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IMPORT SUBSTITUTION AND THE TERMS OF TRADE

by John Sheahan

with associated note on

INVESTMENT CRITERIA FOR IMPORT SUBSTITUTION

by Henry Bruton

Research Memorandum No. 28

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Williams College

Williamstown, Massachusetts

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The collection of ideas knotted together under the general heading of the terms of trade gained special significance for import substitution when Raul Prebisch and the Economic Commission for Latin America converted it into a weapon of attack against market-oriented policies.¹ The empirical part of the argument was that prices of food and raw material exports from poorer countries have decreased persistently relative to prices of manufactured imports and may be expected to go on doing so; the deduction from this was that developing countries should shift production from their exports to the goods that they had been importing even though costs of domestic production were higher than the current costs of importing. A series of careful analyses/^{has since} demonstrated that the facts were doubtful and that the step from measurement of the net barter terms of trade to a generalized case for import substitution was indefensible.² But they did not go on to construct a framework

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1. The Economic Development of Latin America and Its Principal Problems (Lake Success, New York: UN, 1950); "Commercial Policy in the Underdeveloped Countries," American Economic Review, May 1959, pp. 251-73; Towards a Dynamic Development Policy for Latin America (New York: UN, 1963), ch. 1.
 2. Cf. Robert Baldwin, "Secular Movements in the Terms of Trade," American Economic Review, May 1955, pp. 259-69; Theodore Morgan, "The Long-Run Terms of Trade Between Agriculture and Manufacturing," Economic Development and Cultural Change, Oct. 1959, pp. 1-23; M. June Flanders, "Prebisch on Protectionism: An Evaluation," Economic Journal, June 1964, pp. 305-26.

into which projections of the terms of trade, if properly established, could be put together to answer the policy argument about import substitution.

When the question is focused directly on import substitution, as distinct from concern with the distribution of income among countries or problems of the balance of payments, it becomes clear that neither the net barter terms of trade nor any other of the accepted concepts is directly applicable.³ The present paper suggests a measure to fill that gap and provides some illustrations of how it works out for recent years. The proposed measure has many of the defects of those commonly used: it has all the headaches of the standard comparisons of relative prices plus the problems involved in index numbers of changes in productivity. It differs from the familiar indicators only in that the concept which is so imperfectly measured corresponds more closely to the main point at issue.

Beyond the question of calculating national scores for the terms of trade, what could really be useful would be a formulation which could be disaggregated to specify relative advantage of economic sectors or more narrowly defined activities within each developing country. The measure proposed is intended to be a step in this direction: to provide a possible guide for sector allocation of resources.

3. The bible used to define the accepted concepts of the terms of trade is Charles P. Kindleberger, International Economics, 4th ed. (Homewood, Illinois: Irwin, 1968), pp. 73-77.

1. THE NET BARTER TERMS OF TRADE

The earliest studies of Prebisch and the Economic Commission for Latin America concluded that the poorer countries must produce and sell ever-increasing quantities of their exports per unit of their imports. The best empirical examinations of this assertion have been consistent in repudiating the idea that there was any such long-term historical trend against the prices of primary products through the nineteenth and the first half of the twentieth centuries.⁴ But Kindleberger's study, while finding little evidence of any such continuous deterioration in the relative prices of primary products, concluded that "there is something to the notion that the merchandise terms of trade tend to move against underdeveloped and in favor of developed countries."⁵ His explanation emphasized the relatively low degree of flexibility in resource allocation to be expected in the early stages of development. And one of the crucial forms of flexibility is precisely the ability to drop those exports which do not pay in order to move either toward new exports or to import substitution. Poor barter terms of trade do not prove that more import substitution is needed but they suggest that there is a case for considering it actively among the other ways of adapting to weak demand for major exports.

The somewhat reserved support Kindleberger provided for the

4. See especially Morgan, op. cit., and Kindleberger, The Terms of Trade (Cambridge, Mass., MIT, 1956), pp. 232-75.

5. Ibid., p. 307.

idea that there has been a long-term trend against relative prices of the exports of underdeveloped countries was strengthened by postwar data reviewed when he returned to the subject ten years later.⁶ While the Prebisch view of inexorable deterioration had been largely discredited by study of prewar data, it looked somewhat better when viewed as a forecast of the 1950's. The UN index of the net barter terms of trade for developing countries shows an average rate of deterioration of 0.9 percent a year from 1953 to 1967.⁷ On the other hand, it held almost exactly even for 1961-67 considered separately. The period of deterioration in the 1950's coincided with rising unemployment and slow growth in the United States; the better results for the terms of trade in the 1960's must have been favorably influenced by a period of much stronger demand in the U.S.

Theodore Morgan's studies of the same questions similarly discredit the proposition of any strongly adverse trend for primary products before the 1950's, while noting more of a tendency in this direction during that decade. But his main emphasis is on the diversity of experience for particular developing countries and products. For 1953-60, when the net barter terms of trade worsened for developing countries generally, they improved by more than 20

6. "The Terms of Trade of Primary Products," in Marion Clawson, ed. Natural Resources and International Development (Baltimore: John Hopkins, 1964), pp. 339-65.

