THE JAPANESE WAR ECONOMY: 1940-1945

BY JEROME B. COHEN

EDITORIAL NOTE: In seeking "simple" solutions for Far Eastern developments, basic economic materials and facts are often overlooked. It is as short-sighted, for example, to explain the end of the war in terms of the bombs at Hiroshima and at Nagasaki as to assume that the attack at Pearl Harbor was the sole and fundamental cause of the Pacific conflict. A careful study of the statistics of Japan's economic strength and weaknesses reveals that the economy of the country was close to complete collapse in the summer of 1945, that reserves were practically nil, and that lengthy prolongation of the war effort on the part of Japan on any significant scale would have been impossible.

After the surrender, when reliable first-hand information was finally available, it was generally concluded that most American estimates compiled in this country during the war had exaggerated the productive capacity and staying powers of Japan. What effect a more accurate estimate might have had on our war strategy is impossible to determine; it might have made a difference at Okinawa, and it might have eliminated the need for the A-bomb. Debate on such points is fruitless, but it is of interest to consider the reasons for such overestimation on our part. Undoubtedly many factors contributed, including over-reliance on actually suspect Japanese statistics and attachment of excessive importance to Japanese propaganda claims. American long-range interests in the Pacific area and an awareness of a coming period of American influence there may have figured in some instances. One important factor was the lack of a sufficient number of trained specialists in Far Eastern affairs who could, in the early war period, give adequate information and guidance to programs of Far Eastern research.

This study of the Japanese war economy, written by Mr. Jerome Cohen, offers some basic statistical material, derived from original Japanese sources and data obtained by the United States Strategic Bombing Survey, on what actually happened in Japan from 1940-1945. Mr. Cohen's aim is to present the economic facts to students of Far Eastern affairs so that future evaluations may be more accurate than were those of wartime.

During the war Mr. Cohen served as a Lieutenant, United States Naval Reserve, and his last assignment was with the United States Strategic Bombing Survey in Guam, Japan and Washington. For the opportunity to study at first hand the Japanese economy he is indebted to Mr. Franklin D'Olier, Chairman of the Survey, and Mr. Paul Nitze, Vice-Chairman. Mr. Cohen, who is at present with the Veterans' Administration, is on leave from the Department of Economics of the College of the City of New York. He has previously written for the Journal of the American Statistical Association, Current History, Journal of Higher Education, Inter-American Quarterly, etc. All expressions of opinion and interpretations contained herein are the sole responsibility of the author and not of the United States Navy or the United States Strategic Bombing Survey.

PREWAR DECADE

BY THE END of 1941 Japan had completed a decade of planned industrial expansion and could look back upon a period of considerable achievement. Industrial output had risen from six billion yen in 1930 to thirty-two billion by 1942. The early predominance of light industry over heavy had been completely reversed. Heavy industry, which had constituted thirty-eight percent of total industrial output in 1930, had by 1942 reached seventy-three percent of the total.  

Over the decade 1930-1940, it is estimated that the index of Japanese "real" gross national product rose from fifty-seven to 100. Some of the basic heavy indus-

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This issue of the Far Eastern Survey is devoted almost entirely to a detailed analysis of the short-sighted economic planning with which Japan began the Pacific War and the internal factors which contributed to Japan's collapse.
tries were built from the ground up in the 'thirties and had by 1941, in terms of the Japanese perspective, achieved significant proportions. The motor vehicle industry, for example, which in 1930 produced only 500 units (cars, trucks, busses, etc.) reached a production level of 48,000 units annually during 1941. Only 400 planes of all types were produced in 1930. By 1941, the newly created Japanese aircraft industry was turning out over 5,000 planes a year. Domestic output of aluminum ingots had risen from nineteen tons in 1933 to 71,740 tons in 1941. Other basic heavy industries were expanded in substantial degree. Ingots steel production in Japan proper rose from 1.8 million tons in 1931 to 6.8 million tons by 1941. Over the same decade coal production increased from 28,000,000 tons to 56,000,000 tons. Electric generating capacity in the home islands which was 4.5 million kilowatts in 1930 reached 9.4 million kilowatts in 1941. By 1940 the production of organic high explosives in Japan was greater than in the United States. Merchant ship production rose from 92,093 gross tons in 1931 to 405,195 gross tons in 1937, the peak ship-building year of the decade. Naval shipbuilding rose from 15,050 gross tons in 1931 to 231,990 gross tons in 1941.

**Imports From North China and Manchuria**

By 1941 Japan’s grip on North China and Manchuria was secure and her economy bolstered by their contributions. Japanese investments in Manchuria had risen from ninety-seven million yen in 1931 to 1,420 million yen in 1941. The Japanese steel industry depended upon North China for coking coal. Production of such coal in North China and Mongolia rose from ten million tons in 1938 to twenty-four million in 1941. Manchurian coal production rose from sixteen to twenty-four million tons over the same period. China supplied fourteen percent of Japan’s iron ore imports in 1937; by 1941 it furnished forty-nine percent. Pig iron production in Manchuria increased from 476,000 tons in 1934 to 1,400,000 tons in 1941 and ingot steel production rose from 137,000 tons in 1935 to 573,000 tons in 1941. Exports of Manchurian pig iron to Japan rose from 383,000 tons in 1935 to 548,000 tons in 1941. Soybeans from Manchuria became an important supplementary item in the Japanese diet. By the end of the decade Japan's salt requirements were met largely from North China and Manchuria, while an increasing variety of non-ferrous metals and ferro-alloys were supplied by Manchuria and Korea.\(^{1}\)

