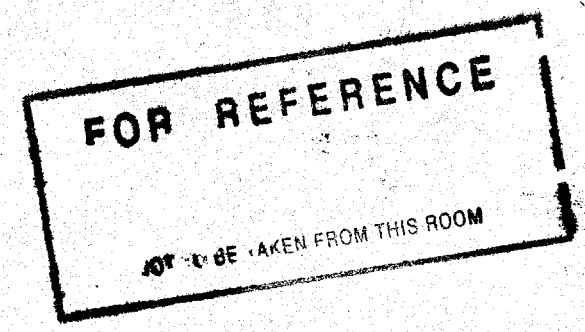

ANALYSIS OF THE TURKISH AUTOMOTIVE INDUSTRY AND FACTORS AFFECTING ITS DEVELOPMENT

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INTRODUCTION

STATEMENT OF THE PROBLEM

In a world where only the fittest can survive, it is evident that any country in the present situation of Turkey has to perform a rapid development in the economic and social aspects.

There are many views and theories about how to perform this accomplishment. Industrialization happens to be one of the most popular suggestions. In the meanwhile, it is worthwhile to mention that a certain amount of industrialization in the general sense has already been achieved.

The choice of the first large scale industry to start with under the "present" circumstances has always been an interesting subject for discussion in many circles. The automotive industry, for a considerably long time, has attracted many disciples and opponents and has been the focus of attention.

The procedure generally applied for evaluation of whether to invest is the feasibility analysis. Generally, to make this analysis more meaningful other alternatives should be considered and a comparative analyses be made. These analyses are considered to be beyond the scope of this study. However, analyzing the problem in this way, one inevitably neglects the

effects of some indirect and/or intangible factors which may be just as important as the tangible ones in providing an objective study.

The objective of this thesis, therefore, is: (a) to review briefly the factors leading to the choice or rejection of the automotive industry for Turkey; (b) to discuss the problems that should be considered; (c) and to suggest precautions that should be taken under the given circumstances.

Methodology

The automotive industry has been defined, its pertinent parameters described and the requirements on which it is based, are reviewed. The general development of the industry, its establishment in developing countries and the problems generally faced are discussed. Concrete examples are quoted.

The development of the industry in Turkey is summarized together with the existing problems. A systems approach is made to the economy and a model is discussed for positive future development.

Considering the fact that the establishment of the automotive industry is already under way, recommendations are made and discussed, to improve the present situation. The model is applied to a typical situation based on the given recommendations.

The production data have been obtained by means of a questionnaire sent to all vehicle manufacturers in Turkey, in December 1967. Other information and data have been obtained by interviewing

eminent persons belonging to the industry.

The fact that the author has been working part-time in the Turkish automotive industry for the last sixteen months has given him the opportunity to get in close contact with hundreds of people of all professions and numerous nationalities, related to the automotive industry. It is believed that these conversations have contributedconsiderably, in forming a general picture of the complex.

CHAPTER I

GENERAL DESCRIPTION OF THE AUTOMOTIVE INDUSTRY

Background

The automotive industry is a network of industries closely knit together. In producing a single vehicle, the outputs of many diverse industries are combined in an assembly line and into the final product. Not counting the processes for producing the needed capital goods and tools, the semi-finished inputs of a vehicle assembler are supplied by the

Steel Production and Alloying
Sheet Steel Forming
Engine and Engine Parts Manufacturing
Gear Manufacturing
Piping
Other Specialized Metal Forming and Heat Treating
Brake Equipment
Lining Manufacturing
Chrome Plating
Plastics
Spring Manufacturing
Rivet, Screw and Bolt
Rubber
Ignition Equipment
Fuel Injection Equipment
Glass
Meters and Gauges
Electronics
Electrical Motor and Generator Manufacturing
Paper
Paint
Lead and Lead Derivatives
Bearing
Carburation Equipment
Wire, Cable, Connector and Insulator
Asbestos

Carbon Brushes
Porcelain
Aluminum Producing and Working
Lock
Lighting Equipment

and other industries, and the degree of integration among these functions depends upon individual firm policies. All industries the outputs of which are utilized in one way or another by the vehicle manufacturers, are defined as "Supporting Industries".[1]

Since the automotive industry creates a demand for the products of these industries, it can be said that its establishment promotes investments and developments in these related fields, provided some conditions, mainly economical, are fulfilled.

Therefore, it is generally accepted that the automotive industry is the best complex of industries that will initiate an overall movement towards industrialization.

General Requirements for the Establishment of the Automotive Industry

The automobile itself, by nature, is a very complex product. It is composed of hundreds of subsystems and thousands of parts which have to function together towards a common goal. The total system is itself a dynamic one, and like hydrodynamic and aerodynamic models, its performance cannot be predetermined exactly on the design table, or by a physical model testing.

[1]It is difficult to define the boundaries of the automotive industry, especially of the supporting branches because a supporting function can be common to more than one complex.

This hypothesis is verified by the long change-over time of approximately two months, and the occasional call-backs. For the original starting and operation of the complex, there are a number of basic requirements which have to be present. These may be summarized as follows.

Technology

Technological know-how is a must for designing, manufacturing and improving a proper product at the industrial and engineering design levels, as well as at the production levels. A country must have its own technically oriented production personnel in order to perform the above mentioned functions.

The production line of an automotive plant has several unique characteristics. First of all, since the product is an extremely complex one, the number of production steps is extremely large. This fact can best be visualized by comparing the length of a typical consumer durable production to a vehicle assembly line. For example, the subsystems making up a refrigerator are quite few in number. This complete unit on the other hand, can serve the automotive industry as just a small subsystem, in the form of an air conditioner.

It can be said that the automotive production consists of a long main assembly line supplied by still longer numerous assembly lines. The capital equipment needed to make up such a complex assembly line is comperably very expensive. Therefore, even in the most modern plants, all the activities are directed towards a single assembly line, where all kinds of vehicles are produced. Seeing a tractor followed by a pick-up, which is leading a convertible is

not an uncommon in plants producing such diversified products.

All these products require different inputs. In addition to this, even similar automotive products are custom-made to a certain extent. The different colors, interior finishes, and optional equipment that can be fitted into today's automobile introduces unique problems into the production system.

Managerial Know-how

Large automotive plant are quite different from and significantly harder to manage than the small craft shops. They are not outsized craft shops as far as the managerial functions are concerned. Special kinds of experience, training, and education are needed by managers of such firms. The function of production planning and programming gains utmost importance, due to the need for perfect synchronization. The cost of an error is very high. Since the product itself and its components are bulky and heavy, a misplaced unit on any assembly line becomes a manace, and blocks the operation of the whole plant for a complete cycle.

The industrial design of the product is also of prime importance. Since international compatibility and competition is the major characteristic of the industry, the appearence and the extras given by the manufacturer become marginal and crucial elements of success.

Manpower

The labor input to the industry is substantial, even if a large amount of automation is employed. In spite of the fact that most of the factories use automatic machinery and equipment, the large number of operations force the industry to employ large number

of workers. The kind of labor is important is also important, and in order to perform a compatible function to the mentioned tasks of the management, a specially trained and experienced labor force is required. Turkey, in this respect, is in an advantageous position due to the large number of Turkish workers who are employed in the German automobile plants, and will return to their own country in the future as trained workers.

Supporting Industries

The industries which were introduced under the heading "General Description", as desirable outcomes of the automobile industry, are at the same time prerequisites to an extent. A proper automobile industry cannot be said to develop and exist unless a large percentage of the foresaid industries operate in the country.

Examining one of the major automotive industry centers of the world, it is worthwhile to note that firms of all sizes producing semi-finished inputs and auxiliary parts for the vehicle manufacturers are concentrated around the Detroit area.

The problems faced by these supporting industries are quite identical to those faced by the final assemblers themselves. A systems approacch to the situation would reveal that these supportin industries act as subsidiary branches feeding the main assembly line. Therefore, it is evident that they should normally produce under the same discipline and at a compatible rate and quality.

Capital

The automotive industry and its satelites require a vast sum of capital investment. All the machinery employed are special purpose equipment designed and oriented for a particular use. This fact

increases the initial cost of equipment while limiting its flexibility considerably. On the other hand, in most developing countries, alternative investment possibilities with equal rates of return, which require much smaller capital investments, discourage the enterpreneurs from being a small share holder in a large enterprise.

Meanwhile, since most of the necessary capital equipment is of foreign origin, large stocks of foreign cureency or credits are needed.

These shortages, together with the necessitiy of capital accumulation in order to initiate the establishment of manufacturing motor vehicles as an industry in the country, encourages the international giants to invest in developing countries.

Market Size

The size of the national market, generally is indicated as a direct factor affecting the economic development of a country. The same thing can be said for the automotive industry, also. In addition to the demand for the product, the size of the market affects the inputs to the industry.

Supporting industries, for example, which have wider markets for their different products can develop faster and better, and can therefore serve the automotive industry more effectively and more efficiently.

The technological developments, the advancements in managerial know-how, the availability of a large and qualified work force, and the accumulation of capital can take place more favourably in large markets. Therefore, it can be concluded that larger countries with larger markets have a distinct advantage over others in establishing the complex.

CHAPTER II

DEVELOPMENT OF AUTOMOTIVE INDUSTRY AND ITS REQUIREMENTS IN SPECIFIC SITUATIONS

Original Development of Automotive Industry and Developed Countries

It is practically impossible to visualize the original development of the automotive industry seperately from the industrial development histories of the economic leaders of the twentieth century, mainly because the evolution of the automotive industry itself has taken place in a similarly evolving environment.

The "General Motors Story" within the United States of America's industrial development is worth reviewing.[1]

Mr. Durand, the founder of the firm now known as G.M., was already in the carriage business, having started as a contractor, he then began assembling and finally manufacturing some components himself. Being an able businessman, he foresaw the future of the "Horseless Carriage" just at the time when Henry Ford started marketing the famous "Model T", and bought a bankrupt motor car factory, Buick. First, making use of his present carriage factory, and then as conditions changed, building new plants, he became the leader of the industry in

[1] A.D. Chandler, Jr, Strategy and Structure (The M.I.T. Press, Cambridge, Massachusetts, 1962), p. 114-162.

a few years.

Here, a point of interest, is that the "Horseless Carriage" industry has been regarded and treated as the continuation of the "Horsy Carriage" industry. Anyway, in those days there were many similarities between the two kinds of carriages mentioned above except for the power unit. However, as the product developed rapidly, the character of the industry producing it followed an equally ineresting course of development and finally turned into a different industrial complex.

During this evolution of the industry, various imperfections, along the vertical flowlines of materials, were detected. This problem was solved by vertically integrating the firms producing the semi-finished inputs used in the same line , extent of integration depending upon individual firm policies.

When one focuses his attention on the developed countries of the Western World, he sees that almost all of them already possess the automotive industry. A deeper survey reveals that these countries have long ago satisfied the basic requirements listed in Chapter I . Luxembourg can be listed as an example of a developed country not possessing the automotive industry because of its diminutive size, and Switzerland can be cited as an exception in spite of its small size.

The Case of the Underdeveloped Countries

The items listed in Chapter I , namely manpower, technology, managerial know-how, capital, supporting industries and a sufficient size, are the basic requirements a developing country has to satisfy in its course of development in order to start its automotive industry. Generally speaking, underdevelopment can be described as the lack of these factors and therefore it can be concluded that the country in question has to achieve a certain amount of economic and industrial development in order to initiate the automotive industry and that the automotive industry is not the first step to take in the course of development.

In the case of a developing country, a large scale investment does force the already scarce financial resources of the country and in most cases necessitates the presence of external long-term credits. In addition to this, the shortage of experience and know-how, and the present laws in most developing countries tend to promote foreign investors to make the necessary investments. Consequently, the already established automotive giants of the world become the prospective investors who tend to run the new-born branch for their very own benefits. A live example of this is illustrated in Chapter III, in the case of Spain. Therefore, one other problem faced by most developing countries is the risk of losing national control of a major industry.

CHAPTER III

SOME EXAMPLES OF AUTOMOTIVE INDUSTRY IN DEVELOPING COUNTRIES

While studying a developing sector in a country, it is normal to examine the course followed by the same sector in other countries which have recently passed through the same stage of development. The author finds it worthwhile, therefore to review briefly the development of the automotive industry in Spain, Mexico and India. These countries possess some of the characteristics of Turkey's industrial development problems.