7. Reference is to the index for "Economic Class II" countries, based on commodity prices, from United Nations, Yearbook of International Trade Statistics. The calculation given is based on a simple regression of the index against time.

percent for 3 of the 29 countries he reviewed.⁸ Similarly, his data for individual commodities, comparing 1960 to 1937 prices, demonstrates extreme differences among their changes. This diversity is exactly the point to which attention should be directed. It would be extremely costly for the developing countries to turn away from primary production in general but at the same time it could be advantageous for them to shift resources away from those particular products for which trends are adverse.

Price alone is not, of course, the only question. If price decreases are associated with major increases in volume, providing rising earnings of foreign exchange, this may be the central consideration, directing attention to the income rather than the net barter terms of trade. Or if costs of production come down more rapidly than prices, it may pay to keep on with a product despite adverse price trends. This latter question is considered, but not answered, by the factorial terms of trade.

II. THE INCOME AND FACTORAL TERMS OF TRADE

The purpose of the income terms of trade, the ratio of export earnings to an index of import prices, is to measure the buying power of total exports. This is often the measure stressed in connection with Latin American development problems, perhaps because so many of the countries in the area which have pushed industriali-

8. "Trends in Terms of Trade, and Their Repercussions on Primary Producers," in Roy Harrod and Douglas Hague, International Trade Theory in a Developing World (New York: St. Martin's, 1963), p. 61.

zation have been slowed down by inability to finance imports of capital equipment and production materials. It does not provide any indication whatsoever about the desirability of import substitution or any other form of reallocation.

As shown in Table 1 following, the income terms of trade improved for all developing regions in recent years. But the degree of improvement differed markedly among regions, and all of them lost a substantial fraction of the value of increased export volume because of adverse price changes. For all three of the regions given, the quantitative significance of the rise in export volume far outweighed the price components of the income terms of trade. For Latin America, where the evidence of foreign exchange constraints on growth is particularly widespread, the improvement of the income terms of trade was less than half of that for the other two regions. It may be noted that the main difference in results for Latin America was not attributable to worse price trends but to a greatly inferior achievement in raising export volume.

The industrialized countries (those designated as economic class I in United Nations tabulations), gained income from the developing regions through changes in relative prices between 1956 and 1966. Their export prices went up 7 percent and import prices down 1 percent. Since export volume increased 94 percent, their income terms of trade in 1966 improved to 2.10 times the level of 1956. As compared to Africa, the difference in degree of improvement was wholly a matter of better prices. As compared to Latin America the main part of the explanation was better performance of

**Table 1. Components of the Income Terms of Trade for Developing Regions
1956-1966**

	<u>Exports</u>		<u>Imports</u>	<u>Income T of Trade</u>
	<u>1966 prices relative to 1956 prices</u>	<u>1966 volume relative to 1956 volume</u>	<u>1966 prices relative to 1956 prices</u>	<u>1966 relati. 1956</u>
Developing Africa	0.94	1.94	1.03	1.77
Developing Asia	0.95	1.77	1.02	1.65
Latin America	0.96	1.41	1.02	1.33

Source: United Nations, Yearbook of World Trade Statistics, 1966 (Geneva: UN, 1968), pp. 32-33.

export volume, not prices. It should also be noted that the developed countries increased their exports of primary goods at almost exactly the same rate as their exports of manufactured products.⁹

The rise in exports of primary products from industrial countries was associated with changes in techniques permitting greatly reduced costs in many branches of agriculture. In both the United States and Western Europe output per man has been rising faster in agriculture than in manufacturing, reversing the relationship that prevailed up to the war. New techniques have come more slowly in the developing countries but are now spreading there too. They should result in greatly increased production and better living standards but are also likely to pull down export prices. These changes should call for considerable reallocation of primary production throughout the world, depending on the balance between changes in external prices and changes in costs for individual countries.

The factoral terms of trade, which are intended to bring changes in productivity into the picture along with changes in prices, could go in either direction as productivity gains rise. The single factoral terms of trade, which multiplies the net barter terms by an index of productivity in export fields, should in general rise for those countries with above-average productivity improvement.

9. United Nations, Yearbook of World Trade Statistics, 1966 (New York: UN, 1968), p. 35.

But this measure does not give any clear signal about the advisability of continuing with exports, whether it rises or falls, because it does not compare alternatives.

The double factoral terms of trade comes closer to the idea of weighing alternatives but not close enough because it compares the wrong things. It multiplies the net barter terms by a ratio between the domestic index of factor productivity in producing exports and an index of productivity abroad in the fields providing imports to the country concerned. This gives a measure of comparative rates of improvement of real incomes in home and foreign export sectors but not of alternative earnings in exports as compared to import substitution. The measure needed for decisions about resource allocation should instead weigh export prices and productivity against the sacrificed value of foregone domestic production for the home market.

III. A PROPOSED NEW MEASURE APPLICABLE TO IMPORT SUBSTITUTION

Jacob Viner suggested the right type of comparison many years ago, though his proposal looks and is most impractical as formulated because it involves non-measureable "utility indexes" intended simply to illustrate the theoretical concept.¹⁰ A relatively minor revision of the same general idea makes possible a formulation which could, at least in principle, be measured and

10. Studies in the Theory of International Trade (New York: Harper and Brothers, 1937), pp. 560-61.

applied to questions concerning desirable directions of import substitution.

