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D00185

United Nations Industrial Development Organization

Distr.
LIMITED

ID/WG.13/21
10 December 1968

ORIGINAL: ENGLISH

The Seminar on the Establishment and Development of the Automotive Industry in Developing Countries

Karlovy Vary, 24 February - 14 March 1969

THE ESTABLISHMENT OF AN AUTOMOTIVE INDUSTRY IN DEVELOPING COUNTRIES[1/]

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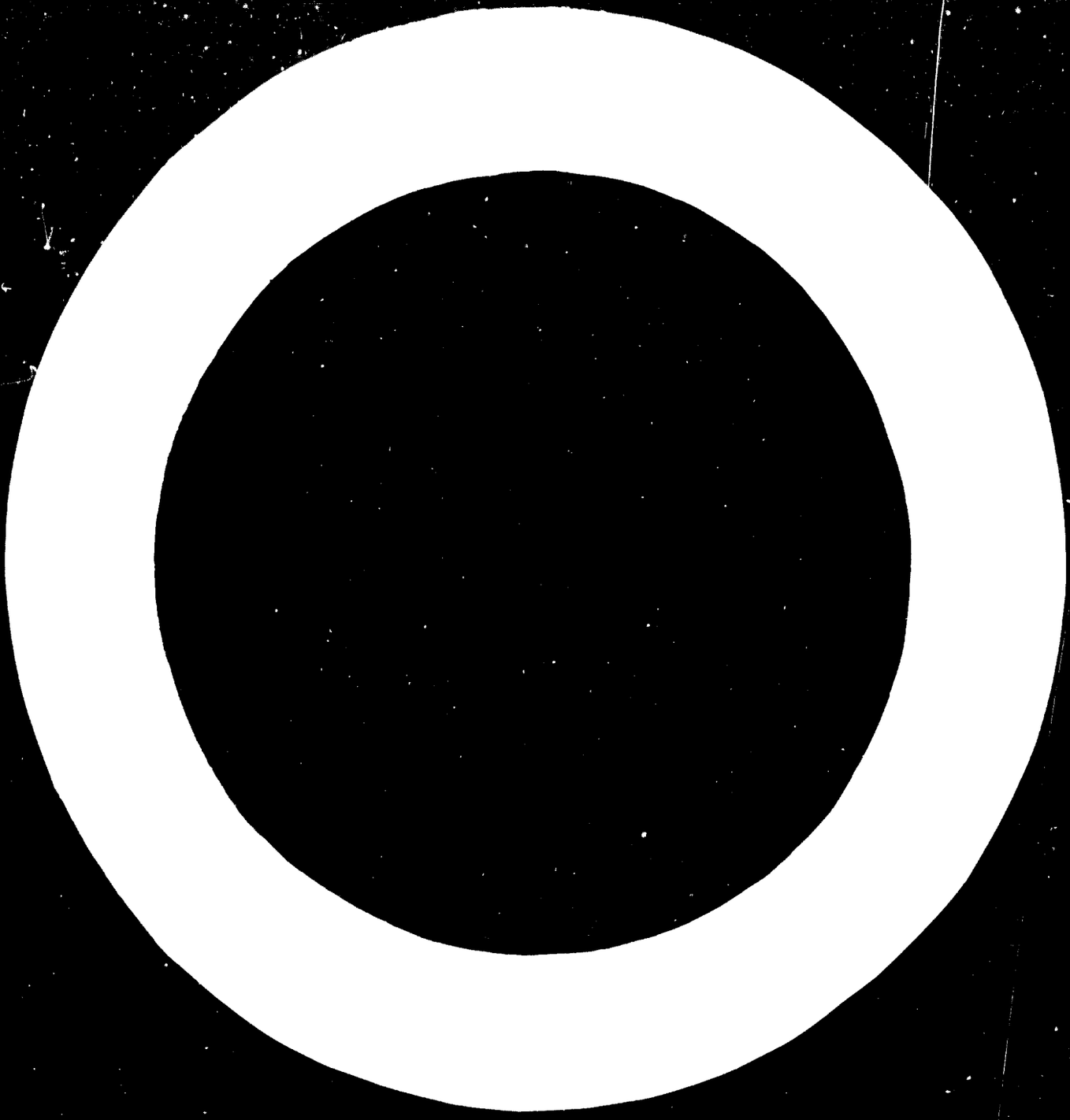

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Introduction

1. This report attempts to point out the main factors that affect the establishment of an automotive industry in a developing country and the problems that arise during the different stages of its growth. It emphasises the contributions that established automotive corporations can make and suggests careful selection of a suitable licenser from among them. The paper also indicates the rewards the licensers expect to compensate them for their assistance.

2. The report describes the varying conditions existing in developing countries and the significant differences among technologies for the manufacture of passenger cars, tractors, trucks and buses. It also discusses the various policies of the automotive corporations that grant manufacturing licenses in developing countries.

3. In general, this report considers manufacturing to include machining parts from raw and semi-finished materials, buying components and materials from suppliers and assembling sub-groups and final vehicles. Since 50 to 70 per cent of automobile-production cost is composed of the costs of the raw materials, semi-finished parts and finished components purchased by the car-maker from other manufacturers, a separate chapter of the report considers the development of the supplier industry.

4. Many statements in this paper apply as well to industries similar to the automotive industry, such as those manufacturing major domestic appliances and textile machinery.

I THE MANUFACTURE AND MARKETING CHARACTERISTICS OF VARIOUS VEHICLES

5. The present study of the automotive industry considers the production of passenger cars, trucks, buses and tractors. This includes the manufacture of the parts or groups of parts incorporated in these vehicles.

6. The level of design, technology of manufacture and economic scale of production are dictated by competitive international corporations. These factors vary greatly according to product, i.e. passenger car, truck, bus or tractor. Since these are all classified as automotive products, it is important to review their significant features and differences before drawing conclusions which otherwise might not apply to the production of all vehicle types.

Passenger cars

7. Design, production technology, automation and mass production have developed more rapidly with respect to passenger cars than to other automotive products because of the large increase in their world consumption and the heavy price competitiveness in this field. The increasing volume of passenger cars on the road today shows that the industry is of strategic importance to its customers. The passenger car is an important means of transport; consequently, this industry influences road construction, service and filling stations, the demand for fuel etc. It is also of critical importance to its suppliers, including the steel industry.

8. Passenger car design is of great importance to the consumer, and styling is therefore the major concern of the manufacturer. The functional aspect of the passenger car is being taken for granted, while its looks, comfort, luxury and special features and accessories are becoming the distinguishing features of each car make.

9. The increases in production costs of similar passenger cars has been small over the past twenty years in comparison with increases in wage rates, costs of materials and equipment and the continual improvement of the safety and styling of passenger cars. The small increase in production cost has been possible only because of the progressive improvement of utilization of materials, labour and equipment through better production technology and design, together with mass production and automation. An explosion in the scale of production has also made it possible to reduce the cost of purchases from other industries by

increasing the sizes of orders and standardizing them. In addition, the design of passenger cars has been heavily revised to limit cost by a reduction in the number of unnecessarily high safety factors (imposed in the past by the limited knowledge of metallurgy) and by development of materials and manufacturing techniques. This trend has been most prevalent in the production of passenger cars and has consequently had greater influence on their design than on that of any other vehicle.