Spain

ENASA-PEGASO.- The motor vehicle industry has a relatively long history in Spain. The first initiative came from Senòr Emilio de la Cuadra in 1888 as a company named Compania de Coches Automoviles which started producing passenger cars.

The activities of the firm were improved after it had been taken over by Hispano Suiza, in 1904. Cars manufactured under this name, until 1939, gained international fame as conneisseurs' collection items.

In 1946, Instituto Nacional de Industria (I.N.I.) [1] "bought" the firm and built a second factory near Madrid. The name of the firm was changed to Empresa Nacional de Autocamiones S. A. (E.N.A.S.A.).

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[1] INI, is an official institution directing all state economic enterprizes.

The capital investments in the firm consists of:

INI	$ 31,400,000.-
Leyland Motors Corp.....	2,500,000.-
Others	1,100,000.-
Total	$ 35,000,000.-

Leyland Motors Corporation, besides being a partner, acts as an adviser, a trainer and provides of licenses to manufacture components.

The total number of employees at the end of 1963 was 6930.

The firm produces heavy trucks, army vehicles, locomotives, diesel marine engines and buses. In addition to the above, Bosch fuel pumps and Allis Chalmers tractors are manufactured under license agreements.

All research and development is carried on by an independent division; Centro de Estudias Tecnicos de Automocion(C.E.T.A.)

All sales activities of the firm is handled by Commercial Pegaso S.A. , an independent firm owned 75% by E.N.A.S.A. and 25% by Leyland Motors Corporation.

The production rate of the firm became significant only after 1951 and the production figures for 1962 are

Light Trucks	3126
Heavy Trucks	1366
Light Buses	411
Heavy Buses	899
Total	5802

In 1963, the total production figure dropped to 5703 with a corresponding sales value of approximately $ 52,000,000.- . The contribution to sales, per employee, is calculated to be in the vicinity of $ 7,500.- .

SEAT.- Sociedat Espanola de Automotives de Turisma was established in May 9th, 1950 . The invested capital of the firm is $ 15,000,000.- , being distributed as:

INI	51 %
FIAT	12.5%
Others (Local Banks).....	36.5%
Total 100	%

At the end of 1964, the total number of employees was given as 6344, and daily production rates as

FIAT 1400 and 1500	50
FIAT 600 D	200

In 1965, however, SEAT nearly doubled its production to slightly more than 100,000 units per year, in order to comply with new regulations set up by the government.

The sales contribution per employee is calculated as $9566, and the firm distributed a dividend of 6 to 9% from its net income even at the lower production level of 1963.

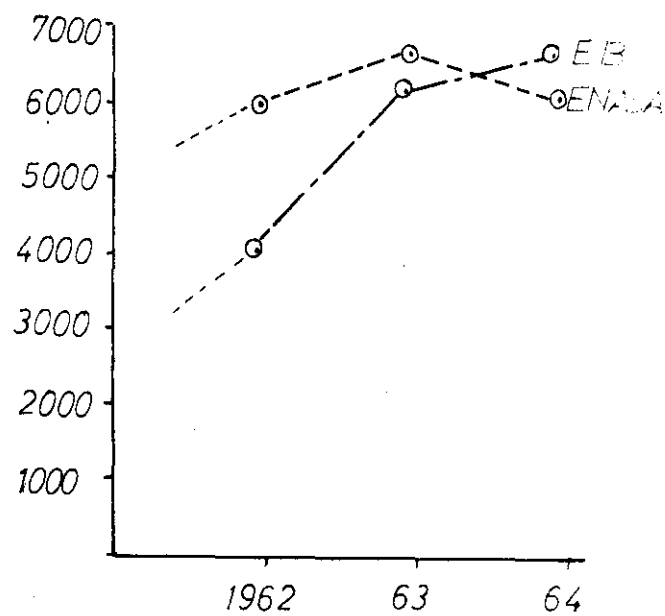
Barreiros.- Besides the above mentioned two institutions, the authority in the field representing private enterpreneurship is Eduardo Barreiros, a self-made millionaire, now governing a $ 100,000,000.- industrial complex. In November 1965, the number of the firms he owned or controlled was twenty three, with shares in six others.

Barreiros entered the motor business right after the second world war, and the first diesel engine (patented, but a "chinese-copy" of Perkins, G.B.) ran out of his assembly line in 1954. Trucks made by Barreiros, powered by Barreiros started to

be seen on Spanish roads since 1959.

About this time, General Francisco Franco decided to open Spain to foreign investment by joining the Organization for Economic Cooperation and Development (O.E.C.D.). One article of the newly made Spanish regulations related to foreign capital made it compulsory that the majority of the capital had to be of local origin. So, foreign investors had to find able, rich and reliable partners. At the time, nobody else, but Barreiros himself satisfied these requirements and in a short time formed ventures with D.V.A. , A.E.C. , David Brown, Hanomag, Gulf Oil and many others. He also formed E.F.I.S.A. , a finance company, in order to initiate time-payment sales.

The comparative truck sales of E.N.A.S.A and Barreiros is shown in the adjacent graph. In 1964, 2000 of E.N.A.S.A.'s trucks included in this chart were absorbed by the export market.



After saturating his share of the truck market, Barreiros turned to automobiles. Not to be constrained to the home market such as S.E.A.T. , Eduardo Barreiros started negotiations on export rights with his prospective partners. After the collapse of negotiations with numerous firms, an agreement was reached in June 1964 with

Chrysler International S.A. Geneva. The capital investment was distributed among the partners as shown below:

Chrysler International ... $ 20,000,000.-
Barreiros ..... $ 30,000,000.-

In 1965, the government established a barrier to the newcomers of the industry by imposing on each new venture a first-year production minimum of 100,000 cars; thus keeping other manufacturers out. A new decree imposing an 80% local content delayed Chryslers production for several months, however, the following year, in 1967, the local content was required to increase to 90% and engines too, were to be locally manufactured. Importing fenders and other body parts that follow the latest fashion of Detroit design has become a policy of the firm probably due to cost benefits. Assuming a 300-day working-year, 100,000 cars is approximately equal to four days' production of the U.S. automotive industry with a production value of 7,600,000 for 1963. Certainly producing parts that require very heavy presses and extremely expensive dies would only be economical at such large rates, if the model is to be changed yearly.

Near the end of 1965, Barreiros has put in a formal bid to buy S.N.A.S.A. , but was not permitted to do so.

In a recent reorganization activity in the Barreiros industrial complex; Chrysler International was given considerable control over all the Barreiros Group, in addition to the production of the Chrysler "Dart"(the model manufactured in Spain).

It is suspected that this concession given to Chrysler enabled Eduardo Barreiros to acquire stocks of Chrysler International in return;However, no evidence is available to prove the argument.

Out of 126,967 passenger cars registered in Spain in 1964, 119,510 were manufactured locally. The number of locally manufactured cars registered in 1965 reached 159,190, which is a remarkably high level. Data for the years 1966 and 1967 are not available but the level of production is known to have increased significantly.

Mexico

Similar to Turkey's situation, the main factor that initiated automotive manufacturing in Mexico is the shortage of foreign exchange. In order to save foreign currency and decrease the deficit in the balance of payments as well as help solve the unemployment problem, producing cars and trucks in Mexico was encouraged by the government.

In 1962, eleven companies, including General Motors, Ford and Chrysler, were producing thirty four different models employing 7500 with a total payroll of $ 12,000,000 per year. The total number of cars produced in 1962, barely reached 40,000.

After the government enforced a 60% local content, additional investments of $ 200,000,000.- for new plants increased output to 62,000 in 1964 and the measure decreased the number of firms to seven, producing fifteen models. Now, 15,500 employees are paid $ 26,000,000.- per annum.

It is a fact of interest that the manufacturing of parts and components was given special emphasis at the initial stage. Consequently, the big-three, Ford, G.M. and Chrysler, are now enjoying the benefits of this emphasis by using standardized transmissions, rear axles, brakes and clutches although each

manufacture their own engines. On the other hand vehicle manufacturers' biggest complaint is that government controlled prices and quotas let them barely break even.

In spite of this rapid development and increase in production figures, the number of cars per 1000 people is expected to rise to 27 in 1970 from 24 in 1965.

India

The automove industry had started originally in 1947 by C.K.D. assembly. Since then, significant developments in the supporting industries have been observed and at the moment, 257 subsidiary manufacturers produce parts such as wheels, engine valves, tie rods, clutch discs, braking equipment, fuel injection systems, shock absorbers, pistons, radiators, velve guides, inserts, flywheels, leaf springs, electrical components and other products.

At the end of 1967, six assemblers were producing at a yearly production rate of:

33618	Passenger Cars
31329	Trucks
10391	Jeeps

The supply is far from satisfying the demand and prospective customers have to deposit cash in a bank and wait three years for delivery. At the moment, the registered vehicles were:

343221	Passenger Cars,
377000	Trucks and buses
93000	Jeeps

It should be noted that presently, India's main problem is quite different in nature and magnitude and far more severe than ours.

CHAPTER IV

DEVELOPMENT OF AUTOMOTIVE INDUSTRY IN TURKEY

History

The history of the automotive industry in Turkey can be traced back to 1929, when Ford Motor Company opened a Completely Knocked Down (C.K.D.)[1] assembly plant in İstanbul (between Tophane and Salıpazarı) to serve Ford's Near Eastern markets. However, the operations had to be ceased in 1932 due to:

1. The ideas of a political power group that did not favour the operations of foreign firms in Turkey, due to her experience with capitulations, and tended to ban their operations.

2. The fact that constant denounciations[2] of unknown persons kept the firm from operating normally,

and the firm decided to carry the plant elsewhere. Consequently, in 1932, the plant was moved to Alexandria and Bucarest where production seemed to be more profitable.

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[1] C.K.D. Completely Knocked Down - The principle of importing the smallest divisible components and assembling them locally. The degree of divisibility and thus the definition of C.K.D. have always been controversial topics.

[2] Turkish Customs Laws offered prizes to denouncers of illegal activities. All inputs of the Ford assembly plant were imported tax-free. Prize-hopers kept denouncing the government officials that the imported goods were sold in the local market instead of being used as factory inputs. Inspite of the fact that no such evidence was found, officials acquired an anti-Ford attitude and curtailed their operations.

After an intermission of more than twenty years, the automotive industry reappeared on the scene in the form of a different product- the Minneapolis-Moline tractor -. A short analysis of the situation would reveal the conditions that lead to this decision at that time.

During the first half of the century, the largest portion of Turkey's G.N.P. had been a result of agricultural activities which by no means were carried out in modern and efficient ways. The total number of tractors operating in 1938 was approximately 3500, while this number increased very insignificantly during the following decade, to 4000 in 1950.

The sudden introduction of an extremely liberal regime in 1950, induced the bulk import of about 40,000 tractors of fifty different makes into the country in a very short period of four years. Lack of planning and proper controls introduced many economic and practical problems such as:

1. The lack of "machinery concept" and general knowledge among the farmer users caused abuses, mishandling and waste of equipment.

2. The diversity of brands and models rendered training of customers (farmers) uneconomical and almost impossible.

3. The diversity of brands and models also rendered the training of service personnel and carrying an inventory of spare parts uneconomical, as well as impractical.

The presence of the above factors caused a large number of the foresaid tractors to become inoperative in the next few years.

In the meantime, Turkey's foreign exchange reserves decreased to a very low level while the balance of payments

X showed a constant deficit. However, inspite of the misuse of the previously imported tractors, the advantages of modern methods had once been demonstrated, and therefore the demand for modern agricultural machinery increased substantially.

Taking the demand for tractors, their marginal productivity, the expensive lesson learned and Turkey's foreign trade position into consideration, it was suggested that standardized local production of tractors would be the best alternative.

The erection of the Minneapolis-Moline-Türk plant was based on the assumption that the factory which would start with simple assembly work, would shortly gear itself up for local manufacturing to achieve a target value of 80% local production in ten years. Unfortunately this optimistic plan could not be carried out due to various reasons.