Let P_x stand for an index of export prices, P_m for import prices, V_x for an index of labor productivity in production of exports, and V_m for a similar index of productivity in activities replacing imports. Then the proposed measure of the terms of trade relevant to import substitution, designated t_m , is:

$$t_m = \frac{P_x}{P_m} \cdot \frac{V_x}{V_m}$$

It will be noted that the form of this measure and three of its four terms are the same as those used for the double factorial terms of trade. But the meaning is different. An improvement in the double factorial terms of trade indicates something about international differences in income gains but nothing about resource allocation within the country considered. A positive trend for the measure proposed is a signal favoring a shift of resources toward exports and a reduction of emphasis on import substitution.

The measure given is a short-hand formulation of the general problem of allocation between two sectors if both their prices and costs are allowed to vary. The left hand ratio is simply the net barter terms of trade. This would be a valid indicator for resource allocation by itself if costs of production in both sectors were either perfectly stable or changed at the same rate. As Viner points out, this is just the way that the classical economists thought of the matter; they relied on the net barter terms of trade as a sufficient indicator because they usually considered

relative costs to be stable.¹¹ But there is less excuse for repeating the error now that technological change is so rapid: differences among rates of change in productivity for any extended period may easily be greater than differences among price changes in world markets.

The right-hand side of the measure is meant to be a proxy for changes in relative costs of production. If the ratio rises it states that productivity in export industries is increasing faster than productivity in fields of import substitution. This is a familiar, if notoriously inexact, way of estimating that costs of production are falling in export fields relative to costs in import substitution. It would be less exposed to objection if the V_1 referred to total factor productivity for all inputs. As used below, in the absence of more defensible measures, they refer only to labor productivity. If a greater rate of increase of labor productivity in export fields were purchased through disproportionately heavy inputs of capital and land, then a rise in the index could be a signal in the wrong direction.

Given all these qualifications, a conclusion that Viner's index of foregone utilities is just about as operational as the proposed measure would be understandable. But it may still be of interest to see how this measure of the import substitution terms of trade works out for recent years. Applying it first to all developing countries considered collectively, it shows a negative

11. Ibid., p. 561.

trend. As noted above, their net barter terms of trade deteriorated at a rate of 0.9 percent a year for 1953-67. The deterioration was concentrated in the 1950's but was not offset by improvement in the 1960's. FAO estimates of agricultural productivity for developing countries indicate a rate of improvement of 1.1 percent per year for the period 1953-61. UN indexes of labor productivity in manufacturing for developing countries show a rate of gain of 3.0 percent per year.¹² The difference of 1.9 percent in the two rates of productivity change was much more significant quantitatively than the trend of the net barter terms of trade.

The same approach applied to individual developing countries gives widely varying results, particularly because of marked differences among them in rates of labor productivity gains in agriculture. A sample of agricultural productivity improvement rates calculated by the FAO for nine developing countries shows a range from 0.4 percent a year for Thailand up to 4.5 percent a year for Malaysia.¹³ Turning this upside-down in the tradition of comparative advantage, the conclusion is that it would be a much greater mistake for Malaysia to push import substitution than it would be for Thailand, unless Malaysian experience with export prices is worse, or experience with productivity gains in manufacturing is better, by a joint difference of more than 4 percent per year.

12. FAO, The State of Food and Agriculture, 1965 (Rome: FAO, 1965), UN, Statistical Yearbook, 1966 (New York: UN, 1967), p. 56. The periods covered by these estimates differ: the calculation for agricultural productivity refers to 1953-61; that for productivity in manufacturing to 1955-63.

The proposed measure shares some conceptual difficulties with other indicators of terms of trade and creates some new ones of its own. The data refer to a particular period in the past, which may be unrepresentative and misleading about the future. The measures of productivity refer to labor which may, in the agricultural sector, be the least important input to be economized. And the whole approach, as with other indicators of the terms of trade, focuses on change from a starting point which may itself be far out of equilibrium.

The decade of the 1950's was clearly very special historically in that so many of the developing countries adopted policies intended to favor industrialization even at the expense of agricultural development. This often resulted in severe misallocation of capital, with inappropriately capital intensive techniques in industry and inadequate investment in agriculture. The resulting structure of gains in labor productivity undoubtedly overstated relative progress in industry, in the sense that the gains were purchased at high opportunity costs not reflected in the productivity data. This means that historical data on relative productivity trends between agriculture and industry do not serve as a useful guide for allocation decisions in those cases for which the system of prices and incentives has been badly distorted.

For all developing countries considered together, the

13. FAO, op. cit., p. 99.

observed ratio of productivity gains in manufacturing to those in agriculture was nearly three to one during the period considered. If the more extreme cases of autarky and distorted price systems were taken out, the remaining ratio would correspond more closely to real differences in rates of improvement and it would surely be lower. Some indication of what it might be is given by Kuznets' estimate of the prewar relationship in the countries that are now industrialized. He concluded that "the rate of growth in product per worker in the agricultural sector was at least two thirds of the rate of growth in product per worker for the entire economy."¹⁴ This relationship would still, of course, argue for shifting resources away agriculture unless the net barter terms of trade were moving strongly in its favor.