10. The producers who have survived are those who have been able to exploit more intensely their domestic markets and diversify, merge and extend their operations internationally. This group consists of a limited number of companies, known by name to anyone associated with the industry. With this development have come problems of a different nature in all fields, especially that of marketing. The last twenty years have witnessed a change from how to make enough cars to satisfy demand to how to sell what must be produced if costs are to be reduced to a competitive level.

Trucks and buses

11. The increase in world demand for trucks and buses has also been great, although it cannot be compared with the growing consumption of passenger cars. The size of a typical truck- or bus-chassis producer has grown, many of the smaller producers have vanished, and design and production technology have advanced. Competition has been quite fierce, but much less so than in the passenger car industry. This difference is illustrated by the fact that the largest truck producers in Europe make about 40,000 medium-sized units of varying types and models per year. This is less than the smallest passenger car producer in the developed countries.

12. In addition to the small, highly specialized truck-makers, who cater to special demands at special prices, producers with a profitable output of 6,000 standard trucks per year still exist in Europe. This situation in truck production is likely to change, but at a slower rate than in passenger car production. As a result of this situation the need for automation and mechanization in truck production has been less than in passenger car production. The marketing of trucks overseas has been limited by variations in road regulations and usage (differences in types of cargo, length of trips etc.). Bus-body production

includes operations which are more difficult to mechanise; consequently, bus bodies are produced in small quantities by a large number of body-builders in Europe.

13. When sold overseas, the transport costs of buses and trucks increase in proportion to the size of such vehicles. This fact has discouraged mass-production trends in commercial vehicles since products manufactured on a large scale must ultimately be transported greater distances.

14. Passenger cars have been considered in the past to be luxury articles rather than transport equipment like trucks and buses. This viewpoint may be changing rapidly in many countries, even in those where utilitarian doctrines and philosophies, predominate.

Tractors

15. Tractor production is considered in this study because its principal features are similar to those of the other automotive products. In the 1950s, competition in tractor sales was less fierce than was the case with trucks. Tractor design underwent relatively few changes during that period, but this may be attributed to the lack of need for the development of this product.

16. Growing competition in tractor production over the last three years has reduced the number of producers and has decimated the number of firms that were producing only tractors. However, tractors are still produced in developed countries in somewhat greater quantities than trucks, though in much smaller quantities than passenger cars.

II LOCAL CONDITIONS AND PROBLEMS

Suitable conditions for automotive production

17. The factors that must be considered in determining whether demand in a country is enough to justify domestic vehicle production are the size of its population; per capita income; financial resources; volume of road traffic owing to transport of goods; area of cultivable land; existing sub-suppliers of raw materials, semi-finished and finished parts and components; availability of skilled labour and management personnel; relationships with neighbouring countries and markets; attitudes of local authorities etc. The feasibility of setting up an automotive plant in a developing country further depends on the state of vehicle production in developed countries, where passenger cars (especially bodies) are being produced and sold on a much larger scale than tractors, trucks or buses. In contrast, the demand for commercial vehicles in many developing countries is as great as the demand for passenger cars. Consequently, developing countries should begin their automotive production with assembly and gradually progress to the manufacture of parts, first for buses and trucks, then for tractors and, ultimately, for passenger cars.

18. Generally, market potential should be approximately at the level shown below to justify setting up an automotive factory:

	Annual sales		
	Assembly	Manufacture (1 type)	Remarks
Bus bodies	-	300	With cheap labour
Truck and bus chassis	2,500	6,000	5 tonners
Tractors	3,000	10,000	30-65 horsepower
Passenger cars (medium)	20,000	50,000	Excluding production of body panels
		200,000	Including production of body panels

19. This indicates a general level, but special conditions must be considered in every individual case. The number of vehicles registered (vehicle population) and annual production in some developed and developing countries are given for comparison in table 1.

20. This table illustrates the differences in consumption with respect to some of the vehicles in question. It also shows that countries with a small car population tend to produce a relatively large number of makes, thereby increasing the handicap arising from the smaller size of their markets.

Table 1

Examples of world car population and production

Country	Vehicle population Registered - 1966[a] (in thousands) Cars	Trucks	Buses	1965 production (in thousands) Cars	No. of makes	Commercial vehicles	No. of makes	Approximate imports as percentage of [illegible]
United States of America	76,000	15,000	311	9,300	4	1,300	11	
Germany	9,800	940	39	2,800	5	255	9	
United Kingdom	9,100	1,700	98	1,700	5	455	5	(Production in Great Britain)
France	8,800	1,900	48	1,400	4	217	6	
Italy	5,500	640[b]	26	1,000	1	66[b]	3	(Fiat cars only)
Japan	2,200	4,500[b]	103	700	10	1,170[b]	13	
Union of Soviet Socialist Republics	not available			201	N.A.	450	N.A.	
Australia	2,900	870	17	300	5	47	5	
Brazil	1,060	760	85	100	4	79	9	90[c]
Spain	960	440	24	140	3	70	10	
Argentina	930	607	20	130	8	65	7	
Mexico	760	380	32	126	7	89	7	7[c]
Federal Republic of Germany	not available			103	N.A.	13	N.A.	
Czechoslovakia	not available			84	N.A.	32	N.A.	
Poland	not available			29	N.A.	27	N.A.	
India	370	265	80	23	3	46	5	90[c]
Yugoslavia	180	79	8	35	1	12	4	90[c]
South Africa	1,200	333	23	129	8	47	11	
Venezuela	380	140	10	38	7	16	7	
Portugal	240	85	3	30	9	7	15	Under 50
Philippines	160	97	32	9	7	6	9	
Algeria	210	92	4	6	1	2	2	

Table 1 (contd.)

Country	Cars	Trucks	Buses	Cars	No. of make	Commercial vehicles	No. of make	Approximate domestic content %
Malaysia	164	48	4	11	5	N.A.		
Pakistan	70	35	10	6	3	4	3	
Morroco	160	60	3	6	2	2	4	
Peru	135	92	9	1	2	1	2	
Colombia	115	94	21	-	2	2	2	Under 5 (planned)
United Arab Republic	100	33	12	6	1	6	2	

Source: World Automotive Market Survey, McGraw Hill (except production in Malaysia, Pakistan and the United Arab Republic).

a/ New registrations are usually about 8 to 15 per cent of these figures.

b/ Including small and midget trucks which are extensively used in Japan.

c/ In most cases, this includes manufacture of large body panels.

Defining the structure of the industry

21. Local authorities should define the structure of the automotive industry in accordance with prevailing local conditions. Such a definition involves the decisions described in detail below.

22. Vehicles must be selected which suit domestic requirements, with emphasis on utilitarian models and a limitation of the number of different types and sizes. The same models should be retained over a period long enough to amortize special tooling. This type of programme leads to standardization with the focus on utility as compared to a wide range of consumer choice. The authorities must also decide whether to establish the production of buses, trucks, tractors and cars one after the other or begin all these projects at once. Another important decision is whether all vehicles should be made in one factory or whether each type should be manufactured in a separate factory. The production of various vehicles in one factory may result in better utilization of equipment, facilities and enterpreneurs and standardization of technology and purchases from the supplier industries. Because of the increase in the size of the business it may also be possible to attract foreign firms and build strong ties with them. However, the intricate organizational and management problems which are likely to arise from such centralization can outweigh these advantages. Finally, the local authorities must decide if working with one licenser for all vehicles is preferable to working with a different one for each vehicle or even more than one for the same vehicle.

