CHAPTER IV

MARKET EXPANSION, HEAVY INDUSTRIES AND IMPORT STRUCTURE
Apart from transport, heavy industries were another key factor determining the trade structure of America. This chapter makes an attempt to highlight the key role of heavy industries in the trade structure of America.

In this section, we will give an account of the growth of heavy industries in America during the period 1870-1945.

During the closing decades of the nineteenth century while the consumer goods industries still dominated the output of manufactures, producer durables were the only class of products that increased their share in the total value of output of finished commodities. In current prices, their share increased from 10.3 per cent in 1860 to 12.5 per cent in 1900 whereas the share of consumer durables and semi-durables declined from 9.3 per cent to 9.2 per cent and from 23.6 per cent to 20.5 per cent respectively.\(^1\) With the turn of the century, for some time, the producer durable goods sector continued to be the most rapidly growing sector of manufacturing. During 1900-1908, the average share of semi-durables declined to 20.3 per cent, the average share of consumer durables increased to 9.8 per cent but the output of producer durables increased at a faster rate — this

sector increased its average share to 12.4 per cent of the total output. During 1909-18, the average share of semi-durables declined to 19.7 per cent, the average share of consumer durables increased to 10.9 per cent while that of the producer durables increased to 13.4 per cent. In 1918 prices, the above picture does not change much except for the fact that there is some acceleration in the output of consumer durables during the decade 1909-12.

This pattern of growth is not strictly speaking true in the period after 1918 because since then it is the output of consumer durables that has expanded at the fastest rate. By the decade 1929-38, the average share of consumer durables in current prices had increased to 14.9 per cent while that of the semi-durables and producer durables had fallen to 13.6 per cent and 12.4 per cent respectively. In 1913 prices the rise in the share of the consumer durable commodities is even more marked - their average share hovered around 17.5 per cent during 1929-38. However, we can still assert that it is the rapid growth of the automotive industry and the inclusion of products of certain machinery industries in the consumer

3. Ibid.
4. Ibid.
5. Ibid.
6. Ibid.
durable goods sector that accounts for the accelerated growth of that sector. On the whole, it is the durable manufacturing sector that has grown more rapidly than the nondurable sector of manufacturing. The production index (1935-39 average = 100) for the durable goods sector rose from 87.8 during 1921-25 to 303.4 during 1941-45 while that of the nondurable sector rose from 68.2 to 162.6 over the same period. Combining both the sectors, over the period from 1926-30 to 1941-45, the highest rate of growth of output was recorded by the transportation equipment industry, the machinery industry and the chemical industry. Further, during the years from 1930 to 1940, the index of manufacturing production of the machinery industry kept pace with that of the transportation equipment industry (which includes the production of automobiles). It is only after 1940 that the growth rate of transportation equipment industry has superseded that of the machinery industry.

If we look at the figures showing the relative shares of some selected consumer goods industries and producer goods industries in the total manufacturing employment, once again a decline in the former and a relative rise in the latter is

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7. This is clear from the detailed commodity classification given in ibid., p. 13, Table 3.


9. See Ibid.

10. Ibid.
indicated after the period 1870 — reversing the trend prevailing before that date. Woollen and worsted goods which had accounted for 5 per cent of employment in manufacturing in 1870 had sunk to 2.9 per cent in 1910. Cotton and cotton goods accounted for 7.29 per cent of manufacturing employment in 1870 but accounted for only 6.13 per cent in 1910. Leather and leather goods similarly dropped their share from 8.56 per cent in 1870 to 4.72 per cent in 1910. These had been the leading industries of the period before 1880. On the other hand, employment in iron and steel products increased from 7.88 per cent to 15.19 per cent, and in transportation equipment it increased from 5.63 per cent to 8.88 per cent over the same period — 1870-1910.

On the whole, from the above account it is fairly evident that the period after 1870 was characterized by a relatively rapid growth of the heavy industries in the American economy.

II

We will in the following two sections show that the growth of heavy industries is largely explainable in terms of a rapid growth of the market for the products of these industries. The market for the products of heavy industries will be shown to have expanded because of:

(a) rapid growth of a homogeneous consumer market,
(b) high acceleration effect of (a) on the growth of heavy industries.

II. We will also explain the reasons for this market being supplied by domestic production rather than by imports.

III.