A related problem in considering agriculture is the possibility that labor inputs may have insignificant opportunity costs. In the extreme case of pure excess labor in agriculture, comparisons of changes in its productivity would be totally irrelevant. Three decades of research and debate on this question have led to a general conclusion that such cases must be rare if they occur at all.¹⁵ But there may still be many reasons why labor productivity could be a poor guide to cost changes in agriculture. In particular, output per unit of land may be a superior indicator.

14. Simon Kuznets, Modern Economic Growth (New Haven: Yale, 1966), p. 116.

15. Charles Kao, Kurt Anshel, and Carl Eicher, "Disguised Unemployment in Agriculture: A Survey," in Carl Eicher and Lawrence

Comparisons of gains in land productivity between industrial and developing countries for the postwar period, or from prewar averages to postwar, show the same patterns as comparisons of labor productivity: the rates of gain in North America and Western Europe were far higher than in the developing areas. But land productivity in the developing areas did improve slightly faster than labor productivity from 1953-55 to 1962-63, at 1.8 percent a year as against 1.1 percent for labor productivity.¹⁶ Clearly, an index of total factor productivity would be superior to measures for any single factor, but for the period indicated either one of the two considered would indicate that for the developing countries cost reductions in agriculture have been slower than in manufacturing.

A third source of possible confusion is that the measure proposed, like all other indicators of changes in the terms of trade, simply begs the question of whether or not the starting point is an equilibrium situation. If it is not, then even a perfectly correct identification of current trends may point the wrong way for decisions. The problem may be illustrated by applying the measure to data for Argentina.

Argentina is the median country in the above sample of productivity gains in agriculture, with an annual rate of improvement of 2.0 percent for 1953-61. Its net barter terms of trade

Witt, Agriculture in Economic Development (New York: McGraw-Hill, 1964), pp. 129-44.

16. FAO, op. cit., pp. 97-98.

deteriorated at about 0.5 percent a year, whether considered for that period or for 1955-64. For 1955-64, labor productivity in manufacturing apparently improved 6.0 percent a year.¹⁷ When these estimates are combined, the import substitution terms of trade indicate that the country should have been shifting resources from agriculture toward manufacturing, chiefly because of the high rate of gain of output per man in manufacturing.

The result is disconcerting because Argentina has long served as a model of a country which wasted growth potential by starving an export-oriented agriculture sector.¹⁸ It is very likely that the system of multiple exchange rates and biased incentives in effect at the beginning of the 1950's helped pull the economy far away from anything resembling an equilibrium position; that real income could have been much higher with more resources used in production of exports and fewer diverted to low-productivity manufacturing industries. Starting from such a distorted initial position, perfectly stable terms of trade would seem to suggest, falsely, that the distribution of resources should be left unchanged. The real meaning would be rather that trends in relative prices and productivities were in balance, neither adding to nor subtracting from the initial requirements for redistribution. In the example given, the deterioration of the import substitution

17. U.N. Statistical Yearbook, 1963, pp. 57, 94, and 1965, pp. 105, 156.

18. Cf. Carlos Díaz-Alejandro, "An Interpretation of Argentine Economic Growth Since 1930," Part II, Journal of Development Studies, Jan. 1967, pp. 155-74.

terms of trade means that trends in productivity and prices were working in such a way as to subtract from the losses caused by the initial set of distortions.

IV. RELATIVE PRICES AND PRODUCTIVITY GAINS AMONG BRANCHES OF INDUSTRY

Comparative advantage usually focuses on current relative costs and values, ignoring both price trends and differential rates of productivity improvement. It is understood that relative prices will change and that the optimum set of activities may alter correspondingly. The easiest assumption to make is that investors will study the trend of prices and avoid getting trapped in the wrong fields by basing their decisions on current prices alone. Similarly, it may be assumed that investors will not give up new possibilities because of high initial costs of production if they can plan on rapid subsequent increases in efficiency. Neither of these assumptions can be carried over to experience in developing countries with any great confidence; forecast improvements in costs come with steep discounts if they are believed at all, and current relative prices probably dominate thinking about profits. But the idea of building estimates of price and productivity trends into the process of decision is not in any sense contrary to the principle of comparative advantage.

The import substitution terms of trade tries to put in more formal terms the idea of including price and productivity trends in current decisions. It should be a useful formulation for multi-dimensional choices, though stated above with reference to two

sectors only. To consider an extended set of activities, p_m and v_m should be replaced by numeraires of average price and productivity improvement. Designating such numeraires as p_a and v_a the reformulation of the import substitution terms of trade applicable to sector i then becomes:

$$t_i = (p_i/p_a) (v_i/v_a)$$

The natural choices for p_a and v_a might appear to be the domestic wholesale price index and the average rate of labor productivity improvement for the economy as a whole. This would be a satisfactory solution for v_a but not for p_a . Domestic price trends in the typical context of import restrictions and other forms of price distortion could easily lead to choices among fields that would be inefficient for the economy as a whole. They often do. A preferable solution would be to use world prices for both p_i and p_a . If consideration is restricted to tradeable goods, for which world market prices or pre-tariff landed prices can be established, then an index p_a could be calculated for all such activities.¹⁹

