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I am submitting herewith a dissertation written by Mark A. Stephens entitled "An Analysis of the Brazilian Motor Vehicle Industry: The Political Economy of Its Development and Its Significance to the Brazilian Economy." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Economics.

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AN ANALYSIS OF THE BRAZILIAN MOTOR VEHICLE INDUSTRY: THE POLITICAL ECONOMY OF ITS DEVELOPMENT AND ITS SIGNIFICANCE TO THE BRAZILIAN ECONOMY

A Dissertation

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Doctor of Philosophy

Degree

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Mark A. Stephens

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ABSTRACT

The study focuses on the Brazilian motor vehicle industry as an example of the application of an import-substitution-industrialization strategy in a less developed country. In 1956, the Brazilian government instituted a comprehensive plan to create a fully integrated domestic motor vehicle industry. This study describes the policies used by the government in implementing its strategy and analyzes the effectiveness of this strategy in light of its objectives.

Much of the information and data presented were collected in Brazil in the form of published works and reports from sources such as the motor vehicle producers association, the motor vehicle parts producers association, government agencies, and academic studies. Figure from the Brazilian Input-Output table were used to calculate the linkage effects of the motor vehicle industry. Domestic resource cost and foreign exchange savings were also calculated from available data.

The analysis of the data indicated that the motor vehicle industry was an appropriate choice as a target industry for import substitution, and that the objectives of this type of strategy were achieved to a significant degree.

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INTRODUCTION

The primary emphasis of this study is on the role of the Brazilian motor vehicle industry in the development of the Brazilian economy. The study consists of an examination of the development of the Brazilian motor vehicle industry, especially focusing on the effects of government policy, followed by an examination of the impact of the Brazilian motor vehicle industry on the Brazilian economy, using such measures as linkage effects, employment and income creation, and foreign exchange savings. The introductory background information which is presented below is essential to a full understanding of the context in which the development of the industry has taken place.

Brazil is the fourth largest country in the world in terms of surface area, and it had an estimated population of 118.61 million in 1980. In 1980, Brazil's Gross Domestic Product (GDP) was $248.6 billion, in 1980 prices [1:147]. In spite of its size relative to most other countries in the world, Brazil is still considered to be among the "Less Developed Countries" (LDC's). The evolution of Brazil's economy has followed a pattern which is similar in many respects to that of the other LDC's and particularly to those in Latin America.

Historically, Brazil's economy has been based on one, or a few, primary products from either agricultural or extractive industries. Sugar cane, cacao, rubber, coffee, and gold have been among the most significant products. These types of industries tend to be export-oriented, and, given the low income and price elasticities of foreign

demand for primary products in general, these industries tend to be highly sensitive to external shocks. These external shocks may take any number of forms, such as the interruption of trade due to wars, changes in consumer preferences in other countries, new production techniques which may eliminate a particular advantage of the country, or the introduction of substitute products. The sensitivity of primary product type industries to such shocks contributes to a characteristic recurrent cycle of "Boom and Bust." Another characteristic of these industries is their tendency to have only limited influence on the rest of the economy. The benefits of a boom phase generally accrue only to those who are directly involved in these industries.

During the first half of the twentieth century, as means of worldwide communications and transportation began to improve, Brazilians began to take notice that their country was indeed among the "less developed nations" of the world. Brazil's leaders became anxious to accelerate their country's economic development. The ruinous effects of World War II on Brazil's traditionally leading industries further emphasized the vulnerability of Brazil's economy. Meanwhile, the 1940's and 1950's proved to be a period of rapid change in the field of development economics. The theories of economic development that were being set forth during this period seemed to address some of the very problems with which the Brazilian leaders were most concerned. There were several economists at that time who were particularly interested in identifying the most efficient means

of transforming agriculturally based economies (generally characterized by economic stagnation) into industrially based economies (generally characterized by rapid growth, typically measured by the rate of capital formation, GDP and per capita income). Among the more influential of these economists was Albert O. Hirschman, who described his theories in a book entitled The Strategy of Economic Development, published in 1958 [2]. In this book, Hirschman sets out what he believes to be an efficient strategy for leaders in LDC's to follow in order to speed up the development process. He sets forth those problems which he feels are most acute, namely a lack of social overhead capital and a lack of the "ability to invest" (ability to make and carry out development decisions). It is Hirschman's contention that creating an imbalance between the rate of growth of social overhead capital (SOC) and directly productive activities (DPA), will set up the conditions necessary to maximize the rate of capital investment. This is the case whether development proceeds via excess capacity or via shortage with respect to SOC. The imbalance between SOC and DPA sets up tremendous pressures and incentives to invest, by creating new investment opportunities while at the same time making these opportunities more obvious, thus reducing the need to rely on the private sector's "ability to invest," and thereby minimizing the need for one of the scarcest factors of production in most LDC's.

Within the realm of those investment projects classified as DPA, Hirschman points out that the complementary features of various types of industries should be exploited. Specifically, he states that

those industries which exhibit the greatest total linkages should be stimulated first. Increasing investment in these industries creates an imbalance within the category of DPA investment projects. The pressures and incentives created by the accelerated investment in certain key industries should then pave the way for new investment in other, related industries. This type of strategy makes the secondary investment decisions easier by making them more clear cut. That is, the imbalance exposes the need for other related investments, and in this sense reduces some of the risk for the potential investor.

Hirschman discusses the importance of the import industries as a signaling device in helping a country to select its key industries. In a separate work, Hirschman sets forth four factors which are significant in initiating import substitution industrialization in Latin America: wars, balance of payments difficulties, growth of a domestic market, and official government policy [3:4-5]. Wars, especially world wars, greatly affect trade flows and force countries to produce those things which they have been importing. The war factor is strongest, of course, during the war, but it may in fact have a long term influence by sowing the seeds of domestic industrialization. The second factor, balance of payments difficulties, refers to the inability of most countries in the region to import on a permanent basis, due to a lack of foreign exchange, the goods and services that the population desires. The lack of foreign exchange, in turn, is due to an inability to export. The third factor, growth of the domestic market for a product, makes the possibility of supporting domestic

manufacturers a more realistic expectation. Fourthly, governments, through official policy, can close off the domestic market to foreign competition, and/or institute various types of incentive plans for domestic manufacturers, thereby creating an environment conducive to the growth of domestic firms. Hirschman advocates selecting particular imports, not necessarily all, as targets for future domestic industries. As has been discussed, potential linkage effects and the size of the domestic market are factors which he considers important in determining which imports should be targeted for substitution. Once target industries have been selected, Hirschman advocates the use of standard import substitution policies by the government (tariffs and quotas on imports of competing goods, foreign exchange controls, subsidies, tax credits, etc.) in order to make investments in those industries more attractive to both domestic and foreign firms [2].

Of course, Hirschman's view is not without its critics, but the various debates which have taken place over these issues are not of prime concern in the scope of this work. Rather, the point of interest is how the basic ideas of Hirschman (and others similar to his) worked together with changing economic conditions to manifest themselves in a dramatic change in the development strategy of the Brazilian government. This study of the changes which took place in the Brazilian motor vehicle industry takes on a new significance when viewed in such a setting. All four of the factors outlined by Hirschman [3], as discussed above, have been significant in the

evolution of the Brazilian motor vehicle industry. A basic premise of this work is that the Brazilian government policies of the mid 1950's closely followed the basic strategy set out by Hirschman for accelerating economic growth. Furthermore, in choosing to implement Hirschman's ideas, the Brazilian government selected motor vehicles as a target industry because it appeared to fit Hirschman's target industry criteria most closely.

There have been numerous studies made of the effectiveness of various attempts to implement import substitution industrialization policies in LCD's [3;4;5;6]. Most of these studies are oriented toward attempting to derive better methods of measuring the degree of import-substitution that has taken place over time in various industries within countries. There have been some studies which compared the relative effects of import substitution industrialization in the automobile industry among several different countries [7;8;9]. Additional studies have focused more specifically on the case of the automobile industry in Brazil [10;11;12]. However, there has yet to be an in-depth study of the Brazilian motor vehicle industry which attempts to integrate the changes in the political and economic conditions over time with a detailed analysis of the industry's internal structure and with a study of its role in the development of Brazil's economy.

Much of the information included in this study was collected in Brazil. The author interviewed representatives of Ford do Brasil, General Motors do Brasil, Mercedes-Benz, Saab-Scania, and Volkswagen

do Brasil and toured the production facilities of each of these companies except Mercedes-Benz. Brazilian documents were collected from the Getúlio Vargas Foundation (S.P.), the University of São Paulo, the Automobile Producers Association (ANFAVEA), the Automobile Parts Producers Association (SINDIPEÇAS), and from official government agencies.

As was stated previously, the first part of this study focuses on the history of the Brazilian motor vehicle industry. Chapters I, II, and III present facts about the development of the motor vehicle industry as well as facts about the economy and government policy which relate to the development of the industry. The chapter divisions reflect the rather distinct stages of historical development which occurred in the Brazilian motor vehicle industry.

Chapter I discusses the beginnings of the industry and its development prior to June of 1956. It thus establishes the background for the events that took place from 1956 through 1960, and which are discussed in Chapter II. The five-year period from 1956 through 1960 represents the turning point of the Brazilian motor vehicle industry, for it was in June of 1956 that Grupo Executivo Indústria Automobilística (GEIA) was established by the government, under President Juscelino Kubitschek. The creation of GEIA, its objective, and the powers given it by the government were to quickly and radically change the direction of the Brazilian motor vehicle industry relative to the path of development it had followed for the previous fifty years or so. Although most of Chapter II is concerned with the

political changes that were put into place by GEIA, information on the performance of the industry is also included, as well as some summary figures designed to measure the degree to which the goals and objectives established by GEIA were met.

Chapter III discusses the continuing development of the industry after 1960. Beginning in the mid 1960's and continuing into the early 1970's the industry experienced a period of rapid growth which induced additional investment. The formation of OPEC and the rapid rise in world oil prices after October of 1973 brought an end to the industry's boom phase. Strong growth did not resume until the late 1970's, when the government began to offer strong incentives to increase production for export.

Chapter IV presents and discusses an analysis of the linkage effects of the Brazilian motor vehicle industry. The objective of Chapter IV is to draw some preliminary conclusions regarding the appropriateness of choosing the motor vehicle industry as a target industry in Brazil's economic development strategy.

Chapter V continues the direction of the material presented in Chapter IV by discussing various measures of the impact of the motor vehicle industry on the Brazilian economy. Chapter V also discusses the changing role of the industry, over time, as a leading sector of the economy.

Finally, Chapter VI summarizes the effects of Brazil's motor vehicle industry on the country's economy, and draws final conclusions regarding the effectiveness and/or appropriateness of the

selection of the motor vehicle industry as a target industry for development through import substitution industrialization in Brazil.

CHAPTER I

THE MOTOR VEHICLE INDUSTRY IN BRAZIL PRIOR TO 1956

Introduction

The history of Brazil's motor vehicle industry can be seen as evolving in two distinct phases. During the first phase, before 1956, firms in this industry were involved primarily with the assembly of complete knock down (CKD) or semi-knock down (SKD) units that were imported from the assembly firm's home country facility. In June of 1956, the second phase began when President Juscelino Kubitschek decreed, as part of his overall industrialization program, that Brazil would embark on developing a true domestic motor vehicle industry. That is, the existing firms would no longer be allowed to import units CKD or SKD, but rather would have to manufacture or buy these parts domestically. The process of change was to be accomplished over a five-year period. In this chapter, information relevant to the motor vehicle industry will be presented for the period up to 1956*. The material presented below will set the stage for a discussion of the significant changes that took place in June of 1956. The events that occurred after June 1956 will be presented in Chapters II and III.

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*The study by Nascimento (Formação da Indústria Automobilística Brasileira: Política de Desenvolvimento Industrial en uma Economia Dependente) is a major source of data for this and the succeeding chapter.

1919 and Before

According to a report issued by Federação das Indústrias do Estado de São Paulo (FIESP), the first motor vehicles in circulation in Brazil were imported from Europe [13:1]. This report states that the first vehicle entered Brazil in 1871, and that throughout this early period all the vehicles in use were imported from Europe.

In 1904, Grassi, a Brazilian firm, was founded. It was established for the purpose of manufacturing bodies and assembling imported CKD units from Europe. In 1907, Grassi assembled the first automobile in Brazil—a Fiat. In 1908, Grassi had imported bus chassis and was in the process of setting up a facility to manufacture bodies. In 1910, Grassi manufactured the first bus body. The company went on to specialize in bus and truck assembly [11:14].

The first of the foreign motor vehicle firms to make the move into Brazil was the Ford Motor Company. In 1919, Henry Ford decided to set up an assembly line in São Paulo, S.P. for the purpose of assembling the model "T," but it was not until the middle of the 1920's that any significant assembly operations began [13:1].

1920-1929: Foreign Firms Move In

The 1920's were a period of rapid growth in the motor vehicle industry. Most firms entering the industry were foreign-based subsidiaries of established U.S. firms. These firms were attracted to Brazil as a potentially large market for private transportation that was open to outside competition and had no domestic competition.

After Ford's initial move into Brazil in 1919, General Motors followed in 1924 and International Harvester in 1926. All three firms settled in the São Paulo area, in what are now called the A,B,C cities of Santo Andre, São Bernardo, and São Caetano. The data are limited on these firms at this early stage. The available statistics show that General Motors began assembly in 1927 with approximately 12,000 units and expanded to 27,000 units by the following year. In addition to its assembly line, Ford also initiated a training center to train both line workers and maintenance workers in 1926.

During this same period, related industries evolved to supply the fledgling assembly firms. These represent a clear example of the backward linkage effects of the new vehicle industry. The most notable entrants were tire manufacturers. In 1923, Pirelli and Firestone Tire & Rubber Company set up operations in São Paulo. They were followed by the Goodrich Rubber Company of Brazil, Inc. in 1928, and the General Tire & Rubber Company in 1929, both of which were also located in the São Paulo area.

The federal government, under the administration of President Washington Luiz, was involved with expanding the nation's transportation network in an effort to connect the major cities and open up the vast interior of Brazil. One aspect of the drive was the opening of many new highways, which gave further stimulus to the motor vehicle industry.

1930-1939

The general economic conditions existing in Brazil during the early 1930's were much the same as in the rest of the world, a state of severe recession. The decline in the level of economic activity actually began in 1929, with a 2.5 percent fall in real GNP from the previous year. The following three years proved to be much worse in terms of the decline in real GNP. Over the period 1929 through 1931, real GNP fell by 18 percent. The decline in GNP reached its trough in 1931, at Cr$123.9 (millions of 1950 Cruzeiros). Although 1932 did mark the beginning of a continuous rise in real GNP for the remainder of the decade (except 1938), the increase in GNP in 1932 was an insignificant increase to only Cr$124.1 (millions of 1950 Cruzeiros). The 2.75 percent average yearly growth rate of real GNP for the decade was made possible by the above average increases that occurred in the mid 1930's (average yearly increase in real GNP for 1932 through 1935 was 7 percent) as the world-wide depression began to give way to renewed economic growth [11:17].

It is interesting to note that Brazil ran a deficit in its merchandise balance for two consecutive years in 1937 and 1938. This is significant because Brazil incurred a deficit in this balance only five times during the period 1862 to 1939. The general surplus condition of Brazil's merchandise balance over this period was due primarily to their strong position in the world market for coffee, which was Brazil's primary export during those years.

Over the decade of the 1930's, as the overall rate of growth in the Brazilian economy became more erratic and began to slow, so did the advances in the motor vehicle industry. In response to the slowdown in the economy in general, and motor vehicles in particular, the government became more aggressive in trying to stimulate industrial growth, including that of the motor vehicle industry [11:18].

With respect to the motor vehicle industry, the government, in its efforts to stimulate the assembly of vehicles, in 1931 lowered the tariffs on the importation of CKD units by 30 percent. The government followed this by a further reduction of 20 percent in 1933. These reductions in tariffs on imported CKD units, coupled with the fact that the transportation costs were lower for CKD than SKD, increased the profitability of those firms engaged in assembly, which would account for the increased number of motor vehicles in use [11:19].

The increasing volume of vehicle assembly exerted additional backward linkage effects, as evidenced by an increasing number of firms in the tire and rubber industry. In 1937 a Brazilian firm, Companhia Brasileira de Artefatos de Borracha, was founded in Rio de Janeiro. In 1938, Goodyear Tire & Rubber Company entered the industry and was followed by Dunlop do Brasil in 1939, both settling in São Paulo.

During roughly the same period, the government was actively attempting to stimulate other basic industries, such as steel, cement, plate glass, petroleum, etc. These efforts manifested themselves in

three additional decrees. First, Decree #300, on February 24, 1938, established exemptions from paying import duties on the importation of machinery, related parts, and materials needed in those industries mentioned above. These exemptions made it far easier for firms in those industries to obtain their needed materials.

Eleven months later, on January 19, 1939, the government issued two additional decrees, #1058 and #1059, which allowed the government to supply funds for importing essential equipment and materials that could be used in the construction of port facilities and in local industries that could be put to producing defense-related products.

Another significant government action was the creation of the Carteira de Crédito Agrícola e Industrial do Banco do Brasil (CCAI), in 1938. The CCAI was designed to channel investment funds into those particular industries which the government wished to stimulate.

Based on the number of exemptions and incentives that the government granted during the 1930's, it is clear that the government was becoming more heavily committed to accelerating industrial growth in Brazil. The motor vehicle industry, even at this early stage, was taking on increasing importance in the minds of policy leaders as being a potentially dominant industry in Brazil. In the later years of the 1930's, the government, in an attempt to increase the steel industry's capacity, was planning a government steel facility at Volta Redonda, known as Companhia Siderúrgica Nacional. Even at this stage, a domestic motor vehicle industry was being envisioned (as opposed to simply assembly operations) as a possible forward linkage

of the expanding steel industry. Certain adjustments were made so that the mill at Volta Redonda would be better suited to the production of products needed by a motor vehicle industry [11:20].

1940-1949

The policies of the 1930's were designed to make it easier for new lines of manufacturing to get started by making it simpler and less expensive to import equipment and materials from existing suppliers in the more highly developed countries (DC's). With respect to the motor vehicle industry, the new entrants were foreign firms which were granted the same privileges as the existing firms. In some cases, additional incentives were granted these firms due to the fact that the government felt that they brought in new production techniques and experience that Brazilian firms were lacking. The motor vehicle parts industry, which was growing up simultaneously with the assembly firms, typically took a slightly different approach. Foreign parts firms tended to enter into joint ventures with existing parts producers or new Brazilian firms just entering the industry. There are a couple of reasons for this approach over the one chosen by the assembly firms (that of wholely owned subsidiaries). First, unlike the major motor vehicle producers, who had previously set up similar types of operations in other foreign countries, the parts producers had little such experience in setting up foreign operations. Therefore, these firms felt more comfortable both in sharing the risk and in using the knowledge of operating in Brazil which domestic firms

had. Secondly, unlike the assembly firms, which had no domestic competition, the entrants into the parts industry did face some domestic competition that made the move into Brazil more difficult and risky.

According to Nascimento, many people felt that the policies enacted in the 1930's gave too much incentive to foreign-based firms, and therefore stifled potential domestic firms which might otherwise have tried to enter the vehicle assembly industry. The Second World War changed the bias of the government's policies favoring foreign firms. With the outbreak of war among the DC's, it became increasingly difficult, if not impossible in some cases, to continue to import the necessary equipment and material to keep industry growing. This change in world conditions represented a significant stimulus to domestic industry. Domestic firms now had to fill the supply needs of the newly created industries. The rising prices of imported material caused by wartime shortages in the DC's offset the negative effects on domestic firms of the tariff exemptions given in the early 1930's and the decreasing effectiveness of the Tariff Law of 1934, whose protection to domestic firms had been eroded by inflation [11:21-22].

