,039	1,371,453	1,453,048	1,369,160*?	1,346,755	1,232,818
Workforce	Emdem	116,352	125,787	111,527	93,026	97,422	103,301	108,376	115,416	1,187,766	120,071
	Salzgitter										
Capital investments (mill DM)		785	755	1,187	374	332	832	1,046	1,709	2,251	2,182
#hours/unit prod. (A)		156	165	180	166	148	151	149	169	176	195
Index to VWAG		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Index to VW Group		0.891	0.897	0.914	0.917	0.876	0.873	0.856	0.894	0.880	0.886
						*plus 19,112 Porsche 924's	+From now on these figures INCLUDE production for Porsche				
AUDI NSU AUTO UNION	Neckarsulm*										
Sales (mill DM)	Ingolstadt	2,584	3,687	3,063	3,429	3,030	4,230	4,509	5,171	4,903	5,774
Sales (units)		296,895	398,842	284,977	309,189	246,253	339,883	317,154	344,100	299,987	329,246
Production (units)			409,793	266,420	-205,380	240,905*	339,883+	317,154	344,100	299,987	329,246
Workforce		31,173	33,880	28,936	23,280	25,363	28,349	28,492	29,767	29,065	30,256
Capital investments (mill DM)		250	134	90	87	158	156	276	278	336	802
#hours/unit prod.			165	217	227	211	167	180	173	194	184
Index to VW AG			1.000	1.206	1.367	1.426	1.106	1.208	1.024	1.102	0.944
Index to VW Group			0.897	1.102	1.254	1.249	0.965	1.034	0.915	0.970	0.836
VW DO BRASIL	Sao Bernardo										
Sales (mill DM)	do Campo*	2,038	2,105	2,638	3,294	3,570	3,231	3,461	3,266	2,816	3,251
Sales (units)	(Brazil)	337,662	386,906	454,828	502,501	527,808	474,467	516,443	522,177	488,155	313,266
Production (units)			379,370	458,950	-458,960	529,636	472,192	518,603	525,703	514,237	295,303
Workforce		28,264	31,957	39,232	38,722	39,467	38,241	41,398	43,959	46,671	33,573
Capital Investment (mill DM)		225	319	350	202	143	89	143	199	333	546
# hours/unit prod.			168	171	169	149	162	160	167	182	227
Index to VW AG			1.018	0.950	1.018	1.007	1.073	1.074	0.988	1.034	1.164
Index to VW Group			0.913	0.868	0.934	0.882	0.936	0.92x	0.884	0.910	1.032

(A) Assumes 2000 hours, for indexing only.

Table 3-30 (con't)

Subsidiary	Location *Main Office and/or plant	1972	1973	1974	1975	1976	1977	1978	1979 (Apr 1 - Dec 3)	1980	1981
VW CAMINHOES	Sao Bernardo do Campo* (Brazil) (formerly Chrysler of Argentina							Purchased from Chrysler			
Sales (mill DM)		--	--	--	--	--	--	--	187	194	287
Sales (units)		--	--	--	--	--	--	--	12,398	14,309	10,325
Production (units)		--	--	--	--	--	--	--	12,945	14,309	10,325
Workforce		--	--	--	--	--	--	--	3,423	3,417	2,618
Capital investments (mill DM)		--	--	--	--	--	--	--	10	32	24
# hours/unit prod.		--	--	--	--	--	--	--	529	478	507
Index to VW AG		--	--	--	--	--	--	--	3.130	2.716	2.600
Index to VW Group		--	--	--	--	--	--	--	2.799	2.390	2.305
VW ARGENTINA	Buenos Aires* (Argentina)									Purchased in Spring from Chrysler	
Sales (mill DM)		--	--	--	--	--	--	--	--	920	488
Sales (units)		--	--	--	--	--	--	--	--	35,280	23,800
Production (units)		--	--	--	--	--	--	--	--	31,630	18,528
Workforce		--	--	--	--	--	--	--	--	4,255	4,133
Capital investment (mill DM)		--	--	--	--	--	--	--	--	6	44
# hours/unit prod.		--	--	--	--	--	--	--	--	269	446
Index to VW AG		--	--	--	--	--	--	--	--	1.528	2.287
Index to VW Group (mfg.)		--	--	--	--	--	--	--	--	1.345	2.027
VW AMERICA	Warren, MI*	In this period VW America was a distribution company HQ'd at Englewood Cliffs, NJ. In 1975, VW began to construct local plants and VW America and the newly set-up VW Products Corp. handled American assembly and distribution.			UNDER CONSTRUCTION						
Sales (mill DM)							4,081	4,319	4,906	5,792	7,475
Sales (units)							281,654	298,459	336,804	368,065	336,669
Production (units)							--	40,195	175,170	225,943	204,990
Workforce							3,385	6,360	9,102	10,048	9,891
Capital invest. (mill DM)							369	262	96	191	446
# hours/unit prod.							--	316	104	89	97
Index to VW AG							--	2.121	0.615	0.506	0.497
Index to VW Group							--	1.816	0.55x	0.445	0.441

Table 3-30 (con't)

Subsidiary	Location *Main Office and/or plant	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
VW MEXICO	Puebla/Pue.* (Mexico)										
Sales (mill DM)		441	598	859	933	801	676	871	1,205	1,515	2,461
Sales (units)		58,413	88,577	114,794	97,524	71,741	71,790	91,136	112,511	121,663	139,237
Production (units)					-69,945	84,562	52,292	94,609	109,707	127,374	138,303
Workforce		5,922	9,927	11,204	9,653	8,683	7,558	10,158	10,873	13,465	15,409
Capital investments (mill DM)		64	115	123	57	30	21	20	194	200	300
# hours/unit prod.					276	205	289	215	198	211	223
Index to VW AG					1.663	1.385	1.914	1.443	1.172	1.199	1.144
Index to VW Group					1.525	1.213	1.671	1.236	1.048	1.055	1.014
VW SOUTH AFRICA	Vitenhagen* (South Africa)										
Sales (mill DM)		336	459	523	523	437	390	495	551	867	1,113
Sales (units)		35,148	46,585	48,958	47,718	38,631	32,778	43,519	48,935	62,242	61,886
Production (units)		35,917	46,692		49,885	37,485	33,809	43,328	48,930	60,437	62,968
Workforce		4,081	5,420	5,258	5,231	4,675	4,660	5,369	5,419	7,322	8,610
Capital investments (mill DM)		48	35	15	16	27	43	10	25	75	142
# hours/unit prod.		227	232		210	249	276	248	222	242	273
Index to VW AG		1.455	1.406		1.265	1.682	1.824	1.664	1.314	1.375	1.400
Index to VW Group		1.297	1.261		1.16x	1.473	1.595	1.425	1.175	1.210	1.241
VW BRUXELLES	Brussels (Belgium)										
Sales (mill DM)		324	422	506	522	773	908	1,130	1,199	1,156	1,336
Sales (units)		81,890	99,464	101,436	75,169	97,305	104,430	122,880	121,007	110,156	117,251
Production (units)		-82,206	99,469	101,440	-75,260	97,314	104,435	122,901	121,029	110,206	117,261
Workforce		2,125	3,219	3,229	2,773	2,960	3,781	3,996	4,463	4,539	4,649
Capital investments (mill DM)		41	16	13	8	4	12	7	34	72	36
# hours/unit prod.		52	65	64	74	61	72	65	74	82	79
Index to VW AG		0.333	0.394	0.356	0.446	0.412	0.477	0.436	0.438	0.466	0.405
Index to VW Group		0.297	0.353	0.325	0.409	0.361	0.416	0.374	0.392	0.410	0.359

Table 3-30 (con't)

Subsidiary	Location *Main Office and/or plant	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
TAS IVORNICA AUTOMOBILA	Sarajevo, Vogasca (Yugoslavia)	UNDER CONSTRUCTION									
Sales (mill DM)											
Sales (units)				11,773		10,059		11,027		14,206	20,821
Production (units)						9,108		10,260		13,668	20,167
Workforce											
VW NIGERIA			UNDER CONSTRUCTION								
Sales (mill DM)		--	--	--							
Sales (units)		--	--	--	-9,350	17,224		36,741	20,860		29,348
Production (units)		--	--	--		16,244		23,840			
Workforce		--	--	--							
VW GROUP											
Sales (mill DM) (incl. all sales taxes)		15,996	16,982	16,966	18,857	21,423	26,373	29,336	30,707	33,288	37,878
Sales (thou. units)		2,197	2,280.9	2,051.8	2,037.9	2,142.1	2,239.2	2,393.2	2,538.6	2,494.7	2,279
Production (thou. units)		2,292.5	2,335.2	2,068	1,948.9	2,165.6	2,219.9	2,384.5	2,541.8	2,573.9	2,245.6
Workforce		192,083	215,058	203,730	176,824	183,238	191,891	206,948	239,714	257,930	246,906
Labor cost		4,463	5,309	5,718	5,550	6,413	6,810	7,656	9,113	10,782	11,779
Capital investment (mill DM)		1,573	1,556	1,883	941	1,141	1,697	1,990	3,100	4,279	4,851
# hours/unit prod.		175	184	197	181	169	173	174	189	200	220

Table 3-30 (con't)

VOLKSWAGEN COMPANIES (now defunct)

Name	Location	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
MOTOR PRODUCTS, LTD.	Melbourne (Australia)					Sold to Nissan on March 31					
Sales (mill DM)		~134	148	203							
Sales (units)		15,593	14,097	16,695	15,385	15,781					
Production (units)											
Workforce											
P.T. GERMAN MOTOR MFG.	Djakarta (Indonesia) operated jointly by VW, Daimler-Benz, and Indonesian partner -2:1 VW:Benz										
Sales (mill DM)											
Sales (units)			approximately equals production								
Production (units)			4,022	6,526	≳5,900	5,989+	1,162*	1,042*			
Workforce											
MEVOSA	Madrid (Spain) "Compagnie Hispano Alemanu de Productos Mercedes-Benz y Volkswagen SA"										
Sales (mill DM)											
Sales (units)		~10,573	12,297	≲12,748							
Production (units)											
Workforce											

+(3317 Volkswagens) Volkswagen only
Sold to Spains Instituto Nacional de Industria
and to Daimler-Benz

IV. B. Renault

Table 3-31

RENAULT: EUROPEAN OPERATIONS 1981

PLANT	EMPLOYMENT			SIZE	PRODUCTION			SALES Mfrancs
	Workers	ETAM (office, technicians, supervisors)	Senior Staff	(1980 figure)	Item	Volume	Total Assembled Vehicles	
Billancourt (also houses HQ, listed separately)	12,198	6,540 TOTAL = 19,829	1,091	982,000 m^2	Assembled Renault 4, 4F	159,350	159,350	
					Engines	232,650		
					Cast iron foundry	19,800 tons		
					Aluminum foundry	5,100 tons		
Flins	15,628	2,392 TOTAL = 18,227	207	873,000 m^2	Assembled Renault 5	241,450		
					" Renault 18	96,690	338,140	
					WORK FOR OTHER UNITS			
					Renault 5 sets	217,240		
					Renault 18 bodies	76,100		
					R18 stationwagon floors	45,530		
					Chroming for bumpers	989,980		
					CKD kits for R5, R12, R18			
					wheels painted (electrophoresis)	3,893,100		
Sondouville	8,491	1,213 TOTAL = 9,795	91	483,000 m^2 (+ new bldg)	R18 (sedan/station wagon)	150,520		
					R20/30	77,270	227,790	
Douai	6,583	903 TOTAL = 7,565	79	459,000 m^2	Renault 5	60,000		
					14	84,070		
					9	73,600	217,670	
Cléon	7,247	1,318 TOTAL = 8,670	105	356,000 m^2	Engines	886,700		
					Transmissions	1,390,400		
					Foundry	12,300 tons		
Le Mans	6,593	2,312 TOTAL = 9,024	119	362,000 m^2	Front axles	884,230		
					Rear axles	922,530		
					Cast iron foundry	43,090 tons		
					Pain	15,710 tons		
Orleans	759	145 TOTAL = 918	14	8,300 m^2 (1981 figure) 26,800 m^2	8 mm valves	9,994,000		
					new type of gear box shaft for brooching/welding tappets			

Table 3-31 (con't)

RENAULT: EUROPEAN OPERATIONS 1981

PLANT	EMPLOYMENT			SIZE (1980 figure)	PRODUCTION			SALES Mfrancs
	Workers	ETAM (office, technicians, supervisors)	Senior Staff		Item	Volume	Total Assembled Vehicles	
Dreux	742	150 TOTAL = 903	11	37,700 m^2	Wraparound bumpers, seat shells R14,18 dashboards Preimpregnated materials Wire harness Wire	7,900 452 30 tons 1,580 hrs 428 miles		
Choisy-le-Roi	1,080	179 TOTAL = 1,276	17	45,000 m^2	Tubes & bars Springs Std. replacement for engines & new engs.	88 million 226 million 82,691		
Grand-Couronne	798	273 TOTAL = 1,089	18	75,000 m^2	Large CKD kits Small CKD kits	130,820 50,850		
Cergy-Pontoise (storage center)	262	95 TOTAL = 367	10		Warehouse			
Scieries	38	12 TOTAL = 54	4					
Rueil-Lardy Technical Center Test tracks @ Lardy	741	2,448 TOTAL = 3,818	629	122,000 m^2 55,000 m^2				
Main Office (Boulogne-Billancourt)	431	3,902 6,419	2,086					
Saint-Ouen	348	254 TOTAL = 621	9		mfg. of beading & molding machining digital control electro-erosion reproducing machine			
Renault Engine Division (Bieures?)								3,576 ("Traditional activities" brought in 438; the rest from other activities)
Ireland plant (This may be a subsidiary, but isn't listed in the corp. structure)					Renault 4 Renault 4 (Fourgannette) (light van)	5,612 (1980)		

Table 3-31 (con't)

RENAULT SUBSIDIARIES & DIVISIONS
Automobiles

NAME	LOCATION	SIZE	EMPLOYEES	PRODUCTION			SALES (Mfrancs)	EARNINGS (Mfrancs)
				Item	Volume	Total Assembled Vehicles		
Societe de Vehicules Automobiles de Batilly (SOVAB)	Bastilly (head office)		1,025	Master Traffic	12,640 3,202	15,660	631.1 (net)	
Mauberge Construction Automobile (formerly (pre-1979) Chausson-Carrosserie	Maubeuge	143,000 m^2	2,960	Renault 18 Fuego		66,270 vehicles SHIPPED so this may be a sales figure	1,818.0 (net)	4.8
Societe de Mechanique d'Irigny (SMJ)	Irigny	72,000 m^2	893	Steering assemblies Brake pressure limiters; lathe work	438,200 395,310 303,710 hrs.		34.1 (net)	0.25
Societe Mechanique de Villerubanne (SMV)	Villeurbanne	46,180 m^2	557	Parts for: autos (92%) farm tractors (8%)			387.4	- 2.6
Societe Mosellane de Mechanique (SMM)	Yutz (Thionville)	48,653 m^2	521	machining of aluminum parts for auto engines, transmissions, design, piston manufacture			30.7 (net)	
Division Renault Moteurs (DRM) (Commerical division of Renault Group Industrial Department Not really a manufacturer. Mainly the sales division; interdivision relations.	Le Plessis-Robinson			sales to competing industries of engines, gear boxes, travelling frames, various parts & components. Sales to private work-workshops, parts			3,395.0 (1980)	
Founderies du Poitou	Poitiers (head office) Dange-Saint-Romain	41,000 m^2	440	cast aluminum, cylinder heads; cast aluminum crankcases	480,000 120,000			
Renix Electronique (or just RENIX) (51% owned by Renault; 40% owned by Benidx)	Toulouse Cedex		208 (1980)	electronic ignitions & other electronic products			18.8 (1980)	
Societe Textile de l'Ostrevant (Sotexo)	Somain-Aniche (head office)		197	seatcover sets	188,700		66.64 (net)	845,000 (francs)

Table 3-31 (con't)

RENAULT SUBSIDIARIES & DIVISIONS
Automobiles

NAME	LOCATION	SIZE	EMPLOYEES	PRODUCTION Item	PRODUCTION Volume	PRODUCTION Total Assembled Vehicles	SALES (Mfrancs)	EARNINGS (Mfrancs)
Societe de magasinage et de gestion des stocks (Sofrastock SA)	Paris (head off.) Storage centers: Saint-Andre de l'Eure Epone Palaiseau Bures Chaulnes Henin-Beaumont Villefrance-sur-Saone Le Blanc-Mesnil Garges-les Gonesse Aubergenville Production Units (2): TOTAL	 35,000 m^2 37,000 m^2 28,000 m^2 32,000 m^2 12,500 m^2 27,000 m^2 10,000 m^2 25,000 m^2 10,000 m^2 6,000 m^2 222,500 m^2 230,000 m^2	627	Stock management Manufacturing: small assemblies, parts assembly by welding, chemical products, paints	1,000 tons (1980)		193.0	4.8
SIBOD Conches Sodicam SA	Wholly owned by SoFrastock (Head Office) Boulogne-Billancourt (Admin. off) Saint-Cloud		310	raw timber for packing, etc. chemical products vehicle Accessories paint	18,000 m^3 (1980)		17.5 (est.) 247.0	 8.0
Renault Industrie de Tournaises (RIT)	Tournai		669	wire harnesses other, e.g., sheet metal, engines, etc.)	453,000 hrs. 75,700		2,977.0 (BF)	178.1 (BF)
Renault Industrie Belgique SA (RIB)	Belgium		3,841	Renault 4 Renault 5 Renault 14	17,500 135,460 20,700	173,660	21,322.0 (BF)	178.1 (BF)
Renault Industrie Osterreich	(Austria)		92	aluminum die castings	1,450 tons			
Renault Portuguesa	(Portugal) (incl. Setubal Cacia)			Renault 4 Renault 5 Renault 12 TL Renault 12 Break Renault 4 - Fourgonette		27,895	3,906 (mill. of escudos, net of taxes)	

Table 3-31 (con't)

RENAULT SUBSIDIARIES & DIVISIONS
Automobiles

NAME	LOCATION	SIZE	EMPLOYEES	PRODUCTION Item	Volume	Total Assembled Vehicles	SALES (Mfrancs)	EARNINGS (Mfrancs)
Fabricacion de Automoviles Renault de Espana SA (FASA Renault)	(Spain)		21,913	Renault 4 Renault 4 - Fourgonnette Renault 5 Renault 6 Renault Seite Renault 12 Renault 14 Renault 18		301,186		
IMV	(Yugoslavia)			Renault 4 Renault 18 TL	26,725 2,569	29,294		
Societe Franco-Suedoise de Moteurs (PRV) (a Peugoet-Renault-Volvo joint, evenly-held subsidiary)								
Compagnie d'Affretement et de Transport (CAT) (freight & transp.)	Head office: Boulogne-Billancourt		889	transport research; shipment transports			1,473.9	19.9

European Subsidiaries: CAT Belge, CAT Spanish, French Air CAT, COMATRAN, CWS, SETH, SCMT, SGAN, TED, CAT Voyages

LIMITED PRODUCTION DIVISION (Automobiles);

NAME	LOCATION	SIZE	EMPLOYEES	PRODUCTION Item	Volume	Total Assembled Vehicles	SALES (Mfrancs)	EARNINGS (Mfrancs)
Societe des Automobiles Alpine Renault	Dieppe	23,810 m^2	460	Renault 5 GTL A310 V6 Coupe Renault 5 Turbo Renault 5 Alpine Renault 5 Apline Turbo	799 1,301 651 13,488	2,751	456.0	5.5 (after taxes
Bureau d'Etudes et de Recherches Exploratoires (BEREX)	Dieppe	2,965 m^2		engineering studies for small production				
Renault Sport	Viry-Chatillon	5,000 m^2	140 (1980)	design & development of prototypes for auto racing				

Table 3-31 (con't)

RENAULT SUBSIDIARIES & DIVISIONS
Automobiles

NAME	LOCATION	SIZE	EMPLOYEES	PRODUCTION			SALES (Mfrancs)	EARNINGS (Mfrancs)
				Item	Volume	Total Assembled Vehicles		
RENAULT-PEUGEOT JOINT SUBSIDIARIES:								
Franciase de Mecanique	Dauvrin (Haisnes)	309,160 m^2	4,504	castings diesal engines for (Peugeot 104, 505,604) Renault (14,18,20,30) Trafic, Master, A310 (Alpine), Citroen, Talbot, Volvo, DeLorean	46,900 tons 687,000			
Societe de Trnasmis-sions Automatique (STA)	Ruitz (Barlin)	85,247 m^2	1,383	Renault auto transm. Renault bevel gears Peugeot rear axles	48,471 200,917 338,503			

Table 3-31 (con't)

RENAULT SUBSIDIARY: Renault Vehicules Industriels
1980 data
RVI is the major Renault manufacturer of trucks, busses, etc.

PLANT	LOCATION	EMPLOYMENT	PRODUCTION: Item	PRODUCTION: Volume (assumes 240 day work year)	PRODUCTION: Total Assembled Vehicles	SIZE
Vénissieux-Saint-Priest (all at Vénissieux except 1 item at Saint-Priest (axles))	near Rhone-Alpes	9,700	Cast iron foundry	28,800 tons		570,000 m^2
			Axles, drive axles	62,400		
			Aluminium foundry	1,440		
			Iron mill	21,600		
			Cabs	18,000		
			Engines (4.5,6-cyl., V8's)	25,200		
			Highway tractors, trucks	3,120	3,120	
		1,100	urban, interurban, trolley busses	888	888	
Monplaisir	near Lyon	1,000	small, medium parts Mechanical components			50,000 m^2
L'Arbresle (Cornela)	near Lyon	360	heat pumps (domestic use) silencers, air chambers, small mechanicals, some sheet metal work			15,000 m^2
Meyzieu	near Lyon	70	plastic parts rear sides buses cab wings tubings			
Andrézieux-Bouthedon	near Lyon	540	gearboxes for intermediate & high road-clearance vehicles	19,400		32,000 m^2
Bourg	near Lyon	1,458	chassis frames	16,800		
			cabs	14,400		
			vehicles (high road-clearance, military)	19,200	19,200	70,000 m^2
Basse-Normandie	Blainville	5,800	3.5 ton vans, trucks tractors	33,120	33,120	312,000 m^2
			CKD dits of the above	4,560		
Limousin		2,250	engines (4-cyl.gas; 6-cyl. dies) gear boxes axles, rear axles tank engines motopropeller units, spare parts			122,000 m^2
Annonay		2,700	urban, interurban tourist buses	2,400	2,400	
TOTALS (1981 DATA - Annual Report)		28,196	2.5-5 ton vehicles	6,967		SALES / EARNINGS (Millions of francs)
			5-15 ton vehicles	18,727		
			15 ton+ vehicles	18,511		
			Urban & interurban buses	2,719		
					48,924	4,877.9 / - 308.0

Table 3-31 (con't)

RENAULT SUBSIDIARIES

(Machine Tools & Equipment)

NAME	LOCATION (1980)	EMPLOYEES	SIZE (1980)	PRODUCTION		SALES (Mfrancs)	EARNINGS (Mfrancs)
				Item	Volume		
Renault Machines Outils (RMO)	Boulogne - Billancourt	680	3,790 m^2 (office) 23,005 m^2 (workshops, warehouses) 26,795 m^2	specialized machinery piston, lathe		315.4 (net)	consolidated w/organizatio earnings
Société de Mecanique de Castres (SMC)	Castres (head office) Mēlou (factory)	464	? 18,500 m^2	special machines, transfer equipment		195.8 (net of taxes)	19.0
Constructions de Clichy (CC)	Bobigny	271	6,610 m^2	grinding machines		103.9 (net)	- 7.0
ACMA-Cribier	Beauchamp	387	12,570 m^2	special equip. for machining, assembly, packaging; robots for handling, painting, welding. (nuclear mfg. 1980)		134.4 (net)	-49.9
SEIV Automation	Evry Cedex (head off.) Evry (Factory)	309	5,400 m^2	automated equip. for mass prod. handling components, assembly machines, testing equipment, 3-D measuring machines, self-propelled shop trucks		128.7 (net)	- 5.5
Société Anonyme des Automotes Programmables SMC (SAAP) new company took over some SMC operations.		124		Programmable controllers (origin SMC's)		126.5	8.4

Table 3-31 (con't)

RENAULT SUBSIDIARIES (Industrial Products)

NAME	Location (1980)	Employees	PRODUCTION Item	PRODUCTION Volume	Size (1980)	Sales Mfrancs	Earnings Mfrancs
Société des Aciers Fins de l'Est (SAFE)	Hagondange (Head Office in Billancourt)	2,860	Steel Forgings	143,272 tons 46,357 tons	138,356 m^2 (1980)	809.0	-114.8
Société Nouvelle de Alpes Roulements (SNR)	Annecy (head office) Methet Argoney & Plaisir Seynod	4,236			158,653 m^2		- 4.6
(Cevennes)	Ales	168	Bearings	47,400,000 units or 15,045 tons	5,855 m^2		- 0.5
	Total	4,404			164,508 m^2	1,143.2 net of taxes	- 5.1
Compagnie des Produits Industriels de l'Ouest (CPIO)	Nantes (head office) Factories: Carquefoce Marnes-les-Mines/ Calonne-Ricouart (new) Vitre		Plastics? (listed in '80; unlisted in '81)		60,500 m^2 10,000 m^2 13,700 m^2		
	Totals	2,108	Industrial Rubber goods	11,258 tons	84,200 m^2	414 Mfrancs (net)	-28.6 Mfrancs
Metallurgie du Temple SA (Métaltemple)	Saint-Michel-de-Maurienne	694	Precision casting Cold Stamping Tooling (1980 fig.)	1,023 tons 7,127 tons 100,536 hrs.	45,859 m^2	157.9 (net)	- 14.5
Société Bretonne de Fonderie dt de Mécanique (SBFM)	Lorient (head office) Caudan (factory)	1,495	steel & various cast iron foundries	45,600 tons	63,945 m^2 (1980)	299.6 (net)	- 26.8
Société de Dévelopment et de Diversification Industrielle (DDI)							

(Guess: This subsidiary coordinates intersubsidiary relations; it holds virtually all of SODICAM, a service/production subsidiary (see automobile subsidiaries). DDI is listed in the structure as a manufacturer)

Table 3-31 (con't)

RENAULT SUBSIDIARIES - (NON-AUTO)

RENAULT AGRICULTURE

NAME	LOCATION	EMPLOYMENT	PRODUCTION			SALES Mfrancs, unless otherwise noted	EARNINGS Mfrancs, unless otherwise noted	SIZE
			Item	Volume	Total Assembled Vehicles			
Farm Machinery Div. (FMD) (or Division Matériel Agricote (DMA))	Le Mans Vélizy - Villacoublay	2,861	Tractors	12,730	12,730	1,805.6 (incl. Renault Agri. Center)		79,343 m^2 (1980 silverbook figure)
6 commercial subsidiaries, 2 extensions; 1 subsidiary each in Germany (RTM), Italy (RMAI), England (RAI)								
Société Rivierre - Casalis	Fleury-les-Aubrias (main office) (1980)	403	Conventional pickup-balers Round balers	1,025 1,146		130.7 (net of taxes)	- 3.3	
Compagnie Européene de Mecanique, Engins et Tracteurs (CEMET)	Chindrieux (main office) (1980)	24 (1980)	Forestry equipment	61 (60 of which were in France)		24.7 (net of taxes)	- 1.7	
Société de Material Agricote et de Travaux Publics (SMATP)								
This appears to be mainly a holding company, as it controls the FMD and Rievierre Casalis)								

Table 3-31 (con't)

RENAULT SUBSIDIARIES (Engineering)

NAME	LOCATION(S) (1980)	EMPLOYEES	PRODUCTION		SIZE (1980)	SALES Mfrancs	EARNINGS Mfrancs
			Item	Volume			
S.E.R.I. Renault Ingenierie	Bois d'Arcy (head office) Lyon, Nantes } satellites	503	Consulting, construction, technical assistance, sales (equip., buildings) turnkey projects, technology transfer			275.7 (net of taxes)	0.5
Société d'Ingenierie en Ressources Humaines et de Transfer de Maîtrise Industreielle (SIRTES)	Boulogne-Billan-court	85	Development, application, and transfer of Renault knowledge in human resources engin-eering			27.9 (net)	50,000 (francs)
Société Francaise d'Etudes et de Réalisation de Machines et d'Outillage (SOFERMO)	Meudon-la-Foret (head office)	121	Specialized design & custom equip. mfg.	210,000 hrs (1980) (in 1980, sales were 43.5 Mfrancs)		64.7	1.9

Table 3-31 (con't)

RENAULT SUBSIDIARIES
(Motors & Leisure Time Equipment)

NAME	LOCATION(S) (1980)	EMPLOYEES	PRODUCTION		SIZE (1980)	SALES Mfrancs	EARNINGS Mfrancs
			Item	Volume			
Bernard Moteurs	Head Office: Le-Plessis-Robinson					367.0 (net)	- 3.1
	Factories: Rueil-Malmaisson		Gasoline engines Lawnmowers	98,700 units 45,000 units	25,000 m^2		
	Saint-Ouen		Aluminum foundry painting		6,315 m^2		
	Saint-Satur		cast-iron foundry		10,200 m^2		
		1,551					
Manufacture industrielle de cycles et motocyles (Micmo-Gitane)	Machecoul	553	bicycles & light motorcycles (Gitaine, Gitasprint, Dynamic, Bernard-Hinault, Cyril Guimard, Aprilia	220,000	35,000 m^2	171.0 (net of taxes)	3.2
Renault Marine Subsidiary: SEFA	Biganos (head office) Marchoprime Archachon La Teste	160	inboard motors	1,653	11,500 m^2	57.8 (net)	-15.5

IV. C. Ford of Europe

Table 3-32

FORD: EUROPEAN OPERATIONS (1981-1982)

PLANT	LOCATION	EMPLOYMENT			SIZE (000s of sq. ft; from FF 5/82)	PRODUCTION	
		Hourly paid (FF 9/82)	Other Total-Hour paid	Total (from FF 5/82)		Item	Volume
Belfast	N. Ireland	1,170	230	1,400	348	Carburetors Distributors	
Cork	Ireland			900 (FOE)	45,801 m^2 (FOE)	Cortina cars	
Halewood (3 plants)	England	11,600	1,400	13,000	5,436	Escort cars Escort vans Transmissions	
Treforest	South Wales	240	60	300	83	Spark plugs ceramic insulators	
Swansea	South Wales	1,520	380	1,900	1,206	Rear axles (Cortina, Capri, Transit, Cargo) Brake parts; truck gearboxes, crown wheels, pinions, hubs, drums	
Bridgend	South Wales	1,540	260	1,800	1,228	CVH engine (for Escort)	~500,000
Langley	England	2,200	600	2,800	1,419	Cargo trucks A-series trucks R-series bus chassis commercial vehicle parts	
Enfield	England	1,130	220	1,350	297	Electrical components; spark plugs	
Woolwich	England	380	70	450	209	Engine & transmission parts	
Croyden (near Woolwich)	England	270	30	300	102	Small stampings	
Basildon (1) (2 plants) (2) Truck HQ for Europe	England	2,230 620	1,120 130	3,350 750 1,500	1,360 330	Tractors } Radiators } Small engine parts	41,500
Dunton Near Basildon Research/Engineering	England	1,240	2,160	3,400	912		15,000 (tests/yr)

Table 3-32 (con't)

FORD: EUROPEAN OPERATIONS (1981-1982)

PLANT	LOCATION	EMPLOYMENT Hourly paid (FF 9/82)	EMPLOYMENT Other Total-Hour paid	EMPLOYMENT Total (from FF 5/82)	SIZE (000s of sq. ft; from FF 5/82)	PRODUCTION Item	PRODUCTION Volume
Boreham near Basildon Commerical vehicle test track Competitions Center European Tractor and Equipment Training Center	England						
Harold Hill Apprentice training	England			50	68		
Leamington	England	1,000	200	1,200	395 (613) (also from FF 5/82)	components for Ford petrol engs., brake parts Transmission casings	
Daventry Service Training Center	England	1,080	520	1,600	1,800	Parts (HQ) (service training)	
Southampton	England	3,420	580	4,000	1,506	Transit vans, buses Lt. truck cabs Cargo cab panels	
Dangenham (6 plants) (7 according to FOE)	England	19,400	4,600	24,000	9,827	assembled Fiesta; assembled Cortina; engines, foundry; forge; metal-stamping; & body molding	
Warley near Dagenham Europe Administrative HQ	England			1,700	441		
Aveley (& Thurrock) near Dagenahm	England	740	760	1,500	1,011	Industrial Products: ind. engines; pilot plant; KD packing plant	
FORD EUROPE (Continent) Note changes in sources & Units (for size)							
Oslo Nat'l Sales Co. Parts Distribution	Norway						

Table 3-32 (con't)

FORD: EUROPEAN OPERATIONS (1981-1982)

PLANT	LOCATION	EMPLOYMENT			SIZE (000s of sq. ft; from FF 5/82)	PRODUCTION	
		Hourly paid (FF 9/82)	Other Total-Hour paid	Total (from FF 5/82)		Item	Volume
Stockholm Nat'l Sales, distribution center	Sweden						
Helsinki sales, distribution center	Finland						
Copenhagen Sales, distribution center	Denmark						
Amsterdam Sales, distribution center	Netherlands						
Antwerp parts distribution	Belgium				165,058 m^2 (FOE)	assembled tractors (FOE)	
Lommel proving ground	Belgium				3,226,009 m^2 (FOE)		
Brussels Marketing Institute Gov't Affairs Off.	Belgium						
Genk	Belgium			11,000 (FOE)	474,270 m^2	Taunvs transit	
Wvelfrath	Germany				27,756 m^2 (FOE)	transmission components; steering components, suspension components (FOE)	
Cologne	Germany			21,000 (FOE)	1,001,000 m^2 (FOE)	Granada Capri Fiesta trim plastics parts engines forgings castings for transaxle cases transmission cases clutch cases	
Dueren	Germany				89,280 m^2 (FOE)	rear axles hubs (FOE)	

Table 3-32 (con't)

FORD: EUROPEAN OPERATIONS (1981-1982)

PLANT	LOCATION	EMPLOYMENT			SIZE	PRODUCTION	
		Hourly paid (FF 9/82)	Other Total-Hour paid	Total (from FF 5/82)	(000s of sq. ft; from FF 5/82)	Item	Volume
Saarlouis	Germany			8,300 (FOE)	351,081 m^2 (FOE)	Escort car trim body panels (FOE)	
Berlin	Germany				27,000 m^2	plastics	
Charleville	France				45,468 m^2 (FOE)	forward shovel-loaders (FOE)	
Paris sales, distribution center	France				27,378 m^2 (FOE)		
Bordeaux (2 plants)	France				147,631 m^2	C3 automatic transmissions; transacles for Fiesta, Escort (FOE)	
Zurich sales company office	Switzerland						
Madrid sales company office	Spain						
Valencia	Spain			9,100 (FOE)	366,224 m^2 (FOE)	Fiesta Escort engines for Fiesta Escort (FOE)	500,000/yr
Lisbon	Portugal			950 (FOE)	22,111 m^2	Cortina Transit van Cargo truck	
Vienna sales company office	Austria						
Salzburg offices, vehicle preparation center	Austria						
Rome sales company, parts	Italy						

V. European Performance Statistics

Table 3-33

VW PERFORMANCE STATISTICS
(Group Level)

General Indicators Only

	71	72	73	74	75	76	77	78	79	80	81
Gross Revenues (DM mil.)		15,982	16,966	16,966	18,857	21,423	24,152	26,724	30,707	33,288	37,878
Production (units mil.)	2.353	2.192	2.335	2.067	1.948	2.165	2.218	2.384	2.541	2.573	2.246
Employees (000)	202	192	215	204	177	183	192	207	240	258	247
Gross Labor/unit (DM)	1,876	2,036	2,273	2,765	2,848	2,961	3,069	3,211	3,585	4,189	5,168
Units/Employee	11.7	11.4	10.9	10.1	11.0	11.8	11.6	11.5	10.6	10.0	9.1
Net Earnings (DM mil.)	147	206	330	(807)	(157)	1,004	419	574	667	321	136
Depreciation (DM mil.)	912	992	1,506	1,148	1,246	1,263	1,600	1,456	1,696	2,102	2,934
Primary Cash	1,059	1,198	1,386	341	991	2,267	2,019	2,030	2,363	2,423	3.070
Capital Investment (DM mil.)	1,947	1,573	1,556	1,883	941	1,141	1,697	1,990	3,100	4,279	4,851
Net Operating Flow	(888)	(375)	(170)	(1,542)	50	1,126	322	40	(737)	(1,856)	(1,781)
(Same, as defined by VW)	(588)	(28)	115	(1,265)	379	1,914	791	619	(107)	(1,138)	(915)
Long Debt as % Capital	15.5%	24.8%	24.5%	38.4%	42.0%	36.2%	36.8%	26.2%	21.8%	20.9%	21.6%
Short Liabilities, % Current Assets (1)	73.8%	69.5%	75.4%	85.7%	70.9%	50.1%	45.5%	40.2%	46.1%	60.0%	63.5%

(1) Proxy for working capital liquidity.

