CHAPTER VII

IMPORTS OF MINERAL RESOURCES
This chapter is an attempt to analyse the pattern of trade in three mineral resource materials: petroleum, tin and iron-ore.

**PETROLEUM**

We will show here that the United States of America has shifted from the position of a net exporter to a net importer of petroleum mainly because of the growth of a domestic market for this product.

In the United States, the commercial production of petroleum is first supposed to have begun in 1859.1 The demand for oil was first created by the growth of urbanisation and industrialisation and the consequent need for a cheap illuminant and lubricant. The average annual domestic output of petroleum (in million barrels) increased from 7.52 during 1870-74 to 49.66 during 1890-94 and to 233.49 in 1910-14.2 The average annual net exports (in million barrels) increased from 4.31 in 1870-74 to 12.20 in 1890-94 and to 37.86 in 1910-14.3 However, because domestic consumption also rose rapidly, the average annual net exports, as a percentage of output, declined from 57.31 in 1870-74 to 36.64

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2. See Table 3 given at the end of Chapter II, P. 80.
3. See ibid.
in 1890-94 and to 16,22 in 1910-14.\textsuperscript{4} Over time, this growth in domestic demand has become quite significant because:

(a) The growth of automobile and truck transportation created the first really large market for fuel oil. In a continental economy, like the US, a land transport system based on trucks and automobiles meant a vast network of routes and immense mileage covered. Development of this transport system meant a huge increase in domestic demand for oil. The cost of transportation of oil was kept down by the development of pipe-line transportation.

(b) The shift from coal burning locomotives to diesel locomotives in railroads also increased the demand for fuel oil.

(c) In many industrial fields also petroleum and natural gas were substituted, as sources of power, for coal and coke.

All this has led to a very sharp increase in the domestic consumption of petroleum. The average annual consumption (in million barrels) increased from 206,32 in 1915-19, to 1,063,54 in 1925-29, to 1,369,34 in 1945-49 and to 2,442,40 in 1950-54.\textsuperscript{5} The significant thing to note is that

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\textsuperscript{4} See ibid; see also Figure 4 given at the end of Chapter II, p. 87.

\textsuperscript{5} See Table 3 given at the end of Chapter II, p. 89.
there has been no decline in the output of petroleum. The average annual domestic output (in million barrels) increased from 330.20 in 1915-19 to 1,171.00 in 1925-29 to 1,673.40 in 1945-49 and to 2,336.30 in 1950-54. However, the rate of growth of domestic consumption has been far above the growth rate of domestic output. As a consequence, the average annual net exports, as a percentage of output, declined from 0.35 in 1915-19 to 4.64 in 1940-44. Since the 1940s the US has shifted to a position of net importer of petroleum - the average annual net imports amounted to about 0.96 per cent of output during 1945-49, about 16.9 per cent of output in 1950 and about 9.19 per cent of output during 1950-54.

Thus the shift in the pattern of trade in petroleum came about not because of a fall in the domestic output but because of the fact that the rate of growth of domestic consumption has been far above the rate of growth of domestic output - even though the domestic output increased significantly throughout the period under our consideration. All this is clearly evident from Figure 1 which shows the trends in the domestic output and consumption of petroleum.

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6. See ibid.

7. See ibid.; see also Figure 4 given at the end of Chapter II, p. 87.

8. Ibid.
TRENDS IN DOMESTIC OUTPUT AND CONSUMPTION.

$PP - Pp_1 =$ domestic output.

$Pc - Pc_1 =$ domestic consumption.

Scale:
- X-Axis: 2 divisions = 1 year
- Y-Axis: For first forty divisions, 1 div. = 5 m. barrels.
  For rest of the divisions, 1 div. = 10 m. barrels.

YEARLY AVERAGE — — — — —
We will show here that even though tin is a complementary import material of America, imports over time have declined because of technical progress. The case resembles the imports of some of the agricultural raw materials (described in detail in Chapter VI).

The average annual net imports of tin (in millions of dollars, 1954 price weights) increased from 62.94 in 1900-04 to 114.72 in 1920-24 and to 148.40 in 1925-29. Net imports, however, declined to $104.40 million in 1945-49 and to $106.08 million in 1950-54. Only during 1940-44 imports had somewhat recovered to $127.02 million.