Selecting the licenser

23. Neither the licensee nor the local authorities in developing countries have had much initial experience in planning and setting up viable automobile factories. They must rely to a great extent on the help of a licenser until they acquire a working knowledge of the industry. Their selection of a licenser from among the firms that produce vehicles suitable for the needs of their country should be guided by the following factors:

(a) Certain licensers, such as General Motors and Fiat, have a large range of products and models, while others, such as Volkswagen and Massey Ferguson, are specialists.

(b) Large firms, such as Ford and General Motors, may be less interested in small licensing operations than smaller companies (e.g. American Motors, Simca, Citroen or Volvo) would be.

(c) Firms such as Fiat and Renault are anxious to move into developing countries, while others (e.g. Mercedes and Volkswagen) are more reserved at present.

(d) Japanese, Spanish and Yugoslav firms are also trying to give licences, although their own industry has been established only recently. They are more willing and flexible, though less experienced in overseas operations, than the older United States and European firms.

(e) Distances, language differences and political, commercial and social relationships between their countries all affect the prospects of smooth collaboration between licenser and licensee.

24. The attitudes of the companies mentioned depend on their management, ownership and general policy. It should also be noted that some of these firms are currently undergoing changes. Chrysler Corporation has bought into Simca and Rootes, and Mercedes-Volkswagen and Renault-Peugeot mergers seem to be possible. Such developments could change the attitudes of these firms towards the granting of manufacturing licenses in developing countries.

Local regulations

25. The growth of the automotive industry in developing countries depends on local regulations for guidance and support. For example, the number of licenses for assembly of vehicles should be limited. The assembly of numerous types and makes could be quite feasible, but this often delays local integration because of lack of standardization. In addition, the government should enforce reasonable schedules of domestic content; make sure that foreign licensers have a meaningful over-all stake in the business; promote local supplier industries to provide the automobile industry with products of adequate quality at reasonable prices; and assist the industry in extending sales into neighbouring countries by means of export subsidies and special agreements. Also important to the developing automotive industry would be duty-free import of equipment and materials, tax rebates and other incentives; protection from imported vehicles; support in raising the required funds, in both local and foreign currencies; and continuity of policy on matters affecting the industry.

III THE ROLE OF INTERNATIONAL FIRMS IN THE ESTABLISHMENT OF THE INDUSTRY

Technical assistance and know-how

Transmitting manufacturing technology

26. Automotive production in a developing country should begin with the manufacture under licence of an existing type of vehicle and with the purchase of technical assistance and know-how. In this way the difficulties in design, development and technology that are typical of the initial years of manufacture of a prototype can be avoided and management can concentrate on its other problems.

27. Licensers must simplify their documentation for use in developing countries. They should modify their production technology to suit the scale of production and the local conditions of their licensees by allowing for the use of available raw material and cheap labour. Licensers can achieve this by reducing automation, simplifying tooling and introducing manual operations to save on investment costs. It is quite unsatisfactory if the licenser limits his duties to giving information in the form used in his own factories.

28. Licensers are usually willing to make the necessary adjustments in technology, but they frequently underestimate the work and effort that such changes require of their executive and management personnel. Experienced international corporations are aware of the expenses involved and consequently insist on adequate compensation. This is ultimately to the benefit of the licensee, because a licenser who has underestimated his costs may try to make up for it in the quality of his services.

Ensuring satisfactory product quality

29. Vehicles produced under licence in developing countries tend to be inferior in quality for many reasons. For one thing, there is little competition from imports in protected markets; in certain cases (e.g. the United Arab Republic and Yugoslavia), there is no competition between local makers because only one type of car is produced. In addition, local traffic authorities do not use adequate tests to control quality prior to registration and there is a lack of uniformity in the supply of raw and semi-finished

materials and finished components from the local industry. Another reason for the lower quality of these vehicles comes from the necessity in developing countries to rely more on the human element because production is less mechanized. Unfortunately, it often happens that workers and supervisors are not sufficiently reliable and conscientious. Finally, it is obvious that the tendency to buy the cheapest goods and underpay workers and employees, combined with the tendency to stress quantity (cutting corners on quality) in order to make up for delays, also affects the quality of the final product.

30. The licenser should ensure satisfactory product quality by enforcing inspection procedures strictly and by recommending minimum standards for purchased goods and finished vehicles.

After-sales servicing

31. The 25 or 30 firms that export built-up cars to developing countries also assume responsibility for their servicing. Local garages do simple repair jobs under the supervision of these firms and local dealers who also supply them with spare parts. Once local assembly and manufacture begin, servicing becomes the responsibility of the local car-makers. The market is then usually shared between about five makers, a number sufficient to replace imports.

32. One result of this is that some of the existing garages close down or change from servicing cars to other jobs. The remaining garages, which were organized to serve smaller quantities of any one make, are inadequate to service larger quantities of that make, especially since they are no longer supported by the licensers.

33. The licensee is often unaware of the fact that his reputation depends as much on the life-long performance of the car he sells as on its condition when the buyer takes delivery. As part of the know-how they contribute, licensers should help their licensees in setting up a central service organization to keep complete records of sales, supervise use of vehicles, control and provide assistance to garages making repairs, and enforce maintenance according to prescribed schedules. The licensers should also provide assistance in equipping authorized garages with service tools and special equipment, ensuring availability of spare parts in the area where

the vehicles are in use, training repairmen to work in branches throughout the country, and handling guarantee claims and customer complaints.

Product design

34. Once a licensee is able to manufacture an existing vehicle with technical assistance from his licensor, he can then focus his attention on modifying or redesigning the vehicle so that it is more suited to local conditions. Such modifications may well be justified by certain local conditions, special customer requirements and the small scale of production.

35. In general, a licensee initially cannot bear the cost of a design and development department. His licensor can provide assistance here by using his own research facilities to modify the vehicle so that it is suitable for use under local conditions and its manufacture is in accordance with the technology of small-scale production.

36. Modifications demanded by local conditions could affect many of the principal parts of the vehicle. For example, road conditions would affect car design with respect to ground clearance, suspension, steering and axles, while temperatures and the amount of dust would affect the plans for the cooling and lubricating systems. Other modifications might be necessary to allow for the type of terrain (mountainous or flat) because this affects the amount of power required and the choice of gear ratios. The size of families and amount of luggage determine the sizes of the passenger and baggage compartments of the car, just as the design of a commercial vehicle body is affected by the type and amount of cargo it will transport.

37. In modifying the vehicle to suit the technology of small-scale production, changes in design should also be undertaken. Such changes should make it easier for the licensee to make parts economically in small quantities; to use less expensive, manually operated or semi-automatic equipment, even if this requires more labour input; and to use locally available materials whenever technically and economically feasible.

38. Appropriate changes in design may include using bent instead of pressed (with dies) sheet-metal parts, replacing pressed or forged parts with cast parts, using fibre-glass instead of sheet-metal bodies, replacing a one-piece body side panel with a number of welded pieces, substituting flat glass for curved, and reducing the variety of sizes and types of nuts, bolts, screws, wires and raw materials used.

39. Licensers recognize the importance of introducing such modifications and have even shown willingness to redesign a vehicle completely when necessary. Major automotive companies are equipped for this as they are continuously changing their own models. Chrysler has redesigned a truck to suit conditions and rational production technology in Turkey. Renault has recently redesigned the Dauphine in accordance with conditions in Brazil, and the firm expects that costs will be lower if it is also made there. In addition, the sales of this car will then increase to an extent that will justify the loss of the benefits that would otherwise be derived from its interchangeability with models produced by Renault in France.

