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Wolfram Liepe

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The Natural Resource Content of United States Foreign Trade 1870-1955

By

JAROSLAV VANEK

Cambridge: The M.I.T. Press, 1963.

Pp. xvi, 142, \$4.00

In this book Vanek attempts to explain observed long run changes in the natural resource content of United States foreign trade through international trade theory. On the whole, the attempt is successful, and the theoretical sections, particularly, should contribute to a better understanding of changes in a country's comparative advantage in international trade as they occur over time.

In his concentration on the long run, however, Vanek neglects recent medium term changes—particularly the rise in American agricultural productivity in the last twenty years which might have led to interesting policy conclusions. Vanek writes as if international trade had taken place in a free trade environment, so that the possible influence of tariffs or agricultural price support policies on the resource content of United States trade are not considered. It may be that these policies made little difference over the long run, but the subject would have at least deserved a discussion.

Not surprisingly, Vanek shows in the empirical chapters of the book that the natural resource content of United States exports has, on the whole, fallen, and that of imports has risen over the period 1870 to 1955. The value of primary goods—which Vanek calls “resource products”—is used as the basic measure of the natural resource content of trade, in place of rent for which the required data are not available. In the empirical chapters, the general thesis is demonstrated through several specific indicators: (1) The direct resource content of trade, counting only the primary goods themselves; (2) apparent consumption of resource products as a percentage of production; and (3) the direct and indirect resource product content of United States trade derived with the aid of the 1947 input-output table of the United States economy.

International trade theory is normally presented in static terms to explain the underlying causes of comparative advantage, and the benefits which can be derived from international exchange. In the

theoretical sections of this book, Vanek formulates the theory skillfully and clearly for the dynamic situation of the economic development of a major country to a highly industrialized society. He distinguishes between two sets of factors of production: (1) natural resources and (2) capital-labor. A distinction is also made between two sets of products: (1) natural resource intensive and (2) capital-labor intensive. And he shows, largely through geometry and verbal reasoning, how trade in the two groups of products must be affected by the following factors: (1) Changes in the relative abundance of natural resources versus labor and capital; (2) technological developments leading to a more efficient application of the basic factors of production which may either offset or reinforce the effects on trade of increasing scarcity of natural resources; and (3) demand changes, due to different income elasticities and changes in tastes, which have tended to raise the consumption of capital-labor intensive manufactured products much more than that of resource intensive products.

Not included in his theoretical model, however, are policy variables such as tariffs, subsidies, quantitative restrictions, and price supports. A man of Vanek's outstanding theoretical competence might have included them and thus have written a more interesting and probably more relevant book. However, the omission may have been deliberate since the inclusion might have meant a considerable expansion of the scope of the book, including theoretical complications and consideration of the tariff history of the United States.

The net effects of changes in factor scarcities and in technology manifest themselves in productivity statistics, and Vanek shows some of the relevant productivity trends in Chapter 8; these can be compared with the recent work of Kendrick¹ and Barnett and Morse.²

The total productivity indexes, whose estimated changes are shown in the table, are made up of real output indexes divided by a weighted combination of indexes of labor and capital inputs. Much depends, of course, on the weights, coverage and time periods, so that differing results among estimates are not surprising. However, over the long period from about 1880 to the 1950's the three estimates show approximate correspondence.

Surprisingly, the productivity index for mining has advanced

1. Kendrick, *Productivity Trends in the United States* (National Bureau of Economic Research, 1961).

2. Barnett & Morse, *Scarcity and Growth* (Resources for the Future, Inc., 1963).

TABLE 1
TOTAL UNITED STATES PRODUCTIVITY INDEXES
COMPOUND ANNUAL PER CENT CHANGE

<i>Estimate by</i>	<i>Time Period</i>	<i>Agriculture</i>	<i>Mining</i>	<i>Manufacturing</i>
Vanek ³	1880 to 1950	1.1%	2.4%	1.7%
Barnett and Morse ⁴	1870/1900 Aver. to 1957	0.9%	2.1%	N.A.
Kendrick ⁵	1879 to 1957	1.2%	2.1%*	1.7%*
Kendrick ⁶	1937 to 1957	3.1%	1.7%*	1.8%*
Barnett and Morse ⁷	1937 to 1957	1.7%	2.7%	N.A.

faster over this period than productivity in either agriculture or manufacturing. Apparently, technical advances and discoveries of new resources have more than offset depletion or quality deterioration in existing mineral resources.

Concerning United States foreign trade, this phenomenon presents something of a puzzle. For the minerals content of United States exports has fallen and that of United States imports has risen significantly from 1880 to the 1950's. This trend would be consistent with declining relative United States productivities in mining, but the facts seem to show the opposite. Vanek sees the answer to this puzzle in a very rapid rise of the United States demand for minerals which caused the United States to become a net minerals importer in spite of the improvement in domestic minerals productivity.

Another possibility, which Vanek discounts, but which may be at least as important, is that minerals productivity abroad may have risen even faster than domestically—and it is the change in productivities relative to other countries which influences changes in comparative advantage.

The evidence found by Vanek on comparative productivity movements between the United States and foreign countries is scanty. For minerals, he bases the contention that United States productivity has risen faster than foreign productivities entirely on a few

* Total productivity to 1953, 1957 estimated by adjusting labor productivity.

