SOME EMPIRICAL EVIDENCE REGARDING RICARDO'S THEORY OF COMPARATIVE ADVANTAGE

A Thesis

Presented to

the Faculty of the Department of Economics

University of Houston

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

William D. Bronson

May 1969

SOME EMPIRICAL EVIDENCE REGARDING RICARDO'S THEORY OF COMPARATIVE ADVANTAGE

An Abstract of

A Thesis

Presented to

the Faculty of the Department of Economics

University of Houston

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

---

by

William D. Bronson

May 1969

ABSTRACT

This study is an attempt to verify the classical theory of comparative advantage as an explanation for the patterns of world trade in manufactured goods. Data from various United Nations sources are utilized to arrive at values for relative labor productivity and relative export values for thirteen industrial categories for a total of twenty-four countries. Correlation coefficients are computed for regressions on relative labor productivity and relative export performance for these countries. An effort is made to establish a pattern in the results obtained through consideration of such factors as per capita income, average differences in labor productivity, and average wage levels. It is concluded that the relatively poor results obtained are due primarily to the use of insufficiently detailed data.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

This study is an attempt to verify, through an examination of empirical data, the classical theory of comparative advantage. This theory was originally formulated by David Ricardo,[1] and essentially stated that a country would export those goods in which it had a comparative advantage in labor productivity and import those goods in which it had a comparative disadvantage. Later explanations of the basis for trade, also discussed in the body of this study, ascribed the basis for comparative advantage to such things as differing factor endowments. However, the hypothesis examined in the present study is based upon the original Ricardian formulation.

The results of a number of empirical tests of the classical theory of comparative advantage have been published, and these are reviewed below. In general, these studies of two-country models have found a reasonably good correlation between relative labor

---

[1]Some would give this honor to Torrens. See Robert Torrens, An Essay on the Production of Wealth (Reprints of Economic Classics, New York: Augustus M. Kelley, 1965), pp. 248-52.

productivity and relative exports. The correlation has not been significantly improved through consideration of other variables such as unit wage cost or net unit cost.

The present study utilizes data from various United Nations sources to arrive at values for relative labor productivity and relative export values for thirteen broad industrial categories for a total of twenty-four countries. These data are for calendar year 1958. Both simple and logarithmic correlation coefficients are computed for regressions of relative export performance on relative labor productivity for all possible pairs of nineteen countries. In addition, five other countries (for which data for all thirteen industries was not available) were compared with the United States. A further comparison was made of the United States and the twenty-three other countries in the study after elimination of trade with each other. This permitted an evaluation of relative export performance when facing an identical market, i.e., the rest of the world.

An effort is made to establish a pattern in the results obtained, examining countries in view of various factors such as per capita income, average differences in labor productivity, and average wage levels.

A review is then made of various imperfections in the structure of the international economic system which might explain the results obtained. It is concluded that while results of the empirical investigation do not give strong support to the classical theory of comparative advantage, this is primarily due to imperfections in both the international economic structure and the data utilized.

CHAPTER II

THE THEORY OF COMPARATIVE ADVANTAGE

The classical economists accepted the labor-embodied theory of value as the basis for the value of goods traded within a country. Factors, especially labor, were assumed to be mobile and to keep the price of a good from deviating from the value of the labor it contained. Each region of a country produced the goods which it could make more cheaply (i.e., with less labor) than other regions.

Since factors were relatively immobile internationally, the labor-embodied theory of value provided no explanation of the basis for trade between nations. The return to labor in one country could stay high or low relative to that in other countries for an indefinite period.

If trade were in two commodities, in each of which one country had an absolute advantage, the basis was the same as that for trade between regions. However, if one of the countries were more efficient in the production of both goods, absolute advantage could not then regulate trade. To explain trade in this situation, Ricardo

developed the law of comparative advantage.[1] If a country had an absolute advantage in the production of two goods, it would still probably have a greater advantage in the production of one of these goods than in the production of the other. It would export the good in which it had a greater advantage (or comparative advantage) and import the good in which it had a lesser advantage (or comparative disadvantage). This would be true even though it could produce the good in which it had a comparative disadvantage more efficiently in some absolute sense than the other country.