With the end of World War II in 1945, world trade began to revive and once again the domestic firms were at a disadvantage. The foreign-dominated assembly firms flourished. However, the domestic parts producers were not displaced completely because they had had time to perfect their products during the war, and, because they had

gained a larger market share, they were able to experience economies of scale. After the war, then, the domestic parts firms were better able to compete with imported parts from the DC's. The items being supplied domestically included batteries, lights, belts, bumpers, and jacks, among others [11:24].

In 1945, Companhia Americana Industrial de Ônibus (CAIO) was founded, as was Vemag. Operations were set up by Vemag to assemble Studebaker, Massey Harris, and Scania Vabis from imported CKD units. During this same period, Brazil imported increasing amounts of capital goods as well as consumer goods and rapidly depleted the surpluses in its balance of payments that had accumulated during the war years. In 1947, Brazil again had a deficit in its balance of trade ($55 billion). Over the period 1947-1949, the deficit grew to $355 billion. In response to the rising deficits and the even larger foreign debt, the government began to take steps to reduce imports and stimulate import substitution. On February 23, 1948, the government passed Law #262, which established an import licensing system for the distribution of foreign exchange. This law made it more difficult and expensive to obtain foreign currency to import products which the government labeled "non-essential," usually consumer goods. At the same time, the new law was still favoring the importation of capital goods and materials that were to be used in those industries which the government was encouraging.

The auto parts industry was the one of the industries that benefited most from law #262. In 1941, there were five firms

in this industry. In 1948, there were roughly 20 firms, and in 1949, there were nearly 100 firms in the industry. Most of these firms were established in São Paulo near the major assembly operations. In 1949, 65 percent of the auto parts and assembly firms were located in São Paulo. These firms accounted for approximately 92 percent of all production, employing nearly 80 percent of all workers employed in the motor vehicle industry [11:26].

1950-1955

The period of the early fifties was one of diversity both politically and economically. It was during this time that many advances were made, which resulted in accelerating economic growth in general and in the motor vehicle industry in particular. The early 1950's was a period of crisis and change politically, which culminated with the ascent of Juscelino Kubitschek to the presidency in 1956. Kubitschek was to have the greatest impact on the motor vehicle industry of any single political leader.

As the decade of the forties ended, there was a steadily growing industrial base and a strong domestic market for automobiles and trucks, so the stage was set for rapid expansion of the domestic motor vehicle industry. The "cold war" and the Korean war, which interrupted trade between Brazil and its trading partners in Europe and the U.S., also had a significant impact on the growth of domestic industry. The overall economy showed significant and sustained growth in the early fifties, with real GNP increasing every year at an average rate of 5.3 percent per year [11:29,45].

As was previously stated, the import licensing law of 1948 had a positive effect on the auto parts industry, and it stimulated the import-competing firms in that industry. Most of the new firms were subsidiaries of foreign-based firms which previously had only been assembling their products in Brazil. Now many of the new firms were beginning to produce domestically, that is, producing with a higher degree of domestic content. That meant that in 1950, 1951, and 1952, imports of equipment and raw materials not available domestically were increased substantially.

In 1951, Getúlio Vargas began his second administration, which, according to Nascimento, was characterized by the significant influence of financial capital, both foreign and domestic. This led to an acceleration in the growth of an already vigorous industrial sector [11:30]. The government was again attempting to stimulate economic growth, although it did not adopt an overall plan of action. Instead, the government granted special privileges to certain investors or potential investors who agreed to invest in those industries in which the government was most interested. In fact, this included the motor vehicle industry, where the government allowed firms producing auto parts to have more liberal access to imported materials and equipment. The domestic production of auto parts continued to grow and keep pace with the rest of the motor vehicle industry, but production was concentrated on those parts that were used in the greatest numbers and those which utilized less sophisticated technology and equipment. Domestic producers were not anxious to install the more advanced and

expensive equipment needed to produce the more sophisticated parts due to the instability of protection in the market and to the reluctance of assembly firms to use domestic parts, which they considered to be lacking in quality. Due to the increased level of importation of material and equipment brought about by a relaxation of import restrictions, Brazil again experienced a deficit in its balance of trade: roughly $197 million in 1951, and up to $541 million in the following year.

The government was therefore forced to tighten its restrictions on imports, and especially the restrictions on those goods which accounted for the largest percentage of imports. Motor vehicles and petroleum were two such products, and therefore greater emphasis was placed upon the domestic development of both of those industries. The government responded to the problems in its foreign sector with a number of different pieces of legislation. The government began by creating, through Decree #29806 in 1951, the Commission for Industrial Development (CDI). This commission was created under the advisement of Horacio Lafer, then the head of the Ministro da Fazenda (Treasury Department). The CDI was to report directly to the president of Brazil. The CDI was charged with the duty of devising the most efficient and orderly means of organizing the private sector in conjunction with the administration, to lead to the establishment of new industries and to encourage expansion of existing industries. The CDI was seen as the primary organization for outlining future policies designed to encourage the development of certain key industries through a process

of indicative planning, where the private sector coordinates future investment and production decisions with the government planning authorities. Just after the formation of CDI, a subcommission was formed, called the SubCommission for the Manufacture of Jeeps, Tractors, Trucks, and Automobiles (1951). This subcommission was directly responsible for devising policies that would stimulate the development of the motor vehicle industry. In October 1952, the subcommission submitted its plan for encouraging the production of auto parts and accessories, as well as the gradual implementation of a domestic Brazilian motor vehicle industry. This plan was to be implemented immediately in conjunction with other aspects of the government's development plans, which were initiated by Aviso #288, passed on August 19, 1952. Aviso #288 was passed in order to control imports (to reduce balance of trade deficits) and to protect the domestic market from foreign competition. This Aviso, which was administered through Carteira de Exportação e Importação (CEXIM), limited the licensing of imports to those products that were not already being produced domestically. Although this law was generally applicable to all industries, it did have a significant effect on the motor vehicle parts and accessories industry. In effect, it prohibited the importation of at least 100 different parts and accessories for motor vehicles.

The subcommission report reaffirmed the use of Aviso #288 and further recommended a prohibition on the importation of fully assembled vehicles, as well as a prohibition on the importation of

unassembled units containing those parts that were being produced domestically. That is, those unassembled units that were imported would have to come in without the various parts that were on the CEXIM list of parts produced domestically. The list of prohibited parts was to be revised periodically to include all of the parts that were being produced domestically. In addition, the commission felt that the government should institute certain incentives for those firms engaged in vehicle assembly, in order to break down the resistance to the program of gradual nationalization.* A number of suggestions were made in the area of incentives and advantages which could be given to the assembly firms. It was recommended that these firms be allowed to import semifinished parts and accessories, and that they be given priority in obtaining import licenses for equipment and raw materials not available domestically. The importation of such equipment and material was to be exempted from import duties, but quotas would be instituted. The precise quota for each firm would be proportionate to the level of nationalization attained in the vehicle and the amount of credit that had been extended to each firm.

The recommendations contained in the subcommission's report on the motor vehicle industry were accepted by CDI and the president, and an additional aviso was issued by CEXIM that extended Aviso #288. Aviso #311, passed December 24, 1953, was to prohibit, starting July 1, 1953, the importation of complete and assembled motors for

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*Nationalization refers to the process of increasing the degree of domestic content of products and not to state ownership.

vehicles. The only vehicles that were to be allowed in were CKD without frames, upholstery, seats, and springs.

On the whole, 1953 was not a very good year for the economy. The rate of growth of real GNP dropped to 2.6 percent, a rather sharp decline from the previous year [11:29]. This drop in the rate of increase in real GNP was coupled with a deterioration in the foreign sector, which was caused by a decrease in the value of Brazil's exports. These two factors threatened the potential for continued expansion of industry by limiting the country's ability to import as well as to stimulate further growth domestically. In reaction to the situation, the government continued to rely on Law #262 (Licença Prévia) as a means of restricting imports. However, the government not only wanted to restrict imports, but also wanted to find ways of attracting new foreign investment which could be used to accelerate the degree of import substitution (and thereby add to Brazil's industrial base). It was in this political environment that the government instituted a number of changes in their exchange rate structures. This was begun with the passage of Law #1807 on January 7, 1953, which in effect created a dual foreign exchange market. It created a free foreign exchange market parallel to the official foreign exchange market. This system was set up so that the products of an exporting firm, if valued in terms of foreign currency, would be sold to the government at the free market rate. Because the official rate of exchange was being held artificially low, the free market rate was more favorable to Brazilian exporters. At the

same time, all imports into Brazil continued to be subject to the Regime of Licença Prévia, and all foreign exchange needed to purchase imports had to be obtained from the government at the official rate. (The official rate was held artifically low in an effort to make it more attractive to favored industries to import, and the resulting scarce foreign exchange was then allocated by the government under Licença Prévia.) This system acted as a powerful stimulus for exporting firms and for the importation of those consumer and capital goods in which the government was most interested. According to Nascimento [11:37], the dual exchange system effectively eliminated the restrictions on the remittance of interest, dividends, royalties, and other factor incomes earned domestically by foreign capital.

Law #1807 was regulated through Decree #32285 of February 19, 1953. According to this decree, foreign capital brought into Brazil could be exchanged at the free market rate, then any remittance of profits would be exchanged at the official rate. In addition, once foreign capital entered Brazil and was exchanged according to the free market rate, application could be made for an import license, and, upon meeting the selective criteria for importing machines and other equipment, the funds would be exchanged again at the official rate. This system worked to the definite advantage of the foreign investor, in effect granting him a relatively large subsidy. For example, when the official rate was Cr$20 to the dollar, while the free market rate was roughly Cr$38 to the dollar, foreign capital of $100,000 would be exchanged for Cr$3,800,000. Then, if the firm

wished to import equipment and materials worth $100,000, and it met the import requirements for obtaining a license, the firm would only need Cr$2,000,000. The firm could pocket the remaining Cr$1,800,000, or roughly $90,000, giving them a 90 percent subsidy on their dollar investment. Under this system, firms which borrowed capital from foreign sources (as opposed to direct foreign investment) were at a disadvantage, since loans had to be negotiated at the official rate.

Law #1807 also revised an earlier law, Decreto-Lei #9025, which was passed on February 24, 1946, in order to restrict the remittance of profits and other income. Decreto-lei #9025 had restricted the remittance of foreign capital to 20 percent of that which was registered with the Carteira de Câmbio of the Bank of Brazil. With Decree #32285, a limit of 8 percent was set on what could be remitted out of interest, profits and dividends. SUMOC was given the power to delay the remission of capital in excess of the 8 percent [11:37].

On October 7, 1953, SUMOC issued Instruction #70, which maintained the favorable conditions toward foreign investment that had been initiated through the Regime da Licença Prévia, and continued to give advantages for investment that were consistent with Avisos #288 and #311. According to Nascimento, Instruction #70 had a number of significant effects on the regulation of foreign exchange markets in Brazil. Basically, it established a classification system for imports which was based upon "degree of need." This system resulted in price increases on imports in the less favored categories, thereby allowing

domestically produced substitute products to have a bigger share of the market. Secondly, this instruction extended the privilege of importing capital goods without covered exchange to any firm which was authorized by SUMOC [11:38].

As a result of the above policies, additional firms entered both the assembly and auto parts industries, and older firms engaged in plant expansion. In 1952 and 1953, three new assembly firms were established. Willys Overland of Brazil was established in São Paulo in 1952. In 1953, Mercedes-Benz built a truck assembly line in São Paulo that was later expanded to produce bus chassis and assemble buses. Also in 1953, Volkswagen constructed an assembly line designed to assemble passenger cars as well as utility trucks. CAIO began to manufacture the entire chassis for its buses in 1953, therefore only importing motors and axles. In the same two-year period, some 280 new auto parts firms were founded, and numerous existing firms were expanded. The successes above were cited by various firms to convince the government that if the subsidies and other incentives to import needed materials and equipment were higher, growth would be even more rapid [11:39].

During 1953 the trade balance for Brazil began to improve. The capital account, however, remained in deficit for the entire first half of the decade. The government interpreted this problem as further evidence that more incentives were needed to stimulate an inflow of foreign capital. In response to this perceived need, SUMOC issued Instruction #81 on December 22, 1953. This instruction expanded the

definition of "investments of special interest to the national economy." Thus, a wider range of investments became eligible for preferential treatment under Law #1807. This change referred only to the finances involved in the investment in "special industries," establishing that the payment of principle and the interest on the principle were to be made through the official exchange rate, with a minimum surcharge to be added on as fixed by SUMOC [11:40].

On December 29, 1953, seven days after SUMOC issued Instruction #81, the government passed Law #2145, which in effect constituted a consolidation of the new exchange system. Foreign trade continued to be subject to the Regime of Licença Prévia. The importation of machinery and equipment that was seen as being essential to the development of the national economy continued to be exempted from the usual import licensing procedures, and covered exchange was not required. Law #2145 was implemented by Decree #34893, which was issued January 5, 1954. It basically reaffirmed Instruction #70 of SUMOC. This decree maintained the possibility of transferring the interest, profits, dividends, and principle of loans and investments by foreigners according to the free exchange rate. If a loan was made for the purpose of starting new firms or expanding existing firms which operated in those industries that the government deemed "basic," the interest and principle of that loan could be remitted according to the official exchange rate.

In an effort to assist in the development of the automotive industry specifically, the Subcommission for the Fabrication of Jeeps,

Tractors, Trucks, and Automobiles had recommended in its 1952 report that a special organization be established that would be an executive committee, with the power to intervene at every level of administrative decision-making, as well as a consulting body, to aid in the solution of particular problems. This group would take care of those questions, problems, and complex decisions involved in overall establishment of a motor vehicle industry, and not the day-to-day problems particular to a specific project. In February 1954, the Subcommission had several projects accepted by the CDI and the President. One of those projects consisted of the creation of the Comissão Executiva da Indústria de Material Automobilístico (CEIMA). This gave the automobile industry official status as being an "industry of relevant interest to the national economy" and, therefore, able to take advantage of those policies designed to stimulate basic industries [11:41].

Another project that was accepted was a plan for the production of light and medium trucks. It was here that the minimum standards were set for the nationalization of truck production over a period of four years (see Table I-1). According to Nascimento, this was not a highly ambitious schedule, because, in 1952, Fabriçã Nacional de Motores (FNM) was already producing trucks that were 35 percent nationalized by weight. The plan, however, also suggested that it was possible that an upper limit of nationalization of 92 percent by weight and 86 percent by value of all vehicles could be reached in four years [11:42].

The Commission (CEIMA), which was instituted by Decree #35726 on June 25, 1954, was to be the primary tool of the government's type

Table I-1

Index of Nationalization for Light and Medium Trucks

Year	Index (% of total weight)
1954	20
1955	35
1956	50
1957	65

Source: Benedicto H. Nascimento, Formação da Indústria Automobilística Brasileira. São Paulo: Universidade de São Paulo, 1976, p. 43.

of indicative planning in the creation of a domestic motor vehicle industry. This commission had the power to issue incentives to firms as a means of stimulating the industry. The following are examples of possible positive incentives: exemption of firms from tariffs or other taxes; maintenance of a protected market; granting of credits to importers, as well as lower exchange rates on certain imports; and making special arrangements to allow foreign firms to remit interest, profits, and principle to their home country. The commission could also impose negative incentives on those firms which failed to meet the goals for the industry as set forth by the government. In order to enhance communication and cooperation, firms wishing to participate in the program would be allowed to have a representative on the commission [11:43].

According to article three of Decree #35726, CEIMA was to have the following duties: (a) promote and coordinate studies with reference to the following subjects: nomenclature, revision of

custom duties, classification of marketers by exchange categories for purposes of importation, standardization of materials, preparing the specialized types of labor needed, supplying of primary materials and capital goods, statistics, industrial census, tax and legislative measures, markets, costs of production, shows and exhibitions, proposals of new industries, incentives, catalogs and publications, new lines of productions, and other interests of the automobile industry; (b) elaborate and submit plans to CDI on how to diversify and expand the automobile sector and make its plans consistent with the overall CDI plans of industrialization and the overall condition of the national economy; (c) control the execution of those government plans and policies that affect the automobive industry; (d) assist the organizations which control foreign exchange and commerce by establishing importation criteria (for the items needed by the automotive industry) that would be necessary for the execution of government plans; (e) solicit aid from other government agencies for any assistance that would prove helpful in fulfilling their planned goals; (f) collaborate with other government agencies when possible so as to bring about uniform execution of the total government plan as well as that for the automotive sector; (g) register the firms producing automotive products. The commission was to be composed of a diverse group of both government administrators and leaders of industry with special interest in the automotive sector [11:42-44].

Almost exactly two months following the passage of Decree #35276, the president of Brazil committed suicide, and a political crisis

ensued. This brought an end to the existing plan for the development of the Brazilian automobile industry.

CHAPTER II

THE BRAZILIAN MOTOR VEHICLE INDUSTRY IN TRANSITION: 1955-1960

The Crisis Years: 1955-1956

The political crisis that was started in Brazil in August of 1954 by the suicide of President Getulio Vargas was compounded by a significant deterioration in the economy's performance as well. Brazil's balance of trade fell into deficit once again. There were two major factors which led to this situation: (1) renewed incentives (Law #1807/1953) given by the government for the importation of materials and equipment that were to be used in building up "basic industries," (2) the coffee market, which had been favorable during 1953 and the first half of 1954, deteriorated sharply in the latter half of 1954, due to the prospect of an exceptionally good harvest coupled with problems of placing the coffee in the American market. Due in large part to these two factors, from 1953 through 1954, the Cruzeiro suffered a significant depreciation relative to the U.S. dollar of approximately 136 percent in Brazilian terms over the period. This, too, contributed to Brazil's difficulties in importing the materials and equipment that were needed in order to sustain the industrialization process. These problems manifested themselves in a significant slowdown in the rate of growth in GNP from a high of roughly 7.7 percent in 1954 to a low of roughly 1.9 percent in 1956 [11:45].

During the interim period between President Vargas' death in August of 1954, and the emergence of the "Plano de Metas" of President Kubitschek in July of 1956, a number of significant new policies were introduced, primarily designed to perpetuate the industrialization that had begun in the early 1950's. In addition, there was renewed emphasis on seeking new ways to stimulate an inflow of foreign capital, both physical and financial. From 1947 through 1955, Brazil had experienced a net capital outflow which, in the view of the government, was retarding the country's industrialization efforts. During this period the government was relying on two laws (Law #1807 and Instruction #70 of SUMOC - The Superintendent of Money and Credit), both enacted in 1953, to encourage an inflow of foreign capital. Law #1807 set up a multiple exchange rate system designed to favor the importation of certain types of capital, and Instruction #70 specified the method for implementation of Law #1807, as well as specifying that SUMOC would have the authority to exempt some imported capital goods from the rules set up by Law #1807.

The program initiated with Law #1807 was designed to replace the previous licensing system that had been developed after World War II in an effort to restrict imports which were rapidly depleting Brazil's reserves of foreign exchange. Law #1807 and Instruction #70 instituted a system of multiple exchange rates which operated through a weekly exchange auction. As Gordon and Grommers stated, "This provided a de facto devaluation of the Cruzeiro for imports and established a market mechanism for equating foreign exchange supply and demand" [10:17]. Law #1807 set up five categories for imports,

depending on the perceived needs as determined by Brazil's national goals for economic development. The least favorable treatment applied to luxury items and those products whose domestic supply was adequate (category #5). Exchange certificates were issued in separate auctions for each of the five categories. The price of the various exchange certificates was determined by the demand for and the allotment of exchange to each category. As can be seen from Table II-1, the price of these exchange certificates varied considerably from one category to another. The effective exchange rate was equal to the price of the exchange certificate plus the official rate of exchange (Cr$18.50 per dollar) plus a 10 percent tax on the official rate and a few small fees [10:17]. There was a limit of $50,000 U.S. per week on individual importers.