Table 3-34

RENAULT: SUMMARY PERFORMANCE STATISTICS
(Group Level)

General Performance Indicators Only*

	72	73	74	75	76	77	78	79	80	81
Gross Revenues (FF mil.)	16858.6	16800.9	20063.5	22906.9	30970.6	35280.1	40785.8	49608.5	59582.3	65663.2
Gross Production (mil. units)	1.318	1.414	1.487	1.391	1.659	1.737	1.718	1.899	2.053	1.811
Employees	95,661	97,518	96,504	100,147	110,406	110,485	108,586	106,740	105,319	103,613
Gross Labor/unit (FF)	2,582	2,823	3,193	4,010	4,177	4,514	4,910	5,127	5,520	6,794
Units/Employee	13.78	14.51	15.41	13.90	15.04	15.73	16.29	17.80	19.50	17.48
Profit (FF mil.)	74.6	56.9	35.9	(551.2)	610.7	12.1	158.7	469.7	985.6	(1639.0)
Dep. & Amort. (FF mil.)	695.2	769.5	704.8	699.2	991.8	1071.1	1246.6	1419.6	1540.9	1684.9
Primary Cash (FF mil.)	769.8	826.4	740.7	148.1	1602.5	1083.2	1404.3	1889.3	2526.5	45.9
Capital Investment: No subs. (FF mil.)	N.A.	N.A.	1223.2	1208.9	1258.8	1510.0	1374.2	1428.0	2955.7	3648.6
Net Operating Flow (FF mil.)	N.A.	N.A.	(482.5)	(616.3)	343.7	(426.8)	30.1	461.3	429.2	(3602.7)
Long Debt as % Capital	59.4%	49.2%	45.3%	53.2%	57.9%	51.8%	51.7%	50.7%	57.1%	64.6%
Net Working Capital (FF mil.)	480.5	326.6	359.6	270.2	254.6	179.5	228.3	948.3	918.7	1218.4

* Note: Line items have been selected for international comparability, <u>but</u> major accounting differences, and year-to-year classification changes mean full comparability is not possible.

Table 3-35

DAIMLER BENZ PERFORMANCE STATISTICS

General Indicators Only

	71	72	73	74	75	76	77	78	79	80
Gross Sales (DM mil.)	10,003	11,041	12,624	13,656	16,414	18,315	20,407	20,645	23,736	26,714
Production (mil. units)	.472	.525	.547	.545	.579	.618	.649	.632	.681	.708
Employees	141,083	143,793	150,014	149,175	149,742	155,003	163,302	167,165	174,431	183,392
Units/Employee	3.35	3.66	3.65	3.66	3.87	3.99	3.98	3.79	3.90	3.86
Gross Labor/unit (DM)	5,666	5,894	6,594	7,549	7,994	8,421	9,037	9,436	9,838	10,298
Earnings (DM mil.)	207	275	277	269	310	392	445	474	540	570
Depreciation (DM mil.)	574	633	573	629	786	785	726	804	1,094	1,189
Primary Cash (DM mil.)	781	908	850	898	1,096	1,177	1,171	1,278	1,634	1,759
Capital Investment (DM mil.)	731	636	503	672	869	697	832	1,133	1,560	1,520
Net Operating Flow	50	272	347	226	227	480	339	145	74	239
Long Debt as % Capital	36.2%	37.0%	39.8%	41.2%	44.0%	45.9%	41.7%	42.5%	42.8%	47.5%

Table 3-36

BMW SUMMARY STATISTICS
(All Monetary Figures in Million DM)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Sales	1907.1	2319.3	2608.0	2492.3	3254.5	4287.0	4993.0	6959.2	6560.3	6898.5	7822.1	9371.6
Net Profit	32.2	92.9	93.2	42.0	74.0	126.0	125.3	150.6	175.0	160.0	145.0	200.0
Depreciation	112.7	23.4	128.2	139.4	142.8	160.5	222.5	249.6	294.4	330.1	473.1	615.8
Prime cash in	144.9	116.3	221.4	181.4	216.8	286.5	347.8	400.2	469.4	490.1	618.1	815.8
Capital invest.	153.6	250.3	250.0	159.4	167.3	320.8	335.1	304.9	472.8	738.9	815.6	752.5
Net Op. Cash Flow	-8.7	-134.0	-28.6	22.0	49.5	-34.3	12.7	95.3	-3.4	-248.8	-197.5	63.3
Current Assets	449.8	526.6	681.0	589.7	710.3	980.4	1203.0	1486.2	1584.9	1617.8	1697.6	2200.1
Current Liab.	149.7	198.2	280.5	264.9	288.4	463.3	514.9	485.6	513.3	582.7	576.8	746.7
Net Working Cap.	300.1	364.3	400.5	324.8	421.9	517.1	688.1	1000.7	1071.6	1035.1	1120.9	1453.4
Total Employees	23207	24750	27737	25805	28989	30192	33398	35171	36777	37246	39777	40738
Salaried	5336	5769	6522	6385	6590	6979	7786	8408	9294	10022	10583	11113
Hourly	17051	17945	20079	18338	21043	21554	23804	24815	25461	25118	27113	27398
Production												
Cars	164701	182858	197446	188965	221298	275022	290236	320853	336981	341031	351545	378769
Motorcycles	18772	21122	20856	23160	25566	28209	31515	29580	24415	29260	33120	30554

Table 3-37

FORD WERKE AG: SUMMARY STATISTICS

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Sales Revenue Mil. DM	5775	6133	4983	6366	8657	10163	10475	10911	8692	10544	11724
Production Mil. Units	.7064	.7534	.4677	.6345	.8128	.8785	.8473	.8613	.6444	.7342	.7959
Total Emp. Act.	54349	54188	49418	48150	52929	56332	58247	57772	49767	49403	49100
Profit Mil. DM	158.2	252.8	-175.9	283.2	627.8	579.3	549.3	483.1	-462.8	-319.2	5.1
Dep. Amort. Mil. DM	328.7	328.8	297.4	257.9	289.7	289.9	321.7	288.7	311.8	317.1	510.0
Op. Cash in Mil. DM	486.9	581.6	121.5	541.1	917.5	869.2	871.0	771.8	-151.0	-2.1	515.1
Add Fix Asst. Mil. DM	240.7	237.6	202.2	183.7	170.4	234.3	314.5	455.9	343.3	579.7	737.1
Net Op. Flow Mil. DM	246.2	344.0	-80.7	357.4	747.1	634.9	556.5	315.9	-494.3	-581.8	-222.0
Rev. Per Unit DM	8175	8141	10655	10034	10651	11569	12363	12668	13488	14362	14730
Wage Sal. Mil. DM	1270.6	1448.5	1378.1	1555.2	1873.2	2127.0	2326.2	2503.5	2379.5	2480.1	2557.8
Per Unit DM	1799.0	1923.0	2947.0	2451.0	2305.0	2421.0	2745.0	2907.0	3693.0	3378.0	3214.0
Inventory Mil. DM	590.5	738.8	637.0	576.3	655.0	628.7	887.3	899.2	674.3	752.5	869.3
Other Current Asst.	612.1	838.8	532.7	976.4	1793.4	2267.9	2046.8	1824.7	1738.8	1926.7	1603.1
Curr. Asst. Mil. DM	1202.6	1577.5	1169.7	1552.7	2448.4	2896.6	2934.1	2723.9	2413.1	2679.2	2472.4
Other Liab. Mil. DM	992.5	1018.7	832.6	735.8	865.8	1167.1	1125.4	1085.7	1653.3	1850.2	1362.6
Est. Net WK Mil. DM	210.0	558.8	337.1	767.3	1582.6	1729.5	1808.6	1638.2	759.8	829.1	1109.9
Long Term Debt	98.0	85.9	73.7	10.2	.0	.0	.0	.0	.0	.0	.0
Equity	1174.9	1419.3	1163.1	1274.6	1780.6	1639.3	1606.1	1539.6	1056.5	1056.5	1061.6
Debt % LT Capital	.007	.057	.060	.008	.000	.000	.000	.000	.000	.000	.000

Table 3-38

FORD WERKE EMPLOYMENT SUMMARY

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Total Employees	54349	54188	49418	48150	52929	56332	58247	57772	49767	49403	49100
Hourly	42041	41568	37351	37466	42174	45085	46612	45791	37969	38295	38151
Salary	11490	11832	11309	9894	9952	10409	10768	11100	10918	10260	10073
Apprentice	818	788	758	790	803	838	867	881	880	848	876
Est. Labor Hours/Emp.	1770	1759	1631	1678	1732	1706	1665	1667	1599	1599	1599
Est. Staff Hours/Emp.	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Vehicles Produced	706364	753446	467713	634536	812798	878468	847275	861275	644417	734249	795896
Hours Per Vehicle:											
Hourly	105.3	97.0	130.2	99.1	89.9	87.6	91.6	88.6	94.2	83.4	76.6
Salary	29.3	28.3	43.5	28.1	22.0	21.3	22.9	23.2	30.5	25.2	22.8
Apprentice	2.0	1.8	2.6	2.1	1.7	1.6	1.7	1.7	2.2	1.8	1.8
Total	136.7	127.2	176.4	129.2	113.6	110.5	116.2	113.5	126.9	110.4	101.2
Mix:											
Cars	669332	701977	423902	594665	771134	828134	808934	803841	592812	688326	749722
C.V.	37032	51469	43811	39871	41664	50334	38341	57434	51605	45923	46174
Car Ratio	.948	.932	.906	.937	.949	.943	.955	.933	.920	.937	.942

Table 3-39

FORD INTERNATIONAL LABOR SUMMARY

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
TOTAL WW UNITS	4.862	5.024	5.698	5.973	5.368	4.690	5.422	6.553	6.557	5.944	4.426	4.402	4.328
US CARS	2.266	2.390	2.639	2.685	2.336	1.868	2.197	2.625	2.632	2.044	1.397	1.385	1.271
US TRUCKS	0.719	0.716	0.924	1.086	0.991	0.809	1.018	1.345	1.458	1.183	0.753	0.717	0.803
US TRACTOR	0.033	0.032	0.041	0.040	0.041	0.038	0.035	0.040	0.036	0.051	0.035	0.032	0.024
TOTAL US	3.018	3.138	3.604	3.812	3.369	2.715	3.249	4.010	4.126	3.279	2.186	2.133	2.098
OUTSIDE US	1.844	1.886	2.094	2.161	1.999	1.975	2.173	2.542	2.431	2.665	2.240	2.269	2.230
TOTAL EMPLOYEES WW	0.432	0.433	0.443	0.474	0.465	0.416	0.444	0.479	0.507	0.495	0.427	0.405	0.379
US EMPLOYEES	0.229	0.225	0.233	0.250	0.235	0.204	0.220	0.239	0.257	0.239	0.180	0.171	0.156
FOREIGN EMPLOYEES	0.202	0.208	0.210	0.225	0.229	0.212	0.224	0.240	0.250	0.255	0.247	0.234	0.223
WW TOTAL LABOR COST	4412.7	4973.2	5996.0	7108.2	7317.3	7165.7	8653.3	10839.2	12494.0	13227.2	12417.2	12238.3	11756.7
WW PAYROLL	3675.2	4066.6	4905.5	5769.2	5892.6	5629.2	6639.2	8338.3	9774.9	10169.1	9519.0	9380.1	8863.0
US PAYROLL	2667.2	2935.5	3536.1	4027.0	3981.9	3560.5	4380.4	5653.4	6581.2	6262.6	5248.5	5507.5	5352.7
FOREIGN PAYROLL	1008.0	1131.1	1369.4	1742.2	1910.7	2068.7	2258.8	2684.9	3193.7	3906.5	4270.5	3872.6	3510.3

VI. Miscellaneous Japan vs U.S. Pricing in U.S.

Table 3-40

COMPARABLE PRICING: SMALL CARS IN U.S.
1983

	Toyota Corolla	Toyota SR-5	Nissan Sentra XE (400)	Nissan 310 ('82)	Mazda GLC (L)	Mazda GLC	Honda Civic 1500	Ford Escort L	Escort GL	Chevette	Cavalier CS	Pontiac 2000 LE
Length	166	168	167	160	160			163	163	162	172	174
Weight	2100	2100	1900	1947	1900			2000	2000	2100	2400	2400
Base Price	6018-6808	7248-7308	6099-7049	5689-6689	6095-6745	5695-6245	6204-6245	5639-6052	6384-6779	5469-5616	6363-6633	7020-7497
Reclining seats	x	x	x	x	x	x	x	65	x	x	x	x
Trip odometer	x	x	x	x	x	x	x	?	?		x	x
Intermitt. wipers	x	x	x	x	x		x	49	49		x	49
Full carpet	x	x	x	x	x	x	x	?	x	?	x	x
Rear defroster	x	x	x	x	x	x	x	124	124	125	x	125
Body molding	x	x	x	x	x	x	x	45	x	x	x	?
Clock	x	x	x	x	x		x	57	57			
Tinted glass	x	x	x	x	x	x	x	90	90	90	x	90
Split rear seat	x	x	x	x	x	x		N.A.	N.A.	N.A.	N.A.	N.A.
Remote hatch release	x	x		x	x		x		x		x	x
Full instr. & tach.		x	x	x			x	87	87		x ½	140
AM/FM	?			?	?	?	?					
AM/FM stereo		x	x									
Power brakes	x	x	x	x	x	x	x	95	95	95	x	x
5-speed			x	?	x	x	x	76	76	75	75	x
Remote fuel door			x	x					x			
Power steering			x						210			199
Remote rear window			x						109			
Rear wiper			x	x	x		x		117	117		117
Remote mirror			x		x	x						
Comparabe Price	6018-6808	7248-7308	6099-7049	5689-6689	6095-6745	5695-6245	6204-7104	6327-6740	7398-7793	5971-6118	6438-6708	7740-8217

Table 3-41

COMPARABLE PRICING - U.S. 1983

	Datsun Maxima	Buick Century Limited
Length	184	189
Weight	2794	2694
Base Price	$10,869	$ 9,425
6 cycle	x	150
5 speed	x	N.A.
Power brakes	x	x
Power steering	x	x
Int. wipers	x	49
Tilt wheel	x	105
Rear Defrost	x	135
Tinted glass	x	105
Full carpet	x	x
Air cond.	x	725
Halozer lights	x	22
Int. light package	x	135
Full instru.	x	83
Reclining seats	x	90
Console	x	75
2 remote mirrors (elec)	x	137
Power windows	x	255
Power locks	x	170
Entry lights	x	
Defroster timer	x	N.A.
Driver seat (lumbar)	x	N.A.
Tilt seat	x	N.A.
Cruise control	x	170
Remote trunk release	x	
Remote fuel release	x	
AM/FM cassette	x	277
Auto antenna	x	60
Comp. Price	$10,869	$12,168

INTERNATIONAL COMPARATIVE COST ANALYSIS

The purpose of this task was to place in a global context the European automotive production cost structure. It was the intention at the outset of research to perform a uniform cost comparison between the U.S., Japanese, and European industries. During the early phases of work, however, it was discovered that there was no "average" European cost structure, owing to the wide divergence among European companies with regard to production systems and products. Therefore, this research was not directed to find a single European cost estimate which could be compared to other producers, but rather to define the various European positions vis-a-vis the more homogenous estimates obtainable in the United States and Japan.

Research in this task followed two distinct phases. The first approach, comprising about 80 percent of the effort in this task, focused primarily on overall employment costs. In general this effort attempted to define overall levels of employment cost including managers and workers, at both the assemblers and suppliers in the major producing nations. The heavy focus on employment cost definition was considered critical for two major reasons.

First of all, once all the employment is accounted for through the supplier sectors, it becomes clear that employment is the largest factor in the cost structure of most of the national producing industries. Although the auto industry is often thought to be a capital intensive industry, and although it uses extremely large amounts of equipment, it has very high employment costs. For example, it is often stated in the United States that General Motors pays more for Blue Cross benefits to workers than it does for steel. It is similarly asserted that in Europe social welfare costs easily exceed the cost of major component purchases. Although we have not explicitly sought to corroborate such statements, the orders of magnitude are clear; the total payments to workers and managers including wages, salaries, and benefits are clearly larger than the purchases of pure raw material. Therefore, it was felt that by defining the overall employment costs of the industries, we would have defined the greatest portion of the cost structure, with the greatest amount of explanatory power in accounting for international cost differences.

Also, it is in the area of total employment costs where the greatest amount of international change will be occuring over the next several decades. Therefore, it was felt important to begin defining in a rough fashion the amount of change required of the various national producers. It is the employment cost category which will be most greatly affected by changes in trading patterns, and which will be most likely to produce the political activity associated with the auto industry. Owing to the overall importance of this cost item, it was considered vital to expend considerable resources in defining it.

The second reason for defining employment cost was that it made it easier to define other cost elements in the European cost structure. It is comparatively easy to estimate the overall employment cost of a company or of a national industry, given the availability of good data, but it is much more difficult to assess less visible costs relating to particular raw materials, heat, light and power, microtaxation, and other elements. Therefore, once the analyst has defined a rough estimate of employment cost, the residual cost items become easier to calculate. For example, if one can successfully extract employment cost from the "cost of goods" line item in the income statements of various companies, then one automatically has a residual which will represent the purchases of materials and outside services by that company.

Therefore a major reason for concentrating first on employment costs, was to enable subsequent research to better define non-employment cost.

The second major phase of research in this program built upon the earlier disaggregated analysis in an attempt to define in a general fashion total manufacturing costs for the various national producers. The results of this research are at this point incomplete, but the topic is the main focus for continuing cost analysis in a subsequent research effort. The main research problem in this category was to separate the non-automotive business from the financial accounts of the major motor vehicle companies. This was especially tricky in the European environment. A number of European motor vehicle producers are highly diversified into non-automotive areas. For example, Volvo, a significant European auto producer, has recently diversified into large energy operations and unrelated areas such as food and food servicing. Volkswagen recently acquired a significant position in business equipment. Renault is actively pursuing major ventures outside the motor vehicle industry. For this reason, it is not possible to simply compare data from financial statements in Europe to financial statements in the United States and Japan.

Much of our preliminary work in this area has been to seek data which will allow us to separate the non-automotive financial accounts. As might be expected, this estimation procedure is quite complex, and at this point it has not been possible to perform a comprehensive disaggregation for all European producers. West German data proved to be particularly amenable to such disaggregation, so results here are largely expressed only for West German companies. It is not felt that this represents a serious liability in the current research, because the West German industry represents a significant portion of the international car business. Therefore, drawing comparisons between West German producers and those in the United States and Japan is at least a partially valid measure of regional cost differences.

It is vitally important to understand that the purpose of this research is not to find the exact cost for various car types. The purpose of this research was to find ranges of credible cost differentials through the use of multiple data sources. The basic research assumption was that if significant cost differentials could be found from existing data stemming from several different sources, then it could be concluded that the order of magnitude of cost difference was approximately valid. If multiple data sources indicated no clear cost differential, or if several data sources conflicted with each other, this would indicate a need for further refinement before a conclusion could be drawn.

At no point was any attempt made to compare directly say, a Volkswagen Golf with a Toyota Corolla or a Chevrolet Chevette. Such specific cost comparison requires much greater control of the variables involved, which would have been well beyond the resources of this contract.

Therefore, it is important to note that the conclusions expressed in this document represent only those cost differentials which could be confirmed by multiple data sources at a general and fundamental level.

Analysis did proceed far enough to determine that indeed, large international cost differentials exist, but contract resources limited these conclusions to general differentials expressed as ranges. It must also be kept in mind that within any given national industry, especially in Europe, different producers experience different levels of cost. Therefore, it is invalid to say that all German producers experience a specific cost differential compared to all Japanese producers. Data appended in support of these conclusions represent this divergence. We have chosen to present all of the data in raw form to allow the reader direct access to the intercompany differences and the divergence of estimates possible.

Problems Encountered in this Type of Analysis

International motor vehicle cost comparisons have been a hot research topic since the late 1970s. As one might expect, given the variety of definitions and sources of this data, considerable controvery has surrounded publication of estimates. It is the observation of analysts on this project that most of the discrepancies in apparent cost measurements have arisen because definitions have not been made comparable. For example, if one lines up all of the estimates of US versus Japan cost differentials, one finds a range from approximately \$500 per unit to well over \$2,000 per unit. It is our observation that some of these estimates, primarily at the low end, result from faulty analysis. But it is much more important to understand that most of these estimates are valid, although they are defined in different ways. For example, some estimates compare a stripped small car in one nation to a stripped small car in another nation. Other analyses compare the cost of the average vehicle produced in one country to the average vehicle produced in another. Some estimates have calculated a landed cost differential while other are defined only in terms of manufacturing costs in the home country. It is obvious that such wide differences in interpretation will yield vastly different results, even though each result may be valid and well supported by its data.

For these reasons it is once again important to clarify that this research was aimed primarily at discovering the manufacturing costs of large groups of vehicles, not specific car types, nor of landed cost differentials. It is also important to understand that this research does not attempt to estimate retail price differences in the various markets to which these cars are shipped.

In all cost estimating research, the analysts face two major problem areas. First is the issue of data comparability: are the different national statistics carried in a common definition, or are there deviations in survey methods? The second major problem in motor vehicle costing is the issue of comparable car types: are the costs being compared among nations calculated on two cars which can be considered comparable vehicles? Most of the work on this project was focused on the data comparability question, largely because the question of vehicle comparability is a much more subjective phenomenon.

Data Comparability

A major problem in many recent international cost comparisons especially in employment cost comparisions, has arisen because the analysts have used data largely from financial statements of companies with varying degrees of vertical integration. It is not valid, for example, to compare the employment costs in General Motors to that in British Leyland owing to the much higher degree of parts production occuring within General Motors' integration chain. Most of the early cost analyses suffered from this problem and have been soundly criticized over the past several years. In order to circumvent this problem, research on this project had as its primary goal the identification of multiple data sources which could be used in conjunction with financial statement analysis in order to define the industrial cost patterns over the entire sector including both the assemblers and suppliers. It was the intention of this research to therefore define the overall costs of production on roughly comparable international industry bases, without regard to differences in vertical integration among producers within each country or between each country.

For example, in the total employment comparisons, an employment data base was calculated for each of the nations to include managers and production workers at assemblers and suppliers down through the basic fabrication operations. This would exclude from the employment estimate persons working solely to produce raw material, i.e., basic steel, glass, plastic, rubber, and aluminium. The data bases were also constructed to exclude non-integral peripheral industries, such as the newsprint industries which make paper used in auto company office supply. This particular data base captured most of the relevant manufacturing operations and also most of the relevant employment cost. For example, various estimates suggest that there are only about 8-15 labor hours in a ton of finished steel. Similar data can be calculated for other raw material. This means that the raw materials portion of the car would represent a low amount of employment when compared to the manufacturing operations most normally associated with the motor vehicle business.

On the total cost analysis, similar steps for comparability were taken. For example, final output data from financial statements were compared to government statistics on production value for the entire sector. In this way it was possible to exclude the strictly non-automotive portions of the business in many areas, and to have two independent data sources cross-check with each other.

It should be noted that our cross-checking procedures were quite successful in discovering incompatible or nonsensical data. But this also represented a major problem in presenting some of our conclusions. For example, in data from both the British and Italian industries, we have noted wide discrepancies in per unit costs derived from financial and government data sources. This indicator has meant to us that neither series should be trusted in its current form and therefore we have excluded observations on these industries from our overall conclusions. We have noted similar discrepancies in the cross-checking procedure for the industries in France, Belgium, Sweden, Spain and The Netherlands. We do not believe these "red flags" are the result of poor data, but rather of the fragmented nature of the industries in these countries and the complex pattern of component shipping among them. No matter the reason, however, these discrepant indicators do not allow us to draw conclusions about the "national" industries in these countries at this time.

Comparable Vehicle Types

Considerable controversy has surrounded international cost comparisons in the area of the vehicles being compared. For example, we have noted almost complete disagreement among the various industry and academic analysts concerning what are comparable vehicle types. It has been asserted for example that large American cars should not be compared to smaller Japanese cars. It has also been asserted that even when two cars command the same price in a given market that they are not comparable, owing to the differences in technical specification between them. It has also been observed that even when two identical cars can be found in terms of technical equipment that they are not comparable because the engineering specifications on one car are tighter than on the other car.

Examples of these comparative problems abound. For example, is it legitimate to compare a Chevrolet and a Mercedes-Benz of exactly the same size, weight and options configuration? One might argue that even though these cars appeared comparable, that the Mercedes-Benz engineering specifications would be more finely tuned thereby creating a greater labor intensity. It has often been asserted that American cars would be naturally more labor intensive than German cars because American cars have high levels of optional equipment such as air conditioning, power steering, and power brakes which are not so prevelant on German cars. However, a counter argument could be made that the engineering on German engines, transmissions and suspensions, designed to allow much higher speed driving and performance agility, would be comparable to the provision of air conditioning and power equipment on the less sporty American car. It has also been argued that a Japanese car selling for $10,000 will have fewer overall parts in it than an American car selling for $10,000. For example, one can find examples of Japanese cars with as many instrumentation and convenience options on it but with many fewer body panels used to make the body of the car. Some have argued that even though the consumer options might be identical on the two cars, the labor efficiency of the two cars is not comparable owing to a simpler design in the Japanese vehicle.

The traditional economic approach to this dilemma has been to compare cars on the basis of price, assuming that the economic price of a car carries with it the consumer's perception of comparative value and that therefore it would provide a useful comparison. However, it is the strong conclusion of analysts in this program that such economic procedures, which might be valid within the borders of a single nation are completely invalid in international motor vehicle costing, owing to strategic structural effects. For example, the price of a Mercedes-Benz in the United States could easily be 60 or 70 percent higher than an identical vehicle sold in Germany. The difference in international pricing on this identical car line would result from the image positioning of Mercedes-Benz in the North American market, not strictly from differences in vehicle design. Also, market segments even within a single nation are widely divergent and consumers in one segment may value some components more highly than consumers in another segment. For example, in the United States it is clear that in certain market segments a manual transmission is highly valued by a certain type of consumer, while in other segments an automatic accrues much higher value than a manual transmission. Therefore the pricing function, as a determinant of comparability, simply does not stand up to the fragmentation of international markets, and the wide divergences in consumer value which have much more to do with car image than with car componentry. Price analysis might be useful over short periods of time within homogenous market segments, but it provides no solution to the comparability dilemma when cast in international terms.

As a result of these varying complex factors, it is the judgement of analysts in this research project that the vehicle comparability question will never be answered satisfactorily. It is our conclusion that there will never be any consensus on the comparable "molecular" value of any car type, or on its economic value, or on the value of its image. Value remains in the eye of the beholder, and in the international market there are many perspectives to be considered.

The issue of vehicle comparability was treated only in a general fashion in this analysis. It is entirely possible to distinguish and correct for the highly divergent outliers, such as the vehicles produced by Mercedes-Benz, or for the production of heavy trucks as compared to motor cars, but once the analysis moves into the grey areas of the middle range of the mass markets, the comparability question remains open for highly subjective interpretation. It is the observation of the analysts on this project that the unresolved vehicle comparability question does not limit the importance of the conclusions of this analysis. It is simply a fact that no matter what differences can be measured in terms of consumer perception or technological sophistication, there are widely divergent cost structures among the international producers, which represent a competitive reality far beyond the reach of philosophy. This analysis has made general adjustments to remove the extremes in the comparability question, such as calculating the production value of a heavy truck to be several times that of the average car. In essence, the motor vehicle production mix of the various nations was adjusted to produce a roughly average mix whose comparision to other national mixes would not be invalid. It is explicitly noted by the authors that additional refinement is legitimate, but it is also noted that most refinements to this analysis will not significantly alter the general cost differentials we have calculated.

Research Approach and Methodology

As mentioned above, research was focused in two general areas. First, considerable effort was expended on defining total employment cost differences. Next, additional effort was expended on trying to define total manufacturing costs, bringing into play the various adjustments for vehicle mix mentioned above.