We will here explain in detail point I of the above section.

The expansion in the market for the products of heavy industry in America resulted from two principal factors:

I. Firstly, this was a consequence of the rapid growth of a homogeneous consumer market. Kuznets has shown that from the decade 1920-29 to 1930-39, annual average H.N.P. (at 1929 prices) rose from $3,40 billion to $708.9 billion.12 Though in the twentieth century there was a decline in the rate of change of H.N.P. per decade, however, on the whole, the average rate of growth of H.N.P. per decade, over the period 1909-29 to 1939-49, has been 12.1 per cent.13 Thus in general, over the entire period there was a fairly rapid growth of the consumer market. Further, demand in America arose from fairly middle ranged income groups because despite immigration, the wages were


13. Ibid., p. 50, Table 3.
high - at least higher than in England. This means that the consumer market was homogeneous in character. So there arose a relatively large demand for homogeneous types of machines and this induced mechanization in the economy.

II. Secondly, this tendency towards the growth of mechanization in a fairly rapidly growing consumer market produced a high acceleration effect on the growth of heavy industries. The high accelerator again reflected the factor endowment of the economy in three ways:

(1) Firstly, the abundance of land and the consequent continental character of the American economy implied that economic expansion would necessarily involve a high transport content. This in an age of railroad transportation implied high capital output ratios in the economy (capital investments here being complementary to land).

The tendency towards high capital output ratios for the economy as a whole was accentuated by the existence of a closed circle of supply and demand in the coal-iron-railroad complex. What we mean by this closed circle of growth is that the growth of railroads in an economy creates a demand for coal and iron and, to that extent, directly stimulates their production. However, to increase the supply of coal and iron resources it is also necessary to build an extensive system of
railroads in the economy. Thus the entire circle is a self-contained one and this tends to make the growth of heavy industries to some extent a self-propelled one. In the American economy, this complex became significant during the period from the Civil War to World War I because the growth of heavy industries in this period was based on a coal-iron dominated complex. The significance of railroads in it becomes clear from the fact that prior to the connection of the East and the West by railroads, mineral fuel as a smelting fuel for iron was being used only by the iron industry in the East while the iron industry of the West was based on charcoal. The reason for the persistence with the use of charcoal in the West was firstly, the inferior quality of coke that was available at Pittsburgh. Pig iron smelted from this coke was also of an inferior quality while its price was not low enough to offset this factor. Secondly, the anthracite pig iron of the East could not be made available to the West because of the high costs of transportation. With the growth of railroads towards the West, this pattern of growth was affected in a dual way: firstly, because of the ease of transporting anthracite iron over the Allegheny Mountains through the railroads, production of charcoal pig iron in the economy declined at a rapid rate. Secondly, large scale production of rails stimulated the exploitation of the superior and pure quality coke deposits of the Connelsville area. This raised the quality of pig iron smelted with coke at Pittsburgh. So in the decades after
the Civil War the use of coke as a smelting fuel from iron became widespread in America.16

The linkage effects of the railroad sector for the growth of iron and steel industry, the coal mining industry, and the consequent rise of metal based industries around this complex, became significant in the post Civil War era because the railroads directly constituted an important element of the total demand for coal, iron and steel in the economy. It has been estimated that the total iron consumed by the railroad sector (i.e., iron used in the production of iron and steel rails, and for railroad uses other than rails) must have been close to 50 per cent of the total pig iron production of the United States of America in 1871 and 1881.16 With the transition to steel, the first products to make this transition were the rails. Steel consumption by rails alone was close to 80 per cent of the total output of rolled steel products during the 1870s and the 1880s. In the railroad boom of the early 1880s, the proportion of rolled steel products accounted for by rails was over 90 per cent.17 This consumption of steel by the railroad sector did decline thereafter. Still until 1901 more than

17. Temin, ibid., p. 276, Table C.7.
50 per cent of the total output of rolled steel in each year went into the production of rails. This demand for steel was an important stimulus to the production of coke in the economy. Further, the indirect demand for coke as a smelting fuel was joined on a large scale by a direct demand for coal as a fuel for locomotives. In fact, during the 1880s this demand overshadowed the indirect demand for coal, via the iron and steel industry. In 1885, for example, of 70 million tons of bituminous coal consumed, 42 per cent was burned as locomotive fuel, the railroad having become by far the most important single customer.