The procedure suggested would thus involve combining world price trends with domestic trends in labor productivity. It would give high values to those goods for which world prices were rising

19. The calculation suggested would not be an easy matter by any means, but the necessary information on external prices is exactly the same kind as that already used successfully in calculations of implicit exchange rates. For a fine example, see Stephen R. Lewis, Jr., "Effects of Trade Policy on Domestic Relative Prices: Pakistan 1951-64," American Economic Review, March 1968, pp. 60-78.

faster than average unless the country's rate of productivity improvement for these goods were sufficiently below average to offset the price advantage. Alternatively expressed, it would call for development of those industries for which the rate of productivity improvement is above average, unless the relative value of that commodity on world markets were deteriorating at a rate sufficient to offset the superior productivity trend. It should be noted that this approach makes no distinction between export activities and import replacement. If the combined price and productivity trends are in the right direction then the activity would be preferred whether it is an import substitute or an export.

The idea just presented for selection among activities owes a good deal to an alternative approach proposed by Henry Bruton. He emphasized the importance of differential rates of productivity gain among sectors, and calculated the trade-offs between immediately higher costs and superior productivity gains for several sectors in specified Latin American countries.²⁰ A slightly rephrased illustration of his method may help to bring out the ways in which it differs from that proposed here. Table 2, following his approach, gives estimates of labor productivity gains by industrial groups for developing countries considered collectively and for more industrial countries as well.

20. "Import Substitution and Productivity Growth," The Journal of Development Studies, April 1968. See his note on "Investment Criteria for Import Substitution," attached to this paper.

Table 2: Rates of Growth of Labor Productivity in Manufacturing for Less Industrialized and for Industrial Countries, 1955-1964

	<u>Annual percentage increase in output per man, compound rates between end-years</u>	
	<u>Less industrialized countries</u>	<u>Industrial countries</u>
All Manufacturing	3.0	3.8
Light industry	2.2	3.4
Heavy industry	4.7	4.1
<u>SITC Sectors</u>		
20-22, Food products	1.6	2.5
23, Textiles	3.0	4.7
24, Clothing, footwear	2.8	2.5
27, Paper products	5.0	3.7
31-32, Chemicals, petroleum	4.5	7.2
33, Non-metallic minerals	3.6	4.6
34, Basic Metals	2.6	3.2
35-38, Metal products	4.8	3.7

Source: United Nations, Statistical Yearbook, 1966, (New York: UN, 1967). pp. 56-57.

Note: a highly appropriate footnote to the table in the original source underlying these calculations gives good reasons for the warning that, although these series "may have useful applications, they should not be interpreted as exact indicators of changes in labor productivity."

The structure of productivity changes shown for the less industrialized countries in Table 2 helps to bring out one of the chief reasons for the never ending conflict between those economists who emphasize comparative advantage and those who focus on the creation of new domestic industries regardless of relative costs. The fields of manufacturing that usually come closest to competitive costs for most developing countries, and often constitute the first exports of manufactured goods which are not dependent on special raw material endowments, might be identified with sectors 20-24 or with light industry in general.²¹ But the fields which would be favored by trade along lines of apparent comparative advantage are those for which productivity growth is slowest. Choice of fields according to relative performance in productivity improvement would favor paper and metal products in particular, heavy industry over light (except for basic metals), and import replacement over those lines of production more nearly able to compete in world export markets.

Bruton's formulation of the problem provides a suggestive bridge between current comparative advantage and prospective productivity changes. His method was to take the difference between

21. Compare the data on relative prices for Argentine manufactured products given in David Felix, "The Dilemma of Import Substitution -- Argentina," in Gustav Papanek, ed., Development Policy -- Theory and Practice (Cambridge, Mass.: Harvard, 1968), p. 85, and the set of price comparisons for eight Latin American countries and the United States in United Nations, The Process of Industrial Development in Latin America (New York: UN, 1966), pp. 130-43.

rates of productivity gain by sector in the individual developing company as compared to that in the United States for the same sector, pick out as candidates for future comparative advantage those sectors in which the developing country has the faster rate of gain, and then calculate the amount of initial excess cost that the developing country could expect to compensate within ten years by superior improvement of productivity.²² Using the data given in Table 2, this comparative approach would give a slightly different order of preferences. The first two sectors picked out without considering external productivity gains, paper and metal products, would remain the first two even after shifting attention to the difference in rates of productivity improvement between developing and industrial countries. But the latter approach would move clothing, basic metals, and food products up relative to chemicals, textiles, and non-metallic minerals.

Decisions on resource allocation, one would hope, would never be taken on the basis of evidence concerning such heterogeneous categories. But if this technique were applied on a more narrowly defined basis, should it be expected to give useful guidance? The reasons given earlier for introducing the new measure of terms of trade argue against using an order of preference selected by comparing domestic productivity gains to productivity gains abroad. Comparative rates of productivity growth at

22. Op. cit., Tables I and II, pp. 320 and 322.

home and abroad would be the key measure if they were translated directly into relative costs. To some extent, they are. But the correlation of price trends with trends in labor productivity is rarely exact. Divergences are introduced by the fact that total cost does not exactly parallel labor cost, by differentials in wages often acting to prevent translation of productivity gains into cost reductions, by differences in rates of growth of demand which cause long periods of above-or-below average ratios of price to cost of production, and many other factors. Developing countries should not steer away from fields in which productivity gains abroad are above average unless these productivity changes result in falling world prices.