In the employment cost measurement task we employed two general submethods. The first method could be called the "survey method" since it was based upon broad assessments of employment not attached to particular companies. The basic data sources for this effort were goverment statistics on the various labor forces, and employment statistics provided by supra-company organizations such as trade associations or other research groups. Differences in survey methods were noted among the various data sources, and appropriate adjustments were made. In general, this research proceeded in the following way.

The "Survey Method

First the standard government employment statistics, such as the SIC classifications in the United States, were gathered and compiled to include both assembler and supplier company data. Very often these data bases would also include estimates of the hours worked by employees, the wages and salaries paid on a national basis, as well as subclassifications into the various component industries of the motor vehicle industry. It was discovered that not all of these data bases were directly comparable. For example, the SIC 371 Motor Vehicle and

Equipment account in the United States excludes a large body of workers classified in the "automotive stamping" industry in that country. So although SIC 371 would indicate between 700,000 and 1 million workers in the motor vehicle industry, it would exclude more than 100,000 workers in the automotive stamping operations which were still an absolute requirement to the production of cars. In other nations the basic motor vehicle and equipment accounts would include such stamping workers, which meant that direct comparison would understate the amount of US labor content in the equation. Another problem related to statistics in countries with a high export pattern. A number of motor vehicle equipment workers would make parts that would not be built into cars in that country, but would be shipped to other nations for production into finished units there. And, in Japan the problem of non-regular workers had to be rectified.

The employment differentials in this analysis related primarily to the countries of West Germany, Japan and the United States.

At the first order of analysis, computations were derived from the basic government employment statistics. A few words about these data sources are appropriate.

Japanese estimates were derived from the MITI Industrial Census for the motor vehicle and components categories. This is an especially thorough survey which avoids many of the problems often associated with Japanese cost analysis. For example, not only does it survey assemblers and suppliers, thereby getting around the vertical integration problem, it includes in the survey temporary workers, contract workers, and even unpaid family members attending work. It also includes all part-time workers. Therefore this data is subject to none of the criticisms normally leveled at international comparison with Japanese costs. The "hidden work force" is included, and the issue of differences in vertical integration completely negated.

The US computations were derived from the SIC accounts. It is very important to note that the SIC 371 Motor Vehicle and Equipment account is not as comprehensive as the Japanese survey of its industry. As noted above, the SIC 371 account explicitly excludes automotive stampings and a variety of other automotive components, which are included by defintion in the Japanese surveys. Therefore, a direct comparison between the SIC 371 account and the Japanese Industrial Census will understate the differences in employment efficiency in the two industries. It is interesting to notice that even with this direct comparison, which is biased strongly in favor of the United States, a significant difference is detected in the hours of employment required to make a car in the two nations. Under no circumstances is it possible to calculate an estimate which suggests that the Japanese require as many hours as the Americans to produce a vehicle. Basic analyses in this document were derived using the SIC 371 only, so it should be clearly kept in mind that such an estimating process understates the amount of employment required in the United States to produce a vehicle. Additional analysis was performed using estimates to correct for the deficiences in the SIC 371 reporting. Previous multiplier analysis in this project was subject to criticism on these multiplier add-on estimates, so they are not presented as the central theme in this document, primarily because the deficient SIC 371 account indicates a strong American competitive disadvantage in itself.

West German statistics from the government agencies responsible for employment counts were used as a basic comparative device in this analysis. Like the Japanese accounts, these surveys are quite thorough and very well defined. They include explicit measurements of the guest workers which might be thought equivalent to the temporary work force in Japan. In addition, the German survey method gathers its data along several dimensions, which adds to the comprehensive nature of the statistical base. For example, employment is counted both by plant location and by the nature of business. This further insures that the survey method does not exclude from the motor vehicle count employees like stamping workers in American auto plants who are excluded from the SIC 371 accounting.

The German data required some refinement in order to make direct comparisons. For example, owing to the rather unique structure of the German motor vehicle industry, a large proportion of employees in parts operations are making parts which are not built into cars made in Germany but are exported to assembly plants in other areas. For this reason it was required to remove their employment from the basic comparative data base so as to not overcharge their labor to cars produced strictly within Germany. Owing to the precision and specificity of the German statistics, this was a fairly easy operation. The parts workers adjustment was performed by using a ratio of parts value exported compared to parts value shipped to final assembly in Germany.

Similar data bases were constructed for the industries in France, Italy, and Sweden, but their comparability is not good. For example, the French data taken in the raw form would suggest that French automotive workers work upwards of 2600 hours per year. This number was at strong variance with estimates in other nations which suggested that typical automotive workers would work only between 1500 and 2200 hours per year.

It seems inconceivable that the French work force would be working significantly longer hours than the work force in Japan, traditionally known to work during holiday periods and on weekends. This apparent raw hourly estimate is also totally inconsistent with the working hour limitations in French contracts, and with the holiday structure so visible in France. Therefore, it has been assumed that some portion of the French government statistics are not at all comparable to the statistics derived in other nations, and although these data are presented, they should not be considered comparable in their existing form.

Swedish employment statistics are quite thorough, but comparison to other nations is hampered owing to the high degree of international component dependency exhibited by Swedish vehicle producers. We found no reasonable method to correct for the amount of imported and exported componentry product in the Swedish industrial base.

Statistics on the Italian industry appear to suffer from various changes in classification on a time series basis. We suspect that for any given year, Italian employment data could be adjusted to a comparable basis with other nations but we found no method to sort out the year-to-year discrepancies in the accounts. In addition, we found significant adjustment problems owing to the much wider diversity of products made by Fiat. As a result, the Italian data have not been included here in order to avoid extremely misleading interpretations.

In the cases of Japan, West Germany, and the United States, additional employment data sources could be found in the surveys provided by trade associations. Analyses of these data were performed to check for consistency, and the results of this interpretation were as follows.

In the case of Japan, trade association employment counts were considerably lower than the MITI data, probably because they would tend to exclude temporary workers. The effect of using such data would be to increase the apparent efficiency measurements of the Japanese, that is, to further lower the Japanese cost in comparison to the other nations. The use of these data would certainly not indicate problems with our main conclusions, which rest on the much more thorough government statistics. In the United States, trade association data indicated the opposite. For example, data compiled by the various trade associations indicated motor vehicle employment all to be higher than the SIC 371 account measured by the government. The effect of the use of this data would be to produce a calculation indicating an even higher cost of employment in American production, which would certainly not destroy the conclusions of this analysis. Therefore although the data have been included for reference purposes, it should be noted that our fundamental conclusions rest on the much more narrowly defined US government data. In the case of West Germany, trade association estimates tended to be very close to the governmental statistics. In some cases this resulted because of the coterminous nature of the surveys, but it is our conclusion that the complementary nature of these two data bases results more from the well defined nature of the German industry and the specificity of their statistical analyses in general.

The result of this employment analyses and sensitivity testing is believed to be quite valid because the basic official statistics indicate strong differences in employment cost, and because corroborating data if applied to the equation would support not deny these basic conclusions. For example, inclusion of any other statistics would serve to increase the disparity in employment costs between the Japanese producers and those in the United States and Europe, not to decrease the estimates. As a result, although it is not asserted that the results of this assessment attain engineering precision, it is clear that there is a fundamental employment cost differential among the producing nations.

The Financial Method

A second method was used to estimate employment costs deriving from the completely different and unrelated data base, in order to check the results found using the survey method. This second method should be labelled the "financial method". In this task, data were obtained from company financial statements, and from value-related economic accounts, which were not the same as the employment statistics in the various nations. Although some of the calculations were complex, the method can be described simply. The first order of analysis was to identify employment costs as reported in company financial statements. This was relatively straightforward, but was subject to differences in vertical integration among the companies measured. It was easy to determine the employment cost at a given company, but this would not tell how much total employment was used to make that company's cars, because it could not define employment at the suppliers of components purchased by the auto assembler. In order to estimate the supplier employment content an estimation method was derived.

The materials purchase account at an auto company will quite simply represent the revenue account of various supplier companies shipping into the auto assembler. Therefore, this method determined to find the average revenue output per worker at component companies beneath the auto assembler. This per capita measure could then be used to calculate "employee equivalents" represented in the materials purchasing of the auto assemblers.

In Japan, for example, various economic data break out the revenue of supplier company groups according to their employee size. Since auto companies in that nation all employ more than 5,000 workers, the largest employment category, it was relatively easy to estimate the revenue generated for each supplier worker beneath the level of the auto companies. This per capita measure was used to estimate the amount of component company labor in the components purchase accounts of the various auto companies. This estimation procedure generally corroborated the cost estimates derived by using the completely independent government employment survey data. In almost every instance the cost calculated from this particular financial method, including suppliers, was lower than the cost calculated using the broader government statistical series. As a result it was determined that the two methods indicated a roughly consistent estimate of Japanese employment cost per vehicle. These estimates, appended, indicate that the total employment cost including managers and workers, assemblers and suppliers, in the Japanese auto industry has never exceeded $2,000 per unit at yen exchange rates of 215 to the dollar. It averages between $1,000 and $1,500.

Similar calculations were performed for the United States and several European countries, but these estimates require further refinements for international comparison because of the complexity of multi-currency exchange rate. The results of the financial method are presented in this document only for a two-way, United States to Japan comparison, and even at this level they are left incomplete. The reason for this is that the financial method only reinforced the conclusions derived earler under the survey method, which indicated a very large total employment cost differential between the United States and Japan. To further refine the financial method would require estimating assumptions which some readers might view as too idiosyncratic or unsubstantiated. And, all such refinements would merely increase the calculated differences in employment costs between the two nations. Therefore, the financial method in this project has been used primarily as a double checking device on the original survey method, not as a means of estimating a more precise cost differential.

Total Manufacturing Cost Estimates

Once fairly consistent estimates of employment cost differentials had been obtained, research efforts focused on defining total cost differentials. This method involves primarily the use of financial statements, but also contains a cross check procedure derived from government economic output measurements. It is important to note that the results of the total cost effort are not yet complete, and are the primary subject matter of subsequent research in a derivative contract.

The total cost estimation procedure is relatively easy to describe, although calculations for individual companies vary in complexity. In general this method starts with a review of automotive revenues, that is, the final cost of motor vehicle products as they leave the assemblers factory. Again, it is important to emphasize this is not an estimate of landed cost differentials.

The first research problem is to make these international revenue estimates roughly comparable. The major work here centered on removing revenues earned by individual companies from their non-automotive businesses. Most companies in the world either report these revenue categories separately, or provide information which allows the analyst to disaggregate the automotive from the non-automotive business. The first step then is to bring the financial statements of each of the world motor vehicle companies to the level of automotive revenue only.

At this point, an additional problem of comparability is encountered. The automotive revenues reported by the various international car companies contain revenues from the sale of finished vehicles but also the revenues from the sale of parts not assembled into vehicles. In the case of parts which are in a direct export account, it is easy to separate the parts sales from the vehicle sales. However, for most companies, this leaves a residual revenue line which includes the sale of finished vehicles and of service parts. It is not believed that this mixing of revenues presents a serious problem of comparability, primarily because the ratio of parts sales to auto sales is remarkably consistent among the various international motor companies. Although time series data are not consistent on the parts versus vehicle sales, all international companies have at one time or another reported data which allows this particular distinction. By tracking this data as it is available, it has been concluded that for most motor vehicle companies the ratio of parts revenues to motor vehicle revenues is approximately 10 percent. Individual variations exist, for example, some Japanese companies produce only 8 percent of their revenues in service parts sales while some others record revenues as high as 16 percent of total automotive products sales. Producers in some markets having obtained a "near monoploy" on service parts business through captive distributorships can be expected to have higher than a 10 percent rate of parts sales in their revenue accounts, however, the deviations from the international mean average are insignificant when compared to differences in measured revenue per unit.

Therefore, this analysis proceeds by dividing total automotive revenues, including service parts, by automotive units produced. The deviation noted in parts revenues around the mean would only represent of two to perhaps five percent or revenue per unit, much less significant than the fundamental revenue unit differences measured in this analysis.

The next step in this analysis is to find appropriate per unit measures of the other cost items in the financial statements. The issue of differences in vertical integration is not important here since the main point is not to define the differences in materials per car, or labor per car, but gross differences in overall production cost. The vertical integration differences will produce measured differences only in the elements of cost per car, not total revenue at the final output level. Therefore, data are appended which reveal the various other cost elements on a per car basis measured at the assembler level.

This total estimating procedure only serves to confirm the large cost differentials found in the employment cost analysis mentioned above. For example, it is clear that Toyota gathers about $4,500 of revenue on its average vehicle exported from Japan, from a vehicle mix which includes not only small utilitarian cars but is heavily dominated by highly optioned cars shipped to the developed markets in North America and in Europe. Even the most conservative estimates of total American cost per car exceed this $4,500 estimate by a very wide margin. For example, it can be seen in some of the appended data that American factory revenue per unit for comparable time periods is well in excess of $7,000 per unit, using estimating assumptions which are extremely beneficial to the American side of the equation. Given the fact that American producers were losing money on car sales at this time, it is clear that the production cost is in excess of the factory revenue per unit. Again, it must be noted this is not a comparison of landed cost differentials. Toyota would incur extra expenses, for example, shipping and tariffs above the $4,500 as computed in this analysis. But it is abundently clear that the large cost differentials found in the employment estimating procedures are strongly corroborated by total cost estimates.

This estimation procedure was also applied to European automotive producers. However, as is the case in many other elements of European analysis, the presentation of results is very difficult owing to the wide divergence of producers in the European region. For example, the gross cost per unit of Mercedes-Benz is simply not directly comparable to the gross cost per unit of British Leyland, or of Renault. As is the case in other elements of the project, the German statistics were the most specific and easy to work with. Therefore, the results in this document are based largely upon an assessment of Volkswagen and of Fordwerke. Assessment of these European producers, and preliminary assessment of other European producers, further reinforces the other analysis. It is clear that the Japanese producers are the world's lowest cost producers, the US companies are now the world's highest cost producers, and the various European companies lie scattered in the middle.

MAJOR CONCLUSIONS

Conclusions of this research are as follows. US production cost per vehicle, under <u>any</u> estimation procedure, exceed the Japanese cost on roughly comparable vehicles by more than $1,500, converted at 215 yen per dollar. Most directional indications in this analysis suggest that the production cost differential at the same exchange rate probably exceeds $2,000 per unit. As mentioned above, the Toyota export vehicle averages $4,500 of total revenue, which still earns the company a profit, indicating their costs are even lower. Similar methods applied to United States producers indicate raw production costs all exceeding $9,000 per unit, which when adjusted for differences in vehicle mix and accessories, bring the American equivalent into the $7,000 to $8,000 range.

Comparisons between the U.S., Japan, and Europe are more difficult to measure, but the directions of this analysis are clear. Under the most conservative of estimates, U.S. production costs are at least $500 higher per unit than comparable European product lines. This calculation is based upon longer term exchange rates, not the extremely detrimental rates of 1983 owing to an overly strong dollar against the European currencies. As is indicated in the appended tables, raw calculations suggest that the U.S. production cost could exceed the production cost of the most efficient European producers by about $1,000 or more. While there is some strong basis to argue that the Japanese produced mix and the U.S. produced mix are not comparable, and that significant mix adjustments are required for cost comparison, it is much more difficult to argue that the U.S. production mix is extremely richer than the European production mix. European cars, while they may not be equipped with air conditioning and other power options are clearly produced with a high degree of luxury, and in the case of Germany, extreme technical specification. It is therefore suggested by this analysis that the raw data comparisons between the U.S. and Europe are more valid than the raw data comparisons between the U.S. and Japan.

It is quite clear for example that Daimler-Benz is able to earn profits on cars sold in Germany at the $10,000-$14,000 level. Although these same cars often command prices of $20,000-$30,000 in the United States, it is clear that the German-sold are not "strippers" when compared to products made in America and sold in America. Although they have been having difficulty lately, Volkswagen is clearly able to earn money on a car mix whose prices are comparable to American prices but whose production costs are significantly lower. It is also constructive to notice the difference between the Ford Germany operations and the Ford U.S. operations. Ford of Germany is clearly capable of producing a full line model mix at average production costs considerably lower than Ford of the U.S.

In truth it can be argued that most European cars are "simpler" than American cars because of the lower level of emissions equipment required. However, it should also be noted that significant numbers of European cars are built to U.S. federal specifications, including all the relevant equipment and that the Europeans are able to achieve their lower production costs while being saddled with the requirement to produce more car types out of the same plant. For example, European cars achieve lower than American production costs while being built with both right-hand and left-hand drive, emissions controls which differ for several countries within Europe, the United States and Japan, and with varying requirments for dashboard instrumentation, language labeling, safety standards and a host of other production complexities. American producers face no such variability in their production runs and are able to produce much higher volume runs without the substantial production problems posed by, say, right-hand versus left-hand drive. American car option lists are indeed longer than European option lists, and appear at first blush to represent production complexity, but in the new vehicle designs instrumentation packages and options packages are being much more standardized, reducing the complexity of production.

Given all these various elements, the rather significant differences between U.S. and European production costs cannot be explained away by arguments concerning vehicle mix or complexity. It is true that the downscale units produced in Europe, say the Renault 4 model, should not be compared to even a low scale Chevette, the simplest American car, but the average European car mix is not substantially different from that produced in the United States. Therefore the cost differentials measured here are indicative of fundamental competitive differences.

These cost differentials should not be construed as a generally higher level of efficiency in Europe, compared to the United States. Some of the cost differentials, especially those regarding French producers, are the result of the exchange rate. Some differences do represent composite tax effects or other goverment policy differences. But the fundamental differences between the European averages and the American averages appear to be similar to the differences between the U.S. and Japan. Automotive employment in Europe is generally lower cost than similar employment in the United States. This occurs for a variety of reasons, but cannot be overlooked. In some cases, as in Britain, a declining industry has forced the wage premiums of auto workers down towards the national manufacturing wage averages. In other instances such as in Germany, contract settlements have included provisions for retraining and productivity improvements which have countered wage and benefits price increases, resulting in a moderation in cost per hour worked compared to the trend in the United States during the late 1970s. In the case of Italy, direct strategic action in a retrenching industry has gained efficiency and reduced employment costs. In the case of France, a variety of factors have contributed to both low wages and possibly subsidized factor inputs.

So, there is no simple source for the fundamentally lower cost of the European production operations. Therefore, it is difficult to draw conclusions about the future meaning about such cost differentials. But it is clear that while U.S. production cost in total soared during the late 1970s, the European experience was one of relative moderation, which produces the existing disparity in the early 1980s.

The results of these cost estimates, although significant, do not mean that the United States industry will be completely dominated by European or Japanese competitors. Regional market differences, and other factors, mean that not all American products are exposed to the average cost calculated in Japan and in Europe. Such cost differentials do however substantiate the observations of other researchers that it is the industry in the United States that faces the greatest amount of change during the next several decades. It is clear from this analysis that the United States producers have reached a point of disadvantage which is broader than just a competitive problem with Japan. It appears that there is a fundamental deviation of the U.S. industry from the international standards as represented by Europe and Japan.

The analyses of costs in Europe are not entirely negative in their implications for the U.S. producers. For example, it may seem impossible to some to achieve Japanese level of costs in the United States, but in Europe producers have demonstrated that motor vehicles can be produced in an efficient, low-cost manner, with very strong social benefits for employees, and the economy at large. The overall implication of our European analysis suggests that it is quite possible for the U.S. base to regain international efficiency without adopting some of the "lock-step" techniques often attributed to Japan. It is also clear from the European cost analysis that lower cost automotive production need not mean great deprivation for automotive workers. It is clear that the U.S. overall production system requires extensive revision, but it is not clear that American workers would object to the social situation of many European auto workers, whose system allows an overall lower production cost.

GROSS COST ESTIMATES

The following tables present results of analysis geared to find total automotive cost per automotive unit sold. It should be emphasized that additional information will be provided by follow-on research to this contract.

As befitting the nature of this contract, data are presented in the raw state, and analytic transformations shown in detail. Again, it should be noticed that the purpose of this contract was to define reasonable ranges of cost, not to define a particular car-to-car cost comparison of engineering precision. The following analyses clearly reveal the magnitude of cost differential upon which the conclusions of this study rest.

A word of caution is in order. The calculations shown here are not landed cost calculations, so the visibly large differences between American and European cars will be moderated somewhat by shipping and emissions equipment added to European cars shipped to the U.S. Second, although these calculations were performed at exchange rates not as severe as those of late 1983, it can be expected that over the long term, as the U.S. dollar approaches levels of the late 1970s, some of the measured cost differences should moderate.

Table 4-1

FORD WERKE COST ESTIMATES FROM INCOME STATEMENTS
(All financial amounts in million DM unless noted.)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
SALES REVENUE	4642.5	5528.7	5744.5	6133.2	4983.3	6366.3	8657.2	10163.0	10475.2	10911.3	8691.6	10544.4	11723.7
MAT,SUPP,ETC	2673.9	3209.9	3254.8	3466.2	2754.8	3544.2	4878.1	5823.2	5825.4	6110.7	5326.4	6404.4	7172.9
LESS:INV INC	35.5	67.4	-6.9	132.2	146.4	-21.6	-3.8	10.0	110.0	-36.4	-97.6	48.7	44.1
NET MATERIAL	2638.4	3142.5	3261.7	3334.0	2608.4	3565.8	4881.9	5813.2	5715.4	6147.1	5424.0	6355.7	7128.8
SAL & WAGE	980.6	1189.9	1270.6	1448.5	1378.1	1555.2	1873.2	2127.0	2326.2	2503.5	2379.5	2480.1	2557.8
SS TAXES	116.4	143.6	155.8	182.5	178.1	206.4	270.7	307.2	345.5	369.7	338.4	352.9	366.2
RETIREMENT	26.7	33.6	43.2	49.3	155.8	98.9	140.7	129.4	143.4	149.1	192.6	230.8	114.1
EMPLOY COST	1123.8	1367.1	1469.6	1680.3	1711.9	1860.4	2284.6	2563.5	2815.1	3022.3	2910.5	3063.8	3038.1
DEPR FIXED	346.2	335.1	328.7	328.8	297.4	257.9	289.7	289.9	321.7	288.7	311.8	317.1	510.0
DEPR OTHER	.8	1.5	1.8	1.7	1.3	2.5	2.4	1.4	2.0	1.6	6.7	3.9	1.6
LOSS DEPR/DISP	4.0	1.3	.1	2.2	4.9	8.7	13.3	9.5	14.1	1.4	.1	5.7	7.6
LOSS RETIRE	4.4	4.1	2.9	2.8	2.0	1.1	1.4	2.0	3.3	5.2	4.3	4.0	7.2
TOT DEPR ETC	355.5	341.9	333.5	335.5	305.7	270.2	306.7	302.8	341.2	296.9	322.9	330.7	526.4
INTEREST	47.5	55.2	46.6	44.9	36.5	29.4	25.2	23.5	38.7	43.4	95.6	143.8	189.9
PROP/OTH TAX	79.8	144.4	131.8	199.0	53.7	124.2	377.0	668.1	611.3	573.3	41.4	32.6	71.4
OTH EXPENSE	425.0	524.4	544.6	556.9	480.7	513.1	577.3	631.4	811.8	796.1	855.6	972.6	1098.6

Table 4-1 (con't)

PER UNIT ESTIMATES IN DM PER UNIT

UNITS PROD MIL	.681	.776	.706	.753	.468	.635	.813	.878	.847	.861	.644	.734	.796
MATERIAL/UNIT	3875	4051	4618	4425	5577	5620	6006	6617	6746	7137	8417	8656	8957
EMPLOY/UNIT	1651	1762	2080	2230	3660	2932	2811	2918	3323	3509	4516	4173	3817
DEPR/UNIT	522	441	472	445	654	426	377	345	403	345	501	450	661
INTEREST/UNIT	70	71	66	60	78	46	31	27	46	50	148	196	239
TAX/UNIT	117	186	187	264	115	196	464	760	722	666	64	44	90
OTH EXP/UNIT	624	676	771	739	1028	809	710	719	958	924	1328	1325	1380
COST/UNIT	6859	7188	8194	8163	11111	10028	10400	11386	12196	12631	14975	14844	15144
NON-FIN COST/U	5526	5813	6698	6655	9237	8552	8817	9536	10068	10646	12933	12829	12774
SALES REV/UNIT	6819	7127	8132	8140	10655	10033	10651	11569	12363	12669	13488	14361	14730
REV/CST RATIO	.994	.992	.993	.997	.959	1.000	1.024	1.016	1.014	1.003	.901	.967	.973

PER UNIT ESTIMATES IN DOLLARS PER UNIT

EXCHANGE RATE	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
MATERIAL $	$1,615	$1,688	$1,924	$1,844	$2,324	$2,341	$2,503	$2,757	$2,811	$2,974	$3,507	$3,607	$3,732
EMPLOY $	$688	$734	$867	$929	$1,525	$1,222	$1,171	$1,216	$1,384	$1,462	$1,882	$1,739	$1,590
DEPR $	$218	$184	$197	$186	$272	$177	$157	$144	$168	$144	$209	$188	$276
INTEREST $	$29	$30	$28	$25	$33	$19	$13	$11	$19	$21	$62	$82	$99
TAX $	$49	$78	$78	$110	$48	$82	$193	$317	$301	$277	$27	$18	$37
OTH EXPENSE $	$260	$282	$321	$308	$428	$337	$296	$299	$399	$385	$553	$552	$575
TOT COST $	$2,858	$2,995	$3,414	$3,401	$4,630	$4,178	$4,333	$4,744	$5,082	$5,263	$6,239	$6,185	$6,310
NON FIN CST $	$2,303	$2,422	$2,791	$2,773	$3,849	$3,563	$3,674	$3,973	$4,195	$4,436	$5,389	$5,345	$5,323
SALES REV/UN $	$2,841	$2,970	$3,389	$3,392	$4,439	$4,180	$4,438	$4,820	$5,151	$5,279	$5,620	$5,984	$6,138

Table 4-2

VW A.G. UNIT COSTING : NO GROUP
All financial valules in million DM unless noted.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
SALES REV	9912.8	11237.1	10398.6	11563.3	11218.6	11369.7	16914.3	19837.1	22382.8	24257.2	N/A	26401.7	27027.7
MATER/SUPP ETC	5812.2	6586.3	5869.8	6725.3	6599.4	6313.4	10204.5	12340.1	13922.3	15137.1	N/A	16609.5	17487.5
LESS:INV. INC.	115.7	107.4	-7.2	263.9	-78.2	-142.3	83.2	73.8	15.7	240.4	N/A	-176.9	-67.0
NET MATERIAL	5696.6	6478.9	5877.0	6461.4	6677.7	6455.7	10121.3	12266.3	13906.7	14896.8	N/A	16786.4	17554.5
SAL & WAGE	2286.9	2767.4	2700.8	3166.1	3374.7	3120.2	3275.7	3692.7	4133.6	4666.7	N/A	5413.5	5556.2
SOCIAL EXP	253.4	313.4	318.9	392.7	407.9	388.4	440.5	493.9	584.9	642.7	N/A	755.0	836.8
PENSION	94.1	116.9	116.7	140.3	157.5	84.4	574.7	282.0	318.1	298.8	N/A	376.8	391.0
EMPLOYEE COST	2634.4	3197.7	3136.4	3699.1	3940.1	3593.0	4290.8	4468.6	5036.7	5608.2	N/A	6545.2	6783.9
DEPREC FIXED	535.5	544.0	574.7	564.4	600.6	699.0	708.3	849.5	701.3	705.7	N/A	1158.0	1330.7
WRT-OFF FINANC	43.1	18.7	13.0	38.7	4.0	.3	47.4	380.6	99.4	208.3	N/A	833.4	571.6
WRT-OFF CURRNT	9.4	21.3	7.9	13.1	16.7	8.6	18.2	4.6	30.4	94.5	N/A	42.9	60.6
LOSS ON DISP	1.8	3.8	5.7	2.6	4.5	4.6	3.4	4.2	1.3	.9	N/A	7.8	3.2
"DEPRECIATION"	589.7	587.8	601.3	618.8	625.7	712.5	777.3	1238.9	832.4	1009.5	N/A	2042.1	1966.1
INTEREST	41.2	37.0	52.8	75.8	90.9	197.5	166.2	157.7	104.0	63.1	N/A	226.7	44.3
TAXES	264.6	191.0	415.9	282.2	188.9	241.2	311.6	1291.4	1443.0	1742.4	N/A	476.7	335.8
OTHER EXPENSE	997.3	1154.2	879.3	932.3	1056.1	909.9	1255.0	1310.8	1831.7	1926.2	N/A	2215.9	2013.4

Table 4-2 (con't)

PER UNIT ESTIMATES IN DM PER UNIT

UNITS SOLD MIL	1.626	1.705	1.472	1.448	1.238	1.357	1.562	1.687	1.752	1.725	N/A	1.565	1.529
MATERIAL/UNIT	3504	3799	3994	4461	5393	4758	6482	7271	7936	8636	N/A	10727	11478
EMPLOY/UNIT	1620	1875	2131	2554	3182	2648	2748	2649	2874	3251	N/A	4183	4436
DEPR/UNIT	363	345	409	427	505	525	498	734	475	585	N/A	1305	1286
INTEREST/UNIT	25	22	36	52	73	146	106	93	59	37	N/A	145	29
TAX/UNIT	163	112	283	195	153	178	200	765	823	1010	N/A	305	220
OTHER EXP/UNIT	613	677	598	644	853	671	804	777	1045	1117	N/A	1416	1316
COST / UNIT	6288	6829	7450	8333	10160	8926	10837	12290	13214	14635	N/A	18080	18764
NON-FIN CST/UN	5124	5674	6125	7015	8576	7407	9230	9920	10811	11887	N/A	14909	15914
SALES REV/UNIT	6097	6589	7066	7983	9061	8380	10832	11758	12774	14062	N/A	16871	17672
REV/CST RATIO	.970	.965	.949	.958	.892	.939	1.000	.957	.967	.961	N/A	.933	.942

PER UNIT ESTIMATES IN DOLLARS PER UNIT

EXCHANGE RATE	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
MATERIAL $	$1,460	$1,583	$1,664	$1,859	$2,247	$1,983	$2,701	$3,030	$3,307	$3,598	N/A	$4,470	$4,783
EMPLOY $	$675	$781	$888	$1,064	$1,326	$1,103	$1,145	$1,104	$1,198	$1,355	N/A	$1,743	$1,848
DEPREC $	$151	$144	$170	$178	$211	$219	$207	$306	$198	$244	N/A	$544	$536
INTEREST $	$11	$9	$15	$22	$31	$61	$44	$39	$25	$15	N/A	$60	$12
TAX $	$68	$47	$118	$81	$64	$74	$83	$319	$343	$421	N/A	$127	$91
OTHER EXP $	$256	$282	$249	$268	$355	$279	$335	$324	$436	$465	N/A	$590	$549
TOT COST $	$2,620	$2,845	$3,104	$3,472	$4,233	$3,719	$4,515	$5,121	$5,506	$6,098	N/A	$7,533	$7,818
NON-FIN CST $	$2,135	$2,364	$2,552	$2,923	$3,573	$3,086	$3,846	$4,133	$4,504	$4,953	N/A	$6,212	$6,631
SALES REV $	$2,540	$2,745	$2,944	$3,326	$3,775	$3,492	$4,513	$4,899	$5,322	$5,859	N/A	$7,030	$7,363

NOTES ON THE FORD AND GM AUTO ESTIMATES

The following estimates of Ford and GM automotive gross costs represent initial efforts to clarify the overall costs of US-built automotive product. In their current form they are quite valid to sense the magnitude of cost differential between US, European and Japanese companies. That is, they reveal in the raw state cost differentials well in excess of the conclusions expressed in this document, and do not invalidate such conclusions. It should be cautioned that these Ford and GM estimates should not be used in their current state to calculate precise differences among producers, because additional refinements are required for such comparison.

For example, in the GM data, gross costs per unit have not been adjusted for taxes paid on automotive product, or tax credits received in the same area. And, in their existing form, no adjustments have been made for vehicle mixes.

Such refinements will lower the apparent cost expressed in these raw data. For example, comparing the raw gross cost of GM to that for Toyota in this document suggests a gross cost difference of more than $5,000 per unit. This number should <u>not</u> be used as the cost difference in its existing form. Items, such as shipping and distribution costs, must be added to the Toyota number, and some tax and other items adjusted out of the GM numbers before a comparable difference can be measured.

As a first attempt in adjustment, data in the following tables have been adjusted downward, using preliminary assumptions. For example, the GM data have been reduced by the inter-divisional shipping ratio, to correct for possible parts made in America but built into Canadian cars.

This should be considered the most conservative estimate for GM, before mix adjustment, since GM also accepts products made in Canada for U.S. sale. In the Ford data, one set of estimates derives operating costs per U.S. unit, before financial income and charges, to sense the lower bound of possible cost estimates for Ford U.S.