Thus on the one hand, the demand for coal, iron and steel in the railroad sector directly propelled the growth of the coal, iron and steel industries. On the other hand, the supply of mineral fuel was made available in the entire economy only when a connection first between the East and the Pittsburgh area, and then with the other areas in the West had been established either through direct railroad transport or a combination of rail and water transport. So the production of coke, pig iron and steel, and the growth of railroads were all to a great extent interdependent and they formed a closed circle of growth.

18. Ibid.

By accelerating the growth of heavy industry, the closed circles of demand and supply in the coal-iron-railroad complex further tended to increase the capital intensity of the economy.

In the automobile era, as the further expansion of railroad mileage has stopped, the importance of the coal-iron-railroad complex has been reduced. However, the accelerator effect on the growth of heavy industries has continued to operate because of a large and homogeneous consumer market. A large and growing consumer market has permitted a general diffusion of mass production techniques, standardization etc. This factor has been highly favourable for mechanization and this has produced a high accelerator effect on the growth of heavy industries. The expansion of the machinery industry, the steel industry, the transportation equipment industry etc. in the post World War I period is evidence of this. Further, as the petroleum complex has risen to prominence in the automobile era, it has induced the rapid growth of the chemical industries (since most chemicals are intensive consumers of oil).

(2) The second principal way in which the high accelerator reflected the factor endowment was through the existence of scarcity of labour in America. Scarcity of labour meant the prevalence of high wages and this biased production methods in the economy towards mechanized modes. Even in the twentieth century, despite rapid population expansion, the natural resource base of the United States of America, is still enormous
as compared to its population. This mechanization has continued to grow in the economy (capital investments here being a substitute for labour). The ratio of total capital to annual N.L.P. rose from 5.13 in 1970 to 6.40 in 1919, fluctuated to 6.11 in 1934 and declined thereafter mainly because of the effects of depression and World War II. Reproducible capital per member of the labour force (in 1923 values) rose from £2.32 thousand in 1970, to £6.19 thousand in 1919 and to £6.57 thousand in 1923. This ratio ceased to rise after that date and had failed to recover to the 1923 level even by 1944. However, if we relate capital to man-hours a different picture emerges. This shows a rise in the supply of reproducible capital per man-hour from £1.86 thousand in 1970 to £3.76 thousand in 1909 and to £6.11 thousand in 1923. Also, the rise was resumed after 1939 and by 1944 the reproducible capital per man-hour was higher than in 1923 - rising to £6.26 thousand.

(3) Thirdly, as a result of a mass immigration of unskilled labour into America after the mid-nineteenth century, the supply of skilled labour relative to unskilled labour became scarce. Or in other words, the supply of unskilled labour became more responsive to demand than the supply of skilled labour. This

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20. Kuznets, n. 8, p. 82, Table 12.
21. Ibid., p. 78, Table 11.
22. Ibid.
made it easier for the manufacturer to give effect to his choice of highly mechanized techniques requiring only semi-skilled labour for performing the operations. 26

We have shown above the three principal ways in which the high accelerator reflected the factor endowment of the economy. To summarize these three ways briefly:

1. (a) Abundance of land meant high transport content in the economic development process. This in an age of railroad transportation implied high capital output ratios (capital investments being complimentary to land).

(b) The capital output ratio was raised also because of the existence of a closed circle of demand and supply in the coal-iron-railroad complex.

(c) In the automobile era, the high accelerator effect has continued to operate because of a large and homogeneous consumer market.

2. Scarcity of labour biased production methods towards mechanized modes and this has meant increased capital output and capital labour ratios (capital investments being a substitute for labour).

3. Scarcity of skilled labour and the relative abundance of unskilled labour, after the mid-nineteenth century facilitated the adoption of mechanized techniques.