It should be noted that Table 2 shows a productivity improvement of 3.8 percent a year for all manufacturing in industrial countries from 1955 to 1964. But average export prices for manufactured goods sold to developing countries by industrial countries did not decrease at all; they apparently increased at a rate of 2.2 percent a year.²³ The difference may be explained wholly or in part by differences in the combinations of products involved, but when the question is related to specific goods that are under consideration for production it is the price trend that matters and not productivity abroad.

The type of measure proposed above, combining world price

23. United Nations, Statistical Yearbook, 1966, p. 412.

trends with comparative rates of domestic productivity improvement, should point in the right direction for raising questions of priority. It does not take into account differences in initial cost levels. If product 1 scores high in terms of price and productivity trends, it may still be a mistake if its immediate cost of production is far greater than the cost of obtaining it through international trade. Similarly, it may have a relatively low rating in terms of price and productivity trends (as seems to be the case for textiles, a favorite early export of developing countries), but still be a desirable industry to develop if current opportunity costs are especially low. Bruton's method of comparing the dynamic gain against the immediate loss, calculating how great an immediate loss may be offset within a ten-year period, provides the essential correction necessary. The only difference suggested here is that the proposed new measure, combining price trends with domestic productivity improvements, be used instead of the comparison between domestic and foreign productivity gains.

V. CONCLUSIONS

Analysis of the terms of trade is inescapably linked to the question of what comparative advantage means. The two sets of ideas are sometimes treated as if they were separable, with the former referring primarily to the distribution of income among nations and the latter to the allocation of resources. But if a country's terms of trade change persistently this must ordinarily be more than a problem or a windfall with respect to foreign

exchange earnings; it must be a signal that comparative advantage is changing and that the structure of production should be changed along with it. The trouble with the familiar set of measures of the terms of trade is that none of them says anything systematic about the desirable direction of reallocation. The measure proposed here points toward ways of assessing the relative merits of export expansion as opposed to import substitution, taking into account the pattern of change in productivity as well as that of prices. Further, it could be adapted to help select among specific sectors and activities those which appear to be most favorable with respect to combined consideration of price and productivity trends.

Comparative advantage as it is often understood puts too much emphasis on current costs and prices, to the neglect of dynamic factors. If it were analyzed in terms of continuous evolution it might become at once more palatable as an idea for those concerned with development and more accurate as a guide to decisions. Arguments about the terms of trade at least have the merit of focusing attention on a process of change; where they mislead is that they neglect changes in relative costs in order to emphasize changes in prices. When changes in relative costs are brought into the picture along with changes in relative prices, the terms of trade come close to a dynamic formulation of comparative advantage.

INVESTMENT CRITERIA FOR IMPORT SUBSTITUTION

Henry J. Bruton

In the preceding paper John Sheahan points up the inadequacy of the net barter (and other conventional) terms of trade as a criterion for the allocation of investible resources between increasing the capacity of traditional export activities and increasing the capacity of import replacement activities. He suggests and defends a new measure of terms of trade, designated as the Import Substitution Terms of Trade, as the criterion. The purpose of this note is to derive this criterion in a somewhat different fashion, and to elaborate other implications of the use of such a criterion of allocation. It may be observed that the original version of this note was written independently of Sheahan's paper in an effort to formulate more satisfactorily than was done in my earlier paper¹ the conditions that must prevail before a

1. Henry J. Bruton, "Import Substitution and Productivity Growth," The Journal of Development Studies, April 1968.

country can profitably undertake import replacement activities. The present version, somewhat expanded, was prepared after reading his paper.

I

Consider a single, developing country producing a traditional

export commodity, X , and importing a manufactured commodity, M.²

2. That a single country only is considered is important. If all developing countries were assumed to proceed in the same way at the same time, a range of other problems appear which are not reviewed here.

(Groups of commodities may of course be considered, in which case X and M are indices.) In the present period, the economy has a given quantity of resources to invest to add to its productive capacity. If it invests all of these resources in traditional export activities the increase in foreign exchange earnings (FE) is

$$1) \Delta FE = \Delta X \cdot P_X + \Delta P_X \cdot X$$

where P_X is the price of X and the double increment component ($\Delta X \cdot \Delta P_X$) is ignored as being very small. For the present, assume that the income elasticity of foreign demand for X is zero. (This assumption is important and is relaxed in Part II.) Then unless the elasticity of foreign demand for X (E_X) is infinite, ΔP_X is negative. (And if E_X is infinite, then there is no problem.) Since $\Delta P_X = \frac{P_X}{E_X} \frac{\Delta X}{X}$, Equation 1) may be rewritten as

$$2) \Delta FE = P_X \cdot \Delta X \left(1 + \frac{1}{E_X}\right)$$

As E_X is negative, the expression on the right hand side is larger, the larger absolutely is E_X . To put the same point, ΔP_X is determined by E_X and $\frac{\Delta X}{X}$. Equation 2 expresses the increment in foreign exchange earnings in terms of a demand parameter, E_X , and a supply

variable, ΔX . The former is given from the standpoint of the country, and the latter depends on the physical productivity of the investible resources (given their quantity) in the traditional export activities.