Notice also in the Ford case, that Ford financial statements have not provided a consistent set of cost categories over time. The table here displays most of the reported data which can be used to separate American automotive costs from international costs, in order to show ranges of cost, without using many refining assumptions. Additional work will be required to reconcile the various methods implicit in this table.

It is notable that in all cases, it is impossible to conclude that the U.S. production cost differential vis-a-vis Japan is less than $1,500. As was stated in the text of this document, it is our conclusion, based upon the many data sources available that the cost differential can not be less than $1,500, and is probably greater than $2,000. Data on the following tables tend to corroborate these conclusions without equivocation.

Table 4-3

GM ESTIMATED AUTOMOTIVE COST STRUCTURE
(All financial amounts in dollars million unless noted.)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
US AUTO REVENUE	13421	22619	23895	28117	23447	26137	37070	44317	49603	51094	42812	48804	47391
NET INCOME	609.1	1935.7	2162.8	2398.1	950.1	1253.1	2902.8	3337.5	3508.0	2892.7	-762.5	333.4	962.7
AUTO % NET INC	.710	.890	.850	.840	.810	.770	.790	.840	.960	.900	1.270	-.200	1.010
AUTO NET INC	432.5	1722.8	1838.4	2014.4	769.6	964.9	2293.2	2803.5	3367.7	2603.4	-968.4	-66.7	972.3
AUTO GROSS COST (AUTO REV-INC)	12988	20896	22056	26102	22677	25172	34776	41514	46235	48490	43780	48870	46419
US UNITS SOLD	3.591	5.767	5.741	6.512	4.678	4.658	6.218	6.695	6.878	6.445	4.771	4.611	4.042
GROSS COST/UNIT	$3,617	$3,623	$3,842	$4,008	$4,848	$5,404	$5,593	$6,201	$6,722	$7,524	$9,176	$10,599	$11,484

NOTE: THE ABOVE IS A RAW GROSS ESTIMATE. US OPERATIONS SELL PARTS TO NON-US OPERATIONS WHICH SHOULD BE DEDUCTED. THE INTERDIVISIONAL SALES RATIO FOR US IS ABOUT 12% OF REVENUE, WHICH WOULD BE A POSSIBLE ADJUSTMENT RATIO TO THE ABOVE NUMBERS. GROSS COST COULD NOT BE MUCH BENEATH SUCH AN ADJUSTED NUMBER AND WOULD LIKELY BE HIGHER.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
ADJUST. COST/UN	$3,183	$3,189	$3,381	$3,527	$4,266	$4,756	$4,922	$5,457	$5,916	$6,621	$8,075	$9,327	$10,106

THIS ADJUSTED NUMBER SHOULD BE CONSIDERED THE BEST CASE IN COMPARING THE AMERICAN DATA TO OTHER PRODUCERS. IT IS AN ESTIMATE WHICH WOULD CONTAIN NO PARTS SALES, WHILE DATA FOR OTHER PRODUCERS INCLUDE PARTS.

Table 4-4

FORD GROSS COST PER UNIT SUMMARY

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
WORLDWIDE AUTOMOTIVE REVENUE RATIO													
TOTAL REV.	14980	16433	20194	23015	23621	24009	28840	37841	42784	43514	37086	38247	37067
AUTO REV	13540	14999	18516	21040	21528	21688	26499	35073	40040	39899	33303	34673	33683
AUTO REV %	.904	.913	.917	.914	.911	.903	.919	.927	.936	.917	.898	.907	.909
US REVENUE	N/A	N/A	N/A	N/A	N/A	N/A	20482	27762	31019	28191	21882	23482	24274
EST US AUTO REV	N/A	N/A	N/A	N/A	N/A	N/A	18819	25731	29030	25849	19650	21288	22058
US OP PROF ACT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
US PAT ACT.	N/A	N/A	N/A	N/A	N/A	N/A	429	942	809	-199	-2018	-1195	-1118
US TAX (-CR)	N/A	N/A	N/A	N/A	N/A	N/A	253	523	249	-567	-679	-306	-168
US PBT EST.	N/A	N/A	N/A	N/A	N/A	N/A	682	1465	1058	-766	-2697	-1501	-1286
US PBT ACT.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1107	-890	-2799	-1615	-1447
							§=EST		ACTUAL PBT=¶				
US AUTO COST(E)	N/A	N/A	N/A	N/A	N/A	N/A	18137	24266	27923	26739	22449	22903	23505
US UNITS			3.563	3.772	3.328	2.677	3.215	3.971	4.090	3.227	2.151	2.102	2.074
EST COST/UNIT	N/A	N/A	N/A	N/A	N/A	N/A	5642	6111	6826	8285	10438	10897	11333

Table 4-4

FORD GROSS COST PER UNIT SUMMARY

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
WORLDWIDE AUTOMOTIVE REVENUE RATIO													
TOTAL REV.	14980	16433	20194	23015	23621	24009	28840	37841	42784	43514	37086	38247	37067
AUTO REV	13540	14999	18516	21040	21528	21688	26499	35073	40040	39899	33303	34673	33683
AUTO REV %	.904	.913	.917	.914	.911	.903	.919	.927	.936	.917	.898	.907	.909
US REVENUE	N/A	N/A	N/A	N/A	N/A	N/A	20482	27762	31019	28191	21882	23482	24274
EST US AUTO REV	N/A	N/A	N/A	N/A	N/A	N/A	18819	25731	29030	25849	19650	21288	22058
US OP PROF ACT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
US PAT ACT.	N/A	N/A	N/A	N/A	N/A	N/A	429	942	809	-199	-2018	-1195	-1118
US TAX (-CR)	N/A	N/A	N/A	N/A	N/A	N/A	253	523	249	-567	-679	-306	-168
US PBT EST.	N/A	N/A	N/A	N/A	N/A	N/A	682	1465	1058	-766	-2697	-1501	-1286
US PBT ACT.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1107	-890	-2799	-1615	-1447
								§=EST	ACTUAL PBT=¶				
US AUTO COST(E)	N/A	N/A	N/A	N/A	N/A	N/A	18137	24266	27923	26739	22449	22903	23505
US UNITS			3.563	3.772	3.328	2.677	3.215	3.971	4.090	3.227	2.151	2.102	2.074
EST COST/UNIT	N/A	N/A	N/A	N/A	N/A	N/A	5642	6111	6826	8285	10438	10897	11333

Table 4-4 (con't)

OTHER METHODS

AUTO REV WW	13540	14999	18516	21040	21528	21688	26499	35073	40040	39899	33303	34673	33683
-AUTO OP INC WW	N/A	N/A	N/A	1514	512	388	1477	2582	2380	736	-2179	-1246	-361
AUTO OP CST WW	N/A	N/A	N/A	19526	21016	21300	25022	32491	37660	39163	35482	35919	34044
TOT REV NET	14980	16433	20194	23015	23621	24009	28840	37842	42784	43514	37086	38247	37067
US REV NET	N/A	N/A	N/A	N/A	N/A	N/A	18199	24769	27799	24408	18429	19739	20541
US/CAN REV NET	11119	12360	15095	17090	17098	16129	19858						
"US" REV %	N/A	N/A	N/A	N/A	N/A	N/A	.631	.655	.650	.561	.497	.516	.554
EST US AUTOPCST US UNITS	.000	.000	3.563	3.772	3.328	2.677	3.215	3.971	4.090	3.227	2.151	2.102	2.074
E. USOPCST/UNIT	N/A	N/A	N/A	N/A	N/A	N/A	4912	5356	5982	6806	8199	8820	9096

THE ABOVE IS AN UNDERESTIMATE OF US COST, BECAUSE IT DOES NOT REFLECT THAT US LOSSES WERE LARGER THAN OFFSHORE

US/CAN AUT REV	N/A	N/A	13980	15785	15750	14765	18555						
US/CAN AUT PBT	N/A	N/A	1344	1191	413	12	767						
US/CAN PAT						67	546	968					
US/CAN AUT CST	N/A	N/A	12636	14594	15337	14753	17788	N/A	N/A	N/A	N/A	N/A	N/A
US/CAN UNITS			3.848	4.102	3.730	3.033	3.556						
US/CAN CST/UNIT	N/A	N/A	3284	3558	4112	4863	5002	N/A	N/A	N/A	N/A	N/A	N/A

Table 4-4 (con't)

OTHER METHODS

AUTO REV WW	13540	14999	18516	21040	21528	21688	26499	35073	40040	39899	33303	34673	33683
-AUTO OP INC WW	N/A	N/A	N/A	1514	512	388	1477	2582	2380	736	-2179	-1246	-361
AUTO OP CST WW	N/A	N/A	N/A	19526	21016	21300	25022	32491	37660	39163	35482	35919	34044
TOT REV NET	14980	16433	20194	23015	23621	24009	28840	37842	42784	43514	37086	38247	37067
US REV NET	N/A	N/A	N/A	N/A	N/A	N/A	18199	24769	27799	24408	18429	19739	20541
US/CAN REV NET	11119	12360	15095	17090	17098	16129	19858						
"US" REV %	N/A	N/A	N/A	N/A	N/A	N/A	.631	.655	.650	.561	.497	.516	.554
EST US AUTOPCST US UNITS	.000	.000	3.563	3.772	3.328	2.677	3.215	3.971	4.090	3.227	2.151	2.102	2.074
E. USOPCST/UNIT	N/A	N/A	N/A	N/A	N/A	N/A	4912	5356	5982	6806	8199	8820	9096

THE ABOVE IS AN UNDERESTIMATE OF US COST, BECAUSE IT DOES NOT REFLECT THAT US LOSSES WERE LARGER THAN OFFSHORE

US/CAN AUT REV	N/A	N/A	13980	15785	15750	14765	18555						
US/CAN AUT PBT	N/A	N/A	1344	1191	413	12	767						
US/CAN PAT						67	546	968					
US/CAN AUT CST	N/A	N/A	12636	14594	15337	14753	17788	N/A	N/A	N/A	N/A	N/A	N/A
US/CAN UNITS			3.848	4.102	3.730	3.033	3.556						
US/CAN CST/UNIT	N/A	N/A	3284	3558	4112	4863	5002	N/A	N/A	N/A	N/A	N/A	N/A

SUMMARY INFORMATION: US AND JAPAN AND WEST GERMANY

The following tables present some of the summary results of cost analysis; specifically, a conservative comparison of U.S. and Japan employment content per vehicle, and a summary of Toyota gross revenue per unit. These data should be read in conjunction with the "Additional Employment Cost Analysis" section following them, and with the data contained in the OEM and Japanese update sections of this contract. The Toyota information can also be compared to the Gross Cost estimates contained earlier in this section.

Also contained here is a detailed recasting of West German employment statistics, to bring them to roughly comparable form with regard to U.S. and Japanese estimates. It must be noted that the US statistics presented here are quite conservative -- they exclude from the employment account categories of workers such as "automotive stamping" which are contained in both the German and Japanese data. Reference should be made to the details of the "Additional Data" section for anlaysis of U.S. supplier multiplier add-ons. One should keep in mind that the German data have not been adjusted to reflect the extraordinarily high technical content of the Daimler-Benz, BMW, and Porsche product lines.

Table 4-5

COMPARISON OF EMPLOYMENT CONTENT PER VEHICLE: US AND JAPAN

USING GOVERNMENT STATISTICS OF MOTOR VEHICLES AND COMPONENTS
NO ADDITIONAL SUPPLIER ESTIMATES
(US FIGURES EXCLUDE "AUTOMOTIVE STAMPING" EMPLOYMENT)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	6MO'83
FOR THE US: USING SIC 371 ACCOUNT DATA														
EMPLOYEES (1)	.799	.849	.875	.977	.908	.792	.881	.947	1.005	.990	.789	.789	.705	.731
HOURS/WK/EMP(2)	40.3	41.2	43.0	43.5	40.6	40.3	42.9	44.0	43.3	41.1	39.9	40.9	40.3	41.0
HR/YR/EMP (3)	2096	2142	2236	2262	2111	2096	2231	2288	2252	2137	2075	2127	2096	2132
VEHICLES (4)	8.283	10.671	11.310	12.681	10.071	8.986	11.497	12.702	12.899	11.479	8.009	7.954	6.979	8.385
HOURS/VEHICLE	202.1	170.4	172.9	174.2	190.3	184.8	170.9	170.6	175.4	184.4	204.3	210.9	211.6	185.8
FOR JAPAN: USING MITI CENSUS OF MANUFACTURES DATA														
EMPLOYEES (5)	.580	.575	.607	.634	.615	.601	.622	.629	.638	.651	.683	.704	N/A	N/A
HR/YR/EMP (6)	2300	2261	2256	2275	2114	2040	2143	2176	2172	2204	2232	2197	2158	N/A
VEHICLES (7)	5.289	5.811	6.294	7.083	6.552	6.942	7.841	8.515	9.269	9.636	11.043	11.180	10.732	N/A
HOURS/VEHICLE	252.2	223.7	217.6	203.8	198.4	176.7	170.1	160.9	149.5	149.0	138.0	138.4	N/A	N/A
US - JAPAN	-50.1	-53.3	-44.7	-29.6	-8.1	8.1	.9	9.8	25.9	35.4	66.3	72.5	N/A	N/A

(1) Includes production and non-production workers; excludes "automotive stamping" and others in the industry.
(2) Includes overtime; excludes vacation, holiday, sick leave and absenteeism.
(3) Weekly hours, times 52 weeks.
(4) From MVMA.
(5) Motor vehicle and components. Includes: motorcycle workers, all parts workers, temporary contract workers, unpaid family members attending work, part time workers, and all non-production workers.
(6) As reported by the Ministry of Labor for the sector.
(7) From JAMA. Includes car, truck, bus only. Excludes more than 6 million motorcycles, and more 400,000 knocked-down kits also produced by the above workers.

Table 4-6

TOYOTA MOTOR SALES REVENUE PER UNIT SUMMARY

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
OVERSEAS MOTOR VEHICLE ONLY												
GROSS REV. YMIL	188301	251230	409417	347535	381537	542835	735135	1025174	1213439	1081902	1428771	1763190
UNITS MIL	.415	.531	.821	.709	.747	.828	.957	1.245	1.409	1.262	1.502	1.804
REV/UNIT YEN	453388	473083	498515	489901	510491	655592	768093	823317	861239	857557	950935	977353
EXCHANGE RATE	215	215	215	215	215	215	215	215	215	215	215	215
REV/UNIT $	2109	2200	2319	2279	2374	3049	3573	3829	4006	3989	4423	4546
DOMESTIC JAPAN MOTOR VEHICLE ONLY												
GROSS REV. YMIL	534610	563608	597563	755251	835410	902239	1000179	1055456	1069145	1326506	1439586	1327518
UNITS MIL.	1.108	1.151	1.205	1.501	1.537	1.370	1.429	1.383	1.304	1.579	1.628	1.452
REV/UNIT YEN	482288	489625	496106	503206	543601	658417	700061	763336	820094	839993	884320	914403
EXCHANGE RATE	215	215	215	215	215	215	215	215	215	215	215	215
REV/UNIT $	2243	2277	2307	2340	2528	3062	3256	3550	3814	3907	4113	4253
OFFSHORE/UNIT $	2109	2200	2319	2279	2374	3049	3573	3829	4006	3989	4423	4546
DOMESTIC/UNIT $	2243	2277	2307	2340	2528	3062	3256	3550	3814	3907	4113	4253
DIFF OVER(UNDER	-134	-77	11	-62	-154	-13	316	279	191	82	310	293

SOURCE: TOYOTA MOTOR SALES ANNUAL REPORTS

WEST GERMAN MOTOR VEHICLE INDUSTRY

PRODUCTION AND EMPLOYMENT STRUCTURE

	1977	1978	1979	1980	1981
MOTOR VEHICLES AND MOTORS					
TOT EMP MIL.	.376388	.396591	.412212	.417801	.411258
OFTHIS: WORKERS	.301743	.317658	.329213	.328672	.319175
OFTHIS: SAL	.074645	.078933	.082999	.089129	.092083
HOURS (MIL.)	509.421	523.797	542.905	517.822	508.298
WAGE DM MIL	9672	10499	11574	12138	12445
SAL.DM MIL	3712	4112	4588	5212	5710
OUTPUT DM MIL	70065	78181	85355	86360	94719
EXPORT DM MIL	33875	35649	40729	43720	51922
EXPORT RATIO	.483	.456	.477	.506	.548
HOURS/WRKR/YR	1688	1649	1649	1575	1593
EST HR/SAL/YR	1800	1800	1800	1800	1800
WG/HR/WRKR DM	18.99	20.04	21.32	23.44	24.48
SAL/HR/SAL DM	27.63	28.94	30.71	32.49	34.45
PARTS FOR MOTOR VEHICLES AND MOTORS					
TOT EMP MIL	.208220	.213937	.220172	.224707	.219895
OFTHIS: WORKERS	.165517	.169994	.175345	.178067	.172689
OFTHIS: SAL	.042703	.043943	.044827	.046640	.047206
HOURS MIL.	285.131	286.249	295.877	289.947	279.009
WAGE DM MIL	4431	4767	5253	5685	5793
SAL DM MIL	1649	1788	1932	2161	2313
OUTPUT DM MIL	17868	18244	20304	21071	22104
EXPORT DM MIL	4326	4567	5156	5656	6120
EXPORT RATIO	.242	.250	.254	.268	.277
HOURS/WRKR/YR	1723	1684	1687	1628	1616
EST HR/SAL/YR	1800	1800	1800	1800	1800
WG/HR/WRKR DM	15.54	16.65	17.75	19.61	20.76
SAL/HR/SAL DM	21.45	22.61	23.94	25.74	27.22
ADJUST ABOVE WORKFORCE FOR EXPORT PARTS: MIL. EMPLOYEES					
WORKERS	.125444	.127440	.130818	.130269	.124876
SALARY	.032364	.032943	.033444	.034121	.034136
BODIES, TRAILERS, ETC FOR MOTOR VEHICLES					
TOT EMP MIL	.04084	.03972	.041085	.041563	.039243
OFTHIS: WORKERS	.032472	.031619	.032936	.033085	.030774
OFTHIS: SAL	.008368	.008101	.008149	.008478	.008469
HOURS MIL.	57.978	54.486	56.929	55.452	50.138
WAGE DM MIL	795	808	898	969	940
SAL DM MIL	281	287	311	350	369
OUTPUT DM MIL	4471	4454	5091	5347	5550
EXPORT DM MIL	1003	984	1152	1252	1608
EXPORT RATIO	.224	.224	.224	.224	.224
HOURS/WRKR/YR	1785	1723	1728	1676	1629
EST HR/SAL/YR	1800	1800	1800	1800	1800
WG/HR/WRKR DM	13.71	14.83	15.77	17.47	18.75
SAL/HR/SAL DM	18.66	19.68	21.20	22.94	24.21

Table 4-7 (con't)

PRODUCTION DATA

ACTUAL PRODUCTION AND "CAR PRODUCTION EQUIVALENTS"

PKW*					
UNITS MIL	3.567	3.626	3.658	3.239	3.281
DM MIL	37004	40375	43247	41817	46057
DM/UNIT	10373	11136	11824	12909	14036
RATIO TO CAR	1.000	1.000	1.000	1.000	1.000
CAR EQUIVALENTS	3.567	3.626	3.658	3.239	3.281
KB*					
UNITS MIL	.233	.265	.275	.282	.297
DM MIL	2214	2949	3392	3758	4115
DM/UNIT	9489	11142	12340	13347	13874
RATIO TO CAR	.915	1.001	1.044	1.034	.988
CAR EQUIVALENTS	.213	.265	.287	.291	.293
LKW*					
UNITS MIL	.275	.266	.281	.315	.272
DM MIL	9662	9628	10960	12558	13363
DM/UNIT	35143	36221	39015	39870	49044
RATIO TO CAR	3.388	3.253	3.300	3.089	3.494
CAR EQUIVALENTS	.931	.865	.927	.973	.952
OMNI*					
UNITS MIL	.018	.015	.016	.017	.017
DM MIL	1998	2062	2257	2458	2682
DM/UNIT	109115	141378	140704	141619	156775
RATIO TO CAR	10.519	12.695	11.900	10.971	11.169
CAR EQUIVALENTS	.193	.185	.191	.190	.191
SZM*					
UNITS MIL	.020	.016	.020	.025	.030
DM MIL	1692	1482	2024	2535	3449
DM/UNIT	82808	93838	100059	100269	116456
RATIO TO CAR	7.983	8.426	8.463	7.767	8.297
CAR EQUIVALENTS	.163	.133	.171	.196	.246
TRAILERS	.108	.118	.130	.137	.127
ACT. PRODUCTION	4.222	4.304	4.380	4.016	4.024
CAR EQUIVALENTS	5.176	5.191	5.363	5.028	5.090

Table 4-7 (con't)

HOURS PER VEHICLE CALCULATIONS					
HOURS WORKED: MILLION					
MOTOR VEHICLES AND MOTORS					
WORKER	509.421	523.797	542.905	517.822	508.298
SALARY	134.361	142.079	149.398	160.432	165.749
PARTS FOR MOTOR VEHICLES AND MOTORS: ADJUST FOR DIRECT EXPOR					
WORKER	216.098	214.593	220.742	212.118	201.759
SALARY	58.256	59.297	60.199	61.417	61.445
BODIES, TRAILERS,ETC					
WORKERS	57.978	54.486	56.929	55.452	50.138
SALARY	15.062	14.582	14.668	15.260	15.244
TOTAL HOURS: MILLION					
WORKER	783.497	792.876	820.576	785.392	760.195
SALARY	207.679	215.958	224.265	237.110	242.438
HOURS PER VEHICLE: ACTUAL PRODUCTION					
WORKER	185.6	184.2	187.4	195.6	188.9
SALARY	49.2	50.2	51.2	59.0	60.3
TOTAL	234.7	234.4	238.6	254.6	249.2
HOURS PER VEHICLE, CAR EQUIVALENTS					
WORKER	151.4	152.7	153.0	156.2	149.4
SALARY	40.1	41.6	41.8	47.2	47.6
TOTAL	191.5	194.3	194.8	203.4	197.0

(NOTE: THE ABOVE HOURS ARE MORE INCLUSIVE THAN US HOURS)

WAGE AND SALARY PER VEHICLE					
WAGE AND SALARY: MIL DM					
MV AND MOTOR	13384	14611	16162	17350	18155
PARTS/ADJ/EXP	4608	4914	5360	5740	5862
BODIES/ETC	1076	1095	1209	1319	1309
TOTAL	19068	20620	22731	24409	25326
DM/ACT PROD	4516	4790	5190	6078	6294
EXCH RATE	2.4	2.4	2.4	2.4	2.4
$/UNIT	1882	1996	2163	2532	2623
DM/CAR EQ'S	3684	3972	4238	4855	4976
EXCH RATE	2.4	2.4	2.4	2.4	2.4
$/UNIT	1535	1655	1766	2023	2073

Table 4-8

SUMMARY OF JAPANESE AUTO INDUSTRY EMPLOYMENT
FROM JAPAN AUTOMOBILE MANUFACTURERS ASSOCIATION
1981

EMPLOYMENT CATEGORY	EMPLOYEES
AUTO INDUSTRY	187,035
AUTO PARTS INDUSTRY	466,643
AUTO BODY INDUSTRY	50,638
STEEL MANUFACTURERS	103,954
NON-FERROUS METAL MANUFACT.	26,924
TIRE & TUBE MANUFACT.	36,193
GLASS & GLASSWARE MANUFACT.	5,280
OTHER(PLASTIC, TEXTILE, PAINT, BATTERY, BEARING, ETC)	400,000
TOTAL	1,276,667
HOURS PER EMP. PER YEAR	2,266
CARS, TRUCKS, BUSES PRODUCED*	11,179,962
EMPLOYEE HOURS PER VEHICLE	259

*EXCLUDES MOTORCYCLES AND KNOCKED-DOWN KITS MADE BY THESE EMPLOYEES.

Table 4-9

ESTIMATED US AUTO INDUSTRY EMPLOYMENT: DIRECT AND INDIRECT MANUFACT
FROM MVMA DATA AND BLS INFORMATION
1981

DIRECT AND INDIRECT EMPLOYMENT PER $1 BILLION OF FINAL DEMAND FOR MOTOR VEHICLES		ESTIMATED TOTAL EMPLO BASED UPON $54.8 BILL DEMAND, 1972 DOLLARS
CATEGORY	EMPLOYMENT	
MOTOR VEHICLES	15837	867,868
FABRIC, YARN	525	28,770
TEXTILES,NEC	734	40,223
PRINT, PUBLISH	268	14,686
PRINT, PUBL,NEC	275	15,070
INDUST. CHEMICALS	280	15,344
TIRES & TUBES	363	19,892
PLASTIC PRODUCTS	425	23,290
BASIC STEEL	1852	101,490
FERROUS FORGE, FOUNDRY	1501	82,255
ALUMINUM	432	23,674
COPPER	265	14,522
SCREW MACHINE PROD	451	24,715
METAL STAMPING	1861	101,983
TOOLS, HARDWARE	591	32,387
METAL PRODUCTS, NEC	641	35,127
ENGINES, GENERATORS, ETC	296	16,221
METALWORKING MACHINERY	360	19,728
GEN. INDUST. MACHINERY	366	20,057
NON-ELEC. MACHINE, NEC	612	33,538
ELEC. LIGHT, WIRE	257	14,084
ELEC. EQUIP, NEC	579	31,729
OTHER MANUFACTURE	4125	226,050
TOTAL	32896	1,802,701
HOURS/EMP. PER WEEK		41
HOURS/EMP PER YEAR		2,127
VEHICLES PRODUCED		7,972,916
EMPLOYEE HOURS PER VEHICLE		481

ADDITIONAL EMPLOYMENT COST ANALYSIS: US, JAPAN, WEST GERMANY, FRANCE

The following data have been appended for additional perspective on the cost analysis question. These represent the results of the first round of analysis in this project, and have been reviewed widely by analysts in the program. Because this review process raised questions concerning some elements of the data, these analyses are not provided as the primary conclusions of the report.

In particular, some analysts suggested the multipliers for supplier labor applied to the U.S. base employment were not comparable to the definitions of Japanese employment, in such a way as to overstate the comparative American employment content, in the following tables only. Subsequent research was unable to resolve the issue, so it is not clear whether or what particular bias may be contained in the following sheets. It was concluded, however, that the basic data in the following tables were realistic and consistent, so this section of analysis is appended to provide both some basic information and a broader perspective on the complexities amd range of cost differentials. It was felt fitting in the exploratory nature of this contract to provide the broadest amount of information, reference material, and analytic methodology captured during the research into this task.

Conclusions of this report rest upon data provided in the preceding pages.

WEST GERMANY: MOTOR VEHICLE TOTAL EMPLOYMENT ESTIMATES

The following pages present preliminary assessments of the employment efficiency and cost in the West Germany motor vehicle industry. Even though West German statistics are of extremely high quality, further research is required to make these data fully comparable to U.S. and Japanese employment assesments. At this point, the West German statistics still are not adjusted for workers who make only parts for non-automotive products. The main data sources used for this analysis are the employment statistics provided by the VDA (the West German automotive trade association), the Federal Statistical Office (Statistisches Bundesamp), the annual reports of several companies, and data contained in MIT Auto Program work by Wolfgang Streeck and Andreas Hoff.

Unlike the faulty SIC code data in the United States, German industrial statistics are quite thorough and well-defined. The statistical employment data on the motor vehicle industry are cross classifed according to three categories: individual plant sites, lines of business across companies, and by companies whose primary business is within the statistically defined line of business. As a result, one avoids the under-reporting and artificial distinctions imposed on the sector statistics by the U.S. SIC code data.

Within each category, employment data are further classified into several sections: total employment, employment in motor vehicle and motor producing companies, employment at parts producing establishments, employment in establishments producing trucks and trailers, and employment in the repair industry.

Within each of these categories, additional detailed statistics are provided on: production workers vs. salary workers, precise working hours of production workers, cash remuneration to both production workers and staff, and total production value output net of the value-added taxes. Such data allow one to calculate to a very detailed level the employment content and basic cost of the industry down through the production chain. There appear to be some slight discrepancies in the data concerning workers whose sole task it is to make Omnibuses, but these discrepancies are a very small percentage of the total measurement system.

In addition, the German automobile company annual reports provide extremely detailed analysis of employment costs and employment structure. These data show precise expenditures for all basic wage and benefit packages, and for total cost of non-cash fringe benefits. In addition, it is very easy to discern the employment loads at each of the individual plant sites within West Germany, and it is further possible to disaggregate the shipments of knock-down vehicles and parts supplied to non-Germany assembly plants.

Given such wealth of information, it is quite easy to cross reference the company statistics to the official government statistics, and therefore to measure quite precisely any company differences in hours worked, pay, or benefits. In addition to these statistics, it is quite easy to discern per vehicle factory cost, before VAT, which allows one to decompose the German mix in quite detailed fashion.

A major problem in international comparison is the fact that the German mix of vehicles is extremely "heavy" both in terms of the number of heavy vehicles produced, and in terms of the high technology content of each of the vehicles. For example, when one runs raw estimates of Daimler-Benz per unit labor content, one finds in-house hours of roughly 3-4 times the number of in-house hours at Volkswagenwerk AG. This appears to be an anomoly, until one also adjusts the Daimler-Benz mix according to the production value per unit. Then it becomes clear that each unit produced at Daimler Benz, be it a truck or a car, has a much higher technical intensity and quality level than the mass-produced small German cars. Using such data it is possible to bring the German mix down to a Volkswagen gulf equivalency basis. For this preliminary assessment such adjustments have not been completely performed, but they will be made shortly.

Preliminary Conclusions

Despite the preliminary nature of this assessment, several conclusions are abundently clear. The German industry in general, and individual producers in particular, experience lower employment costs per unit compared to equivalent products produced in the United States. The sector wide statistical data suggests that the small German car equivalent can be produced for under 200 hours of total employment time. This includes assemblers and suppliers, managers and workers. When the mix is further adjusted to correct for the high technical content of Daimler-Benz and BMW cars, we expect the German industry wide estimate to approach 175 to 190 hours per average vehicle. These data would then be comparable to the U.S. estimates contained elsewhere in this document, which suggests that the average U.S. car or equivalent could not be produced for less than the German employment content.

It is important to understand that the German cost efficiencies derive from several structural factors, which should be separated according to time periods.

During the early 1970s efficiencies derived from these factors:

- o Better labor productivity (hours per vehicle), despite total cost per hour worked similar to that in the U.S.
- o Lower staff cost per unit because of better staffing levels, and lower remuneration per staff person compared to the United States system.
- o In addition, as with the Japanese industry, a higher percentage of each German vehicle is built at lower cost supplier sites. These supplier sites appear to be more efficient in labor hours, and lower-cost, compared to the components sector in the United States.

During the late 1970s and early 1980s the following factors apply:

- o Continued better labor productivity in terms of hours per vehicle, compared to the U.S., despite higher technology additions to the car lines.
- o Very importantly, a declining premium of auto company pay compared to general wage levels of the West German work force. This is the opposite of the U.S. effect experienced from 1979 through 1981.
- o (Note, the above factors are not affected by exchange rates.)

- In addition, in the international markets, West German employment costs benefited from favorable exchange rates against the currencies of a number of other market countries.
- The West German auto industry also continued better staffing patterns and lower staff remuneration, compared to the U.S. system.
- And again, a higher percentage of each vehicle was built at the lower cost supplier end of the production chain.

So, the sector wide picture of the West German industry is one of relatively good "system efficiency" especially compared to the U.S. system of production. Despite two oil shocks and resulting cyclical downturns, the German industry has maintained better production labor content at all times, and better staff patterns, despite fluctuations.

Individual company comparisons of German companies to U.S. and Japanese companies are not fully conclusive at this point, because results have not been fully adjusted for differences in vertical integration. For example, comparisons of Fordwerke in Germany to Ford of North America suggest that the German operation is slightly more efficient in terms of employment hours per vehicle, and lower cost because it experiences lower cost per hour worked. But, the German Ford results are somewhat confused owing to the special relationship Ford Germany has with the Genk assembly plant in Belgium and the Ford of U.K. operations. Ford of Germany is the primary producer of products which are built in Genk, and provides a substantial number of vehicles which are sold by Ford of the U.K. in Britain. Since the results displayed in this document do not adjust the German Ford operations for their parts and non-automotive sales which would reduce the reported labor content numbers here, it does appear that final analysis will indicate the Ford German operation to be more efficient than the Ford U.S. operation in general. It is notable that the percentage of salaried workers at Ford U.S. is considerably higher than that percentage at the German Ford operation, but as of this analysis, the effects of finance company staffing patterns have not been fully adjusted. Comparison of Volkswagen to the American companies presents a clearer picture of intercompany German efficiency patterns. Despite small differencies in vertical integration, it is clear that the Volkswagen operation is more efficient than comparable U.S. operations.