Marketing

40. The small market for automotive products in a developing country limits sales, increases fixed costs per unit (as compared with large car-producers) and increases the price of materials, parts and supplies because of the smaller volume of purchases.

41. Developing countries need to expand their home market by exports, especially to neighbouring countries. However, such expansion involves several problems. First, neighbouring developing countries have little confidence in each other's products, especially motor vehicles. They all want their own plants and do not want to import from a country of similar size. Second, it is difficult for a developing country to establish a reputation for its product on international markets. For example, Volkswagens made in Brazil and priced competitively met with sales resistance from Dutch and Swiss Volkswagen dealers, although the German Volkswagen company vouched for the quality of the Brazilian product.

42. Other expansion difficulties in developing countries include high operating costs, which make it difficult for new companies to compete in price with the large established firms; lack of experience in negotiating export transactions and in delivering cars and parts abroad; ineptitude in servicing and maintaining vehicles abroad and supplying them with spare parts; and keeping up with innovations and developments in design.

43. The many ways in which a licenser can help extend his licensee's restricted domestic market will now be described in detail.

44. The licenser can purchase certain parts for his own production from his licensees and organize the exchange of different parts among licensees. This

helps cut down the licensee's costs by extending the scale of production of certain items. He can then export these products to balance his imports of the components which it is difficult for him to make competitively.

45. The licenser can also suggest that his licensees specialize in producing parts more suited to their local conditions, control and possibly guarantee the quality and reliability of the licensee's exported products, and use parts made by the licensees for his own production in order to build up confidence in their products. However, this type of programme involves a number of problems, such as determining the parts suited to each licensee, subdividing parts production among different licensees all wanting to make the same item, establishing the quality and continuity of products from a developing industry, persuading the licensee to absorb initial cost disadvantages, and adjusting the licenser's own purchase methods.

46. These problems are not insurmountable. The Yugoslav factory, TAM (Tvornica Automobila Maribor - "Maribor Automobile Factory") has exchanged truck parts with its German licenser, Magirus-Deutz, for the last five years. TAM has also supplied parts to Magirus-Deutz's licensee in the United Arab Republic and is trying to organize, with its licenser's help, an exchange of parts between the licensees in India, the United Arab Republic and Yugoslavia.

47. The licenser can also help extend his licensee's restricted domestic market by ordering certain spare parts for older models and special accessories for the licenser's world markets from his licensees. Such parts are produced on a relatively small scale with little mechanization in developed countries and their prices are consequently high. This type of transaction is particularly convenient if the older model is still being produced by the licensee.

48. The licenser can help in the export of built-up vehicles in the following ways: by allowing his trade name to be associated with his licensee's products; by assuring his overseas distributors that the quality of his licensee's products is equal to that of his own; by using his overseas marketing experience and contacts to assist the licensee in concluding export transactions; and by using his dealers and service organizations overseas for after-sales servicing of his licensee's products.

49. Specialization in one type, size or tonnage of vehicle helps improve a licensee's economy of scale. However, this one type may not suit all

customers on his domestic market who invariably have different requirements. Rather than diversify, licensees could exchange different vehicles between themselves and complement each other's product line. Fiat's 600D, 124 and 1300 are to be produced in Yugoslavia, the Union of Soviet Socialist Republics and Poland, respectively and this may well lead to an exchange among these countries. Though more difficult to organize, this type of specialization would be beneficial between Latin American and African countries.

50. Another helpful policy the licenser could follow would be to rely on a licensee to supply a model discontinued by the licenser on his home and world market. Certain models (e.g. the Fiat 1100 and 600D) have retained a fair portion of their original market, even after newer models of a similar size (the Fiat 1300/1500 and 850, respectively) have superseded them. Fiat is contemplating stopping its production of the 600D in Italy and ordering the cars which can still be sold in Italy and abroad from Spain and Yugoslavia. This would relieve Fiat of producing this model at a time when current annual demand for it is about 30,000 cars, a figure that is likely to decrease rapidly. This is still a considerable volume of business for Yugoslavia's CZ (Crvena Zvezda - "Red Star") factory (production 35,000 Fiat cars in 1965) or Seat in Spain (production about 30,000 in 1965).

51. A licenser could similarly entrust to his licensee the total production of special vehicles or special executions of current models (sports cars, tourist buses, special purpose truck chassis such as tippers), which are also produced on a smaller scale than standard commercial vehicles or passenger cars. Volvo is considering making one of its special trucks in Argentina for the world market. German truck-makers order their special models from small firms in the Federal Republic of Germany which "tailor-make" them, but economies in labour costs, which are high in such cases, could be effected if these vehicles were made in developing countries.

52. The licenser plays an essential part in guiding such marketing schemes to success. Very few new automotive industries have been able to gain recognition in world markets without backing from a large established corporation. A possible exception is the Japanese automotive industry, which is now gaining world-wide markets. However, this industry has lagged considerably in recognition compared with other Japanese industries, a fact which shows how difficult it is to extend the marketing of vehicles internationally without the support of and collaboration with an established firm.

53. Many licensers do not seem to be fully aware of the potential of co-operation with their licensees in marketing arrangements. Others are aware of the possibilities but may be reluctant to proceed for fear of indirectly hurting their reputation in markets where they are already established. They advocate exchange among their licensees, but as little direct exchange with their own production as possible. Firms who succeed in assisting their licensees by buying components from them enjoy a clear advantage over competitors in the same country.

54. Certain firms use such arrangements as "bait" to gain access to markets in developing countries where authorities have limited the makes of vehicles to be produced locally. Massey Ferguson is trying to enter the Mexican tractor market, where there are already two established tractor-makers, by offering to make additional axles in Mexico to be exported to Detroit. The Mexican authorities are using this proposal to bring pressure on the existing tractor producers (Ford and John Deere) to do the same. Special efforts of this kind can only be expected from the international firms in exceptional circumstances, as when they must force their way into a crowded market. Nevertheless, the advantages they offer to a developing country may be greater than the harm which could result from adding another producer to a limited domestic market.

Operating costs

55. The complicated nature of the automotive industry makes it particularly difficult to measure and allocate costs. Unwise purchases, excessively large stocks, or stoppages in production due to short stocks can increase costs considerably. Only experienced management personnel can locate abnormal expenditure and prescribe the most immediate and appropriate remedy. The licenser must emphasize the importance of cost analysis and control in a growing automotive enterprise and help his licensee set up an adequate costing system for his scale of operation. Cost allocation and accounting, continuous inventory and stock control should be introduced from the very start of operations, since these procedures become more intricate once the plant is actually in operation.

56. Generally, fixed costs per unit and prices of purchase materials and supplies are high in the relatively small plants that operate in developing countries. Furthermore, in spite of the lower capital investment cost due

to less automation, the cost of depreciation per unit in developing countries is often as high, or even higher, than is the case with plants that are more automated but produce more units. Labour is the only element of cost that might give the producer in a developing country an advantage. However, the advantage in wage rates is often lost because of the low productivity of labour in developing countries. Moreover, labour accounts for only 3 per cent of the cost of manufacturing passenger cars and not more than 15 per cent of the production cost of buses. Therefore, the small-scale producer is invariably at a disadvantage in the significant cost areas such as purchase of materials (50 to 70 per cent of total production cost), general and overhead expenses (15 to 30 per cent) and depreciation (7 to 15 per cent). Consequently, the unit cost of vehicles manufactured in small quantities is usually significantly higher than that of mass-produced vehicles.