X + One other step taken towards establishing an automotive industry in Turkey is the construction of a "100 % Turkish" prototype, namely the "Devrim" which can be regarded as an action of prestige to prove that cars could be manufactured in the country. The astronomically high costs of the three units made should not be included in any analysis for the very reason that being prototypes, every component that went into them was custom made.

In the meanwhile, following the tractor assembly plant, several other assembly plants, producing trucks and buses have been opened - for example Otosan 1960, Chrysler 1962, Otobüs Karoseri Sanayii A.Ş. 1963 etc.

The Turkish Automotive Industry As It Is Today and Its Problems

In order not to repeat the mistake faced with the tractors during early 1950's, and to have positive control over all assembler/manufacturers, a decree was issued on 14th April, 1964[1]. This decree has laid the principle regulations concerning thirteen different products, three of which are of interest to the subject, namely:

1. Agricultural machines
2. Trucks, pickups and other commercial vehicles
3. Buses

This decree defines the "foreign exchange savings ratio" as:

$$\frac{a - b}{a}$$ where

a = Factory export price of complete product at mother firm's country,

b = Factory export price of all components necessary to assemble the product in Turkey. It is evident that this value excludes parts manufactured locall

A more popular expression currently used for foreign exchange savings ratio is "local percentage" and it is worthwhile to note that this ratio is determined indirectly as:

1 - Imported Percentage

because it is rightly predicted that using local costs for parts manufactured within the country would easily be abused as well as misleading for this purpose.

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[1] T.C. Resmî Gazete, Montaj Sanayii Talimatı, 14 Nisan 1964 Salı, Sayı 11682.

The foresaid decree, number 6/2905, sets minimum technical, financial and administrative facility limits for firms already in the "assembly industry" as well as those that will join in the future. Most important of all, obligatory minimum local percentages are set at a yearly increasing basis and yearly regulations are issued listing parts, the importation of which is prohibited.

The minimum local percentages for commercial vehicles have been set as:

Years	% Local
1964	20
1965	30
1966	40
1967	45
1968	50

It is also emphasized that newcomers to the industry have to comply with all the regulations including the local percentage at the time of their entry.

At the beginning of 1968, these firms operating under the explained regulations and producing vehicles in Turkey can be listed as:

Firm	Products
B.M.C. (İzmir)	Trucks, Tractors, Light Buses
Chrysler	Trucks, Pick-ups
Çelik Montaj	Pick-ups, Motorcycles
Çiftçiler	Light Buses
Genoto	Trucks, Pick-ups
M.A.N.	Trucks
Motorlu Araçlar(uses TOMS plant)	Trucks
Minneapolis (FIAT)	Tractors
M.K.M.K.	Tractors
Otomarsan	Buses
Otosan	Trucks, Light Buses, Anadol
Otoyol	Trailers, Trucks, Truck-tractors

Taşıt Sanayii(Mersin)	Heavy Trucks
Uzel	Tractors
Ünver	Trucks ,Large and Small Buses
Verdi	Jeeps
Zirai Donatım Kurumu	Tractors
Mataş(uses Ünver's Plant)	Land-Rovers

Most assemblers today are of the opinion that selling their products has not been a problem, but the main competition exists in acquiring the import permits and foreign exchange allocations for imported components from a quota. The allocations are made on a point system, according to the decree. The whole of the quota is divided in three main groups, as indicated below according to the given percentages:

Capital	35 %
Labor	15 %
Foreign Exchange Saving .	50 %

Then each subgroup is redivided among applying assemblers according to their respective figures.

It is also emphasized that due to the underallocation of foreign exchange, all the plants are operating at less than full capacity.

Inspite of all the shortcomings of the present status-quo, some of the benefits it has given to Turkey's industry is summarized by an authority as[1]:

1. It has initiated the notion of "assembly line".
2. The lack of qualified assembly line workmanship has been realized.
3. It has helped train qualified workers in order to meet todays modern industrial requirements.

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[1] A conference by Mr. Ahmet Binbir, General Manager of Otosan, 4th April 1968, Social Hall, Robert College.

The same authority described the Turkish automotive industry by giving the following values for the end of 1967.

Total Investment	T.L. 300,000,000.-
Capital Investment(i.e. machinery and equipment)	T.L. 150,000,000.-

It was also added that approximately 14300 were employed by the assemblers at the same time. The number of firms, other than the assemblers, supplying the industry is quoted to be approximately 150 (most of them concentrated in the İstanbul area) by the same lecturer.

A breakdown of Turkish vehicle production figures is presented in the appendix. The information obtained is the result of a questionnaire given to vehicle manufacturers. Strict company policies kept the author from learning the values in some cases.

One main problem faced by the Turkish vehicle manufacturers today is the non-synchronized situation of the supporting industries. Each manufacturer, to comply with the domestic percentage regulations, arranges facilities for producing components locally, however, since no co-operation and co-ordination exists, everyone of them tries to solve its own problems. Common goals, such as manufacturing radiators locally, are handled seperately and therefore the efficiency and quality can not surpass a certain level.

One other limitation of the supporting industries, as quoted by an interviewee[1] is their shortage of know-how (both technical and managerial)and financial resources. In some cases,

[1] An interview has been made with Mr. Güven Osma, Koç Holding Company, 1968, on present problems of the industry.

contractors had to be financed, trained and their firms reorganized for them. Only then, it was emphasized, that subcontractors could be dependable.

One other shortcoming of the present system was indicated to be on the demand side. In the previous chapters, the importance of capital accumulation was explained and related to the starting of such an industry. The same factor also determines the purchasing power of the market. The writer has been told on several accasions that the shortage of capital has been limiting the highly potential market from absorbing the outputs. It has also been added that at this level of output, this shortage has not yet been a trouble, but unless a sound financing system is established, automotive production can not reach the very high levels of production some of the developing countries have already achieved.

CHAPTER V

RELEVANT ASPECTS OF THE AUTOMOTIVE INDUSTRY IN TURKEY

Significant Factors of Economic Feasibility

In analyzing the economic feasibility of the automotive industry as applied to Turkey, special consideration is to be given to the evaluation of two main factors, which affect the feasibility greatly. These factors, which will be briefly discussed here, are demand and the variation of unit costs versus the volume of production.

Demand.- The second five year plan of the Turkish Republic[1] quotes the demand figures for motor vehicles as:

TABLE 1
DEMAND FIGURES FOR MOTOR VEHICLES

Years	1962	1967	1972
Commercial Vehicles (Trucks, Pick-ups etc.)	14817	7500	12000
Buses and Light Buses	3329	2000	3900
Passenger Cars	4050	16000	31000

It is explained that the values obtained for this table are results of an extrapolation process using the input transactions

[1] Başbakanlık Devlet Planlama Teşkilatı, İkinci Beş Yıllık Kalkınma Planı, Ankara, Kasım 1967, p. 517, Tablo 330.

of the park[1] as data. In other words, the analysis is a projection of supply rather than demand. It is also added that, since the inputs of the park were far from satisfying the demand at the respective times, the projections obtained will also be considerably lower than the real demand. A concrete example of this effect can be observed in the figures given for tractors[2]. The demand figure given for tractors for the year 1967 is 6600, while the real figures of production for the same year appears to be nearly twice that value, if referred to the production figures cited in the appendix of this thesis. In addition to this, the fact that long waiting lines still exist for tractors, proves that the market is not yet satisfied.

A miscellaneous factor misleading the projections made by official circles in Turkey is the discrepancy between the allocated number of units and the real production figures. Importable goods into Turkey are divided into two categories by the regime. The first category is the "liberation list", the items of which are importable at will. The second category is composed of quota items, importable only through allocations and licenses. Some of the parts and components that constitute the C.K.D. inputs of a typical Turkish assembly plant belong to the first list while the rest belong to the second, when reviewed item by item. On the other hand, all the imported inputs of an assembly plant are allocated as explained in Chapter IV.

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[1]The park of a country is defined as the sum of the registered vehicles in operation.

[2]B.D.P.T. İkinci Beş Yıllık Kalkınma Planı, p.499.

In order to assemble more units than allocated, some assemblers import only parts belonging to the second list, using their allocation. The rest of the material, belonging to the liberation list, is imported normally at the required quantities to complete the otherwise obtained components.

Although this procedure is not controlled by official circles, few assemblers admit this action unofficially.

One other analysis supporting the hypothesis that the real potential is substantially higher than estimations made using the foresaid methods, is made, ~~by Otomobil Endüstrisi Etüd ve Organizasyon Kurulu.~~ The per-capita-incomes of ~~fourty six~~ countries of different economic structures and their populations per passenger car are plotted versus eachother, and a hypothetical curve is fitted to the points[1]. The data required for the analysis had been taken from U.N. Statistics, 1960.

Assuming no shifting of the curve since the time of calculation, and substituting the current per-capita-income of the Turkish Republic, a theoretical answer of approximately 102 people per car is obtained. This value is significantly lower than the actual population-car ratio of 282[2]. Table 2 and figure 1 reflect this analysis.

Based on the above discussion, one can conclude that the figures given by the State Planning Organization can only be considered as a pessimistic projection.

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[1] T.C. Sanayi Bakanlığı, Otomobil Endüstrisi Etüd ve Organizasyon Kurulu, Türkiye'de Otomobil Endüstrisi Hakkında Rapor, Eylül, 1962.

[2] B.D.P.T. İkinci Beş Yıllık Kalkınma Planı Hazırlık Çalışmaları, Karayolu Taşıması Raporu.

TABLE 2

PER-CAPITA-INCOMES AND POPULATIONS PER CAR OF SIGNIFICANT COUNTRIES

Country	Per-Capita-Income U.S. $	Population Per Car [1]
South Korea	131.87	1921
Pakistan	53	1800
India	65.62	1600
Turkey	179.21	718
Japan	297	290
Greece	304.35	208
Spain	263	176
Mexico	262	76
Italy	457	30
West Germany	869	13.5
Great Britain	1017.50	10.9
France	875	9

Equation of line fitted:

$$y = 101.82 \cdot 10^{4}x^{-1.635}$$

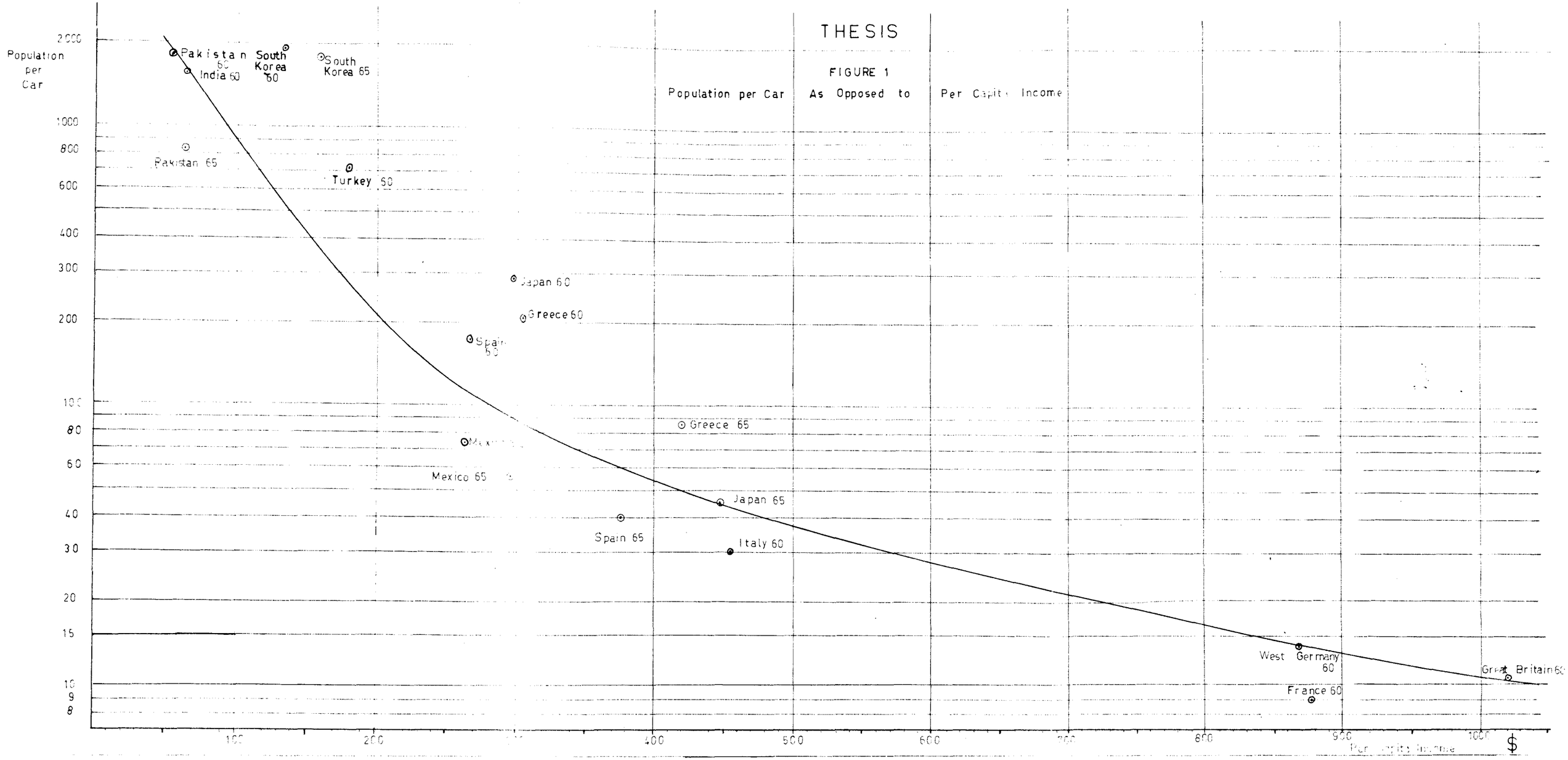
~~For the sake of convenience, the original table of fourty six countries has been abridged to twelve.~~