It should be noted that even if one is comparing apparently similar German and American cars, the German car will have a higher level of technological content for several reasons. German vehicles have been adding an increasing number of emission control components, reducing the previous discrepency in technology content vis-a-vis American produced cars. In addition, owing primarily to the requirement for high speed driving, German cars tend to have a tighter level of engineering specification, as well as more complex and expensive handling systems. Over the past decade, German producers have also moved increasing "upscale" through the addition of luxury varients at the broad upper range of the product portfolio. Also German cars must be produced in both left- and right-hand drive configuration. Although German cars do not often carry major options such as air conditioning to the extent that American vehicles do, the basic technological content of the vehicle is on average higher. Given this higher level of technological content, it is clear that the slightly lower employment hours per car figures for the Germans indicate a general advantage in production efficiency and staffing patterns.

This analysis has not yet explicitly calculated the cost per hour worked, and therefore the cost of employment in each German vehicle. However, as the preliminary tables show, the basic cash remuneration of the German employment force is at least 10% beneath current U.S. levels. In addition, it should be noted, again, that a greater percentage of each German vehicle is built using lower cost supplier employment. It is expected, therefore, that this analysis will ultimately suggest that the overall employment cost per vehicle in West Germany is lower than on comparable vehicle in the United States, despite fluctuations in exchange rate value.

Table 4-10

WEST GERMANY: SECTOR-WIDE EMPLOYMENT ESTIMATES

TOTAL EMPLOYMENT HOURS PER VEHICLE
ASSEMBLERS AND SUPPLIERS
ADJUSTED FOR VEHICLE MIX

PRELIMINARY

	77	78	79	80	81
WORKERS					
Hours Per Vehicle	154.6	156.3	157.8	151.6	153.2
STAFF					
Hours Per Vehicle	41.7	43.4	43.9	49.4	49.7
TOTAL	196.3	199.7	201.7	201.0	202.9

- Adjusted for direct export of parts by parts makers, but NOT for parts production by assembler companies.
- Requires further mix adjustment to correct for extremely high quality and technology of Daimler-Benz autos.
- Calculated using "Car Equivalents" for production, as described on the following tables.
- Excludes FordWerke Genk, Belgium operations.
- Staff time estimated at 1800 +/- "working hours" per year.
- Workers time estimated at NET hours worked per year.

Table 4-11

WEST GERMAN AUTO INDUSTRY EMPLOYMENT STRUCTURE

Total Employees

	77	78	79	80	81
Motor Vehicles & Motors	376,388	396,591	412,212	417,801	411,258
Parts	208,220	213,937	220,172	224,707	219,895
Bodies/Trailers	40,840	39,720	41,085	41,563	39,243

Adjusted For Direct Parts Exports

	77	78	79	80	81
Production Workers					
Motor Vehicles & Motors	301,743	317,658	329,213	328,672	319,175
Parts (1)	125,462	127,496	130,807	130,345	124,854
Bodies/Trailers	32,472	31,619	32,936	33,085	30,774
Non-Production Workers					
Motor Vehicles & Motors	74,647	78,933	82,999	89,129	92,083
Parts (1)	32,369	32,957	33,441	34,140	34,126
Bodies/Trailers	8,368	8,101	8,149	8,478	8,469
Total Adjusted	575,061	596,764	617,545	623,849	609,481

STILL NOT ADJUSTED FOR AFTERMARKET OR NON-AUTO PRODUCTS
EXCLUDES REPAIR AND DEALERSHIP EMPLOYEES

(1) Adjusted by ratio of production in directly exported parts.

Source: VDA

Table 4-12

WEST GERMAN MIX ADJUSTMENT
(million units)

	Actual Production				
	77	78	79	80	81
Cars	3.567	3.625	3.657	3.239	3.281
Kombi's	.233	.265	.275	.282	.296
Trucks	.275	.265	.280	.314	.272
Buses	.018	.015	.016	.017	.017
Truck Tractors	.020	.015	.020	.025	.029
Total	4.104	4.186	4.249	3.878	3.892

	"Car Equivalents"				
	77	78	79	80	81
Cars	3.567	3.625	3.657	3.239	3.281
Kombi's	.213	.265	.281	.291	.292
Trucks	.931	.864	.906	.972	.952
Buses	.192	.185	.186	.190	.191
Truck Tractors	.163	.133	.167	.196	.245
Total	5.067	5.073	5.198	4.890	4.962

Adjusted by production value per unit, before tax.

Source: VDA

Note: German mix is particularly "heavy" in terms of technology and complexity of heavy vehicles.

Table 4-13

WEST GERMANY: WORKING HOUR ESTIMATES

Hours Per Employee Per Year

FOR WORKERS
(ARBEITER)

	77	78	79	80	81
Motor Vehicles & Motors	1688	1649	1649	1575	1593
Parts	1723	1684	1687	1628	1616
Trucks, Trailers	1785	1723	1728	1676	1629

FOR STAFF

- Approximately 1833 -

Table 4-14

WEST GERMANY: CASH COST PER HOUR WORKED

EXCLUDES BENEFITS
WORKERS ONLY

DM PER HOUR

	77	78	79	80	81
Motor Vehicles & Motors	18.99	20.04	21.32	23.44	24.48
Parts	15.54	16.65	17.75	19.61	20.76
Trucks, Trailers	13.71	14.83	15.77	17.47	18.75

$ PER HOUR AT 2.4 DM/$

	77	78	79	80	81
Motor Vehicles & Motors	7.91	8.35	8.88	9.77	10.20
Parts	6.48	6.94	7.40	8.17	8.65
Trucks, Trailers	5.71	6.18	6.57	7.28	7.81

NOTE: FOR 1979-1981 AT MAJOR AUTO COMPANIES, TOTAL COST INCLUDING BENEFITS WAS ROUGHLY DOUBLE THE CASH COST EXCLUDING BENEFITS

Table 4-15

WEST GERMANY: IN-HOUSE VEHICLE EMPLOYMENT ESTIMATES
TOTAL EMPLOYMENT HOURS PER VEHICLE

PRELIMINARY

	VW A.G.*	FORDWERKE***	DAIMLER-BENZ
71	138	168	490
72	139	181	441
73	151	167	432
74	147	(231)**	379
75	139	156	347
76	128	148	348
77	128	141	343
78	125	142	355
79	138	140	346
80	141	147	331

- EXCLUDES SUPPLIERS
- NOT ADJUSTED FOR MIX
- ONLY DAIMLER IS ADJUSTED FOR NON-AUTO WORKERS

* EXCLUDES AUDI AND CONTRACT PORSCHE PRODUCTION
** RAPID DROP IN PRODUCTION
*** NOT FULLY ADJUSTED FOR GENK, BELGIUM, OR FOR SALES VIA U.K.

PRELIMINARY CALCULATIONS: FRENCH MOTOR VEHICLE INDUSTRY

EMPLOYMENT ESTIMATES

The following tables reflect the first preliminary calculations on the French industry. Data sources are complex and sometimes inconsistent.

These data are not corrected for vehicle mix, and require adjustment for parts production, direct export of parts and non-automotive production.

Data are adjusted enough for rough comparison to other countries. Calculations now underway suggest that overall hours will be reduced substantially (but not beneath 200 hours), once the vast differences between Renault and PSA are taken into account.

Our early conclusions are that the industry contains much employment, but that remuneration is well below U.S. and German levels; possibly near Japanese levels across the sector.

Table 4-16

FRANCE

ROUGH ESTIMATE, AUTO SECTOR EMPLOYMENT CONTENT

VERY PRELIMINARY

	Total Employment	Est. Hours per Employee	Production (million)	Est. Gross Hours per Vehicle
71	397,864	2150	3.010	284.2
72	412,392	2117	3.328	262.3
73	436,380	2097	3.596	254.5
74	415,561	2045	3.462	245.4
75	426,600	1987	2.861	296.2
76	452,000	2059	3.402	273.5
77	455,000	2030	3.507	263.3
78	459,000	2021	3.507	264.4
79	452,500	2002	3.613	250.7
80	435,500	2007	3.378	258.7

- NOT ADJUSTED FOR VEHICLE MIX
- NOT ADJUSTED TO NET WORKING HOURS
- NOT ADJUSTED FOR PARTS OR AFTERMARKET SALES

NOTE: WE ARE FINDING MAJOR DIFFERENCES BETWEEN RENAULT AND PSA. PSA APPEARS TO HAVE SIGNIFICANTLY HIGHER HOURS PER VEHICLE.

Table 4-17

PRELIMINARY

FRANCE: ESTIMATED "GROSS PAY" PER HOUR WORKED

French Francs

	Manual Workers	Non-Manual Workers
75	14.0 FF	17.3
76	19.1	18.2
77	21.0	23.3
78	21.8	25.9
79	25.7	28.1
80	25.7	31.0

- Excludes benefits.
- Assumes 1 month vacation/time not worked.
- Excludes executive remuneration.
- Excludes lowest-paid suppliers.

U.S.

PRODUCTION VOLUMES

Table 4-18

U.S. VEHICLE PRODUCTION USED FOR LABOR CONTENT ANALYSIS

Big Three

Cars, Trucks, Buses, Tractors

	Actual Production(1)	"Production Equivalents"(2)
1975	8,410,534	9,216,919
1976	10,985,959	11,740,702
1977	12,194,725	13,094,455
1978	12,316,126	13,290,054
1979	10,802,247	11,644,845
1980	7,435,243	7,952,878

(1) Actual factory production of cars, trucks, buses, tractors.

(2) Adjusted to reflect higher labor content of heavier vehicles (making one truck is equivalent to making 3.5 cars for example); brings the mix to a "car-equivalents" basis.

U.S.

EMPLOYMENT ESTIMATES

Table 4-19

U.S. MOTOR VEHICLE EMPLOYMENT USED FOR LABOR CONTENT ANALYSIS

(BIG THREE)

Production, Clerical, Managerial

	Actual Employment (1) (Ford Adjusted Down)	Adjusted Employment (2)	Est. Supplier Employment (3)	TOTAL
1975	770,796	717,488	466,367	1,183,855
1976	866,804	821,311	533,852	1,355,163
1977	937,632	889,412	578,118	1,467,530 (4)
1978	983,554	931,523	605,490	1,537,013
1979	951,380	905,818	588,782	1,494,600
1980	761,384	713,928	464,053	1,177,981

(1) Actual quarterly emp. averaged for year; Ford excludes non-vehicle employees.

(2) Adjusted downward by ratio of non-auto revenue to exclude non-vehicle employees.

(3) From 0.65 job multiplier; derived elsewhere in this document; actual range 1.028 to 1.971.

(4) Bureau of Census says 1,645,000 Vehicle and Parts employees in 1977.

EXCLUDES BASIC MATERIALS

<u>Why Supplier Employment Must be Estimated in the U.S.</u>

Unlike those in Japan or the Major European countries, the government statistics for Motor vehicle ands supplier employment in the U.S. are quite fragmented and confusing, and not immediately comparable to the data kept by other countries.

The problem arises from the SIC code (Standard Industrial Classification) accounting, which artificially separates workers in the production chain. For example, even auto company employees making parts for cars may be excluded from the "motor vehicle and parts" SIC 371 series, as they may be classified elsewhere as "electrical workers" or similar. One needs to go considerably beyond SIC 371 in order to identify even auto company employees. SIC 371 further confuses the data by including in the series <u>some</u> but not all supplier company employees. The result is a composite series which does not at all reflect the employment composition of the motor vehicle employment base.

The problem becomes readily apparent when one compares actual auto company employment to the SIC 371 account, purported to represent auto companies <u>and</u> suppliers. SIC 371 has a hard time even matching the employment count of the Big Three automakers, let alone accounting for the additional tens of thousands of supplier companies.

(See attached sheet for some comparisons.)

The magnitude of the "error" becomes more apparent when one compares the SIC data to the more easily definable Industrial Census data, which attempt to identify automotive output in a variety of different SIC code locations. While the SIC code data would suggest less than 1.0 million employees in motor vehicles and components, the Census data imply many hundreds of thousands of additional employees in the component sector.

Compare Census Data to SIC 371: 1977

	Census	SIC
M.V. & Car Bodies	342,600	443,000
Tr. & Bus Bodies	35,000	45,800
M.V. Parts & Access.	451,300	426,500
Truck Trailers	27,900	26,400
Mot. Homes & Chass.	16,200	?
Auto Stampings	132,000	not reported
SUBTOTAL	1,005,000	941,700
Non-auto categories producing automotive components (1)	640,000	not reported
TOTAL	1,645,000	941,500

(Total used in this analysis)............1,467,530 (2)

(1) Estimated by MVMA by multiplying automotive value output within each employment category by the employment total of that category. The amount shown in this line has been adjusted here to exclude the pure raw materials employment estimates.

(2) This is the employment count derived elsewhere in this document, using the derived supplier add-on ratio. It is presented here for comparison to the official estimates.

It is clear from these comparisons that one should not think in terms of 1.0 million employees in the sector, but in terms of at least 1.5 million. Such higher estimates are consistent with economic studies of the sector.

Other data tend to corroborate such estimates. For example auto companies (total employment of the Big Three near 1 million) report how much of their revenue was distributed to employees versus "suppliers". Even though some "supplier" disbursements are for services, not components, the ratios are instructive.

Percentage of Revenue Distributed

	To Employees	To Suppliers
General Motors	33.4%	50.2%
Ford Motor Company	28.7%	60.0%

These ratios, while not perfect, imply it is quite reasonable to think of supplier employment as an additional 50% of the auto company employment, at least.

In other countries, government statistics compare much more favorably to company and trade association statistics, even though reconcilliation is still required in terms of reporting definitions. But the distorted nature of U.S. statistics has required the estimating procedure used elsewhere in this document.

Table 4-20

COMPARISON OF ACTUAL U.S. AUTO COMPANY
EMPLOYMENT TO REPORTED SIC 371
(MOTOR VEHICLES AND EQUIPMENT) EMPLOYMENT

	Actual Employment, GM, Ford, Chrysler Only (1)	SIC 371 Total (2)	Of This: (000's) Mot. Veh. & Car Bodies	Truck & Bus Bodies	Parts and Access.	Truck Trailers
72	900,313	874,800	415.2	46.1	378.5	30.5
73	967,190	976,500	461.6	51.3	429.9	33.7
74	868,214	907,700	416.2	54.8	402.7	34.1
75	770,796	792,400	375.3	45.5	352.5	19.2
76	866,804	881,000	415.9	43.7	399.0	22.3
77	937,632	942,000	443.0	45.8	426.5	26.4
78	983,554 (3)	997,200	463.0	46.1	455.8	30.6

(1) Excludes Ford Aero & Communications, Finance, Insurance
Excludes American Motors
Excludes All Suppliers
Excludes more than 7 Truck Makers

(2) Commonly cited as "The Motor Vehicle Industry"

(3) In 1978, GM alone employed 528,850 blue collar workers, more than the entire "Motor Vehicles & Car Bodies" total SIC.

IT IS CLEAR THAT SIC 371 SEVERELY UNDER-REPORTS THE MOTOR VEHICLE SECTOR IN THE U.S.

ESTIMATES OF SUPPLIER EMPLOYMENT IN THE U.S. MOTOR VEHICLE INDUSTRY

U.S. statistics are not as detailed as Japanese ones concerning the number of people employed in the motor vehicle supplier companies. To estimate labor content on a basis comparable to the Japanese statistics, one must therefore derive estimates of U.S. supplier employment. The following tables show the results of using the larger data series from the Bureau of Labor Statistics, and the Bureau of the Census. These series, when taken in their entirety overstate the amount of employees, so they must be adjusted downward toward their motor-vehicle-only labor content.

Notice that the two series, even after adjustment suggest more than one supplier job per one motor vehicle manufacturing job. The range is 1.028 supplier jobs to 1.971 supplier jobs. The authors believe this may include workers making aftermarket parts, which would overstate the labor content vehicles. Therefore, to be conservative, this analysis uses the lowest possible multiplier reasonably consistent with the data - that of the "Parts and Accessories" segment of the SIC data.

This suggests only 0.65 supplier jobs per 1.0 motor vehicle manufacturing job, considerably lower than the 1.028 to 1.971 range found from using the entire data series. Analysts will note this is also considerably lower than typical multipliers used in other economic analyses, derived from input-output work and other analyses.

Table 4-21

ESTIMATES OF U.S. MOTOR VEHICLE SUPPLIER EMPLOYMENT

SUMMARY OF TWO ESTIMATION METHODS

Ratio:
Supplier Employees to Motor Vehicle Manufacturing Employees

	ESTIMATE I	ESTIMATE II
Motor Vehicle Manufacturing Employment	1.000	1.000
Parts and Accessories: Primary	.659	.815
Parts and Accessories, Not Included Above	.369	1.156
Total Parts & Access.	1.028	1.971

RATIO USED FOR THIS ANALYSIS 0.650

(1 auto company job brings 0.65 supplier jobs)

Table 4-22

ESTIMATE I

Estimates of Supplier Employment in U.S.

Motor Vehicle Sector

1977 Industry Structure
Motor Vehicle Manufacture

	Employment	Ratio	Employment	Ratio
A. Motor Vehicles and Car Bodies (1)	443,000			
Truck and Bus Bodies (1)	45,800			
Truck Trailer Manufacturing (1)	26,400			
Automotive Stampings (2)	132,000			
Sub Total	647,200	1.000	647,200	1.000

Parts and Component Manufacture

	Employment	Ratio	Employment	Ratio
B. Parts and Accessories Manufacturing (1)	426,500	.659	426,500	.659
C. Rubber/Plastic Hose & Belting(2)			2,100	
Steel Springs (2)			5,400	
Engines, not elsewhere classified (2)			15,600	
Carburetor, Piston, Rings, Valves (2)			26,600	
Motors and Generators (2)			91,200	
Lamps & Vehicular Lighting (2)			18,500	
Batteries (2)			19,800	
Engine Electrical Equipment (2)			59,700	
Sub Total C.			238,900	.369
Total B. & C.			665,400	1.028

(1) SIC - code Employment Classification

(2) Bureau of Census Classification

Source: BLS, Bureau of Census, MVMA

Table 4-22 (con't)

ESTIMATE II

Supplier Employment in U.S. Motor Vehicle Sector

Re-Cast 1977 Bureau of Census Data

	Motor Vehicle Manufacture	
	Employees	Ratio
A. Motor Vehicles and Car Bodies	342,600	
Truck and Bus Bodies	35,000	
Truck Trailers	27,900	
Motor Homes	16,200	
Automotive Stampings	132,000	
Sub Total	553,700	1.000
	Parts and Components Manufacture	
B. Motor Vehicles Parts and Components	451,300	.815
C. Non-Automotive Industries Producing Automotive Products (Automotive Portion Only)	640,000	1.156
B+C Sub Total	1,091,300	1.971

Source: Bureau of Census, MVMA

U.S.

WORKING HOUR ESTIMATES

Table 4-23

U.S. ANNUAL HOURS WORKED PER EMPLOYEE

IN MOTOR VEHICLE SECTOR

2 Series

	GM Hours/Emp.(1)	BLS Hours/Emp. Motor Veh. and Equip. 52 week (2)	BLS Hours/Emp. Motor Veh. and Equip. 50 week (3)
1975	1998	2096	2015
1976	2191	2096	2015
1977	2192	2288	2200
1978	2094	2246	2160
1979	2037	2137	2055
1980	1947	2075	1995

(1) From GM Annual Reports; payroll data

(2) Actual BLS data; 52 week basis

(3) BLS data adjusted downward; assuming actual data overstates actual hours spent at work

U.S.

HOURLY LABOR COST ESTIMATES

COMPUTATION OF U.S. INDUSTRY LABOR COST

The following tables show how a weighted wage was obtained for one year in this analysis. The basic method was to scale known cost per hour information according to the employment in each survey category; this was a simple calculation. The one addition of information from beyond the survey, was the inclusion of the general manufacturing wage for a portion of employment in the "other" category. Since this wage was rather low, for its employment weight, its inclusion will probably understate the total average, if anything.

The exact number and composition of the labor cost can be debated *ad infinitum*. It should be noted that in this document, the wage estimates do not exceed published data, and the total supplier employment charged to motor vehicles may be biased toward the low side, compared to economic multipliers derived in input-output work (possibly understating labor cost).

Table 4-24

ESTIMATED U.S. MOTOR VEHICLE SECTOR

HOURLY LABOR COST

(Wage and Benefits)

2 Methods

Year	Using Employment Ratio From Supplier Analysis (1)	Using Sector Ratio From 1977 Ind. Census (2)
75	$ 8.92	$ 8.25
76	9.54	8.75
77	10.60	9.78
78	11.61	10.72
79	12.73	11.79
80	15.09	14.37

(1) 0.606 Auto Co. employment ratio times auto labor cost, plus 0.394 Supplier employment ratio times General Manufacturing wage and benefit cost (BLS).

(2) Use 0.779 ratio of weighted sector labor cost, times auto company labor cost; from 1977 Ind. Census scaling calculations.

Table 4-25

1977 U.S. WAGES AND BENEFITS: COMPONENT SECTOR COMPARED TO AUTO COMPANIES

A. Scale Per Capita Payroll to Motor Vehicle and Car Bodies

Employment Category	Per Capita Payroll (1)	Scale
Mot. Veh. & Car Bodies	$20,604	1.000
Truck & Bus Bodies	12,331	.598
Mot. Veh. Parts & Acc.	17,761	.862
Truck Trailers	11,441	.555
Motor Homes	10,549	.512
Auto Stampings	18,490	.897
Other	N.A.	N.A.

(1) Excludes benefits

B. Scale Hourly Wage and Benefit to Auto Company Actual

	Hourly Cost (1)	Emp. Wt. (2)	Weighted Hourly Cost
Mot. Veh. & Car Bodies	$12.56	.208	$2.61
Truck & Bus Bodies	7.51	.022	0.17
Parts and Acc.	10.83	.274	2.97
Truck Trailers	6.97	.017	0.12
Motor Homes	6.43	.010	0.06
Auto Stampings	11.27	.080	0.90
Other	7.59 (3)	.389	2.95
		1.000	$9.78

Weighted Sector Cost ($9.78) = .779 times Auto Cost ($12.56)

(1) Use above scale, and actual $12.56 total hourly labor cost of auto companies.
(2) % of total employment in this sector survey.
(3) Use actual wage and benefit total for general manufacturing, from BLS.

SUMMARY STATISTICS FOR JAPAN LABOR CONTENT ANALYSIS

The following tables contain the basic summary information used to derive the ranges of Japanese labor content and cost in motor vehicles. Data are shown for production, employment, hours worked, and cost per hour worked. These data were combined in the various scenarios to derive the summary charts in the main text of this document. Detailed information and derivations are contained in subsequent appendices.

PRODUCTION DATA. Notice that labor cost calculations were run using actual production of cars, trucks, buses. It is important to note that such estimates exclude more than 6,000,000 additional units built by this labor force, thereby overstating the labor content of vehicles built in Japan.

Although they are not explicitly shown in this text, calculations were run adjusting the Japanese mix to a "car equivalents" basis, with the intent of removing some of the now minimal differences between average vehicle sizes in the two countries (cars and trucks). In this case, mini-cars were not counted as whole cars, and the extra labor in Japanese trucks was accounted for (as in the U.S. "production equivalents" case). In addition, motorcycles and knocked down kits were charged as partial cars. The new result was to produce labor content and cost estimates lower than those displayed in this document. Since the desire was to produce an analysis which had almost no potential to overstate the U.S.-Japan differences, this document displays the upward-biased Japanese data.

EMPLOYMENT. Considerable controversy surrounds the sector-wide estimates of Japanese labor content. It is often asserted that many "hidden" workers lie beyond the employment statistics of the Japanese auto companies. These tables display the several major estimates of both auto company and supplier employment in Japan. They include the "non-regular" workforce, so often asserted to be "hidden" in "sweat-shops". All four produce different totals, because they use different cut-points in their surveys. The MITI survey is the most complete, and contains the workforces of the other surveys. However, it must be adjusted downward for this analysis, because large numbers of these workers are making non-auto products and their labor should not be charged directly to cars, trucks, and buses. In truth, the MOL data should be adjusted also, but for reasons mentioned often, we have left is at its higher level. No matter what adjustments were made for final calculations, all of these employment estimates contained people making automotive parts.

HOURS WORKED. These data are well-reported in Japan, and not especially difficult to use in estimation. This document uses two sources: the official Ministry of Labor statistics, and the labor union survey of its own workers. The official statistics are collected at the plant level, including suppliers, and therefore are very responsive to actual conditions. Given that a major labor issue is the amount of time each employee works, and the desire for a shorter work period, one would not expect the union survey to understate the estimated working time. Use of these data therefore are not expected to grossly understate Japanese labor content.

LABOR COST. Considerable data exist on Japanese labor charges, including the highly publicized "fringe benefits" (which are often alleged to be "hidden"). The estimation problem is therefore one of scaling a sector-wide estimate to the known data. This document performs this from four different sources of labor (and management) cost: the Transport Equipment Industry data (dominated by motor vehicles); the Motor Vehicle Industry data (a different government survey); the Japanese labor union survey of companies (Jidosha-Shoren); and the company reports of several key companies (the data in SECTION II of this document are of a separate company-based source).

In essence, the four sources were properly "located" within the sector (did they include components or assemblers, for example), and then a sector-wide average was computed by indexing from the "fixed" data points. As with <u>any</u> averaging calculation, one can find deviations or differing samples from the system being averaged, but one should consider several aspects of this average. First, the method assumes that workers in the component companies will receive the same ratio of benefits that workers at large companies (Toyota) receive. Since this is not generally the case, it would tend to overstate the fully-loaded cost of the middle ranks of the industry. Second, the very lowest wages in the production system (the "cottage industry" workers) are <u>not</u> included in the average, even though their labor content <u>is</u> included in the labor measures. This means the averaging process will tend to underrepresent the lowest labor cost, while still representing this labor content, thereby overstating the sector-wide cost. Such averaging methods should effectively compensate for any "fringes" or "subsidies" which may not already be included in the basic data.

Table 4-26

SUMMARY OF SENSITIVITY RUNS: JAPAN EMPLOYMENT DATA
NOT A SIMULATION SUMMARY--MERELY REPRESENTATIVE CASES

RUN NUMBER	1975	1976	1977	1978	1979	1980
	HOURS PER VEHICLE					
1	176	170	160	149	148	131
2	149	144	136	127	126	112
3	154	148	140	131	131	117
4	165	158	149	141	132	118
5	159	154	145	136	127	113
6	168	162	150	137	129	123
7	138	133	124	112	106	100
8	147	138	128	120	115	112
9	124	123	108	97	97	95
10	120	120	105	94	94	91
MAX	176	170	160	149	148	131
MIN	120	120	105	94	94	91
"AVERAGE*"	150	145	135	124	121	111

* ONLY OF THESE SELECTED CASES.

JAPAN

PRODUCTION VOLUMES

Table 4-27

PRODUCTION SERIES USED FOR LABOR CONTENT ANALYSIS

CARS, TRUCKS, BUSES ONLY

	Production Used Cars, Trucks, Buses	Vehicles Produced By Workers, But Not Included in Computations: Motorcycles	K-D Motorcycles	K-D Car, Truck, Bus
75	6,941,591	3,802,547	-	
76	7,841,447	4,235,112	-	
77	8,514,522	5,577,359	-	
78	9,269,153	5,999,929	706,750	330,321
79	9,635,546	4,475,956	1,024,040	403,490
80	11,042,884	6,434,524	967,879	439,068

NOTE: THE WORKFORCE USED FOR LABOR CONTENT CALCULATIONS MAKES NOT ONLY THE VEHICLES ON THE RIGHT ABOVE, BUT PARTS AND NON-AUTO PRODUCTS. BY CHARGING FULL LABOR TO CARS, TRUCKS, BUSES ONLY, VEHICLE LABOR CONTENT IS OVERSTATED.

Source: JAMA

JAPAN

EMPLOYMENT ESTIMATES

Table 4-28

EMPLOYMENT SERIES USED FOR LABOR

CONTENT ANALYSIS

(All Workers: Production and Clerical)

	MITI (1)	Adjusted for Non-Auto Production	MOL (2)	Industry Surveys Assemblers (3)	Suppliers (4)	(5) Total
75	601,156	510,983	544,000	198,923	243,224	442,142
76	622,251	528,913	564,000	197,474	278,465	475,939
77	NAT		570,000	199,962	255,026	454,988
78	637,841	542,165	583,000	200,941	253,153	454,094
79	651,342	553,641	559,000	(228,034)	262,512	490,546
80	NAT		565,000	234,875	274,430	509,305

(1) MITI Census of Manufactures

(2) MOL Monthly or annual labor survey

(3) Industry association survey: '79 and '80 from fiscal year annual reports

(4) JAPIA trade association survey

(5) THIS IS SIGNIFICANT SERIES, BECAUSE LABOR BEYOND THESE COMPANIES WILL BE AT THE LOWEST WAGE SCALES IN JAPAN

NAT = Not Available in Translation

Table 4-29

LABOR DATA IN CENSUS OF MANUFACTURES

(MITI)

A. For companies larger than 20 workers

1. Regular Employees, including:

- temporary labor employed for 30 days or more
- temporary or daily labor employed for 18 days or more in November and December
- directors and trustees receiving monthly salaries

2. Self-employed and family members, including:

- private owners and members of family working regularly without compensation.

Above are broken into Production, Supervisory, and Male, Female

B. For companies of less than 20 workers

- Same as above, without Production/Supervisory split.

C. Head Offices, if separate from plants

- Regular workers, as defined above

Source: MITI Census Forms

Table 4-30

COMPARISON OF JAPAN'S TWO MAJOR

MOTOR VEHICLE EMPLOYMENT SERIES

(How Much Labor Should Be Charged To Cars, Trucks, Buses?)

Motor Vehicle and Components

Employee Count
(Production and clerical/managerial)

	MITI	MOL	% Difference (MITI/MOL)
75	601,156	544,000	10.5%
76	622,251	564,000	10.3
78	637,841	583,000	9.4
79	651,342	559,000	16.5

MITI includes temporary workers, but also more products, unpaid family members, and part-time workers. Therefore each employee should not count as a full labor year, and not all labor should be charged to finished vehicles.

MOL excludes some temporary workers, but each employee represents a full labor year. MOL still contains more than finished vehicles.

NOTE: MORE THAN 15% OF MOTOR VEHICLE COMPANY OUTPUT IS IN PARTS AND NON-AUTO PRODUCTS. MORE THAN 19% OF COMPONENT SUPPLIER IS IN SAME. THEREFORE:

1. The MOL series is probably a good employment proxy for cars, trucks, buses.

2. The % of non-auto output applied against the % of temporary workers excluded from the MOL series (more than) balance out.

3. The MITI series must be adjusted downward if it is to be used for labor content of finished cars, trucks, buses.

4. Even after such adjustments, both series still contain the labor which makes several million motorcycles, and several hundred thousand knock-down kits. So using these data for employment estimates will tend to overstate the labor content of cars, trucks, buses.

Table 4-31

HOW MUCH OF JAPAN'S "MOTOR VEHICLE"

SECTOR PRODUCTION IS NOT IN FINISHED

VEHICLES

	% of Production Value or Factory Sales	
Motor Vehicle Companies	15.8 %	(1)
Component Producing Companies	19.5%	(2)

(1) Weighted % of Toyota, Nissan, Honda, Toyo Kogyo, Isuzu (18.8%, 10.6%, 14.0%, 18.7%, 24.1% respectively)

(2) % of production value not going to 4-wheel motor vehicles.

Source: Company Annual Reports; JAPIA Annual Survey (1980 and 1981 Fiscal years)

JAPAN

HOURLY LABOR COST ESTIMATES

Table 4-32

JAPAN HOURLY LABOR COST PER HOUR WORKED (1)

WAGE, BONUS, OVERTIME, AND FRINGE BENEFITS

$ At 215 Yen

	Toyota Only (2)	Jidosha-Soren Assemblers Only (3)	Motor Veh. & Equipment Sector (4)	Transport. Equipment All Co's (5)	Transport. Equipment Small Co's (6)
1975	$ 6.43	$ 6.18	$ 5.69	$ 5.62	$ 4.13
1976	6.66	6.69	6.32	6.08	4.47
1977	7.31	7.33	6.88	6.65	4.89
1978	8.07	7.92	7.41	7.19	5.29
1979	8.59	8.49	7.88	7.71	5.67
1980	8.97	8.87	8.23	8.05	5.92
1981	9.72	9.62	8.93	8.74	6.43

Numbers in small type are actual calculations. Numbers in boldface type are extrapolated from actual data, using the sector average rate-of-change index.