Law #1807 also abolished the restrictions on the remittance of profit and other capital transfers, and a free market exchange rate was instituted for these purposes. Both laws provided for preferential exchange rates to be instituted for the importation of certain items considered to be indispensable. In addition, a preferential exchange rate (known as the "Cost-of-Exchange Rate") could be obtained to finance the importation of certain capital equipment through loans of at least a five year maturity. This preferential treatment was reserved for equipment which was considered by SUMOC to be of "special interest to the national economy." This particular feature of the law was significant because the automobile industry was designated as being of "special interest to the national economy" early on by SUMOC.

Table II-1

Exchange Rates for Imports in Various Categories:
September 1956

Category	Products	Cruzeiros per U.S. Dollar
Category I	Agricultural supplies	51
Category II	Ores, raw materials	71
Category III	Industrial machinery, vehicles	142
Category IV	Office machinery, fresh fruits, some consumer goods	187
Category V	Other items, including all those of which local supply is satisfactory	302
Free Rate	Invisibles, and most capital transactions	68.50
Preferential Rates	Petroleum, wheat, fertilizers, newsprint, and other special items	19 to 54
Cost-of-Exchange	Interest and amortization on registered capital imports	43.82

Source: International Monetary Fund (IMF), International Financial Statistics, December 1956.

The process involved for those firms attempting to take advantage of the above regulations was quite complex and inefficient. Therefore, on January 18, 1955, SUMOC issued Instruction #113, which was designed to streamline the procedures for obtaining the required permission and licenses needed to take advantage of the government's import incentives. Instruction #113 established that Carteira de Comercio Exterior (CACEX) had the authority to issue import licenses to foreign investors, who were allowed to import machinery without covered foreign exchange, provided the investor would agree to accept payment in the form of cruzeiro capital participation in the firm in which the machinery was to be used [10:19]. This privilege was automatically extended to those firms importing machinery that was to be used in producing goods in categories I to III of the import control system. Firms could apply for the privilege to import equipment needed in the production of goods in higher categories, but a special appeal to SUMOC itself was needed. In addition, the investing firm had to prove that it either already possessed the capital, or had the necessary resources for obtaining the capital, and it had to agree to implement the imported capital in its operations. Instruction #113 put those Brazilian firms not obtaining external financing at a disadvantage since those firms receiving external financing were able to convert their loans into cruzeiros at the official exchange rate raised by a surcharge of Cr$40 to the dollar. There was, however, also a limit of the annual installment that firms could pay of 20 percent of the value of their loan. The extent to which CACEX could

grant these privileges was dependent upon its fund of foreign exchange credits, which was quite limited at first.

In addition to the new policies of the Brazilian government, there were changing economic conditions in the United States and Europe which tended to encourage greater interest on the part of industrial firms to enter Brazil and/or expand their operations there. The winding down of the reindustrialization of Europe, and the merger movement that was changing the structure of industries in the United States during this period, gave firms in both areas the desire to seek out new markets where they would have the possibility of earning higher profits on their investments than in their own countries.

Together, these changes brought an acceleration of the process of nationalization of the vehicle industry in Brazil. Many of the firms operating in Brazil (or starting new operations there) were attempting to increase the degree of nationalization of their business so as to obtain greater advantages from the government, which in turn gave them advantages over competitors and importing firms. Instruction #113, therefore, had a significant impact on the structure of Brazilian firms as well as foreign firms operating in Brazil. Foreign firms wanted to have better relations with Brazilian suppliers so as to increase their level of nationalization, and Brazilian firms wanted to form arrangements and joint ventures with foreign firms so as to be able to take advantage of the new incentives as well. Therefore, firms in industry in general and motor vehicles in particular became "mixed" in the sense that there were fewer purely Brazilian firms or foreign

wholly owned subsidiaries. Instead, most were of a joint venture type between Brazilian and foreign-owned firms.

There is an interesting difference in perception of the significance of Instruction #113 and the "Law of Similars"* between Nascimento and Gordon and Grommers [11:10]. Nascimento focuses almost exclusively on the effects of Brazil's policies of granting import licenses and the use of multiple exchange rate systems, all designed to manipulate Brazil's imports so as to conserve its scarce foreign exchange reserves while insuring that only items essential to its development goals were allowed to be imported. Nascimento almost totally ignored the effects of the "Law of Similars" and its influence on foreign firms' desires to invest in Brazil. This is a point which Gordon and Grommers bring out effectively from their interviews with American firms which have operations in Brazil. They point out that although the incentives offered by the Brazilian government to invest in Brazil were persuasive, and there appeared to be a very large potential market for their products, one of the most important factors in their decisions to invest in Brazil was the "Law of Similars" looming in the background and its potential effect on their ability to export to Brazil. Given the potential of the Brazilian market for products such as motor vehicles, it was felt that sooner or later someone

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*The "Law of Similars" actually refers to a series of government decrees dating back to 1890 which prohibited the importation of any products for which there existed a similar domestic product. Due to the ambiguous nature of these decrees, these laws could be applied selectively at the government's discretion.

(domestic or foreign) would begin to produce domestically, and that once this occurred, the Brazilian market would then be closed off to all outside competition. Therefore, while the government was offering such privileges to foreign investors, many firms took advantage of the situation in hopes of effectively sealing the market for themselves. Whether or not the "Law of Similars" was considered directly with much weight, it most certainly did have an effect on the firms' overall decisions and the speed with which these decisions were made. Gordon and Grommers presented the following example of how all the various laws worked together:

> . . . a company that began manufacturing automotive parts for the replacement market in 1951 reported that it had no difficulty in obtaining licenses for importing machinery, and was in addition granted considerable reductions and exemptions from import duties. It should be noted, however, that the decision to go into Brazil would probably have been made without the favorable tariff treatment. The company foresaw a rapidly expanding market for its product in Brazil, in which it wanted to participate. Because of the existence of a local industry, protected by the law of similars, importing was impossible, so that there was no option but to undertake manufacturing [10:27].

The following figures on foreign investment in Brazil (Table II-2) show that Instruction #113 represented a significant improvement in the government's attempt to stimulate industrial development through the influx of foreign capital. However, Instruction #113 in no way represented a complete, consistent strategy for industrial development in general and even less so with respect to the motor vehicle industry in particular, even though it was the automotive industry which benefited most from Instruction #113. This instruction contained no planning goals, no timetable and therefore no way of measuring its own

Table II-2

Foreign Investment Through Instruction #113: 1955-1959

Industrial Sectors	Thousands of Dollars	% of Total
Non-manufacturing	1.7	0.43
Public Services	0.3	0.08
Mining	14.2	3.59
Iron and Steel	41.8	10.56
Automotive Machinery	213.3	53.90
Textile	9.1	2.30
Chemical Pharmaceutical	17.9	4.52
Wood-Rubber	41.5	10.49
Paper	26.6	6.72
Food	11.0	2.88
Plastics	4.9	1.24
Others	2.0	0.51
Total	395.7	100.00

Source: Benedicto H. Nascimento, Formaçao da Indústria Automobilística Brasileira. São Paulo: Universidade de São Paulo, 1976, p. 49.

effectiveness. It was not until early 1956, when Kubitschek assumed presidency of Brazil, and shortly afterwards instituted the "Plano de Metas" (literally translated, plan of goals), that Brazil was to have a truly complete, consistent plan designed to stimulate a domestic motor vehicle industry in five years.

Plano de Metas: 1956-1960

On January 31, 1956, Juscelino Kubitschek de Oliveira became the president of Brazil. It was through his initiative and guidance that significant advances were made in the nationalization process of the motor vehicle industry. Statements made by Kubitschek both before and after he became president illustrate his philosophy of

industrialization and provide a preview of the direction that the motor vehicle industry was about to take. During his campaign in 1955, Kubitschek stated that ". . . it was his intention to give limited support to a smaller number of industries, those which were of greater and more immediate interest to the national economy." He promised that if elected, ". . . legislation would be proposed to congress to designate certain industries as target industries, each with its own set of goals which were to be obtained during his administration. Among the first of these target industries was to be the automobile and truck industry" [11:56]. The Kubitschek administration felt that the ideal solution to accelerate industrialization would be for Brazilian firms to form associations with foreign firms of the same type, thereby utilizing the experience, methods of production, and patents of the foreign firms for the production of trucks or automobiles, while at the same time strong incentives would be granted to the national auto parts industry [11:57].

Upon becoming president, Kubitschek began immediately to implement his ideas by creating the Development Council (CD) in February of 1956. The CD was to be directly subordinate to the president and would consist of the following members: ministers of the various national agencies, the chiefs of the civil and military cabinets and the presidents of the Bank of Brazil and the National Bank of Economic Development. This council was assigned the following functions: (a) study the measures needed in the coordination of the nation's economic policy, particularly in regard to economic

development; (b) devise plans and programs aiming to enhance the efficiency of government activities and to stimulate the private sector; (c) analyze and study reports on the evolution of different sectors within the national economy; (d) study and prepare preliminary plans of laws, decrees, and other administrative acts necessary for the attainment of the objectives mentioned in (a) and (b) above; (e) stay informed on the implementation of those measures whose adoption has been approved [11:57]. The functions of the CD were similar to those of the Commission for Industrial Development which had been set up under the administration of Vargas. It was the immediate task of the current CD to make the preliminary studies for the preparation of what was called the "Plano de Metas." Within the CD a group was formed (called Grupo de Trabalho sobre a Indústria Automobilística) to do the preliminary planning for the motor vehicle industry. This group was headed by Lucio Meira, Minister of Transportation, who had served as the leader of the Subcommission on the Fabrication of Jeeps under the Vargas administration.

Early in March of 1956, shortly after Kubitschek took office, two new Instructions, #127 and #128, were issued by SUMOC. These two Instructions simply tightened up on the importation of CKD vehicles and modified some of the definitions that had been specified in previous Instructions. The most significant new legislation pertaining to the motor vehicle industry did not come until a few months later, when the group studying the industry had a chance to make its recommendations to the president. In May 1956, the group headed by Lucio

Meira issued its report on the automobile industry. The report contained an analysis of the motor vehicle and parts industry that existed in Brazil at that time. In addition, the report contained the preliminary plan for the creation of the Grupo Executivo da Indústria Automobilistica (GEIA) and for the establishment of guidelines for the creation of a domestic automobile industry [11:57].

It was reported by the Ministry of Transportation and Public Works that the Brazilian economy could absorb approximately 52,000 transport vehicles, trucks and buses per year over the period 1956-1961. In fact, the market for these types of vehicles was so strong that many firms were concentrating on the production of those vehicles and did not have much interest in the production of automobiles. The strong market conditions for trucks and buses was the result of an expanding national economy that was relying to an ever greater degree on highway transportation. In addition, the report concluded that the Brazilian market for automobiles was such that it could absorb an annual production of approximately 15,000 units. It was also felt that the automotive market would continue to grow, and therefore firms in this market could expect to do well because of the increasing expenditures being made during this period on the nation's highway system.

With respect to the existing level of nationalization, it was estimated in the report that in the production of a medium size Chevrolet truck, 37.21 percent by weight was accounted for by locally produced parts that were available in sufficient numbers to supply

the industry. An additional 30.49 percent of the truck's parts by weight either were produced locally in insufficient quantities or would be produced locally within two years [11:58].

Based on the analysis that was presented in the report on the automobile industry, the group made several recommendations as to what measures should be taken in order to insure that the motor vehicle industry developed along lines that were consistent with the government's overall plans for the economy. The report also made recommendations on ways to expedite the desired changes in the industry. First, the group recommended that firms in the motor vehicle industry should be private as opposed to state-owned. The group felt that the Fábrica Nacional de Motores (FNM) should be sold to private interests. The group perceived that the basic philosophy of the government was to intervene directly only in those cases when private interests were not forthcoming. Second, it was recommended that the firms should be basically foreign so as to bring certain benefits to the nation, such as new capital equipment, new methods and techniques of production, and utilization of established commercial networks. Meanwhile, the auto parts production should be left primarily to Brazilian firms, thus creating a horizontal structure in the industry and insuring maximum utilization of the existing auto parts producers [10:55]. Third, the type of motor to be produced (diesel or gasoline) should be left up to the individual firms. Fourth, firms producing in the auto parts industry should be allowed to import equipment without covered foreign exchange, while at the same time it should be much

harder for simple assembly-type firms to enter. Fifth, the producers of auto parts should produce them entirely within the country, while the assembly firms would be encouraged to utilize the ever growing number of domestically produced parts, although exceptions would be granted so that parts that were not available domestically could still be imported. Sixth, the steps in the nationalization process should be fixed on the simple criterion of percentage of weight of the vehicle, varying with the different types of vehicles. Finally, the group recommended the creation of an organization to apply the recommended standards and procedures, consolidating the various administrative sectors that would have dealings with this industry, such as SUMOC, CACEX, etc. This organization was to be authorized to negotiate with producers [11:61].

In addition to the above recommendations, the group also established a five-year plan (1956-1960) for the nationalization of the production of trucks, as well as preliminary plans for the creation of Grupo Executivo da Indústria Automobilística (GEIA) and for the establishment of guidelines for the automobile industry. In order to implement the recommendations and conclusions of the group's report, the president of Brazil issued Decree #39412 (drafted by the group) on June 16, 1956. This decree "established and regulated the basic policies relative to the Brazilian automobile industry, as well as the competence and authority of the executive bodies that would take charge of the application of these policies" [11:61].

Decree #39412 officially created GEIA. The primary role of GEIA was to devise and coordinate the implementation of all government

policy with respect to the motor vehicle industry. GEIA reported directly to the Development Council (CD). The group (GEIA) was made up of five members: the Minister for Transportation and Public Works, president; executive director of SUMOC; director of the National Bank for Economic Development (BNDE); director of CACEX; and director of the Carteira de Câmbio (director of foreign exchange). In addition, a Consultant Council was formed which also included five members, each of whom had some expertise in the fields of motor vehicles, vehicle parts, or other related industries. The Consultant Council was to provide GEIA with all of the technical support it might require in carrying out its various functions. The role of GEIA was similar to that of CEIMA in the Vargas administration, but GEIA's philosophy differed considerably from that of CEIMA with respect to the types of policies to be instituted in order to shape the overall structure of the motor vehicle industry. GEIA's policies reflected to a large degree the political philosophy of President Kubitschek.

Through GEIA, a series of benefits and concessions was granted by the government to those firms which demonstrated a legitimate desire to make long-term commitments in Brazil. The granting of privileges to firms was contingent upon those firms' commitments to the goal of steadily replacing imported components with Brazilian-made parts. Each firm had to show GEIA its actual plans for progressive nationalization of its products through the deletion of imported components. The implicit understanding of the overall plan was that firms not participating in the program would be excluded from the Brazilian market.

The incentives granted by GEIA to those firms choosing to participate in the Brazilian plan were of three basic types. First, equipment and materials needed in the motor vehicle industry were granted Instruction #113 treatment (importation without covered foreign exchange). Second, firms that needed to purchase equipment were given a preferential "cost of exchange" foreign exchange rate and a five year minimum payback period for financing imports. Third, initially these imports were exempted from all import duties. This exemption was replaced, after June 30, 1959, by a schedule of reduced tariffs based on the degree of nationalization achieved.

In addition to favorable treatment in the importation of equipment, extremely favorable terms were arranged for the importation of those components that had not yet been replaced by domestic production. In order to reduce the cost of essential imports, a system of foreign exchange allotments was set up to provide the needed foreign currency at below free market rates. The particular exchange rate any firm received depended upon the category to which its imports were assigned. Originally, there were five auction categories into which all imports were classified. Those firms manufacturing trucks, utility vehicles, and jeep-type vehicles which had attained at least 60 percent nationalization of their engines were in the first category (a), and manufacturers of trucks and jeep-type vehicles who had not yet achieved 60 percent nationalization of their engines were in the second category (b). Manufacturers of utility vehicles who had not achieved at least 60 percent nationalization of their engines, and

all passenger car manufacturers were in the third category (c). When the original agreement ended on June 30, 1959, the exchange benefits were extended at a slightly higher rate until January 1, 1960, after which the importation components were brought into the general auction category. The significance of these exchange benefits is even more evident when one considers the effects of freezing exchange rates during a period of rapid inflation, such as was the case in Brazil during this period (see Table II-3).

Table II-3

Exchange Rates for Importation of Automotive Components: September 1957-1959
(cruzeiros per U.S. dollar)

Category	1957	1958	1959
Group A	63.12	63.12	76.00
Group B	83.89	83.89	100.00
Group C	107.48	107.48	130.00
General Category	92.80	218.30	182.43

Source: L. Gordon and E. Grommers, United States Manufacturing Investment in Brazil: The Impact of Brazilian Government Policies 1946-1960. Boston: Harvard University Press, 1962, p. 50.

In addition to exchange and tariff measures, certain other significant benefits were made available to automotive projects approved by GEIA. These projects were to be classified among "basic industries" with respect to financial assistance from the National Development Bank (BNDE). Also, entry of technicians into the country would be facilitated [10:50]. The "Plano Nacional de Fabricação de

Veículos a Motor (National Plan for the Manufacture of Motor Vehicles) was instituted in July of 1956 through a series of decrees, each of which referred to a different type of vehicle. The national plan consisted, basically, of four decrees. The first two decrees, #39568 and #39569, both issued on July 12, 1956, referred to the production of trucks and jeeps, respectively. These two decrees were followed on July 30, 1956, by decree #39676A which referred to the production of medium-size trucks and pickup trucks. Finally, on February 26, 1957, decree #41018 was issued, which referred to the production of passenger cars. Each of these decrees established the minimum goals for each year in the process of gradual nationalization of each of the above types of vehicles. These decrees were followed on November 18, 1960, by Resolution #319, issued by GEIA, which established the levels of nationalization for each category that were to be attained in 1961 (see Table II-4). The firms operating in the

Table II-4

Levels of Nationalization in the Automotive Industry
(percentage by weight of vehicle)

Type of Vehicle	Date of Measurement						Realized in 1962
	12/56	7/57	7/58	7/59	7/60	12/61	
Trucks	35	40	65	75	90	98	98.0
Jeeps	50	60	75	85	95	99	99.6
Light & pickup	40	50	65	75	90	98	97.5
Automobiles	--	50	65	85	95	99	98.4

Source: Benedicto H. Nascimento, Formação da Indústria Automobilística Brasileira. São Paulo: Universidade de São Paulo, 1976, p. 66.

motor vehicle industry had to achieve the stated goals for their particular category of vehicle in order to take advantage of the various incentive programs which GEIA had instituted.

The decrees established the standards which the finished vehicles were to meet in terms of weight and other characteristics. Contained in these standards, therefore, was the government's definition of a complete vehicle which was to be used in calculating the index of nationalization. Producers were relatively free, in the attainment of their nationalization goals, to use whatever parts and accessories they wished, with the only major exception being the engine. There were strict regulations on the engine and its internal parts which could only be avoided if the particular vehicle under consideration had unusual engine requirements. The production of each firm was established by GEIA in accordance with the demand for exchange. GEIA was at liberty, however, to increase the exchange allotment to those firms which had exceeded their minimum nationalization index, with the availability of exchange being the upper limit. Any firm whose production failed to reach the minimum index of nationalization established in its respective decree would have its benefits suspended. These benefits could be reinstituted, however, if the firm were to attain 90 percent of its goal in the case of trucks and 95 percent of its goal in the case of passenger vehicles. The attainment of the nationalization index could be accomplished either by the vehicle producers manufacturing their own parts domestically or by utilization of Brazilian subcontractors [11:68].