Concurrently with the building up of her industrial potential, Japan had undertaken to stockpile those essential raw materials which were not obtainable within the Inner Zone. By 1939 Japan had built up an oil reserve of fifty-one million barrels, which was more than the combined production and imports during the ensuing war years. At the outbreak of war on December 7, 1941, forty-three million barrels were on hand. Iron ore stockpiles in the home islands amounted to about 2.6 million tons in December, 1941. Bauxite reserves totaled 254,740 tons, or a nine months' supply at the 1941 rate of utilization. The stockpile of scrap iron and steel reached a peak of 5.7 million metric tons in 1940 and then declined to 4.4 million tons in 1941. Ammunition on hand at the beginning of 1942 totaled nearly five years' production at the 1942 rate, while land weapons exceeded six years' production. The 81,000 motor vehicles on hand amounted to a two year supply at the 1941 rate of production.

**Strategy For a Short War**

The Japanese leaders were impressed by their decade of economic growth. But despite the greater degree of economic autonomy achieved with the consolidation of the Inner Zone, Japan was still too exposed and too vulnerable due to her continued dependence upon certain basic raw materials derived principally from the southern areas. Without crude oil, bauxite, rubber, tin, nickel, and copper, the pomp and power of empire were pretense and sham. With the regions from which these industrial essentials flowed in the hands of potential enemies, Japan's economic machine could be brought to a halt at their will. Accordingly when a favorable confluence of international events made it likely that Japan could escape the growing economic pressure being exerted upon her, could acquire the sources of these essentials with impunity and without serious fear of effective retaliation, she moved. Germany was planning to administer the *coup de grace* to Russia; the Dutch and French were beaten and negligible factors; England, fighting for her existence in the West, was impotent in the Orient, and was expected to follow Russia to defeat. The United States, unmobilized, was completely absorbed in using its then current resources in the seemingly futile attempt to keep Russia and Britain propped up against Germany. A six months' delay might find Germany, a complete victor in Europe, exercising a conqueror's right over the Far Eastern possessions of the powers it had broken. Japan could not afford to hesitate longer. To strike a paralyzing blow, wage a short defense, then negotiate a peace in which she would give up the furthest corners to which the surge of empire had carried her, but not yield the basic

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\(^{1}\) Kokunai Keizai Shiryō No. 31, "The Domestic Conversion to Heavy Industry in Recent Years," Research Bureau, Foreign Ministry (Gaimusho), Tokyo, 1945.

essentials, was Japan's plan of action. The United States, faced by the futility of trying to beat back victorious Germany in the West and stopped in its retaliatory drive on Japan by a tenacious defense of the many well fortified islands of the Pacific which barred the way, would, it was hoped, realize the senselessness of its efforts and come to terms.

It is now clear from the weight of accumulated evidence that the Japanese leaders did not expect to fight a long war. Their war plan looked to the acquisition of strategic raw materials, not to broadening the base of the economy. Although impressed by their economic achievements, they were not deluded into believing that in the long run their economy was a match for that of the United States.\(^3\)

Statements of Japanese leaders at the outbreak of hostilities that they were prepared to wage a 100 years' war were for the purpose of bolstering morale at home and to convince the American public of the futility of trying to break the Japanese defense, and thereby hasten acceptance of a negotiated peace. The best economic evidence that the Japanese leaders expected no prolonged contest with the United States is the fact that in the year after the outbreak of the war they made no effort to expand the base and capacity of their industrial machine. Having mustered their resources and thrown them at the enemy, they were content to sit back and wait for the enemy to realize the futility of its counter-blows and then come to terms. They had no plan to lift total output to try and match America's massive economic weight. They had not reckoned in such terms and when, a year later, they were jolted out of their complacency into action, it was too late.

**Inherent Limitation of Economy**

Lack of a blueprint to lift total output was a manifestation of the inherent limitation and vulnerability of the pigmy Japanese economy. Had the Japanese leaders thought in terms of pitting their economic resources against those of the United States in a war of attrition it is highly unlikely that they would have launched the Pearl Harbor attack. Japanese munitions output at its peak was never more than ten percent of ours. Both her coal and steel production were only one thirteenth of ours. Throughout the war the ordnance program had to be tailored to fit an economy incapable of any major overall expansion. Fifty percent of the population was engaged in feeding the nation and still twenty percent of the rice consumed annually had to be imported. The 1941 total food supply allowed for an average caloric intake only 6.4 percent above a subsistence minimum. Japan practiced the most intensive agriculture in the world; her rice yield per acre was the highest, dependent on the lavish use of phosphate, potash and fish fertilizer. If fishing grounds were lost, sources of food or fertilizer imports cut off, or synthetic ammonia plants forced to allot a larger percentage of their production to explosives rather than to fertilizer, the Japanese population would soon be hungry.

