ENERGY CONSUMPTION BY AUTOMOBILES IN JAPAN

by

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MASTER OF CITY PLANNING

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

JUNE 1985

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Chairman, Departmental Committee on Graduate Students

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Waichiro Hayashi

Submitted to the Department of Urban Studies and Planning
on May 28, 1985 in partial fulfillment of the
requirements for the Degree of Master of City Planning

ABSTRACT

This report examines Japan's national policy in the postwar period toward energy consumption by automobiles. Japan, more than any other industrialized country, is dependent on imported energy sources. In 1978, the national consumption of energy was only 5.2% of the total world energy use of seven million barrels of oil per day (mbd). This level of consumption may seem moderate when compared to consumption in the United States of 27.6% of the total world energy consumption (36.2 mbd) and the EEC's consumption of 14.4% of the total world energy use (18.9 mbd) for the same year. However, unlike the United States which imported 54.0%, Japan imported 85.4% of its total energy needs.

The degree of Japan's dependence on imported sources of energy is one means of appreciating Japan's concern for maintaining a smooth flow of energy into Japan and controlling domestic fuel consumption. The first oil shock of 1973 crystallized all of the domestic fears that this dependence on foreign energy sources would have on the nation.

While the degree of Japan's dependence cannot be ignored, energy consumption by motor vehicles, especially gasoline consumption by automobiles, has not been a critical factor in Japan's overall national energy policy. The reason for this situation is that despite the rapid increase in motor vehicle use and ownership, the consumption of energy by motor vehicles remains a relatively small percentage of total energy consumption. Another factor which has decreased the importance of gasoline consumption is that in producing heavy fuels which have been critical for Japan's economic development, gasoline has been a natural product of the refining process. Thus, the increasing consumption of gasoline has not resulted in an increased importation of petroleum.

This thesis discusses the manner in which Japan has reacted
to the increased growth of motor vehicle use and ownership. The national policy, such as the tax system, minimum fuel mileage standards and gasoline sales restrictions, are directed at a variety of public goals and are part of a national effort to reduce energy consumption in all sectors.

Thesis supervisor: Dr. Ralph Gakenheimer

Title: Professor of Urban Studies and Planning
ACKNOWLEDGEMENTS

A list of all those people who have contributed to this thesis is very much in order, as well as very long. The nature of my research has required the cooperation and assistance of professors, fellow students, professionals in the field of transportation and energy and my family. Without them, this thesis would never have been completed.

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Special thanks go to my advisor in Japan, Professor Masaki Koshi of the Institute of Industrial Science at Tokyo University. I would also like to thank the fellow students and Ms. Kaneko at the Institute for their useful advice and camaraderie when things got rough. All of the members of the Japanese Study Group of the Future of the Automobile Program were extremely supportive and helpful to me during my research in Japan, especially Professor Hideo Nakamura of Tokyo University. I am especially grateful for the support of the staff members of the International Association of Traffic Safety Sciences (IATSS), especially Mr. Suzuki, Mr. Inami, Ms. Watanabe and Ms. Shimamura. They were always there when I needed them, even by long distance telephone. Without all of my friends in Japan, I would never have been able to recognize the many sides of an issue when it is examined cross-culturally. I also would not have been able to enjoy my stay nearly half as much.

My parents also deserve special thanks for their unfailing encouragement, support and love.

Finally, I am deeply indebted to my wife, Judy, who served as a typist, editor and critic for this thesis. Her constant support and companionship are the real reasons for completing this thesis.
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INTRODUCTION

This report examines Japan's national policy in the postwar period toward energy consumption by automobiles. Japan, more than any other industrialized country, is dependent on imported energy sources. In 1978, the national consumption of energy was only 5.2% of the total world energy use or 7 million barrels of oil per day (mbd). This level of consumption may seem moderate when compared to consumption in the United States of 27.6% of the total world energy consumption (36.2 mbd) and the EEC's consumption of 14.4% of the total world energy use (18.9 mbd) for the same year.¹

Keeping in mind this dependence on imported energy, Japan has also been the fastest growing market for trucks and passenger cars in the world in the postwar period. Despite the excellent and extensive public transportation systems in Japan, one of the most significant developments in the postwar period is the phenomenal growth in the use and ownership of the car. Today, Japan ranks second only to the United States in terms of the total number of registered motor vehicles and eleventh in terms of registered passenger cars.

From an American perspective, the memories of the 1973 oil embargo are only too clear. For Americans used to cheap gasoline, large cars and very little controls on use,
the embargo resulted in dramatic gasoline price increases and long gasoline lines. Occasionally, the frustration of these long lines led to violent confrontations as Americans adjusted uncomfortably to a slew of measures such as reduced speed limits on major highways, carpool matching efforts sponsored by radio stations and queue management techniques (odd-even pump access days, minimum gasoline purchase requirements).

It is from this less than pleasant memory in the United States that the topic of energy consumption by automobiles in Japan was developed. What should have been considered as major impediments to the diffusion of motor vehicles in Japan such as the lack of infrastructure and the terrible problem of traffic safety accidents in the early 1960's were dealt with quite effectively by Japan. Thus, the concurrent energy crisis and the rapid use of the automobile appeared at first to be another major factor which could threaten the use of the car in Japan. I felt that by better understanding the uneasy accommodation of the automobile from the perspective of energy consumption, useful lessons would be found for countries that are currently experiencing a fast growth in motor vehicle use, and it would be one means of better understanding the dynamics of Japanese society, government and industry.

I have purposely chosen not to compare Japan's
experience with other countries. Quantitative comparisons can be equally misleading because of the differences in survey methods, misunderstandings about assumptions, but most importantly, the lack of a context under which this data can be interpreted. In addition, the language, especially in terms of interpretation, remains a non-tariff barrier for almost everyone, even after years of hard study.

Therefore, this paper will not attempt to compare the experiences of Japan with other countries because the situation is complex and such an effort may distort, bias and dilute the description. However, whenever possible the experiences and practices of other nations facing similar problems will be described in order to add perspective to this study and to clarify Japan's lessons from the viewpoint of the cultural perspective of each reader.

In this paper, I will first provide a background for transportation in Japan and the development of the range of national policies which have affected the pattern of motor vehicle use. This will be followed by a description of the phenomenal growth in motor vehicle use and the policy responses to this development. Many of these policies have minimized the potential negative impacts of increased energy consumption by automobiles by curbing use. However,
an understanding of the development of the pattern of energy consumption and the important role of gasoline sales to the oil industry are necessary to develop a full account of the role of gasoline consumption by motor vehicles. Then, the impact of policies directed toward energy consumption by automobiles will be evaluated together with the contingency plans that have been created in the event another energy crisis appears. Finally, the future prospects of energy consumption by automobiles will be evaluated.
Chapter 1: Transportation in Japan

Intense population density created by limited habitable areas and centralization have dramatically affected the pattern of transportation in Japan. If Japan were superimposed onto the map of the US, it would stretch from the New England States to South Carolina (see Figure 1).

However, physical size alone does not adequately describe the country. The total population is approximately 115 million, roughly twice that of countries such as West Germany, the United Kingdom, Italy and France. It has the seventh largest population in the world. Physically, the whole country is so mountainous that less than a fifth of the land mass is level enough to permit agricultural or other economic activity. Belgium and the Netherlands have a higher ratio of people to total land area, but when one compares in terms of habitable area, Japan (with the exception of perhaps Hong Kong or Singapore) has one of the highest densities of both population and production per square mile of habitable area of any country in the world.

Today, Tokyo alone has a population of 8.5 million, and there are eleven million people when one also includes the metropolitan area. Alongside Tokyo is Yokohama with 2.5 million people and Kawasaki, which sits between these
FIGURE 1: Map of Japan Superimposed on the United States
two cities, with a population of one million. This tri-city area without any discernable boundaries may be the largest concentration of people in the world.

Industrial activity and most of the Japanese people are concentrated in the area stretching from metropolitan Tokyo and its neighboring cities westward along the Pacific coast through Nagoya to the Kansai area and down the inland sea to Northern Kyushu. Along this route are endless stretches of factories and houses, interspersed with agriculture.

The density has meant that adequate demand exists for heavy public investments in public transportation. Thus, as early as 1872, the Meiji government chose to ignore road improvements in favor of railway construction by constructing a system between Shimbashi in Tokyo to Sakuragicho in Yokohama. This system grew to 581 kilometers in 1886 to 2,761 kilometers in 1891. In 1908, the Railway Nationalization Law was passed, and 4,500 kilometers of private railways were purchased to create the foundation for today's rail network.  

As a result a system of public and private railways were built which offer an efficient and affordable means of travel within Japan, a fact which continues to have a tremendous impact on car use and demand even in the current
The extreme centralization of politics and culture, as well as the news media in Japan, result in a situation where important policy decisions and attitudes are made in Tokyo. Consequently, the automobile maybe the ideal mode of transportation in rural areas and smaller cities, but these circumstances are neglected for policies and attitudes developed from the perspective of one of the world's most densely populated cities. It is for this reason that although Japan has one of the largest automobile markets in the world, private automobile use is considered to be wasteful by the media and the key opinion leaders in Tokyo.

Local and national governments have instituted campaigns to discourage automobile use, and in 1980, the national government prohibited its employees from using automobiles for commuting. These attitudes also surfaced in 1964 after the completion of Japan's first expressway, the Meishin, because passenger cars were the major users. The controversy did not end until the highway authorities lowered tolls for trucks to attract more commercial traffic. The continued perception of the automobile as a "luxury" stems from the extreme poverty of the period preceding and following the Second World War and the unprecedented growth in automobile use and ownership in
the last twenty years. These attitudes continue to have an important impact on the development of public policy.

The Background for Automobile Use in Japan

A striking characteristic of Japanese history is the lack of experience with four-wheel vehicles. Travel within Japan has always been difficult as a result of the mountainous terrain, the large number of rivers and the division of the country into four major islands. Ventures overseas were strictly prohibited during the Tokugawa period (1510-1868 AD), and the general public was permitted to travel outside of Japan only after Commodore Perry's gunboats threatened the country in 1868 which precipitated a collapse of the government. During the Tokugawa period, there were roads throughout Japan, but these passages were mainly used for sankin-kotai, a system where daimyo (lords) or their families spent alternate years in Tokyo as hostages of the Tokugawa rulers to ensure that other clans would not revolt against the central government. These processions were completed by foot or palanquin, and a road network that could accommodate wheeled vehicles was never constructed. The long neglect of road improvements in Japan led to a steady deterioration of roadways. Although in the prewar period when engineers were sent to Germany to study the Autobahn and to the United States to study the
road network, the construction and improvement of roads were not high public investment priorities. Even the old Tokaido road, which was the major intercity highway between Osaka and Tokyo, the two largest cities in Japan, was mostly unpaved.

In the postwar period, the Japanese government, partially motivated by a need to corroborate international loan requests with feasibility studies, requested an American mission led by Ralph Watkins to study the Kobe-Nagoya Expressway. The Watkins Report described Japan's roads as "incredibly bad." In fact, they were so bad that the report blatantly stated "no other nation has so completely neglected its highway system." Of course, Japan's roads have improved tremendously in the last thirty years, but it has only been in the last two decades that motor vehicles began to be used for personal transportation. Even today, automobile use, especially for commuting, is regarded by most Japanese people as wasteful, selfish and against the public interest.
Chapter 2: The Growth of the Domestic Market

Despite the lack of a history of using wheeled vehicles and the various government policies that have curbed automobile use and ownership, motor vehicle registration, especially for passenger cars, has grown at a tremendous rate. The railway's share of total passenger miles traveled in Japan declined steadily from 1960 to 1979, while the share of auto passenger miles increased (see Figure 2). In 1979, this trend slowed down while the automobile has become a major means of transportation.

Prior to 1960, the majority of motor vehicles were used for freight or commercial purposes (67% of the total fleet of 278,000 vehicles in 1950). However, by 1961, although the aggregate number of motor vehicles increased by over 1000%, 67% of the fleet was composed of passenger cars. This trend has continued steadily so that today, Japan is second only to the United States in terms of the total number of registered motor vehicles and eleventh in terms of the registered passenger cars (see Figure 3).

Affluence

The intense increase in demand has been aided by several factors. One of these has been the increasing affluence of the postwar period, which provides a striking contrast compared with the quality of life in the prewar
Figure 2: Modal Shares of Total Passenger Travel - Japan

Source: Masaki Koshi, "General Background of Auto Usage in Japan"
Figure 3: Number of Motor Vehicles per 1,000 Persons in Selected Countries (As of the end of 1981)

Source: Automobile manufacturers associations of respective countries.
period. As illustrated in Figure 4, the growth of automobile ownership almost runs parallel to the increase in the gross national product during the postwar period.

**Infrastructure Development**

Another factor has been the increased investments in infrastructure to facilitate automobile use. Figure 5 illustrates the dramatic level of road investments and construction levels during the postwar period.

**Market Competition**

The nature of the market and fierce competition within the domestic market have also increased domestic registration. Whereas the American market has only three major automakers, Japan has eight major makers, with one manufacturer specializing in the production of mini-cars. The intensity of competition among these manufacturers has resulted in frequent model changes, large variances within one model line and the addition of innovative accessories such as fuel injection, anti-skid brakes and turbochargers which were introduced to the domestic market one to two years earlier than they were introduced to foreign markets.

Moreover, there have been instances when automakers have sought to create a new market niche by developing a
Real GNP per capita (1970 price) and car ownership rate.

Figure 4: Real GNP per Capita (1970 prices) and Car Ownership Rate
Figure 5: Trends in Road Investment

Source: Ministry of Transport
car that does not fit into an existing market. The Honda City, a 1100 cc, 1500 pound car priced at approximately $3,000 is an example of innovative product design. This car bridged the gap between mini-cars and subcompacts by packaging a product that eliminated the performance sacrifices of the mini-car and yet was priced only several hundred dollars more. The City also has a distinctive style, has been advertised by clever slogans and is clearly geared to the generation of younger drivers and second car purchasers who are the fastest growing segments of the market.8

Intense competition within the domestic market occurs not only in terms of the pace of model changes, but also in terms of price. Japanese automobile manufacturers have introduced a much broader range of prices on the domestic market because they are not limited in the total number of vehicles that they can sell, as is the case of the market in the United States.9 The openness of the Japanese market has resulted in the introduction of models starting at $1,500 for mini-cars to over $20,000 for a full-size family car with all of the options. Intense competition exists along the full-line from the major manufacturers and the specialty manufacturers. This fierce competition has meant lower prices and a larger model choice for Japanese consumers. As illustrated in Figure 6, the selling price
Figure 6: Automobile Purchase Price Versus Consumer Price Index in the United States and Japan (1971-1981)

of a new Toyota Corona has become steadily lower than the consumer price index, whereas the average price of automobiles has increased at the same rate or higher than the consumer price index in the United States.