As was stated earlier, it was the policy of the GEIA program to promote a horizontal structure in the automotive industry. GEIA, therefore, encouraged the development of independent parts suppliers, rather than encouraging vehicle manufacturers to make their own parts. Since the vehicle manufacturers were held responsible for complying with the nationalization schedules, it was in their best interest to take an active role in the creation of an independent supplying and subcontracting industry. In some cases, local suppliers were selected and supplied with technical and perhaps financial assistance. This system did not always work well, because local suppliers were sometimes too optimistic in their commitments and failed to live up to expectations at a critical time. The preferred way of establishing a supplier, especially for major parts and highly technical parts, was for the foreign assembly firms to persuade a supplier in its home country to undertake manufacturing in Brazil. In contrast to the situation with assembly firms, however, foreign parts manufacturers which moved into Brazil usually engaged in joint ventures with pre-existing Brazilian companies. In their interviews with American parts firms which made the commitment to move into Brazil, Gordon and Grommers came up with several identifiable factors which were significant in those firms' decisions to manufacture parts in Brazil. First, there was the potential size of the Brazilian market, which would be protected from outside competition. Second, these firms would be allowed to export parts to Brazil until their domestic operations were ready to produce locally. Third, there was a limited time frame in

which to import equipment duty-free under Instruction #113. Fourth, duty-free entry of subcomponents was an important incentive, as also was the possibility of importing used or reconditioned equipment as investment in kind under Instruction #113. The implication of this latter feature was that firms would be able to reach a breakeven level of production at a reduced volume, due to the cost savings as compared to the purchase of new equipment. Sixth, there was evidence that American vehicle producers put considerable pressure on suppliers in their home market to move into Brazil if they wished to continue doing business in the home country [10:55-56].

On August 14, 1957, Law #3244, also referred to as the "Tariff Law," was passed. This law reduced the number of foreign exchange auction categories from five to two, and replaced specific import duties with a schedule of ad valorem duties, which varied according to the essentiality of the imported goods and the availability of similar products from local sources [10:21]. A very significant feature of the Tariff Law was a provision which created an alternative system of tariff and exchange benefits for manufacturers of passenger cars weighing up to 1,600 kilos. The exchange rate advantages provided by this system were considerably less than those of the GEIA program, but the nationalization requirement was much more relaxed. In Table II-5 below, the tariff reductions that were established by this provision are presented. In order for firms to take advantage of this program, they were required to obtain permission from the Ministry of Transportation and Public Works. In addition, certain

Table II-5

Reductions in Duties on Parts for Passenger Cars Imported Under Article 59 of the Tariff Law

Nationalization of Weight	Reduction of Duties on Remaining Imports
15%	40%
25	60
35	70
45	80
Over 45	90

Source: Benedicto H. Nascimento, Formação da Indústria Automobilística Brasileira. São Paulo: Universidade de São Paulo, 1976, p. 68.

restrictions were placed on the firms, such as a limit on the rate of profit of 18 percent on the assembly firm and 18 percent on the retail firm, and a limit on the FOB value of $2300 (where the exchange commission set the minimum value of the cruzeiro at Cr$100 to the dollar in 1957 and Cr$130 to the dollar in 1958).

The import duties on those parts and accessories which the government allowed into Brazil (those parts and accessories which were not currently being produced in Brazil) were small and inversely proportional to the degree of nationalization of the vehicle for which they were intended. This can be seen clearly in the following tables, Table II-6 and Table II-7.

Law #3244 of 1957, Instruction #161 of 1958 of SUMOC (which regulated Law #3244), and directive #522 of 1958 of MVOP (Ministry of Transportation and Public Works) were all instituted to aid those firms which had failed to meet their preset nationalization index.

Table II-6

Import Tax Rates (12/31/59)

Index of Nationalization by Weight (%)	Ad Valorem Tax Rate (%)
20.0 to 50.0	20.0
50.1 to 65.0	15.0
65.1 to 75.0	4.0
75.1 to 80.0	3.0
80.1 to 85.0	2.5
85.1 to 90.0	2.0
90.1 to 95.0	1.5
95.1 and up	1.0

Source: Benedicto H. Nascimento, Formação da Indústria Automobilística Brasileira. São Paulo: Universidade de São Paulo, 1976, p. 69.

Table II-7

Import Tax Rates (9/30/60)

Index of Nationalization by Weight (%)	Ad Valorem Tax Rate (%)
65.1 to 75.0	4.0
75.1 to 80.0	3.0
80.1 to 85.0	2.5
85.1 to 90.0	2.0
90.1 to 95.0	1.5
95.1 and up	1.0

Source: Benedicto H. Nascimento, Formação da Indústria Automobilística Brasileira. São Paulo: Universidade de São Paulo, 1976, p. 69.

MVOP directive #522 provided that any automobile production firm which had had its project approved by GEIA, but for technical reasons fell short of its goal, would be allowed to continue to operate. However, these firms would have to make arrangements to install equipment either from Brazilian sources or contractors in other countries which would allow them to reach an index of nationalization of 50 percent by weight of the vehicle by June 30, 1959, and 95 percent by July 1, 1960. It was felt that these measures would stimulate the production of automobiles during a period when most firms in the industry were concentrated in the production of trucks and buses [11:68-69].

Clearly, by the end of the original period of the Plano de Metas, a domestic motor vehicle industry had been created. That is, based on the domestic content of new motor vehicles in Brazil by either weight or value, the GEIA program was successful. No inference should be drawn here with respect to the ability of these newly created firms to continue to operate in the absence of all governmental protection and incentives, nor is it inferred that these firms initially would have been able to compete effectively in international markets with other firms outside Brazil. However, with respect to the objectives established by GEIA, for the Brazilian market, in terms of production and degree of nationalization, the program is considered a success. Whether or not this program accomplished all of its objectives, short-term and long-term, both explicit and implicit, and with what degree of efficiency, is the subject of the remainder of this work.

CHAPTER III

AN ANALYSIS OF THE BRAZILIAN MOTOR VEHICLE INDUSTRY SINCE 1960

The Early Years: 1960-1967

Under the original structure of GEIA any firm or group of potential investors could submit a proposal for consideration as a first step in establishing a domestic motor vehicle production facility in Brazil. Slightly more than thirty such proposals were approved initially by GEIA but only eleven of those projects were actually undertaken and put into operation. This group of firms formed the core of the domestic motor vehicle industry in Brazil. Although several significant changes in the structure of the industry have taken place over time, the firms which presently form the core of the industry were among the original eleven.

The eleven original firms can be divided into three basic groups, according to the origin of the capital invested in each: (1) firms whose capital was predominately Brazilian, (2) firms whose capital was approximately 50 percent Brazilian and 50 percent foreign, (3) firms whose capital was predominately foreign [14:40]. As can be seen from Table III-1, six of the eleven firms fell into the third group, and the other five were split between the first two groups. This arrangement was basically in line with the overall philosophy of GEIA, which was to concentrate on developing the industry with external instead of internal sources of capital.

Table III-1

The Original 11 Firms in the GEIA Program

Firms, By Type of Ownership	Capital (CR$)	Origin of Foreign Capital
I. Predominately Domestic Control		
1. Willys-Overland do Brasil	5,610,000	USA & France
2. Vemag	2,000,000	Germany
3. Fabrica Nacional de Motores	4,000,000	Italy
II. Approximately 50% Domestic Control		
1. Mercedes-Benz do Brasil	5,000,000	Germany
2. Simca do Brasil	600,000	France
III. Predominately Foreign Control		
1. Ford Motor do Brasil	3,677,000	USA
2. Scania Vabis do Brasil	610,000	Sweden
3. General Motor do Brasil	3,575,000	USA
4. International Harvester	1,636,000	USA
5. Volkswagen do Brasil	4,385,000	Germany
6. Toyota do Brasil	175,000	Japan

Source: Jose Almeida, A Implantação da Indústria Automobilística no Brasil. Rio de Janeiro: Fundação Getulio Vargas, 1972, p. 40.

The original firms produced a full range of vehicles. Some firms, such as Ford, Volkswagen and FNM, produced passenger cars as well as light to medium trucks and utility vehicles. Other firms, such as Mercedes-Benz, Scania Vabis, and International Harvester, tended to concentrate on medium to heavy trucks and buses [15].

As one would imagine, the transition from planning to implementation and operation was not a smooth one. The domestic content regulations imposed by the government were quite ambiguous indeed. To transform the industry, in only five years, from one predominately concerned with assembling imported CKD units to one which was a true domestic producer of motor vehicles, was a goal which put the new firms under severe pressure to use increasing numbers of Brazilian-made parts. Initially, this meant using higher priced, and, in many cases, lower quality parts in their vehicles [11:65]. In addition, due to the relatively short time frame in which the firms had to have their operations functioning, and the prospect of GEIA reducing and then eliminating its import incentives, many firms initially over-invested in fixed capital. This resulted in significant amounts of excess capacity for most of the original firms. Finally, the large number of firms attempting to operate in a still small (albeit potentially large) market, meant that none of the firms were able to achieve any meaningful economies of scale in production. The excessive market fragmentation, excess productive capacity and high-cost parts meant that earning a profit during these early years was all but impossible.

Table III-2 below compares the cost of producing motor vehicles in Brazil in January of 1967 to the cost of producing them in the U.S. at that time. The figures in Table III-2 show quite clearly that

Table III-2

Cost Increases at Successive Stages of Local Integration in Production of Cars and Light Trucks for Brazil Relative to the United States

Stages of Local Production	(1) Cost Index (U.S.=100)	(2) Share of Total Content (%)
1. Assembly	140	15
2. Mandatory items	150	6
3. Easily supplied parts	160	4
4. Supplies Development required	150	10
5. Engine and driveline-assembly and machinery		
a. Make	130	5
b. Buy	270	4
6. Engine and driveline-foundry		
a. Make	160	13
b. Buy	180	3
7. Amortization and running costs of parts requiring specialized investment	200	12
8. Sheetmetal and other components	180	27
9. Subtotal	172	99
10. Import content	160	1
11. Total value	171	100

Source: Jack Baranson, Automotive Industries in Developing Countries. Baltimore: The Johns Hopkins Press, 1969, p. 36.

production costs were substantially higher in Brazil than in the U.S., which was the home of the parent companies of several of the major Brazilian firms. The added cost ranged from 30 percent to 70 percent over the same activities in the U.S., with the overall result being

that the same vehicle produced in Brazil would cost approximately 71 percent more to produce than in the U.S. Thus, if an automobile was produced in the U.S. for $2,000, it would cost approximately $3,400 to manufacture that same automobile in Brazil.

Table A-1 (see Appendix) shows yearly profit rates of Brazilian motor vehicle firms, beginning in 1966. The table shows that the return to net book value was negative for roughly over half of the firms for 1966 and 1967. The largest losses were associated with those firms that were predominately under Brazilian control and had the smallest production levels. The largest losses in 1966 were incurred by Vemag (48.9 percent) and International Harvester (19.2 percent). During the same year, Vemag production amounted to 7,611 cars, or 6.3 percent of the automobile market, and 7,204 light trucks and utility vehicles, or 10.4 percent of that particular market. Meanwhile, International Harvester had ceased production after having produced only 412 medium and heavy trucks in the previous year. (See Tables A-2 through A-6, in the Appendix, for production figures.) In 1967, the general profit picture worsened for Brazilian-dominated firms, in terms of their return to net book value. Although Vemag's losses dropped to 5.3 percent, FNM showed a loss of 9.4 percent, Willys Overland's profit dropped to 0 percent, and Simca had a loss of 77.4 percent. All of these firms had very low production levels and relatively minor shares of their market.

It was not totally unexpected, of course, for the early stages of development of this type to be characterized by high cost and

relatively low volumes. It would take time for the market to expand, for firms to gain economies of scale, and for improvements in productivity to occur through "learning-by-doing." However, the poor profit picture, combined with an ensuing economic and political crisis (which culminated with a military coup in 1964) meant that several of the original eleven firms would be unsuccessful. The government's new austerity programs, coupled with the general economic slowdown, further exacerbated the early structural problems within the industry. Aside from the year following the coup, GDP, in constant terms, grew at an average of 3.87 percent per year from 1963 through 1967. (See Appendix, Table A-7, for GDP figures.) The economic slowdown resulted in a rather slow rate of increase in overall production of motor vehicles over the period 1962-1967. The average annual rate of growth in the production of passenger cars showed the largest gains, with an increase of 15.29 percent. The light truck and utility vehicle segment of the industry showed a decrease in production rates of 19.73 percent, while medium and heavy truck production decreased by an average annual rate of 26.28 percent over the same period. These figures tend to reinforce the assertion that the general slowdown in the economy and the credit contraction imposed during this period by the government did indeed lead to an eventual "shakeout" in the industry, beginning late in 1966 and continuing into 1969. Automobile production seems to have done better due to an expanding market for cars and some creative buying schemes on the part of individuals in order to circumvent the otherwise tight credit market [9:12-13].

In late 1966, Chrysler International acquired 92 percent of Simca, the parent corporation of Simca do Brasil, which had steadily operated at a loss during the few preceding years. Also in 1966, Volkswagen took over Vemag. Alfa Romeo took control of the Fábrica Nacional de Motores, and, in 1967, Ford acquired controlling interest in Willys Overland from Kaiser and Renault. Finally, in 1969, Saab and Scania merged in Sweden, and therefore Scania Vabis in Brazil became Saab-Scania. The result of this activity was to remove virtually all domestic controlling interest from the motor vehicle industry and pass it to foreign-dominated corporations, so that by 1969, the structure of the industry reflected almost complete foreign control, as shown in Table III-3.

Economic Boom Years: 1968-1974

The period from 1968 through 1974 (the year of the Arab oil embargo and the insuing worldwide recession) can only be characterized as one of rapid economic expansion in general and particularly with respect to the motor vehicle industry. During this period, the overall economy experienced an average annual growth in GDP, in constant terms, of 11.07 percent (markedly higher than the previous four-year period) [1:147]. It appears that much of this turnaround in economic activity was due to the military government's new expansionary economic policies, intended to increase public support of the government. One significant change was the increased availability of credit, which had been very tight in the previous period. Starting around 1968,

Table III-3

Firms and the Origin of Control in the Brazilian Motor Vehicle Industry: 1969

Firms and Type of Ownership	Capital (CR$)	Origin of Foreign Capital
I. Predominately Domestic Control		
None		
II. Approximately 50% Domestic Control		
1. Mercedes-Benz do Brasil	131,752,000	Germany
III. Predominately Foreign Control		
1. Chrysler Corp. do Brasil	136,180,100	USA
2. FNM (Alfa Romeo)	70,629,128	Italy
3. Ford do Brasil	274,023,005	USA
4. General Motors do Brasil	188,665,578	USA
5. Karmann-Ghia do Brasil	6,566,466	Germany
6. Saab-Scania	23,000,000	Sweden
7. Toyota do Brasil	2,078,995	Japan
8. Volkswagen do Brasil	364,493,920	Germany

Note: Puma Veículos A Motores Ltda. is a producer of sports cars which is under Brazilian control; however, in 1969 it controlled only 0.1 percent of the total market.

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

the government opened up additional sources of credit to businesses as well as consumers. This greatly stimulated domestic demand for motor vehicles, both commercial and private. As Mericle points out, "In 1970 consumer credit amounted to 9.7 billion cruzeiros. This figure grew to 14.1 billion in 1971, 22.3 billion in 1972, 37.1 billion in 1971, and reached 40.9 billion cruzeiros by June 1974. An estimated 50 to 60 percent of this total was used to finance automobile purchases" [9:18].

In addition to expanding the overall economy and increasing availability of credit, the government's policies benefited the upper and upper middle income classes, leading to an ever increasing concentration of income at the top of the income distribution. Given that the demand for automobiles is relatively elastic with respect to income, this provided an additional boost to automobile sales during this period [9:16-17]. The figures in Table III-4 clearly illustrate the significance of income in the demand for automobiles, as well as the significance of the concentration of income.

Recall that in 1968, Brazil's motor vehicle industry had considerable excess productive capacity, and it had just undergone a restructuring which consolidated control of the industry in the hands of more experienced foreign producers. Thus, the industry was in an excellent position to take advantage of the changing economic conditions ditions. This is quite evident from the rapid acceleration in production of all types of motor vehicles that took place over the entire period (1968-1974). The expansion and its effect on the

Table III-4

1970 Expenditures on Automobiles by Income Class

Family Income Class	Expenditures on Automobiles (CR$000.000)	Percent of Total Expenditures on Automobiles
Up to 2 times minimum wage	39	1.85
From 2 times to 5 times the minimum wage	170	8.07
From 5 times to 10 times the minimum wage	473	22.46
More than 10 times the minimum wage	1,424	67.62
Total	2,106	100.00

Source: Fundação Instituto Brasileiro de Geografia e Estatística. Anuário Estatístico do Brasil, 1978, p. 830 [16].

production mix can be seen clearly in Tables III-5 and III-6. The remarkable increase in the production of light trucks and utility vehicles is partially explained by the fact that several of these vehicles, such as jeeps and certain types of station wagons, could be considered in a similar category with automobiles because they were consumed privately rather than commercially.

The effects of the very rapid growth in production (approximately 325 percent for the entire industry) were obviously beneficial for the producing firms. Many of the firms began to reach or exceed the minimum size production runs required to obtain the

Table III-5

Production Index for the Brazilian Motor Vehicle Industry: 1968-1974 (1969=100)

Year/Type	Automobiles	Light Trucks Utility Vehicles	Medium and Heavy Trucks
1968	67.9	100.8	103.5
1969	100.0	100.0	100.0
1970	105.1	182.6	84.7
1971	144.1	193.4	85.4
1972	174.4	228.2	104.0
1973	196.7	316.3	136.0
1974	223.7	431.3	158.1

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

Table III-6

Production Mix for the Brazilian Motor Vehicle Industry: 1968-1974

Year/Type	Automobiles	Light Trucks Utility Vehicles	Medium Heavy Trucks
1968	58.9%	17.8%	23.3%
1969	68.3	13.7	18.0
1970	60.7	23.9	15.4
1971	66.9	19.8	13.3
1972	67.3	17.2	15.5
1973	62.8	20.6	16.6
1974	59.2	24.8	15.9

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

economies of scale that existed in the vehicle industries in more developed countries. Baranson estimates that a minimum production run of approximately 120,000 units is necessary to begin to achieve any significant economies of scale [7:29]. Prior to 1968, not a single motor vehicle firm in Brazil could qualify as an economically efficient producer according to Baranson's criterion. In 1968, however, Volkswagen reached an annual production level of 128,089 passenger cars. At that time, no other firm was close to achieving a similar level. Ford had the second highest production level, at 23,376 automobiles in 1968. By 1974, three automobile producers in Brazil had reached or exceeded the 100,000 units annually mark. Volkswagen was producing 269,247 units, General Motors 126,329, and Ford 104,578. The minimum size for efficient production in trucks is considerably lower, and comparable gains were made in that area [15].

The gains in economies of scale due to expanded production translated directly into increasing productivity of both labor and capital. Over this period (1968-1974) unit labor costs fell by an average rate of 5.8 percent per year, with a total decrease in unit labor cost of 31 percent. The figures for capital costs per unit are not as widely available, but they, too, showed a significant decline. Over the period 1966 through 1971, capital cost per unit fell by an average of 8.5 percent per year, with a total decrease of 39 percent [16]. These two results seem to be directly attributable to the increased volume, and probably also to improved techniques of operation brought about by greater foreign control and "learning-by-doing" at the production level.