Ricardo explained this by use of an example in which he assumed that two countries, England and Portugal, traded in two commodities, cloth and wine. The following amounts of labor were required to produce a given quantity of wine and cloth in the two countries:

Country	Man-years per Unit of Cloth	Man-years per Unit of Wine
England	100	120
Portugal	90	80

[1] David Ricardo, The Principles of Political Economy and Taxation (third edition; reprinted, London: J. M. Dent and Sons, 1965), pp. 81-83.

It was assumed that one unit of cloth could be exchanged for one unit of wine after trade had opened up. In this situation, England found it advantageous to concentrate on the production of cloth to meet her needs in wine, rather than produce it relatively inefficiently at home. Conversely, Portugal found it advantageous to concentrate on the production of wine, and export additional wine to purchase the cloth she required. For example, if cloth were produced in Portugal, one unit would require the expenditure of 90 man-years of effort in its production; if these 90 man-years were devoted to the production of wine, which required 80 man-years per unit of output in Portugal, the resulting 1 1/8 units of wine could have been traded to England for 1 1/8 units of cloth. Conversely, if Portugal were content with one unit of cloth, she could have produced one unit of wine with only 80 man-years of effort and traded the wine to England for the unit of cloth, rather than use 90 man-years in its production at home. In either event, it was clear that it was advantageous for Portugal to engage in trade with England for the cloth she required, even though it was produced less efficiently in England.

A similar situation existed for England, even though she was at an absolute disadvantage in the production of both goods. If

England wanted one unit of wine, it would have required 120 man-years of effort for its production at home; if the same 120 man-years of effort had been devoted to the production of cloth, 1 1/5 units could have been obtained which could then have been traded to Portugal for 1 1/5 units of wine. If, on the other hand, England were content with one unit of wine, this could have been obtained by producing one unit of cloth, with the use of 100 man-years of effort, and trading it to Portugal for the unit of wine. Thus, it could be seen that trade was to England's benefit, although she was less efficient in the production of both goods than was her trading partner. Through this exchange, each country was enabled to enjoy more than if each produced all of its own needs, even though one of the countries was able to produce both goods more efficiently. Thus international trade did not require offsetting absolute advantages, but was possible where a comparative advantage (and therefore comparative disadvantage) existed.

John Stuart Mill[2] showed that trade in the Ricardian example did not have to take place at the price ratio where one unit of

---

[2]John Stuart Mill, Principles of Political Economy (fifth edition; New York: D. Appleton and Co., 1894), Volume II, pp. 139-43.

cloth equalled one unit of wine, but could take place at any price ratio between the limits set by the domestic price ratios before the opening of trade. Within these limits, the price ratio at which trade was actually conducted was determined by the relative strengths of the reciprocal demands of the two countries for the products involved. In the example, the limits would have been one unit of cloth equals 5/6 unit of wine (at which point England would have been as well of to produce both at home) and one unit of cloth equals 1 1/8 unit of wine (at which point Portugal would have been as well off to produce both at home). The value of one unit of cloth would thus have to be between 5/6 unit and 1 1/8 unit of wine for trade to take place. The exact value at which trade would take place would depend upon the relative strength of English demand for wine and Portuguese demand for cloth.

The labor-embodied theory of value was subsequently rejected as invalid, and Haberler advanced the idea of opportunity costs.[3] The cost of cloth in the long run was the amount of wine a country

---

[3]Gottfried von Haberler, The Theory of International Trade (London: William Hodge and Co., Limited, 1936) pp. 175-82.

had to give up to get additional units of cloth. Factors no longer used in the production of wine did not necessarily have to be used in the production of cloth, and therefore factor immobility was not the controlling factor. The question was simply how much of one commodity must be given up to get more of the other. This led to development of the production-possibilities or transformation curve, showing output when all factors were used for the production of either good and for all possible intermediate combinations of the two.

A straight-line curve indicated constant costs, and the slope of the curve represented the price. If the price deviated from this, resources would shift to bring it back to the equilibrium position. However, when countries traded at an intermediate price, each could sell the product in which it had a comparative advantage at a higher price. Therefore, with constant costs it would theoretically pay each country to concentrate all production on one product.