57. Apart from the extension of its licensees' markets, the automotive corporation can help its licensees to reduce costs by modifying design, as mentioned earlier; reducing material, labour and overhead costs by using modern management methods, time-and-motion studies, critical path techniques, cost controls etc.; and defining the feasible sequence for manufacturing parts locally to increase domestic content.

58. The licenser can direct his licensee to schedule production and domestic procurement of parts to limit increases in costs. Some steps in this direction would be for the licensee to start with parts and jobs which lend themselves to small-scale production; start with simpler parts and jobs which require limited skill and supervision, but which are expensive enough to make a meaningful domestic contribution; and schedule procurement from the domestic supplier industry to follow the same rationale.

59. Domestic contribution can be further encouraged if parts made locally are exported to pay for the import of other parts which are particularly expensive to make and less often mass-produced (e.g. body panels, ball bearings etc.). Spain, for example, imports body panels from Fiat and exports other parts to them. Yugoslav car-makers import nuts, screws and washers cheaply from the Federal Republic of Germany and export castings. Countries such as Argentina, Brazil and India, which produce over 90 per cent of their car components locally, may be able to reduce their costs by importing such parts and paying for them by exporting others.

Labour and management training

Management

60. The role of management is particularly critical in the automotive industry, owing to the complex nature of this industry. Certain automobile firms in developing countries manufacture many types of vehicles under various licenses. Each of these vehicles has over 10,000 parts whose production requires a large variety of manufacturing operations, equipment and labour skills. Intricate store-keeping, purchase transactions and cost controls require a combination of technical, commercial and administrative skills. In addition, technicians are required for the planning, design, development and technology of manufacture. Furthermore, the local executives and managers must be capable of learning from the staff of their licensers while still commanding their respect.

61. There are many specific problems involved in the training of the supervisory and management group. Some of them are as follows:

(a) The number of recruits with sufficient background, personality and reliable character is limited.

(b) The selection of executives is difficult.

(c) Unnecessary personal competitiveness frequently develops among local executives and supervisors, thus reducing interdepartmental co-operation.

(d) It is difficult to teach leadership, co-operation, discipline and make the correct decisions with respect to general corporate benefit.

(e) There are differences in language, academic training, past experience and social and cultural background between the licenser's staff and the local executives.

62. The automotive corporations can solve some of these problems by carefully selecting the individuals they send to train supervisors and managers on the job; sacrificing key men from their own staff to perform supervisory and managerial work until the local group is prepared to take over; helping the local group to screen and select senior officers; and making it their task and that of their staff to train the available local recruits to be suitable supervisors and managers.

Labour

63. Trained labour is often not available in developing countries. Training methods for skilled workers on the job or in the licenser's factory have been

standardised and are effective as long as recruits are carefully selected and suitable trainers are provided by the licensor. Problems arise in retaining trained workers, however, as they tend to migrate or move to other industries.

64. It is more difficult to train workers to be reliable and conscientious than it is to help them acquire professional skill. Good foremen, supervisors and inspectors are hard to find and difficult to train quickly in developing countries.

65. Another problem is the inability of the new industry to establish piece rates soon after the start of operations. This is common in developing countries because of the immaturity of the industrial system and labour force. The scales fixed by the management are usually inadequately planned and balanced; the workers are suspicious of the system, and their output is often reduced by factors beyond their control. This leads to a postponement of the setting of piece rates, a situation that inevitably contributes to lower labour productivity in developing countries and usually cancels the cost advantages expected from lower wages.

Foreign exchange requirements

66. The manufacture of vehicles is usually established stage by stage over a number of years and the supplier industry is organized in a similar way. Consequently, new local and foreign currency funds are required for capital investment throughout the build-up period.

67. Receipts from sales in local currency finance operating expenses. These expenses include the cost of imported materials and component parts, royalties, fees etc. which must be paid in foreign currency. This requires a considerable supply of foreign exchange until most of the materials and components are available locally.

68. The local manufacturers and authorities should estimate the funds and exchange required during the build-up period and make sure that their resources cover the needs. Underestimation of requirements or the inability to provide the necessary funds, especially the foreign exchange, can impede progress in local integration and production of vehicles.

69. The item which is usually underestimated is the requirement for imported materials. One reason for this is that the start-up time required to solidly establish a manufacturing concern is often underestimated and this lengthens

the period of assembly. Second, the savings in a foreign currency resulting from assembly, with about 5 per cent domestic content, are negligible, as is shown by the table below. The table also shows the unexpected financial burden that comes from packing and increases in freight costs when importing semi-knocked-down vehicles. The amounts are given in US dollars.

	Import assembled	Semi-knocked-down	Completely knocked-down
Ex-factory price	1,000	980	950
Minor deletions	-	- 50	- 50
	1,000	930	900
Packing and f.o.b. charges		110	
Freight and insurance	40	80	100
Total	1,040	1,120	1,000

70. A third reason for the underestimation of the amount of imported materials required is that the quantity of vehicles to be produced locally cannot be limited in the initial years of vehicles manufacture, as the local authorities hope, until domestic content rises to an appreciable level. In fact, demand has been known to rise sharply with the establishment of a local car industry. Fourth, local manufacture (domestic content) does not progress as rapidly as planned.

71. An example of miscalculation of foreign currency requirements is shown in table 2 below as a comparison of theoretical and actual requirements. The same miscalculation is shown graphically in figure 1 below. In this example, the foreign currency that was estimated to be adequate to import materials and parts for the production of 113,000 cars over a ten-year build-up period (to reach 97 per cent domestic content) was used up over three years to make 23,000 cars (reaching a net domestic content of 16 per cent). The example also shows that the cost of fixed assets for manufacturing car parts (excluding the supplier industries) is small compared to the amount of foreign currency required for importing materials and parts.

72. An assembly or manufacturing plant cannot be subjected to ups and downs (depending on how much currency is available) similar to those involved in the importation of built-up cars. Theoretically, an increase of local content will result in a reduction in the over-all foreign currency requirement despite increases in the quantity of vehicles produced. Actually, there is an initial

peak in foreign currency requirements which often creates a subsequent shortage of exchange. Consequently, the industry is unable to import enough materials to operate at maximum capacity. This leads to a reduction in volume and an increase in operating cost per unit, and, subsequently, in sales price as well. Customs duties must then be increased to provide protection from imports. It may be beyond the power of local authorities to remedy the difficulties that can result from this situation.

73. The licenser can help his licensee avoid foreign exchange problems by making realistic estimates of foreign exchange requirements and directing the licensee to manufacture components from local materials and to use locally made supplier parts. The licenser can also help by permitting the licensee to purchase standard components such as bearings and electrical and fuel system components etc. from international manufacturers who allow him to pay in "soft" currency. The licenser can provide further assistance by expanding his licensee's export market and by extending meaningful credit facilities (three to five years) to the licensee for the supply of materials and parts delivered by the licenser and helping him to procure supplier's credits for the purchase of machinery.