If the investible resources were used to produce domestically the product (or products) which had been imported, M , the total "demand for foreign exchange replaced" is $\Delta M \cdot P_m$. The P_m is the import price of the good, not the domestic price. If $\Delta M \cdot P_m$ exceeds the ΔFE obtained from Equation 2) above, then the investment in M is more profitable than investment in X . More exactly, if import replacement is an immediately profitable use of resources (i.e., $\Delta M \cdot P_m > \Delta FE$ in the first period subsequent to the completion of the investment projects) the following inequality must hold:

$$3) \frac{P_x \Delta X \left(1 + \frac{1}{E_x}\right)}{\Delta M \cdot P_m} < 1$$

or

$$4) \frac{P_x}{P_m} \frac{\Delta X}{\Delta M} \left(1 + \frac{1}{E_x}\right) < 1$$

Now $\frac{\Delta X}{\Delta M}$ is the ratio of the increments in the physical outputs of X and M were all investible resources allocated to one or the other activities. It is therefore the ratio of the physical productivities of resources in the two areas. Write these productivity measures as A_x and A_m respectively and 4) becomes

$$5) \frac{P_x}{P_m} \frac{A_x}{A_m} \left[1 + \frac{1}{E_x}\right] < 1 \quad 3$$

3. To illustrate, suppose that both X and M are produced via a Cobb-Douglas production function and have the same production elasticities, then

$$X = A_x K^a L^b$$

$$M = A_m K^a L^b$$

Hence with a given quantity of capital and labor to apply, outputs will differ as the productivity coefficients, A_x and A_m differ.

The expression $\frac{P_x}{P_m} \frac{A_x}{A_m}$ is John Sheahan's Import Substitution Terms of Trade. He uses labor productivity as an indicator of A_x and A_m , a practice not without some empirical support. The expression in brackets shows what will happen to P_x as the increased exports occur. I.e., if $E_x > 1$, this expression is less than unity and the price decline (ΔP_x) is not such that it will completely offset the increase in the quantity that is exported. If world prices of X and M are assumed constant, then the allocation decision rests directly on the A's. If $E_x < 1$ the expression in brackets is negative, and as $\frac{P_x}{P_m} \frac{A_x}{A_m}$ cannot be negative, a demand elasticity below unity is a sufficient (but not necessary) condition for Inequality 5) to hold.

In a free trade, competitive world with trade balancing exchange rates, Expression 5 will exceed unity as long as $E_x > 1$. Under such conditions $A_x > A_m$ and prices follow costs so that Sheahan's Import Substitution Terms of Trade exceed one, and the entire expression exceeds unity. In this case of course new investment enters activity X.

Over a series of investment periods, it is necessary to consider the rates of change of the components of Inequality 5). For convenience write r_{ax} , etc. for the percentage rate of growth of A_x , etc. If 5) is greater than unity now, but $r_{am} > r_{ax}$ then, ceteris paribus, at some point in the future Inequality 5) will hold. Impounded in the ceteris paribus is the rate of change of P_m and the rate of change of E_x .⁴ If one further projected a declining P_x ,

4. P_m may change for numerous reasons, one of which is productivity growth in the rest of the world. If P_m follows productivity growth elsewhere, then r_{am} in the developing country must exceed the rate of growth of productivity in this activity in the rest of the world as well as in activity X at home.

(a falling E_x) and a rising P_m then the achievement of Inequality 5) will occur much earlier than if the entire weight is placed on $r_{am} > r_{ax}$. As Sheahan emphasizes declining net barter terms of trade (P_x / P_m) is neither a necessary nor a sufficient condition to shift to import replacement. Evidently if P_x / P_m is falling at 5 percent per year while A_x / A_m is rising at 6 percent, while E_x remains constant, Inequality 5) will not fall. Empirically, it is probable that P_x / P_m is declining or constant for most developing countries, and that this will not be altered by a rising E_x . Hence much depends on what is happening to A_x / A_m .

If productivity growth in activity M were independent of the level of output or investment in that activity, then no problem arises. The country simply waits until A_m has increased relative to A_x so that 5) is less than unity, and then allocates its resources

accordingly to Sector M. In this case the country will be maximizing its income at each period. Evidence on productivity growth does not support this position. The productivity of resources in a given activity rises only if the resources are used in that activity. Factors of production do not increase their productivity in the textile industry (or do so only very modestly) by being employed in the food processing industry. In this event the exploitation of the higher rate of growth of productivity in activity M means that resources must be allocated to this sector prior to the obtaining of Inequality 5). To do this requires that current income be sacrificed, and that protection be afforded to activity M. To sacrifice current income in anticipation of higher future income means that we shift from maximizing income in each period to maximizing its present value. And this in turn requires the use of a discount factor. The fact that $r_{am} > r_{ax}$ is not a sufficient condition for the import replacement. The discount factor employed must be such that the future higher income compensates adequately for the current sacrifice.⁵