The manufacturers are highly competitive and their products are sold by an effective dealership system. The relationship between the manufacturer and the dealership is very close and mutually beneficial. Corporations such as Toyota are very lenient with inventory financing and allow a full fifty days to pay for a shipment. Since most cars are sold within this period, Toyota has underwritten the financing. Other manufacturers such as Nissan has an equity relationship with 40% of its dealerships and this pattern exists for other corporations as well. In addition, the manufacturer may provide training for the sales staff, help train mechanics and provide the expertise and part of the financial investment necessary to start a dealership.

One interesting characteristic of automobile sales in Japan is that salesmen conduct much of their business on a door to door basis. The most successful of these salesmen keep in close touch with former customers in order to receive information about potential customers. Despite this grass roots approach to sales, dealerships in Japan are mammoth when compared to dealers in the US. For
example, Tokyo Nissan had 1980 sales of over $300 million. It operates 18 showrooms, 17 used car lots and 22 service stations, employing 600 mechanics. Tokyo Toyopet, the largest car dealer in Japan, employs 5,000 people, operates 50 offices and moves 7,000 new cars and 8,000 used cars a month. 10

**Availability of Credit**

The purchase of a motor vehicle represents a substantial financial investment. Although 60% of cars are purchased by cash, the development of a credit system has allowed a larger number of people to purchase motor vehicles. Although the use of credit in retail sales accounts for only 10% of retail sales, credit sales account for 40% of total automobile sales, and automobile dealers are the most common source of the loan. (see Table 1).

These dealer loans are in turn financed by a subsidiary of the motor vehicle company. Interest rates are more favorable at banks, but the loans which they offer usually have a ceiling of $2,000. In most cases, the 17-18% loan over a 25 month period which most automobile dealers offer is the only way a consumer is able to finance an automobile. 11 High interests are due in part to the lack of competition from other lending institutions to make automobile loans and also factors in the Japanese used car
### Table 1: Automobiles Sold and Use of Credit

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of cars (1000 vehicles)</th>
<th>Amount of credit (billion yen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>4100</td>
<td>817.5</td>
</tr>
<tr>
<td>1971</td>
<td>4020</td>
<td>939.8</td>
</tr>
<tr>
<td>1972</td>
<td>4390</td>
<td>1177.7</td>
</tr>
<tr>
<td>1973</td>
<td>4950</td>
<td>1215.6</td>
</tr>
<tr>
<td>1974</td>
<td>3850</td>
<td>1293.4</td>
</tr>
<tr>
<td>1975</td>
<td>4610</td>
<td>1559.5</td>
</tr>
<tr>
<td>1976</td>
<td>4110</td>
<td>1756.4</td>
</tr>
<tr>
<td>1977</td>
<td>4200</td>
<td>1776.3</td>
</tr>
<tr>
<td>1978</td>
<td>4680</td>
<td>2010.0</td>
</tr>
<tr>
<td>1979</td>
<td>5150</td>
<td>2220.4</td>
</tr>
</tbody>
</table>

¥250 to U.S. $1.00.

Source: Ministry of International Trade and Industry and the Japan Automobile Manufacturers Association
market which have led to shorter car life and faster depreciation rates. However, as the used car market matures and other financial institutions enter into this market of consumer loans, terms may become more attractive for the automobile owner.\textsuperscript{12}

\textbf{Public Transportation}

The deficits of the Japan National Railway, which amounted to $4 billion in 1981 have resulted in major reductions in services for rural areas and rising fees in other areas. This development has been coupled with a slow appreciation of the potential convenience offered by the motor vehicle, especially in outerlying areas. In many rural areas in Japan, public transportation has always been available, but it is not unusual to wait one hour or longer for the appropriate train. Private automobiles eliminate this inconvenience and offer door-to-door service.\textsuperscript{13}
Chapter 3: The Impacts of Motor Vehicles

Coping with Safety

Motor vehicles have created a slew of social problems that have threatened to curtail use. One of the most dramatic of these problems has been the increase in motor vehicle related accidents. (Table 2 indicates the trends in traffic accidents in Japan.) Between 1948 and 1961, the number of accidents increased by over 2,500%. The most dramatic increases occurred at a period when the process of motor vehicle use and ownership accelerated between 1959-1961 when the total number of accidents increased by 123% and between 1967 and 1969 when the total number of accidents increased by 38%.

During the late 1950's and the 1960's, traffic safety became a major issue in Japan. Early attempts to decrease automobile related accidents were directed at the automobile user. In 1951, the Metropolitan Police Board began to use rubber balloons to detect alcohol levels of drivers. Although drivers had been licensed since the prewar period, more stringent policies were necessary in the postwar period as the number of motor vehicles increased dramatically. By 1956, the driver licensing system was classified into first and second classes, separate classes for large vehicles were issued for the first time, and by 1960, the designated driving school
Table 2: Accident Rates

<table>
<thead>
<tr>
<th>Year</th>
<th>Accidents</th>
<th>Index (average per day)</th>
<th>Killed</th>
<th>Injured</th>
<th>Index (average per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925-1944</td>
<td>913,070 ( )</td>
<td>-</td>
<td>-</td>
<td>58,902</td>
<td>-</td>
</tr>
<tr>
<td>1945</td>
<td>12,904 ( )</td>
<td>-</td>
<td>34.3</td>
<td>4,409</td>
<td>26</td>
</tr>
<tr>
<td>1946</td>
<td>17,778 ( )</td>
<td>-</td>
<td>48.7</td>
<td>4,565</td>
<td>27</td>
</tr>
<tr>
<td>1947</td>
<td>21,341 ( )</td>
<td>-</td>
<td>58.5</td>
<td>2,841</td>
<td>23</td>
</tr>
<tr>
<td>1948</td>
<td>25,113 ( )</td>
<td>-</td>
<td>68.8</td>
<td>3,780</td>
<td>23</td>
</tr>
<tr>
<td>1949</td>
<td>33,212 ( )</td>
<td>-</td>
<td>91.0</td>
<td>4,202</td>
<td>25</td>
</tr>
<tr>
<td>1950</td>
<td>41,423 ( )</td>
<td>-</td>
<td>113.5</td>
<td>4,429</td>
<td>26</td>
</tr>
<tr>
<td>1951</td>
<td>56,487 ( )</td>
<td>-</td>
<td>160.2</td>
<td>4,685</td>
<td>28</td>
</tr>
<tr>
<td>1952</td>
<td>80,019 ( )</td>
<td>-</td>
<td>219.2</td>
<td>5,544</td>
<td>33</td>
</tr>
<tr>
<td>1953</td>
<td>83,859 ( )</td>
<td>-</td>
<td>257.2</td>
<td>6,274</td>
<td>38</td>
</tr>
<tr>
<td>1954</td>
<td>93,981 ( )</td>
<td>-</td>
<td>257.5</td>
<td>6,279</td>
<td>38</td>
</tr>
<tr>
<td>1955</td>
<td>122,691 ( )</td>
<td>-</td>
<td>338.1</td>
<td>6,751</td>
<td>40</td>
</tr>
<tr>
<td>1956</td>
<td>146,833 ( )</td>
<td>-</td>
<td>402.3</td>
<td>7,575</td>
<td>45</td>
</tr>
<tr>
<td>1957</td>
<td>168,799 ( )</td>
<td>-</td>
<td>482.5</td>
<td>8,248</td>
<td>49</td>
</tr>
<tr>
<td>1958</td>
<td>201,292 ( )</td>
<td>-</td>
<td>551.5</td>
<td>10,079</td>
<td>60</td>
</tr>
<tr>
<td>1959</td>
<td>449,917 ( )</td>
<td>-</td>
<td>1,232.6</td>
<td>12,056</td>
<td>72</td>
</tr>
<tr>
<td>1960</td>
<td>463,693 ( )</td>
<td>-</td>
<td>1,352.6</td>
<td>12,865</td>
<td>77</td>
</tr>
<tr>
<td>1961</td>
<td>478,856 ( )</td>
<td>-</td>
<td>1,314.6</td>
<td>11,445</td>
<td>68</td>
</tr>
<tr>
<td>1962</td>
<td>631,866 ( )</td>
<td>-</td>
<td>1,457.4</td>
<td>12,301</td>
<td>73</td>
</tr>
<tr>
<td>1963</td>
<td>657,183 ( )</td>
<td>-</td>
<td>1,523.5</td>
<td>13,319</td>
<td>76</td>
</tr>
<tr>
<td>1964</td>
<td>667,236 ( )</td>
<td>-</td>
<td>1,554.2</td>
<td>12,484</td>
<td>74</td>
</tr>
<tr>
<td>1965</td>
<td>425,844 ( )</td>
<td>69</td>
<td>1,167.0</td>
<td>13,904</td>
<td>83</td>
</tr>
<tr>
<td>1966</td>
<td>621,481 ( )</td>
<td>73</td>
<td>1,428.7</td>
<td>13,518</td>
<td>81</td>
</tr>
<tr>
<td>1967</td>
<td>636,006 ( )</td>
<td>88</td>
<td>1,739.9</td>
<td>14,256</td>
<td>85</td>
</tr>
<tr>
<td>1968</td>
<td>720,880 ( )</td>
<td>105</td>
<td>1,975.0</td>
<td>16,257</td>
<td>97</td>
</tr>
<tr>
<td>1969</td>
<td>718,080 ( )</td>
<td>100</td>
<td>1,967.3</td>
<td>16,765</td>
<td>100</td>
</tr>
<tr>
<td>1970</td>
<td>700,290 ( )</td>
<td>98</td>
<td>1,918.6</td>
<td>16,278</td>
<td>97</td>
</tr>
<tr>
<td>1971</td>
<td>692,283 ( )</td>
<td>92</td>
<td>1,806.3</td>
<td>15,318</td>
<td>95</td>
</tr>
<tr>
<td>1972</td>
<td>566,713 ( )</td>
<td>82</td>
<td>1,607.4</td>
<td>14,574</td>
<td>87</td>
</tr>
<tr>
<td>1973</td>
<td>490,442 ( )</td>
<td>68</td>
<td>1,342.7</td>
<td>11,432</td>
<td>68</td>
</tr>
<tr>
<td>1974</td>
<td>472,938 ( )</td>
<td>66</td>
<td>1,255.7</td>
<td>10,792</td>
<td>64</td>
</tr>
<tr>
<td>1975</td>
<td>471,041 ( )</td>
<td>66</td>
<td>1,290.5</td>
<td>9,734</td>
<td>58</td>
</tr>
<tr>
<td>1976</td>
<td>460,549 ( )</td>
<td>64</td>
<td>1,262.1</td>
<td>8,945</td>
<td>53</td>
</tr>
<tr>
<td>1977</td>
<td>464,377 ( )</td>
<td>66</td>
<td>1,271.3</td>
<td>8,783</td>
<td>52</td>
</tr>
<tr>
<td>1978</td>
<td>471,573 ( )</td>
<td>66</td>
<td>1,282.0</td>
<td>8,466</td>
<td>50</td>
</tr>
<tr>
<td>1979</td>
<td>476,777 ( )</td>
<td>66</td>
<td>1,202.4</td>
<td>8,760</td>
<td>52</td>
</tr>
<tr>
<td>1980</td>
<td>485,578 ( )</td>
<td>68</td>
<td>1,320.4</td>
<td>8,719</td>
<td>52</td>
</tr>
</tbody>
</table>

Notes: 1) Prior to 1959, excludes very small accidents such as injury for less than eight days or property damages under ¥20,000.
2) Beginning 1956, excludes property damages.
3) Beginning 1972, includes figures for Okinawa Prefecture.
4) Figures in parentheses represent fatal accidents.
system was started to standardize the driver education process. Congestion was increasingly becoming a problem, and therefore, in 1956, taxi cruising in the Ginza was prohibited. Speeding motorists were becoming an additional problem, and in 1960, Tokyo extended its speed restrictions to cover the entire metropolitan area. Although speed regulations existed in the prewar period, today's regulations became codified with the passage of the revised Road Traffic Law in 1960.14

A major problem for policy makers was to develop policies that could effectively deal with problems that had not occurred before. One such problem was providing a process for compensating the victims of automobile related accidents. The Automobile Damage Compensation Security Law which was passed in 1955 is an attempt to address this problem. This law included a number of provisions to increase the rights of accident victims and to settle disputes arising out of motor vehicle related accidents. The law included measures for stronger principles of liability so that victims would not have to prove fault, motor vehicle insurance was made mandatory, and provisions were created for government compensation for cases where the injured party cannot recognize the assailant or where an accident occurs with a party that is not properly insured.15
Gradually, Japanese society developed a set of legal and policy mechanisms to effectively deal with the negative impacts of automobile use.

Coping with Environmental Concerns

The large scale use of motor vehicles resulted in dramatic increases in environmental pollution in the 1960's. The air and noise pollution levels in the congested cities of Japan were becoming increasingly intolerable. During the summer of 1970 and 1971, photochemical smog struck Tokyo and other metropolitan areas, and since that time, reports of smog induced health hazards were reported more frequently. Major disasters that were not attributable to increased automobile use, but linked to Japan's postwar industrialization in Minamata (mercury poisoning), Yokkaichi (sulfur oxide poisoning) and in Toyama (Itai-itai disease), alarmed the public, as well as the policy makers, about the urgent need to improve the environment.

The initial government response occurred during July 1966, when the Ministry of Transport issued administrative guidance to the industry to reduce CO emissions on new cars to less than 3%. These guidelines were incorporated into the ministry's new automobile regulations with the passage of the Air Pollution Control Law of 1968. In 1969, this standard was further limited and in 1970, the regulation
was extended to used cars.

Japan's automobile industry was firmly against further proposals to regulate the industry. The reasoning that was adopted by the industry was similar to the ones adopted by American automobile producers before the enactment of the Clean Air Act. The arguments by the industry were their lack of technology to meet the standards and their difficulty in coping with the costs of complying with these standards. What is interesting in Japan is that the industry did not use the argument that as a result of complying with the regulation, profits would fall, and workers would be laid off. However, the 550,000 members of the Jidosha Roren (Japan Federation of Automobile Workers Union) were in full agreement with the industry that the proposed standards were too high.