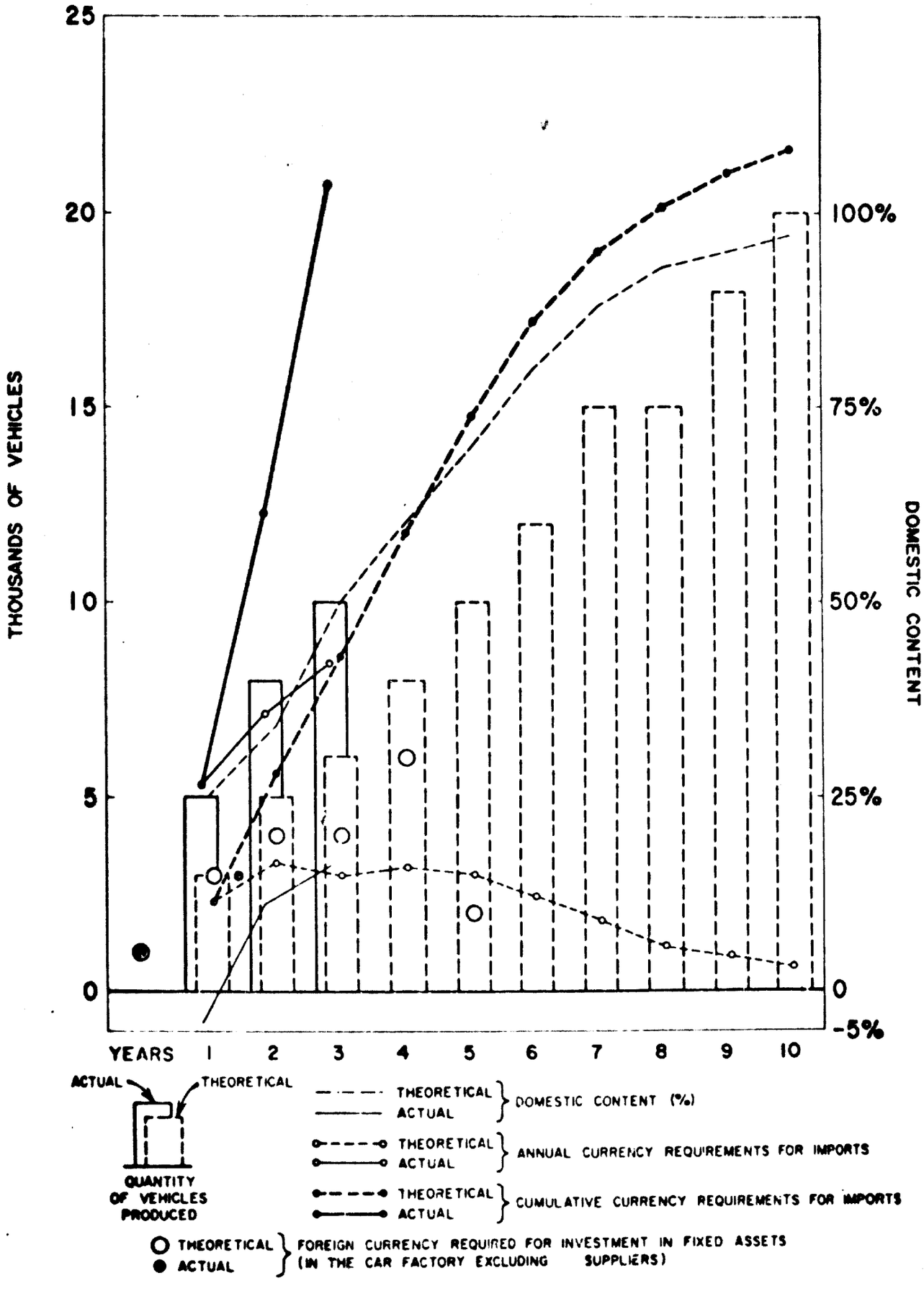
Table 2

Foreign exchange requirements for imports required for a newly established automotive industry

	Theoretical											Actual			
Year	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3
A. Quantity of vehicles produced															
Per year (in thousands)	-	3	5	6	8	10	12	15	15	18	20	-	5	8	10
Cumulative (in thousands)	-	3	8	14	22	32	44	59	74	92	112	-	5	13	23
B. Domestic content (%)															
In factory	-	10	14	20	25	30	35	40	43	43	43	-	5	7	10
Local purchases from suppliers	-	15	20	30	35	40	45	48	50	52	54	-	5	10	12
Extra packing and freight	-	-	-	-	-	-	-	-	-	-	-	-	-14	-6	-6
Total	-	25	34	50	60	70	80	88	93	95	97	-	-4	11	16
C. Imported components/unit (%)	-	75	66	50	40	30	20	12	7	5	3	-	104	89	84
D. Annual requirements of currency For imports (A x C) (in cost per thousand complete vehicles)	-	2.3	3.3	3.0	3.2	3.0	2.4	1.8	1.1	0.9	0.6	-	5.2	7.1	8
E. Cumulative currency requirements For imports (in cost per thousand complete vehicles)	-	2.3	5.6	8.6	11.8	14.8	17.2	19.0	20.1	21.0	21.6	-	5.2	12.3	20
Foreign currency for investment in fixed asset for domestic content in factory only, excluding investment for supplier parts and material production (converted into cost per thousand complete vehicles)	1	3	4	4	6	2	-	-	-	-	-	1	- 3 -		-

Figure 1

Foreign exchange requirements for imports required for a newly established automotive industry



IV DEVELOPING THE AUTOMOTIVE SUPPLIER INDUSTRY

Products made by the supplier industry

74. About 10,000 different supplier parts and materials per model are usually purchased by a vehicle producer in a developing country, accounting for 50 to 70 per cent of his total costs. These parts and materials can be subdivided into three main groups - raw materials, semi-finished parts and finished components and parts.

Raw materials

75. This group consists mainly of steel strips, bars, tubes, light alloy materials etc. which are machined into finished parts in the automotive factory itself. These materials are made to general standards and are also used in industries other than the automotive industry.

Semi-finished parts

76. Included here are cold-rolled steel sheet; various iron castings; steel, aluminium and other metals; steel forgings etc. These parts are manufactured by the metallurgical industry from raw materials, but require further machining or pressing in the automotive factory itself. Similar semi-finished parts, manufactured with the same basic equipment, are used by other industries.

Finished components and parts

77. This group includes pistons, rings, bearings, springs, starters, dynamos, auto-electrical equipment, carburettors, fuel pumps, steering units, clutches, brake cylinders etc.; in other words, the parts that are directly incorporated into the vehicle. Such items are used only by the automotive industry and allied or similar industries. This group of products could also include items such as finished crankshafts, valves, gear-boxes, propeller-shafts etc., and even complete engines from specialized factories, if these are available on the market at suitable terms.

78. The lack of any supplier part or the late delivery of a raw material or semi-finished part will stop vehicle production and cause severe losses. This accounts for the fact that large car-makers in developed countries

control many of the firms that supply them with critical raw materials and parts. This could be a reason for increasing domestic content in developing countries at a more rapid rate than would be justified on the basis of considerations only.

Sequence of growth of supplier industries

79. The supplier industries described below usually exist in developing countries before the automotive industry is established.

Spare and replacement parts industry

80. Car components such as tires, batteries, V-belts, plastics, matting and fast-moving spare parts, have short lives (three or four changes per car), and are consumed in larger quantities as spare parts than as original components in new vehicles. The demand for spares could well develop into quantities that would justify their domestic manufacture before the establishment of an automotive industry. Such parts can be used later by the car industry if their quality is improved. However, they do not usually account for more than about 5 to 10 per cent of the price of a vehicle.