(1) From MOL Series of working hours for entire motor vehicle and equipment industry survey. Applied to total labor cost in other series.

(2) Excludes lower-paid non-regular wages (although hours-worked includes their labor time).

(3) Union survey of 11 assemblers.

(4) Assemblers <u>and</u> component makers. Exludes low-cost small companies on cost side, but uses their labor in hours-worked side.

(5) Average sector, <u>including</u> high-paying large companies.

(6) Average of small suppliers; excludes wage level of low-paid temporary help.

Table 4-33

TOTAL LABOR COST, JAPAN ASSEMBLERS

JIDOSHA-SOREN (UNION) SURVEY

WAGES AND FRINGE BENEFITS[(1)]

Year	Monthly Cost per Worker ¥	Cost Per Hour $ at 215 Yen MOL-hours	Cost Per Hour $ at 215 Yen J-S hours
1980	351,954	$ 8.87	$ 8.46
1981	369,280	N.A.	$ 9.10

(1) Includes: wage, overtime, bonus, compulsory welfare, voluntary welfare.

Source: Jidosha-Soren, labor union, annual survey of auto assembler wages and benefits

Table 4-34

TOYOTA: LABOR COST PER EMPLOYEE, INCLUDING FRINGE BENEFITS

Annual Labor Cost Per Employee			Cost Per Hour Worked ($ at 215 Yen)	
Fiscal Year	¥/Year (000's)	% chg.	MOL-Series (1)	J-S Series (2)
72	¥ 1,600	-		$ 3.17
73	1,923	20.2%		3.77
74	2,353	22.4		5.00
75	2,821	19.9	$ 6.43	6.22
76	3,068	8.8	6.66	6.46
77	3,413	11.4	7.31	7.12
78	3,768	10.2	8.07	7.80
79	4,069	8.0	8.59	8.30
80	4,271	5.0	8.97	8.55
81	4,613	8.0		9.47

(1) MOL Survey on hours; Motor vehicles and equipment

(2) Jidosha-Soren; union survey of 11 assembers

Labor Cost includes: straight time, overtime, bonus, mandatory welfare, optional welfare. Data through 1977 include meal subsidies and housing subsidies. Data after 1977 are not clear on these items.

Source: Company Annual Reports and Information Handbook

Table 4-35

CASH LABOR COST, JAPAN MOTOR VEHICLE AND EQUIPMENT INDUSTRY (1)

WAGE, OVERTIME, BONUS (2)

Year	Monthly Cash Earnings Per Emp. (3) ¥	Cost per Hour $ at 215 Yen MOL-based	J-S based
1975	173,333	$ 4.74	$ 4.59
1976	202,052	5.26	5.11
1977	223,317	5.73	5.58
1978	239,994	6.17	5.96
1979	258,848	6.56	6.34

(1) 35% of this industry is high-cost assemblers.

(2) Excludes fringe

(3) Total of managerial and production workers; production workers average 6% less than this figure.

Source: MOL Survey

Table 4-36

TOTAL LABOR COST PER HOUR IN JAPAN MOTOR VEHICLE

AND EQUIPMENT INDUSTRY

Assuming Same Fringe Benefit Ratio As In Transportation Equipment Industry (1)

Year	Est. Total Cost Per Hour $ at 215 Yen MOL-based	J-S based
1975	$ 5.69	5.51
1976	6.32	6.14
1977	6.88	6.70
1978	7.41	7.16
1979	7.88	7.61

(1) Wage and Fringe = 1.201 times cash earnings

Table 4-37

LABOR COST AND RELATED ITEMS: JAPAN TRANSPORTATION EQUIPMENT INDUSTRY*

Year	Annual Cash Labor Cost Per Worker, and Shipment Value Per Worker: Shipment/Worker (1) ¥ million	Labor Cost/Worker (2) ¥ million	Cash Labor Cost Per Hour Worked ($ at 215 ¥): MOL-series	J-D series
75	¥ 15.6	¥ 2.111	$ 4.81	$ 4.66
76	17.9	2.359	5.12	4.97
77	20.7	2.562	5.48	5.34
78	23.1	2.830	6.06	5.86

(1) Total Shipment value divided by total employees

(2) Wage, overtime, bonus. Excludes non-cash fringe

* Dominated by autos and components. Includes high-wage assemblers, as well as lower wage suppliers.

Source: MITI Census of Manufactures

Table 4-38

TOTAL LABOR COST, TRANSPORTATION EQUIPMENT INDUSTRY

BY COMPANY SIZE, 1978

CASH EARNINGS AND FRINGE BENEFITS (1)

Company Size (employees)	Monthly Total Labor Cost Per Employee ¥	Cost per Hour $ at 215 Yen MOL-based	J-S based
5000 +	¥ 300,585	$ 7.72	$ 7.46
1000 - 4999	292,015	7.50	7.25
300 - 999	264,208	6.79	6.56
100 - 299	221,258	5.69	5.49
30 - 99	205,684	5.29	5.11
Ind. Average	279,828	$ 7.19	$ 6.95

Source: Japan Yearbook of Labor Statistics.

(1) Includes: wage, overtime, bonus, mandatory welfare, optional welfare, housing subsidy, recreational facilities, food subsidy.

Table 4-39

INDICES OF LABOR COST

(Used to extrapolate from actual cost calculations)

	Toyota	Motor Veh. and Equipment	Transp. Equip.	Jidosha Soren (cash only)	Average of Available Indices*
1975	1.000	1.000	1.000	1.000	1.000
1976	1.039	1.114	1.067	1.103	1.081
1977	1.145	1.216	1.146	1.230	1.184
1978	1.254	1.299	1.258	1.309	1.280
1979	1.334	1.381		1.402	1.372
1980	1.375			1.492	1.434
1981	1.523			1.586	1.555

* Used to extrapolate labor cost in this analysis.

JAPAN

WORKING HOUR ESTIMATES

Table 4-40

ANNUAL LABOR HOURS PER WORKER IN JAPAN

2 SERIES

SCHEDULED HOURS PLUS OVERTIME

Year	Whole Sector Ministry of Labor (1)	Assemblers Only Jidosha-Soren (2)
70	NAT	2432 hours
71	NAT	2406
72	NAT	2349
73	NAT	2371
74	NAT	2187
75	2040	2108
76	2143	2209
77	2176	2233
78	2172	2248
79	2204	2280
80	2214 (3)	2323
81		2266

(1) Survey of all motor vehicle and equipment companies, by Ministry of Labor.

(2) Union survey of 11 motor vehicle assemblers.

(3) Estimated from first five months.

NAT = Not available in translation

"FINANCIAL METHOD" DATA

The following tables show the primary results of cost comparisons derived directly from financial reports in the two countries.

Notice that the results for the U.S. companies exclude the costs of their suppliers, and include only those workers and staff employed by the car company. The Japanese estimates, on the contrary, fully include all supplier costs.

It is instructuve to see the large cost differences even in this imcomplete comparison. The true differences are larger than these comparisons suggest.

Notice also that this method requires very little in the way of data transformation, interpretation, or assumptions. The only estimates derived statistically are the the "Materials" line of the Japanese tables; all other data are directly reported.

Notice also the significant difference implied in the "Management" cost estimates for Japan. This is the topic of further investigation, but its implications are clear; Japanese fixed costs are considerably lower than U.S. ones.

DATA FROM U.S. ANNUAL REPORTS

Table 4-41

FORD UNIT EMPLOYMENT COST ESTIMATES

	Vehicle Production (mill.)	Total Employees (000's)	Hours Worked/ Year (1)	Hourly Cost/ Hour Worked $ (2)	Payroll/unit $ (3)
80	1.924	179.9	1995	$19.99	$2,728
79	3.126	239.5	2055	15.94	2,009
78	3.826	256.6	2160	14.09	1.720
77	3.781	239.3	2200	12.84	1,495
76	2.976	219.7	2015	12.01	1,472
75	2.538	203.7	2015	10.96	1,403
74	3.139	235.2	2030	9.49	1,268
73	3.482	249.5	2175	8.43	1,156
72	3.237	232.9	2150	7.83	1,092
71	2.850	225,3	2060	7.21	1,030
70	2.690	229.4	2016	6.40	991

(1) From BLS: 50 weeks per year.

(2) Includes benefits

(3) Excludes benefits and non-hourly employees

SOURCE: Company Annual Reports, MVMA, BLS

Table 4-42

FORD: ESTIMATED EMPLOYMENT COST STRUCTURE
(EXCLUDES SUPPLIERS)

	71	72	73	74	75	76	77	78	79	80	81
Estimated Hours Per Vehicle											
Non-Hourly	45.5	40.9	38.7	40.5	43.9	40.0	34.0	35.2	46.7	57.0	57.7
Hourly	101.0	98.3	99.6	97.4	101.6	96.4	91.9	94.8	97.2	111.7	97.8
TOTAL EXCLUDING SUPPLIERS	146.5	139.2	138.3	137.9	145.5	136.4	125.9	130.0	143.9	168.7	155.5
Estimated Cost Per Vehicle											
Non-Hourly	$ 328	320	326	384	481	480	437	496	744	1139	1251
Hourly	$ 728	770	840	924	1114	1158	1180	1336	1549	2233	2120
TOTAL EXCLUDING SUPPLIERS	$1056	1090	1166	1308	1595	1638	1617	1832	2293	3372	3371
Cross-Check Data											
Units (mil)	2.819	3.197	3.442	3.098	2.500	2.942	3.742	3.790	3.075	1.888	1.937
Implied US Emp. Cost ($ mill)	2977	3485	4013	4052	3988	4819	6051	6943	7051	6366	6530
Actual World Total Labor Cost ($ mill)	4973	5996	7108	7315	7165	8653	10839	12494	13227	12417	12238
Implied Non-US Cost ($ mill)	1996	2511	3095	3263	3177	3834	4788	5551	6176	6051	5708
Per Capita Labor Cost											
US Auto (Calc.)	14520	16267	17674	18927	21754	23842	27189	19409	32004	39314	42012
Non-US Auto (Calc.)	8753	10995	12517	13018	12647	15856	18649	20525	22519	22850	22891
World Avg. (Actual)	11483	13547	14986	15745	17220	19493	22615	24666	26744	19098	30234

GM UNIT EMPLOYMENT COST ESTIMATES

	Vehicle Production (mill.)	Total Employees (000's)	Hourly Cost/ Hour Worked ($)	Hours Worked/ Year
80	4.753	517.0	$18.44	1947
79	6.444	620.0	15.13	2037
78	6.875	611.0	13.76	2094
77	6.702	580.0	12.56	2192
76	6.234	536.5	11.23	2191
75	4.649	479.9	10.59	1998
74	4.672	517.8	9.52	1974
73	6.514	589.4	8.10	2131
72	5.741	551.9	7.58	2092
71	5.764		7.01	2030
70	3.593		6.29	1962

(1) From: Hourly Emp.; cost/hr including benefits; hours worked; production

(3) From trend ratio of hourly-to-total employee cost.

SOURCE: Company Annual Reports, MVMA

Table 4-44 GM ESTIMATED EMPLOYMENT COST STRUCTURE
(EXCLUDES SUPPLIERS)

	71	72	73	74	75	76	77	78	79	80	81
					Hours Per Vehicle						
Officials & Managers	16.1	17.1	16.0	15.3	14.8	15.6	15.5	15.2	16.9	20.9	21.2
Professional	8.7	10.1	9.6	9.8	10.1	10.0	10.0	10.2	11.6	14.6	16.0
Other White Collar	20.9	20.0	18.2	16.2	14.6	15.4	15.0	15.4	15.5	18.4	18.3
Hourly	137.0	138.7	135.4	144.6	136.7	132.0	134.1	131.6	137.4	141.0	151.2
TOTAL	182.0	185.9	179.2	185.9	176.2	173.0	174.6	172.4	181.4	194.9	206.7
					Estimated Cost Per Vehicle						
Non-Hourly	$ 269	301	299	332	353	389	430	473	568	843	930
Hourly	$ 960	1051	1097	1377	1448	1482	1684	1810	2095	2601	2994
TOTAL	$ 1229	1352	1396	1709	1801	1871	2114	2283	2663	3444	3924
					Cross-check Data						
Units (mil)	5.764	5.741	6.514	4.672	4.649	6.234	6.702	6.875	6.444	4.753	4.628
Implied US Emp. Cost ($ mill)	$ 7084	7762	9094	7984	8373	11664	14168	15696	17160	16369	18160
Actual					$ Million						
Hourly Payroll	4782		6153	5400	5564	7700	9300	10300	11000	9800	11100
Total Benefits	1400		1700	2000	2100	2400	3200	3400	3700	4400	4100
Bonus	90	101	113	6	33	140	161	168	130	0	0
Implied Salary Payroll	812		1128	578	676	1424	1507	1828	2326	2169	2960

DATA FROM JAPANESE FINANCIAL REPORTS

(FROM THE MAIN INCOME STATEMENT AND SUPPLEMENTARY "PRODUCTION COST" TABLE)

Table 4-45

JAPAN: FULL EMPLOYMENT COST PER VEHICLE (1)

(CHARGES COST OF NON-VEHICLE PRODUCTS TO VEHICLES)

	INCLUDES SUPPLIER LABOR FOR MANUFACTURED PARTS					
Fiscal Year	76	77	78	79	80	81
TOYOTA						
Mgt (2)	$ 27	$ 28	$ 26	NA	$ 31	$ 32
Production Labor (3)	234	248	250	-	270	299
Parts Labor (4)	432	438	462	-	490	537
TOTAL	$ 693	$ 714	$ 738		$ 791	$ 868
DAIHATSU						
Mgt. (2)	52	51	NA	57	58	NA
Prod. Labor (3)	267	273	-	278	287	-
Parts Labor (4)	219	237	-	276	273	-
TOTAL	538	561		611	618	
TOYO KOGYO						
Mgt. (2)	85	84	99	NA	101	82
Prod. Labor (3)	473	483	440	-	383	411
Parts Labor (4)	341	339	330	-	403	437
TOTAL	899	906	869		887	930
NISSAN						
Mgt. (2)	NA	NA	NA	NA	94	105
Prod. Labor (3)	-	-	-	-	362	372
Parts Labor (4)	-	-	-	-	477	506
TOTAL					$ 933	$ 983

(See Notes Next Page)

Table 4-45 (con't)

THESE COMPANIES MAKE LARGE SHARE
OF MEDIUM AND HEAVY TRUCKS
AND BUSES

	Fiscal Year					
	76	77	78	79	80	81
HINO						
Mgt. (2)	$ 31	$ 28	NA	$ 33	$ 37	NA
Prod. Labor (3)	434	388	-	472	509	-
Parts Labor (4)	566	491	-	573	595	-
TOTAL	1031	907		1078	1141	
ISUZU						
Mgt. (2)	100	106	NA	NA	NA	NA
Prod. Labor (3)	486	502	-	-	-	-
Parts Labor (4)	768	779	-	-	-	-
TOTAL	$1354	$1387				

(1) Includes: management, clerical, staff, production workers, outside directors and auditors; wage, bonus, overtime, mandatory welfare, voluntary welfare; food and housing subsidy, vacation. For: auto companies, component makers. Excludes labor content of pure raw material (steel, glass, plastic, rubber).

(2) In the auto company; includes bonus and retirement. Excludes stock options and some non-cash "perks" like cars.

(3) In the auto company; total expenditure regular and non-regular workforce.

(4) Employment cost in the "materials" purchased by the auto company.

ADDITIONAL DATA

The following tables present early data of an analysis of employment structure of the world's motor vehicle companies. The aim of this work will be to determine structural differences which may have competitive implications.

For example, it is now clear that high U.S. vehicle costs are partly the result of high staffing patterns and pay, compared to other world companies. The following tables indicate an approximate order of the disparity.

Additional work will attempt further refinement of the differences between direct labor and the "system" costs of staffing patterns, and geography.

Table 4-46

Comparison of Employment Composition

Ratio of Employment

	VW A.G. 81	Ford Werke 81	Opel 81	Ford U.K. 81	Fiat 79	Daimler A.G. 80	Ford U.S. 81	GM U.S. 81	Chrysler U.S. 81
Salary	.169	.208	.200	.240	.198	.191	.375	.264	.331
Hourly	.831	.792	.800	.760	.802	.809	.625	.736	.669

NOTES:

1. Not all are directly comparable above, owing to differing accounting classifications.
2. Table only useful for approximate comparison
3. Japan does not report hourly/salary split, because production workers are on monthly salary
4. GM composition is suspect, owing to very different "regional headquarters" pattern and highest level of vertical integration

Units Produced per Employee*

	VW A.G.	Ford Werke	Opel	Ford U.K.	Fiat	Daimler A.G.	Ford U.S.	GM U.S.	Chrysler U.S.
Salary	60.9	70.3	68.1	28.7	56.5		27.3	33.5	37.6
Hourly	12.3	18.8	16.8	9.0	14.0		16.4	12.1	18.6

* For rough comparison.

Table 4-47

Comparisons of "Out of Plant" Employment

GM and Toyota

1980

At first, Employment Composition Ratio Seems Similar (1)

	Toyota		GM
Non-Production	.250	White Collar	.239
Production	.750	Blue Collar	.761

But, Detailed Examination Reveals Structural Difference (2)

Toyota		GM
.055	Out of Plant	.110
.945	In-Plant	.890

(1) Annual Reports

(2) Plant-by-plant count, Annual Reports, Publicity Brochures

DEVELOPMENTS IN THE JAPANESE MOTOR VEHICLE INDUSTRY

The U.S. and European producers are not alone in facing major changes owing to the internationalization of the motor vehicle industry. It is quite clear based upon assessment of developments from 1980 through 1983 that the Japanese industry is in a stage of major transition, comparable in magnitude to its growth in volume during the late 1960s and 1970s, but of a different variety.

Considerable data have been presented in this document in other sections concerning the Japanese producers, and the reader is referred to those data appendices. This chapter provides additional data, as it has become available during the performance of this contract.

Japanese Experience Slower Production Volumes

The 1980-83 period represented only the second time in the history of the Japanese motor vehicle industry that their producers faced a decline in the rapid trajectory of production growth. Although the Japanese experience of the past several years was nothing in comparison to the decline in volume in the United States or the slowdown in Europe, it did represent a significant deflection of the long-term growth pattern of the Japanese industry. While most of this volume decline was the result of trade restraints imposed by nations around the world, primarily in North America and in Europe, it was also partially a result of economic problems created by the second oil shock and by the general slowdown in the world economic picture. The effects of this volume decline were not universally felt in Japan, and different producers faced different challenges as is quite evident in the accompanying financial statistics.

The primary effect of volume slowdown was to pressure the margins and cash flow of the small Japanese producers. Although it is commonly felt in North America and in Europe that the Japanese producers are collectively strong, it should not be overlooked that several of the smaller producers obtained nothing like the market and financial power of the large producers such as Toyota and Nissan. Isuzu appears to be the most substantially affected company, as is indicated by its deteriorating financial condition, the requirement to gain capital from its American affiliate General Motors, and in several of the financial indicators surrounding cash flow of the corporation. On the other end of the scale it appears that Honda remained the most successful both in terms of continued international penetration and in terms of general profitability and financial indicators. Detailed analysis of Toyota indicated that although it was affected by the worldwide slowdown, most of the evident changes in financial indicators were the result of the merger between Toyota Motor Company and Toyota Motor Sales. Data which suggests a financial slowdown at that corporation should be carefully evaluated since it appears that most of deflections were the result of accounting changes brought about by the merger.

Although this deflection in volume and the subsequent financial pressure was disturbing to many of the Japanese companies, it by no means represented the financial destruction so clearly evident in the North American industry and in portions of the other parts of the world. However, several indicators do bear watching. For example, during the past several years the Japanese experienced a fundamental increase in the employment cost per unit and in the fixed cost per unit for various producers. This was fundamentally a reflection of the decline in units against a relatively fixed labor and non-labor cost base, but it also represented production cost increases owing to new product introductions, escalation in research development and capital costs, and a shift towards a more complex internationally competitive product line. So it is noticable that the Japanese unit costs increased during this period, but this by no means represents the Japanese inflation asserted by many as inevitable which would tend to to bring Japanese costs towards those represented in the American or European industries.

The volume decline, in aggregate, also represented the first time in recent history that the Japanese experienced a deflection in their rapid productivity growth rates. On one indicator, the Ministry of Labor aggregate hours for vehicle production, the Japanese experienced about a six percent increase in average hours required to produce vehicles during 1981-82. It should be noted that although this represented a disruption of a trend which might have alarmed a number of Japanese, this six percent increase was on a base of hours per car which was substantially lower than any other producer in the world, and therefore does not represent a reversal of the international productivity competitive problem. For example, during the same time frame American producers sustained an hours per vehicle penalty owing to volume losses well in excess of 20 percent of their base hours before the recession. The experience of European producers varied by region, but also exceeded the detremental trend effect on the Japanese.

Even though this blip in productivity rates of gain did not do anything to close the international competitive gap, it has apparently created conditions which are slightly novel to the Japanese producers. For example, considerable new evidence suggests that Japanese auto companies are no longer the most preferred employers sought out by newly graduated entries to the Japanese labor force. A number of Japanese articles during 1983 described the results of the national hiring surveys which indicated that newly graduating Japanese were turning more towards the high technology companies and were turning away from automotive producers, in such a way that automotive producers are not capable of obtaining the highest levels of new graduates in their employment ranks. This is also indicated by preliminary data now being released which indicates that Japanese auto companies have scaled down their new hiring plans, most likely indicating their strategic assessment of slower growth compared to the late 1970s. These observations are only deserving of mention here, because the hard data and the surveys supporting the articles will not be released until later in 1984.

For the Japanese this period has brought a general change in the strategic plans of the Japanese companies, as indicated primarily in their renewed intensity to abolish the trade restraints established during the recent international automotive recession. Statements being issued in Japanese financial reports also indicate a new conservatism, with statements from the chief executive officers referring to a more sober international penetration vision.

Japan's Producers Still Remain the World's Strongest

Despite the volume trend which may have been alarming to a number of Japanese companies, compared to their recent history, it is very clear that Japanese auto companies are still the most powerful, and the best positioned producers in the world. They will be able to capitalize on gains made during the late 1970s, and will remain the major competitive threat to other producers in all aspects of the international motor vehicle business.

For example, despite the fact that Japanese costs increased compared to recent trends, there has been almost no reduction in the cost differentials between Japanese and U.S. producers. In some cases, certain European producers through strenuous rationalization efforts have gained ground vis-a-vis the Japanese, but other European producers have not been able to make any great strides in reducing the Japanese cost and price pressure. The $1,500 cost differential between U.S. and Japanese products which was measurable during the late 1970s, has in no means been diminished. In addition, for certain Japanese producers the cost positions have actually improved.

This improvement is a relative one, which must consider the product mix shift of the Japanese. Although the per unit cost of Toyota cars for example has risen in the last two years, the output of Toyota vehicles has moved considerably more towards the luxury and sporty end of the model line. This means that even though their costs have increased, their pricing positions and their profits in offshore markets have increased despite the volume slowdown. In the case of Honda, not only have their products been considerably richened, but their international position has been quite strengthened by their ten-year internationalization strategy, which has left them with usable production sites outside of Japan.

In other measures, it is clear that the Japanese power has not been diminished. For example, even though profit streams may have been pressured in some companies, the overall financial picture of these producers represents nothing like the weakened condition of the U.S. and European producers, measured on a long term basis. Cash flows are still quite strong at all the Japanese producers, and they have been able to continue investment in new equipment and in new product technology despite the slowdown in business. The experience at other companies around the world has been the opposite, with cash flows drying up, debt levels increasing rapidly, and product introduction rates slowing down compared to the rate of introduction of the Japanese.

Part of this financial review contains a somewhat counterintuitive financial indicator. It should be noticed on the accompanying sheets that the debt position of several of the Japanese companies has been increasing. This is far from a negative indicator. During the 1970s the Japanese companies, formerly the highest debt holders in the world, took great pains to reduce their debt exposure on their balance sheet, and in the case of Toyota the company was able to completely eliminate long-term debt from its capital structure. At this point, the Japanese companies have become so strong that they have been able to increase borrowing not to sustain lower levels of operations but rather to expand internationally and to advance their already powerful product lines. The increase in debt therefore represents a new competitive thrust on the part of the Japanese, a thrust made during the period when most of the world auto companies were retrenching. This means that the Japanese have actually advanced a bit on the worldwide market cycles compared to other producers because the Japanese will be able to rebound more quickly should the world market continue to pick up.

In addition, the extremely strong dollar compared to the yen is yielding the Japanese excess profits in sales to North America, despite the quota restraint on finished unit deliveries to the United States and Canada. It is important to note that not all of these profits are reported back to Japan, owing to the disaggregation of the offshore sales and delivery networks, but these profits are just as usable to maintain the international competitive pressure mounted by the Japanese during the late 1970s. The strong profits being earned in dollars can be quickly converted to currencies that are weaker against the dollar, be they yen currencies or European currencies. These financial amounts can be used to expand the Japanese international production network in such a way that the Japanese international presence will remain quite strong.

In addition, during the recent months domestic demand in Japan has picked up for a variety of reasons, and as the Japanese auto consumer becomes richer in general, these sales should become more profitable than they had been during the late 1970s. Although profits have been increasing for U.S. domestic sales by U.S. producers, U.S. producers have by no means reached the volume levels of domestic sales that they obtained in 1978. On the other hand, Japanese producers appear quite capable of not only returning to their historic volume levels but they should be able to advance beyond this in the next several years.

Another positive aspect of the changes being faced by the Japanese motor vehicle industry is to be found in the supplier sector. During the 1960s and early 1970s Japanese suppliers were essentially provincial suppliers not up to the international competitive standards represented by major suppliers in other nations, such as Robert Bosch, and others. At this point, owing to several decades of rationalization, and cooperation among suppliers and assemblers, Japanese component suppliers are now to be considered "world class" suppliers. Having attained both technological sophistication and an extremely powerful cost position Japanese component suppliers have begun to export more to automakers in the United States and in Europe, and to establish their own offshore networks. As a result, despite quotas on Japanese finished unit deliveries, the overall sector in Japan has been growing with strong financial returns now being defused down through the supplier sector.

This trend has been bolstered by the second oil shock in the United States and the requirement that U.S. auto companies outsource to cut internal production costs. Japanese component suppliers are now benefiting strongly from these outsourcing deals, and are now assured of enough business in North America that they can afford to establish production operations here. In addition, supplier penetration has begun in Europe as evidenced in several ways. For example, even in the strongly protected French market, Clarion Radio has been able to move in mainly through joint venture efforts. In addition component suppliers have benefited from the British Leyland and Honda connection, and from several other component purchases by European producers.

Perhaps the most ironic, positive influence on the Japanese industry is occurring because of the trade restraints issued by other nations. One of the effects of the market share restraints in Europe and the unit quotas in North America has been to set up a rather unique Japanese competitive situation. For example, because Japanese producers are not allowed to ship all the units they can sell to North America, they have <u>not</u> been forced to <u>compete with each other</u> in this region. Prior to the institution of the quota, Japanese producers were competing not only with American companies but amongst themselves to gain market share in North America. A similar pattern was quite evident in Europe, although the penetration rate was slower than in the United States, owing primarily to the tariff structure, value-added tax structure, and the lack of a broad distribution network on the part of the Japanese producers in Europe. When quotas were instituted and the demand for Japanese cars remained higher than the quota level, Japanese producers no longer had any incentive to compete amongst each other.

Instead, they acted quite rationally and formed the equivalent of a cartel with a strong high price umbrella. With their unit deliveries made certain by political action, the companies were then free to move upscale in their product lines to extract the highest possible prices from their restricted export markets. The most immediate effect of this was that Japanese companies no longer competed against each other for small utilitarian car sales in North America and in the protected areas of Europe. Such small car competition under the quotas would have gained Japanese producers absolutely nothing, and it can be argued that the move upscale has damaged certain segments of the formerly U.S.- and European-dominated markets.

Another aspect of this trade restraint is the international positioning strength it has given the Japanese vis-a-vis the Third World markets. With no incentive to ship small low-cost cars to the export markets in North America and in Europe, the Japanese were free to turn this small-car capacity toward the Third World markets which are still quite accepting of these vehicles. This is precisely the type of vehicle which is required by the less affluent consumers in the Third World, and the Japanese have had few problems in continuing their export shipments to areas such as Africa, South America and especially the Asia-Pacific belt.

The result of this situation is a unique position which is extremely advantageous to the Japanese. They reap large financial returns by selling high profit cars to the restricted North American and European markets. At the same time they have been able to reallocate the lower profit small car lines to a still growing Third World market portfolio. This growth is not being obtained by natural economic growth in the Third World markets but rather by Japanese displacement of cars formerly sold by European and North American headquartered companies. The Japanese penetration rates in Australia, New Zealand and in portions of Africa are the most striking evidence of this trend.

As a result of this situation the Japanese are generating very large financial resources from the rich but protected markets, and they are establishing a strong market presence in the Third World nations, which will be the growth markets of the future. This has serious strategic implications for other producers who intend to remain global during the next two decades. First of all, Japanese producers are still gaining in gross financial terms from their profitable sales in the North American and European markets. Second of all, the Japanese are obtaining an early and high market share in the Third World nations through the shipment of vehicles which would otherwise have been destined to go to North America and Europe. This is allowing the Japanese to develop an infrastructure of distribution and political favor in the developing markets which they did not have before the trade restraints. In essence, the Japanese do not have to compete with each other in developed markets and they can focus the resources earned from those markets toward development of the markets in which the Japanese formerly had little presence.

A possible additional side effect of this trade restraint extension is that the Japanese have now moved into a higher image position in the North American market and possibly in the European markets. As the

Japanese began to remove the small cheap cars from these markets and move upscale into more luxurious versions, they have increasingly solidified their image in the eyes of North American consumers as providers of a full line of product. Seven years ago it was unheard of to pay high prices for Japanese cars. Today however Japanese producers are having little trouble selling cars in the $10,000-$20,000 range in North America, with prices moving upward in several European market segments also. Although Japanese producers may complain about the effects of trade restraints, the overall situation when considered globally is far from disadvantageous for them.

Additional Japanese Strategic Movements

Japanese producers represent several other threats during the next three to five years. Since the late 1970's the rate of introduction of new Japanese products to the world markets has accelerated tremendously. This results from two factors. First, more Japanese producers have now reached the level of medium sized international producers, where they had been formerly small producers. This gives them considerable market presence in a number of markets, and collectively they are presenting more car types to the world's consumers. In addition, each Japanese producer has accelerated its rate of product introduction, basing these derivatives from technological gains made during the late 1970s. The result, when viewed from the recipient nations, is a proliferation of Japanese product offerings which will be difficult to match on the part of U.S. and European producers.

The most striking example of this is the success Honda has recently had in proliferating its product line. Five years ago Honda had two basic car types, the Civic and the Accord. As of the 1984 model year in North America and in Europe, Honda is producing a utilitarian two seater, a sporty two seater, a Civic model line which contains a sedan, a hatchback, and a small van-like station wagon, an upscale 2+2 Prelude, and an Accord model line with both two-door and four-door versions. In addition, in other markets they are delivering certain truck derivatives. Five years ago Toyo Koygo was basically selling a two-seat rotary sports car, and a small Econobox GLC. Today, Toyo Koygo sells the two-seat XR7, the GLC model line in several configurations, the 626 which might be considered a compact car, and the 929 (Europe only) which can be considered a large European or intermediate sized American car. Toyota, although it was already a full line producer in the 1970s, has proliferated its international product line in a similar fashion. For example, the Econobox Corolla model line is now made in six completely different international configurations and is therefore able to address that many more market segements. Similar proliferation has occured in the larger Toyota products.

Adding to this proliferation of body styles, the recent Japanese forays into turbo-charged engines and sophisticated drive line componentry, will make it extremely difficult for the formerly dominant high volume producers to reconfigure their product operations to meet this onslaught of new product. For example, during the 1970s General Motors in North America was configured to produce five major product lines each in configurations exceeding a million units apiece. Now however, General Motors must disintegrate this high scale operation, and begin to proliferate more cars along the lines of the Pontiac Fiera if they are to meet the many more Japanese products appearing in the North

American market. It is instructive to note that this product proliferation and its attendant pressure on North American producers has occurred despite the quota limitations. In essence, the Japanese are creating entirely new market segments dispite the fact that they are limited on overall product volume.