The movement to reduce effluent levels was helped tremendously in June 1971 when Japan received news that the US Clean Air Act of 1970 (Muskie Act) which established stringent CO, hydrocarbon and NO standards for 1975 and 1976 was passed. One reasoning was that the American government, in passing such an important piece of legislation, had confirmed that the industry possessed or could develop the technology and had the capital to comply with the regulations. The frequent amendments to the Muskie Act weakened this argument, but the continued
pressure from consumer groups, metropolitan governments and concerned environmentalists resulted in the adoption of standards in 1975 that would be more restrictive than the levels established in 1973 and regulations similar to the United States law. Table 3 indicates Japan's emission standards as of 1981 compared to several countries. The 1978 emission standards for motor vehicles imported into Japan were delayed until April 1, 1981.\textsuperscript{16} Noise is another environmental problem associated with automobiles. Therefore, the noise pollution law was established in 1968 and revised in 1970 (see Table 4). However, it is nearly impossible to regulate the cumulative noise levels of traffic and so compliance has been very low.\textsuperscript{17}

Together with regulating the automobile user, environmental problems resulted in governmental regulations of the producers as well. Different remedies were being developed for the uneasy accommodation of the automobile.
<table>
<thead>
<tr>
<th></th>
<th>CO</th>
<th>Hydrocarbons</th>
<th>NOx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan (for 1976)</td>
<td>2.10</td>
<td>0.25</td>
<td>0.60</td>
</tr>
<tr>
<td>Japan (for 1978)</td>
<td>2.10</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>US, Federal Government (for 1975)</td>
<td>9.30</td>
<td>0.93</td>
<td>1.93</td>
</tr>
<tr>
<td>US, California (for 1975)</td>
<td>5.60</td>
<td>0.56</td>
<td>1.29</td>
</tr>
<tr>
<td>EC Countries</td>
<td>17.8\text{-}42.4</td>
<td>1.9\text{-}3.1</td>
<td>2.5\text{-}4.0</td>
</tr>
<tr>
<td>Sweden (For 1976)</td>
<td>24.2</td>
<td>2.1</td>
<td>1.90</td>
</tr>
</tbody>
</table>

Source: OECD and Toyota Motor Sales Company Survey

Notes:
1. 0.86 for passenger cars with equivalent inertia weight of more than 1,000 kg.
2. Test methods: Japan: 10-mode (hot)  
   US: LA4-mode (cold and hot)  
   EC: ECE-mode (cold)  
   running distance = 4.052 km  
   Australia: LA4-mode (cold)  
   Sweden: LA4-mode (cold)
4. Japan also has 11-mode (cold) control values.
5. Under California standards, if a vehicle satisfies a CO value of 3.4 g/mile, the NOx requirement is eased to 1.0 g/mile. In reverse, if a NOx value of 0.7 g/mile is satisfied, the CO value is eased to 7.0 g/mile.
6. Control values in the EC countries are determined by vehicle weight, and there is a 25% easing of NOx control values for A/T cars. The latter measure will be abolished in Oct. 1981.
Table 4: Maximum Permissible Limits of Automobile Noise

<table>
<thead>
<tr>
<th>Type of vehicle</th>
<th>Crusing noise &amp; exhaust noise</th>
<th>Accelerated running noise</th>
<th>Effective date of accelerated running noise 1982 reg.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinary, small-sized and light motor vehicles (excluding those exclusively used for carrying passengers with a riding capacity of 10 persons or less, and two-wheeled motor vehicles)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Those vehicles of which total weight exceeds 3.5 tons and maximum power exceeds 200 Hp</td>
<td>80</td>
<td>86</td>
<td>86</td>
</tr>
<tr>
<td>Those vehicles of which total weight exceeds 3.5 tons with maximum power under 200 Hp</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Those vehicles of which total weight under 3.5 tons</td>
<td>74</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td>Ordinary, small-sized and light motor vehicles exclusively used for carrying passengers with a riding capacity of 10 persons or less (excluding two-wheeled motor vehicles)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>81</td>
<td>New model vehicle: October 1, 1982</td>
</tr>
<tr>
<td>Motorcycles (those of which displacement exceeds 125 cc)</td>
<td>74</td>
<td>78</td>
<td>Existing model vehicles: September 1, 1983</td>
</tr>
<tr>
<td>Motor-driven cycles (those of which displacement less than 125 cc)</td>
<td>70</td>
<td>75</td>
<td>Imported vehicles: April 7, 1984</td>
</tr>
</tbody>
</table>

Note: Effective date of 1979 regulation to imported vehicles is April 1, 1981.

Chapter 4: Specific Policies Directed at Drivers

Parking Regulations

Perhaps the most important factor which influences automobile ownership is the "garage requirement." This law requires the owner to verify the availability of a parking space prior to registering his or her car.

In a country where land can be as expensive as $503 per square foot, the cost of a parking space may far exceed the cost of the car. In many areas of Tokyo parking spaces are rare and can cost over $100 a month to rent. The "mini-car," which is defined as a motor vehicle with an engine displacement of less than 550 cc's, is the only automobile which escapes this stringent requirement. The lower cost of ownership for this type of automobile is one reason for its extreme popularity. 18

The availability of on-street parking for short-term use is also scarce in Japan. In 1981, there were only 13,500 parking meters in the entire nation. In urban areas, off-street parking provisions are only available for deliveries and visitors. Employees rarely receive parking spaces.

The Licensing System

The licensing system is another barrier to automobile use. Potential applicants must pass a comprehensive
written examination which rigorously tests traffic laws and must demonstrate a knowledge of the mechanical aspects of the automobile, as well as driving competence.\textsuperscript{19} Graduates of approved driving schools have higher success rates than those who have not attended (see Table 5). The average time and costs needed to pass the examination can be very expensive, an estimation of approximately one month and about $1,000 to pass a driving examination. Furthermore, as indicated in Table 6, this expense increases incrementally with age.

\textbf{Tax Policy}

In Japan, motorists must pay a number of general and specific taxes associated with automobile ownership and use. There are four taxes directly related to auto ownership: the commodity tax, the automobile tax, the acquisition tax and the tonnage tax (sometimes called the weight tax). The commodity tax is levied to the manufacturer, and the acquisition tax is paid by the consumer when an automobile is purchased. The automobile owner then pays an automobile tax and a tonnage tax every two years when the car is inspected, although these taxes are assessed annually. There is also a special tax for mini-vehicles (motor vehicles with engine displacements less than 550 cc's).
Table 5: Success Rates for Passing the First Class Regular Drivers Examination

<table>
<thead>
<tr>
<th>Year</th>
<th>Applicants (A)</th>
<th>Successful applicants (B)</th>
<th>Success rate B/A (%)</th>
<th>Graduates from designated driving schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>8082459</td>
<td>3399431</td>
<td>42·1</td>
<td>1861724</td>
</tr>
<tr>
<td>1972</td>
<td>8075746</td>
<td>3018348</td>
<td>37·4</td>
<td>1778176</td>
</tr>
<tr>
<td>1973</td>
<td>6832934</td>
<td>3001427</td>
<td>43·9</td>
<td>1804668</td>
</tr>
<tr>
<td>1974</td>
<td>6979707</td>
<td>2984943</td>
<td>49·9</td>
<td>1752824</td>
</tr>
<tr>
<td>1975</td>
<td>6140388</td>
<td>3061284</td>
<td>49·9</td>
<td>1793332</td>
</tr>
<tr>
<td>1976</td>
<td>6213871</td>
<td>3139770</td>
<td>50·5</td>
<td>1834056</td>
</tr>
<tr>
<td>1977</td>
<td>6795027</td>
<td>3549363</td>
<td>52·2</td>
<td>1979971</td>
</tr>
<tr>
<td>1978</td>
<td>6808089</td>
<td>3697827</td>
<td>53·7</td>
<td>2064833</td>
</tr>
<tr>
<td>1979</td>
<td>6370242</td>
<td>3750702</td>
<td>58·9</td>
<td>2100639</td>
</tr>
<tr>
<td>1980</td>
<td>6232547</td>
<td>3784993</td>
<td>60·7</td>
<td>2207743</td>
</tr>
</tbody>
</table>


Table 6: Average Hours of Driving Lessons by Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Average hours of driving lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 and 19</td>
<td>35·1</td>
</tr>
<tr>
<td>20–29</td>
<td>39·9</td>
</tr>
<tr>
<td>30–39</td>
<td>44·8</td>
</tr>
<tr>
<td>40–49</td>
<td>49·1</td>
</tr>
<tr>
<td>50</td>
<td>54·0</td>
</tr>
<tr>
<td>All ages</td>
<td>40·5</td>
</tr>
</tbody>
</table>

Source: Interviews conducted at the National Police Agency by the author (1981 figures).
In addition to these direct taxes, the automobile user must also pay a number of local and general taxes, including the local road transfer tax and the gasoline tax. The local and national Liquid Propane Gas Tax (LPG) is charged if this fuel is used. Particularly heavy is the fuel tax burden for Japanese consumers when compared to the United States, but is similar in rates to the European Economic Community (EEC).\textsuperscript{19}

Governmental justification for tax increases has recently been couched in terms of promoting fuel savings through increases in fuel prices. For example, immediately after the first oil shock in April 1974, the gasoline tax was raised from 24,300 yen/kiloliter ($97.20/kiloliter) to 29,200 yen/kiloliter ($117.00/kiloliter). Subsequently, the government has justified an increase in the tax to 36,500 yen/kiloliter ($146.00/kiloliter) in July 1976, and once again to 45,600/kiloliter ($182.00/kiloliter) in June 1979 in the wake of the second oil shock. (In February 1985, $1 = 250 yen)

The cumulative impact of these taxes for the automobile user has been to raise the total cost of automobile ownership and use. Table 7 illustrates the average tax burden for an automobile owner based on eight years of ownership, a 1600 cc class motor vehicle, a vehicular weight of 980 kilograms, an annual gasoline
<table>
<thead>
<tr>
<th>Type of Tax</th>
<th>Private Cost (Yen)</th>
<th>Commercial Cost (Yen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commodity Tax</td>
<td>175,000</td>
<td>175,000</td>
</tr>
<tr>
<td>Acquisition Tax</td>
<td>50,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Weight Tax</td>
<td>100,800</td>
<td>43,922</td>
</tr>
<tr>
<td>Automobile Tax</td>
<td>276,000</td>
<td>72,000</td>
</tr>
<tr>
<td>Gasoline Tax</td>
<td>437,600</td>
<td>437,600</td>
</tr>
<tr>
<td>Local Road Tax</td>
<td>78.720</td>
<td>78.720</td>
</tr>
<tr>
<td>Total for 8 years</td>
<td>1,118,120</td>
<td>837,242</td>
</tr>
<tr>
<td>Average annual cost</td>
<td>139,765</td>
<td>104,655</td>
</tr>
</tbody>
</table>

Source: Japan Automobile Manufacturer's Association
consumption of 1,200 liters of gasoline and a purchase price of one million yen. The burden of these taxes are particularly high when compared to other countries. Figure 7 illustrates the comparison in taxes for selected countries levied at the time of acquisition and during various stages of use.

The government has been careful to minimize the impact of these taxes on commercial activity. For example, an exemption from the gasoline tax and local road tax is granted for naphtha used in manufacturing petrochemicals, oil used for electric power generation, kerosene for non-automotive uses and products for export. Exemption for the light oil dealing tax is allowed for non-automotive use in agriculture and railways. Moreover, different tax rates apply for private and commercial uses. Table 8 illustrates the tax base and tax rates for various automobile-related uses.

The Inspection System

The inspection system adds to the cost of automobile ownership. The high cost of inspections is a result of a mandatory checklist that includes inspection of the steering, brake, electrical, transmission, suspension, exhaust, engine and emission control systems. In addition, the instrument panel, the condition of the frame and body
<table>
<thead>
<tr>
<th>Country</th>
<th>Commodity tax</th>
<th>Acquisition tax</th>
<th>Weight tax</th>
<th>Motor vehicle tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>20.3</td>
<td>10.2</td>
<td>18.6</td>
<td>50.9(%)</td>
</tr>
<tr>
<td>U.K.</td>
<td>Value added tax</td>
<td>Special motor vehicle tax</td>
<td>Motor vehicle tax</td>
<td>35.0</td>
</tr>
<tr>
<td>W. Germany</td>
<td>Value added tax</td>
<td>Motor vehicle tax</td>
<td></td>
<td>35.4</td>
</tr>
<tr>
<td>U.S.</td>
<td>Retail sales tax</td>
<td>Registration tax</td>
<td></td>
<td>55.0</td>
</tr>
</tbody>
</table>
Table 8: Automobile Related Taxes

<table>
<thead>
<tr>
<th>Types of Taxes</th>
<th>Tax Base</th>
<th>Tax Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Private</td>
</tr>
<tr>
<td>Commodity Tax*</td>
<td>Japanese made cars = factory sales price</td>
<td>22.5%</td>
</tr>
<tr>
<td></td>
<td>Imported Cars = C.I.F.</td>
<td>17.5%</td>
</tr>
<tr>
<td></td>
<td>Engine capacity over 2000 c.c.</td>
<td>15.0%</td>
</tr>
<tr>
<td></td>
<td>Engine capacity between 551 - 2000 c.c.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engine capacity less than 550 c.c.</td>
<td>10.0%</td>
</tr>
<tr>
<td></td>
<td>miscellaneous</td>
<td></td>
</tr>
<tr>
<td>Acquisition Tax*</td>
<td>Purchase Price</td>
<td>5.0%</td>
</tr>
<tr>
<td>Tonnage Tax*</td>
<td>Assessed by 0.51 ton of curb weight.</td>
<td>$6,300/yr.</td>
</tr>
<tr>
<td>Automobile Tax</td>
<td>- 550 cc</td>
<td>$6,500</td>
</tr>
<tr>
<td></td>
<td>550 - 1000 cc</td>
<td>$25,500</td>
</tr>
<tr>
<td></td>
<td>1001 - 1500 cc</td>
<td>$30,000</td>
</tr>
<tr>
<td></td>
<td>1501 - 2000 cc</td>
<td>$34,500</td>
</tr>
<tr>
<td></td>
<td>2001 - 3000 cc</td>
<td>$71,000</td>
</tr>
<tr>
<td></td>
<td>3001 - 6000 cc</td>
<td>$77,000</td>
</tr>
<tr>
<td></td>
<td>6000 cc and above</td>
<td>$129,000</td>
</tr>
<tr>
<td>Gasoline Tax *</td>
<td></td>
<td>$45,600/kiloliter</td>
</tr>
<tr>
<td>Local Road Tax *</td>
<td></td>
<td>$8,200/kiloliter</td>
</tr>
<tr>
<td>Liquified Gas Tax</td>
<td></td>
<td>$17.5/kilogram</td>
</tr>
<tr>
<td>Light Oil Tax *</td>
<td></td>
<td>$24,300/kiloliter</td>
</tr>
</tbody>
</table>

Notes: Motor vehicles that are used for transporting freight or passengers as part of a business are classified as commercial vehicles and are eligible for tax reductions.