Other supplier industries

81. In developing countries there are often industries that manufacture simple materials and parts similar in technology and form to those used in the car industry, e.g. grey castings, small dye castings, cables, glass, light bulbs, upholstery, woodwork, rubber products, etc. These industries can be assisted in upgrading their specifications and technology sufficiently to produce supplies for the car industry.

82. Other material and component industries are rarely economically feasible until they can supply parts directly to an automotive plant, and they are therefore unlikely to exist before one is established. These industries can be subdivided into three groups each of which is described below.

83. The first group consists of industries that manufacture materials and components common to the automotive and other industries, e.g. high-tensile steels, steel castings, electrical components, chains, engine parts, oil seals etc. Similar parts are used in other engineering industries, such as those manufacturing domestic and electric appliances, industrial engines,

pumps, motorcycles and spare parts and wagons for the railways, which appear in developing countries at about the same time as the automotive industry. Once automotive production begins, requirements for these products increase to a level which may justify setting up a factory. However, specifications for materials and components and the technology of manufacture warrant the entry of such an industry into a licence and know-how agreement.

84. The second group consists of those industries that produce materials and components essentially for the automotive industry. Included in this assortment of products are forgings, malleable casting, cold-rolled steel sheet and components such as clutches, brake components, linings etc. These products are used mainly in the car industry in developing countries, although they are also used in other industries in developed countries. Some of these materials and components may be produced for a visibly growing automotive industry. They are specialized in design and technology and can only be made satisfactorily with a foreign licence and know-how.

85. The third group includes industries producing typical "mass-production" items. Certain products manufactured by the first two groups of industries, e.g. ball bearings and diodes for alternators, may be manufactured at such a high level of mass production in developed countries that they cannot be produced under licence in smaller quantities at competitive costs. Such products presently account for only about 5 per cent of the cost of a complete vehicle and should be imported until the demand for them is large enough to justify their domestic production.

86. It is expected that the components that comprise about 10 per cent of the price of the vehicle will be almost immediately available from suppliers. With further development of the industry and increase in the demand for vehicles, more parts can be satisfactorily produced to replace imported components.

Planning new supplier industries

87. There are two alternatives with respect to the timing of the automotive production in relation to its supplier industries, most of which do not exist in developing countries when car manufacture is first contemplated. First, automobile production should only be introduced when most of the required raw materials, semi-finished and finished parts are already being produced satisfactorily for other consumers in the country. Second, automobile

production should begin with the import of materials and components until a demand is created which, combined with that of other existing consumers, is adequate to justify the gradual establishment of supplier industries.

88. It is improbable that adequate automotive supplier industries will exist in a country before the car industry is established there, because the industries which precede automobile manufacture (e.g. construction, textiles etc.) rarely require the materials and components needed for making vehicles. The advent of automobile production standardizes requirements for materials, components and spare parts and creates a general interest in and a uniform demand for them. Through the supplier of the licenser, the industry also provides a source of know-how for local supplier industries. Therefore, the second alternative is inevitable, and the resultant problems should be dealt with as effectively as possible.

89. The typical problems that arise from importing materials and components are as follows:

(a) Because of the difference in transport costs it may be cheaper to import certain finished parts than it is to import their raw material or semi-finished blanks.

(b) The import price of components and semi-finished parts, especially forgings, will be very high if the licenser modifies his products and discontinues his orders of the same parts.

(c) There are problems involved in packing, conserving etc., and in defining the responsibility for damages (supplier, shipper, port storage facilities). Returning faulty parts or materials to the supplier is expensive.

(d) Requirements for imported parts and materials are for relatively small quantities and comprise a large number of various specifications and dimensions. Only dealers and small wholesalers are interested in such small orders, and they will raise prices accordingly.

(e) A long delay before actual delivery of required materials makes it necessary to tie up funds in large stocks.

(f) The shortage of and restrictions with respect to the foreign currency necessary to import materials and components make it difficult to co-ordinate production and can cause stoppages.

Role of local entrepreneurs and authorities

90. The growth of a local supplier industry depends on the quality of the local licensees and on the regulations and contributions made by local authorities. Several important contributions can be made by the local groups. For one thing, they can exert the correct amount of pressure on the licenser, at the proper time, to increase domestic content by developing the supplier industry in the country. This has its drawbacks, but it has proved to be the most effective way of setting up the supplier industry in countries that are ready for it. Second, the local groups can assist in procuring the funds and foreign currency required to finance the purchase of investment goods, materials tools and other materials. In addition, they should avoid the premature assumption of projects that are financially, administratively and technically difficult. The local groups should also give appropriate subsidies and incentives and provide protection from imports.

Sources of know-how for the supplier industries

Raw materials

91. The know-how required for the production of raw materials and some of the semi-finished materials (e.g. sheet metal) must be procured by the developing countries for their metallurgical industry from suitable foreign collaborators.

Semi-finished parts

92. The manufacture of semi-finished parts (e.g. grey and steel castings, light metal and aluminium castings, malleable and dye castings, forgings etc.) is part of the matallurgical industry. However, the machined vehicle part is so dependent on the semi-finished part that know-how for its production should be obtained from the vehicle licenser himself. Semi-finished components are made in a separate factory connected with the car factory and other buyers of castings and forgings, e.g. the railway and other local industries. The technology should correspond to the requirements of the market as a whole.

Finished goods

93. The technology for the manufacture of finished goods is usually not directly under the control of the vehicle licenser, but it is in the possession

of his own suppliers. The only effective method by which the suppliers can be collectively brought to give this know-how is via the automotive licenser, who is one of their most important customers.

94. Specific problems may arise if a country has a number of different firms licensing the production of trucks, tractors and passenger cars. For example, these vehicles may have electrical components manufactured by different firms, e.g. Lucas, Bosch, Marelli and Bendix. Electrical equipment would then have to be produced in a small market under four different licences, unless the licensee can combine them or one of the licensers modifies his equipment for use in all vehicles. The vehicle licensers must approve such measures and may have to help modify their car to use a different make of electrical equipment from the one they purchase on their home market. This could create an awkward situation between the automotive manufacturers and their suppliers, who may be reluctant to have a competitive article of equipment built into a car which they have traditionally supplied at home.

95. Femsa, a company supplying electrical components in Spain, has licence agreements with Marelli, Lucas and Bendix, among others, and supplies parts to the Fiat, BMC (British Motor Corporation) and Citroen factories. Some of its products are an ingenious adaptation of the various licences; for example, the generator has been redesigned to be usable with slight alterations in more than one make of vehicle. In this way, a certain degree of standardization and rationale in economy of production is achieved without friction with the car or electrical component licensers.

96. Those providing technology for the production of supplier articles will assist their counterparts in developing countries to retain the goodwill of the vehicle licenser and prevent competitors from gaining access to him through his overseas licensees; earn royalties, know-how and dividends on their capital which will be larger than the same returns at home; secure indirect market access for some of their other products; and supply a limited amount of components to the licensee until local production starts, although this is less important.

97. However, the driving force in getting suppliers to establish licence operations overseas is the pressure that is brought on them to do so by their clients, the vehicle producers, who have started licensing operations abroad. Regulations compelling vehicle licensers to procure more parts locally, as a condition of doing business in the country, make them exert pressure on their suppliers to transmit know-how overseas.