Profits in the motor vehicle industry also improved during the boom period. For the years 1966 and 1967, roughly 50 percent of the firms incurred losses, while over the period 1968-1974 only about 30 percent of the firms experienced losses [9:14-15]. Table A-1 (see Appendix) shows profits by firms.

Initially, the expansion of motor vehicle production was easily achieved due to existing excess production capacity. Toward the end of the boom period, however, it became evident that if the expansion were to continue, increased investment would be necessary. During the period 1971-1973, the government approved $1,477 million dollars worth of projects in the assembly and parts industry, with about two-thirds going into assembly operations. The implementation of these projects greatly increased the overall production capacity of the industry. Among these projects was a joint venture between Fiat, the state of Minas Gerais, and Italy's investment corporation to set up a production facility in Belo Horizonte capable of producing 190,000 units annually and 155,000 engines for export. Also, Volkswagen expanded its operations in São Bernardo do Campo from 1600 to 2500 vehicles daily. Ford and General Motors both built engine plants and introduced new models, as did Alfa Romeo (FNM) when it began producing cars as well as trucks [9:20-21].

Post Oil Embargo: 1974-1980

The most current period in the historical development of the motor vehicle industry covers the years following the 1973 oil embargo

by OPEC. As one would expect, the rapidly rising price of crude oil and its derivatives had a profound influence on the performance and the direction of the motor vehicle industry in Brazil and on the government's overall development strategy. The impact of the quadrupling of oil prices in approximately one year hit the Brazilian motor vehicle industry especially hard due to Brazil's almost total lack of oil reserves.

As can be seen in Table III-7, there was a dramatic slowdown in the rate of growth in the motor vehicle industry. The average

Table III-7

Production of Automobiles and the Entire Motor Vehicle Industry

Year	Automobiles	% Change	All Types of Vehicles	% Change
1974	531,899		897,768	
1975	524,202	-1.45%	920,107	2.50%
1976	526,944	0.05	966,202	5.00
1977	465,505	-11.66	838,506	-13.22
1978	535,531	15.04	999,684	19.22
1979	547,626	2.26	1,114,502	11.49
1980	600,706	9.69	1,150,710	3.25

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

annual increase in production for the industry was only 4.7 percent compared to 24.9 percent for the previous period, 1968-1974. Automobile production was affected to an even greater extent than the industry as a whole, showing a mere 2.3 percent average annual increase

in production. As will be discussed later, the automobile sector was targeted by the government for production cutbacks in its overall conservation program to cut petroleum-using products. This explains in part why automobile production was sluggish relative to the industry as a whole, when in the past it had been a leading component [9:26-29].

In addition to the slowdown in the motor vehicle industry, the Brazilian economy experienced a similar slowdown due to the industrial sector's reliance on petroleum-based energy. Brazil's GDP, in constant terms, grew at a modest rate of 6.68 percent annually over this period, compared to over 11 percent in the boom period of 1968-1974. This slowdown in the overall level of economic growth was responsible for a significant reduction in demand for motor vehicles, particularly commercial vehicles [1:147].

Brazil's balance of trade was significantly affected by the rising world price of petroleum. Over the period 1950 through 1970, Brazil's balance of trade was in deficit only three years: 1952, 1960, and 1962. Over the period 1971 through 1980, Brazil's balance of trade was in deficit every year. The size of the deficit took on greater significance after 1973. For the three years 1971-1973, Brazil's deficit averaged $226 million. For the period 1974 through 1980, the deficit averaged $2,497 million. The dramatic increase in Brazil's trade deficit was principally due to the jump in the value of petroleum imports and not a deterioration on the export side of their balance of trade. As can be seen in Table III-8, petroleum imports

Table III-8

Brazil's Balance of Trade: 1970-1980
(U.S. $000,000)

Year	Value of Exports (FOB)	Value of Imports (FOB)	Value of Petroleum Imports	Balance of Trade	Petroleum Imports / Imports
1970	2,739	2,507	324	232	12.9%
1971	2,891	3,247	466	-365	14.4
1972	3,941	4,232	573	-252	13.5
1973	6,093	6,192	986	-61	15.9
1974	7,814	12,642	3,233	-4,748	25.6
1975	8,492	12,210	3,300	-3,550	27.0
1976	9,961	12,383	4,083	-2,386	33.0
1977	11,923	12,023	4,201	-100	34.9
1978	12,473	13,683	4,617	-1,158	33.7
1979	15,244	18,084	6,918	-2,717	38.3
1980	20,132	22,955	10,291	-2,823	44.8

Source: IMF International Financial Statistics Yearbook, 1983, p. 147.

in 1973 were $986 million, then in 1974 this figure jumped to $3,233 million, resulting in a 278 percent increase in just one year [1:147].

The motor vehicle industry generated additional drains on Brazil's balance of trade during the post-embargo period in the form of increased imports of machinery and equipment to support the investment boom of the early 1970's, as well as increased imports of raw materials which were unavailable in sufficient quantities domestically. The result of the changes in Brazil's foreign trade sector forced it to modify its development strategy, and in particular the motor vehicle industry's role in that overall strategy.

The Brazilian government reacted to its balance of trade crisis in much the same way as other oil-dependent countries during this period.

First, the government attempted to force conservation on the part of the public by raising the legal price of gasoline to $1.70 per gallon, an increase of 242 percent (in real terms) over the period 1973 to 1977 [9:27]. In addition, the government instituted a tight credit policy for financing the purchase of automobiles, both increasing the minimum down payment and reducing the maximum allowable payback period.

On the production side, the government removed the motor vehicle companies from the favored status position in terms of importing machinery, equipment, and raw materials. The imports of these firms were no longer exempted from import duties, assuming an import license could be obtained. In addition, the government instituted an aggressive export promotional policy with respect to the motor vehicle industry. It was hoped that this particular industry could balance part of its import requirements by aiming their production at foreign markets and thereby earning much needed foreign currency. The Brazilian government pursued its policy of export promotion through a series of financial incentives, the primary example being in the form of federal and state tax credits which were in effect export subsidies. Taxes on sales of products abroad were waived, and the firm received a tax credit, equal to the waived tax, payable against taxes owed on domestic purchases of goods and services [9:30].

The response of the domestic motor vehicle industry to the export incentives has been impressive. The value of motor vehicle

exports grew from $76.2 million in 1973 to $1,512.3 million in 1980 [9:30]. The impact of the motor vehicle industry upon Brazil's foreign sector will be discussed further in Chapter V.

CHAPTER IV

THE LINKAGE EFFECTS OF THE BRAZILIAN MOTOR VEHICLE INDUSTRY

Introduction

As was discussed previously, in the Introduction and particularly in Chapter II, the basis of the Brazilian strategy for development (since the administration of Getúlio Vargas) has been development through industrialization. That is, the goal has been to transform the economic base of Brazil from one of agricultural production and primary products to one of an industrialized economy based on manufacturing for both domestic and foreign markets. The Brazilian "plan" centered around import substitution industrialization type policies. That is, industries that were targeted for development were, for the most part, those industries manufacturing products for which the demand was being met by imports. Thus, the government policy-makers were assured that a domestic market already existed for the products to be manufactured by newly created industries.

Such a bold shift in the direction of the Brazilian economy was to require a tremendous amount of new investment in fixed capital. As was pointed out earlier, Albert Hirschman, a significant contributor to the theories of economic development through industrialization, maintains that, in general, the most scarce resource in less developed countries (LDC's) is entrepreneurial ability. That is, there is a

shortage of individuals in these countries who possess the ability to recognize potentially profitable investment projects and organize the necessary resources needed for such projects, and who have the necessary desire and will to commit themselves to these types of opportunities. Therefore, Hirschman asserts, the key to accelerating industrial growth is not in finding more profitable investment projects, but, instead, in finding the appropriate sequence of investments so as to make more efficient use of existing entrepreneurial ability. The government, then, can play a crucial role in industrial development through manipulation of the private sector by its support of those "critical" industries, which, when established, will have the greatest stimulus to further investment in other, related industries.

According to Hirschman, ". . . every nonprimary economic activity, will induce attempts to supply through domestic production the inputs needed in that activity" [2:100]. Secondly, ". . . every activity that does not by its nature cater exclusively to final demands, will induce attempts to utilize its outputs as inputs in some new activities" [2:100]. Thus, there are two inducements at work within the private sector which will stimulate further investment based on the prior investments in a particular industry. First, there is "backward linkage" (derived demand), which refers to stimulation of domestic production of inputs for the industry. Secondly, there is "forward linkage" (output utilization), which refers to stimulation of further activities which utilize the product of the industry. As Hirschman explains, the question is, ". . . how are linkage effects maximized?" [2:104].

It is important at this point to say that, in Hirschman's view, linkages are simply another criterion in the investment decision and that,

> . . . the usefulness of the criterion lies in the guidance it could provide in specific situations with respect to alternatives that arise in the course of development, rather than in the design of any rigid sequence that might be derived from it [2:104].

Hirschman generally accepts the traditional investment criteria for project evaluation, which are the net present value (NPV) and internal rate of return (IRR) rules. However, once a list of possible projects has been compiled, all of which pass the traditional investment criteria, Hirschman believes that linkages should be a strong consideration in choosing among those projects.

On the basis of the factors discussed above, the motor vehicle industry would appear to be an ideal industry on which to build an industrialization program based on import substitution. Prior to June 1956, the motor vehicle industry in Brazil fit into the category of an "enclave import industry," which is described as an industry in which "materials are imported from abroad, some value is added to them through mixing, assembling, packaging, etc., and the finished product is rushed to the final consumers" [2:122]. An enclave import industry, then, is one which concentrates on the last stages of production and is virtually linkage-free. In contrast, a typical "enclave export industry" is usually centered on primary production. Most of the enclave export industries are engaged in the production of primary products (such as copper, oil, etc.) and food stuffs (such

as coffee, sugar cane, rice, etc.). As was mentioned earlier, Brazil's economy had traditionally been based on the enclave export type industry. Certainly, the most significant difference between the enclave import industries and the enclave export industries lies in their potential linkage effects, or, in other words, their potential impact on the domestic economy. The enclave import industries tend to have the highest potential linkage effects, particularly backward linkages, as domestic firms come into existence to supply domestic producers. It is in the area of enclave import industries that import substitution policies are easiest to observe and implement. It is the basic premise of this study that this is precisely what the Brazilian government had in mind in 1956 with its plan for the creation of a domestic motor vehicle industry.

Mathematical Formulation of the Linkages Used in the Analysis of the Brazilian Motor Vehicle Industry

Mathematically, both the backward and forward linkages can be calculated from the data found in a country's national input-output table. As defined by Hirschman, backward linkage is measured by "the proportion of its [a particular industry's] output that represents purchases from other industries" [2:105]. The forward linkage is defined to be "the proportion of its [a particular industry's] total output that does not go to final demand but rather to other industries . . ." [2:105]. A point of caution is in order in terms of the interpretation of the linkage measures. In order for the measures to have any significance in terms of showing the degree of

stimulus that one industry exerts on other industries, one must assume that the industry in question was started first and that the others followed. This is true for both forward and backward linkages.

The actual calculation of the various linkage measures and the accuracy of those measures depends heavily on the quality of the country's input-output table. Any type of analysis which relies on data contained in an input-output table is subject to certain qualifications. First, an input-output table is only a reflection of input coefficients of production at a point in time. Therefore, linkage calculations derived from the table are based on the assumption that any change in production would be brought about by a proportionate change in all inputs. Changes in production which occur due to factor substitution, new technology, economies of scale, and "learning-by-doing" will result in changes in input coefficients and are not captured until the table is revised.

A second limitation of input-output tables is that they are only as reliable as the data used to compile them. In LDC's, data collection is generally not as consistent nor as comprehensive as in more highly developed countries. Also, the data which are available are generally subject to significant distortions generated by government policies of market intervention. Taxation, subsidies, tariffs, quotas, foreign currency controls, etc. all distort the currency values of the country's flow matrix, which is the foundation of the country's input-output table. Although this latter problem can be

partially eliminated through the calculation of shadow prices, such calculations are very complex and subject to error as well.

In spite of the limitations just discussed, linkage measures are considered to be valid criteria for estimating the potential impact of the development of one industry on other, related industries, as well as on a country's entire economy. There have been a number of works by different economists which attempt to apply Hirschman's theoretical work on the concept of linkages and their importance in guiding the investment decision. One of the more prominent studies was carried out by Baer and Kerstenetzky who utilized linkage measures in analyzing the effects of import substitution policies followed by the Brazilian government in the post World War II period. They calculated backward and forward linkages of thirteen Brazilian industries including motor vehicles, by using coefficients derived from the 1947 United States input-output table. Based on these calculations, Baer and Kerstenetzky came to the following conclusions:

> Those industries which show higher import substitution are at the same time those which ranked higher in terms of total repercussions in the economy.
>
> One of the most dramatic types of import substitution occurred in the motor vehicle industry and the repercussions in terms of increased employment and gross value added were higher than anywhere else. It should be noted that the overall linkage effects are also the highest [8:421].

Although several other studies have been done concerning the use and calculation of linkage measures, the methods introduced by Yotopoulos and Nugent seem to be among the most straightforward techniques available [17]. The formulation of the linkage measures employed by Yotopoulos and Nugent are, however, similar to those used

by Baer and Kerstenetzky. These authors define backward linkages as ". . . the ratio of purchased intermediate inputs to the total value of production," which is derived as follows [17:161]:

$$LB_j = \frac{\sum_i X_{ij}}{X_j} = \sum_i a_{ij}$$

where:

X_{ij} = value of the input i used in the production of the product;

X_j = value of the jth product that is produced;

a_{ij} = direct input coefficient of input i into output j.

The forward linkage is defined as ". . . the ratio of interindustry demand to total demand," which is derived as follows [17:171]:

$$LF_i = \frac{\sum_j X_{ij}}{Z_i}$$

where:

$\sum_j X_{ij}$ = interindustry demand for output i;

Y_i = final demand for output i;

$Z_i = \sum_j X_{ij} + Y_i$.

Given that these two measures are simple ratios derived from the input-output table, they measure only the direct impact of a change in demand for one industry's product on those industries which are in some way related to it (either backwardly or forwardly). There is a third linkage measurement, known as total linkage, which is

defined by Yotopoulos and Nugent [17:161] as the direct plus indirect backward linkages. Total linkage is calculated from the inverse of the Leontief matrix, according to the following formula:

$$LT_j = \sum_i a^*_{ij}$$

where:

$$a^*_{ij} = (I - a_{ij})^{-1}.$$

Since the basic data required to make the above calculations are available in an input-out table [15:821-876] published in 1978 for the 1970 Brazilian economy, the above equations are used to calculate linkages in this study. The Brazilian input-output table is the inverse of the Leontif matrix, so it was necessary to compute the direct input coefficient matrix in order to calculate the backward linkages.

Results of Linkage Calculations and Their Interpretation

The Brazilian input-output table of 1970 includes three sectors which account for the domestic motor vehicle industry: sector 1401 is automobiles, sector 1402 is trucks and buses, and sector 1403 is motors and mechanical parts for vehicles. Linkage effects were calculated for each of these sectors and are listed in Table IV-1, along with the ranking of these linkages in comparison to all other sectors.

The table clearly shows that the two primary sectors, automobiles and trucks and buses, rank quite highly in terms of both direct backward and total linkage effects. Both sectors were ranked

Table IV-1

Linkage Calculations for Various Sectors Including Those Sectors Representing the Motor Vehicle Industry

Sector	Backward Linkage	Forward Linkage	Total Linkage	Rank*
Refining of vegetable oils and fabrication of fats for food	0.8811	0.1858	2.5932	1
Pig iron, iron, and steel in primary forms, including iron alloys	0.7349	0.9684	2.2998	5
Trucks and buses, including bodies	0.7016	0.0093	2.2032	6
Automobiles	0.5702	0.0015	1.9598	17
Shoes	0.4779	0.0000	1.6921	38
Motor and mechanical parts for vehicles	0.3882	0.7433	1.6774	41
Paper and pasteboard	0.3876	0.7998	1.6011	50
Rubber industry	0.3980	0.6934	1.5888	52
Distribution (commerce, warehousing, and highway transport of cargo)	0.0517	0.1574	1.0754	87

*Each of the 87 sectors was ranked in order from highest to lowest in terms of total linkage, with 1 being highest and 87 being the lowest.

in the top twenty, indicating significant potential linkage effects on the economy as a whole as it attempts to supply these sectors with their necessary inputs. As one would expect, the forward linkage measures are quite small for these two sectors due to two factors. One factor is that these two sectors, especially automobiles, produce primarily for final consumption and, therefore, the products are not used extensively as inputs into other industries. Secondly, there is a tendency on the part of those industries which purchase vehicles (especially trucks and buses) for use in their production processes to count these purchases as final use instead of as "inputs" into production, thus lowering forward linkage measures.

In regards to the third motor vehicle sector, motors and mechanical parts, its direct backward and total linkage measures are significantly lower than the other two sectors due to the fact that this sector represents a "lower stage" of production. That is, this sector is further back in the production process from the final process, and therefore requires fewer inputs from other sectors. The forward linkage measure for the motors and mechanical parts sector is quite high relative to the other two motor vehicle sectors, precisely because it is a "lower stage" sector. Although the forward linkage of 0.743252 for the motors and mechanical parts sector indicates that the establishment of this sector should have a significant stimulus forward to the automobile and trucks and buses sectors, the fact is that the development of the automobile and trucks and buses sectors preceded that of the motors and parts sector. Therefore, the

relatively high forward linkage associated with the motors and parts sector is significant, but not to as great a degree as the figure appears to indicate.

The linkage rankings of the motor vehicle sectors indicate that some other industries did have higher linkage measures. However, few, if any, of the other industries affect as many different sectors as does the motor vehicle industry. In the input-output table for Brazil, 72 of the 87 sectors were in some way related to at least one of the three motor vehicle sectors. Those sectors which are related to the motor vehicle industry are shown in Table A-8 (Appendix).

In summary, then, the linkage calculations in this study, based on the 1970 Brazilian Input-Output Table, lead to a conclusion which is consistent with that of Baer and Kerstenetzky [8], who based their calculations on coefficients from a United States Input-Output Table. That is, in terms of the linkage criteria, the motor vehicle industry was a very appropriate choice for a "target industry" in Brazilian development strategy.

The Motor and Mechanical Parts Sector as an Example of Backward Linkage Effects

Without question, the one sector most affected by the creation of the domestic motor vehicle industry has been the motor and mechanical parts sector. According to the Brazilian input-output table, the motor and mechanical parts (MMP) sector accounts for 20.08 percent of the value of automobiles and 31.17 percent of the value of

trucks and buses produced. The MMP sector thus represents by far the largest single sector input into domestic motor vehicle production, accounting for 35 percent of the value of inputs into the production of automobiles and 44 percent of the value of inputs used in truck and bus production.