Those taxes marked with an ascender (*) have been raised temporarily and will be reduced unless new legislation is passed. For example, the acquisition tax for passenger cars has been raised from 3% to 5% between April, 1974 and March, 1983.

Tax rates are as of August, 1982.

Source: Ministry of Finance
and undercarriage are examined. In all, 119 items are checked, the automobile washed thoroughly and even the underbody nuts are repainted. What adds to the difficulty of these exams is that the standards for conducting these exams are extremely centralized. Only the District Land Transport Bureau (80 centers) or a maintenance facility certified by the bureau (77,000 in Japan) can conduct a complete inspection.

These inspections are required every two years (three years for new cars), and in addition to the inspection cost, other fees related to automobiles ownership such as the automobile tax, the weight tax and insurance premiums must be paid at the completion of the inspection. Thus as indicated Table 9, an inspection requires a great deal of money to be paid on demand by the automobile user. If the car is ten years old or older, these inspections are required on an annual basis. \( ^{22} \)
Table 9: Cost of Automobile Inspection

<table>
<thead>
<tr>
<th>Class</th>
<th>Owner passenger cars</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1400cc</td>
<td>1600cc</td>
</tr>
<tr>
<td>Inspection Charge</td>
<td>1,200</td>
<td>1,200</td>
</tr>
<tr>
<td>Inspection Maintenance Charge</td>
<td>55,000 - 65,000</td>
<td></td>
</tr>
<tr>
<td>Auto Weight Tax</td>
<td>25,200</td>
<td>25,200</td>
</tr>
<tr>
<td>Auto Tax</td>
<td>30,000</td>
<td>34,500</td>
</tr>
<tr>
<td>Mandatory Insurance Premium</td>
<td>32,650</td>
<td>32,650</td>
</tr>
<tr>
<td>TOTAL</td>
<td>144,050</td>
<td>148,550</td>
</tr>
<tr>
<td></td>
<td>154,050</td>
<td>158,550</td>
</tr>
</tbody>
</table>

Note: Unit: Yen (250 Yen = $1 US Dollar)
Chapter 5: Impact of Policies on Energy Consumption

As the demand for private automobiles increase, the energy consumption of automobiles has grown. This demand has been tempered by the pattern of use in Japan.

Impact of Costs

The combined impacts of high fuel prices, tolls and high maintenance costs as a result of the inspection system have limited automobile use by increasing costs. Driving for long distances can become prohibitively expensive. Toll roads which bypass Japan's narrow, congested roads are expensive by American standards. Merely entering an intra-city expressway to bypass a traffic jam can cost 400 yen (approximately $1.60) in Tokyo. Tolls for inter-city roads are determined by distance and the rate that is charged is a flat 100 yen plus 19.6 yen/kilometer. Thus, a trip between Tokyo and Nagoya (200 miles) will cost approximately 5,500 yen ($22) and will take about three times longer than the super express train. Moreover, as mentioned above, the licensing system and the garage regulation has increased the "entry cost" of automobile ownership. In addition to operating costs, taxes have also raised the cost of operating the car.
The Impact of Taxes

Fuel Taxes

The original rationale for crude oil taxes was to subsidize the domestic coal industry. Subsequent increases on the import duty for crude oil and the gasoline tax have been justified in terms of reducing consumption by increasing costs. However, since 1954, all of the revenues of the gasoline tax and a portion of other fuel related taxes have been allocated to fund Japan's ambitious road improvement and construction program. The development of the new roads and a sophisticated system of expressways have made the automobile a viable alternative to public transportation in many areas. This action has increased automobile use and ownership and has resulted in increased fuel consumption by automobiles. A more positive impact of fuel taxes in terms of fuel conservation has been to reduce congestion by improving roadways and by financing more efficient traffic management systems.

Other Taxes

The automobile tax and the weight tax which must be paid every two years have encouraged the sales of smaller fuel efficient motor vehicles in Japan. The mini-car which is a major beneficiary of the tax system in Japan is a
unique phenomena in Japan and their popularity in rural areas where motor vehicles are essential, but the fact that incomes are lower is one indication of the impact of the tax system on the fleet mix on the Japanese market.

In implementing the tax system a step function type of tax rate is used, and this rate increases with every 500 cc's. Therefore, larger vehicles are charged a higher tax. Figure 8 illustrates the impact of total tax burden for different vehicle classes in five countries. This type of tax system has increased the total tax burden for all engine classes. However, a bias exists against larger, heavier vehicles in Japan, which has meant that smaller cars pay considerably lower taxes. If we compare the tax of 550 cc class automobiles to that of 2,600 cc class vehicles in the four countries, the ratios are as follows: 1 to 8 in the United Kingdom, 3 to 3 in the US, 4 to 1 in West Germany, 4 to 2 in France and 7 to 2 in Japan.

Impact of Lifestyles

Not only the high costs of using private transportation affect automobile users. The average lifestyle of the salaried employee makes it difficult to use a car for other than occasional weekend family drives. The nature of Japanese business requires long hours of socialization and an endless barrage of meetings, so that
Cumulative tax burden of private automobile purchase and ownership during ten years—international comparison.

Source: Jikyo-Jidōsha no Zei Futan no Jittai (Actual Condition of Tax Burden for Private Passenger Cars); (Japan Automobile Federation, 1980). Yen value as of July 1979, ¥250 = U.S. $1.00.

Figure 8: Cumulative Tax Burden of Private Automobile Use and Ownership Over a Ten Year Period
many people who work in Tokyo start the day at 6:00 am and return to their homes approximately 10:00-11:00 pm in the evening.

Although everyone accrues vacation time, it is generally frowned upon to exercise this benefit because of the inconvenience placed on other workers. Particularly true for the younger employees, taking time off from work shows a lack of dedication to the job and the company. As a result of this situation, almost all Japanese workers take vacations at the same time. One major period is the first three days of the year, and the other is during the end of April and the first week of May, a period called "Golden Week." This situation results in extreme congestion of all roads.

It is not unusual to have a forty-mile traffic jam leaving Tokyo at the beginning of either of these holiday seasons. While there are some people who use their cars for these long trips, the media often amusingly targets them for interviews of drivers and families who have foolishly survived thirty or forty hours of entrapment in holiday traffic jams.

**Impact of Commuting Policies**

In a more direct way of discouraging private transportation, the government has developed a policy of
allowing employers to deduct up to 19,500 yen ($78.00) per month for commuting expenses only if public transit is used. Private automobile use generally is frowned upon and only in exceptional cases will companies reimburse approximately 3,600 yen ($14.40) per month for commuting expenses by car if the company is more than ten kilometers from your home.

In almost all cases, the company will not provide a parking space if the office is in an urban area. The cost of off-street parking is prohibitively expensive.23

Moreover, railways, urban subways and streetcars are the most convenient and fastest methods of commuting into urban areas. A typical commute of thirty minutes can be a harrowing two or three hour drive in many situations. Due to the complications of private transportation, railways are the overwhelming choice for trips over 300 kilometers (see Table 10).
Table 10: Passenger Modal Split by Trip Length

<table>
<thead>
<tr>
<th>Trip Length</th>
<th>Road</th>
<th>Rail</th>
<th>Water</th>
<th>Air</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 - 300 km</td>
<td>68.6</td>
<td>30.1</td>
<td>1.1</td>
<td>0.2</td>
<td>100.0</td>
</tr>
<tr>
<td>301 - 500 km</td>
<td>30.5</td>
<td>58.5</td>
<td>7.0</td>
<td>4.0</td>
<td>100.0</td>
</tr>
<tr>
<td>501 - 750 km</td>
<td>9.7</td>
<td>73.0</td>
<td>5.1</td>
<td>12.2</td>
<td>100.0</td>
</tr>
<tr>
<td>751 - 1,000 km</td>
<td>4.2</td>
<td>68.4</td>
<td>3.7</td>
<td>23.7</td>
<td>100.0</td>
</tr>
<tr>
<td>1,001 km +</td>
<td>0.3</td>
<td>36.7</td>
<td>1.5</td>
<td>61.5</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Ministry of Transport
Chapter 6: Gasoline Consumption

In evaluating the impact of energy consumption by automobiles, it is crucial that the oil market be understood. Although the consumption of energy by the transportation sector is lower in Japan than other industrialized countries, the consumption of gasoline continue to grow (see Figure 9). The tremendous increase in the use of the automobile has dramatically affected the level of total energy consumption by automobiles within the last decade. Between fiscal years 1969 and 1979, the share of petroleum consumption by passenger cars grew from 29.5% to 40.2% of total oil consumption within the transportation sector (see Figure 10).

The consumption of gasoline has become an increasingly important component of total energy consumption in Japan. The perception of the automobile as a luxury and the availability of an efficient system of public transportation which most people use for commuting suggests that its use can be limited without too much hesitation. What has occurred in Japan is that characteristics of the energy market have further mitigated the impact of energy consumption by automobiles in Japan. In the following pages, the development of the pattern of energy consumption in the postwar period will be described to explain the role of gasoline consumption prior to the
<table>
<thead>
<tr>
<th>Country</th>
<th>Road Transport</th>
<th>Transportation Sector</th>
<th>Industry Sector</th>
<th>Household Sector</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>19.2%</td>
<td>45.3%</td>
<td>22.7%</td>
<td>6.7%</td>
<td>18.187</td>
</tr>
<tr>
<td>U.S.</td>
<td>25.1%</td>
<td></td>
<td>13.3%</td>
<td>20.1%</td>
<td>6.7%</td>
</tr>
<tr>
<td>W. Germany</td>
<td>26.3%</td>
<td></td>
<td>23.9%</td>
<td>40.0%</td>
<td>6.4%</td>
</tr>
<tr>
<td>France</td>
<td>28.2%</td>
<td></td>
<td>34.0%</td>
<td>5.2%</td>
<td>9.728</td>
</tr>
<tr>
<td>U.K.</td>
<td>35.3%</td>
<td></td>
<td>33.5%</td>
<td>17.1%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Italy</td>
<td>32.3%</td>
<td></td>
<td>32.6%</td>
<td>32.0%</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

**SOURCES:** EPA fuel efficiency ranking of new 1991 passenger cars; Energy Balances of OECD Countries, 1980.

**NOTE:** Road Transport includes diesel and LPG and lubricants.

**Figure 9:** Comparison of Petroleum Consumption Among Selected Countries
Figure 10: Oil Consumption Within the Transport Sector by Mode

Source: Ministry of International Trade and Industry and Ministry of Transport
first oil shock. In later pages, the dramatic changes that have occurred on the consumption side will be outlined to illustrate how an increase in gasoline consumption has aided the oil industry in a period of basic structural changes within Japanese industry.

**The Pre-Oil Shock Market**

An historical explanation of the oil market may help to clarify this situation. Japan was largely self-sufficient in energy during the prewar period. In 1935, coal was the major source of energy and hydro-electric power supplied the remainder of Japan's energy needs. Even in 1953 when the Korean War ended, the ratio of total imported energy accounted for only 17.7% of the country's energy supply. However, in the postwar period, Japan has rapidly become dependent upon other countries for her energy needs. This percentage reached 50% in 1963 and dramatically rose to 75% on the eve of the Arab oil embargo in 1973.

The rapid dependence on imported energy sources can be linked to the government's decision to rebuild the economy based on its heavy and chemical industries. For these emerging industries to be cost competitive, Japan's businesses followed a world-wide pattern of greater crude oil consumption as a result of changing patterns of supply
and costs in the postwar period.

The increased use of oil was facilitated by large supplies, the consumption demands of Japan's growing industries and decreasing prices. The discovery of crude oil in the Middle East and Northern Africa ensured abundant supplies. Moreover, a decision by the American government to limit the amount of crude oil entering the US market in the middle 1950's closed off one of the world's largest markets for the newly discovered crude oil, thereby shrinking the market and further pushing prices down on the world market.\(^{25}\) Another reason for the lower prices was that domestic oil refineries, as well as end users, developed more clout and began to bargain for better prices as crude oil consumption increased in Japan.\(^{26}\) During this period, the Ministry of Finance continued to allocate generous foreign exchange allocations for the purchase of crude oil.