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26. Ibid., p. 131.
It is clear that the existence of a high accelerator in the economy meant a rapid growth in the demand for the products of heavy industry. To the extent that this growth in the market for heavy industries resulted in their expansion in the United States of America rather than abroad, the growth process became cumulative not only because of the volume of income generated by heavy industries but also because these industries were concentrated in space. Their concentrated growth was induced by the characteristics of the coal-iron dominated complex on which the entire structure of heavy industries was based. (This is applicable specially to the pre World War I period). The heavy weight and localized occurrence of coal deposits implied high transport costs in the carriage of coal. This factor generated a pull for the localization of the iron and steel industry near the coal deposits. Around this iron and steel complex, there also grew a concentration of a number of other heavy industries that are oriented to this complex or are intensive in the use of coal or coke as a fuel, with the development of techniques that achieved economy in fuel consumption, some locational shifts in these heavy industries away from coal sites, of course, took place. Nevertheless, all these shifts have taken place mainly in favour of the nodes of the transport network but all within the coal producing states, excluding the state of Alabama, the rest of the coal producing states - namely Pennsylvania, Indiana and Illinois - form a nearly continuous belt. A concentrated growth of production
meant that economies of agglomeration were achieved and the
growth of an industrial heartland was facilitated. Within this
complex, production, income and population increased at a rapid
rate. This growth was apart from what was being achieved
directly through settlement of new lands and export trade in
natural resource products. Thus the heavy industries created a
large and concentrated consumer market which in turn because of
the acceleration effect added to the demand for the products of
heavy industries. In this way, the process of growth of heavy
industries acted like a cumulative process because of their
concentrated pattern of growth.

However, with the advent of the automobile era the
concentrated nature of growth of heavy industries has been modi-
fied to some extent. A dispersion and sub-urbanization of
manufacturing activity is clearly noticed. This phenomenon has
been partly due to the fact that peculiarities of automobile
transportation have made it feasible to have a dispersed loca-
tion of manufacturing activity. However, this is also partly
a result of the economy's declining dependence on coal and
growing dependence on oil and gas, and electricity. Apart from
transportation, many industrial processes, mainly metallurgical
and chemical, have substituted electricity, oil and gas for
coal as a source of power. As Hoover points out, this has
lessened the geographical differences in cost and availability
of energy. This factor has modified the concentrated pattern

26. Edgar M. Hoover, "Internal Mobility And The Location Of
The American Economy (Englewood Cliffs, N.J., 1961,
of industrial growth in the following way:

(a) the growth of electricity as a source of power has considerably affected the layout and local choice of a plant. Electric power can be bought so conveniently that small factories are at less of a disadvantage than they would be if forced to set up a steam or water power unit. Thus a suburban location becomes possible. This accounts for the fact that already by 1919, within the metropolitan areas there was a tendency for suburbanization.

(b) the rise to prominence of oil and natural gas with the commencement of the automobile era, has induced the development of chemical and related industries in some new areas—especially near the oil and natural gas regions (even though it must be admitted that the locational pull of oil is not very strong).

IV

In this section we will spell out in detail point II of section II, i.e., the reasons why the market for heavy industries was supplied by domestic production rather than by imports. Or in other words, we will explain the conditions

26, Ibid.

that favoured the growth of heavy industries in America despite the competition faced by domestic producers from the United Kingdom and other Western European countries.

In the twentieth century, the growth of heavy industries in America is explainable in terms of a larger domestic market in America than in Britain. The same, however, does not hold good for the nineteenth century. Of course, some evidence does seem to suggest that by 1890 the American market for the products of heavy industry had already become larger than the British. By 1890, for example, though the US production of all kinds of steel and total output of pig iron was larger in America than in Britain (America was surpassed by Britain only in the production of open-hearth steel), the product of American furnaces and rolling mills was largely consumed at home while the foreign iron and steel trade of Great Britain and also of Germany far exceeded the American. However, it is not possible to give any conclusive evidence for all products of heavy industry, particularly as for the years before 1890. Now, even if it is accepted that before 1890 the market for heavy industries was still larger in Britain than in America, we must take into account the special advantages possessed by American producers in catering to domestic demand. These were:

(a) advantages derived from high distribution costs of machinery;

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(b) the larger market for any single type of machinery in America than in Britain,
(c) the fact that the local producer by virtue of sheer proximity could more quickly adjust to demand conditions than the foreign producer,
(d) the abundant and elastic supply of metals in America,

Below we will deal with each of these four points in detail.