5. For further elaboration of this point, see Bruton, op. cit.

As protection is necessary another major policy issue is created. There is some evidence that the nature of protection affects the rate of growth of productivity.⁶ Indeed, if protection

6. See Henry J. Bruton, "Productivity Growth in Latin America," American Economic Review, December 1967.

so reduced r_{am} , then this fact too would defeat the import substitution effort. What emerges from all this may be summarized briefly: to exploit a situation in which $r_{am} > r_{ax}$, some protection is required, and since protection distorts, some distortion is required. Distortion however can reduce the rate of growth of productivity, and consequently ways must be found to achieve the protection without dampening the productivity growth in activities M.

When $\frac{P_x}{P_m} \frac{A_x}{A_m}$ is declining due to a rising P_m or falling P_x (for whatever reasons) then there is no question of protection, and resources are not allocated to M in this event until Inequality 5) actually obtains. It is perhaps worth repeating that in no case does the projection of declining $\frac{P_x}{P_m} \frac{A_x}{A_m}$ necessarily imply that M should be protected or that resources allocated to its domestic production.

II

Throughout Part I the assumption was made that the income elasticity of demand (N_x) for X was zero. This assumption is unlikely to be realized, and it is useful to introduce a positive N_x into the analysis. The logic of the argument is unaffected, but the criterion to allocate resources to import replacement activities is, of course, a bit more demanding.

The initial consequence of a positive income elasticity of demand is the effect of ΔX on E_x , for now even with E_x less than

infinite, some increase in X is possible with no downward effect on P. So

$$6) \Delta P_x = \frac{P_x}{E_x} (r_x - N_x r_y)$$

Where r_y is the percentage rate of growth of world income. Then

$$\begin{aligned} 7) \Delta FE &= P_x \cdot \Delta X + \frac{P_x}{E_x} (r_x - N_x r_y) \cdot X \\ &= P_x \cdot \Delta X + \frac{P_x \Delta X}{E_x} - \frac{P_x N_x r_y}{E_x} \cdot X \end{aligned}$$

$$8) \quad = P_x \Delta X \left(1 + \frac{1}{E_x} \right) - \frac{P_x \cdot X}{E_x} N_x r_y$$

and Inequality 5) becomes

$$9) \frac{P_x A_x}{P_m A_m} \left[1 + \frac{1}{E_x} \right] - \frac{P_x X}{P_m \Delta M} \left(\frac{N_x r_y}{E_x} \right) < 1$$

The first term in 9) is Expression 5), but now a correction factor, the second term in 9), is necessary to recognize that rising world income affects the allocation decision. From Expression 9) it is evident that the income elasticity effect is greater, the larger are total foreign exchange earnings in the investing period, the smaller (absolutely) is the price elasticity of demand, and the larger is the income elasticity. The only surprise here is the way that the price elasticity enters. A low price elasticity via its role in the income effect can, to some extent, offset its role in the price effect.

With Expression 9, it is evident that the hurdles to be met before investment in M is profitable are considerably higher than

those shown by Expression 5). In particular, it is to be emphasized that now $E_x < 1$ is not a sufficient condition for import substitution investment. Indeed as just shown the smaller is E_x the higher will be the income effect against import substitution activities. Similarly, the explanation of the behavior over time of $\frac{P_x}{P_m} \frac{A_x}{A_m}$ is now more complex, and the policy implications of such behavior more difficult to pin down. In very general terms however the arguments of Part I hold. It is still only when $r_{am} > r_{ax}$ that it is necessary to consider violating the dictates of 9) in order to reap the rewards of this fact. And of course the discount factor must be applied in this case too before a final decision is reached. If 9) is falling for other reasons, then as in Part I a country will maximize its current income and the present value of its future income stream by continuing to allocate its investible resources to X until 9) in fact obtains.

Perhaps the two most important points emerging from 9) have to do with the roles of $P_x X$ and of N_x and E_x . It is evident that both N_x and E_x can be falling over time, and if E_x is falling more rapidly than N_x (a not unlikely circumstance), then $\frac{N_x r_y}{E_x}$ will rise for a constant r_y . This holds even as both N_x and E_x fall below unity. Since $P_x X$ is, in most developing countries, large relative to $P_m \Delta M$, (larger say than $P_x A_x$ is to $P_m A_m$), this result, added to the prospect of a rising $\frac{N_x r_y}{E_x}$, makes a projection of Expression 9 obtaining rest even more heavily than in Expression 5 on

assumptions about relative rates of growth of productivity in activities M and X. So the need to understand the nature and sources of productivity growth emerges again.

Sheahan's Import Substitution Terms of Trade represents the outcome of a number of processes, and it was to pin down the content of these processes that this note was prepared. Expression 9 provides the most inclusive statement, and shows that price and income elasticities, rates of growth of productivities, rates of growth of world income, and total foreign exchange earnings all enter the picture. Finally, it may be repeated that the policy implications of a projection of falling Import Substitution Terms of Trade depends as much on why they are falling as the fact that they are, and are presumed to continue, falling.