3. Pp. 97, 98.

4. Barnett & Morse, *op. cit. supra* note 2, at 205, 206 (Derived by inverting cost indexes).

5. Kendrick, *op. cit. supra* note 1, at 362-64, 396, 467.

6. *Ibid.*

7. Barnett & Morse, *op. cit. supra* note 2, at 205, 206 (derived by inverting cost indexes).

statistics regarding coal mining. Yet it seems probable to this reviewer that a more detailed investigation would show a faster advance in mining productivity abroad than in the United States. Take petroleum, which represented about forty per cent of United States minerals imports in recent years. The period 1880 to 1957 was one of continual discovery of oil reserves both in this country and abroad. However, in the more recent decades, discoveries in the Middle East, North Africa, and Venezuela, have generally turned up much more productive wells than in the United States, with new foreign wells often producing ten times as many barrels per day than new United States wells (quite apart from any production controls in the United States). A similar observation might be made regarding iron ore, for instance. Thus, in a very large segment of the minerals trade, it is probable that foreign productivities have risen much faster than United States productivity, and that this has been a major cause of the rising minerals content in United States imports and the falling content in exports over the period.

Concerning the long run decline in the agricultural resource product content of United States exports—and the rising agricultural content of imports—Vanek finds the explanation in the slow rise of agricultural productivity relative to the industry and mining sectors. He is not concerned with trends in the last two or three decades, however, which show a dramatic reversal. As seen in the table above, agricultural productivity has been rising much faster than that of mining or manufacturing, at least according to Kendrick's statistics, which show an annual increase of 3.1 per cent for agriculture as compared to 1.7 per cent for mining and 1.8 per cent for manufacturing in the period 1937 to 1957. Foreign agricultural productivity may not have grown as fast relative to foreign industrial productivity, particularly in view of the rapid rise in manufacturing productivity in Europe and Japan and the growing industrialization of underdeveloped countries after World War II.

Thus, while the trend measured from 1880 was downward, comparative productivities since the late thirties should have raised the volume of United States agricultural exports both absolutely and as a share of the total. In other words, one obtains an entirely different impression of possible future trends when investigating the more recent period than one obtains from Vanek's concentration on the long run. Aware of the limitations of his study, Vanek judiciously refuses to make predictions and advises the reader to make his own investigation regarding future possibilities.

In fact, the trade statistics show a doubling of United States agricultural exports in real terms from 1939 to 1957, but total United States exports tripled so that the agricultural share fell behind. Thus, other factors probably outweighed the relative advance of United States agricultural productivity in that period, and the most important of these may have been the restraining influence of United States agricultural price support policies on United States exports. The most interesting possibility raised by the recent trends in productivity is that United States agriculture could more than hold its own in world markets if we changed from price supports, import restrictions, and export subsidies to a free trade policy in agriculture. This is a problem on which Vanek does not comment but which deserves closer attention of economists interested in agriculture, resource policy, and international trade.

Two other points, made in Vanek's book, are particularly worth noting. In chapters 4 and 9, Vanek provides a possible solution for Leontieff's "scarce factor paradox."⁸ Leontieff found that United States exports are relatively labor intensive, while United States imports of competitive goods would be relatively capital intensive if they were made in the United States. This is the opposite of the prevailing impression that the United States has a relative abundance of capital, and therefore would tend to export capital intensive goods and import labor intensive goods.

While there are some statistical objections to Leontieff's procedure and a number of possible explanations of the puzzle, Vanek advances a basic reason in terms of the third major factor, natural resources: With natural resources the relatively scarcest factor, United States imports tend to be natural resource intensive while exports tend to make greater use of the other factors of production, *i.e.*, capital and labor. There appears to be, however, strong complementarity in production—at least in the United States—between natural resources and capital, so that natural resource intensive products generally require the joint use of large amounts of capital. Thus, competitive imports can be more capital intensive (if they were made in the United States) than exports, because the imports are more natural resource intensive than the exports; and this re-

8. Leontieff, *Domestic Production and Foreign Trade: The American Position Reexamined*, Proceedings of the American Philosophical Society, September, 1953; Leontieff, *Factor Proportions and the Structure of American Trade: Further Theoretical and Empirical Analysis*, Review of Economics and Statistics, November, 1956, p. 386.

sult can be consistent with a greater abundance of capital relative to labor in the United States than in the rest of the world.

Another interesting point raised by Vanek is the following: Over very long periods, natural resources will become relatively scarce in the world and natural resource products can be expected to rise in price. But higher future prices, to be expected in time periods measured in generations rather than years, are not taken into account in the private market mechanism which has a more limited time horizon. Therefore, so Vanek claims, social values of primary goods exceed private values; and at actual market prices there has been a transfer of wealth from the primary goods-exporting poor nations to the importing rich nations.

Even if the Malthusian thesis is accepted that eventually natural resource intensive goods will rise in price relative to other goods—a proposition for which no evidence has been found so far in the long run trend of the terms of trade—Vanek's contention is questionable on several grounds. First, the owners of natural resources such as the King of Arabia, the Sheik of Kuwait, and the Venezuelan government are not necessarily poor. Second, and most important, Vanek's argument really states that exports of natural resource commodities, particularly minerals, should be taxed. In fact, mineral exports are already taxed by most countries at a rate considerably higher than other goods; for instance, Venezuelan petroleum taxes amount to over sixty per cent of profits and Chilean taxes take from seventy to eighty-five per cent of profits of the major copper companies. Thus, the social cost versus private cost argument may possibly be turned around; it could well be that existing taxes on mineral exports are too high, with prices after taxes exceeding social costs. The transfer of wealth from rich to poor countries, however, is a separate question subject to moral and political as well as economic criteria.

Vanek's study was originally written in 1957 as a Ph.D. dissertation at the Massachusetts Institute of Technology, and later modified for publication. The reviewer has found the empirical sections at times unnecessarily difficult. On the whole, Vanek has written an original book containing some excellent theoretical economic expositions which make a considerable contribution to the understanding of changes in the composition of international trade.

WOLFRAM LIEPE*

* Associate Professor of Economics, The University of New Mexico, Albuquerque, New Mexico.