One could question whether the MMP sector developed as a backward linkage of the motor vehicle industry, or whether the motor vehicle industry was stimulated by the high forward linkage effects of the MMP sector. This is exactly the type of problem (question) Hirschman cautioned his readers about when he explained that the significance that is placed upon the various linkage measures depends in part on the sequence of events. Namely, which sector came into existence first? This is our guide in determining the direction of influence. In the particular case at hand, the motor vehicle industry seems to have arrived first and, therefore, the MMP sector represents a backward linkage of the motor vehicle industry. Due to the nature of the policies enacted to encourage the creation of the motor vehicle industry, namely the requirements for rapidly accelerated domestic content, the expansion of the MMP sector was even more rapid than it would have been had its growth been based on backward linkage effects alone. There is little doubt that the MMP sector would have grown as the motor vehicle industry expanded, but the intent of the Brazilian government policies was to ensure that the maximum backward linkage effects were felt domestically [10:64]. Traditionally, the foreign-dominated assembly firms had used foreign suppliers of parts

so the government recognized that certain problems and biases in the industry had to be overcome in order for the maximum linkage effects to take place. As was mentioned in previous chapters, prior to the mid to late 1950's, there were only a few parts producers, their capacity to produce was limited, delivery and scheduling were uncertain, production centered around the least sophisticated parts, and quality varied greatly. For these reasons, in addition to the fact that the foreign-based firms had a long working relationship with foreign suppliers, the vehicle producers had little incentive to use domestically produced parts. This reluctance to change greatly reduced the potential linkage effects that were inherent between these two sectors. Therefore, the strict domestic content requirements, which reduced efficiency, productivity, and quality in the early years of the industry, were essential and beneficial to both the long-run growth of the entire industry and its impact on the rest of the economy.

The benefits of the expansion of the domestic parts sector have been significant both in terms of impacting back on the motor vehicle producers and in terms of its impact on the entire economy. The motor and parts sector now provides the assembly firms with approximately 98 percent of their necessary parts [11:66]. The demands of the assembly firms and their close working relationship with the parts firms helped to develop a greater sophistication among producers in the MMP sector. The result has been improved production techniques, better scheduling, and higher quality.

The motor vehicle industry has not been the only benefactor in this development. Approximately 55 percent of the value of production in the MMP sector is used in the motor vehicle sectors and the MMP sector itself, while the other 45 percent of the MMP sector's production goes into other sectors. Thus, the forward linkage effects of the MMP sector extend beyond the motor vehicle industry itself. Therefore, one can say that the backward stimulus of the motor vehicle industry has resulted in the establishment and growth of other industries forward of the MMP sector.

Although the data concerning the motor vehicle parts sector are somewhat limited relative to that which is available for the motor vehicle manufacturers, a fairly clear picture of the importance of this sector, in terms of its size and its importance to the domestic economy, emerges from the data in Table IV-2. As can be seen in the table below, the auto parts industry has grown into a multibillion dollar industry in terms of annual sales. In addition, the MMP sector represents a growing source of foreign exchange, in terms of its export capability. The ability of the auto parts producers to generate an inflow of foreign currency through exports is almost equal to that of the motor vehicle producers themselves. In 1978, exports of auto parts were valued at $640.2 million while exports of vehicles were only valued at $610.4 million. Finally, the employment creation potential of the auto parts sector has been outstanding, exceeding employment in the motor vehicle sector by approximately 114 percent. Although the

Table IV-2

Auto Parts Sector

	1974	1975	1976	1977	1978	1979	1980
Total Sales (U.S. $ Millions)	3,373	3,691	4,338	4,949	6,281	7,200	8,000
Total Sales in Auto Parts (U.S. $ Millions)	2,503	2,707	3,186	3,379	4,449	5,000	5,500
Distribution of Sales by Market (%)							
Terminal Sector	--	--	--	72.8	70.7	71.2	70.7
Spare Parts	--	--	--	18.5	21.6	19.5	18.4
Parts Manufacturers	--	--	--	5.6	4.0	5.3	5.1
Exports	--	--	--	3.1	3.7	4.0	5.8
Registered Capital (U.S. $ Millions)	942	849	1,190	1,287	1,317	1,980	1,550
Labor, Number of Employees							
Direct	147,000	157,000	175,698	182,600	210,000	213,000	214,000
Indirect	73,000	46,000	50,034	52,400	60,000	60,000	64,300
Total	220,000	203,000	225,732	235,000	270,000	273,000	278,300
Total Monthly Salaries Paid (U.S. $ Millions)	40.35	43.82	68.68	59.67	--	--	--
Exports of Auto Parts (U.S. $ Millions)	165	248	287	490	640	718	732

Source: Sindicato Nacional da Indústria de Componentes para Veículos Automotores. Anuário da Indústria Brasileira de Autopeças. São Paulo, 1982.

auto parts sector was not the only sector to feel the impact of the development of the motor vehicle industry, it was certainly the sector most dramatically affected.

CHAPTER V

THE IMPACT OF THE BRAZILIAN MOTOR VEHICLE INDUSTRY ON THE BRAZILIAN ECONOMY

Motor Vehicles and the Transportation System of Brazil

Since Brazil is a large country in both an absolute and relative sense, a large and efficient transportation system for both people and cargo is essential if the country is to ever "open up" its vast interior regions. "Inward expansion" will allow the country to take better advantage of its natural resources, and will also serve to spread the benefits of what growth has already taken place in the south central part of the nation.

Currently, it is quite obvious that "spreading out" from the relatively advanced south central region to the more remote and relatively less advanced central, northwest, and northeast regions has become the "new" developmental direction for the Brazilian government. This philosophy manifests itself in a number of ways. The most obvious indicator of the government's desire to "spread out" was the rather dramatic move of the nation's capital from Rio de Janeiro to the newly created city of Brasília, located in the central part of the nation. This move occurred in 1960, just four short years after the official decision by the government to create a domestic motor vehicle industry. Both of these policy decisions were of the same spirit, that which manifested itself in the administration of President Kubitschek.

More recently, significant work has been done on the trans-Amazon highway and on connecting this project with other infrastructure type projects in the northern regions of Brazil. These developments have laid the ground work for the most ambitious government project to date in the northern region, known as the Carajás project. The focus of the Carajás project is development of the vast mineral wealth of the north and northeast regions, by means of the government working in conjunction with private corporations on a number of separate sub-projects.

It can be argued that none, or at least very few of the projects just discussed would have been successful, or even undertaken, had Brazil not had the necessary transportation facilities to move people and other resources efficiently over great distances. Therefore, one of the most obvious and straightforward impacts of the domestic motor vehicle industry on the Brazilian economy has been the provision of an adequate means of transportation which was essential to further development. Table V-1 presents figures which show the division of intercity transport in Brazil among the various transportation methods for the years 1950, 1960, 1970, and 1978.

Note the steadily increasing dominance of highway transportation, especially from 1950 to 1970. This growing dominance appears to reflect a decision on the part of the government to favor highway transport over other forms [18:179-180; 10:47; 19:188]. Public investment in roads in Brazil from 1961 through 1965 was NCr$3,731.1 million. Total public investment in transportation for the same period was NCr$5,267.7

million. Thus, investment in roads represented 70.9 percent of total transportation investment over this period [20:346].

Table V-1

Intercity Passenger and Cargo Transportation
by Type of Transportation

Type	1950	1960	1970	1978
I. Passenger (%)				
Highway	63.3	75.1	93.5	96.4
Railroad	30.5	19.0	4.7	1.3
Air	5.6	5.8	1.8	2.3
Ocean	0.3	0.1	0.0	0.0
Total	100.0	100.0	100.0	100.0
II. Cargo (%)				
Highway	49.5	60.3	69.6	70.5
Railroad	23.8	18.8	16.9	16.3
Air	0.3	0.1	0.1	0.2
Ocean	26.4	20.8	12.5	10.1
Pipeline	0.0	0.0	1.3	2.9
Total	100.0	100.0	100.0	100.0

Source: Josef Barat, "Transportation and Energy in Brazil," Diagnósticos APEC, 6 (1982), 180.

One advantage which highway transport enjoys over the other types is its greater flexibility and speed in terms of construction. This particular advantage of highway transport was significant in the case of Brazil, due to the vastness of the area involved, and to the relatively limited knowledge of the underdeveloped area in terms of what types of mineral deposits existed and where. What was required in the northern region initially was a flexible system of transport that could accommodate changes rapidly.

A second point in favor of motor vehicle transportation, especially in terms of the government's plans to stimulate economic growth through industrialization, was that the motor vehicle industry had stronger linkage effects, particularly backward linkage effects, than did other transportation industries, namely the railroad and naval equipment industries. Table V-2 presents a comparison of backward linkage figures among these industries.

Table V-2

The Backward Linkage Effects of Transportation Equipment Industries

Sector	Backward Linkage	Rank
Automobiles	0.570226	20
Trucks and Buses	0.701643	12
Railroad Equipment	0.341251	59
Naval and Other Equipment	0.326724	62

Source: Brazilian Input-Output Table.

The two advantages of highway transportation which were just discussed are economic in nature, and seem to provide a rational basis for favoring highway transport, especially in light of relative resource prices that existed during the period in question. Possibly the most important factor in the apparent decision of the Brazilian government to favor highway transportation was the government's basic philosophy, at that time, that economic growth should be generated from the private sector and should be responsive to basic market forces. The government apparently perceived itself

as a facilitator of development, in that it would provide the appropriate environment, manipulate relative prices, provide a basic infrastructure, and generally enhance the economic climate in a way that would result in the most rapid rate of economic (industrial) expansion possible on the part of the private sector. This perception of the role of government seems to be in agreement with Hirschman's view that the government should create an environment in which the basic economic decisions which require entreprenuerial talent are easier and more obvious. This philosophy relates to the choice of dominant transportation method in that the railroad industry had historically been a government dominated industry in Brazil, and, therefore, choosing railroad transport as the preferred method would not have resulted in the desired stimulus to the private sector.

The Significance of the Motor Vehicle Industry as a Segment of the Brazilian Economy

The overall impact of the emerging motor vehicle industry on the Brazilian economy appears significant regardless of the type of measures one chooses. Despite the fact that motor vehicle production is a relatively capital intensive activity compared to some other types of manufacturing and to non-industrial sectors, the employment creation effects have made a positive impact on the economy. In 1966, for example, total employment for the industry was a mere 54,023, however, by 1980 it was estimated that 130,600 individuals were employed in this industry [15]. The average annual increase in employment over this period was 9.4 percent, which was faster than the overall rate for the

economy. In addition, hourly wage rates paid by firms in the Brazilian motor vehicle industry are significantly higher than official minimum wage rates, and therefore the industry represents an effective source of income creation [21]. When related industries, particularly the motor parts industry, are considered as well, the employment and income creation effects appear even more significant.

The importance of the motor vehicle industry relative to the entire economy can be seen by the growing share of total industry sales relative to Gross Domestic Product (GDP). Over the period 1966 through 1969 total motor vehicle industry sales averaged roughly 3.1 percent of GDP, while over the period 1970 through 1979 the average was 3.4 percent. The motor vehicle industry's share of Brazil's GDP was highest from 1969 through 1975, when it averaged 3.6 percent per year. The motor vehicle industry sales made up an ever greater share of private consumption spending, averaging 4.6 percent for the years 1966-1969 and 5.1 percent from 1970 through 1979 [1:146-147].

The magnitude of growth which was achieved in the Brazilian motor vehicle industry required substantial increases in investment. In the case of the terminal sector firms, the source of new investment capital was virtually all foreign. In 1973, for example, 29 percent of total imports of machinery and equipment for the entire manufacturing sector went to firms in the motor vehicle industry [9:26]. In the previous year the motor vehicle firms and the parts firms together accounted for 14.6 percent of all foreign investment in Brazil [9:26]. Unfortunately, this influx of foreign capital (in the form of materials

and equipment) compounded the balance of payments difficulties which Brazil was experiencing in association with the quadrupling of world oil prices from 1973 to 1974. Merchandise imports increased from $2,507 million in 1970 to $12,042 million in 1975. Net outflows in the service category (remittance of profits, royalties, and interest) increased from $1,090 million in 1970 to $3,461 million in 1975 [1:147]. It is understandable, then, that the role of the motor vehicle industry as a leading sector of the country's growth strategy would be called into question. It became apparent that a change in the orientation of the motor vehicle industry was needed, namely a change from production primarily for domestic consumption to more and more production for the export market.

In order to encourage the firms' desires to become internationally competitive, the government shifted the direction of its pressures and incentives to encourage a focus on export-oriented production. Due to the combination of a stagnating domestic market and the shift in government incentives, by 1976 all major Brazilian motor vehicle producers had adopted some type of export strategy. The terms of each firm's participation in an export strategy were outlined in export contracts which were drawn up and signed under Special Fiscal Benefits for Exports (BEFIEX) program. Ford, General Motors, and Volkswagen each committed to better than $1 billion in exports over a ten-year period. The rest of the producers combined committed themselves to slightly over $2.1 billion in exports [9:29].

The impact of the radical shift toward focus on exports is reflected in dramatic changes in the figures for production, domestic

sales, imports, and most of all, exports. In 1970, motor vehicle industry exports totaled $824 thousand, but by 1980 exports had increased to $1.5 million. Table V-3 presents export to import ratios within the industry as well as the ratios of motor vehicle exports to total exports for the years 1960, 1970, 1979, and 1980. These figures clearly show the magnitude of the impact of the industry's export focus.

Table V-3

Export and Import Ratios for Selected Years

Ratio	1960	1970	1979	1980
$\frac{\text{Exports (MV)}^*}{\text{Imports (MV)}}$	0.021	0.284	3.951	3.725
$\frac{\text{Exports (MV)}}{\text{Total Exports}}$	0.002	0.003	0.069	0.071

*MV = motor vehicle.

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

Note in particular the sizeable increase in motor vehicle exports relative to motor vehicle imports, as the ratio moves from being significantly less than one to well over three in just a nine-year period. Also note the increasing importance of motor vehicle exports as a percentage of total exports, a 229 percent increase from 1970 to 1979. In order to obtain a more complete picture of exactly how these increases in exports were achieved, it is of interest to observe the breakdown of exports by vehicle type, which is presented in Table V-4 below. Referring to Table V-4, note the timing of the change in the

Table V-4

Brazilian Motor Vehicle Exports

Year	Automobiles		Light Trucks, Utility Vehicles		Medium and Heavy Trucks		All Vehicles	
	Units	%*	Units	%	Units	%	Units	%
1960	84	0.2	0	0	0	0	84	0.06
1965	47	0.04	27	0.05	6	0.03	80	0.04
1970	134	0.005	96	0.08	51	0.1	281	0.07
1972	6,526	1.6	2,984	1.8	3,136	7.4	12,596	2.0
1973	12,521	2.7	6,032	2.7	5,754	10.4	24,307	3.3
1974	24,854	4.7	32,012	10.6	6,896	10.8	63,762	7.1
1975	36,189	6.9	27,441	8.3	7,968	12.4	71,598	7.8
1976	27,839	5.3	42,521	11.4	9,032	13.4	79,392	8.2
1977	44,549	9.6	15,419	5.2	8,347	10.8	68,315	8.1
1978	60,832	11.4	23,579	5.9	10,129	15.3	94,540	9.5
1979	46,899	8.6	42,461	8.5	14,270	20.6	103,630	9.3
1980	60,471	10.1	75,246	15.8	18,977	25.2	154,694	13.4

*(Units exported/units produced) x 100.

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

percentage of exports. For the first 15 years or so of the industry's existence (from 1956 to 1970) the industry was obviously producing for the domestic market almost exclusively. There are a number of reasons for this. First, it took a while for domestic production to meet domestic demand in the absence of imports from abroad. Second, due to relatively low volumes of production initially, the economies of scale inherent in motor vehicle production had yet to be realized, and therefore productivity was low and domestic producers were less competitive in the world market. Finally, the policies of the government focused on expanding production for the domestic market.

By the early 1970's, all three of the above factors had changed, including the direction of government policy. As a result, domestic producers, with the appropriate incentives, were ready to expand beyond the domestic Brazilian market. Obviously, the combination of increased productivity gained through economies of scale and the export incentives offered by the government was sufficient to allow the domestic producers to compete at an increasing level on the world market. Again referring to Table V-4, note also that while in most years exports of automobiles have accounted for the greatest number of units exported, the medium and heavy trucks have comprised the greatest share of industry exports in later years.

Measurements of Relative Efficiency and Foreign Exchange Savings

In previous parts of this work, it was concluded that the creation of a domestic motor vehicle industry in Brazil had powerful

linkage effects on other industrial sectors which resulted in the anticipated growth of those industries. In addition, the development of this industry had numerous external benefits, such as the transfer of technology, learning-by-doing, and the stimulation of entrepreneurial activity. However, the question of productive efficiency, or the utilization of resources, has yet to be addressed.

When a government decides to encourage the establishment of a domestic import-competing industry through the use of trade restrictions, exchange control schemes, or various types of domestic subsidies, it assumed that this government action is necessary in order to protect the new producers from the more efficient foreign manufacturers. It is further assumed that the new firms in this industry will, over time, become more efficient and not continue to require government aid. Furthermore, it is usually assumed that this activity would not come about in the absence of government intervention, possibly because of a lack of domestic entrepreneurial ability [2:21]. When such a project is undertaken, it is of interest to measure the efficiency of the new domestic producers relative to world competitors and also to measure the industry's utilization of resources. A number of methods have been formulated for measuring relative efficiency and resource utilization. In many cases, the choice of measurement method is determined by the nature of the information that is available for use in making the required calculations.

One of the more popular methods of measuring the degree of protection afforded domestic producers is to calculate the "Effective Rate of Protection" (ERP) for an industry. The concept of effective

protection was most popular during the 1960's and early 1970's. During this period, numerous studies were undertaken to refine the measurement technique and apply it to various situations [22;23;24]. The ERP measures the degree to which a domestic producer's value added is protected by the country's restrictive trade policies (tariffs, quotas, etc.). The following equation expresses ERP in a straightforward manner:

$$ERP = \frac{\text{value added at domestic prices}}{\text{value added at world prices}} - 1$$

Thus, ERP represents the fraction by which domestic value added exceeds value added at world prices [25:435-438]. There are other, more refined equations to express ERP, but such formulations require specific data concerning the nominal tariff structure on imports of finished product as well as imported inputs. Since the author was unable to locate specific data on the actual tariff structures, calculations requiring such data were not included in this study. In the particular case of the Brazilian motor vehicle industry, the author feels that the ERP does not provide as much insight as some other measures, to be discussed in the text which follows. Although the ERP is a good way of measuring the degree to which domestic producers are protected, or given an advantage, over potential foreign producers, this protection was virtually absolute in the case of the Brazilian motor vehicle producers. Under the import licensing system and the foreign exchange control system implemented by the Brazilian government, it was all but impossible, except for diplomatic personnel, to import

any motor vehicles into Brazil. Therefore, measurement of the degree of protection received by the motor vehicle manufacturers is not of as much interest as the measurement of how efficiently the Brazilian firms used the resources made available to them through government interventions.

It is true that the ERP measure can also be used to measure productivity or efficiency, but a similar measure, known as the Domestic Resource Cost (DRC) has been shown to measure efficiency just as well as the ERP, and in some cases is an even better measure than the ERP [24]. The DRC is the ratio of value added at domestic prices in local currency relative to the value added at world prices (or c.i.f. prices) in foreign currency [25:438].

$$DRC = \frac{\text{value added at domestic prices in local currency}}{\text{value added at world prices in foreign currency}}$$

The DRC represents ". . . a measure of the real opportunity cost, in terms of domestic resources, of producing (or saving) a net marginal unit of foreign exchange" [26:16]. Comparison of the DRC to the exchange rate can be useful as an investment criterion, in much the same way that comparison of the internal rate of return to the interest rate is used in domestic investment decisions. When the DRC (measured in terms of local currency per unit of foreign exchange) is less than the market exchange rate, then the investment project will produce a net surplus in local currency. One potential problem with this interpretation of the DRC is that when exchange rate controls or other types of government policies distort the "market" exchange rate,

the value of comparing the DRC with the market exchange rate becomes less certain.