Although the government was very concerned with the increasing dependence on imported sources of energy, initial action was taken only to preserve the domestic coal industry. As indicated in Table \(11\), not only did coal use decrease, but also a larger share of the coal being used in Japan was imported. In order to preserve a domestic energy industry and to minimize economic disruption as a result of mine closings, from 1954, the government bought inefficient
Table 11: Primary Energy Use

(1) FY 1935–60 (Units are millions of tons of coal equivalent)

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Hydro-electric power</th>
<th>Coal (amount imported)</th>
<th>Lignite</th>
<th>Oil (amount imported)</th>
<th>Natural gas</th>
<th>Firewood</th>
<th>Charcoal</th>
<th>Total (millions of tons)</th>
<th>Imported energy as a proportion of total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1935</td>
<td>18.3</td>
<td>61.7 (9.2)</td>
<td>0.1</td>
<td>10.4 (8.0)</td>
<td>0.1</td>
<td>5.9</td>
<td>3.7</td>
<td>62.8</td>
<td>18.8</td>
</tr>
<tr>
<td>40</td>
<td>16.2</td>
<td>66.1 (12.0)</td>
<td>0.2</td>
<td>7.0 (6.5)</td>
<td>0.1</td>
<td>7.0</td>
<td>3.7</td>
<td>90.7</td>
<td>18.5</td>
</tr>
<tr>
<td>47</td>
<td>35.5</td>
<td>43.9 (0.2)</td>
<td>2.8</td>
<td>3.7 (3.2)</td>
<td>0.1</td>
<td>8.3</td>
<td>3.6</td>
<td>50.5</td>
<td>3.3</td>
</tr>
<tr>
<td>50</td>
<td>32.7</td>
<td>51.2 (1.6)</td>
<td>0.9</td>
<td>6.3 (5.3)</td>
<td>0.1</td>
<td>6.2</td>
<td>2.7</td>
<td>69.4</td>
<td>7.1</td>
</tr>
<tr>
<td>55</td>
<td>30.5</td>
<td>44.0 (3.7)</td>
<td>0.7</td>
<td>17.9 (17.4)</td>
<td>0.3</td>
<td>4.4</td>
<td>2.2</td>
<td>95.5</td>
<td>21.1</td>
</tr>
<tr>
<td>60</td>
<td>22.7</td>
<td>38.1 (6.2)</td>
<td>0.4</td>
<td>34.7 (34.1)</td>
<td>0.7</td>
<td>2.3</td>
<td>1.0</td>
<td>154.5</td>
<td>40.3</td>
</tr>
</tbody>
</table>

(2) FY 1955–75 (Units: $10^{10}$ kilocalories)

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Electric power</th>
<th>Coal (amount imported)</th>
<th>Lignite</th>
<th>Oil (crude oil imports)</th>
<th>Natural gas</th>
<th>Firewood &amp; charcoal</th>
<th>Total ($10^{10}$ kcal)</th>
<th>Imported energy as a proportion of total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>21.2</td>
<td>49.2 (4.4)</td>
<td>1.0</td>
<td>20.2 (15.6)</td>
<td>0.4</td>
<td>8.0</td>
<td>56,016</td>
<td>24.0</td>
</tr>
<tr>
<td>60</td>
<td>15.3</td>
<td>41.5 (7.1)</td>
<td>0.6</td>
<td>37.7 (33.0)</td>
<td>1.0</td>
<td>3.9</td>
<td>93,749</td>
<td>44.3</td>
</tr>
<tr>
<td>65</td>
<td>11.3</td>
<td>27.3 (8.2)</td>
<td>0.1</td>
<td>58.4 (51.6)</td>
<td>1.2</td>
<td>1.6</td>
<td>165,614</td>
<td>66.2</td>
</tr>
<tr>
<td>70</td>
<td>6.3</td>
<td>20.0 (12.2)</td>
<td>0.1</td>
<td>68.5 (60.1)</td>
<td>0.8</td>
<td>0.5</td>
<td>310,468</td>
<td>80.9</td>
</tr>
<tr>
<td>73</td>
<td>4.6</td>
<td>15.4 (11.7)</td>
<td>0.0</td>
<td>77.6 (70.9)</td>
<td>0.7</td>
<td>0.1</td>
<td>382,576</td>
<td>89.9</td>
</tr>
<tr>
<td>75</td>
<td>5.7</td>
<td>16.4 (13.1)</td>
<td>0.0</td>
<td>73.1 (71.9)</td>
<td>0.7</td>
<td>0.3</td>
<td>365,719</td>
<td>88.0</td>
</tr>
<tr>
<td>78</td>
<td>4.8</td>
<td>13.7 (10.5)</td>
<td>0.0</td>
<td>72.9 (70.2)</td>
<td>0.7</td>
<td>0.1</td>
<td>384,546</td>
<td>87.5</td>
</tr>
</tbody>
</table>

(3) Coal Production and Volume of Oil Imports

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal production (million tons)</td>
<td>3,776</td>
<td>5,631</td>
<td>2,934</td>
<td>3,933</td>
<td>4,426</td>
<td>5,746</td>
<td>5,564</td>
<td>4,085</td>
<td>2,168</td>
<td>1,860</td>
<td>1,929</td>
</tr>
<tr>
<td>Crude oil imports (10,000 kls)</td>
<td>133</td>
<td>229</td>
<td>196</td>
<td>196</td>
<td>927</td>
<td>3,288</td>
<td>8,763</td>
<td>20,487</td>
<td>28,849</td>
<td>26,279</td>
<td>27,012</td>
</tr>
</tbody>
</table>

(3) Same as for (1) and (2).
coal mines which were promptly closed and only allowed the opening of those coal mines of superior quality. (Coal Industry Rationalization Law) 27

Another measure to assist the domestic coal industry was the establishment of a custom levy on crude oil imports. Furthermore, when MITI secured power to oversee plant conversions from coal to crude oil, the government secured greater powers to ensure an orderly energy transition. However, the pattern of greater crude oil consumption, especially heavy fuel, appeared to be inevitable by the late 1950's as Japan became more dependent on the outside world for her energy supplies.

An action taken by MITI to ensure stable energy supplies and to promote production of value-added products promoted domestic refining. The import of refined oil products was severely limited by the allocation of foreign exchange for crude oil. Resulting from the actions of the Petroleum Advisory Group of General Headquarters (GHQ), some of the majors, mostly American firms, sought active participation in the Japanese marketplace. The majors and domestic oil companies entered into joint ventures or independently developed Japan's oil refining capacity. 28 However, in developing capacity, American methods which emphasized gasoline production because of the extraordinary high consumption of energy by automobiles in the United
States were completely inappropriate for Japan in the period immediately following the Second World War, since there were very few automobiles at the time. Japan's economic recovery in the postwar period was based on the development of the heavy and chemical industries. Therefore, private and public efforts were focused in this direction. This has led to a situation in which Japan adopted refining methods that economically would yield the largest amount of heavy fuel. Historical data reveals that until quite recently at least 50% of the total yield has been heavy fuel (see Figure 11).

The establishment of domestic refining facilities and an increasing demand for heavy fuel meant that gasoline would be made as a by-product of the refining process. Therefore, adequate supplies of gasoline have been available for consumption because of economic growth based on industries which consume heavy crude oil.

The Post Oil Shock Period

The consumption of petroleum has decreased dramatically in the post oil shock period (see Figure 12). This is due to the ability of industry to conserve fuel as well as the slowdown of the Japanese economy. Table 12 illustrates the significant improvements made in energy efficiency in various industries. Because of the decrease
Middle distillates include jet fuel oil, Kerosene, and light oil. Others include lubricants oil, grease, asphalt, refinery gas and LPG.

(Original Source) "Energy Balance Tables in Fiscal 1978-1980 (Common Unit)" of Ref. 2 (pp. 33–61).

**Figure 11: Production of Various Petroleum Products in Japan**
Figure 12: Crude Oil Imports, Fiscal Years 1968-1983
Table 12: Energy Conservation in Industry

Consumption per Production
Unit in Major Industries
(FY 1982/FY 1973)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Improvement in Energy Consumption per Unit Product</th>
<th>Improvement in Oil Consumption per Unit Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>85.0</td>
<td>32.0</td>
</tr>
<tr>
<td>Plate Glass</td>
<td>70.7</td>
<td>65.0</td>
</tr>
<tr>
<td>Cement</td>
<td>71.9</td>
<td>3.7</td>
</tr>
<tr>
<td>Pulp &amp; Papers</td>
<td>91.1</td>
<td>64.1</td>
</tr>
<tr>
<td>Textile Dyeing</td>
<td>73.1</td>
<td>64.7</td>
</tr>
</tbody>
</table>

Source: MITI
Note: FY 1973 = 100
in demand for these fuels, it has become less profitable to refine these products, and therefore, the production of heavy fuel and naphtha has been steadily decreasing. The decrease in production is also a result of the fact that prices for these products are lower on the world market. Oil producing countries are making greater demands to purchase value-added refined products, and the purchase of refined products on the world market has led to greater flexibility in taking advantage of changing prices. Table 13 indicates the changing pattern of production and consumption for naphtha and heavy fuel.

In contrast to naphtha and heavy fuel, gasoline is almost entirely produced domestically, although demand has been steadily rising. The level of gasoline imports have been minimal, although there have been some exports, mainly to the American military. As indicated in Table 14, the overwhelmingly largest user of the gasoline is the motor vehicle.29

A clear change occurred after the first oil shock in terms of the strategic value of gasoline sales for the oil industry. Prior to the oil shock, the sale of heavy fuel was the major concern of the industry, and production levels were developed based on the the demands of heavy industry. Gasoline sales, while always a high profit center, never received as much attention because of the
### Table 13: Production and Consumption of Heavy Fuel and Naphtha in Japan

#### Heavy Fuel

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumption</th>
<th>Production</th>
<th>Imports</th>
<th>Imports/Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>105,387,018</td>
<td>101,575,231</td>
<td>16,811,923</td>
<td>(15.97)</td>
</tr>
<tr>
<td>1971</td>
<td>114,401,931</td>
<td>114,638,082</td>
<td>16,492,792</td>
<td>(13.77)</td>
</tr>
<tr>
<td>1972</td>
<td>123,423,054</td>
<td>128,702,141</td>
<td>13,296,041</td>
<td>(13.23)</td>
</tr>
<tr>
<td>1973</td>
<td>129,356,654</td>
<td>139,415,941</td>
<td>13,450,648</td>
<td>(10.4)</td>
</tr>
<tr>
<td>1974</td>
<td>133,322,017</td>
<td>136,763,991</td>
<td>13,647,037</td>
<td>(11.05)</td>
</tr>
<tr>
<td>1975</td>
<td>110,638,369</td>
<td>128,781,931</td>
<td>6,938,182</td>
<td>(5.7)</td>
</tr>
<tr>
<td>1976</td>
<td>115,883,326</td>
<td>126,498,644</td>
<td>9,886,943</td>
<td>(8.32)</td>
</tr>
<tr>
<td>1977</td>
<td>119,309,758</td>
<td>127,801,382</td>
<td>9,192,659</td>
<td>(7.0)</td>
</tr>
<tr>
<td>1978</td>
<td>117,875,651</td>
<td>124,270,027</td>
<td>7,055,783</td>
<td>(6.55)</td>
</tr>
<tr>
<td>1979</td>
<td>117,664,943</td>
<td>124,046,904</td>
<td>9,491,105</td>
<td>(8.07)</td>
</tr>
<tr>
<td>1980</td>
<td>104,164,179</td>
<td>111,023,386</td>
<td>7,430,598</td>
<td>(7.12)</td>
</tr>
<tr>
<td>1981</td>
<td>90,713,821</td>
<td>95,745,323</td>
<td>7,430,517</td>
<td>(8.19)</td>
</tr>
</tbody>
</table>

#### Naphtha

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumption</th>
<th>Production</th>
<th>Imports</th>
<th>Imports/Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>16,183,117</td>
<td>21,360,067</td>
<td>6,159,935</td>
<td>(24.39)</td>
</tr>
<tr>
<td>1971</td>
<td>20,767,749</td>
<td>24,364,937</td>
<td>4,041,586</td>
<td>(17.34)</td>
</tr>
<tr>
<td>1972</td>
<td>32,021,508</td>
<td>26,918,960</td>
<td>6,114,577</td>
<td>(19.72)</td>
</tr>
<tr>
<td>1973</td>
<td>15,937,186</td>
<td>11,254,653</td>
<td>5,590,688</td>
<td>(14.60)</td>
</tr>
<tr>
<td>1974</td>
<td>16,718,669</td>
<td>20,424,166</td>
<td>7,866,366</td>
<td>(21.48)</td>
</tr>
<tr>
<td>1975</td>
<td>10,664,787</td>
<td>26,347,266</td>
<td>5,039,034</td>
<td>(16.44)</td>
</tr>
<tr>
<td>1976</td>
<td>14,874,592</td>
<td>28,311,211</td>
<td>7,597,961</td>
<td>(22.93)</td>
</tr>
<tr>
<td>1977</td>
<td>25,283,781</td>
<td>28,486,916</td>
<td>3,256,373</td>
<td>(23.40)</td>
</tr>
<tr>
<td>1978</td>
<td>34,783,570</td>
<td>25,669,160</td>
<td>10,143,149</td>
<td>(39.16)</td>
</tr>
<tr>
<td>1979</td>
<td>34,141,309</td>
<td>25,083,431</td>
<td>10,364,511</td>
<td>(41.36)</td>
</tr>
<tr>
<td>1980</td>
<td>28,364,327</td>
<td>22,107,510</td>
<td>7,263,117</td>
<td>(32.96)</td>
</tr>
<tr>
<td>1981</td>
<td>23,993,611</td>
<td>18,258,936</td>
<td>7,241,171</td>
<td>(30.31)</td>
</tr>
</tbody>
</table>

Ministry of International Trade and Industry
Table 14: Production and Consumption of Gasoline in Japan

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Consumption</th>
<th>Production</th>
<th>Refined Imports</th>
<th>Refined Exports</th>
<th>Motor Vehicles</th>
<th>Consumption by Vehicles</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>35,014,969</td>
<td>35,102,491</td>
<td>12</td>
<td>36</td>
<td>34,842,404</td>
<td>99.51</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>34,140,898</td>
<td>34,229,890</td>
<td>26</td>
<td>33</td>
<td>34,044,891</td>
<td>99.72</td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td>34,431,520</td>
<td>34,516,589</td>
<td>----</td>
<td>49</td>
<td>34,333,287</td>
<td>99.71</td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>33,414,282</td>
<td>33,494,482</td>
<td>----</td>
<td>61</td>
<td>33,313,479</td>
<td>99.22</td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>30,105,570</td>
<td>30,163,583</td>
<td>12,737</td>
<td>139</td>
<td>29,827,917</td>
<td>99.08</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>28,870,635</td>
<td>28,914,169</td>
<td>450</td>
<td>509</td>
<td>28,454,371</td>
<td>94.52</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>27,142,858</td>
<td>27,224,008</td>
<td>12,775</td>
<td>4024</td>
<td>26,712,386</td>
<td>98.41</td>
<td></td>
</tr>
</tbody>
</table>

Ministry of International Trade and Industry

Note: All units in kiloliters, except last column which is in percentage.
smaller sales volume. 30

In the post oil shock period, the dramatic decrease in heavy fuel consumption has resulted in damaging over-refining capacity. The financial performance of most of the oil companies has been dismal. The one bright spot has been the brisk sale of gasoline. Refining levels are, in many cases, established by the anticipated sale of gasoline. This explains the abundant supplies of gasoline, as well as the dramatic increases in price.

The increases in gasoline prices have been caused by a number of elements. One major reason for these increases is that strong automobiles sales and incremental usage of private transportation have created a strong demand for gasoline. Another reason is that strong, well-organized national and local lobbying constituencies for automobile users have never developed. The only national organization of this type is the Japan Automobile Federation (JAF), and their main function is to provide road service and travel information similar to American Automobile Association in the United States.