(a) **High Distribution Costs of Machinery**

Firstly, the peculiarities of machinery in the nineteenth century favoured its domestic production rather than its import. The machinery of the nineteenth century used to be heavy in weight and bulky in size because of the huge wheels, chains and conveyors. Thus in relation to speed the weight of all machinery was high. So the distribution costs of products of heavy industry were high compared to the present days. In the twentieth century, apart from the fact that transport costs in general have gone down, transport costs relative to weight have also gone down. In other words, machines are now of high speed relative to their weight. Thus the American machine producer of the nineteenth century tended to derive protection against a foreign producer on account of the high distribution costs of machinery. The foreign producer was at a disadvantage compared to a local producer in America because he would have to incur both the external as well as
internal transport costs on machinery. This disadvantage of a foreign producer increased over time because of the fact that in the nineteenth century ocean transport costs were not falling as rapidly as internal transport costs in America.

High Tariffs on Industrial Products

Moreover, the advantages possessed by the local producers on this account were further increased because of the protection afforded to them by the policy of high tariffs on industrial products, including the products of heavy industry, followed by the American Government in the decades following the Civil War. However, this does not mean that the tariff policy was the major factor leading to the growth of heavy industries in America. To have a clear idea of the role that is attributed to tariffs, we will examine the case of some of the products on which high duties were levied. The most important case is that of duties levied on the imports of iron and steel in their various forms. On pig iron the rate was, in round numbers, $7.00 per ton from 1870 to 1894; it was $4.00 per ton from 1894 to 1909. On steel rails, the rate was $33.00 per ton from 1870 to 1883; $17.00 from 1883 to 1900; $12.44 from 1890 to 1894; and $7.34 from 1894 to 1909. Thus throughout the period from 1870 to 1897, the duties on both of the articles mentioned, and on all the cruder forms of iron and steel, were specific (by weight), and were highly protective. The duty on steel rails was particularly high, being equivalent
to one hundred per cent on the foreign price during most of the time from 1870 to 1883, and from 1883 to 1894 still equivalent to between fifty and eighty per cent. However, as Taussig points out it is very unlikely that tariffs were the most vital factor in the growth of iron and steel and related industries in America. No doubt it was from 1870 onwards that domestic production of pig iron, steel rails etc. was enormous. However, the main factors in the growth of the iron and steel industry have been the availability of coal, iron-ore etc., at low costs and cheap transport rates, and the growth of a large domestic market which meant that opportunities for realizing economies of scale were created at an increasing rate. The advance in production would have been achieved even without protection. However, the importance of the protective tariff policy lies in the fact that it helped in accelerating the process of development of iron and steel and related industries. Taussig also points out that "the protective system caused high profits to be reaped in the iron and steel establishments of the central district; and the stimulus from great gains promoted the unhesitating investment of capital on a large scale". He further argues that "the same sort of growth would doubtless have taken place eventually, tariff or no tariff; but not so soon or on so


great a scale, with a lower scale of iron prices, profits would have been lower; and possibly the progress of investment, the exploitation of the natural resources, even the advance of the technical arts, would have been less keen and unremitting\textsuperscript{31}.

Thus to the extent that high duties helped in accelerating the process of large scale production of iron and steel and related products, the advantages possessed by local producers on account of distribution costs of machinery were further increased.

(b) Large Market for any Single Type of Machinery

Secondly, the machinery market was more homogeneous in America than in Britain. In sharp contrast to the machinery market in Britain, the components and parts required for machinery in America were similar for all types of machinery. This was partly a result of the more homogeneous consumer market in America than in Britain. Apart from this factor, two other major factors seem to account for the machinery market being more homogeneous in America than in Britain:

(i) Since British mechanization started earlier than American, there was in Britain a large stock of machinery of the antiquated type with parts of different specification from later machinery. This was of considerable significance in the nineteenth century because much of the investment in that

\textsuperscript{31} Ibid., p. 161.
century was in durable goods. So investment in any equipment would normally last very long. The relative abundance of labour in Britain also encouraged the use of machinery for as long as possible. So the rate of machinery obsolescence was slower in Britain than in America and machinery would not go out of use quickly in Britain.

(ii) Because of the lack of skill in America compared to Britain, there was a greater tendency in America than in Britain towards standardization of products in the machine-making industries.

Thus even if the market for machinery as a whole might have been larger in Britain than in America, the market for a particular type of machine was far larger in America. So standardization, mechanization and hence the growth of heavy industries was easily induced at a rapid rate in America. Britain, on the other hand, was at a great disadvantage because of the lack of standardization in capital goods industries.