[1] All sizes of cars are included in these analyses and no discriminations are made between cheap and luxury cars. They are

THESIS

FIGURE 1

Population per Car As Opposed to Per Capita Income



Demand Forecast for the Turkish Automobile Market

Taking the limitations of the presently made forecasts into consideration, it is attempted to approach the question from a different angle. Data provided by Otomobil Endüstrisi Etüd ve Organizasyon Kurulu was used for this.

The curve in Figure I is tested against the data obtained for 1965,[1] and it is seen that the randomly chosen nations have changed their respective places, but have followed the general trend of the curve. The large number of countries (namely 46) contributing to the curve is an important factor that decreases the time-sensitiveness of the curve. Moreover, by including many countries at different levels of development a more representative picture of the situation has been given. Therefore, the remaining part of the analysis will be based on the assumption that no shift will occur in the curve as a function of time, especially for a period of only eighteen years.

The assumptions on which the discussion is based are:

a) A 7% annual increase of GNP in Turkey at 1960 constant prices
b) A 3% increase in population per annum
c) Thus, as a result, an increase of 4% per year in the net per capita income

Turkey's present position, $285.00 per capita income and 282 people per car, are plotted on the above mentioned graph. The revisions are shown in Figure Ia. It is assumed that Turkey's population per car value will linearly (on semilog coordinate axis)

[1] Detailed data is tabulated in the appendix.

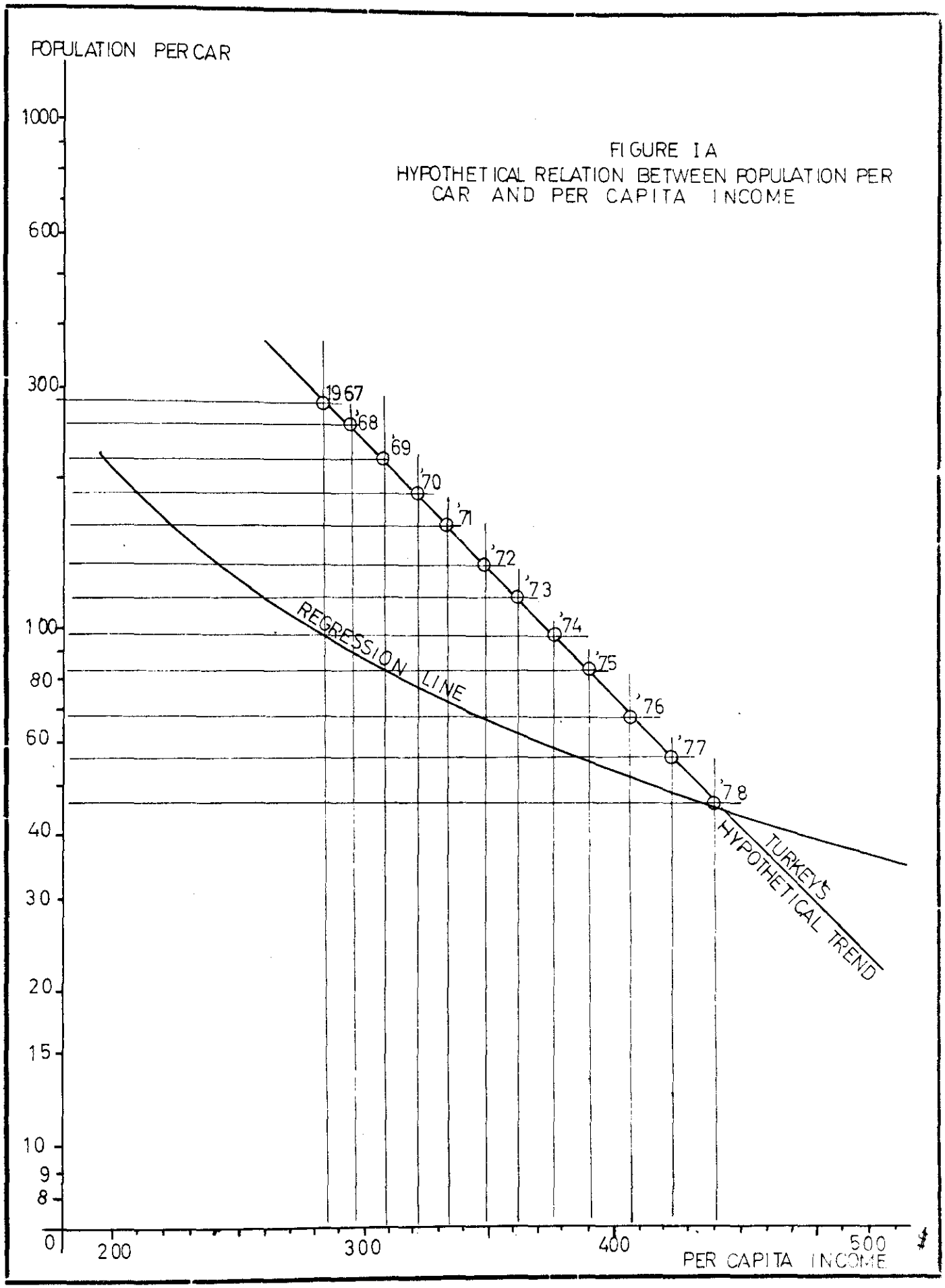


FIGURE IA
HYPOTHETICAL RELATION BETWEEN POPULATION PER CAR AND PER CAPITA INCOME

approach the previously obtained regression line, by the end of the third planning period (1978), since the latter can be assumed linear in such a short interval.

TABLE 2a

CALCULATION OF NET INCREASE
IN THE AUTOMOBILE PARK

(1)	(2)	(3)	(4)	(5)	(6)
Year	Per Cap. Inc. $	Population (1000)	Pop./car	No. of Cars (1000)	Net inc. cars (1000)
1967	285	31,000	282	109	-
1968	296	31,900	255	125	16
1969	308	32,850	218	150	25
1970	321	33,800	185	182	32
1971	334	34,800	160	217	35
1972	347	35,850	135	265	48
1973	361	36,950	115	320	55
1974	376	38,000	97	391	71
1975	391	39,100	84	465	74
1976	407	40,300	68	592	127
1977	423	41,500	56	741	148
1978	440	42,750	46	929	188

The per capita income of Turkey between the years 1968 and 1978 are calculated at a 4% compounded yearly increase and tabulated in Table 2a above, in colounn (2). The population is calculated at a 3% annual increase in column (3). A line joining the 1967 point, and the regression line at 1978 per capita income is dra

with markings of yearly increments. The population per car values are obtained by reflecting the calculated per capita incomes from this line, and tabulated in column (4). Dividing column (3) by column (4), the total number of the registered cars for the future years are obtained, in column (5). The net increase in the park for the year is calculated by subtracting the total value of the previous year from the present year, and is shown in column (6).

The values thus obtained represent the net increase in the park, which is only one part of the total demand. The replacement demand, which is the other part of the total, is calculated as follows.

The scrap rates for vehicles in Turkey are given by the State Planning Organization as follows[1]

For 100 vehicles registered at year 0

Year	Scrap percentage
0	0
1	1
2	1
3	1
4	2
5	2
6	3
7	4
8	4
9	5
10	6
11	8
12	9
13	10
14	11
15	12
16	10
17	6
18	4
19	1
20	0

[1] TC DPT Birinci Beş Yıllık Kalkınma Planı Hazırlık Çalışmaları, Karayolu Taşıması (Ankara, Nisan 1964), p.29

This scale has been placed with year 0 corresponding to each year's marginal increase, and the resulting replacement demand calculated for each year, from the first to the twentieth. The total replacement values corresponding to the respective years are tabulated in column (4) , and the total demand in column (5) in Table 2b

TABLE 2b

DEMAND FOR AUTOMOBİLES - (1968-1978)

(1) Year	(2) No. of Cars (1000)	(3) Net inc. in Cars (1000)	(4) Replacements (1000)	(5) Total Demand (1000)
1948	8.0	-	-	-
1949	10.0	2.0	-	-
1950	13.4	3.4	-	-
1951	16.4	3.0	-	-
1952	25.9	9.5	-	-
1953	27.6	1.7	-	-
1954	28.6	1.0	-	-
1955	29.9	1.3	-	-
1956	33.3	3.4	-	-
1957	36.7	3.3	-	-
1958	34.2	1.5	-	-
1959	37.6	3.4	-	-
1960	45.8	8.2	-	-
1961	52.3	6.5	-	-
1962	60.7	8.4	-	-
1963	72.0	11.3	-	-
1964	74.0	2.0	-	-
1965	90.0	16.0	-	-
1966	106.0	16.0	-	-
1967	109.0	3.0	-	-
1968	125.0	16.0	5.8	21.8
1969	150.0	25.0	5.6	30.6
1970	182.0	32.0	5.4	37.4
1971	217.0	35.0	5.6	40.6
1972	265.0	48.0	6.2	54.2
1973	320.0	55.0	7.1	62.1
1974	391.0	71.0	8.5	79.5
1975	465.0	74.0	11.3	85.3
1976	592.0	127.0	13.7	140.7
1977	741.0	148.0	16.4	164.4
1978	929.0	188.0	20.0	208.0

Volume and Costs.- The volume of production is a very important factor in determining unit costs, especially in industries where large capital investments are required. The magnitude of fixed costs are the main determinant of this phenomenon.

Although the relationships between volume and costs are kept as strictly confidential figures by most vehicle manufacturers, some figures could be obtained. In Figure 2, the data are presented in graphical form and show the relative factory costs as percentages of costs at mother firm factories versus yearly production volume[1].

The curves marked "ideal" were obtained from Ford Motor Company, Dagenham,G.B. for conditions prevailing in England. It is reported that the curve for commercial vehicles cuts the 100% line at 60,000 units. This means that the firm has to produce 60,000 units per year in order to preserve the present costs per vehicle.

The other curves are given by FIAT and Chrysler International S.A. respectively, for 100% local production in Turkey. The difference in costs for a given volume between "home" operations and those in Turkey are explained by those prospective investors as mainly due to the difference in the prices of different inputs. For example, sheet steel prices in Turkey are considerably higher than abroad although sheet steel is locally manufactured.

Another distinct difference of costs is observed between

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[1]Otomobil Endüstrisi Etüd ve Organizasyon Kurulu, Op.Cit.