Moreover, public transportation is reliable and has made private transportation almost completely unnecessary. Thus, despite objections to rising gasoline prices, there have been no concerted efforts to protest rising operating costs.
Government policies may also affect prices through MITI's powers to maintain orderly sales of gasoline. The Gasoline Sales Business Act which was passed to legalize MITI's actions during the first oil shock limits the opening of gasoline stations to one per 200 km on freeways, and minimum density standards limit the number of stations in urban areas. This action was initially established to prevent business failures, as well as to control the sale levels of gasoline.

The distribution system which reflects the extreme fragmentation of the producers also affects prices. Relations among retailers and wholesale firms are exceptionally weak. Unlike Japan's automobile dealers, there are very few capital ties and franchise agreements provided for refiners and distributors with less than full control over retailers.\textsuperscript{31}

A peculiar practice of the distribution system in Japan is that contracts between gasoline wholesalers and retailers do not specify prices or quantity. The prices are settled retroactively by the suppliers usually forty-five days after a delivery by taking into account the market conditions. This means that the wholesale price is determined by the lowest price for which a gasoline retailer can sell the product and still maintain an adequate margin to cover expenses and profit.\textsuperscript{32}
This seemingly upside down practice has been in existence for years because of the intense competition among the nation's thirteen gasoline wholesalers. The freedom that local retailers have in setting prices intensifies the competition at the wholesale level. In turn, the level of competition affects the price of gasoline. For example, it rose to a high of 177 yen/liter ($0.71/liter) two years ago in September, but dropped to 146 yen/liter ($0.58/liter) last year. Prices also vary greatly depending on where the product is sold in Japan. In 1984, the highest prices were recorded in Naha, Okinawa (166 yen/liter = $0.66) and the lowest in Okayama and Fukuoka (141 yen/liter = $0.56). The thirteen oil companies exert strong control over the market. A spot market for gasoline sales appears to be quite small and amounts to the inventory of gasoline stations that have gone out of business.

The importance of gasoline sales as a source of revenue has led to intense competition. Sometimes, competition becomes so keen that the government intervenes after consultation with other government agencies and business leaders (see Figure 13).

Government Powers

The most rigid administrative means of affecting
Figure 13: Wholesale Price of Oil Products

Source: Supplement to Energy in Japan (September, 1976): 4
prices of petroleum products has been price fixing. In the postwar period, prices of petroleum products were fixed from the end of the Second World War until 1952. Price controls were also re-imposed after the first oil shock of 1973.

A much more common tool for influencing prices has been the practice of setting "standard prices." Standard prices were imposed for the first time in 1962 due to large price reductions from the end of the year. Based on ten years of data that reviewed the cost structure of the industry, and then adding to it reasonable profits, "standard prices" were established for different petroleum products. The aim of "standard prices" was not to fix prices, but to establish norms around which various producers will price their products. Similar to other Japanese government actions, the enforcement of "standard prices" occurs only as long as the circumstances that precipitated the administrative guidance continue.

Producers are not legally bound by these "standard prices." What often occurs is that price levels are negotiated and agreements are made informally before official action is taken. The ministry will not impose a request that will damage the industry, and accordingly, industry will do its best to comply with the wishes of the government. During this process, despite the intense
competition in the oil industry and the heated exchanges between government and business, there still remains a sense in Japan that everyone is in the same boat.

The legislative rationale for state intervention was manifested in the Petroleum Industry Law of 1934. Similar to America's anti-monopoly legislation, it was as much private industry which sought protection and relief as well as a ministry which sought greater influence. After the occupation, one of the greatest concerns of the government was to prevent the domination of the domestic marketplace by foreign capital. An effective means of controlling this situation was through the Foreign Exchange Law. Under the law, the Ministry of Finance, through consultations with the appropriate ministry, could allocate foreign exchange for the purchase of foreign goods such as crude oil. However, pressure from the international community forced Japan to abolish this law and open her markets.

The informal, but influential Energy Round Table (Enerugi Kondankai) reported late in 1961 that unless a new Petroleum Industry Law was passed, foreign capital would even further dominate the industry, thereby creating intolerable security risks. Despite the intense opposition from the Keidanren (An Association of Japan's Largest Firms), refiners, steel firms and other important business groups who objected to an increase in state
control, the Petroleum Industry Law was passed to ensure continued governmental influence over the nation's energy plans. The intensity of the debate forced MITI to eliminate a provision within the original legislation to create a new state oil corporation. 38

The new Petroleum Industry Law requires MITI to produce a five year oil plan indicating production and the level of imports of all petroleum products. The oil industry must then submit a production plan taking into account the supply plans approved by MITI and the Petroleum Deliberation Council (a MITI convened industry group that elicits views from the industry). With the passage of the law, MITI acquired the power to license new refining and marketing plans. 39

While in many cases, it would have been more profitable for some refiners whose prices have risen faster to increase their production of gasoline, MITI has thwarted this action by preventing firms from diversifying into other products at the expense of potential reduction in petroleum products that may be less profitable, but essential for the nation.

The Role of Government

A controversy still remains regarding the impact of government policy on industry. Some observers believe that
the industrial structure of the industry has been deliberately planned by government. According to Tsurumi:

A fragmented oil industry--the result of permitting free entry into both the refining and wholesaling of oil but deliberately keeping refining capacity out of vertical integration--was expected to compete vigorously and thus to be relatively weak in price bargaining with highly concentrated user industries. Because oil firms were politically too weak to influence planning the deliberate creation of monopsonistic buyers of industrial oil products proved an effective mechanism for guaranteeing strategic growth industries access to cheap energy. A few large industrial buyers, most notably steel and petrochemicals, were able to drive hard bargains by playing one oil firm off against another.(40)

In a detailed study of the the postwar Japanese oil industry, Caldwell describes this situation in a more political context. She suggests that Japanese policymakers opted for price over security. The oil industry is portrayed as "second to, but necessary, for Japan's high growth industries," and policy was devised to "preclude the emergence of a strong and unified oil industry." 41

However, in assessing the role of the government in influencing prices, it is naive to imagine that, despite its reputation for competence, the bureaucracy could affect market behavior so predictably. A recent study by Samuels explores this question, especially with regard to the role that MITI plays in the oil marketplace. This study
disagrees with the notion that MITI has sought and has been successful in influencing the industry and prices to the extent claimed by other scholars. Samuels states that MITI has not consistently exerted their power to maintain inexpensive fuel prices because a number of policies have been implemented to subsidize the domestic coal industry. He points out that, in fact, factor costs of heavy fuel are not necessarily lower than when compared to other industrial countries. Secondly, the fragmentation within the industry may be attributable to the intense competition within the marketplace. Third, MITI has never had a unified and consistent program for the petroleum industry, and disagreements have occurred within the ministry.
Chapter 7: Policy Directed at Fuel Consumption by Automobiles

The Tax System

The tax system has enabled the construction of better roads and this has been a contributing factor in making the automobile a viable alternative to public transportation, and in addition, has increased motor vehicle use. Furthermore, when custom duties were imposed on petroleum products imported into Japan, the rationale was to assist the domestic coal industry by increasing the price of oil and to raise general revenues, not to decrease consumption.

Although fuel conservation is a rationale that is given, frequently when fuel-related taxes are raised, the most significant increases in oil prices have occurred as a result of OPEC's actions following the first oil shock. Public resentment toward fuel price increases will also most likely be vented toward the large oil companies and the government because of a recent indictment of eleven of the thirteen oil companies for price fixing due to administrative guidance in setting price floors during the first oil shock. 43

Minimum Fuel Mileage Standards

Another governmental action aimed at fuel conservation
has been the passage of minimum fuel mileage standards for 1985 motor vehicles. These standards have set targets that will result in a 12.3% improvement in fuel efficiency from 11.4 km/liter (10 mode) in 1978 to 12.8 km/liter by 1985 (10 mode) (See Table 15).

The impact of this measure has not drastically altered the type of cars that are being produced. Japan's automobile manufacturers have been producing fuel efficient motor vehicles for some time. The average fuel economy of Japanese automobiles decreased slightly in 1975 because of the implementation of more stringent emission controls. Since this time, improvements to emission control equipment and the development of less polluting engines have enabled manufacturers to produce cleaner and more fuel efficient cars.

The guidelines for Japan's minimum fuel economy standards reflect the realistic goals of manufacturers and government after long discussions. It is for this reason that there are no provisions for fines because the goals have already been agreed upon.

Many groups have criticized these guidelines on several grounds. First of all, the standards are based on speeds of 10-mode, but because many of Japan's roads are extremely congested, this speed is usually not attained, and therefore does not realistically reflect the driving conditions of
Table 15: National Passenger Car Fuel Efficiency Standards

<table>
<thead>
<tr>
<th>Vehicle weight*</th>
<th>Fuel efficiency</th>
<th>Class I up to 577.5 kg</th>
<th>Class II over 577.5 to 827.5 kg</th>
<th>Class III over 827.5 to 1,265.5 kg</th>
<th>Class IV over 1,265.5 to 2,015.5 kg</th>
<th>I-IV Overall Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985 standard (km/l)</td>
<td>19.8</td>
<td>16.0</td>
<td>12.5</td>
<td>8.5</td>
<td>12.8</td>
<td></td>
</tr>
<tr>
<td>1978 average (km/l)</td>
<td>18.6</td>
<td>14.4</td>
<td>11.1</td>
<td>7.6</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>Percentage of efficiency increase ('85 vs. '78)</td>
<td>6.5%</td>
<td>11.1%</td>
<td>12.6%</td>
<td>11.8%</td>
<td>12.3%</td>
<td></td>
</tr>
</tbody>
</table>

*Equivalent inertia weight.

Source: Ministry of International Trade and Industry
Japan. Another problem is that many foreign manufacturers cannot meet these guidelines because the guidelines in their countries are not as stringent. Because these makers share only 2% of the market in Japan, they are seeking an exemption as a result of the lack of market penetration for their vehicles.

The Japanese standards should not be confused with the corporation average fuel economy standards (CAFE) that were employed by the United States in 1975. The motivation of each government and the manner in which policy was developed were quite different. In Japan, this policy was a means of encouraging the production of motor vehicles which industry was planning to develop in order to maintain its competitive edge in its markets. In the United States, the standards have been used much more as a means of pulling industry toward fuel consumption standards, which industry may be more reluctant to meet unless the market demand for small, fuel efficient vehicles becomes stronger.

**Gasoline Sales Business Restrictions**

Based on the Gasoline Business Act which was passed on October 3, 1982 after the first oil shock, a new measure was again implemented by MITI and the Natural Resources and Energy Agency to close all gasoline stations on Sundays unless they receive exemptions from MITI. The association
of gasoline retailers together with MITI have developed a system of closing alternative stations. Failure to observe the ban results in a series of sanctions by MITI's regional bureaus to a maximum of a 300,000 yen (US $1,276) and the suspension of the owner's permit to sell gasoline. Japan's 59,273 gasoline operators who have already been hit by decreased sales due to an increase in the number of competing stations are vehemently opposed to this latest action. Kazuo Murata, president of the Sawarabi Oil Company of Kyoto, has sued the government on the grounds that business day restrictions infringes on his constitutional right of freedom of occupation selection. In his suit, Murata also insists that the MITI minister has neglected to take into account the favorable supply of gasoline which is a prerequisite of the law.

What is interesting about MITI's latest measure is that it comes at a time of large inventories of crude oil and a drop in the price of gasoline. There is no apparent danger of gasoline shortages, and therefore, the government actions are not taken seriously by the public. Also, most automobiles are used for shorter trips, and even if a weekend trip is planned, most of the popular places are close enough to urban areas to be reached on a tankful of gasoline. Thus, the latest measure to restrict gasoline sales appears to be a means of reminding drivers and the
general public about the continued need to conserve gasoline rather than a measure to seriously curb fuel consumption.

**Consumer Information**

The fuel consumption of all vehicles sold in Japan has been prominently displayed in all the advertisements for urban and highway conditions for the last ten years. All manufacturers of motor vehicles in Japan conduct their own mileage tests according to established government standards and then submit the results to the Ministry of Transport. Although the fleet mix will be discussed in a later section, it is impossible to gauge the impact of consumer information on sales. What is clear is that sales are concentrated in the class of cars with engine displacements between 1,500 and 2,000 cc's. This market is highly competitive and fuel economy is one of the factors which may sway this market.
Chapter 8: Effectiveness of Fuel Conservation

Actual Fuel Consumption

Although the fuel economy of new cars has been steadily increasing since 1975, actual fuel economy per vehicle has not been improving as rapidly. Of course, much of this discrepancy is a result of the difference between fuel consumption based on actual driving conditions and the fuel economy data derived from test results. Factors such as cold starts versus hot starts can have a great impact on fuel economy. The difference in fuel economy between ideal and actual conditions also reflects the worsened traffic conditions of urban areas and the pattern of using automobiles for short trips.\textsuperscript{47} This discrepancy may also be due to longer car life as a result of technological improvements to motor vehicles and increases to car costs which delay the introduction of more fuel efficient models.\textsuperscript{48}

When an estimate of actual fuel mileage is made, fuel mileage results are less than the fuel mileage standards which have been advertised for new cars during the last ten years. Figure 14 illustrates the estimated actual mileage for motor vehicles between 1960 and 1980. Figure 15 illustrates the average new fleet mileage for gasoline powered cars at 10-mode between 1975 and 1984.
Figure 14: Estimated Fuel Consumption of Motor Vehicles in Japan

Fuel efficiency has been improved by 33% from 1975 to 1980.

* Note: Results of 10-mile test

Figure 15: Fuel Consumption of New Passenger Cars in Japan
**Fleet Mix**

Japanese consumers have not ignored public policies which promote the sale of smaller fuel efficient motor vehicles. In fact, the majority of car sales is dominated by engine displacements between 1,500 and 2,000 cc's. Also, since 1975, there has been an increase in sales of automobiles with engine displacements between 1,000 and 1,500 cc's. Partly due to rising incomes and decreased efforts to promote the sale of mini-cars, after 1974, the sale of these cars has steadily decreased in absolute numbers, although sales increased slightly in 1982. However, the decrease in mini-car sales is not a true reflection of the popularity of mini-vehicles because the total sales of mini-vans and trucks in 1982 accounted for approximately 21.7% of total motor vehicle sales in Japan (1,086,789 mini-vans and trucks were sold in 1982).