The already meager prewar Japanese standard of living began to decline as far back as 1937, due to rising costs and a growing scarcity of certain consumers' commodities. Japan was at the time controlling her production and manipulating her exports and imports to build up foreign exchange balances and to permit the stockpiling of raw materials in preparation for war, as well as to supply her armies in China. For example, the net supply of cotton cloth for civilian use totalled 2,184 million square yards in 1937 but by 1941 had fallen to 310.2 million square yards and to 182.4 million square yards in 1942. Living from hand to mouth, the Japanese civilian economy had no cushion upon which it could fall back in case of a prolonged conflict.

**Deficiencies in Labor Force**

The Japanese labor force was marked by qualitative deficiencies. There was an exceedingly small reserve of skilled workers, due to lack of adequate training programs in the prewar period. The very rapid growth of heavy industry during the 'thirties permitted no opportunity to build up a large reserve of skilled personnel. When the initial war strategy failed and an attempt had to be made to broaden the base of the economy there was found to be a dearth of skill and ingenuity.

The Japanese administrative structure at the outbreak of the war left much to be desired. There was no centralized responsibility for planning and executing economic mobilization. Primary responsibility was vested in the Cabinet. The Cabinet Planning Board, which had been established in 1937, was designed to coordinate cabinet policy in the economic sphere but it possessed no executive powers; it could only make recommendations to the Cabinet. Thereafter, if the proposals were adopted, responsibility for execution passed to the individual Ministries. Each was supreme in its own sphere and jealously guarded its jurisdictional prerogatives. Strangely, they were not amenable to orders of the Prime Minister, who functioned more as the chairman of a board of directors than as executive director of the government.

Complicating the prospect of effective economic control was the existence of Industrial Control Associations. The Army-sponsored "Revised National General Mobilization Law" of March 1, 1941 (Article 18)

\(^3\) See USSBS Interrogations of Baron Hiranuma, Marquis Kido, Prince Konoye and Prince Higashi-kuni, Tokyo, 1945.
authorized the government to bring together by Imperial Ordinance all enterprises in the nation into government controlled organizations. The Zaibatsu, resisting outright the efforts of the Army to control industry, were able to obtain the Major Industries Organization Ordinance of August 29, 1941 which set up in each of the essential industries a National Control Association (Tosei Kai), and subordinate Area Control Guilds (Tosei Kumiai). To these control associations was given the power to control and plan the economic life of the industry. Nominally these associations were responsible to and under control of the various ministries (especially the Ministry of Commerce and Industry). In practice, however, they enjoyed great autonomy and in fact under the “Transfer of Administrative Authority Law” of February 18, 1942 received wide government power to allocate raw materials, regulate output, and so forth. The associations were usually headed by the former president of the largest concern in the industry who had resigned explicitly for that purpose. Thus the Zaibatsu, although they yielded nominally to government control, were in fact able to obtain fairly complete domination of all industry.

During the first year of the war the Cabinet Planning Board had no authority; the Prime Minister did not control the Ministries; the Ministries did not control the control associations. Tojo fought to overcome this administrative chaos and centralize power in himself but was only partially successful. (4)

THE WAR YEARS

The confidence of the early period, the concentration upon the limited economic objectives of the immediate war plan, the failure to be concerned about broadening the base of the economy, are strikingly apparent from the stability of total output in 1940, 1941, and 1942. The gross national product moved from 39.8 billion yen in 1940 to 40.6 billion in 1942. Such concentration as there was during this period upon war output was achieved, not by an expansion of total output, but by a restriction of the civilian economy. Consumer expenditures dropped from 26.7 billion yen in 1940 to 23.8 billion in 1942. The striking contrast between the slow economic mobilization in Japan and the rapid spurt in the United States in the early period may be seen if we compare war expenditures to total gross product in the two countries. The percentage of total production accounted for by government war expenditures and capital outlays in the munitions industries rose from seventeen percent in 1940 to 30.5 in 1942 for Japan, whereas in the case of the United States it increased from 2.6 to 33.5 percent over the same period.

That the Japanese war plan assumed a negotiated peace without large scale fighting can be shown from the relative stability of production. Plant and equipment expenditures in the Japanese munitions industries actually declined between 1941 and 1942. There was no realization of the coming crucial need for merchant shipping. In the fiscal year of 1941,(5) which included the first four months of the war, the total merchant shipping tonnage completed fell to 241,120 gross registered tons, the lowest since 1935. By November 1942, total Japanese merchant shipping was 430,000 tons below the December 1941 level. In 1940-41 no large tankers were built, and tanker construction fell to the lowest level since the mid-thirties. New tanker tonnage in the fiscal year 1940 totaled only 3,928 tons; in the fiscal year 1941 (ending March 1942) only 8,486 tons. (6) Indicative of the relative lethargy and complacency characterizing the war economy of 1942 were the facts that, despite the later drive to expand aircraft production, only sixty-one percent of 1942 aluminum ingot production was channeled into aircraft production, and that the estimated 1.9 million workers needed for the more essential phases of the economy for the fiscal year 1942 fell 300,000 below the comparable total for 1941. (7)

Turning Point in Economic Mobilization

Events in 1942, however, forced a gradual revaluation of Japanese concepts. While the loss of the Battle of Midway was attributed by the Japanese to their own lack of radar and not to a re-emergence of the American fleet, the attack on Guadalcanal, the Allied invasion of North Africa, and the stalemate of the Germans at Stalingrad made it apparent that the initial Japanese war plan had miscarried; that a quick and cheap negotiated peace was unlikely. (8) Accordingly a real effort to raise overall production was gotten under way. It may be said that the winter of 1942 marked the turning point in Japanese economic mobilization.