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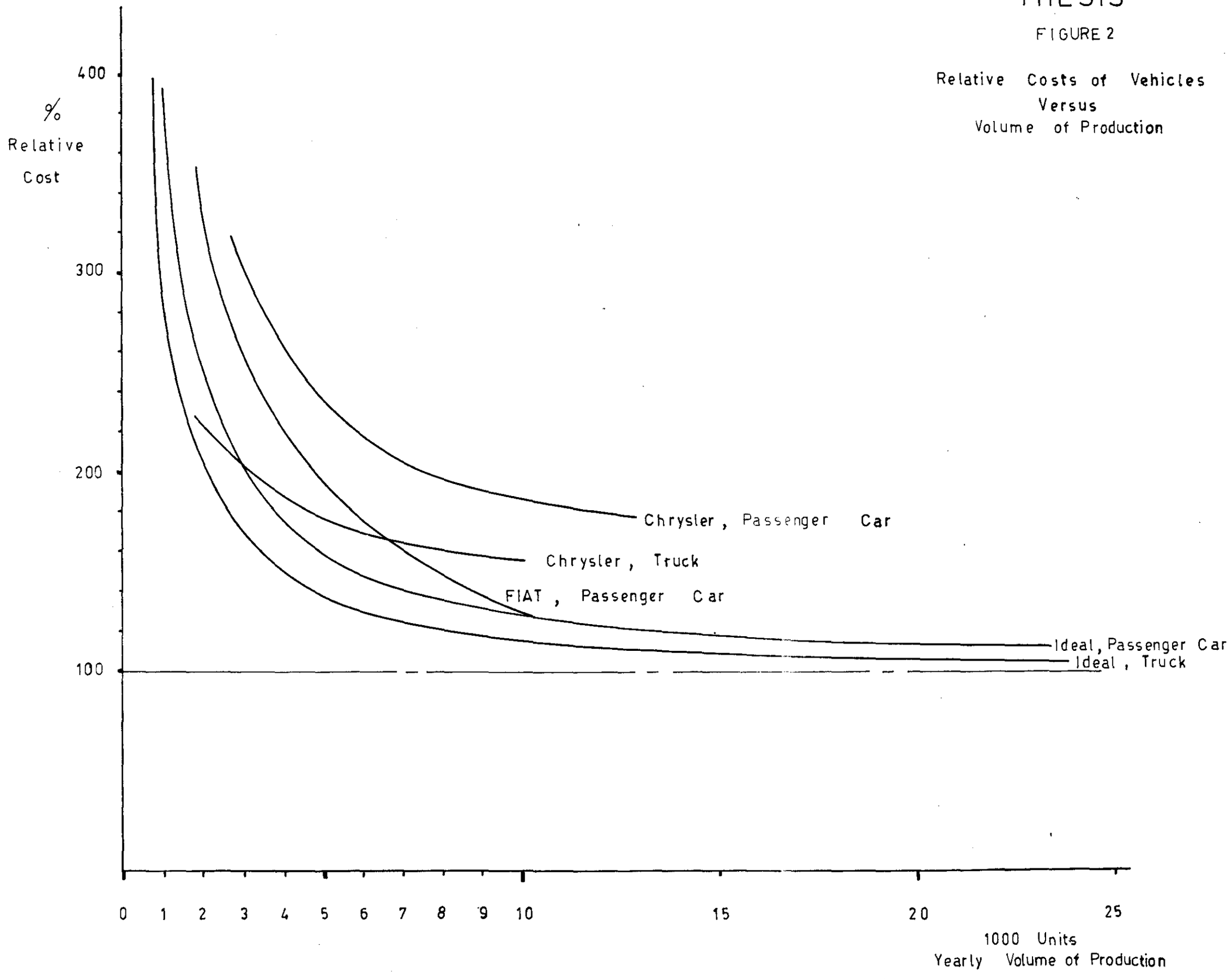
FIGURE 2

Relative Costs of Vehicles
Versus
Volume of Production



the figures given by Chrysler and FIAT for passenger cars to be manufactured in Turkey. This difference is said to be mainly due to the following reasons[1];

1. Different natures of each end product, in other words, the design features of the products are not similar. (Refer to Chapter VI, design features)

2. FIAT's policy of vertical (besides horizontal) integration enables them to manufacture most of their semi-finished parts and components themselves. This coordination helps them decrease the costs of their final products. [A similar effect is reflected for General Motors in the U.S. in comparison to other competitors[2].]

3. FIAT's previous experience has enabled them to gain a special kind of know-how in this kind of investment. (For example the cases for Spain, Yugoslavia and U.S.S.R.)

In spite of all the explanations given in order to rationalize the given information, the author is inclined to think of the latter as not extremely reliable. The reasons being (a) the indirectness of the data and (b) the possibility of having a bias either in the part of the prospective investor or the "Otomobil Endüstrisi Etüd ve Organizasyon Kurulu" reports.

Table 3 is also given by the same source. It is intended to give the values of major components forming a vehicle, as percentages of the whole. The tabulated values represent the means of the values obtained for different countries, and therefore are for a "typical" vehicle, and not necessarily applicable to Turkey.

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[1] Ibid.

[2] A.D. Chandler Jr, Strategy and Structure, p.114-162.

TABLE 3

VALUE OF MAJOR COMPONENTS AS PERCENT OF TOTAL VEHICLE

Component	Value as Percent of Total Vehicle		
	Passenger Car	Truck	Bus
Engine	12	15	11
Gearbox	4	5	4
Transmission	4	5	4
Differential	4	5	4
Front Axle	4.5	5	4
Rear Axle	6.5	8	6
Wheels and Brakes	8	10	10
Tires	4.5	7	5
Electrical Components	4	4	4
Fuel System	3	3	2
Steering Mechanism	5	5	3
Chasis and suspension	15	17	15
Radiator	1.5	2	1.5
Body	22	7	25
Gauges	2	2	1.5
Total	100.0	100.0	100.0

Since the aim of this thesis is far from obtaining exact solutions, and no better information is available, the model to be constructed will be based on the already discussed data, bearing in mind its limitations.

(10) Improve for Turkish E.C.

Effect on the Whole Economy and Industrial Development

Besides being analyzed singularly, a systems approach to the whole Turkish Economy will benefit to evaluate the effects of the automotive industry in general.

Taking the orbital[1] characteristic of the automotive industry into consideration, it would not be unwise to predict that an investment at the center, would increase demand from the sattelites and therefore promote investments in one or more of the supporting industries.

In addition to the supporting industries, the need for a "sales and service" force is quite evident for Turkey. Presently, the concept of service has not gone any far beyond the step of the cornershop mechanic whose technical competence leaves much to be discussed. The potential of this market should not be ignored. A quick glance at India's figures would reveal the fact that against 50,000 employed by manufacturers, another 50,000 employees work for distribution and sales, not counting services. A brief reference to Chapter III (India)would disclose that the marginal magnitudes quoted for India are of approximately the same

[1]The whole automotive industry complex can be resembled to the solar system; assembly being the nucleus and many different supporting industries orbiting anound the nucleus.

order of magnitude of the demand of the Turkish market. Therefore, the number of employees in India's sales and distributin might be expected to form a guideline for Turkey's future sales personnel.

In short, this and similar chains of functions would initiate a kind of multiplier effect which could even go as far as increasing the demand for the final product due to the increased income levels of more people.

One other approaching set of conditions is the entry of Turkey into the European Common Market. The abolition of tariff barriers has been cited by members as a major requirement for acceptance as full member. Evidently entering the common market with a collection of "infant industries" would handicap a country. Because the economical operations of the newly founded industries, in this case the automotive industry, would need some time for development, it is imperative that quick decisions and actions are taken in order to maximize the time span between the start of the industry and the time of entry to the Common Market.

Other Intangible Factors

The large complex of the automotive industry would certainly have an effect on the social structure of the country. Some problems, such as unemployment, would tend to be favourably modified. The fact that the present activities tend to centralize around large cities, especially Istanbul, does not seem very promising to change the present trend of the population of concentrating at certain areas. However, this trend seems common to most count-

ries in similar conditions and the drawbacks and virtues of the latter are beyond the scope of this study.

Needless to say, the fringe benefits of similar large investments are considerable and have improved educational, health, housing, recreational and similar benefits all over the world.

Another factor in favor of the automotive industry is the concept of national pride. The desire of using a product of the country is significantly high and when combined with individual pride, usually symbolized by the ownership of a car, completes the picture from the psychological angle.

In addition to all these, the flexible character of the complex would enable a vast increase in the production capacities of consumer durables as well as industrial capital goods. For example, the development of a gear and gear train industry would not only supply the automotive industry with gearboxes, but also it would serve the machine-tool industry, the textile machinery industry, the farming equipment industry, industrial control mechanisms industry, the shipbuilding industry and the like. Parallel to this, it must also be noted that the establishment of the automotive industry would have some strategic (military) benefits which can even affect the international policies of Turkey, by eventually decreasing her dependence on military equipment of foreign origin.

A Model

Summarizing the above discussed facts and criterion, one can be inclined to think that the turkish automotive industry is doomed to operate at a lesser efficiency than other industrial giants abroad. Adding to this the law of comparative advantage, the wrong conclusion that can be made would be to declare that the Turkish automotive industry would be operating at a loss to the Turkish Economy equal to the difference in efficiency between Turkish and mother-firm production, converted into monetary terms.

However, referring to the tangible and intangible fringe benefits of having the industry established, one would realize that these benefits can not be obtained free of charge.

Therefore, the loss incurred due to the difference in efficiency can be regarded as the price of obtaining the foresaid benefits.

Figure 3 illustrates the argument graphically. The quantities used are:

N = Number of units produced in Turkey

Y = Number of units produced in mother-firm

100 = Relative cost of production of mother-firm, expressed as a percentage of itself

A = Relative cost of production corresponding to N

C = A - 100, Turkey's loss in efficiency due to low volume of production

U = Unit cost of product in Turkey, in monetary terms

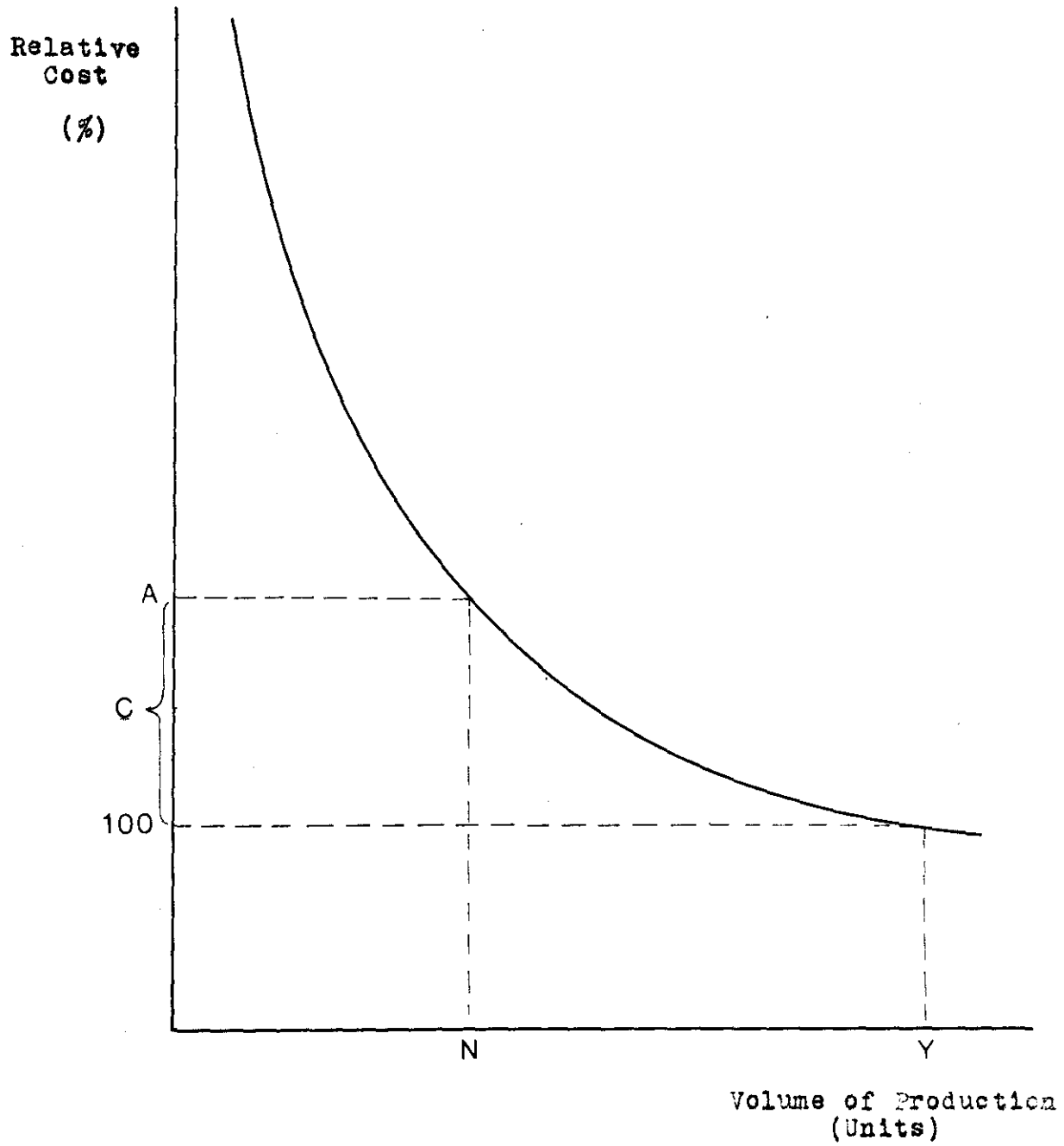

FIGURE 3

GRAPHICAL REPRESENTATION OF MODEL

The difference in efficiency per unit as a percentage of the total local cost per unit is