Many of these mini-vans and trucks are for personal use. As for larger cars with engine displacements over 2,000 cc's, there has been a seven-fold increase in the absolute numbers of vehicles sold between 1973 and 1981, although these cars still constitute only 2.54% of the total market. The increase in popularity of large cars does not suggest a shift in tastes, but it is due to the production by domestic manufacturers of a larger variety of cars over 2,000 cc's. Table 16 summarizes the sales mix.
Table 16: Fleet Mix in Japan

<table>
<thead>
<tr>
<th>Year</th>
<th>2,000 cc</th>
<th>1,500 cc</th>
<th>1,000 cc</th>
<th>500 cc</th>
<th>Subtotal</th>
<th>Mini-cars</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>1,833</td>
<td>186,922</td>
<td>572,167</td>
<td>403,404</td>
<td>1,364,326</td>
<td>546,255</td>
<td>1,930,581</td>
</tr>
<tr>
<td>1970</td>
<td>1,593</td>
<td>289,159</td>
<td>811,798</td>
<td>460,439</td>
<td>1,563,389</td>
<td>717,170</td>
<td>2,280,559</td>
</tr>
<tr>
<td>1971</td>
<td>1,485</td>
<td>304,376</td>
<td>635,244</td>
<td>761,193</td>
<td>1,702,498</td>
<td>612,730</td>
<td>2,315,228</td>
</tr>
<tr>
<td>1972</td>
<td>2,006</td>
<td>706,144</td>
<td>846,613</td>
<td>441,168</td>
<td>2,001,021</td>
<td>449,314</td>
<td>2,450,335</td>
</tr>
<tr>
<td>1973</td>
<td>9,165</td>
<td>968,824</td>
<td>1,188,608</td>
<td>284,168</td>
<td>2,420,725</td>
<td>395,854</td>
<td>2,816,579</td>
</tr>
<tr>
<td>1974</td>
<td>10,935</td>
<td>722,225</td>
<td>1,055,422</td>
<td>103,286</td>
<td>1,891,948</td>
<td>257,912</td>
<td>2,149,860</td>
</tr>
<tr>
<td>1975</td>
<td>14,937</td>
<td>1,007,027</td>
<td>1,220,891</td>
<td>87,457</td>
<td>2,430,224</td>
<td>154,341</td>
<td>2,584,565</td>
</tr>
<tr>
<td>1976</td>
<td>10,890</td>
<td>1,066,020</td>
<td>1,022,046</td>
<td>42,441</td>
<td>2,161,579</td>
<td>175,625</td>
<td>2,337,204</td>
</tr>
<tr>
<td>1977</td>
<td>16,834</td>
<td>1,317,824</td>
<td>836,730</td>
<td>82,000</td>
<td>2,234,188</td>
<td>163,845</td>
<td>2,398,033</td>
</tr>
<tr>
<td>1978</td>
<td>47,113</td>
<td>1,557,975</td>
<td>906,691</td>
<td>42,236</td>
<td>2,564,315</td>
<td>171,789</td>
<td>2,736,104</td>
</tr>
<tr>
<td>1979</td>
<td>59,063</td>
<td>1,640,221</td>
<td>977,666</td>
<td>58,713</td>
<td>2,757,443</td>
<td>168,098</td>
<td>2,925,541</td>
</tr>
<tr>
<td>1980</td>
<td>40,497</td>
<td>1,479,355</td>
<td>989,548</td>
<td>65,266</td>
<td>2,586,566</td>
<td>173,941</td>
<td>2,759,507</td>
</tr>
<tr>
<td>1981</td>
<td>70,406</td>
<td>1,434,910</td>
<td>1,054,789</td>
<td>42,017</td>
<td>2,604,122</td>
<td>165,025</td>
<td>2,769,147</td>
</tr>
</tbody>
</table>

Source: Jidōsha Tokei Nenpō (Annual Automotive Statistics) Japan Automobile Manufacturer's Association

Notes: Before Dec. 1975, mini-vehicles have engine displacements up to 360 cc. Thereafter, maximum engine displacement for mini-vehicles increased to 550 cc's.
of passenger cars over a twelve year period.

In Japan, engines powered by fuels other than gasoline such as diesel or LPG do not constitute an important factor in the market. Although the number of registered diesel powered cars has increased since the second oil shock, these automobiles still constitute less than 2% of all registered cars.

One explanation for this is that during the first oil shock, there was a shortage of diesel fuel while gasoline was plentiful. This may be caused by the production pattern described in an earlier section of this paper in which the refining of diesel fuel is less profitable than gasoline. Whether it is for this reason or for more subjective factors such as increased noise and sacrifices in performance, the consumers appear to be hesitant to purchase diesel cars.

LPG is the second most common alternative fuel used in Japan. Almost all cars that use LPG are taxis, and therefore, their absolute number has remained close to or below 300,000 vehicles. Unless the taxi fleet increases dramatically, which is unlikely, the total number of LPG cars will not increase in the short run (see Table 17).
Table 17: Alternative Powered Cars in Japan

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Diesel Cars</th>
<th>Total LPG Cars</th>
<th>Total Registered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>15,019 (.53)</td>
<td>89,979 (1.8)</td>
<td>2,833,253</td>
</tr>
<tr>
<td>1967</td>
<td>14,615 (.38)</td>
<td>112,704 (2.94)</td>
<td>3,836,415</td>
</tr>
<tr>
<td>1968</td>
<td>13,504 (.26)</td>
<td>135,876 (2.67)</td>
<td>5,209,324</td>
</tr>
<tr>
<td>1969</td>
<td>11,985 (.17)</td>
<td>163,873 (2.36)</td>
<td>6,933,737</td>
</tr>
<tr>
<td>1970</td>
<td>10,738 (.12)</td>
<td>185,845 (2.12)</td>
<td>8,778,975</td>
</tr>
<tr>
<td>1971</td>
<td>8,328 (0.08)</td>
<td>207,117 (1.96)</td>
<td>10,572,124</td>
</tr>
<tr>
<td>1972</td>
<td>4,853 (0.04)</td>
<td>216,166 (1.73)</td>
<td>12,531,151</td>
</tr>
<tr>
<td>1973</td>
<td>3,942 (0.03)</td>
<td>229,602 (1.59)</td>
<td>14,471,631</td>
</tr>
<tr>
<td>1974</td>
<td>3,129 (0.02)</td>
<td>239,419 (1.51)</td>
<td>15,853,551</td>
</tr>
<tr>
<td>1975</td>
<td>4,220 (0.02)</td>
<td>255,350 (1.48)</td>
<td>17,236,326</td>
</tr>
<tr>
<td>1976</td>
<td>12,969 (0.07)</td>
<td>264,499 (1.43)</td>
<td>18,475,570</td>
</tr>
<tr>
<td>1977</td>
<td>39,383 (0.02)</td>
<td>270,169 (1.36)</td>
<td>19,825,717</td>
</tr>
<tr>
<td>1978</td>
<td>90,052 (0.42)</td>
<td>278,676 (1.31)</td>
<td>21,279,694</td>
</tr>
<tr>
<td>1979</td>
<td>164,899 (0.73)</td>
<td>287,767 (1.27)</td>
<td>22,667,304</td>
</tr>
<tr>
<td>1980</td>
<td>302,217 (1.28)</td>
<td>291,577 (1.23)</td>
<td>23,659,528</td>
</tr>
<tr>
<td>1981</td>
<td>431,695 (1.75)</td>
<td>294,300 (1.20)</td>
<td>24,612,277</td>
</tr>
<tr>
<td>1982</td>
<td>468,975 (1.91)</td>
<td>293,406 (1.19)</td>
<td>24,578,524</td>
</tr>
</tbody>
</table>

Source: Jidōsha Tokei Nenpō (Annual Automotive Statistics)  
Japan Automobile Manufacturer's Association
Chapter 9: Contingency Plans

In this study, I have examined various government policies toward fuel consumption by automobiles. However, if the oil flow into Japan is disrupted as it was in 1973 and 1979, it is difficult to discern how the government will respond, what preparations have been made for such emergencies and how the automobile users will be affected. In approaching this problem, what we must consider is that in Japan, the automobile is not the sole means of transportation in the majority of areas. Thus, an emergency situation which may necessitate strong controls on fuel consumption by automobiles will not have the same social and economic impacts as they would have in the United States.

Rationing

After the first oil shock, a number of plans were developed to control the consumption of gasoline by motor vehicles if the flow of crude oil flow is disrupted. Although rationing was not imposed during the first or second oil shocks, the chaos created by these events precipitated a number of measures in the event another oil embargo should take place. One published study entitled the "Study for the Optimum Rationing System of Oil for Household Use" by a MITI deliberated council suggests a
number of measures which should be taken for controlling the use of oil products used by the general public such as kerosene and gasoline. As a result of this and similar studies, and a 70 billion yen ($280 million) fund allocation for the development of emergency measures in 1979, it is likely that rationing tickets have been printed and are being stored in a secret location in Japan.

Japan's allocation system is based on a number of inter-dependent programs. After the first oil shock, policy makers realized that it was difficult to predict the consumption of various oil products. Thus, in 1977, the Japan Oil Distribution Information System (JODIS) was created to monitor the consumption of various oil products throughout the country. If a national oil shortage does occur, MITI will be able to allocate fuel based on past consumption trends, the anticipated shortage, and the priority of oil use in terms of the public interest.

Once allocation decisions are made, users will be informed through the media such as television and newspapers, and coupons will be sold at gasoline stations. Car owners will be able to purchase coupons by presenting documentation such as insurance certificates. Decisions regarding different allocations for different types of cars have not been made public. Provisions have been made for essential emergency vehicles such as fire engines, police
cars and ambulances.

Since emergencies are anticipated to last between one to three months under the current proposal, owners will be able to purchase allocation coupons and reimburse them for gasoline only in the area where the car is registered. This will discourage the use of motor vehicles for longer trips which the government feels is unnecessary during a period of emergency. Currently, JODIS only monitors consumption and does not predict the changing consumption patterns or significant changes in demand in limited areas such as resorts. The fear is that if users are free to reimburse rationing coupons anywhere, periodic shortages will occur in some places, and panic may occur. Another policy recommendation is that users should be encouraged to purchase gasoline from neighborhood gasoline stations in order to further ensure orderly sales during emergencies.

**Other Contingency Plans**

In addition to allocation schemes since the first oil shock, the Japanese government has initiated a number of policies to decrease dependence on imported energy sources, to minimize the actions of oil cartels such as OPEC and to rationalize oil consumption. The most frequently mentioned efforts are:
1. Oil Stockpiling (Petroleum Stockpiling Law, 1975)


3. Promotion of Alternative Energy Programs (Sunshine Project)

Chapter 10: Predictions for the Future

Despite Japan's dependence on imported energy sources, the availability of gasoline in Japan and the relatively low consumption of gasoline by automobiles have minimized the potential negative impacts of growing energy consumption by automobiles. During the early postwar period, the increased demand for heavy fuel by industry was the driving force behind greater crude oil imports, and gasoline production was the natural product of the refining process. More recently, the greater profitability of gasoline sales has ensured that demand will be satisfied by domestic production, although the demand and production of heavy fuel has been declining.

A number of factors may alter the current comfortable accommodation of increasing motor vehicle use, ownership and national dependence on imported sources of energy. The demand for motor vehicles has grown tremendously in the postwar period and it is expected to continue growing in the future, although at a lower rate. One study conducted by the Japan Automobile Manufacturer's Association (JAMA) estimates that the total vehicle demand will be 5.7 million by 1990 or an increase of three percent over the 1980 demand. As for passenger cars, JAMA estimates the demand in 1990 will be 3.5 million, while Predicasts, which made its estimate prior to the second oil shock forecasts 5.3 million. 49.
Another factor which may alter today's situation is the continual decreasing demand for heavy fuel and the increasing demand for gasoline and middle distillates. The yield of heavy fuel decreased from a traditional 60% to 46.53% in 1981, and the Institute of Energy Economics (IEE) forecasts a continued decrease to 30% in 1990 and 25% by 2000. The IEE has recently completed a demand forecast for various oil products until the year 2000. This study predicts that in the industrial sector, a 0.5% rate of increase in demand will occur between 1980 and 2000 in a low price scenario, and demand is projected to decrease in a high price scenario. In the industrial sector, significant increase in gas demand is expected because of the introduction of industrial LNG. (A 6.6% rate of increase until the year 2000 is forecasted in a low price scenario.)

On the other hand, in the transportation sector, gasoline consumption is expected to rise at a rate of 1.7% between 1980 and 2000 in a low price scenario and 0.4% in a high price scenario. The increased consumption of gasoline will be coupled with increased consumption of kerosene and fuel oil (mainly fuel oil A) in the commercial/residential sector. Increased consumption of gas and electricity is expected in the commercial sector due to higher equipment standards, greater number of high-rise buildings and the
development of new towns. The anticipated increase in gasoline and middle distillates, coupled with decreased heavy fuel consumption, will mean that greater investments in heavy oil cracking equipment will be necessary by the domestic oil industry. This requirement will be difficult for an oil industry already plagued with excess capacity and a record of poor financial performance during the post-oil shock period.50

From a national point of view, Japan has continued to import crude oil and has increased her dependence on imported sources of energy in order to encourage industry and to help the nation recover economically in the postwar period. Continued dependence on imported sources of energy with its consequent economic, social and security implications may be more difficult in the future if a greater share of crude oil is consumed by passenger cars and the economic benefits become less significant.

Recent technological developments such as the development of more fuel efficient engines, lighter bodies, improvements to aerodynamics and decreases in rolling resistance have significantly improved fuel economy.51 However, the impact of these new technological improvements
on fuel economy may be offset somewhat by the actual poor driving conditions in Japan. Thus, circumstances which allow the current level of energy consumption by automobiles will change, and energy use by motor vehicles will become a more critical factor in the nation's overall energy policy.
FOOTNOTES


6. One of the first clear cut policy decisions on the part of national government was to improve the nation's roads in the postwar period. In 1954, the first program for large-scale road construction was started by allocating all gasoline tax revenues to the national road program. The rationale for road investment was that highway improvements were necessary in order to provide efficient motor vehicle freight transport and that such investments would help the nation recover economically. This goal has been reached because in 1950, only 8.4% of freight was transported by trucks, 52.3% by railways and 39.4% by sea shipping. In 1980, trucks carried 40.7% of the domestic share of the freight transport, railways carried 8.6% and inland shipping 50.6%. What is significant is that the share of domestic freight by railways in 1980 was approximately equal to levels in 1950 although the total ton-kilometers increased by 577% (64,779 to 439,065 million ton-kilometers). This is a major reason for the current deficits of the Japan National Railways and one of the first recommendations of an advisory committee to restructure the public corporation has been to decrease freight services.