In reality, non-homogeneity of factors meant that costs were increasing (production possibilities curve concave to the origin) as output increased. At the extreme of production for either good,

large quantities of the other had to be given up since less and less substitution of factors was possible. With increasing costs, price could be found only with the addition of demand data. Production took place where the production-possibilities curve was tangent to the price line. Complete specialization was less likely with increasing costs. Consumption was on the price line at some point higher than the transformation curve due to the gains from trade. Generally speaking, if the price of X in terms of Y was lower abroad than at home, it would pay to shift resources from X to Y and trade added Y for X abroad until their relative prices were equal at home and abroad. Thus, a country exported that which was comparatively cheap at home, and imported that which was comparatively expensive.

Why did countries' production-possibilities curves differ? Bertil Ohlin advanced the theory that it was because different goods required different factor inputs, and countries had different factor endowments.[4] Goods were produced which made heavy use of factors common in a country. This gave rise to differences in the

---

[4]Bertil Ohlin, Interregional and International Trade, Harvard Economic Studies, Volume XXXIX (Cambridge: Harvard University Press, 1952), pp. 75-76.

structure of relative commodity prices, thus making international trade possible.

Problems can arise in practice because there is a range over which sutstitution of factors is possible in many kinds of production; the simpler factor-endowment explanation assumes identical production functions among countries for any given good. There is also a difficulty in defining factors; since they are not homogeneous, if they are very narrowly defined, it turns out that much trade is based on absolute advantage. Even so, Ohlin's explanation is broadly true. It is not the efficiency of factors as a whole that creates a basis for trade, but the existence of factor differences, or of differences in factor efficiency which are not the same for all commodities and which are not offset by differences in tastes. In the absence of transportation costs, trade would equalize all relative commodity prices. It also at least tends to equalize factor prices, through the export demand for services of the common factor and the imported "supply" of the output of the scarce factor.

For countries with roughly the same factor endowments and comparable tastes, with increasing costs relative prices would not

differ enough to disclose comparative advantages which would lead to trade. However, the existence of decreasing costs leads to specialization in production which provides a reason for trade. Differences in comparative costs come about not only because of differences in factor endowments, but also through specialization in different commodities, and thus the advantages of decreasing costs. Each country can then produce one good more cheaply than the other.

This was definitely a neo-classical analysis, in that it did not return to Adam Smith's growth-oriented framework. It was an effort at a more sophisticated reallocation analysis. It provided no clue as to how factor totals would change during growth or stagnation; is merely suggested that changes in factor totals were attributable to factor price changes. Although classical theory, especially as expressed by Ohlin, tends to stress identical production functions and differing factor endowments, much of today's trade is based on differences in technology.

If one country is small relative to the other, it may not effect the other's domestic price and thus will reap all of the

benefits from trade. Since the demand and supply aspects of the larger country overwhelm those of the smaller country, trade takes place at one of the limits, to the small country's benefit. However, in general, "offer curves" can be set up for the two commodities; each country will sell its export in small quantities at its starting price, but more and more only at higher and higher prices. The curves thus eventually bend backwards. Plotted on common axes, the countries' offer curves will cross at the ending price ratio between the starting ratios, showing quantities of each good being exchanged. The shape of the curve depends on how quickly domestic demand for the import is satisfied and how quickly supply of the export is exhausted.

Ohlin's factor proportions explaination of comparative advantage overlooked the influence of economies of scale, which could be influenced by domestic "representative demand," and also by cultural affinities between trading partners. It also overlooked the influence of transport costs, which were sufficient in themselves, without differences in factor proportions, to explain trade within a country. Also, at various sets of relative factor prices, the production function may have permitted efficient use of various

alternate factor intensities; the oftener this happened, the less influence differences in factor proportions would exert on relative commodity prices.