Tin finds its chief outlet in steam engines, power driven machinery, electrical machinery, automobiles, tin plated containers for food and other products etc. From these uses of tin it can be seen that demand for it will rise rapidly with the growth of urbanization and industrialization. The supply side, on the other hand, presents a different picture. Domestic supply of tin in the US is inelastic. This inelasticity of tin is, of course, to some extent reduced by


10. Ibid.

11. Ibid.
the fact that as domestic consumption has increased it has been possible to increase at least the secondary production. However, mine production is extremely little and quite a large part of the metal put into use is dissipative in nature. This limits the growth of secondary production to any large extent. On the whole, the domestic supply of tin in relation to its demand in the US can be considered to be inelastic. The foreign supply of tin becomes highly unreliable during the periods of war. Even otherwise tin is a high-valued metal, prices per pound for tin have been higher than for other metals like aluminum, copper, lead and zinc.12

Thus while the market for tin in an urban and industrial economy grew rapidly, domestic and foreign supplies have been inelastic or we can say that foreign supplies have been procured at very high prices. Under the circumstances of inelastic supply, increase in the demand for tin, like the case of raw silk and crude rubber, has stimulated the growth of technical knowledge. Because of technical progress, the consumption of tin has been reduced - largely as a result of economy in the use of tin and the development of substitutes. The development of technical innovations was specially stimulated during the period of World War II. The most important innovation has been the substitution of the hot-dip method of tin-plate manufacture by the electrolytic process. This has

resulted in a great economy in the use of tin, for example, in 1966 a ton of electroplated tin-plate contained an average of
11.9 pounds of tin, as against 27.1 pounds per ton of hot-dipped plate. 13

Apart from this, many partial substitutes for tin have been developed. In the largest use of tin - tin plate for cans - several materials have and can be substituted, including glass, paper, enameled steel, plastics and aluminum. Non-metallic materials, copper, aluminum, and zinc-coated products have largely replaced tin-plate and tinfoil for roofing and construction. 14 Aluminum and alloys of less scarce metals have displaced many other uses of tin. There are also substitutes for tin in chemicals. Substitution of rayon and nylon for silk has decreased the demand for tin chloride for weighting silk.

The development of the electrolytic process of tin-plate manufacture and the growth of substitutes have meant that domestic consumption of tin has been kept below what it would have been in the absence of technical progress. In fact, consumption has declined since the years 1923-29. The average annual domestic consumption (in 1,000 long tons) increased from 32,24 in 1900-04, to 60,92 in 1920-24 to 73,70 in 1925-29. 15

13, Ibid., p. 748.
15, Yearly average figure: calculated from data (preferred series of the source) given in Potter and Christy, Jr., n. 9, p.490.
Consumption (in 1,000 long tons), however, declined to 55,30 in 1945-49 and to 56,36 in 1950-54. Only during 1940-44, consumption (in 1,000 long tons) had recovered somewhat to 67,42.

Thus technical progress accounts for the fact that the consumption and net imports of tin have in fact been reduced.

Iron-ore

Net imports of iron-ore into the US were small in the beginning. For example, the average annual net imports of 526 million long tons were recorded during 1925-29. However, from the 1930s and especially since the 1940s net imports have risen rapidly. From a level of 1,594 million long tons in 1925-29, the average annual net imports increased to 2,096 million long tons in 1945-49 and to 7,106 million long tons in 1950-54.

This increase in net imports is to be explained by the fact that there has been a more rapid increase in the domestic consumption of iron-ore than in its domestic output. The average annual domestic output steadily increased over this

16. Ibid.
17. Ibid.
18. Ibid., p. 446.
19. Ibid.
period - from 7.96 million long tons in 1880-94 to 65.23 million long tons in 1925-29, to 87.64 million long tons in 1945-49 and to 101.70 million long tons in 1950-54. Though the rich ores of Besabi have depleted, technical progress has made it possible to exploit the low grade ores economically and these ores are immensely abundant. The growth of domestic consumption, however, has outstripped this growth of output. The market expansion, in the US, during the period of our study, has been largely in favour of the heavy industries. These industries are intensive consumers of pig iron and steel, so this has meant a huge increase in the demand for iron-ore. The average annual domestic consumption (in million long tons) increased from 2.34 in 1880-94, to 67.74 in 1925-29, to 29.34 in 1945-49 and to 107.66 in 1950-54.

Thus in spite of an increase in the domestic output, net imports of iron-ore have become significant because the increase in domestic demand has outstripped the increase in domestic output.

CONCLUSION

We have shown above that, over the period of our study, domestic demand has played a vital role in the US pattern of trade in petroleum, tin and iron-ore.

20. Ibid.
21. Ibid.