A major issue in road construction is the level of government subsidies for national and local projects. Although the Temporary Law on Road Improvements establishes the ratio of national to local government expenditures, these figures are subject to negotiation. Generally, less
developed areas have priority and in Japan these areas are generally in the North, West and in Okinawa. This policy has been developed to foster economic development all over Japan by extending the road network. However, in allocating funds, politics play an important role. In the postwar period, representation within the national diet is heavily weighed toward rural areas and it has been impossible to take representatives away so that representation has been added to the urban areas which have experienced the greatest growth. However, rural voters have much greater representation. This has resulted in a situation where roads in the outlying areas of Japan with little traffic have outstanding roads, but those in urban areas are in need of repair or expansion. Powerful politicians such Kakuei Tanaka, have been very successful in developing the roadways in their areas.

Future funding of the road program is also unclear. As a result of accumulated national budget deficits, the Ministry of Finance has proposed that gasoline tax revenues be allocated to general revenues. In turn, the Ministry of Finance will authorize expenditures from general revenues and issue construction bonds in order to continue the road program. However, the Ministry of Construction is adamantly against this proposal and it remains to be seen whether revenues that are earmarked for road construction can be diverted to other uses.


8. Other manufacturers have been able to develop a new market niche by creating products with imaginative combinations of styling, technical features and marketing. In addition to the City, Toyota has been also very successful with its "Soarer" line, a luxury sports sedan that has an average engine displacement over 2,500 cc's (a very small market segment up to now that has been dominated by foreign manufacturers) and a price tag that is over $16,000.

9. The orderly trading agreement between the US and Japan limits the number of vehicles that can be sold in the US market. Thus, Japanese manufacturers are selling more expensive lines where profit margins are greater and dealers are loading the cars with options because of the limited supplies and strong demand. A 1982 Study by Harbridge House and published through the American International Automobile Association estimated the surcharge paid by US buyers of
Japanese cars during the first 12 months of the restraints at approximately $1,900 per car.


17. In 1982, according to a survey by the Environment Agency, despite this law, only 17.2% of about 3,700 residential, commercial and industrial sites complied with the maximum noise tolerance levels of 40-65 dB(A)'s.


19. "Japan Inventory Strategy No. 5 - Licensing Requirements," by Hitoshi Honda, Japan Study Group, Future of the Automobile Program (unpublished draft, 1982).


21. Motor vehicles are the major freight and commercial carriers. They receive preferential treatment for all motor vehicle taxes, have less stringent requirements for effluent emissions and noise levels, and pay much lower tolls on expressways. Whenever, motor vehicle related fees are raised, considerable protest arises from organizations such
as the Trucking Association or the Taxi Association and the government must negotiate with these parties. This is in sharp contrast with the lack of protest that is raised by the operator of personal passenger cars when motor vehicle fees are raised or requirements such as licensing or enforcement of laws to control users are made stricter.

22. "Japan Inventory No. 11 - Vehicle Inspections," Shigeru Morichi, Japan Study Group, Future of the Automobile Program (unpublished draft, 1982).

23. The table below illustrates the large percentage of people that commute by railway in large cities areas such as Tokyo and Kei Hanshin.

<table>
<thead>
<tr>
<th>Urban areas</th>
<th>Year surveyed</th>
<th>Population (10000)</th>
<th>Car</th>
<th>Bus</th>
<th>Railway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tokyo</td>
<td>1978</td>
<td>2871</td>
<td>47-1</td>
<td>7-8</td>
<td>45-1</td>
</tr>
<tr>
<td>Kei Hanshin</td>
<td>1970</td>
<td>1423</td>
<td>41-6</td>
<td>12-7</td>
<td>45-7</td>
</tr>
<tr>
<td>Chukyo</td>
<td>1971</td>
<td>611</td>
<td>68-0</td>
<td>18-9</td>
<td>18-1</td>
</tr>
<tr>
<td>Kita Kyushu</td>
<td>1972</td>
<td>312</td>
<td>59-5</td>
<td>28-4</td>
<td>12-1</td>
</tr>
<tr>
<td>Sapporo</td>
<td>1972</td>
<td>142</td>
<td>55-9</td>
<td>32-9</td>
<td>11-2</td>
</tr>
<tr>
<td>Sendai</td>
<td>1972</td>
<td>94</td>
<td>57-9</td>
<td>31-7</td>
<td>10-4</td>
</tr>
<tr>
<td>Utsunomiya</td>
<td>1975</td>
<td>69</td>
<td>75-7</td>
<td>13-4</td>
<td>10-9</td>
</tr>
<tr>
<td>Hamamatsu</td>
<td>1975</td>
<td>57</td>
<td>79-4</td>
<td>15-0</td>
<td>5-6</td>
</tr>
<tr>
<td>Kagoshima</td>
<td>1974</td>
<td>55</td>
<td>69-5</td>
<td>26-5</td>
<td>4-0</td>
</tr>
<tr>
<td>Kanazawa</td>
<td>1974</td>
<td>49</td>
<td>73-8</td>
<td>23-0</td>
<td>3-2</td>
</tr>
</tbody>
</table>

Notes: (1) Excludes walking and bicycles.
(2) Trips by bus and car before or after taking a railway trip are included in railway percentage.
Source: See p. 19 [3].


28. See Chalmers Johnson, MITI and the Japan Miracle for a complete account.

30. In Toyoaki Ikuta's article entitled, "An Analysis of the Recession in the Oil Industry," which appeared as a supplement to the September, 1976 issue of Energy in Japan, the author concludes after reviewing the performance of the major oil firms in Japan, that performance in the period immediately preceding and following the first oil shock was better for those firms with larger gasoline production.

31. Interview at the Ministry of International Trade and Industry (MITI).


33. Ibid.

34. Interview at MITI.


36. Presently, the Japanese Diet passes only about one hundred bills in a session, and these bills are primarily special measures designed to control immediate national problems. Thus, the government relies on agency rule making, administrative guidance and agency interpretation of existing law. The choice of executive over legislative power derives from the prestige accorded the national bureaucracy and the broad enabling statutes that are at their disposal. There is also a strong preference for executive rather than judicial power. This is a strong reflection of the desire to avoid litigation and to resolve conflicts through negotiations, conciliation or mediation.

Administrative guidance is not grounded in legislation, and is often defined as a request for voluntary cooperation which is given by an administrative body and directed at an individual, association, or other juristic person. The administrative body can be any government ministry or agency, or it can be a subgroup or bureau of either of these organizations. These bodies usually guide informally and orally rather than committing anything to paper. Sometimes a party is told specifically what actions an agency wants done or a general outline is presented.

Administrative guidance is typically not a single action. The typical pattern is an initial broad directive followed by repeated incremental instructions by the agency.
to the company. This allows the agency to continually redesign its goals by taking into account external factors, the level of compliance by the company and the ongoing dialogue with the company. If a company does not comply, the agency or the ministry has several options.

The most common means of compliance is "going public" with news of non-compliance and how such action can damage the public interest. Disclosure of non-compliance may also be made to a powerful association such as the Keidanren, industry panels, affiliated banks that holds the companies notes or underwriters in order to influence the company. The ministry also has a number tools that it can exercise in a broad range of unrelated areas such as altering a companies import licenses or quotas of raw materials or altering its export licenses or quotas.

The company has the right to appeal the administrative action, but since the guidance is not a legal measure, such actions do not have well established review provisions. However, unless the administrative action is interpreted as a deliberate abuse of discretion or creates irreparable harm without public benefit, the company has little chance of enjoining the administrative action. Thus, administrative action is a very powerful tool that has been used very effectively by the Japanese bureaucracy, especially during the immediate postwar period to foster Japan's economic growth.


38. Ibid., pp. 21-22.


40. Tsurumi, op. cit., p. 128.


42. Samuels, op. cit., p. 31-33.

43. The Ministry of International Trade and Industry has the authority to exempt an industry from the Anti-Monopoly Law in cases where the nation as a whole is affected or if such action does not harm the public such as the depression cartel that has been developed for the petrochemical
industry. During the Arab Oil Embargo of 1973, MITI exercised this right to form a cartel arrangement among all of the major oil corporations in order to ensure a stable supply of petroleum. As a result of skyrocketing prices for petroleum products, the Federal Trade Commission made a recommendation to end the cartel. The industry complied, but criminal charges were filed by the Supreme Public Prosecutor.

Following an investigation, the Petroleum Association and its two leaders were indicted of limiting production and 12 oil companies and 15 of their executives were charged with increasing prices of oil through an unlawful cartel.

The Tokyo High Court acquitted the defendants in September, 1980 of the charge of limiting products, but convicted them of raising prices through unauthorized cartels. The High Court ruled that the oil industry had increased prices arbitrarily, without consulting the authorities. The ruling does not question MITI's rights to intervene, but the prosecution of the industry, the first under the 1947 Anti-Monopoly Law has received widespread coverage in the media. This latest action has created further public doubt about the interests of big business and government in dealing with the nation's energy problems.

44. 10-mode test are conducted by the manufacturers.

45. The guidelines came about as a result of the decline in fuel economy in 1975 when manufacturers were forced to install fuel robbing mechanisms such as catalytic converters to comply with the new environmental quality standards. The government could have implemented legislation such as CAFE, but chose not to do so. This is due to the preference of ministries and agencies to exercise their administrative powers and not legislate change. One reason is that legislation and legal systems are considered more formal and parties are afraid to break them. Thus, instead of utilizing systems such as litigation, organizations and individuals more commonly resort to informal methods of dispute resolution.


47. Hayashi, op. cit., p. 9.

48. Figure 15, indicates that new car mileage has been increasing since 1975. However, car life is also increasing due to higher replacement costs, better products and a more active used car market (car life of 6.6 years in 1974 versus
Thus, it will take longer to improve overall fuel economy by replacing older vehicles with more fuel efficient vehicles.


51. A questionnaire form containing 24 items mainly directed at automobile technology was prepared and distributed to technical personnel in various areas of research and development, production technology and management through the executive committee of the Japan Study Group of Future of the Automobile Program. The 24 questions were designed to be in common with a questionnaire prepared by Arthur Anderson and Co ("Automotive Industry in the 1980's: A Domestic and Worldwide Perspective, the Second Delphi Forecast - July 1981") so that a comparison could be made. The survey results in the US were shown in the questionnaire for reference. In addition, the questionnaire had a blank space where personal opinions and special considerations could be added. This survey revealed several interesting expectations about the fleet distribution of the car market, anticipated engine displacements, the use of alternative power plants, projected fuel economies and the source of expected fuel economy improvements. (see Masakazu Iguchi, Haruo Shomosaka, Tokuo Yamashita, Hiromitsu Kusano and Kozo Kitoh, "Future Trend of Passenger Cars in Japan," International Policy Forum Working Paper, Future of the Automobile Program , 1982)

<table>
<thead>
<tr>
<th>Table 18: Projected Fuel Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean value of corporate average fuel economy of Japanese passenger cars</td>
</tr>
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</table>
Table 19: Fuel Economy — Sources of Projected Improvements

<table>
<thead>
<tr>
<th>Factor</th>
<th>1992</th>
<th>1997</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of light material</td>
<td>22.4</td>
<td>25.5</td>
</tr>
<tr>
<td>Engine efficiency</td>
<td>29.4</td>
<td>27.3</td>
</tr>
<tr>
<td>Aerodynamics</td>
<td>11.9</td>
<td>11.1</td>
</tr>
<tr>
<td>Drive-train efficiency, including transmission improvements</td>
<td>15.2</td>
<td>14.8</td>
</tr>
<tr>
<td>Tire rolling resistance</td>
<td>9.2</td>
<td>8.8</td>
</tr>
<tr>
<td>Other</td>
<td>11.8</td>
<td>12.4</td>
</tr>
<tr>
<td>Recycle of wasted energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downsizing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small engine displacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable cylinders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel engines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front wheel drive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved efficiency of auxiliary apparatuses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved design</td>
<td></td>
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</tbody>
</table>
Table 20: Japan -- Produced Passenger Cars -- Projected Engine Displacement

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 550</td>
<td>6</td>
<td>7.6</td>
<td>8.5</td>
<td>0.1</td>
<td>0.5</td>
</tr>
<tr>
<td>551 - 1000</td>
<td>2</td>
<td>8.4</td>
<td>11.2</td>
<td>2.1</td>
<td>3.7</td>
</tr>
<tr>
<td>1001 - 1500</td>
<td>36</td>
<td>38.8</td>
<td>40.5</td>
<td>23.5</td>
<td>27.5</td>
</tr>
<tr>
<td>1501 - 2000</td>
<td>54</td>
<td>42.5</td>
<td>37.2</td>
<td>50.4</td>
<td>47.2</td>
</tr>
<tr>
<td>Over 2000</td>
<td>2</td>
<td>2.7</td>
<td>2.6</td>
<td>23.9</td>
<td>21.1</td>
</tr>
</tbody>
</table>
Table 21: Japanese Engine Production — Supercharged and Turbocharged

<table>
<thead>
<tr>
<th>Engine type</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td></td>
<td></td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Share of Production</td>
<td></td>
<td></td>
<td>Gasoline</td>
<td>Diesel</td>
<td>Diesel</td>
</tr>
<tr>
<td>Conventional</td>
<td>95.2</td>
<td>86.1</td>
<td>80.5</td>
<td>95.9</td>
<td>78.0</td>
<td>68.9</td>
</tr>
<tr>
<td>Turbocharged</td>
<td>4.8</td>
<td>12.0</td>
<td>16.1</td>
<td>4.1</td>
<td>19.4</td>
<td>26.2</td>
</tr>
<tr>
<td>Supercharged</td>
<td>0</td>
<td>1.9</td>
<td>3.4</td>
<td>0</td>
<td>2.6</td>
<td>4.9</td>
</tr>
</tbody>
</table>
Table 22: Alternative Power Plants

<table>
<thead>
<tr>
<th>Power Plant Type</th>
<th>1980</th>
<th>1992</th>
<th>1997</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>92.5</td>
<td>84.2</td>
<td>77.8</td>
</tr>
<tr>
<td>Diesel</td>
<td>6.0</td>
<td>12.0</td>
<td>16.2</td>
</tr>
<tr>
<td>Electric</td>
<td>0</td>
<td>1.1</td>
<td>2.2</td>
</tr>
<tr>
<td>Hybrid</td>
<td>0</td>
<td>0.3</td>
<td>0.7</td>
</tr>
<tr>
<td>LPG</td>
<td>1.5</td>
<td>2.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.1</td>
<td>0.5</td>
</tr>
</tbody>
</table>
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