The real gross product rose from 40.6 billion yen in 1942 to 49.3 billion in 1944 as the Japanese raised the sights of the munitions, aircraft and shipbuilding programs and pared the civilian economy to the bone. Government war outlays, after adjustment for price changes, doubled over the period, rising from 9.9 bil-

(4) See USSBS Interrogations of Aikawa, president of Manchuko Industrial Development Corporation, and Hoshino, Chief Cabinet Secretary in 1941, Tokyo, 1945.

(5) The Japanese fiscal year runs from April 1 to March 31.


(7) Labor Mobilization Plan 1941-1942, Ministry of Welfare (Koseisho).

(8) See USSBS Interrogations of Admirals Yoichi and Toyoda, Prince Konoye, Vice-Admiral Seno, Director of Munitions Bureau, Navy Ministry, and Lieutenant General Endo, Chief of Air Ordnance Bureau, Munitions Ministry, Tokyo, 1945.
lion yen in 1942 to 20.2 billion in 1944. Capital outlays in the munitions industry also doubled between 1942 and 1944. Capital outlays in the non-munitions industries were cut to a half billion yen a year while consumers' expenditures declined thirty percent from the 1940 level. Government war outlays and capital expenditures rose from 30.5 percent of gross product in 1942 to 50.9 percent in 1944.

An administrative reorganization resulting in the formation of a new Munitions Ministry was undertaken during 1943 in order to clear the way for greater production. At the beginning of the year Tojo proposed to the Diet that the Prime Minister be given dictatorial power over the other Ministers and over the war economy. Five industries were singled out for special control — shipping, aircraft, light metals, coal, and iron and steel. The Diet voted the emergency powers after a sharp struggle and imperial approval was given on March 17, 1943. However, to placate the industrial interests, an Advisory Council of seven leading Zaibatsu representatives heading the most important Control Associations was established to act as a guide to the Prime Minister in the exercise of these powers.

**Administrative Controls Reorganized**

Continued dissatisfaction with the functioning of administrative controls led to a more drastic reorganization. On November 1, 1943, largely as a result of difficulties experienced with the aircraft industry, a new Munitions Ministry was established, based largely upon the old Ministry of Commerce and Industry. Administrative control over industry as a whole was vested in the new Ministry. Within it, a Total Mobilization Bureau was set up to replace the Cabinet Planning Board which was abolished. The new Bureau was given executive powers previously denied the Planning Board and was designed to act as the central economic control body for the entire war economy.

In addition, under the terms of the Munitions Company Act, the vital war industries were designated as "munitions companies" and placed under control of the Munitions Ministry. While this appeared to limit the power and authority of the Industrial Control Associations, in view of the men named to run the Munitions Ministry, it is clear that the Zaibatsu effectively retained their position throughout the reorganization. However, because the Army and Navy Ministries did not secure complete control over the Munitions Ministry, they refused to become subordinated to it, and responsible centralized planning was rendered impossible. The conflicting demands of the army and navy often forced the Munitions Minister into a position of arbiter with resultant decisions based on an expedient compromise rather than upon sound national policy.(8)

In the field of aircraft production, which was a primary responsibility of the Munitions Ministry, fairly effective centralized control was established, but in other sectors of the war economy, until the end of the war, there was no adequate centralized authority over the allocation of materials.

**Basic Dichotomy of Production**

Although the greatest achievements of the Japanese war economy were registered in 1944 with peak output coming roughly about the middle of that fiscal year, there was a basic dichotomy of production. The peak in output of basic raw materials was reached in 1943; the peak in end product output — ships, planes, ordnance, munitions — came in 1944. Ingot steel output reached a peak of 7.8 million metric tons in 1943 and then fell to 5.9 million tons in 1944. Finished steel rose to 5.6 million metric tons in 1943, then fell to 4.3 million tons in 1944. Coal production rose to 55.5 million tons in 1943, then fell to 49.3 million tons in 1944.

Everywhere in basic materials — coke, iron ore, pig iron, alumina, aluminum ingot — the story was the same. The basic irony — and for the Japanese, tragedy — of their industrial war effort was that, by the time they belatedly recognized the need for raising the level of industrial output and took energetic and, for their economy, enormous strides in increasing capacity and output, it was too late. The declining flow of raw materials would not support the new higher level of output. Thus capacity increased but output fell. By the middle of the fiscal year 1944 the Allied attack on Japanese shipping had so reduced the importation of raw materials that not only was a further rise of total output impossible but the foundations of basic industry progressively crumbled. The Japanese war economy disintegrated at its base, even though utilization of available stocks kept the end product output at high levels for from three to nine months longer. Thus the decline of Japan's warming power started before her economy was subjected to the main weight of the bombing attack during the months of March to August 1945. Typical of this relationship between end products and basic materials was the aircraft industry which during 1944 increased output while its subsidiary aluminum industry was beginning to decline.