$$\frac{C}{A} = \frac{A - 100}{A}$$

Converting into monetary terms, the above expression is multiplied by the unit cost

$$\frac{C}{A} \cdot U$$

Finally, L, the total economic cost[1], for N units of vehicles is given by:

$$(1) \qquad L = \frac{C}{A} \cdot U \cdot N \qquad \text{T.L. per year}$$

On the other hand, if all the fringe benefits of establishing the automotive industry in Turkey were to be listed and evaluated on the basis of their contribution to the economy, per year, a table similar to the one below would have originated:

TABLE 4

CONTRIBUTIONS OF FRINGE BENEFITS
OBTAINED BY ESTABLISHING THE
AUTOMOTIVE INDUSTRY IN TURKEY - A MODEL

Item	Contribution to the Economy (T.L.)
Housing	a
Education facilities and services	b

[1] Economic Cost: The international value of the marginal

TABLE 4

Continued

Item	Contribution to the Economy (T.L.)
Training of Engineers and Other Technical Personnel	c
Training of Workers	d
Management Development	e
Community Development	f
New Employment Opportunities	g
Positive Effects on the Development of Supporting Industries	h
Health and Welfare Services	i
Recreational Facilities	j
Less Dependence on Other Nations for Vitally Needed Vehicles and Parts Which May Also Lead to a More Advantageous International Political Status	k
Other Miscellaneous Benefits	l
Total of Contributions	B T.L. per year

The next step is to compare B and (1) to see if Turkey really is at an economic loss. The difference between economic cost and the total of contributions

$$L - B$$

output that can be obtained by reallocating resources in a more optimal way.

is the net loss to the economy due to a low volume of production. A negative value would mean that in spite of her inefficiencies due to a low volume, Turkey is operating on the positive side of the break even point.

No matter what is being said for and against the establishment of the automotive industry in Turkey, intense activity for its development is under way.

Therefore it would be wise to consider factors that should be analyzed and pitfalls that should be avoided while proceeding towards this goal. This has been attempted in the next section.

CHAPTER VI

RECOMMENDATIONS

Before going into specific recommendations for the Turkish automotive industry, it is worthwhile to summarize briefly how the other considered countries have solved their own problems of similar nature.

In the case of the United States, the main problem in the automotive field had been the non-compatibility of the supporting industries. This problem was solved by vertically integrating these supporting functions into a single system. However, this solution does not seem directly applicable to Turkey due to the shortage of resources, especially of capital.

The Spanish and Mexican experiences reveal that the establishment of a proper automotive industry was pushed by the imposition of a minimum permissible domestic content by the government, which encouraged the vehicle manufacturers to invest in further production facilities. This measure, especially in Mexico, also resulted in a decrease in the number of vehicle brands and models.

The reduction of production costs was achieved by these two countries through two different methods. Spain, having a large potential market, imposed a minimum yearly production volume, in order to induce a wider use of capital equipment. This shift increased the volume-elasticity of production costs and therefore diminished the

costs at higher production rates. Vendors, on their own, ... its severer shortage of foreign exchange and its smaller demand, had to seek an optimization at smaller volumes of production. Controlling vehicle prices, and bringing them to values that barely let manufacturers break-even, induced the producers to seek means for increasing their efficiencies. The pressures exerted by the presence of a minimum local content have forced the larger companies in Mexico to share and standardize the functions of producing major and costly subsystems between themselves, therefore diminish the unit costs of the subassemblies by increasing their volumes of production. All the mentioned measures enabled the overall efficiency of the industry to increase substantially, thus resulting in a reduction of economic costs.

In both the Indian and Mexican cases, industries producing small parts and components were given special emphasis parallel to the assembly - industry. This helped them achieve the pre-set domestic content ratios easily during the initial stages, however, proved insufficient when the local percentage had to be increased beyond a certain value (This is a universal problem and to increase the local percentage more than approximately 50 % , large-scale additional investments have to be made).

After this brief review of universal experiences, the recommendations applicable to Turkey will be considered.

Standardization

The bitter experience of Turkey with tractor imports during the early 1950's is still vividly in mind. The major error of overdiversification which then occured mainly due to the lack of planning, can have comparable results in the case of production too. To prevent this from occuring and to bring unit costs down by increasing the volume of production, standardization is suggested. Standardization , in this section will be studied under two headings:

1. Product Standardization
2. Component Standardization

Product Standardization.- The objective of product standardization is to standardize the end product, i.e. the truck, the tractor or the car. The spirit of the idea is to decrease the number of types offered to the market to a minimum. As a result of this, the number of manufacturers and thus competitors decreases and the producer might exploit monopolistic opportunities, at the extreme. On the other hand, economies of scale tend to increase the efficiency as the volume of production enlargens. Most authors have indicated that making a compromise between the two alternatives is the hardest decision[1].

[1] One interesting approach is made by Gökçe Bayındır, Simplification in The Automobile Park of Turkey, Robert College, August 17, 1966, Part IV.

Component Standardization.- The second method of standardization is by means of controlling the semi-finished inputs that go into the end product. The Mexican solution is an excellent example where it is observed that "the Big Three" (Ford, G.M. and Chrysler) are all using the same basic transmission, rear axle, brakes and clutch. This method has some distinct advantages over the previous for it still permits competition among vehicle manufacturers besides creating economies of scale in the components industries which supply a large percentage of the output by value[1]. To prevent monopolistic action of any of these producers, it is suggested that the critical ones be owned commonly by the vehicle producers.

The question of standardization has gained importance in most of the countries where the automotive industry have initiated in the near past and it is observed that if left on their own, the number of makes and models rapidly increases during the first few years, then starts to decrease as measures are taken until they reach an ascemptode. For example, the number of models produced in Mexico was 34 in 1962, but eventually decreased to 15 in 1965.

To reduce the losses incurred by the less efficient initial period, due to many firms operating at a very low capacity, what Turkey should do in the automotive field is to limit the number of makes and encourage the manufacturers to pool their

[1]Otomobil Endüstrisi Etüd ve Organizasyon Kurulu has calculated that 10-15 % of the final product enters the assembly plant as raw materials; 10 % as labor, and the rest as semi-finished components prepared and manufactured at other premises.

resources in order to produce larger volumes of standardized part and components.

The field of commercial vehicles is already too-much diversified with eleven different makes of similar-purpose trucks and five different brands of tractors produced in 1967.

Realizing the advantages of standardization, one of the larger assemblers, T.O.E. , is working on a project to manufacture 13 different types of diesel engine blocks ranging from 3 to 6 cylinders and from 34 to 155 H.P., all from the same basic block, under an International Harvester license. Parallel to this, another concern is working on a similar large project aiming to supply all Turkish truck assemblers with rear axles and differentials, under an Eaton license.

Consequently, a simplification will take place in the near future, as the case has been in other countries, either by legal action or by market forces.

Local Percentage

The definition of local percentage is given by the "Assembly Industries Decree" (Number 6/2905, April 14, 1964) as:

$$\frac{\text{FOB Complete Unit - FOB Imported Components}}{\text{FOB Complete Unit}}$$

The optimization of this parameter was one of the initial purposes of this analysis. Further study of the topic proved it to be a measure of foreign exchange savings only, and not a measure of industrialization, due to the factors discussed.

In an economy where foreign exchange is scarce and rationing takes place, the following analysis can be applied:[1]

The supply and demand curves of foreign exchange are drawn as in Figure 4, where

Q = Limited quantity of available foreign exchange

C = Hypothetical equilibrium price

A = Price of foreign exchange in free market

B = Officially set price of foreign exchange

According to this analysis, an effect similar to subsidizing import substituters by A - C and taxing export productions by C - B is observed. Therefore, Krueger concludes:

> So long as there is rationing of foreign exchange, the system will result in the expenditure of more domestic resources per unit of foreign exchange saved through import substitution than per unit of foreign exchange earned through exporting.

In addition to the incentives given to import substituters by the very nature of the foreign trade structure, as explained above, additional incentives were given by the government in order to promote domestic industries.

The forein exchange savings percentage originated as a standard of import substitution and was used as a measure to determine the foresaid respective promotions.

Needless to say, today's yardstick of industrialization had been designed for a different dimension to be measured.

One other limitation of the local percentage is the fact it only takes into account the direct inputs. It is assumed that

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[1] Anne O. Krueger, "Some Economic Costs of Exchange Control: The Turkish Case", Journal of Political Economy, LXXIV (October, 1966), p.466.