A second application of DRC measure is pointed out by Bruno, who states, ". . . the DRC method can also be applied, using input-output analysis, as a systematic ex post measure of the cost of a restrictive trade system or as a measure of effective protection of various goods" [26:17]. Thus, in addition to measuring the cost of utilizing domestic resources in a particular project, the DRC can also be used to measure the degree of effective protection.

The DRC measure has become increasingly popular relative to the ERP measure in recent years, and there has been much discussion of these two measures in the literature. Krueger [24] sets forth the conditions under which the two measures are identical. These conditions are: (1) all goods are tradable; (2) no transportation costs; (3) resources are perfectly mobile within a nation but perfectly immobile between nations; (4) all domestic markets are perfectly competitive. According to Krueger, ". . . under these assumptions, the effective tariff [ERP] and domestic resource cost measures will provide identical rankings of value-adding activities" [24:54]. Krueger further states, "When the conditions for equivalence of effective tariff and domestic resource cost measures break down, the domestic resource cost measure is the appropriate measure for estimating the losses associated with restrictist trade regimes and for selecting among investment alternatives" [24:59-61]. Clearly, the assumptions outlined by Krueger do not hold true in the case of the Brazilian motor

vehicle industry, and for this reason, as well as others mentioned earlier, the DRC measure was chosen for use in this study. The author recognizes, however, that any calculations made using the data in the Brazilian input-output table are subject to significant error due to distortions in market prices and market exchange rates caused by government policies and to the problems of data collection and data consistency. The purpose of the calculations which follow is simply to provide a rough quantitative measure of the resource costs of the motor vehicle industry and of its foreign exchange costs or savings to the Brazilian economy.

In order to calculate DRC for the Brazilian automobile industry, the domestic value added per cruzeiro of output (0.42975) was obtained directly from the Brazilian input-output table for 1970. Since data on value added at world prices were not available, the value added figure for United States automobile producers (0.30630 dollars per dollar of output) was obtained from the United States input-output table for 1967, and was used as a proxy for world values [20:48]. Thus, the DRC for Brazil's automobile industry was equal to 0.42975/0.30630, or Cr$1.403 per dollar. In 1970, the official market exchange rate averaged Cr$4.593 per dollar [1:223]. The fact that the DRC of Cr$1.403 per dollar is significantly less than the official exchange rate of Cr$4.593 per dollar indicates the potential for a very large foreign exchange saving through domestic production of automobiles. The DRC figure also indicates that the motor vehicle industry could be competitive in the world market, and therefore must be a relatively

efficient producer. It is important to note that the Brazilian automobile industry was still a favored industry in 1970, and it was taking advantage of numerous benefits and incentives offered by the government. If such favorable factors had not been present, the industry's relative efficiency would probably have appeared less impressive. The DRC figure also indicates, however, that domestic producers could probably have been successful, at least domestically, with less support from the government. Finally, the DRC figure reflects a large potential for foreign exchange earnings through exportation, thus supporting the government's strategy of encouraging more export-oriented production as a means of dealing with the trade deficit problem.

Although the DRC gives an indication of potential for foreign exchange savings, it is not a direct measure. Foreign exchange savings of an industry can be calculated by subtracting the dollar value of imported inputs (both direct and indirect) from the dollar value of imports of the volume of vehicles actually produced (assumes this volume would have been imported if there had been no domestic production).

In order to calculate foreign exchange savings of the Brazilian automobile industry, the dollar value of domestic production was first obtained by taking a weighted average of the import prices of the vehicles actually imported in 1970 ($4,863.49) and multiplying that by the number of automobiles produced in 1970 (249,913) [15]. This yielded a total value of $1,215 million. Secondly, the dollar value

of all imported inputs needed for domestic production was subtracted. This figure included both the direct imported inputs of the automobile manufacturers and the imported content of domestically produced inputs. The direct dollar value of imported inputs by the automobile producers was $41.8 million. The value of import content of domestically produced inputs was calculated by taking a weighted average of the import content of those sectors which supplied at least 0.1 percent or more of the value of automobiles, with each sector's direct input coefficient being its respective weight [16]. The weighted average imported input coefficient was 1.591 percent. Based on the imported input coefficient, the dollar value of imported indirect inputs was $13.7 million. Thus, the total value of imported inputs was $55.5 million. Therefore, based upon these calculations, the foreign exchange savings in 1970 through domestic automobile production was equal to $1,160 million or $4,641 per vehicle, which is approximately 95 percent of the average import price. This savings amounted to roughly 41 percent of Brazil's total import expenditure for 1970 [1]. It is important to note that the imported cars tended to be the relatively higher priced cars and therefore tend to inflate the true foreign exchange saving. It seems clear, however, that the foreign exchange saving would have been significant even with a lower import price for automobiles.

Baer used a similar technique to calculate the foreign exchange saving achieved by the establishment of the Brazilian industry in the 1940's [27:89-91]. The following equations are based on the method which Baer utilized:

$$\text{I.} \quad C(60) = O(60) + M(60)$$

$$\text{II.} \quad C(70) = O(70) + M(70)$$

$$\text{III.} \quad \Delta M(70) = C(70) - O(60) - M(70)$$

Equation I indicates that total consumption of motor vehicles, C(60), in 1960 is equal to the value of domestic production, O(60), plus the value of imports, M(60). Equation II indicates the same for the year 1970. These years were chosen based on the availability of data concerning the motor vehicle industry. Equation III indicates that increase in imports that would have been necessary in order to achieve the 1970 level of consumption of motor vehicles that actually occurred, had the level of domestic production not increased over the period 1960-1970. It should be noted that the figures to be presented differ from those presented in the previous calculations because the figures to follow are for all motor vehicles, not just automobiles. Based on the above equations, if domestic production in 1970 had remained at its 1960 level, Brazil would have had to import 171,192 more vehicles than were actually imported in 1970 in order to achieve its 1970 consumption level. Based on the weighted average price of motor vehicles of $3,445.82 (in 1970) this would have cost an additional $589,896,817.40 in imports [15]. In order to obtain a net foreign exchange saving, the value of all imported inputs must be subtracted from this figure. The value of imported inputs, both direct and indirect, for 1970, was $41,793,643.88 [16]. Therefore, based on Baer's method of calculation, the net foreign exchange saving in 1970 due to domestic production of motor vehicles was $548,103,174.

This saving represents approximately 22 percent of Brazil's total value of imports for 1970 [1:147]. Given Brazil's limited ability to import, it appears obvious that consumption of motor vehicles would have been considerably lower in 1970 if the vehicles had not been produced domestically.

Baer acknowledges that the above method does not take into account the foreign exchange used to pay the interest and amortization of foreign loans used to construct the industry. This method also assumes that 1970 consumption would not have been different had the level of production remained constant since 1960. Although this assumption does not hold true, the method still provides a rough measure of the magnitude of the foreign exchange savings generated by the domestic motor vehicle industry.

In the absence of government intervention with trade, Brazilian consumers would be able to purchase foreign vehicles at the lower free trade price (in foreign currency). The necessity of importing such vehicles in numbers as high as the 1970 consumption level would result in a significant increase in the demand for foreign currency such that the value of the cruzeiro would be further reduced. Thus, the cruzeiro price of imported vehicles would rise and the consumer would still end up paying a higher price for motor vehicles.

Summary

Both the DRC figure and the direct calculation of the total foreign exchange savings seem to give strong support to the notion that the Brazilian motor vehicle industry represents a viable and

competitive industry. In addition to reflecting the relative efficiency with respect to other world producers, the relatively high foreign exchange saving figure shows quite clearly that had Brazil continued to rely basically on imported vehicles, the country could not possibly have imported the same volume, year after year, that the domestic firms have been producing. Given the degree to which the Brazilian economy relies on highway transportation of both people and cargo, the absence of a viable domestic motor vehicle industry would surely have slowed the rate of economic expansion. In addition, when one considers all of the other advantages of domestic production, such as the strong linkage effects, the technology transfer, and the infusion of new capital, the development of the Brazilian motor vehicle industry appears to have played a crucial role in accelerating the rate of economic expansion in Brazil.

CHAPTER VI

SUMMARY

This work is a study of the use of import substitution industrialization policies as a strategy for economic development. This particular strategy is not new, nor is it unique to Brazil. What makes this particular work of interest is that this strategy was just being formalized at approximately the same time the Brazilian government was searching for a strategy that would accelerate its country's rate of economic growth and development. Although some import substitution had occurred in Brazil as a consequence of changing economic conditions, and the government had utilized various policy measures to encourage the establishment of some new industries, the first formal and comprehensive application of import substitution as a development strategy in Brazil was with respect to the motor vehicle industry [10:46]. Since more than 25 years have passed since these policies were first enacted, it is now possible to observe and evaluate the long-run effects of this particular application of import substitution strategy.

As outlined in Hirschman's works on import substitution industrialization policies [2:3], the Brazilian government had a number of criteria upon which it could base its selection of the industry or industries to target as "basic industries," around which the country's growth strategy would be centered. In Hirschman's terms, a target industry should be one which, once established, will make

other types of investment in the private sector more obvious and, in a sense, more certain. Also, it is desirable that the target industry have the potential to be a positive influence on the nation's balance of payments, principally through its ability to generate an export surplus. Whether or not this potential positive influence comes about depends on the overall viability of the target industry. Finally, another desirable quality of the target industry is that its development fit into the overall development effort of the nation and contribute to the comprehensive development goals.

The Brazilian government's selection of the automobile industry as a target industry became clearly evident in June of 1956, when it instituted a five-year plan for the development of an integrated motor vehicle industry. Prior to this time, the industry was composed of several firms, mostly foreign-dominated, which were all engaged primarily in final assembly-type operations. Virtually all of the major components of the vehicles were imported from other nations. The level of sophistication was relatively low and the linkage effects were quite small. In general, the government had played a minor role in the industry, with the exception of creating the government-owned firm, Fábrica Nacional de Motores (FNM).

When the government established its five-year plan for the industry in 1956, the goal for the end of that period was that approximately 95 to 98 percent (by weight) of each vehicle produced in the country would consist of Brazilian-made components. An organization called Grupo Executivo da Indústria Automobilística

(GEIA) was established by the government to work out the details of the plan and to implement it. GEIA was composed of representatives from the industry and from the government. The transformation of the industry was to be carried out in cooperation with the private sector firms which were already established in Brazil, and with any other firms desiring to establish works in Brazil. Rather than attempt to "nationalize" the industry through the establishment of state-owned enterprises, the government implemented certain policies that would create an environment that was more conducive to private sector development. In fact, GEIA's recommendation that the government sell its own firm, FNM, led to the eventual sale of the firm to Alfa Romeo. Although the objectives of the original plan were not met completely, at least not on schedule, the transformation which took place in the five-year period was remarkable.

For the 20 years or so since the end of the original five-year period, the industry has continued to grow, although not at a constant pace. The most significant development in the industry's recent history has been the shift in emphasis from production primarily for the domestic market to production which is more export-oriented. This shift was encouraged by government policies which were established in response to the need for expanded export earnings to offset the disastrous effects of the rapid rise in the world price of oil that began in late 1973.

In order to summarize the effectiveness of the Brazilian government's strategy in this case, it is helpful to review the

initial goals of the strategy, and to determine whether these goals have been met. Specifically, then, the issue is whether the motor vehicle industry, chosen as a target industry for import substitution in Brazil, has met the criteria which are generally accepted as indicators that it was an appropriate choice.

An analysis of the linkage effects of the Brazilian motor vehicle industry was used in this study to determine the extent to which the development of the industry has served to create pressures for investment in other Brazilian industries. It was concluded that the backward linkage effects were relatively strong. In addition to serving as an impetus for investment, the Brazilian motor vehicle industry has played a significant role as a part of Brazil's vital transportation system and as a sector of the country's economy. Without the existence of a viable domestic motor vehicle industry, which provides for an efficient and highly flexible transportation system, many of the current development projects would not be feasible. Finally, this study presents evidence that the Brazilian motor vehicle industry has demonstrated its ability to have a positive influence on the country's balance of payments, through both foreign exchange savings and foreign exchange earnings.

In conclusion, based on the findings of this study, it appears that the motor vehicle industry has successfully served as a target industry in the implementation of an import substitution development strategy in Brazil.

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APPENDIX

Table A-1

Profit Rates of Brazilian Motor Vehicle Firms: 1966-1980
(Return of Net Book Value (%))[a]

Firm	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Fabrica Nacional de Motores[b]	3.5	(9.4)	(12.0)	(58.1)	(3.9)	(14.5)	NA	NA	NA	NA	0.0	(28.0)	(65.1)	(393.1)	
Fiat										NA	(35.4)	(87.1)	(190.3)	(41.3)	(115.5)
Ford	(2.8)	(6.1)	9.6	0.3	(17.2)	(14.0)	14.0	21.5	12.3	13.3	(11.6)	(17.3)	35.2	27.1	46.3
General Motors	5.1	3.3	8.4	12.1	22.5	31.5	26.0	9.5	(8.1)	0.5	(1.4)	(86.8)	(9.7)	(38.2)	44.2
International Harvester	(19.1)	(29.4)	(32.2)	(2.8)											
Mercedes-Benz	10.2	8.5	11.7	13.6	1.9	5.8	14.5	14.4	25.4	18.3	33.0	33.6	28.5	23.4	31.0
Scania Vabis[c]	(0.6)	(1.5)	3.8	2.4	11.4	13.0	42.5	46.9	38.3	24.1	4.9	14.7	4.0	31.5	68.9
Simla[d]	1.6	(77.4)	(9.7)	16.4	NA	(54.6)	(78.1)	1.5	(365.9)	NA	(97.2)	(44.0)	(20.9)	(178.8)	
Toyota	(13.2)	NA	(7.6)	(9.2)	(5.5)	8.8	(11.4)	(5.5)	(5.1)	5.6	20.2	28.1	22.5	25.4	21.4
Vemag	(48.9)	(5.3)	6.8	10.3	20.7	20.6	21.1								
Volkswagen	5.1	6.5	11.5	7.6	18.9	21.1	20.8	17.7	12.7	9.6	12.8	15.6	19.3	18.4	(8.0)
Volvo													0.1	(1.5)	(19.9)
Willys Overland	11.3	0.0	(0.8)												

[a]Percentage of net income before tax on net book value (capital plus free reserves plus deferred receipts less deferred expenditures. Figures in parentheses indicate losses.

[b]After 1977, the data refer to Fiat diesel. [c]After 1969, the data refer to Saab-Scania. [d]After 1966, the data refer to Chrysler.

Source: Rich Kronish and Kenneth Mericle, eds. The Political Economy of the Latin American Motor Vehicle Industry (Cambridge: MIT Press, 1984), pp. 14-15.

Table A-2

Passenger Car Production by Firm: 1957-1981

Year	Chrysler Corp. do Brasil Units	%/Mkt	Fábrica Nacional de Motores S.A. Units	%	Fiat Automoveis S.A. Units	%	Ford Brasil S.A. Units	%	General Motors do Brasil S.A. Units	%	Puma Veículos a Motores LTDA. Units	%	Puma Indústria de Veículos S.A. Units	%	CIA. Industrial Santa Matilde Units	%	Vermag S.A. Units	%	Volkswagen do Brasil S.A. Units	%	Total For All Firms Units
1957	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1958	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,189	100	--	--	2,189
1959	1,217	10.2	--	--	--	--	528	4.4	--	--	--	--	--	--	--	--	1,773	14.8	8,445	70.6	11,963
1960	3,633	9.6	414	1.1	--	--	13,615	36.0	--	--	--	--	--	--	--	--	3,097	8.2	17,059	45.1	37,818
1961	5,814	10.6	454	0.8	--	--	13,043	23.7	--	--	--	--	--	--	--	--	4,642	8.4	31,025	56.4	54,978
1962	6,689	8.9	378	0.5	--	--	21,508	28.7	--	--	--	--	--	--	--	--	7,123	9.5	39,189	52.3	74,887
1963	8,115	9.4	258	0.3	--	--	25,880	30.1	--	--	--	--	--	--	--	--	7,541	8.8	44,230	51.4	86,024
1964	10,436	10.7	161	0.2	--	--	26,216	26.8	--	--	--	--	--	--	--	--	6,915	7.1	54,040	55.3	97,768
1965	6,916	6.7	388	0.4	--	--	27,818	26.9	--	--	--	--	--	--	--	--	6,376	6.2	61,917	59.9	103,415
1966	5,152	4.3	474	0.4	--	--	26,858	22.4	--	--	35	0.02	--	--	--	--	7,611	6.3	80,024	66.6	120,154
1967	3,698	2.8	714	0.5	--	--	26,401	20.0	--	--	125	0.1	--	--	--	--	6,384	4.8	94,830	71.8	132,152
1968	8,564	5.3	1,115	0.7	--	--	23,276	14.4	305	0.2	151	0.1	--	--	--	--	--	--	128,089	79.3	161,500
1969	8,709	3.7	555	0.2	--	--	54,700	23.0	25,792	10.8	272	0.1	--	--	--	--	--	--	147,705	62.1	237,733
1970	10,337	4.1	1,209	0.5	--	--	38,062	15.2	42,331	16.9	--	--	204	0.1	--	--	--	--	157,770	63.1	249,913
1971	15,368	4.5	800	0.2	--	--	53,374	15.6	54,212	15.8	--	--	324	0.1	--	--	--	--	218,568	63.8	342,646
1972	15,593	3.8	506	0.1	--	--	66,178	16.0	66,440	16.0	--	--	484	0.1	--	--	--	--	265,463	64.0	414,664
1973	33,597	7.2	--	--	--	--	89,225	19.1	89,309	19.1	--	--	768	0.2	--	--	--	--	254,676	54.5	467,575
1974	27,006	5.1	--	--	3,600	0.7	104,518	19.7	126,329	23.8	--	--	1,139	0.2	--	--	--	--	269,247	50.6	531,899
1975	13,529	2.6	--	--	4,670	0.9	98,124	18.7	111,677	21.3	--	--	1,576	0.3	--	--	--	--	294,626	56.2	524,202
1976	17,380	3.3	--	--	4,792	0.9	105,582	20.0	117,264	22.3	--	--	1,912	0.4	--	--	--	--	280,014	53.1	526,944
1977	15,099	3.3	--	--	5,213	1.1	77,240	16.6	100,342	21.6	--	--	2,910	0.6	--	--	--	--	263,701	58.6	464,505
1978	13,783	2.6	--	--	4,017	0.8	93,865	17.5	136,102	25.4	--	--	3,390	0.6	88	0.02	--	--	284,286	53.1	535,531
1979	12,798	2.3	--	--	2,290	0.4	94,820	17.3	140,655	25.7	--	--	3,430	0.6	150	0.03	--	--	293,483	53.6	547,626
1980	6,912	1.2	--	--	1,875	0.3	83,885	14.0	153,426	25.5	--	--	2,563	0.4	147	0.02	--	--	351,898	58.6	600,706
1981	1,416	0.3	--	--	887	0.2	78,313	19.3	99,007	24.4	--	--	696	0.2	57	0.01	--	--	225,640	55.6	406,016