Similar moves should be expected in the medium and heavy truck area, and in other industrial vehicles. Japanese truck producers have remained largely at home exporting only in limited fashion to Third World markets and the close-by Asia-Pacific belt. Now however, recent moves signal an intention to go head-to-head against the formerly dominant international truck producers. For example, Hino, a truck producer affiliated with Toyota, is clearly making moves into the North American market, and has established joint ventures with European truck producers such as Volvo. These moves presage an intensification of competition moving up away from cars into the heavy vehicle segments. It should be noted that the costs calculated in the attendant financial statements for some of the truck producers are considerably lower than the production costs on comparable U.S. built products.

A Major Strategic Shift

The past three years have marked a fundamental change in Japanese strategic attitudes towards the world. Recent events have now confirmed what will be a major strategic move on the part of the Japanese producers during the next two decades. In a simple sense the Japanese companies were told that they would no longer be able to "target and flood" their way to volume growth. In essence they have been told to either stay at home or to move offshore. Given this option it is clear that most of the Japanese producers fully intend to move production operations offshore.

This strategic shift on the part of the Japanese comes about because of two major factors. First, and most obviously, trade restraints have indicated that Japanese producers can only penetrate offshore markets by adding production capacity there. What is often overlooked is that as the Japanese have become successful as international producers, fundamental economic influences will dictate an offshore strategy. During most of the growth stages of the Japanese industry the Japanese achieved high levels of production output by selling small volumes of cars to more than 100 markets around the world. Under this kind of a situation it was economically feasible to buy raw materials all around the world, ship these materials back to Japan, and then reship this output in the form of finished vehicles to many small market areas. However, as the Japanese became successful in many of these more than 100 countries, they faced a different economic situation.

As Japanese producers gain volume in several small markets in the same region it starts to become uneconomical for them to buy raw materials all around the world and ship them long distances to Japan to be reshipped to the offshore markets. Japanese penetration rates in areas such as southern Asia, Africa and South America are now approaching volumes that would allow high scale operations in local regions. In essence the Japanese are facing an economic incentive which says that they should no longer continue a multi-market export strategy, but rather they should begin over the next 20 years to replicate "Toyota Cities" offshore near their market areas.

It appears that the recent moves of Honda and Nissan are confirming this general trend. Both companies are heavily investigating production sites in North America, Central America and in Europe. They are engaging in new assembly plant production, and in joint ventures which will eventually lead to production sites. In addition, they are identifying component suppliers in these regions which will provide an infrastructure for assembly operations later on. This should not be viewed as a temporary political move to soften the trade restraints. For example, Nissan has borrowed heavily in the international debt markets, in amounts which approach one billion dollars. This amount of international currency exposure in the capital structure would not be warrented only to serve minor movements to mollify trade restraints. In order to support this kind of international capital exposure Nissan will have to make use of its existing and planned offshore operations. For this company one should therefore expect a period of belt-tightening as the international operations are brought up to speed. Honda is moving in many areas around the world, primarily in motorcycle production and in power products production out of its non-automotive divisions.

It is important to notice that these are not window-dressing plant operations, but fundamental local production operations. It is also important to notice that there is a hierarchy to this technology which can eventually lead to the production of automobiles. To oversimplfy, the engine technology which is applicable in the higher-end motorcycles is also applicable to the lower end Honda cars. It should be assumed that Honda intends to gain a local presence in a number of market areas, bring the skill of workers there up towards that required for motor vehicle production, and then to capitalize upon these infrastructures should the motor vehicle market situation warrent it.

Again, these are not minor moves, and cannot be considered actions purely to beat trade restraints. They represent fundamental risks for these two corporations and are clear signals of their international intentions. It is not clear what this means for other Japanese producers, who have tended to be more provincial and have stayed near home. However, moves by Toyota in the direction of General Motors, Lotus, and varieties of other producers of components indicate that even Toyota intends to move offshore over the longer term. Further confirming evidence is the rapid rate of joint venture formation between European and U.S. producers and Japanese auto assemblers and their captive component affiliates. It appears quite clear that the Japanese strategy is to obtain production operations in the markets which represent the growth areas during the 1990s. In addition, it seems reasonably clear, although more speculative, that most Japanese producers will seek to establish production operations in the lucrative developed markets of North America and Europe.

If this is performed successfully, it means several things. First, the Japanese producers will be able to beat most of the current trade restraints, largely because they will be satisfying the political requests for participation in the export market economies. In addition, the Japanese moves into these areas will make the best use of the existing Japanese production methods, and will represent "greenfield" sites, not comparable to the existing North American or European production plants. Such international movements will be expensive for the Japanese, but, as can be seen in the financial statements appended, Japanese producers have considerable capacity to borrow capital for such expansion. Given their newly acquired consumer images and extremely high profits in the trade protected markets, and their increasing unit penetration via small cars in the Third World, it is higly likely that Japanese based producers will be able to generate capital in order to complete much of the apparent international expansion plans.

Although this type of international expansion will be generally beneficial to the receiving market areas, in that it will generate new production and employment there, it will place increasing pressure on the traditional producers in these regions. Perhaps the best example of this kind of displacement can be found in the Australian region. Several years ago Australia attempted to institute strong local content requirements and other provisions to preserve its industry there and to expand it. Although the ensuing results are quite complex, the net effect was that Japanese penetration via acquisition, and import-export arrangements was quite strong and rapid. In essence, the Japanese have managed to supplant a number of existing operations there, by displacing European and American owned factories. And, this has created several new wrinkles in the international trading arena.

For example, cars built in Australia by Japanese owned companies are by the letter of the law in Australia "Australian" cars. How could they be otherwise, with such strong local content requirements? It appears that several of these Japanese companies intend to ship such cars into Europe where the sale of Japanese built cars has been restricted. The dilemma then facing the European nations is how to define a car being received at the port. Is this a Japanese car, or an Australian car, which in some cases actually receives preferential treatment. The United

States is likely to experience a similar dilemma if Japanese owned operations in Mexico and/or Canada develop significantly.

The fundamental situation is that while most of the world's producers retrench and attempt to recover from the second oil shock and subsequent recession, the Japanese have been able to continue an international development strategy. U.S. and European producers are not to be counted out yet, primarily because they have existing production sites in many more places than the Japanese, but it is clear that the global trends towards internationalization in the motor vehicle industry are currently providing strong benefits to the Japanese.

Table 5-1

ISUZU MOTOR COMPANY PERFORMANCE STATISTICS
(Financial amounts in million Yen unless noted.)

	10/78	10/79	10/80	10/81	10/82
Revenue	572385	635422	687713	727410	719002
Operating Profit	26741	26700	13273	20968	14970
Net Income	13434	12643	4954	8510	6038
Operating Income, % Sales	.047	.042	.019	.029	.021
Net Income, % Sales	.023	.020	.007	.012	.008
Depreciation	9844	12989	17133	18042	21145
Net Operating Inflow	23278	25632	22087	26552	27183
Capital Spending	16571	34043	55807	45407	18662
Net Operating Cash Flow	6707	-8411	-33720	-18855	8521
Current Assets	246191	258767	309102	324489	319609
Current Liabilities	251959	270998	313234	347824	315075
Net Working Capital	-5768	-12231	-4132	-23335	4534
Long Term Debt	58203	67874	137010	162454	210401
Equity	78248	86576	87563	92156	94252
Total Long Term Capital	136451	154450	224573	254610	304653
Debt, % Total Capital	.427	.439	.610	.638	.691
Total Employee Cost	56967	61872	68514	71131	74170
No. of Employees	13538	15802	16994	16643	17564
Cost/Employee, ¥ million	4.2	3.9	4.0	4.3	4.2
Exchange rate	215	215	215	215	215
Cost/Employee, $	$19,572	$18,211	$18,752	$19,879	$19,641

Table 5-2

TOYO KOGYO MOTOR COMPANY PERFORMANCE STATISTICS
(Financail amounts in million Yen unless noted.)

	10/78	10/79	10/80	10/81	10/82
Revenue	686344	835153	1031066	1163078	1179684
Operating Profit	7582	26526	34480	32607	38143
Net Income	2635	7335	15740	19913	25385
Operating Income, % Sales	.011	.032	.033	.028	.032
Net Income, % Sales	.004	.009	.015	.017	.022
Depreciation	20174	20643	23784	30536	41250
Net Operating Inflow	22809	27978	39524	50449	66635
Capital Spending	18493	12409	57245	81180	86821
Net Operating Flow	4316	15569	-17721	-30731	-20186
Current Assets	459298	402317	450590	472437	427609
Current Liabilities	365888	325437	395610	428016	398369
Net Working Capital	93410	76880	54980	44421	29240
Long Term Debt	165618	134062	124890	141876	142914
Equity	87726	93005	119489	142425	176054
Total Long Term Captial	253344	227067	244379	284301	318968
Debt % Total Capital	.654	.590	.511	.499	.448
Total Employee Cost	96617	103211	114846	124727	131158
No. of Employees	27827	26809	27283	27474	27513
Cost/Employee/ ¥ Million	3.5	3.8	4.2	4.5	4.8
Exchange Rate	215	215	215	215	215
Cost/Employee, $	$16,149	$17,906	$19,579	$21,115	$22,173

Table 5-3

HONDA MOTOR COMPANY PERFORMANCE STATISTICS
(Financial amounts in million Yen unless noted.)

	2/79	2/80	2/81	2/82	2/83
Revenue	922280	1069442	1344892	1544149	1746919
Operating Profit	29277	50860	45974	46688	53792
Net Income	16003	23674	30137	24254	31320
Operating Income, % Sales	.032	.048	.034	.030	.031
Net Income, % Sales	.017	.022	.022	.016	.018
Depreciation	23792	25452	28527	37833	44291
Net Operating Inflow	39795	49126	58664	62087	75611
Capital Spending	44506		61792	69301	99068
Net Operating Cash Flow	-4711	824	-3128	-7214	-23457
Current Assets	246635	318064	320684	406394	410995
Current Liabilities	237841	307799	320303	386789	399942
Net Working Capital	8794	10265	381	19605	11053
Long Term Debt	84155	72782	70037	120346	141595
Equity	187329	221252	270165	288428	344598
Total Long Term Capital	271484	294034	340202	408774	486193
Debt, % Total Capital	.310	.248	.206	.294	.291
Total Employee Cost	81119	88348	108992	124720	137101
No. of Employees	21334	21220	23362	25488	27429
Cost/Employee, ¥ million	3.8	4.2	4.7	4.9	5.0
Exchange rate	215	215	215	215	215
Cost/Employee, $	$17,685	$19,365	$21,699	$22,759	$23,248

Table 5-4

TOYOTA MOTOR COMPANY PERFORMANCE STATISTICS
(Financial amounts in million Yen unless noted.)

	6/78	6/79	6/80	6/81	6/82
Revenue	2617407	2802469	3310181	3506412	3849544
Operating Profit	153082	158289	233232	140183	230513
Net Income	116286	102058	143568	132727	141589
Operating Income, % Sales	.058	.056	.070	.040	.060
Net Income, % Sales	.044	.036	.043	.038	.037
Depreciation	74762	89686	100742	120522	156297
Net Operating Inflow	191048	191744	244310	253249	297886
Capital Spending	144924	114177	134989	297080	190489
Net Operating Cash Flow	46124	77567	109321	-18831	107397
Current Assets	688423	760157	925943	812075	1093851
Current Liabilities	451428	503471	624536	609653	706686
Net Working Capital	236995	256686	301407	202422	387165
Long Term Debt	0	0	0	0	0
Equity	750689	834458	990021	1098394	1313583
Total Long Term Capital	750689	834458	990021	1098394	1313583
Debt, % Total Capital	.000	.000	.000	.000	.000
Total Employee Cost	170060	186348	210113	231255	251646
No. of Employees	45203	45233	47064	48757	51034
Cost/Employee, ¥ million	3.8	4.1	4.5	4.7	4.9
Exchange rate	215	215	215	215	215
Cost/Employee, $	$17,498	$19,162	$20,765	$22,061	$22,935

Table 5-5

NISSAN MOTOR COMPANY PERFORMANCE STATISTICS
(Financial amounts in million Yen unless noted.)

	3/79	3/80	3/81	3/82	3/83
Revenue	2306685	2738868	3016190	3198724	3187722
Operating Profit	88822	153585	124458	134340	102124
Net Income	65466	87457	85911	86068	95477
Operating Income, % Sales	.039	.056	.041	.042	.032
Net Income, % Sales	.028	.032	.028	.027	.030
Depreciation	71212	84627	88336	109238	125987
Net Operating Inflow	136678	172084	174247	195306	221464
Capital Spending	115365	116831	148494	196639	204188
Net Operating Cash Flow	21313	55253	25753	-1333	17276
Current Assets	768486	907136	848366	987024	930590
Current Liabilities	714595	805046	776616	865838	810103
Net Working Capital	53891	102090	71750	121186	120487
Long Term Debt	86683	113467	99367	179895	276690
Equity	615153	688032	795166	937068	1030941
Total Long Term Capital	701836	801499	894533	1116963	1307631
Debt, % Total Capital	.124	.142	.111	.161	.212
Total Employee Cost	220238	241902	271870	295205	309556
No. of Employees	56068	55367	56030	57560	58960
Cost/Employee, ¥ million	3.9	4.4	4.9	5.1	5.3
Exchange rate	215	215	215	215	215
Cost/Employee, $	$18,270	$20,321	$22,568	$23,854	$24,420

Table 5-6

DAIHATSU MOTOR COMPANY PERFORMANCE STATISTICS
(Financial amounts in million Yen unless noted.)

	6/78	6/79	6/80	6/81	6/82
Revenue	257489	298711	331357	378410	400687
Operating Profit	4801	7954	4340	4411	3048
Net Income	4437	6459	4563	5260	5172
Operating Income, % sales	.019	.027	.013	.012	.008
Net Income, % Sales	.017	.022	.014	.014	.013
Depreciation	10575	9544	9516	13801	15319
Net Operating Inflow	15012	16003	14079	19061	20491
Capital Spending	12090	5112	21008	32087	19873
Net Operating Cash Flow	2922	10891	-6929	-13026	618
Current Assets	73579	78424	80282	99402	136886
Current Liabilities	68488	65965	80109	107338	149957
Net Working Capital	5091	12459	173	-7936	-13071
Long Term Debt	9015	6633	4349	12903	13036
Equity	52486	57073	59761	63141	69585
Total Long Term Capital	61501	63706	64110	76044	82621
Debt, % Total Capital	.147	.104	.068	.170	.158
Total Employee Cost	32800	36092	41162	44442	51246
No. of Employees	8330	8472	9105	9955	10773
Cost/Employee, ¥ million	3.9	4.3	4.5	4.5	4.8
Exchange rate	215	215	215	215	215
Cost/Employee, $	$18,314	$19,815	$21,027	$20,764	$22,125

DATA ON THE EUROPEAN COMPONENT SUPPLIER INDUSTRY

Introduction

Preliminary analysis in the component supplier area quickly revealed that comprehensive analysis would be nearly impossible. Owing to the fragmentation of the business, the fact that many suppliers are privately held, and the costly translation process required to gather even small amounts of data, it was determined that contract resources would be better devoted to more productive task areas.

Overall assessment of the European components industry is integrated in this document in the European overview section. This section of the document only appends data gathered during performance of this task.

A few comments on the general availability of European supplier data are in order. When research on this task began it was evident that a great many reports had been issued in Europe on the supplier industry, generally falling into two categories. The first category included extensive writing in European Commission government studies, but it was quickly discerned that most of these studies all came from the same general data sources, being highly aggregated government economic statistics largely concerning gross production value and international trade. These data reside primarily in statistical bureaus in each of the nations, and in the centralized statistical houses of the European Community. While these data are vital, they do not reveal considerable detail on the structure of the European supplier industry. Most data are economic aggregates reported in SIC code fashion, in large categories such as "Body Parts". Many of the data reported are confusing since they combine various industries like the bicycle industry in shipments of components for motor vehicles. The fundamental conclusions which can be gleaned from such data are presented elsewhere in this document.

The second class of reporting on the European supplier industry stems largely from the major European consulting houses. These tend to be very expensive reports, ranging upward from $1,000 apiece, and they cover only single topic areas, generally focussing on one aspect of a highly localized supplier region. Several of the broader consulting reports, it turns out, were derived from the identical macroeconomic data used in government supplier industry reports. Therefore, they reveal little beyond the macro-assessments contained elsewhere in this document.

A variety of recent academic programs have been initiated with regard to the European supplier industry, but most of these had not produced results during the performance period of this contract, and were therefore unavailable as data sources, or in other instances, they contained highly propriatary data, not in usable form.

In all instances most reports on the European suppliers were not written in the English language, adding the extra deficit of translation costs to the basic data problems.

The following data represent the best information which could be distilled from information available to this project during the performance period of the contract. As will be noted even upon casual observations, there are extreme discrepancies in reporting definitions. Therefore these data are intended only to provide a sketch of the broad and fragmented European component industry.

Subsequent research, in a derivative contract, will focus more heavily upon disaggregation procedures applied to the macroeconomic survey data. Given considerable recasting of accounts, it is expected that it may be possible to bring into line macroeconomic reporting and the financial statement data, currently available.

It is noteworthy that the European supplier industry is undergoing tremendous amounts of change as the European wide industry seeks to restructure itself, and as the European automotive producers respond to international challenges in their export markets. It is expected that component suppliers in Europe will face a significant degree of retrenchment in some areas, primarily in Britain, and that in other areas there should be a rationalization process which will integrate the production flow of suppliers more completely with the output demands of automotive assemblers. In some cases this restructuring presents new opportunities to suppliers. For example, as American auto companies face record international challenges, their attempts to outsource for small car componentry may bring new business to existing suppliers of these components in the European base. In other cases, the picture for European suppliers is much more bleak. For example, in Britain the substantial collapse of the assembler sector during the 1970s is still producing ripple effects throughout the supplier area. Even in the case of British suppliers who have managed to survive volume declines, British producers will be demanding new standards of quality and cost effectiveness from their British suppliers, or they will begin to outsource to more international competitive component suppliers.

Table 6.1

STRUCTURE OF EUROPEAN COMPONENTS INDUSTRY

	Number of Firms	Number of Employees
Belgium	57	14,000
Denmark	19	2,000
France	360	140,000
Italy	56	60,000
Netherlands	80	6,000
United Kingdom	780	230,000
West Germany	398	220,000
Total	1,750	672,000

Source: CLEPA

Table 6.2

TRADE BALANCES AND SHARES IN AUTOMOBILES

($b)

	Automobiles 1973	Automobiles 1980	Components 1973	Components 1980	Engines 1973	Engines 1980
EEC						
Exports	5.8	12.3	2.6	9.2	1.2	4.2
Imports	0.8	6.0	0.5	2.0	0.3	1.3
Balance	5.0	6.3	2.1	7.2	0.9	2.9
Japan						
Exports	2.6	16.1	0.3	2.2	0.3	1.8
Imports	0.2	0.5	-	0.1	-	0.1
Balance	2.4	15.6	0.3	2.1	0.3	1.7
Shares of intra area trade (%)*						
N. America	5.5	4.9	31.5	31.2	29.8	29.8
W. Europe	58.0	34.8	55.7	51.6	52.1	46.7
Japan	34.6	60.0	9.8	16.4	17.3	23.2

* OECD exports less intra North American and Western European trade.

SOURCE: OECD, SPRU

Table 6.3

EEC TRADE IN AUTOMOTIVE COMPONENTS, 1979

(US $ million)

	Total Trade						Intra-EEC Trade						Extra-EEC Trade					
	Total		Imports		Exports		Total		Imports		Exports		Total		Imports		Exports	
EEC Countries	34,524	(100)	14,161	(100)	20,363	(100)	21,826	(63)	11,686	(83)	10,140	(30)	12,698	(37)	2,475	(17)	10,223	(50)
of which:																		
Belgium/Luxembourg	4,919	(100)	3,930	(100)	989	(100)	4,320	(88)	3,530	(90)	790	(80)	599	(12)	400	(10)	199	(20)
Denmark	461	(100)	291	(100)	170	(100)	270	(59)	204	(70)	66	(39)	191	(41)	87	(30)	104	(61)
France	6,759	(100)	2,527	(100)	4,232	(100)	4,364	(65)	2,058	(81)	2,306	(54)	2,395	(35)	469	(19)	1,926	(46)
Ireland	149	(100)	108	(100)	41	(100)	120	(81)	89	(82)	31	(76)	29	(19)	19	(18)	10	(24)
Italy	3,436	(100)	1,276	(100)	2,160	(100)	2,193	(64)	1,125	(88)	1,068	(49)	1,243	(36)	151	(12)	1,092	(51)
Netherlands	1,587	(100)	1,124	(100)	463	(100)	1,241	(78)	914	(81)	327	(71)	346	(22)	210	(19)	136	(29)
West Germany	11,015	(100)	2,703	(100)	8,312	(100)	5,935	(54)	2,069	(77)	3,866	(47)	5,080	(46)	634	(23)	4,446	(53)
United Kingdom	6,198	(100)	2,202	(100)	3,996	(100)	3,383	(55)	1,697	(77)	1,686	(42)	2,815	(45)	505	(23)	2,310	(58)

Source: EUROSTAT, EIU

Table 6.4

COMPONENTS SUPPLY FOR EUROPEAN AUTO PRODUCERS IN THE MID-1970's

	Ignition System	Electronics	Radiators	Mufflers	Lights & Equip.	Windscreen & Wipers	Brakes	Steering Gear	X-mission	Suspension	Bumpers	Clutch
Fiat	C	C	I + E	C	C	E + C	I + E	I + E	I + E	I + E	C	E
BL	E	E	I + E	I + C	E	E	I + E	I + E	I + E	E	E	I + E
FORD (UK)	I + E	I + E	I + E	E	E	E	E	E	E	C + E	E	E
Vauxhall	E	E	I + E	I + E	E	E	E	E	E	E	I	E
BMW	E	E	E	E	E	E	I + E	I + E	I + E	I + E	I + E	E
Daimler	E	E	E	I + E	E	E	E	I + E	I + E	E	I + E	I + E
Opel	E	E	E	I + E	NA	E	I + E	I + E	I + E	I + E	I	I + E
VW	E	E	I	I	E	E	I + E	I + E	I	I + E	I	I + E
Peugeot	E	E	C	C	E	E	I + E	I	I + E	I	I + C	E
Renault	E	E	C	I + E	E	E	I + E	E	I + E	E	I	E

I = Internally produced
E = Externally produced
C = Produced by controlled company

SOURCE: NOMISMA, Successo, Dec. 1976

Table 6.5

EEC and Japan:

TREND IN OUTPUT OF AUTOMOTIVE COMPONENTS, 1975-1979

(US $ million)

	1975	1976	1977	1978	1979	Compound annual growth rate 1975-1979
Belgium	427	516	646	710	878	
per cent change on previous year		+21	+25	+10	+24	20
France	4,647	5,584	5,755	6,966	8,703	
per cent change on previous year		+20	+ 3	+21	+25	17
Italy	3,100	2,900	3,100	4,000	n.a.	
per cent change on previous year		- 6	+ 7	+29		9
United Kingdom	3,964	3,977	4,514	5,782	6,771	
per cent change on previous year		-	+14	+28	+17	14
West Germany	7,940	9,846	11,853	14,196	17,932	
per cent change on previous year		+24	+20	+20	+26	23
Japan	14,319	17,295	21,247	31,000	33,500	
per cent change on previous year		+21	+23	+46	+ 8	24
of which:						
JAPIA Members	8,230	9,956	12,417	17,812	19,400	
per cent change on previous year		+21	+25	+43	+ 9	24

Source: Fabrimétal, FIEV, STISI, FIEE, Elektrische Lampen Fachverband, Business Monitor, VDA, MITI and EIU estimates

Table 6.6

RELATIVE IMPORTANCE OF MAIN PRODUCT GROUPINGS, 1975 and 1979

(per cent of sales)

	France		United Kingdom		West Germany		Japan	
	1975	1979	1975	1979	1975	1979	1975/75	1974/75
Electrical Equipment	25	23	15	15	19	17	16	18
Engine equipment	13	12	10	10	21	21	15	15
Chassis equipment	44	47	50	51	39	37		
Bodywork equipment	18	18	6	6	14	13	69	67
Not classified	-	-	19	18	7	12	-	-
Total	100	100	100	100	100	100	100	100

Source: EIU

Table 6.7

THE OPTIONS FOR LEAD-FREE FUEL AND COMPONENT CHANGES

Option	0.4% lead (current situation)	0.4% lead plus lead traps	0.15% lead (as in West Germany now)	Four star + lead free petrol for all new cars
Date of introduction	-	1985	1989	1985
Overall energy penalty %	-	zero	2.5	5.0
Cost to motor industry	zero	£414M	zero	£72M
Cost to oil industry	zero	zero	£844M	£828M
Cost to motorist per year	zero	£5- £9	£7- £8	£17- £18
Lead emission per year eventually (tons)	7500	4150	2850	zero
Savings in lead emissioning 1998 (tons)	none	37,500	75,800	75,000

Table 6.8

COMPONENT PRODUCTION BY MAJOR CAR MANUFACTURERS" GROUPS, 1982

COMPONENT	FIAT	GENERAL MOTORS	FORD	PSA	BRITISH LEYLAND	ALFA ROMEO
ELECTRIC EQUIPMENT						
spark plugs	0	0	0			0
alternators	0	0	Ø		0	
batteries	0	Ø	//		//	
starter	0	0	Ø		0	
lighting equipment	0					
horns	0	Ø	Ø			
small electric motors	0	0	Ø	0		
instruments	0	0	Ø			
ignition system	0	0	0			
HEATING AND VENTILATION						
radiators		0	0		0	
thermostats	0	0				
water pumps	0	0				0
heater units	0	0	Ø		0	
air conditioning	0	0	Ø		0	
anti-freeze	0	//	//		//	
ENGINE FUEL FEED						
fuel pumps	0	0			0	
carburettors	0	0	0		0	
filters	0	0	Ø			
petrol engine injection	+	Ø	Ø			+
diesel engine injection	0	Ø				
MOTOR AND LUBRICATION						
vibration-dampers	0					
pistons - rings	x	x	x	x		x
valves	x	Ø	x			
pulleys - belts		Ø	//			
oil pumps	0	Ø				0
lubricant oils	0	//	//			
silencers	0	Ø		0	0	
TRANSMISSION/BRAKES						
clutches		0				
gears - transmissions	x	0	0	x	x	0
suspensions		Ø	0	x	0	0
steering-gears boxes	x	0	0	x	0	x
brake cylinders	0	0	Ø			
brake drums and disks	x	0	0	x	0	x

Table 6.8 (con't)

COMPONENT	FIAT	GENERAL MOTORS	FORD	PSA	BRITISH LEYLAND	ALFA ROMEO
BODY PARTS						
locks	0	0				
window regulators	0	Ø		0		
tanks	x	x	x	0	0	x
seats	0	Ø		0	0	x
wheels	0	0		0		
interior plastic parts	0	Ø		0		
rubber profiles	0		Ø			
windscreen wiper blades	//		//			
safety belts	//	Ø		0		
wheels	0		Ø			
paints	0		Ø			
exterior plastic parts	0	Ø	0	0		

LEGEND:

0 = production by component manufacturer
x = production by final producer
Ø = production by component manufacturer in the U.S., but not in Europe
// = marketing only
+ = presently being developed

SOURCE: FIAT Componenti, NOMISMA

Table 6.9

WEST GERMANY:
MAJOR COMPANIES PRODUCING AUTOMOTIVE COMPONENTS

Company	Number of Employees (1979)	Sales 1979 (US $ million)	Dependence on Automotive Business (% of sales)	Automotive Components	Other Products and Activities	Miscellaneous
Bosch (Group)	120,487	5,894	62.6	.electrical and electronic engine equipment .antiskid systems .lighting equipment .horns, relays, switches, magnetos .wiper systems, DC motors, AC compressors .injection equipment for diesel and petrol engines; brake equipment for commercial vehicles .hydraulics, pneumatics .workshop equipment and test stands .semi-conductors .electronic control units	synthetic materials metal products powder paints household appliances (including home electronic, heating equipment and furniture) electro communications systems television cameras studio equipment industrial equipment power tools generators film and photo equipment	Ownership: 90% Robert Bosch Stiftung (non-profit making foundation)
Zahnrad Fabrik ZF (Domestic Group)	19,213	1,108	65.2 (passenger cars 48.6)	.all gears 53.6% (of which cars 5.5%, commercial vehicles 31.8%) .steering 22.4% .axles 9.6% .pumps, rotors and differentials 8.3% .electric couplings 1.2% .individual parts 5.0%	Of turnover: tractors 13.0% construction equipment 11.0% machine tools 2.0% marine craft 1.0% elevating trucks 1.6% aircraft 0.9% other 1.4%	Ownership: Zeppelin Stiftung, Friedrichshafen 88.8% Hella, Countess von Brandstein-Zeppelin 7.2% Ges. Bürgerlichen Rechts, Esslingen Maag Zahnräder und Maschinen AG, Zurich 4.0%
Fichtel & Sachs AG	10,927	527	70	.engines .clutches	foundry environmental technology	Ownership: Sachs family 50.01% Kommerzbank 25.01% Salzgitter 24.08%

SOURCE: Company reports, EIU

Table 6.9 (con't)

Company	Number of Employees (1979)	Sales 1979 (US $ million)	Dependence on Automotive Business (% of sales)	Automotive Components	Other Products and Activities	Miscellaneous
Varta Group	13,199	753	47.8	.starter batteries	industrial batteries consumer batteries plastics	
VDO (Domestic Group)	9,673	439		.meters and gauges	meters and gauges for marine, aerospace and industrial applications watches and clocks	
Teves	11,600	719	n.a.	.brake actuation systems .disc brakes .friction material .bumpers .hydraulics .pressed parts	hydraulic equipment for aerospace and industrial applications	Ownership: 100% ITT
Knorr Bremse	7,095	431	n.a.	.brakes .brake cylinders	compressors	
FAG (Domestic Group)	22,798	909	n.a.	.rolling bearings and ball bearings for automotive industrial, and aerospace applications .hydraulic brake parts	measuring instruments precision tools accessories for textile machinery sintered parts die-castings grinding wheels conveying systems industrial sewing machines	Ownership: Schafer family
SWF	6,000	268	n.a.	.fractional HP electric motors .windshield/rear window wiper system .electromechanical and electronic components .lights .in-tank fuel pumps .central column switch systems .fuel injection components		Ownership: 100% ITT

Table 6.9 (con't)

Company	Number of Employees (1979)	Sales 1979 (US $ million)	Dependence on Automotive Business (% of sales)	Automotive Components	Other Products and Activities	Miscellaneous
Mahle (Group)	10,962	548	n.a.	.pistons and accessories .cylinders and engine blocks .filters	die castings special flooring fixtures and air conditioning compressors and compressed air equipment	Ownership: Mahle Stiftung
Boge	3,299	175	n.a.	.shock absorbers .flectors .silent blocks		
Wabaco Fahrzeugbremsen GmbH	3,101	198	n.a.	.brakes		Ownership: Transportation Product Group (Pittsburgh, USA) a group of the American Standard Inc. (USA)
Goetze	6,000	242	n.a.	.piston rings .seals and gaskets		Ownership: family concern
SKF	10,459	671	38	.rolling bearings	steel products cutting tools measuring equipment spring retaining rings	Ownership: Aktiebolag SKF 99.9%
Elring	1,725	87	n.a.	.seals and gaskets	rubber equipment insulating materials	

Table 6.10

West Germany: Trends in Employment of Selected Companies, 1975-1980

(number employed)

	1975	1976	1977	1978	1979	1980	Year Ending
Bosch (Group)	105,553	105,827	110,459	117,754	120,487	n.a.	31 December
ZF (Domestic Group)	16,644	16,938	17,399	18,216	19,213	n.a.	31 December
Fichtel & Sachs	10,749	10,911	11,174	11,198	10,927	n.a.	31 December
Varta (Domestic Group)	n.a.	n.a.	n.a.	7,414	7,389	n.a.	31 December
Knorr Bremse	7,370	7,260	7,209	7,223	7,095	n.a.	31 December
VDO	8,495	8,690	8,434	8,475	9,673	n.a.	31 December
FAG (Domestic Group)	25,863	24,342	23,584	23,512	22,798	n.a.	31 December
Boge	n.a.	n.a.	n.a.	3,227	3,299	n.a.	31 December
Mahle (Group)	9,729	9,772	10,259	10,519	10,962	n.a.	31 December
of which: Mahle	(6,405)	(6,455)	(6,739)	(7,067)	(7,414)		
Elring	1,660	1,744	1,727	1,701	1,725	n.a.	31 December
SKF	13,002	11,947	11,358	10,985	10,459	n.a.	31 December
Wabco	n.a.	n.a.	n.a.	2,985	3,101	n.a.	31 December
Goetze	6,470	6,160	5,840	6,040	6,000	n.a.	31 December
Total Sample	205,535	203,591	207,443	215,623			
percent change over previous year		- 0.9	+ 1.9	+ 3.9			
				229,249	233,128		
					+ 1.7		