(c) Local Producer and Adaptation of Machinery to Demand Conditions

Thirdly, a local producer in an economy, because of his nearness to the market is more familiar with it. Hence in comparison to a foreign producer he can adapt his machinery more quickly to demand conditions. The American producer can be supposed to have scored on this account also over his foreign competitor.
(4) **Abundant and Elastic Supply of Metals**

Fourthly, with extensive transport development in the economy, the metals required for machinery production and for other products of heavy industry became available in elastic and abundant supply. The ores of America were rich in their metallic content. The special characteristic of metals is that they are expensive to transport and so various metal-based industries tend to cluster around the sources of metal in order to keep down the costs of transportation. Production of the primary metal is also strongly attracted to the mineral deposits because of the loss of weight of the ores in the process of extraction. So in the absence of an elastic supply of metals in the economy, large demand for metallic products might not have led to the development of heavy industries. But elastic supply of metals ensured that the multiplier effects of expansion and increase in demand for metals with industrial growth were kept at home rather than leaked abroad, and in turn they facilitated the large scale production of all products of heavy industry.

On account of all these factors, domestic demand for the products of heavy industry was more and more met by increasing domestic production rather than by imports from abroad.

V

We will in this section trace the implications of the rise of heavy industries for the trade structure of natural resource products in America.
We have shown in this chapter that during the closing decades of the nineteenth century and till the First World War, the output of producer durables increased at the fastest rate. Over the years from 1926-30 to 1941-45, the highest rate of growth of output was recorded by the transportation equipment industry, the machinery industry and the chemical industry. The producer durable goods sector as well as the machinery sector as a whole are intensive consumers of minerals. To the extent that the output of all these industries increased at a faster rate than other industries, this tendency implied a more rapid rate of domestic absorption of minerals than other raw materials. Indeed, since the last decades of the nineteenth century, domestic consumption of mineral resources has risen at a more rapid rate than that of the agricultural or forest resources. During the period 1870-1900, for example, the total consumption of agricultural products nearly doubled; that of the forest resource products rose by about 51.1 per cent. The consumption of minerals, on the other hand, rose by about 518.5 per cent, over the same period. Over the period 1900-50, the consumption of all agricultural products rose by about 160 per cent.


33. Percentage increase calculated from data about consumption (based on 1954 prices) given in ibid., p. 260.

34. Ibid., p. 424.

35. Ibid., p. 200.
that of the forest resource products rose by only about 7.8 per cent,\textsuperscript{36} while that of the minerals rose by about 437 per cent.\textsuperscript{37}

A more rapid rate of increase in the domestic demand for minerals than for other resources thus put a more intense pressure on domestic reserves of minerals rather than on other resources.

In particular, industries like machinery, transportation equipment are intensive consumers of metals. So a greater pressure on metals than on other natural resources was generated. Total consumption of metals (except gold and silver) rose by about 263.8 per cent over the period 1870-74 to 1935-39, and by about 224.3 per cent over the period 1900-04 to 1945-49,\textsuperscript{38}

Further, the rapid rate of growth of chemical industries - most of which are intensive consumers of oil - has meant a pressure on another component of mineral resources - the petroleum resources. This pressure on domestic oil reserves was put in addition to that put directly by a growth in demand for oil by the automobiles.

Thus the pull of the domestic market has throughout been towards the group of mineral resources - particularly oil

\textsuperscript{36} Ibid., p. 226.

\textsuperscript{37} Ibid., p. 424.

\textsuperscript{38} Yearly average figures and the percentage increase calculated from data about consumption (based on 1954 index price weights) given in ibid., p. 444.
reserves and metals. This tendency has implied a more rapid shift in the trade structure of minerals than that of other natural resource products. The percentage of domestic output exported in the case of most of the minerals has declined sharply whereas imports have risen at a rapid rate. Over the period 1901-05 to 1946-50, imports of all metallic minerals (except gold) rose by about 325.9 per cent. In the case of petroleum, the tendency for imports to rise was accelerated by the fact that oil is non-renewable in use. Increasing domestic demand for petroleum has thus all the more meant a tendency towards increased imports.

CONCLUSION

We have shown above that throughout there has been a rapid expansion of the market for heavy industries - which are intensive consumers of minerals. It is this tendency which has primarily led to a more rapid shift in the position of America from that of a net exporter to net importer of most of the minerals than in the case of other resource products.