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(8) See USSBS Interrogations of Fujiwara (Munitions Ministry forced out by pressure of army and navy groups); Admiral Toyoda, president of the Iron and Steel Control Association, later Munitions Minister 1945; Goko, president and managing director of Mitsubishi Heavy Industries; Hatta, president of the Imperial Petroleum Company and Minister of Commerce and Industry and of Railways; and Shina and Takamine, Chiefs of Total Mobilization Bureau of Munitions Ministry, Tokyo, 1945.
When the air attack came, the Japanese, in marked contrast to the Germans, made little or no effort to repair damaged plants. Shortages of raw materials had created so much unused capacity in industry that it was simpler to shift production from damaged to undamaged plants as the inadequate raw material supply did not permit simultaneous operation of both in any case.

**BASIC MATERIALS**

At the outbreak of the war Japan was critically dependent upon imports of oil, coking coal, bauxite, rubber, nickel, tin, cotton, phosphate, potash, magnesite, graphite, food and many ferro-alloys. Seizure of the southern areas appeared to solve some of those requirements. But processing facilities in those areas were negligible. Time and capital would be required to exploit them. And unless Japan could ward off obvious enemy retaliatory blows designed to capitalize on her greatest weakness, vulnerability to blockade, seizure of the southern areas would be of little value in overcoming the basic weakness of Japan's economy. Actually because of tremendous ship losses and inability to increase shipbuilding proportionately, the southern areas were important for only the first year and a half. After that the Japanese economy, with the possible exception of oil, was based on North China, Manchuria, and Japan proper.\(^{10}\) Japan's own ability to produce basic materials was completely inadequate to support a war against a major industrial power.

The most fundamental limiting factor of the Japanese war economy was the very low iron and steel output. Throughout the war the shipbuilding and munitions programs had to be tailored to fit this output. Much of the administrative rivalry, bickering and quarreling arose from the necessity of allocating an inadequate supply of steel to a variety of pressing and essential demands. Most were vital and legitimate, but all could not be filled.

**Table 1**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Ingot Capacity (in thousands of metric tons)</th>
<th>Ingot Production (in thousands of metric tons)</th>
<th>Finished Production (in thousands of metric tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1937</td>
<td>7,030</td>
<td>5,798</td>
<td>5,147</td>
</tr>
<tr>
<td>1941</td>
<td>10,546</td>
<td>6,837</td>
<td>5,120</td>
</tr>
<tr>
<td>1942</td>
<td>12,053</td>
<td>7,099</td>
<td>5,166</td>
</tr>
<tr>
<td>1943</td>
<td>12,843</td>
<td>7,821</td>
<td>5,609</td>
</tr>
<tr>
<td>1944</td>
<td>13,970</td>
<td>5,911</td>
<td>4,320</td>
</tr>
<tr>
<td>1945*</td>
<td>—</td>
<td>803</td>
<td>492</td>
</tr>
</tbody>
</table>

*First quarter only.*

**Iron Ore Stockpiles Caught Short**

The optimism of the early period is reflected in the rapid utilization of the iron ore and scrap stockpiles while imports were adequate. When imports fell drastically only a small part of the original stockpiles with which Japan began the war remained. Stockpiles dropped from 5.7 million tons at the end of 1940 to 0.3 million tons in the first quarter of the fiscal year 1945. Ironically Malaya and the Philippines, which provided fifty-seven percent, or three million tons, of total iron ore imports in 1940, supplied a mere 150,000 tons in 1942.

Iron ore from China, which supplied ninety percent of 1943 imports to Japan proper, averaged 374,000 tons per month during the first half of 1943, fell to an average of 203,000 tons per month for the second half of the year, and by December 1944 was down to a mere 37,000 tons. As imports fell off and stockpiles declined an intensive effort to step up production of iron ore at home developed, but because of the low "fe" content of the domestic ore, the drive had little effect on steel production.

Even before stockpiles of ore were exhausted, steel operations were reduced and production was allowed to drop below plan without apparent regard to the effect on scheduled production of finished goods. By the last quarter of the fiscal year 1944, finished steel production was only fifty percent of the comparable period in 1943. During the first quarter of the fiscal year 1945, production was running at an annual rate of 1.6 million tons. As a result of naval bombardment of steel facilities in July 1945, virtual cessation of iron ore and coking coal imports, and loss of the rail ferries which carried coal from Hokkaido to Honshu, it is estimated that at the close of the war Japanese steel production was down to about one million ton per annum rate and could not have been maintained at that level for more than three months.

While Japan's coal supply improved materially during the decade before the war, the war years witnessed

\(^{10}\) See Interrogation No. 155, USSBS, Tokyo, October 28, 1945.
a steady decline which quickened, toward the end, into collapse. As may be seen in Table 2, the early 1941-43 decline was due more to the cut in imports than to the decrease in domestic production. By "high grading," domestic output was sustained and the wartime peak of production was reached in the last quarter of the fiscal year 1943.