V THE LICENSER'S REWARDS AND OBLIGATIONS

Rewards

98. The main interests that large international automotive corporations have in operating in developing countries are described below.

Direct marketing of components

99. Licensers wish to retain and extend their penetration in an important market or to introduce their products into an area which can absorb a large quantity of vehicles. They realize that sales must principally take the form of an export of parts to be completed by the local industry, rather than the simple delivery of built-up vehicles. This reduces the volume of their delivery per unit but ensures for them a larger share of the market than for makers delivering built-up units. Consequently, there is usually a considerable increase in a firm's sales when it starts a licensing operation, in spite of the decrease in parts supplied per unit of the products made under licence. This is illustrated in table 3 below.

Table 3

Licensers' deliveries before and during the build-up of a local industry

Year	Imports	Assembly	Manufacture (actual)			Last
	1	2	4	6	8	12
A. New registrations[a]	6,000	6,300	7,000	7,700	8,500	10,000
B. Number of suppliers	30	4	2	2	2	2
C. Average share of licenser (A ÷ B)	200	1,600	3,500	3,800	4,200	5,000
D. Per cent of vehicle supplied by licenser	100	80	60	40	30	10
E. Per cent of vehicle manufactured by licenser[b]	50	40	30	20	15	5
Average volume of business handled by the licenser (C x D)	200	1,280	2,100	1,520	1,260	500
Sales by the licenser of parts manufactured by him (C x E)	100	640	1,050	760	630	250

a/ In a specific range of vehicles, assuming an increase of about 5 per cent per year.

b/ Assuming that approximately 50 per cent of the parts supplied by the licenser are purchased by him from his suppliers.

100. The parts and operations which are initially handled locally by the licensee, are of less interest to the licenser. He is more concerned with increasing his sales of those mass-produced parts that have a long setting-up time, a short piece-time and require expensive tooling. He will therefore postpone the local manufacture of parts such as large body panels. Although this particular situation is of principal advantage to the licenser, it is also beneficial to the licensee, as such parts produce no direct conflict of interest between licenser and licensee. Seat (Spain) has wisely postponed local manufacture of body panels for some models of the cars made under Fiat licence. However, European car licensers complain that regulations in Iran dictate that body panels be made in the early stages of production. This will reduce the licensers' interest in automotive production there without any benefit to Iran.

101. A licensing operation ensures a certain amount of sales for the licenser and makes his volume of business more predictable. Some European firms do 15 per cent of their total business in sales of components and this often accounts for half of their exports.

102. Licensers are particularly interested in growing markets or those that provide access to still other markets through racial, commercial or political ties. Yugoslavia has been attractive to firms for the access it provides to other East European countries.

Indirect marketing advantages

103. Licensers can often sell more of their other vehicles or products, excepting those made under licence, as a result of the access which they acquire to the market in a country where they have a licensing operation.

Supply of equipment and raw materials

104. Licensers profit indirectly from their supplying of machine tools, special equipment and raw and semi-finished materials to their licensee. Most automotive plants built under licence are equipped with machinery of the same make as that used by their licenser. Special tools, dyes and jigs may be supplied by the licenser's own tool shop, while accessories, raw materials and semi-finished parts come from his subsidiaries or associates. The licenser's advantage is not necessarily only in direct commissions from the suppliers who get the business, but may also come from his influence and bargaining position

with such firms. Fiat may well expect such benefits from its supplying of equipment worth about US 100 million for production of the Fiat 124 in the Union of Soviet Socialist Republics.

International skills and image

105. The skills acquired in doing business overseas have a propaganda value that promotes sales and international recognition. It is no coincidence that the large automotive corporations are now subdivided into those having an international licensing organization (firms with up to 40 different licensees throughout the world) and those having none. The latter are, of course, having difficulty in retaining their export business.

Royalties and fees

106. The royalties and licence and know-how fees paid by the licensees help to meet the growing costs of technological research and product development now faced by most automotive firms. It is essential that the licenser be adequately compensated by such fees if he is to cover the expenses of transmitting his know-how and still retain a portion of the fees as a contribution towards development and research expenses.

Obligations

107. Automotive corporations must often undergo certain changes and make certain sacrifices for the sake of their licensees. For instance, the licenser should develop the ability to transmit know-how successfully through capable officers experienced with the problems in developing countries and the special approach required. He should also simplfy documents sent to developing countries, but at the same time ensure that appropriate information is given. The licenser should select efficient and energetic executives from his own plant to assist the licensee and to train local technicians on the job until they are proficient.

108. Another of the licenser's obligations is to adjust his own system at home to make it suitable to a licensing operation which involves the economical packing and shipment of car parts all over the world. He should bear in mind the problems that will be experienced by his licensee in the case of short shipments or damages during transport.

109. The licenser should invest in overseas manufacturing ventures that are economically sound, even if this means depriving his own projects of part of their resources. This may entail an assessment of the priority of safe but

marginally profitable projects at home versus overseas investments. The latter are more risky but provide marketing privileges and can be more profitable. In addition, the licenser should buy parts from his own subsidiaries to make up partially or totally for shipments to them. He must approach the problems that arise from such transactions as his own problems, as this type of compromise is an essential sales tool.

110. The licenser should expand efforts and resources to help his licensees in exporting parts of vehicles, although this will place an additional burden on his own marketing and servicing organizations. He should also use his influence to persuade his suppliers to begin licensing operations abroad.

VI CONCLUSIONS

111. A country must have a suitable industrial background and demand for vehicles before it starts to set up an automotive industry. The local authorities should then decide how many factories are to be set up to make vehicles, and select the appropriate types and models, the production capacity, the extent of incorporation of local parts and the licensers most suited to assist the industry. Local authorities must be prepared to give adequate support to the industry throughout its relatively long start-up period.

112. Automotive corporations should not allow competition among themselves to lead to the establishment of too many small factories in a country with a limited market. However, primary responsibility for preventing uneconomic duplication lies with the authorities in the developing countries.

113. Generally, the industry should be built up gradually and should progress through the following phases:

(a) Assembly of imported components;

(b) Manufacture of parts from imported materials, initially for buses and trucks, later for tractors, and ultimately for passenger cars;

(c) Purchase of components and materials from local factories to replace imports;

(d) Exchange of parts with the licenser;

(e) Exchange of parts with other licensees;

(f) Sharing of export markets with the licenser;

(g) Production of certain vehicles exclusively for the licenser's home demand and world market;

(h) Membership in an international group of licensees guided by the licenser and assisted in marketing and design by him.

114. International automotive corporations can play a leading role in this development by:

(a) Providing production know-how and assistance in design, and by establishing cost and inventory control systems;

(b) Assisting in management and the training of supervisors and workers, and inducing their suppliers to do the same for their counterparts in developing countries;

(c) Helping the licensee overcome problems of scale and foreign exchange limitations by providing export opportunities through their world-wide organizations;

(d) Indicating the best use of available foreign currency;

(e) Participating in financing.

115. Some of the large car-producers are interested in setting up manufacturing subsidiaries in developing countries in order to increase their share of the market in these countries. They are encouraged by the progress made in countries such as Brazil, Spain and Yugoslavia. In exchange for their efforts they expect special marketing advantages: profits from supplying equipment and raw material through their subsidiaries, associates and suppliers; and royalties and know-how fees that are greater than their expenses.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