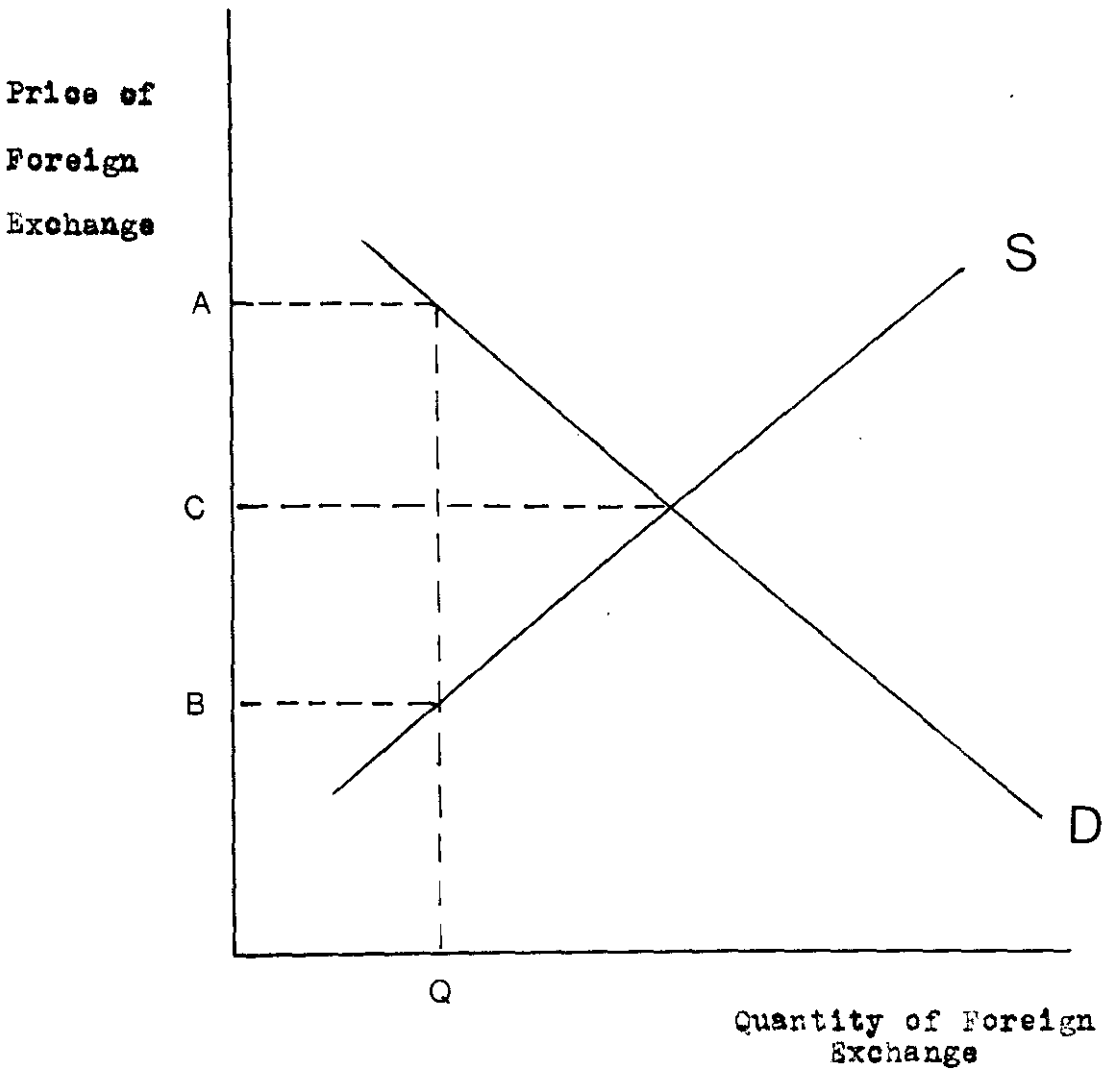

FIGURE 4

Supply and Demand Curves of

Foreign Exchange

all the raw materials and auxiliary inputs are of native origin. As an example, a plastic part of any vehicle is considered to be a domestic product if it is purchased from a manufacturer within the country; However, the assumption that his raw material (raw plastic pellets, in this case) is of Turkish origin is not necessarily correct.

As a conclusion of the discussion about the domestic production percentage, it should be kept in mind that the latter is not a means of measuring the achieved amount of industrialization, but a parameter used to reflect the amount of foreign exchange saved, regardless of the economic cost.

Under foreign exchange shortages, this measure is used internationally to justify local assemblies and manufacture which operate at substandard efficiency.

Long and Short Term Investments

A visit to Turkish automotive assemblers' plants leaves the impression that they consist of a huge hangar with hundreds of workers with primitive and multi-purpose tools running around partially completed vehicles scattered randomly. Job standardization, flow of work, production scheduling and similar techniques to increase efficiency are minimal or non-existent. It is hoped that with the standardization of parts and components resulting in larger volumes of production, modern production management techniques will be implemented with a systems approach.

In most assembly plants, dynamometers[1] are a luxury and

[1] Dynamometer- A device to simulate load conditions on engines, a power absorber.

special-purpose tools are show items. Universal tools and equipment constitute a large portion of facilities. It would be very easy, one would be inclined to think, to shift production from automotive products to other fields such as toys, household durables, steel office equipment and the like just overnight. In fact one of the present assemblers entered the field as a motorcycle manufacturer and suddenly shifted to van and pick-up production, keeping the old line.

It should also be added that no testing for reliability and safety is performed by any assembler, and the effect of this negligence on the extremely high accident rate is suspectible.

In spite of the above discussed topics, there has been relatively a few long-term capital investments in the field. T.O.E. , at the moment, has some advantages in the field and exploits the resources by contracting heavy press-work with other vehicle manufacturers.

Considering the consequences, it would be unjust to blame the vehicle manufacturers for not undertaking long-term investments because it would really have been uneconomical to have a modern, fast-moving assembly line to fit together only 2000 trucks per year.

One other characteristic of the present allocation system, prevents the vehicle manufacturers from determining their production schedules beforehand; Because the allocations are made and announced at the beginning of each year. The lack of time for planning and scheduling limits the efficiency of production and

affects the utilization of labor and capital investments unfavorably.

Therefore, official measures would be desirable both to promote capital investment and to increase volume per plant for higher-efficiency rates. The following recommendations are suggested:

1. Seek means to increase the grand total of the quota substantially,
2. Set a much higher technical and financial facility requirement, for firms that want to operate in the field, than presently quoted in the assembly decree,
3. Set a minimum level of production volume for all firms in the field,
4. Include the investments made by the vehicle manufacturer in supporting industries (based on their share of contribution to the automotive industry) and common financing firms serving the automotive field (refer to Chapter IV, last paragraph) in his record, to be counted for him while allocating his share,
5. Recognize limited tax exemptions to new investments contributing to the automotive industry,
6. Delete the basis of allocation of foreign exchange, in the quota , on labor.

Design Features

A short review of the international automotive industry would reveal that the complex has a considerable amount of momentum. In other words, there is a large time-gap between the discovery of an innovation and its application. This result can be

interpreted as a handicap of making large capital investments in equipment and material producing goods that can rapidly be driven into obsolescence. The disc-brake story of the United States can be shown as the best example of the case when the European competitors started marketing a technically superior product before the Americans. At the beginning, U.S. vehicle manufacturers claimed that their own conventional design of the internally expanding drum-brakes was perfect for their products. However, they changed their attitude in several years and started fitting their faster cars with disc-brakes. At the moment, disc-brakes are optional equipment on even the cheapest models of their lines, and it would not be unrealistic to forecast that they will turn into a standard package in a few years.

A similar example is the recent changes in the transmissions of U.S. cars. In 1968, a major portion of U.S. cars are equipped with automatic transmissions as standard. Manual transmissions for those models are optional at extra cost.

The reasons behind this typical reluctance of shift can be summarized as

1. The present assembly and service facilities being geared for the conventional system,
2. The presence of a large stock of conventional supplies,
3. Most important of all, the fact that large amounts of capital being invested in production equipment designed to manufacture the conventional system.

The greatest danger one is inclined to make, in this case, is to conclude that disc-brakes are better than drum-brakes.

To analyze the case from a viewpoint of effectiveness of application would be wisest. Drum brakes have operated satisfactorily for many decades, but more severe road conditions and increasing speeds did arise the need for higher stopping power. Geographical as well as traffic conditions pushed European needs farther than U.S.'. Therefore the problem became more acute for the Old World, from where the solution emerged.

The moral of the story is that every crucial component (as well as the whole) of a vehicle should be designed for the conditions under which it is supposed to operate, considering the requirements of the future.

Observing the vehicles presently assembled in the country, one sees exact replicas of models designed for conditions existing at a country thousands of miles away. Certainly no redesign would be feasible for such a low volume as at the present, but producing larger numbers of vehicles would of course be unwise without proper adaptations to satisfy local requirements best. For example, mainly due to the hazardous road conditions and local driving habits, the anti-fade characteristic of the disc-brake system had years ago become imperative for passenger vehicles in Turkey.

Besides the "ANADOL", the only passenger car "made" in Turkey at the moment, which carries a fiberglass body, some models from other countries carrying several remarkable innovations are:

1. Chrysler's completely tailored-to-needs van, produced in Greece for Greece,.

2. The wooden body-chasis of the world famous sports car "Morgan" of G.B. , which is a system presently used for bus-body manufacturing in Turkey, especially around the Bursa area,

3. The "Variomatic" transmission of the Dutch"D.A.F." (Daffodil) which makes use of two transmission belts, running through centrifugally operated, variable radii pulleys, and activates the rear wheels independently. The system eliminates the need for gearboxes and differentials,

4. The N.S.U. "Wankel", rotary-cylinder engine,

5. The Chrysler passenger car turbine engine,

and numerous others

Similar innovations are always available, and nobody can predict that the conventional design would be the best solution. One pitfall to be careful about is that the field is one of application, and an innovation is only as good as the outcomes of its implementation. Therefore technical innovations should not be made only by engineering knowhow, but the tools of the modern businessman should also be employed.

To channelize all these factors towards Turkey's benefits, a collective authority formed by local factory representatives and government officials should approve the suitability of every make and model for Turkey (before production), basing the argument on research made by a subordinate organization financed by local manufacturers and the government. Technical, marketing and financial research related to the automotive industry is to be made continuously by the organization for recognizing the countries potentials and improving the products.

An Application

The objective of this section is to demonstrate the outcomes of the suggested precautions, viewed from a Utopic angle. The model will be applied and the output analyzed.

Referring to Figure 8, let Chrysler's curve for truck production in Turkey be our hypothetical curve. This curve alone is carried forward to form Figure 9, which will be used for our analysis.

Let the demand for 7-8 ton trucks be 8000 units, for year "x". The alternatives to be compared are (a) the relative cost per unit as manufactured precently and (b) the relative cost per unit if component standardization is applied to a certain extent.

a) Under present conditions, four major manufacturers are equally sharing the market. Therefore, it can rightly be assumed that each firm produces 2000 trucks per year, at a relative cost of 225% per unit.

b) If a component standardization were applied to the engine, gearbox, differential, electrical components, fuel system, gauges, and steering mechanism, their total weight in the complete truck would be in the vicinity of 30%, by reference to Table 5.

On the other hand, assuming Figure 5 to hold for the collection of components mentioned in the above paragraph, the relative cost of producing 8000 of these (each) would be 160 %.

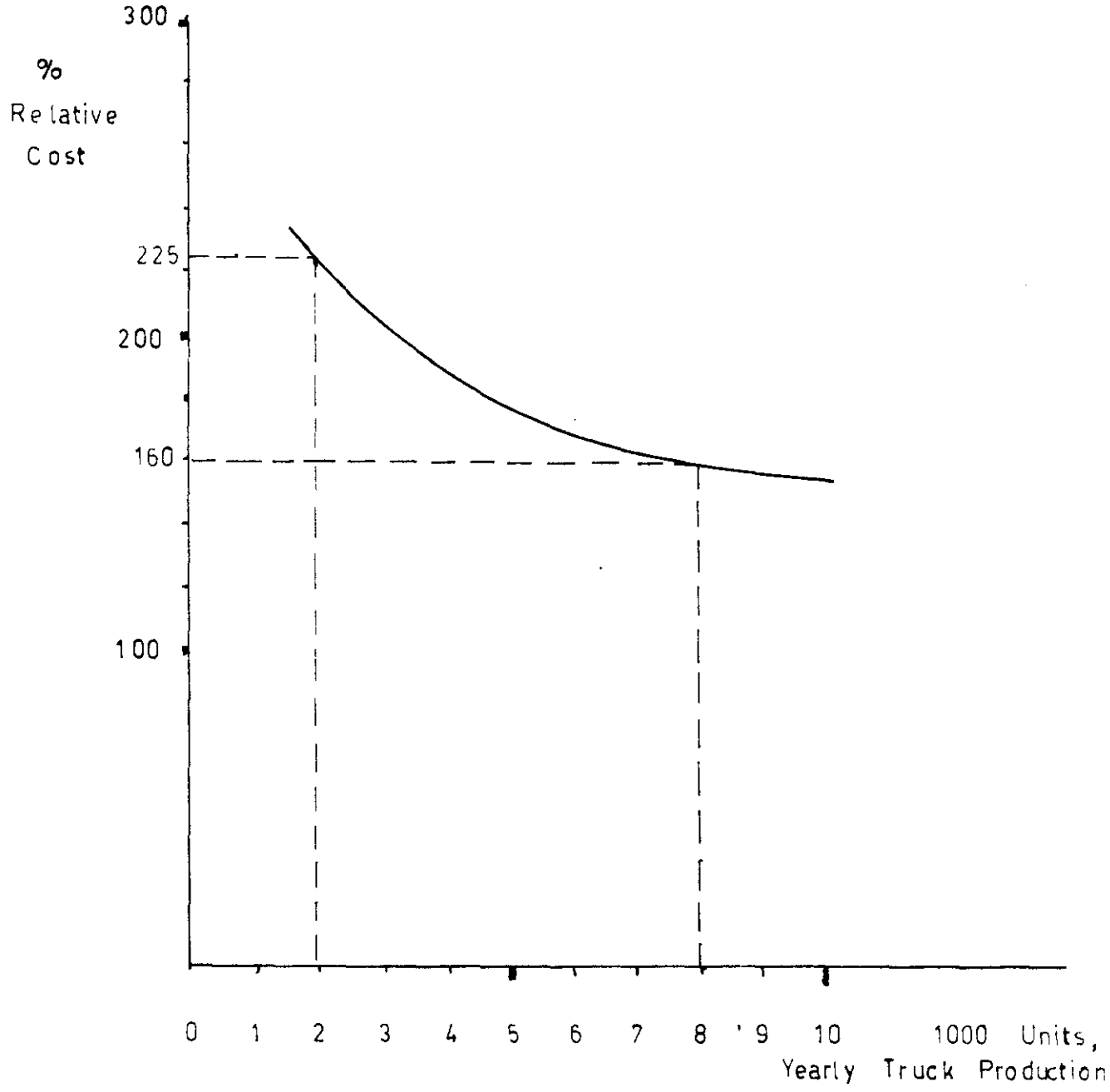

FIGURE 5

Hypothetical Volume - Cost Curve
for Truck Production
in Turkey

Taking the weighted sum of

160 % at 39 %

and 225 % at 61 % would give

$$62 + 138 = 200\ \%$$

That is, by standardizing 39 % of the components, the relative cost of the vehicle falls from 225 % to 200 % of the cost of the mother-firm.