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Production</th>
<th>Imports</th>
<th>Production plus net imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>57,309</td>
<td>10,123</td>
<td>65,431</td>
</tr>
<tr>
<td>1941</td>
<td>55,602</td>
<td>9,585</td>
<td>65,187</td>
</tr>
<tr>
<td>1942</td>
<td>54,178</td>
<td>8,748</td>
<td>62,926</td>
</tr>
<tr>
<td>1943</td>
<td>55,538</td>
<td>6,029</td>
<td>61,567</td>
</tr>
<tr>
<td>1944</td>
<td>49,335</td>
<td>3,135</td>
<td>52,470</td>
</tr>
<tr>
<td>1945</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>10,877</td>
<td>188</td>
<td>11,065</td>
</tr>
<tr>
<td>II</td>
<td>5,238</td>
<td></td>
<td>5,238</td>
</tr>
</tbody>
</table>

Source: Coal Control Association (Sekitan Tosei Kai) and the Japan Coal Company (Nippon Sekitan Kaisha).

Inadequate mine maintenance and repair and insufficient equipment replacement due to underallocation of steel, cement, and lumber finally took their toll and production dropped six million tons during 1944 at a time when blockade operations cut imports by fifty percent. The cutting of new galleries essential for sustained production was neglected. The coal-steel relationship developed in a vicious circle. The primary effect of the decline in coal supply was on the steel output. Competing demands for a share of the dwindling supply of the latter meant that the coal industry received less and less adequate allocations of steel for maintenance and coal output in turn declined more sharply. This condition is reflected in the drop in output per employee per year, from 164 tons in 1941 to 119 tons in 1944 and to 78 tons in 1945.

**Coal From North China Declines**

The most disastrous part of the decline in imports was the sharp reduction in high grade coking coal imports, largely from North China. By early 1944, imports were down to forty percent of their wartime peak and they continued to fall off drastically. While this decline did not prevent smelting of the also dwindling supply of iron ore, it affected the quality of the steel produced and increased fabricating difficulties and rejections. Efforts were made to utilize domestic coal for coking purposes and by the latter half of 1944 the Yawata plant was using sixty-eight percent low grade domestic coking coal.

One of the consequences of the decline in coke oven operation, resulting from both decreased coking coal supplies and exhaustion of iron ore stock, was the reduction in the supply of toluol. During the second half of 1944 toluol production dropped fifty percent from its early 1944 peak and by July 1945 was down to fifteen percent of the highest 1944 month. The drop threatened explosives production and in July 1945 the Japanese army belatedly ordered the steel industry to operate all coke ovens at full capacity regardless of coke demands in order to provide toluol. The decline in coal supply, however, made this impossible. It also contributed to the thirty-three percent drop in cement output between 1943 and 1945.

The year 1945 saw the collapse of the Japanese coal position. Shipments from China were virtually stopped after January. Shipments from Kyushu to Honshu by water fell drastically beginning in April as a result of the mining campaign. The final blow was the carrier strike in July which sank ten out of the twelve Honshu-Hokkaido rail ferries and damaged the other two, cutting coal supplies from Hokkaido drastically. Domestic production fell to 2,712,000 tons in July and to 1,700,000 in August. The latter represented production at an annual rate of 20.4 million tons or thirty percent of the 1940 coal supply, and even this rate could not have been maintained for another month.

**Aluminum Production**

The production of aluminum was one of the new industries which the Japanese built from the ground up during the decade preceding the war. Output rose from nineteen metric tons in 1933 to 71,740 tons in 1941, as shown in Table 3. Peak production was achieved in 1943 when bauxite imports totalled 820,534 metric tons and aluminum ingot output 141,084 tons. During the early war years stocks seemed ample, output adequate, capacity was being increased (from 111,200 tons in 1941 to 171,600 tons in 1943) and the Japanese felt free to be prodigal in their distribution of aluminum. In 1942 only sixty-one percent of total primary ingot was officially channeled into aircraft production and, moreover, due to considerable leakages from certain segments of the industry to prohibited uses, this figure overstates the percentage flow to aircraft. Upon the basis of the availability of aluminum, a more energetic expansion of aircraft production than the program actually carried into effect would have been possible in 1942. Indeed during the middle period of the war increases in aluminum capacity more than matched increases in aircraft requirements and the material was actually in surplus supply as far as scheduled aircraft output was concerned.

Ironically, however, when the drive for greatly expanded aircraft production really got under way in 1944, the supply of the basic raw material fell sim-
ultaneously. The blockade cut deeply into bauxite imports from the beginning of 1944 and by the end of the year had virtually cut off new supplies. Virgin ingot declined from seventy-five to seventy-eight percent of aluminum entering the aircraft pipeline during the second quarter of the fiscal year 1944 to from thirty to fifty percent in the third quarter and to but twenty percent in the final quarter. As bauxite imports fell, the Japanese attempted to substitute aluminous shale from North China (imports were increased from 50,499 metric tons in 1943 to 147,411 tons in 1944) but the substitution proved to be technically impracticable. The inability of the aluminum industry to process shale from North China to any substantial extent led to a sixty-six percent drop in aluminum output between May and December 1944 and meant that the end of the production of metal aircraft in Japan was in sight. Bauxite imports dropped to a mere 1,500 tons in the first quarter of the fiscal year 1945 and stocks vanished. Ingot production fell to 6,647 tons. Thus in the spring of 1945 Japan's aluminum resources were scrap and small amounts of materials held by processors, plus the little eked out from shale and domestic raw material. Had other factors not already dealt major blows to the aircraft industry, lack of aluminum would have brought production to a halt in the autumn of 1945.