Source: EIU, Company Reports

Table 6.11

FRANCE

OUTPUT OF AUTOMOTIVE COMPONENTS BY PRODUCT GROUPING, 1975-1979

(FF million)

	1975	1976	1977	1978	1979
Total Components	15,102	19,811	21,932	24,585	28,055
of which:					
Electricial Equipment	3,690	4,730	5,230	5,700	6,559
of which:					
Distribution, coils, magnetos and other complete ignition equipment	286	364	433	456	557
Alternators, generators and their regulation equipment	429	540	602	652	738
Electric motor apparatus and parts	255	319	383	416	n.a.
Spark plugs and heater plugs	143	175	204	226	250
Starters and other complete starting equipment	365	474	490	564	609
Head lights / Other lighting equipment	945	1,279	1,356	1,601	998
Electric lamp bulbs	169	216	239	273	327
Batteries	631	746	850	888	1,125
Other electrical equipment nes	467	617	673	624	1,080
Engine Equipment	1,989	2,568	2,650	2,885	3,233
of which:					
Cylinder blocks, casings, cylinder heads, cylinder liners, connecting rods, pistons, valves, piston rings, camshafts for petrol engines	610	821	810	835	765
Cylinder blocks, casings, cylinder heads, cylinder liners, connecting rolds, pistons, valves, piston rings, camshafts for diesel engines					129
Carburetors, fuel pumps and components	286	383	408	433	503
Filters and cleaners	300	360	430	452	545
Injectors and fuel injection pumps for diesel engines	308	367	462	565	681
Other engine equipment nes	485	637	540	600	610

Source: EIU, Company reports

Table 6.12

FRENCH COMPONENT PRODUCTION (FF 000's)

	Original Equipment	Replacement Captive Channels	Replacement Independent Channels	Direct Export	Total	%	Imports	%	French Market	%
Electric Equipment	3,997,007	1,454,511	1,595,971	2,432,633	9,480,122	32	1,869,334	18	8,916,823	28
Engine Equipment	1,343,867	282,001	274,616	532,255	2,432,739	8	3,026,151	29	4,926,635	15
Chassis Equipment	6,399,602	1,134,818	1,152,959	4,407,030	13,094,409	44	2,909,461	28	11,596,840	36
Body Work Equipment	3,495,593	195,899	439,067	438,492	4,569,051	16	2,671,552	25	6,802,111	21
	15,236,069	3,067,229	3,462,613	7,810,410	29,576,321	100	10,476,498	100	32,242,409	100

Table 6.13

FRANCE

MAJOR COMPANIES PRODUCING AUTOMOTIVE COMPONENTS

Company	Number of Employees (1979)	Sales 1979 (US $ million)	Dependence on Automotive Business (% of sales)	Automotive Components	Other Products and Activities	Miscellaneous
Valeo (Group)	30,900	1,600 (1980)	81.4	heating and cooling equipment (39.6 per cent of sales in 1980) electrical equipment (41.8 per cent of sales in 1980)	industrial equipment building equipment household equipment	Main shareholders: .public (35.1%) .institutional investors (32.4%) .staff (4.9%) .IDI (3.1%) .UAP group (6.5%) .Suez group (8.5%) .Turner and Newall (UK) (3.4%
of which:						
Valeo	9,441	450	85	heating and cooling equipment	industrial equipment	
Société pour l'Equipement de Vehicules (SEV) (group)	14,918	648	83	lighting equipment electric motor apparatus ignition equipment	household equipment	Main shareholders: .Valeo group (69.86%) of which: .Valeo (0.85%) .Société Financière d'Equipements Automobiles (69.01%) .Renault (0.62%) .Peugeot (0.31%)
of which:						
Paris-Rhône	4,243	172	100	starters, generators, alternators	-	SEV's shareholding: 99.9%
Equipements Automobiles Marchels	4,142	169	100	electric motors, windscreen wipers, headlamps, coils, ignition		SEV's shareholding: 99.9%
Cibie Projecteurs	2,190	162	100	headlamps	-	SEV's shareholding:(99.9%)
SA des Usines Chausson	13,327	873	n.a.	bodies and body parts vehicle assembly (83.4 per cent of sales) Heating and cooling systems (16.6 per cent of sales including other products)	cooling systems for industrial and aviation use	Main shareholders: .Renault (35.12%) .Peugeot (35.12%) .Valeo (10.00%)
Francaise de Mécanique	4,203	528	100	engines and engines parts (crankshaft castings, cylinder liner castings)	-	Main shareholders: .Renault (50.0%) .Peugeot (50.0%)

Source: Company reports, EIU

Table 6.13 (con't)

Company	Number of Employees (1979)	Sales 1979 (US $ million)	Dependence on Automotive Business (% of sales)	Automotive Components	Other Products and Activities	Miscellaneous
General Motors France	3,178	478	39.1	alternators, starters, igniters, spark plugs, coils, fuel pumps, power brakes and other braking equipment, clutches, radiator caps, heating systems, batteries	import and distribution of General Motors vehicles, and household and industrial products	Subsidiary of General Motors Corporation
DBA	7,576 (1979/80)	468 (1979/80)	89.6 (1979/80 at group level)	breaking, steering and transmission equipment, cables and windscreen washers	airplane and aviation equipment	Main shareholder: .Bendix International Finance Corporation (USA) (92.50%)
Cycles Peugeot	6,700	398	30	exhaust systems, steering columns, seats, seat parts	bicycles and mopeds, other	Main shareholder: .Peugeot (67.4%)
Ford France (Bordeaux factory)	3,800 (1980)	328	100	automatic transmissions, front driving axles	-	Owned by Ford-France, a subsidiary of Ford Motor Company
Chausson-Carrosserie	2,927	312	100	stamping; bodies and body parts; vehicle assembly	-	Fully owned (99.9%) by Renault
Société Mécanique Automobile de l'Est	3,782	279	100	gear-boxes and engines		Fully owned (100%) by Peugeot
Luchaire	5,921	249	50 (estimate)	chassis equipment; exhaust systems, transmission joints and shafts, sheet metal and machined parts; plastic and rubber parts	light armament building materials, public health equipment and turn-key projects	
Ducellier & Cie	6,963 (1979/80)	235 (1979/80)	100	electrical and electronic equipment	-	Main shareholders: .Lucas (UK) (50.0%) .Valeo (48.0%)
Aciers et Outillage Peugeot	4,862	227	68.9	sectional automotive parts, bumpers, wheel trims; radiator grills; safety belts; electric motors	hand and power tools; reconditioning of petrol and diesel engines	Main shareholder: .Peugeot (74.6%)
Précision Mécanique Labinal (group)	6,549	218	58.5	cables and wiring harnesses, filter, fuel pumps, overrun brakes for heavy vehicles	aerospace elctronic equipment, industrial electric equipment, mechanical handing equipment	

Table 6.13 (con't)

Company	Number Employees (1979)	Sales 1979 (US $ million)	Dependence on Automotive Business (% of sales)	Automotive Components	Other Products and Activities	Miscellaneous
Jaeger	4,959	205	69 (group level)	instrument panels and meters	instrument panels and meters for aviation; clocks; industrial products	Main shareholders: .Plafinco (Matra-VDO) (53.9%) .Worms group (3.6%) .Bayard group (1.0%)
General Motors Strasbourg	2,833	181	100	automatic transmissions, torque converters, carburettors	-	Controlled by General Motors France
Neiman (Group)	5,500 (rounded)	173	80 (estimate)	anti-theft devices; sound signalling equipment; locks; windscreen wipers; fuel tank caps	industrial locking; sound signalling equipment; motors	Controlled by Paribas group
Société Industrielle Bertrand Faure	3,539	148	100	seats and seat parts, for agricultural tractors	-	Main shareholder: .Bertrand Faure-Epeda (98.18%)
Glaenzer Spicer	2,066	142	94	transmission joints	transmission equipment for rollerstock and industrial applications	Fully owned by Uni-Cardan (99.8%) of the GKN group (UK)
Paulstra	4,052	131	n.a.	rubber and metal parts for suspension, couplings, joints and seats; various rubber parts and plastic parts	rubber parts and plastic parts for industrial use	Shareholders: .Hutchinson-Mapa (95.0%) .Petroplastique (5.0%)
Société de Signalisations Automobiles (SEIMA)	4,221	128	100	headlamps and other lamps switches; anti-theft devices; lighters; flashers; horns, other electrical equipment	-	-
Société de Transmissions Automatiques	1,433	112	100	automatic transmissions; tapered torques; rear axles	-	Shareholders: .Renault (75.0%) .Peugeot (25.0%)
Wabco Westinghouse	1,627	95	n.a.	braking equipment for heavy vehicles	braking equipment for rolling stock	Controlled by American Standard
Solex (Group)	3,067	93	86.6	carburettors	armaments aerospace equipment	Main shareholder: .Matra (73%)

Company	Number Employees (1979)	Sales 1979 (US $ million)	Dependence on Automotive Business (% of sales)	Automotive Components	Other Products and Activities	Miscellaneous
Société Quillery	1,544	72	100	steering wheels and automotive plastic parts	-	Main shareholder: .Peugeot (83.5%)
Floquet Monopole	1,433 (1979/80)	58 (1979/80)	100	pistons, cylinders, cylinder liners, piston rings, valves, joints and other engine equipment	-	Main shareholder: .Dana Corporation (USA) (98.0%)

Table 6-14

COMPONENT SUPPLIERS IN FRENCH AUTO INDUSTRY

COMPANY OR GROUP	PRODUCTS
A.A. GRESBERG	Embrayage/Transmission/Direction
Accus A E V	Batterie/Accus
Accus A M E	Batterie/Accus
ABEX PAGID EQUIPEMENT	Embrayage/Transmission/Freinage
AE FRANCE	Pièces Moteur Ess/Diesel
Alfred TEVES	Freinage
ALLARD	Sièges
JB ALLINQUANT	Suspension
AMCA	Ceintures
AMORTEX (CRTM)	Suspension
AMORTISSEUR DE CARBON	Suspension
AMPLIVERSAL	Cablage, Relais
ARBEL Industrie	Pare-chocs
ADRENNAISE d'Essieux	Suspension
AUTEROCHE	Eclairage
AUTOCLEM	Transmission
AUTOCOUSSIN	Siège, carcasses complètes
AUTOMOTIVE PRODUCTS	Régulation/Injection, ess.
AP PARTS	Pièces moteurs, ess Diesel Freinage, direct climatisation
AVRI	Lave glace
BABY RELAX	Sièges
BAROCLEM	Batteries/Accus
B.B.A. AUTOMOTIVE	Embrayage/Transmission
BEHR France	Climat/Eq moteur
BELLANGER	Echappement
BERU	Régulation Allumage
BOGE	Suspension
BOSAL	Echappement
Robert BOSCH	Equip. Elect/Filtres
Sigma Diesel	Injection diesel
BRETILLE	Pièces moteurs ess/diesel
BRITAX GECO	Système de retenue
BROIS et Cie	Régulation moteur essence
SU BUTEC	Régulation moteur essence
CARRIER KHEOPS	Eclairage
CARTIER	Equipements electriques
VIGNAL	Eclairage
CBS	Machoirs freinages
CIE E A C	Batteries/filtres
SOPARIS	Régul. moteur/filtres
TECAFILTRES	Filtres
S I F	Filtres
Cie F E C	Batteries
C.F.A.E.	Batteries
TUDOR	Filtres

Table 6-14 (con't)

COMPANY OR GROUP	PRODUCT
C G I P	
SECURAIGLON	Ceintures Sec.
RESSORTS INDUSTRIE	Suspensions
PAUMELLERIE ELECT	Charnières
SAFIR	Suspension
HOLOPHANE	Eclairage
MAVILOR	Pièces Moteur Ess/Diesel
CHAMPION	Régulation Allumage
CHARGROS	Radiateurs
CHARDON	Sièges/carcasse
CHAUSSON	Radiateur
CHEVALIER	Suspension/sièges
CHLORIDE FRANCE	Accus/Batterie
CHOLET	Ceintures
Cie INDUSTRIELLE de l'AISNE	Echappement
C I M	Sièges
CIPA	Retroviseurs
CIVA	Pièces moteur Ess/Diesel
CLAES JAHANSON	Direction
CLEMENT ACCUS	Accus/Batterie
COFEA	Eclairage
NORMA	Eclairage
SULLY	Eclairage
COFFI	Pièces Moteur ess/Diesel/filtres
PUROLATOR	Filtres
CO Franco Suédoise Outillage	Ceintures
COLAERT	Suspensions
COMELA	Eq Moteur/Chassis
COMPIN	Sièges
Le CONTROLOGRAPH RBM	Instrument de bord
CORDS	Pièces moteurs ess/diesel
LE COY	Pièces moteur
COUSIN	Sièges, ceintures serrures
CURIE et Cie	Alternateur/Demarreurs
CURTY	Joints
Ste Normande Paul DAHL	Freinage
DAMPERS	Transmissions Injection/Filtres
DARY	Accus/Batteries
DAUPHINOISE-THOMSON	Refroidissement/Climatisation
D B A	Freinage/Demarreur/Direction
STOP	Freinage
F A S	Freinage
F E G	Freinage
DELTA ELECTRONICA	Antivols
DEVIL	Echappements
DIFFUSION FABRIC'AUTO	Ceintures Sécurité
DON	Embrayage/Transmission/frein
DONALDSON	Transmission
DRAFTEX	Pare-chocs
DUBOIS et Cie	Transmission/Climatisation
DUCELLIER	Equipements electriques
DUNLOP	Sièges

Table 6-14 (con't)

COMPANY OR GROUP	PRODUCT
ECRIM	Carrosserie
ELECTRIFIL	Cablage, relais
ELECT METAUX	Accus/batterie
ELECTROMECANICA	Antivols
ELECTRONIT	Alternateurs/demarreur
ELES FRANCE	Freinage
EMBOUTIL	Carrosserie
EMEF	Pompes à eau
EMILTONNE	Moteurs carrosseries
ERMETO	Cablage, relais
EVERS	Freinage
EURO FABRIC'AUTO	Ceintures
EUROPE EQUIPEMENT	Direction
EUROPEENNE DE CARBURATION	Carburation/injection
EYQUEM	Regulation Allemagne
FABRIS	Equipement moteur/suspension
FARNIER et PENIN	Carrosserie
BERTRAND FAURE	Sièges
FEDERAL MOGUL (SFCM)	Pièces moteurs coussinets
FEMSA	Equipement electrique
FERLOR	Carrosserie
FIAAM	Filtres
FIAMM	Signalisation acoustique
FIDAY	Suspension
FILTREX	Filtres
FLOQUET MONOPOLE	Pièces meteurs
INDUSTRIE PRECISION MARTI	Pièces moteurs
FLEETGAURD	Filtres
FOGEPE	Embrayage/Trans/suspension/Direct.
REV	Freinage
Sté APPLICATION MECANIQUE	Freinage
FONDERIE DE GENTILLY	Equipements chassis
FRAM	Filtres
FRANCAISE DE MECANIQUE	Pièces moteur
FRANCE TAMBOUR	Freinage
FREIX	Embrayage/Transmissions/freins
FRENDO	Embrayage/transmissions/freins
FRIGETTE FRANCE	Suspension/freinage
GABRIEL	Régulation préchauffage
GARRETT FRANCE	Compresseur volumetrique turocompresseur
GAUTHIER et fils	Echappement
GAYTON H	Echappement
GENERAL MOTORS FRANCE	Equipements electriques, moteurs, chassis
GHESTEM	Eclairage/climatisation
GHIBAUDI FRANCE	Alternateurs/demarreurs
GIPELEC	Accumulateurs/batteries
GLAENZER SPICER	Embrayage/transmission
GOETTE et Cie	Freinage
GOETZE FRANCE	Pièces moteur
GREGOIRE et BARILLEAU	Cablage, relais

Table 6-14 (con't)

COMPANY OR GROUP	PRODUCT
GUR FILTER	Filtres
HELLA	Eclairage
HOUDAILLE LE LAURAIN	Suspension
HUITRIC	Accus/batterie
INDELIS	Cablage, relais
ISKRA FRANCE	Equipements electriques
ISRI FRANCE	Sièges
JACOTTET	Embrayage/transmissions
KOOP, KUHRLE, KAUSCH	Compresseur volumetrique turbocompresseur
KLG	Régulation moteur essence
KLIPPAN	Ceintures
KONI	Suspensions/ammortisseurs
KLEIN	Carrosserie
LABINAL PRECISION MECHANIQUE	
RKG	Cablages
GUIOT	Régulation pompes/filtres
TELMA	Freinage
PURFLUX	Filtres
GELBON	Filtres
CABLAUTO	
LATOUR	Suspension/barres
LAURENT et BLOCH	Sièges
LAUTRETTE	Filtres
LE BOZEC GAUTIER	Filtres
LEROUX	Pièces moteur/pistons
LETANG ET REMY	Carrosserie
LUCAS	Equipements electriques/suspension
GIRLING	Freinage
CAV ROTODIESEL	Régul. moteur diesel/Inject filtres
LUCAS RIST	Cablage
LUCAS Serv France	Pièces rechange
LUCHAIRE	Echappement, pare-chocs
HELFER	Bloc cyclindre
MAGNETI MARELLI	Equipement electrique
MAHIEU	Accus/batterie
MAITRE SIGNALISATION	Eclairage/cablage, relais
MANN et HUMMEL	Filtres
MANUFACTURE DES RESSORTS	Suspension
MANZONI BOUCHOT	Rétroviseurs
MAPCO	Freinage
MARANDIN	Suspension barres
MASSELIN	Suspension barres sièges
MATRA	
SOLEX	Carburation
JAEGER	Instrument bord/relais
DAV	Cablage, relais
MAZDA	Eclairage, lampes
MECANIQUE Genérale de BRIVES	Equipement moteurs/chassis
MECANIQUE DE LA LOUPE	Transmission
MECANIQUE PRECISION MAINE	Equipements moteurs
Sté MECANIQUE DE PRINGY	Equipements moteurs
Sté MECANIQUE DE VILLEUBRANNE	Freinage, suspension direction
MEILLOR	Joints meteurs
MERIDIONALE	Batterie/Accus
MEROBEL	Pompes régulation

Table 6-14 (con't)

COMPANIES OR GROUPS	PRODUCTS
MICHELIN	Jantes, roues
MOATTI	Filtres
MONDI	Régulation Diesel, Injection alternateurs
MONROE AUTO EQUIPEMENT	Suspension
MOREAU	Carrosserie, Attelages
MOTORCRAFT FORD	Equipements electriques/Filtres/suspension
MOTOROLA	Régulation allumage/altrenateur
MOTTEZ	Sièges
MSL AXO	Eclarage, cablage, relais
MTG AVA	Régulation allumage, cablage
MADELLA	Equipements moteur, embrayage, transmission
NACAM	Embrayage/transmissions
NEIMAN	
NEIMAN	Serrure, antivol, centures
KALXON MIXO	Signalisation acoustique
FRANKANI	Eclairage
SEIM ROTIN	Eclairage/Instrument bord/relais cablage
SEIMA	Climatisation, eclairage
	Instrument bord/relais cablage
PAUL JOURNEE	Interrupteurs, serrures, essuie glaces
RHONE ISERE	Serrures, anti-vols
NEWTON	Suspension, amortisseurs, ceintures
NON STOP	Ceintures sécurité
OLDHAM	Batterie/accus
ORLEANNAISE DE LITERIE	Sèiges
OSRAM	Eclairage lampes
OTAC	Pare chocs
OVERLAND	Batteries/Accus
PAILLARD	Suspension freinage
PALMER GA STANLEY	Alternateur, demarreur
PAULSTRA	Pare-chocs, supports moteurs
PHILIPS	Eclairage, lampes
Ets JAMES PIAT	Instrument bord
PISTONS COLMAR	Equipement moteur Piston
PISTONS MAHLE	Pistons
PISTONS KARLSCHMIDT	Pistons
PISTONS FRANCAIS	Equipement moteur pistons
PLESSEY	Régulation moteur diesel
POLYSOL	Accus/Batterie
FONDERIE de PONT A MOUSSON	Freinage/Suspension
PRESTOLITE	Accus/batterie
Sté PROCEDEC VERNET	Reffroidissement/climatisation
LE PROFIL/STYLPROFIL	Pare chocs
Sté Vosigienne Profilage	Equipement carrosserie
DANOIS	Equipement carrosserie
PROUST	Filtres
PSA	
A.O.P.	Petits moteurs/pare chocs/ceintures
QUILLERY	Equipements carrosserie
Ste COMMERCIALE MOTEUR	Equipements moteurs
THOMSOM CST	Régulation moteur ess.
MECHANIQUE du Ht THIN	
CYCLES PEUGEOT	Equip. moteurs/direction
SND	Sièges/pare chocs
STA	Transmissions
PEUGEOT JAPY	Equipements moteurs/transmissions

Table 6-14 (con't)

COMPANIES OR GROUPS	PRODUCTS
QUINTON HAZELL	Direction/climatisation
Le RAPIDE	Carrosserie
RECAM SONOFADEX	Alternateurs/Equipement moteurs/embrayages transmission/frein
RECORD FRANCE	Suspension/amortisseurs
RENIX	Régulation. Allumage, Transmission
RENONDIN et LOSSON	Embrayage/transmission
REYDEL	Equipements carrosserie
RHONE POULENC	Sièges
RING FRANCE	Eclairage
RIVA	Pompes meteurs
ROBERT FRERES	Carrosserie
ROSI	Echappement
ROUSSEL	Refroidissement
SABLE	Sièges
SACHS	Filtres/embrayages/transmissions/suspensions
SAFIR	Ressorts suspensions
SAFRI MORETTE	Eclairage
Sté APPLICAT. METAL ROUGE	Direction moteurs essence/diesel
SAPAIC	Bloc cylindres
S A S	Batterie/Accus
SATGE	Equipements moteurs/essence/diesel
SCHNEEBELI CHABAUD	Climatisation/echappements
SERMA	Equipement carrosserie
SESA	Eclairage/cablage
S F A A	Equipement carrosserie
Sté INDUSTRIELLE de COUSSINETS	Equipement moteurs: coussinets
SICA	Tubulures, courrois caoutchouc
SIMON	Freinage
SIMPLEX	Serrures antivols
SHAP	Batterie/accus
SKF	Equipement moteur
SKM	Carrosserie
Sté NOUVELLE DE ROULEMENTS	Pièces moteurs ess/diesel
SOCOP	Eclairage/cables
SODEREP	Equipements chassis
SOFAZ DURON R	Freinage
SOFRALUB	Filtres
SONNENSCHEIN	Batteries/accum.
SPECIALITES G H	Ceintures
STANDARD PRODUCT INDUSTRIE	Carrosserie
SPICA	Régul. Moteur Essence
STAM	Moteur
STAMAT	Direction
TAULET	Sièges
THOME	Pièces moteur
TONNELINE	Echappement
TORRIX	Cablage, relais
TRW	
JEUDY	Pièces moteurs
GEMMER	Direction

Table 6-14 (con't)

COMPANY OR GROUPS	PRODUCTS
T.S.A.	Pièces moteurs/filtres
TUBAUTO	Tubulures/sièges
NO SAG	Sièges
T.V.A.	Direction
ATELIER METAL ST URBAIN	Transmission/suspension
UCP	Carrosserie
VALEO	
VALEO	Embrayage/transmission, freins/refroid.
E.A. MARCHAL	Régul. Allumage/relais
SEV MARCHAL	Alternateur/Demarreur/eclairage
SEV ALTERNATEUR	Alternateur/Demarreur
SOMA ET	Embrayage/transmission
FLERTEX	Embrayage/transmission/Freins
CIBIE	Eclairage
JOS	Eclairage
PARIS RHONE	Régul/moteur/Moteur/relais/AH demarreur
SEV SERVICE	Rechange
SCAMEA	Régulation Moteur essence
UFAGA	Embrayage/transmission, freins
FAESSA KINBY	Eclairage
V.D.O.	Instruments de bord
E.D. VEGLIA	Instrument bord/climatisation
CYCLAM	Chauffage
JM VERNHES	Régulation moteur essence
VIGNAL et ANDREZ	Régulation moteurs pompes
WABCO WESTINGHOUSE	Freinage
WEBER	Régulation carburation
J WECO	Pièces moteurs essence/diesel
WIMETAL	Tubulure, echappement
WITTMER	Transmissions
YVEL	Serrures
ZEPELLINI FRERES	Equipements moteurs

Table 6-15

TOP UK COMPONENT SUPPLIERS (1981 Figures)

Company	T/o	Automotive %	Amount Sold to B.L.	% of Suppliers Total Sales
	£m		£m	
Dunlop	1,569	61	38	4
Lucas	1,072	80	128	12
GKN	1,961	42	95	5
Michelin	425	100	-	-
Assoc. Eng.	368	90	26	7
Burmah Oil	1,086	17	-	-
A.P.	197	94	36	18
British Steel	?	?	57	1.8
Birmid Qual.	?	?	26	12
Rubery Owen	?	?	24	?
Smiths Ind.	-	-	23	8
Rockwell	-	-	22	0.4

Table 6-16

BELGIUM:
MAJOR COMPANIES PRODUCING AUTOMOTIVE COMPONENTS

Name of Company	Number of Employees	1979 Turnover (BF million)	Main Activities
Champion Spark Plug Europe	1,100	2,730	Spark plugs
Volvo Car Pruduktie Sint Truiden	850	2,271	Starter gear rings, suspension parts, brake parts, transmission and steering equipment, disc brakes
Renault Industrie Belgique (Tournai plant)	620	2,200	Wiring and cables
Etablissements Daniel Doyen	800	1,724	Batteries, garage equipment, distribution of automotive components, garage equipment and industrial products
Robert Bosch Produktie	875	1,575	Windscreen wipers and washers
Klippan	655	1,267	Safety belts
Accumulateurs Tudor	800	1,186	Batteries
Monroe Belgium	800	1,183	Shock absorbers
Cibié-Hainaut	600	1,080	Electric lighting and signalling components
Bosal Benelux	400	956	Exhaust systems
Bureau Technique International	80	687	Water pumps and other engine components; brake parts; clutch linings.
Alfred Teves Mechelen	230	675	Disc brakes
SA Belge des Usines Chausson	300	449	Radiators and parts, oil coolers, braking systems, fuel tanks and sheet metal parts.
Les Ateliers Mécaniques	300	418	Suspension springs
Don International	240	417	Brake parts and clutch linings
Anciens Etablissements Denies	300	306	Fuel tanks and sheet metal parts

Source: Fabrimétal and Trends, EIU

Table 6-17

"FIAT COMPONENTI" OPERATING COMPANIES AND THEIR MAIN PRODUCT LINES

1) ASPERA S.p.A.

1979 turnover: 190 $m; employees: 3.800; plants: 4

<u>Compressor Division</u>

Non-motor industry products	-for household -appliances	-compressors for refrigerators and air conditioning

<u>Engine Division</u>

Non-motor industry products	-for hobbies	-two- and four-stroke engines for lawnmowers

2) COMIND S.p.A.

1979 turnover: 346 $m; employees: 7.200; plants: 9

<u>AGES Division</u>
<u>SAGA S.p.A. (50%)</u>

Motor industry products	-braking system -body (exterior) -suspension system	-brake rubber pipes and pads -rubber profiles -vibration dampers

<u>STARS Division</u>

<u>COMIND SUD S.p.A. (100%)</u>
<u>COMPLASA SA (49%) (Spain)</u>

Motor industry products	-heating/ventilation -interior	-heater unit -car seals -roof and panelling -steering wheels -interior finishing and padding
	-body (exterior)	-plastic bumpers, frontals and grills -SMC body parts -moulded protective strips and rims
Non-motor industry products	-for farming	-"drip" irrigation systems

Table 6-17 (con't)

SIEM Division		
Motor industry products	-lighting equipment	-headlights -side and rear lights
CAVIS S.p.A. (51%)		
Motor industry products	-generation and distribution of electrical current	-cables -steering column-mounted switches and controls
Non-motor industry products	-for building	-plastic slabs

3) FIAT LUBRIFICANTI S.p.A.

1979 turnover: 182 $m; employees: 700; plants: 3

Motor industry products	-braking system -lubrication	-brake fluid -lubricant oils for engines, gear-boxes and differentials
Non-motor industry products	-for industrial use	-oils

4) GILARDINI S.p.A.

1979 turnover: 295 $m; employees: 6.700; plants: 19

CROMODORA Division		
GILARDINI SUD S.p.A.		
Motor industry products	-body (exterior)	-plastic bumpers, frontal and grills -metal bumpers -rear-view mirrors -light alloy wheels -zamak handles and other parts
	-exhaust system	-silencers

Table 6-17 (con't)

SAVARA Division		
Motor Industry products	-petrol engine fuel feed	-pumps -air filters
	-diesel engine fuel feed	-air filters
	-engine cooling system	-thermostats -water pumps -radiator caps
	-electric -equipment -lubrication	-screen washers -lighters -oil filters
WHITEHEAD MOTO FIDES Division		
Motor industry products	-interior	-commercial vehicle seats -mechanical parts for seats
	-body (exterior) -lubrication	-locks -oil pumps
Non-motor industry products	-for marine use	-outboard engines
CORTE & COSSO Division		
Motor industry products	-suspension system	-shock absorbers -gas-filled springs
VALENTINI Division		
Motor industry products	-interior	-rubber mats
FLEXIDER Division GILARDINI DO BRASIL (100%) (Brazil) SEPI METUFLEX S.A. (100%) (France) TUBI MERIFLEX S.p.A. (100%)		
Non-motor industry products	-for industrial investment and power stations	-flexible parts for piping, heat expansion compensators, flexible piping and elastic mountings -filters -arms for loading/unloading fluids
INDUSTRIALE Division		
Non-motor industry products	-for marine use	-piston rings

Table 6-17 (con't)

SURECO Division

Non-motor industry products	-for ecology and safety	-miscellaneous products

RIP Division

Non-motor industry products	-for industrial use	-ring joints

CASTAGNETTI S.p.A. (51%)

Non-motor industry products	-for ecology and safety	-water conditioners

5) IVI S.p.A.

1979 turnover: 125 $m; employees: 1.400; plants: 3

Motor industry products	-paints	-electrophoresis primers and enamels -touch-up primers and enamels
Non-motor industry products	-for industrial use -for household appliances -for building	-paints and resins -paints -paints

6) MAGNETI MARELLI S.p.A.

1979 turnover: 514 $m; employees: 12.200; plants: 19

ELECTRICAL EQUIPMENT Division

Motor industry products	-engine cooling system	-electric fans
	-heating/ventilation system	-electric fans
	-generation and distribution of electric current	-alternators and voltage regulators -starter motors -anti-theft switches
	-electric equipment	-power controlled headlight cover mechanism -windscreen wipers -window regulator units
Non-motor industry products	-for aviation	-electric equipment

Table 6-17 (con't)

<u>BATTERY Division - YORK S.p.A. (37.5%) - COMPAGNIA GENERALE ACCUMULATORI S.P.A. (100%)</u>		
Motor industry products	-generation and distribution of electrical current	-starter batteries
Non-motor industry products	-for industrial use	-batteries
<u>IGNITION Division</u>		
Motor industry products	-ignition system	-coils -distributors
<u>SPARK PLUG Division</u>		
Motor industry products	-ignition system	-spark plugs
<u>COMPRESSED AIR Division</u>		
Motor industry products	-braking system	-brakes systems trucks

7) WEBER S.p.A.

1979 turnover: 178 $m; employees: 6.400; plants: 5

<u>CARBURETTOR Division</u>		
<u>CARTER WEBER (50%) (USA)</u>		
Motor industry products	-petrol engine fuel feed	-carburettors
<u>ALTECNA Division</u>		
Motor industry products	-diesel engine fuel feed -braking system	-injectors -injection pumps -car brakes

Table 6-17 (con't)

8) MARELLI Autronica S.p.A.

(joint venture: Magneti Marelli 50%, Weber 25%, Fiat 25%)

Plants: 2

Motor industry products	-ignition system	-breakerless and electronic ignition
	-generation and distribution of electrical current	-voltage regulators
Non-motor industry products	-for automation and industrial control	-test and diagnostic benches
	-for electric industry	-thick film circuits

SOURCE: FIAT Componenti, NOMISMA