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

Table A-3

Light Trucks and Utility Vehicles Production by Firm: 1957-1981

Year	Chrysler Corp. do Brasil Units	%	Fiat Automoveis S.A. Units	%	Ford Brasil S.A. Units	%	General Motors do Brasil S.A. Units	%	Gurgel S.A. Units	%	Mercedes-Benz do Brasil S.A. Units	%	Puma Ind. de Veículos S.A. Units	%	Toyota do Brasil S.A. Units	%	Vemag S.A. Units	%	Volkswagen do Brasil S.A. Units	%	Total for All Firms Units
1957	--	--	--	--	10,492	87.2	--	--	--	--	--	--	--	--	--	--	1,174	9.8	371	3.1	12,037
1958	--	--	--	--	19,034	67.7	1,453	5.2	--	--	--	--	--	--	--	--	2,816	10.0	4,819	17.1	28,122
1959	--	--	--	--	27,974	62.9	3,153	7.1	--	--	--	--	--	--	489	1.1	4,492	10.1	8,383	18.8	44,491
1960	--	--	--	--	30,777	57.5	4,238	7.9	--	--	--	--	--	--	295	0.6	6,927	12.9	11,299	21.1	53,536
1961	--	--	--	--	33,435	55.6	4,079	6.8	--	--	--	--	--	--	7	0.01	6,277	10.4	16,315	27.1	60,113
1962	215	0.3	--	--	46,335	60.4	6,476	8.4	--	--	--	--	--	--	627	0.8	8,421	11.0	14,583	19.0	76,657
1963	1,450	1.7	--	--	55,141	65.5	5,061	6.0	--	--	--	--	--	--	1,510	1.8	6,547	7.8	14,428	17.1	84,137
1964	652	1.1	--	--	33,765	55.0	6,624	10.8	--	--	--	--	--	--	2,237	3.6	5,789	9.4	12,378	20.1	61,445
1965	220	0.4	--	--	29,304	51.6	4,330	7.6	--	--	--	--	--	--	961	1.7	8,884	15.6	13,114	23.1	56,813
1966	135	0.2	--	--	39,725	57.2	6,340	9.1	--	--	--	--	--	--	900	1.3	7,204	10.4	15,098	21.8	69,402
1967	33	0.1	--	--	26,636	43.3	8,103	13.2	--	--	--	--	--	--	576	0.9	5,009	8.1	21,172	34.4	61,529
1968	--	--	--	--	31,748	45.0	10,949	15.5	--	--	--	--	--	--	949	1.3	--	--	26,883	38.1	70,529
1969	236	0.3	--	--	23,397	33.4	14,951	21.4	--	--	--	--	--	--	890	1.3	--	--	30,475	43.6	69,949
1970	1,403	1.1	--	--	33,112	25.9	17,342	13.6	40	0.03	--	--	--	--	593	0.5	--	--	75,241	58.9	127,740
1971	760	0.6	--	--	37,738	27.9	19,039	14.1	21	0.02	40	0.03	--	--	509	0.4	--	--	77,157	57.0	135,264
1972	7,037	4.4	--	--	46,698	29.3	24,348	15.3	129	0.1	2,734	1.7	--	--	588	0.4	--	--	78,070	48.9	159,604
1973	7,669	3.5	--	--	50,786	23.0	32,753	14.8	414	0.2	4,292	1.9	--	--	645	0.3	--	--	124,694	56.4	221,253
1974	8,091	2.7	--	--	61,488	20.4	35,878	11.9	817	0.3	5,051	1.7	--	--	639	0.2	--	--	189,703	62.9	301,721
1975	6,619	2.0	--	--	62,702	18.9	47,784	14.4	428	0.1	5,328	1.6	--	--	895	0.3	--	--	207,952	62.7	331,708
1976	6,056	1.6	4	0.001	56,903	15.3	50,650	13.6	1,142	0.3	5,787	1.6	--	--	1,498	0.4	--	--	249,622	67.2	371,662
1977	3,657	1.2	1,608	0.5	41,314	13.9	30,346	10.2	1,329	0.4	6,972	2.4	--	--	2,695	0.9	--	--	208,491	70.3	296,412
1978	1,567	0.4	47,723	12.0	53,132	13.4	47,197	11.9	1,717	0.4	8,562	2.2	--	--	3,669	0.9	--	--	234,317	58.9	397,884
1979	2,471	0.5	128,690	25.9	64,275	12.9	55,355	11.1	1,675	0.3	8,772	1.8	179	0.004	4,105	0.8	--	--	232,220	46.7	497,742
1980	4,384	0.9	159,635	33.6	69,798	14.7	63,782	13.4	1,955	0.4	8,072	1.7	550	0.1	4,310	0.9	--	--	162,339	34.2	474,825
1981	4,300	1.4	130,011	43.0	38,839	12.8	48,504	16.0	1,145	0.4	5,994	2.0	127	0.004	4,070	1.3	--	--	69,663	23.0	302,651

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

Table A-4

Medium and Heavy Trucks Production by Firm: 1957-1981

Year	Chrysler Corp. do Brasil		Fábrica Nacional de Motores S.A.		Fiat Automoveis (FNM)		Ford Brasil S.A.		General Motors do Brasil S.A.		Int. Harvester Máquinas S.A.		Mercedes-Benz do Brasil S.A.		Saab-Scania do Brasil S.A.		Volvo do Brasil Motores e Veículos S.A.		Total for All Firms
	Units	%	Units	%	Units	%	Units	%	Units	%	Units	%	Units	%	Units	%	Units	%	Units
1957	--	--	2,912	16.0	--	--	4,756	26.1	4,860	26.7	--	--	5,517	30.3	162	0.9	--	--	18,207
1958	--	--	3,990	13.3	--	--	7,495	25.0	7,752	25.8	--	--	10,693	35.6	84	0.3	--	--	30,014
1959	--	--	2,077	5.4	--	--	12,483	32.5	13,683	35.7	841	2.2	8,967	23.4	302	0.8	--	--	38,353
1960	--	--	2,463	6.2	--	--	13,704	34.4	13,386	33.6	1,227	3.1	8,589	21.6	422	1.1	--	--	39,791
1961	--	--	2,040	7.0	--	--	10,151	34.8	9,432	32.3	1,024	3.5	6,192	21.2	339	1.2	--	--	29,178
1962	--	--	892	2.3	--	--	15,207	39.3	12,352	31,9	1,272	3.3	8,297	21.4	722	1.9	--	--	38,742
1963	--	--	1,323	5.8	--	--	8,422	36.9	7,004	30.7	358	1.6	4,964	21.7	780	3.4	--	--	22,849
1964	--	--	1,260	5.7	--	--	8,320	37.4	7,176	32.3	535	2.4	4,362	19.6	596	2.7	--	--	22,249
1965	--	--	1,344	5.9	--	--	8,451	37.3	6,624	29.2	412	1.8	5,154	22.8	668	2.9	--	--	22,653
1966	--	--	1,394	4.3	--	--	11,418	35.4	9,567	29.6	--	--	9,025	27.9	895	2.8	--	--	32,299
1967	--	--	965	3.4	--	--	8,957	31.4	9,031	31.6	--	--	9,211	32.3	397	1.4	--	--	28,561
1968	--	--	1,142	2.7	--	--	14,355	34.2	13,726	32.7	--	--	12,048	28.7	719	1.7	--	--	41,990
1969	2,897	7.1	1,582	3.9	--	--	10,930	26.9	12,055	29.7	--	--	12,276	30.3	829	2.0	--	--	40,569
1970	2,121	6.2	--	--	1,551	4.5	4,955	14.4	10,606	30.9	--	--	14,347	41.7	798	2.3	--	--	34,372
1971	1,629	4.7	--	--	1,940	5.6	4,295	12.4	10,029	28.9	--	--	15,882	45.8	886	2.6	--	--	34,661
1972	1,246	3.0	--	--	1,913	4.5	5,829	13.8	13,137	31.2	--	--	18,742	44.4	1,306	3.1	--	--	42,173
1973	2,240	4.1	--	--	2,402	4.4	7,978	14.5	18,441	33.4	--	--	22,479	40.7	1,649	3.0	--	--	55,189
1974	3,324	5.2	--	--	3,640	5.7	9,880	15.4	19,991	31.2	--	--	25,064	39.1	2,249	3.5	--	--	64,148
1975	4,327	6.7	--	--	3,824	6.0	9,545	14.9	14,356	22.4	--	--	28,997	45.2	3,148	4.9	--	--	64,197
1976	4,395	6.5	--	--	4,791	7.1	9,446	14.0	13,215	19.5	--	--	31,756	47.0	3,993	5.9	--	--	67,596
1977	3,218	4.1	--	--	5,517	7.1	11,642	15.0	23,697	30.5	--	--	33,515	43.2	3,807	4.9	--	--	77,589
1978	1,604	2.4	--	--	3,414	5.2	9,740	14.7	11,328	17.1	--	--	37,164	56.1	3,019	4.6	--	--	66,269
1979	1,705	2.5	--	--	3,097	4.5	11,780	17.0	11,649	16.8	--	--	37,929	54.9	2,974	4.3	--	--	69,134
1980	2,949	3.9	--	--	3,288	4.4	11,773	15.7	14,345	19.1	--	--	38,917	51.8	3,817	5.1	89	0.1	75,179
1981	3,941	6.8	--	--	3,191	5.5	7,702	13.3	8,020	13.9	--	--	30,964	53.6	2,721	4.7	1,206	2.1	57,745

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

Table A-5

Production Mix (Automobiles, Light Trucks and Utility Vehicles, Medium and Heavy Trucks): 1957-1980

Year	Automobiles %	Light Truck & Utility Vehicles %	Medium & Heavy Trucks %	Total %
1957	--	36.0	63.9	100
1958	3.6	38.9	57.5	100
1959	12.6	38.6	48.8	100
1960	28.8	33.5	37.6	100
1961	38.2	33.2	28.6	100
1962	39.4	30.3	30.3	100
1963	49.7	28.9	21.3	100
1964	53.9	25.8	20.3	100
1965	56.5	24.5	19.0	100
1966	54.2	23.6	22.3	100
1967	59.5	20.9	19.6	100
1968	58.9	17.8	23.3	100
1969	68.3	13.7	18.0	100
1970	60.7	23.9	15.4	100
1971	66.9	19.8	13.3	100
1972	67.3	17.2	15.5	100
1973	62.8	20.6	16.6	100
1974	59.2	24.8	15.9	100
1975	57.0	27.7	15.3	100
1976	54.1	31.5	14.4	100
1977	51.2	34.2	14.6	100
1978	51.0	37.1	11.8	100
1979	49.1	37.6	13.3	100
1980	52.2	33.3	14.5	100

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

Table A-6

Production Index for the Brazilian Motor Vehicle Industry: 1957-1981 (1969=100)

Year	Automobiles	Light Trucks and Delivery Vehicles	Medium and Heavy Trucks
1957	--	17.2	44.9
1958	0.9	40.2	74.0
1959	5.0	63.6	94.5
1960	15.9	76.5	98.1
1961	23.1	85.9	71.9
1962	31.5	109.6	95.5
1963	36.2	120.3	56.3
1964	41.1	87.8	54.8
1965	43.5	81.2	55.8
1966	50.5	99.2	79.6
1967	55.6	88.0	70.4
1968	67.9	100.8	103.5
1969	100	100	100
1970	105.1	182.6	84.7
1971	144.1	193.4	85.4
1972	174.4	228.2	104.0
1973	196.7	316.3	136.0
1974	223.7	431.3	158.1
1975	220.5	474.2	158.2
1976	221.7	531.3	166.6
1977	195.4	423.8	191.3
1978	225.3	568.8	163.3
1979	230.4	711.6	170.4
1980	252.7	678.8	185.3
1981	170.8	432.7	142.3

Source: Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA). Livro Verde e Amarelo.

Table A-7

GDP Figures: 1963-1980

Year	Gross Domestic Product (1980 Prices) Cr$(000,000,000)	% Δ Year to Year
1963	3,093	
1964	3,183	2.91
1965	3,922	23.22
1966	4,069	3.75
1967	4,268	4.89
1968	4,745	11.18
1969	5,216	9.93
1970	5,725	9.76
1971	6,412	12.00
1972	7,128	11.17
1973	8,124	13.97
1974	8,896	9.50
1975	9,395	5.61
1976	10,305	9.69
1977	10,866	5.44
1978	11,387	4.79
1979	12,148	6.68
1980	13,104	7.87

Source: IMF International Financial Statistics Yearbook, 1983, pp. 146-147.

Table A-8

Direct Input Coefficients for the Motor Vehicle and Parts Sectors

	Sector	1401 Automobiles	1402 Trucks & Buses, Including Bodies	1403 Motors & Mechanical Parts for Vehicles
1. 0101	Vegetable extractives, forestry, hunting, and fishing	.000003	.001614	.000082
2. 0201	Farming	.000000	.000015	.000000
3. 0301	Cattle raising	.000001	.000014	.000005
4. 0401	Cattle farming and rural industry	.000025	.000267	.000071
5. 0501	Extraction of metallic and non-metallic minerals, including pelletization	.000059	.000226	.001191
6. 0502	Extraction of combustive minerals	.000001	.000019	.000038
7. 1001	Cement (including cement articles)	.000001	.000000	.000001
8. 1002	Glass and glass articles	.013379	.008265	.000473
9. 1003	Other products of non-metallic minerals	.000539	.001440	.002191
10. 1101	Pig iron, iron and steel in primary forms, including iron alloys	.001668	.002702	.009164
11. 1102	Rolled steel	.041676	.079710	.067678
12. 1103	Cast iron and steel	.011876	.014898	.020227
13. 1104	Non-ferrous metals	.005738	.012414	.029242
14. 1105	Other metallurgic products	.049055	.023112	.056852
15. 1201	Pumps and internal combustion engines (except for cars, trucks, and buses)	.000401	.000405	.000117

Table A-8 (continued)

Sector	1401 Automobiles	1402 Trucks & Buses, Including Bodies	1403 Motors & Mechanical Parts for Vehicles
16. 1202 Bearings, transmission equipment and and other pieces and accessories for machines, instruments and equipment, including industrial tools	.020951	.012836	.004732
17. 1203 Industrial and commercial machines, instruments and equipment and rendering of industrial services	.008890	.006165	.008569
18. 1204 Machines, equipment and installation for agriculture and processing of food products, including pieces and accessories	.000633	.000325	.000300
19. 1205 Machines and equipment for office and domestic use	.000051	.000058	.000049
20. 1206 Highway tractors and machines, including pieces and accessories	.004228	.005769	.001671
21. 1301 Equipment for production and distribution of electrical energy	.001710	.000669	.000312
22. 1302 Electrical conductors	.002877	.001599	.000744
23. 1303 Electrical material and repair of electrical instruments and equipment	.046319	.028223	.005087
24. 1304 Electrical instruments	.002937	.002798	.000761
25. 1305 Electronic material	.000243	.000198	.000016
26. 1306 Communication equipment and instruments	.000971	.001161	.000050

Table A-8 (continued)

Sector	1401 Automobiles	1402 Trucks & Buses Including Bodies	1403 Motors & Mechanical Parts for Vehicles
27. 1401 Automobiles	.017917	.029612	.007187
28. 1402 Trucks and buses, including bodies	.002377	.010704	.001223
29. 1403 Motors and mechanical parts for vehicles	.200807	.311677	.085070
30. 1404 Naval industry, including repairs	.000048	.000034	.000020
31. 1405 Railroad vehicles and other vehicles	.000768	.001096	.000386
32. 1501 Wood industry	.000274	.012473	.000962
33. 1601 Furniture industry	.000105	.000460	.000206
34. 1702 Paper and pasteboard	.000015	.000035	.000540
35. 1703 Paper and pasteboard goods	.000060	.000046	.001046
36. 1801 Rubber industry	.053241	.051494	.005126
37. 1901 Leather and hide industries and luggage manufacturing	.000025	.000191	.000062
38. 2001 Chemical elements, organic and inorganic compounds except petro-chemicals and carbochemicals	.001047	.001827	.001417
39. 2002 Alcohol production by processing of cane and cereals	.000000	.000006	.000046
40. 2003 Basic and intermediate refining and petrochemistry	.003323	.004098	.006390
41. 2004 Coal derivatives	.000173	.000319	.001221

Table A-8 (continued)

Sector	1401 Automobiles	1402 Trucks & Buses Including Bodies	1403 Motors & Mechanical Parts for Vehicles
42. 2005 Resins, artificial and synthetic fibers, and synthetic elastomers	.000174	.000489	.001404
43. 2006 Unrefined vegetable oils	.000007	.000010	.000206
44. 2007 Pigments, paints, sealers and solvents	.010803	.015136	.001889
45. 2008 Various chemical products	.000647	.000750	.000609
46. 2101 Pharmaceutical industry	.000022	.000032	.000024
47. 2201 Perfume, soap, and candle industry	.000037	.000050	.000036
48. 2301 Plastic materials industry	.010935	.018145	.009558
49. 2401 Processing of textile materials of animal and vegetable origin	.000287	.000333	.000285
50. 2402 Spinning and weaving of artificial or synthetic textile fibers	.000061	.000059	.000580
51. 2403 Spinning and weaving of natural fibers	.000310	.000114	.000959
52. 2404 Other textile industries, including knitting mills	.000832	.000582	.002406
53. 2501 Clothing articles and accessories	.007208	.000033	.000256
54. 2502 Shoes	.000072	.000071	.000026
55. 2601 Coffee processing	.000000	.000000	.000001
56. 2603 Roasting and grinding of coffee, fabrication of instant coffee	.000000	.000001	.000000

Table A-8 (continued)

	Sector	1401 Automobiles	1402 Trucks & Buses Including Bodies	1403 Motors & Mechanical Parts for Vehicles
57. 2605	Processing of other vegetable products	.000002	.000001	.000037
58. 2606	Slaughtering, excluding poultry and meat preparations	.000005	.000353	.000017
59. 2608	Preparation of fish and fabrication of preserved fish	.000000	.000001	.000000
60. 2609	Dairy products	.000001	.000000	.000001
61. 2610	Sugar mills	.000004	.000008	.000024
62. 2611	Sugar refining	.000000	.000000	.000001
63. 2613	Refining of vegetable oils and fabrication of fats for food	.000030	.000061	.000046
64. 2614	Other food industries	.000002	.000006	.000003
65. 2701	Beverage industry	.000003	.000003	.000004
66. 2901	Publishing and printing industry	.000883	.000014	.000079
67. 3001	Various products	.002827	.001531	.000285
68. 4001	Production and distribution of electrical energy	.004638	.005529	.009595
69. 5101	Distribution (commerce, warehousing, and highway transport of cargo)	.027169	.023175	.029449
70. 5201	Railroad transport	.000099	.000139	.000221

Table A-8 (continued)

Sector	1401 Automobiles	1402 Trucks & Buses Including Bodies	1403 Motors & Mechanical Parts for Vehicles
71. 5202 Aquatic transport	.000166	.000211	.000437
72. 5601 Parts and accessories for industrial repairs	.008611	.005837	.009285
Sum	.570247	.701648	.388248
Value Added	.429753	.298352	.611752
Total Value	1.000000	1.000000	1.000000

VITA

Mark A. Stephens was born in Montgomery, Alabama, on March 16, 1953. He attended elementary and secondary schools in Texas and Pennsylvania. From January 1969 to January 1971 he attended high school in São Paulo, Brazil, and was graduated from Christ Church Grammar School, Perth, Australia, in July 1971. The following September, he entered Louisiana State University, and in May 1975 received a Bachelor of Science degree in International Trade and Finance from the College of Business Administration. In the Spring of 1976, he entered The University of Tennessee, Knoxville, and began graduate study in Economics. In August 1980 he received a Master of Arts degree in Economics and continued to pursue the Doctor of Philosophy degree in Economics. In September 1980 he was appointed Instructor of Economics at Tennessee Technological University. In June 1985 he received the Doctor of Philosophy degree in Economics from The University of Tennessee, Knoxville. His areas of specialization are Economic Development, International Economics, and History of Economic Thought.

The author is a member of the American Economic Association, Southern Economic Association, Omicron Delta Epsilon, Beta Gamma Sigma, and Alpha Kappa Psi. Mr. Stephens will be employed as an Assistant Professor at Tennessee Technological University after graduation.