**Oil Production**

Combined Inner Zone oil production from all sources — domestic natural petroleum, synthetic oil, and Manchurian shale oil — amounted to roughly five million barrels annually, or about one-sixth of total needs, during 1941, while refining capacity, on the other hand, totaled about thirty-five million barrels annually in the Inner Zone. Since the Japanese militarists, high navy officers in particular, had always regarded this domestic supply as inadequate and negligible, they had concentrated, in the years before Pearl Harbor, on building up a tremendous oil inventory which reached a peak of fifty-one million barrels in 1939 (see Table 4) but then declined, due to United States, Dutch and British embargoes, to forty-three million barrels by December 7, 1941.

This forty-three million barrel reserve would, at the estimated rate of consumption, last two years, by which time the Japanese leaders expected to have free and uninterrupted access to the great oil resources of the Netherlands East Indies and to have built up their synthetic oil production to substantial proportions. In one aspect of their plan the Japanese succeeded. By the end of 1943 they had managed to restore oil output in the southern zone to almost its prewar level. Production of crude oil in the southern zone had totaled sixty-five million barrels in prewar 1940, then dropped to twenty-six million barrels in 1942 but was increased to a wartime peak of fifty million barrels in 1943. During 1943 there was no lack of oil in the southern regions and the fleet was able to fuel locally at will. Difficulty began to be encountered, however,
in getting the oil to Japan. Indeed, oil imports reached their peak in the first quarter of the fiscal year 1943 and fell thereafter due to the developing blockade and the mounting losses of tanker tonnage. Furthermore, requirements mounted steeply during 1942 and 1943 under pressure of military operations on a scale beyond that anticipated by the Japanese war planners. Rising consumption made it impossible to close the gap between oil receipts and expenditures. As a result, in spite of most stringent efforts to economize and to employ substitutes, total inventory of both crude and refined declined from the forty-three million barrels on hand at the outbreak of hostilities to thirteen million barrels by the beginning of the fiscal year 1944.

The Japanese failed in their plan to develop an adequate synthetic oil industry. While they had hoped to step up synthetic oil production to fourteen million barrels during 1943, they actually only produced one million barrels, or eight percent of their goal. For the entire period of their seven year plan they met only nine percent of the 43.6 million barrel target production and, as fifty-five percent of their synthetic production was located in Manchuria, the blockade in late 1944 and 1945 rendered even this relatively useless. Limitations of technical skill and the inability of the pigmy economy to supply competing military and industrial needs for large quantities of high grade steel and complicated equipment combined to prevent the construction of large-scale, synthetic oil plants in Japan even before Pearl Harbor and made it out of the question afterward. The plants that did operate, unlike those in Germany, were never an important factor in aviation fuel production.

Japan's ability to obtain oil was not limited by its extractive or refining capacity but only by the ability of its shipping to move the oil to the home islands. The drop in shipping tonnage afloat during 1944 under the impact of the submarine and air attack was so severe that oil imports fell sharply. During the third quarter of the fiscal year 1944 imports were just one third of those in the corresponding quarter of 1943 and by January of 1945 imports of crude ceased entirely. By this time, stocks of crude were less than 500,000 barrels compared to the twenty million barrel crude reserve with which Japan started the war.

So desperate did the oil situation become with the interdiction of shipping cutting off oil imports entirely that the navy turned to pine root oil as a substitute fuel; 34,000 kettles (11) were set up throughout the country and 200,000 kilolitres of pine root crude oil were produced but none was ever refined. By April 1945 naval oil stocks were so low that of the five Japanese battleships remaining afloat, there was only enough fuel left for one, the Yamato, to sortie against our forces invading Okinawa. The Japanese admiral in charge of the Navy Supply Bureau testified (12) that while forty to fifty thousand kilolitres of aviation gas per month were required for air warfare, only 28,000

Table 4
Japanese Oil Position 1937-1945
Inner Zone—Crude and Refined
(In thousands of barrels)

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Crude Petroleum</th>
<th>Refined Products</th>
<th>Inventories*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Imports</td>
<td>Production</td>
<td>Total</td>
</tr>
<tr>
<td>1937</td>
<td>20,231</td>
<td>2,470</td>
<td>22,701</td>
</tr>
<tr>
<td>1938</td>
<td>18,404</td>
<td>2,465</td>
<td>20,869</td>
</tr>
<tr>
<td>1939</td>
<td>18,843</td>
<td>2,332</td>
<td>21,175</td>
</tr>
<tr>
<td>1940</td>
<td>22,050</td>
<td>2,063</td>
<td>24,113</td>
</tr>
<tr>
<td>1941</td>
<td>3,130</td>
<td>1,941</td>
<td>5,071</td>
</tr>
<tr>
<td>1942</td>
<td>8,146</td>
<td>1,690</td>
<td>9,836</td>
</tr>
<tr>
<td>1943</td>
<td>9,848</td>
<td>1,814</td>
<td>11,662</td>
</tr>
<tr>
<td>1944</td>
<td>1,641</td>
<td>1,585</td>
<td>3,226</td>
</tr>
<tr>
<td>1945 **</td>
<td>0</td>
<td>809</td>
<td>809</td>
</tr>
<tr>
<td>1944 I</td>
<td>994</td>
<td>419</td>
<td>1,413</td>
</tr>
<tr>
<td>II</td>
<td>224</td>
<td>386</td>
<td>610</td>
</tr>
<tr>
<td>III</td>
<td>423</td>
<td>379</td>
<td>802</td>
</tr>
<tr>
<td>IV</td>
<td>0</td>
<td>401</td>
<td>401</td>
</tr>
<tr>
<td>1945 I</td>
<td>0</td>
<td>406</td>
<td>406</td>
</tr>
<tr>
<td>II</td>
<td>0</td>
<td>403</td>
<td>403</td>
</tr>
</tbody>
</table>

* At beginning of period.
** First half fiscal year.