The economic cost of not standardizing can be calculated:

$$L = \frac{A - 200}{A} \cdot U \cdot N$$

$$L = \frac{225 - 200}{225} \cdot U \cdot 8000 = 888\ U$$

On the other hand, the new unit cost U_1 is

$$U_1 = \frac{200}{225} \cdot U$$

Dividing the economic cost by the new unit cost, the incremental number of vehicles that can be constructed without further expensing is obtained:

$$\frac{888\ U\ 225}{200\ U} = 999 \text{ units}$$

In other words, the economic cost of not standardizing 39 % of components at a yearly production volume of 8000 trucks is equal to 999 vehicles.

CHAPTER VII

CONCLUSIONS

Industrialization has generally been suggested as a means to develop the Turkish economy. The initiation of the automotive industry has been a popular proposal, mainly due to the large size and content of the industry. Psychological attractiveness along with national pride in developing such an industry has speeded its initiation. An important characteristic of the automotive industry is the fact that it serves as a link between many other industries by absorbing their outputs. Therefore, its development can induce a parallel growth of the above mentioned supporting industries.

The basic requirements for the establishment and operation of the automotive industry are (a) an available active working force, (b) a certain minimum level of technological know-how, (c) managerial know-how, (d) accumulated capital to finance investments (e) the presence of a certain amount of supporting industries and (f) sufficiently active markets to operate in, which will supply the required inputs and absorb the outputs of the automotive industry.

In the industrially advanced countries of the world, the automotive industry had achieved a development parallel to the development of the overall industrial structure, to which it has been a major contributor. On the other hand, the developing count-

ries are at a disadvantage in establishing an automotive industry since the lack of the above mentioned requirements and resources are crucial.

After reviewing the course of development of the automotive industry in Turkey, the present demand estimations are found to be underestimating. An analysis of the relationship between unit costs and volume of production disclosed the fact that unit costs of production are expected to be considerably higher than those abroad due to the small volume concerned and expensive inputs.

A systems approach to the national economic benefits has revealed that the potential of the industry to create new fields of employment, and other fringe benefits such as the provision of miscellaneous services and facilities should be considered as the major objective offsetting the incremental costs of operating at a lower production rate than larger and more efficient firms abroad.

After a brief comparison with product standardization, component standardization is recommended due to the fact that the latter reduces the risk of a monopoly in the final product. Moreover, producing several end-products with slightly different characteristics would still be possible and preferrable for it can satisfy human desires better.

Upon discussing the concept of local percentage, it is concluded that the standard used for evaluation of the automotive industry is not a measure of industrialization, but a measure of foreign exchange savings only. This measure, together with the

inevitable characteristics of the foreign trade regime, has been employed to give incentives to local producers.

After discussing the importance of long-run investments, and reviewing objectives in investments employed in Turkey, measures that should be taken to promote long-run investments in the field have been stated.

The design features of the proposed models for manufacturing in Turkey have to be given special consideration, and the requirements for the designs should be analyzed from a viewpoint of specific applications. The proposed models have to be approved by a specialized board the establishment of which is recommended. Numerous non-conventional designs, which should be regarded as examples of solving problems in a more suitable way than conventionally, have been mentioned in the text.

Finally, assuming a component standardization of 39 % by value, the economic cost of not standardizing is calculated to be 25 % (relative cost) of mother-firm's factory cost or 11.1 % of the local cost.

Converting the above to physical units, it is figured out that at a production rate of 8000 vehicles (trucks) per year, 999 additional vehicles can be manufactured with the given resources.

To summarize the discussion, it can be concluded that, in spite of the fact that the establishment of the automotive industry might seem to be unfeasible at a first glance, a systems approach can prove that provided that (a) the given precautions are taken, (b) the developments properly controlled and (c) tangible and intan-

gible fringe benefits of establishing the industry taken into consideration, the development of the automotive industry may render profitable in the long run.

APPENDIX

TABLE A 1

REGISTERED VEHICLES IN TURKEY[a]

Year	Cars	Trucks	Buses	Total
1948	8012	11403	2622	22037
1949	10071	13201	3185	26457
1950	13405	15404	3755	32564
1951	16427	18356	4569	39352
1952	23938	24722	5510	54170
1953	27692	27549	5933	61174
1954	28599	30250	6671	65520
1955	29970	34429	6848	71247
1956	33377	35070	7914	76361
1957	36756	36919	8291	81965
1958	34244	39721	8065	82030
1959	37616	48094	8881	94591
1960	45765	57460	10981	114208
1961	52381	64706	13956	131043
1962	60731	73323	16437	150491
1963	72034	80695	19269	171998
1964	79449	75379	20412	175240

[a]Source: Karayolları Genel Müdürlüğü, Karayolları Rehberi.

TABLE A 2

TURKISH VEHICLE PRODUCTION

MAKER & ADDRESS	MAKE, MODEL AND ENGINE	PRODUCTION 1966	1967	1968
BMC SANAYİ ve TİCARET A.Ş.	BMC TM 135 BMC 5.7 Litre	500	2000	4000
Gazi Bulvarı No:47/49	BMC 10/60 Tractor	-	1100	3000
P.K. 260 - İZMİR	BMC 5.7 Litre Diesel Engine	-	-	1000
CHRYSLER SANAYİ A.Ş.	Dodge - Desoto - Fargo			
P.K. 53 - Kadıköy,	D 100 Pick-up (Petrol) 4x2	676	-	-
İSTANBUL	W 100 Pick-up (Petrol) 4x4	624	-	-
	D 100 Town Panel	24	-	-
	D 300 Light Truck	66	-	-
	D 406 Truck, Perkins 6/354	932	-	-
	D 500 Truck	796	-	-
	D 600 Truck	128	-	-
	KN 700 Truck	-	800	-
	PD 600 Truck	-	2400	-
MOTORLU ARAÇLAR TİCARET A.Ş.	International Harvester	232	-	-
Büyükdere Cad. No:23	Loadstar 1700 Truck, Petrol and Diesel			
Şişli - İSTANBUL	Loadstar 1703 Bus. Petrol and Diesel	150	-	-
	Loadstar 1800 Truck, Perkins 6/354	685	-	-

MAKER & ADDRESS	MAKE, MODEL AND ENGINE	PRODUCTION 1966	1967	1968
OTOMAK TÜRK TİCARET LTD.ŞTİ.	Commer Minibus (Petrol)	144	102	-
Büyükdere Cad.No:6,	Commer 6 Ton Diesel Truck			
Beyazıd Han, Mecidiyeköy	BZ 669, Perkins 6/354	100	60	-
İSTANBUL	Commer 7 Ton Disel Truck			
	VBAW 762, Perkins 6/354	44	240	-
TÜRKİYE ZİRAİ DONATIM KURUMU	Fordson 5000 Diesel Tractor 65 HP	-	400	)4000-5000
ADAPAZARI	Fordson 2000 Diesel Tractor 37 HP	-	2748	
MİNEAPOLİS-MOLINE TÜRK				
TRAKTÖR ve ZİRAAT MAKİNE.A.Ş.	Fiat Diesel Tractor 4 cyl.	2700	4000	7500
P.K. 24 - ANKARA				
ARÇELİK A.Ş.	Innocenti Lambro, 200, 3 wheel 2 stroke van	600	-	-
Sütlüce, Karaağaç Cad. 2-4	Epple-Buxbaum SP 100 Combine Harvester,			
Halıcıoğlu - İSTANBUL	Perkins 4/236	-	-	-
ÇELİK MONTAJ TİC.ve SAN.A.Ş.	Skoda 1202 Pick-up	950	1900	-
Sirkeci, Emirler Sok.No:3/1	Jawa 250 cc motorcyle	3000	5000	-
İSTANBUL	CZ 125 cc motorcycle	3800	5500	-
	Stadion 50 cc motorcyle	3850	-	-

MAKER & ADDRESS	MAKE, MODEL AND ENGINE	PRODUCTION 1966	1967	1968
TAŞIT SANAYİ A.Ş. Büyükdere Cad. TMT Han, Mecidiyeköy - İSTANBUL	Leyland heavy Trucks (Super Reiver)	250	250	-
UZEL LTD. ŞTİ. Kışla Cad. No:1, Rami - İSTANBUL	Massey-Ferguson Tractors MF 135 MF 165	- -	4797 988	7350 650
MATAŞ Ünver Sanayi Tesisleri Bahçelievler, Bakırköy - İSTANBUL	Land-Rover	-	250(Estimated)	
Üver Sanayi Tesisleri Bakırköy - İSTANBUL	Magirus - Deutz Bus Renault	- -	360 -	- -
VERDİ Tic.LTd.Şti., Cumhuriyet Cad.Pegasus Evi, Harbiye - İSTANBUL	Jeep	-	-	-

MAKER & ADDRESS	MAKE, MODEL AND ENGINE	PRODUCTION 1966	1967	1968
OTOSAN OTOMOBİL SANAYİ A.Ş. P.K. 102 - Kadıköy, İSTANBUL	Ford D 750 Trucks	(Estimated)	2000	2000
	Anadol Cars	-	-	6000
GENOTO - General Otomotiv SANAYİ ve TİCARET A.Ş. Kurtuluş Deresi Sokak, Dolapdere - İSTANBUL	Bedford Diesel Trucks	-	2000	-

NOTE : Figures for 1966 reflect the production schedules

SOURCE : Questronnaires sent to vehicle manufacturers.

TABLE A 3

DATA FOR VERIFICATION OF TH REGRESSION LINE BETWEEN POPULATION PER CAR AND PER CAPITA INCOME[a]

Country	Population (1000)	Cars in Use (1000)	p.c.Inc. Index (1958 = 100) 1960	1965	Pop./car	p.c. Income
Japan	96,275 (1/10/65)	2,188.0	126	186	45.0	445
S. Korea	29,184 (1/10/66)	16.3	101	178	1780.0	160
Pakistan	100,870(65) 97,854 (1/11/61)	12[illegible].3 (65)	105	133	435.0	93
France	48,328 (65) 46,520 (7/3/62)	9,800.0 (65) 7,008.0 (62)	108 (60)	130 (65)	5.1	1050
W.Germany	58,839 (65) 52,377 (6/6/61)	9011.1 (65) 5167.0 (61)	114	135	6.3	1030
Greece	8,551 (66) 8,387 (10/3/61)	104.3 (65) 49.3 (61)	105	146	85.0	422
Spain	31,804 (65)	785.0	102	143 (64)	40.3	375
Mexico	99,689 (66)	771.1	104	117	55.0	295

[a] Calculated from United Nations Statistical Yearbook 1966 (United Nations, New York, 1967)

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List of Interviewees

Güven [illegible] .... Koç Holding

Doğan Karaosman .... Dizel Tic. Koll. Şti.

G.J. [illegible]anners .... Lucas (Export) Ltd. London

Fikret Çeltikçi .... Türkiye Sınaî Kalkınma [illegible]

Mehmet Betil .... Türkiye Sınaî Kalkınma Bankası