Source: Japanese Army-Navy Oil Committee; Cabinet Planning Board; Fuel Bureau of Munitions Ministry.
kilot litres were available in early 1945, of which 8,000 kilolitres were alcohol. By June this figure had dropped to 8,000 kilolitres total of aviation gas. Reconnaissance flights and antisubmarine patrols were cut. Tail. Other flights were cut to a minimum. Only fighter pilots continued to receive training and they received only half the minimum number of training hours previously thought necessary. Over 100,000 tons of oil burning shipping in the home island coastal trade were laid up early in 1945 despite the desperate need for shipping tonnage. All vehicles, even military trucks, were converted from the use of gasoline. Despite all these drastic measures to curtail oil consumption, oil tanks all over Japan were running dry and being torn down for scrap. By the time the air attack against refineries had begun in earnest during June of 1945, stocks of crude oil were virtually exhausted and the refineries almost entirely shut down.

**BLOCKADE AND DEBACLE**

When these basic sinews of production were snapped by the ever-enveloping blockade, Japan had lost the war. The fighting might continue for a little while, but the ultimate debacle was inevitable. The growing lack of vital materials brought even the most ingenuous and optimistic of Japanese planners to pessimism and despair.

The blockade hit the Japanese economy from a thousand sides all at the same time. Of the 6.3 million tons of merchant shipping with which Japan began the war and the 3.3 million tons constructed during the war, Allied forces in effectuating the blockade destroyed 8.5 million tons. As the shipping situation became more desperate an increasingly larger percentage of the ever shrinking steel supply had to be allotted to ship construction. As a result ammunition and ordnance output had to be reduced drastically. Furthermore, a major effect of the blockade on armament supply was the sinking of a large percentage of finished ordnance en route to the combat zones. Losses rose from three percent of the total shipped in 1942 to fifty percent in 1945. Even naval shipbuilding was hit. Only seventy-two percent of planned output was attained in 1944 and the plan for 1945 was set at but fifteen percent of the 1944 total.

Aircraft output was limited by engine production which fell off after the spring of 1944 due to a growing shortage of alloy-steel. Molybdenum and vanadium could no longer be obtained from Burma, nor could nickel from the Celebes, nor chromium or tungsten from the Philippines or China, nor cobalt, quartz crystals, columbium and tantalum from any of the controlled territories. Even had it been possible to sustain aircraft production there would not have been fuel enough left to train pilots or to fly the planes in combat. Any attempt to increase plane output would have been thwarted by the aluminum shortage. As the blockade tightened rubber for tires was reserved for air- craft use and otherwise serviceable vehicles, desperately needed, were laid up for lack of tires. Deep sea fishing was abandoned. Fertilizer supplies were cut off. Rice shipments from the south stopped. So desperate did the food position become that in April 1945 the Japanese, despite their great need for raw materials from North China, Korea, and Manchuria, their sole surviving sources of supply, were compelled to allocate all remaining shipping to the importation from the mainland of food only.

Under such circumstances all the efforts of the Japanese planners to meet the demands of the military establishment and the pared-to-the-bone needs of the civilian population produced only a diminishing fraction of requirements. The basic cause of Japan's defeat was the failure of her war plan—the failure of her gamble on a short war—and the resultant necessity of having to pit her pigmy economy in a prolonged contest against a vastly superior economic power. The blockade heightened the disparity and brought Japan to the economic breaking point. The air attack persuaded her leaders to recognize the facts.

**BOOKS ON THE PACIFIC AREA**


Hernando Abaya's record of the war years and initial post-liberation period in the Philippines states the case of the little men, the freedom-hungry Filipinos who never submitted to Japanese occupation. It is an indictment of the Filipino collaborators, puppets of the Japanese, and of American postwar policy which facilitated their return to power as the ruling oligarchy of Philippine politics and economic life, now serving American masters. It is a stern accusation, articulating the wrath of the Filipino nationalist, frequently scorching and bitter. It probes mercilessly behind the façade of Malacañan—the Philippine White House—and official United States proclama- tions, letting the chips fall where they may, to reconstruct the complex pattern of politics in the Philippines from Pearl Harbor to the presidential elections of April 1946. It spells out the charge that the common Filipino, the resistance movement and the peasants, were betrayed and robbed of the fruit of victory by the collaborationist Filipino politicians and postwar American policy. It excoriates the American vested interests who maintain economic control of the Islands and buttress feudalism and reaction there.

As was to be expected the publication of the volume has stirred up somewhat of a hornet's nest and has offended the sensibilities of sheltered Americans who piously believe that America can do no wrong. It has disturbed the dust in the Department of Justice files under which Walter Hutchinson's official report on collaboration in the Philippines lies buried to this day beyond the reach of the American public. It has undoubt-