Staffan B. Linder[5] pointed out that the factor-proportions model was only one of a number of alternative ways of explaining differences in relative price structures. He argued that while the Ohlin version was adequate for explaining trade in natural-resource-intensive products, it was not adequate in explaining trade in manufactures.[6] He argued that a country could not achieve a comparative advantage in the manufacture of a good which was not demanded on the home market. Basically, the reason was unfamiliarity with foreign markets as compared with the domestic market. The production functions of goods demanded at home were relatively the most advantageous ones.[7]

Linder viewed potential imports as all products for which there was a home demand at going market prices; thus the range of potential

---

[5]Staffan Burenstam Linder, An Essay on Trade and Transformation (New York: John Wiley and Sons, 1961), p. 16.

[6]Ibid., p. 17.

[7]Ibid., pp. 87-91.

exports was identical to, or included in, the range of potential imports. Trade was potentially greatest between countries with similar demand structures, because potential export ranges were identical, whereas with differing per capita income they only overlapped somewhat. It followed that trade would be most intensive, measured as a percentage of national income, among countries with similar demand structures.[8] Trade could not be measured in absolute values since these depended upon the absolute value of per capita income. To the extent that per capita income determined demand structure, trade would be more intensive the more equal per capita incomes were. Linder assumed that tastes and distribution of income were similar. This similarity in demand structures implied similar factor proportions, since the average amount of capital per worker was a major element in determining per capita income. With these similar countries, trade was based on the same reasons as intraregional trade, which led to specialization once trade began. Over time, patterns of trade emerged. These patterns also changed over time, as differing growth rates altered demand structures at a differential rate. As the range of potential imports changed

---

[8] Ibid., p. 94.

so did the range of potential exports. At any one time, the pattern could be distorted by such things as cultural affinities. The factor proportions model maintained the opposite, since the more capital and labor proportions differed (hence per capita income and therefore demand structure), the more widely would commodity price structures differ and the greater would be the scope for trade. Linder was willing to retain only rent's tendency to equalization, due to trade in natural-resource-intensive products. He did not accept this tendency for labor or capital, since he thought that trade in manufactures had a different basis than factor endowments.

Linder believed that the conventional analysis overstated the gains from trade to underdeveloped countries. This was basically because import-competing industries were destroyed by imports and resources could not be reemployed, since a characteristic of underdeveloped countries was their lack of reallocative ability.[9] For a country starting at a subsistence level of income, this would be a serious situation. For growth countries, the conventional analysis understated the gains from trade. There was not only more

---

[9] Ibid., p. 32.

efficient allocation (higher marginal product), but new factors were developed (transport, management, etc.) to raise the total in a cumulative manner.[10]

Linder accepted the factor-proportions theory as explaining trade in primary (natural-resource-intensive) products.[11] Countries with equal per capita income could have competitive natural resource endowments, and comparative advantage would then explain trade. Even for countries with unequal per capita incomes, the income elasticity of demand for primary products could lead to much trade; there was a demand for such products over a wide income range, so there would be trade even without home demand.

Linder's empirical test was to examine selected countries' average propensity to import from other countries. His results tended to lend support to his hypothesis.[12]

---

[10] Ibid., p. 66.

[11] Ibid., p. 86.

[12] Ibid., pp. 110-123.

Kravis[13] advanced a theory to explain certain types of trade. According to him, the structure of trade was determined primarily by "availability"; that is, trade took place primarily in those goods not available at home. These could be unavailable in either the absolute sense, such as those requiring the use of some particular natural resource, or in the sense of having an inelastic supply at home or requiring heavy capital investment. Goods available at home were as a rule not traded, due to the existence of transportation costs, tariff barriers, and imperfect markets. These goods would be produced at home, although at a slightly higher cost than would be necessary if they were traded. Among those goods which were unavailable were those which were sufficiently differentiated to make them non-homogeneous with those available at home, and those resulting from technological breakthroughs or innovations.

---

[13] Irving B. Kravis, "Availability and Other Influences on the Commodity Composition of Trade," Journal of Political Economy, LXIV (April, 1956), p. 146.

CHAPTER III

SURVEY OF THE LITERATURE

A direct test of the classical comparative cost theory is not possible, because what is relevant are the pre-trade relative prices; with trade, relative prices are changed so that they no longer necessarily indicate their pre-trade relationships. For this reason, it is necessary to use something which would reflect pre-trade relative prices and also not be significantly altered by trade taking place. Relative labor productivities have been used as a proxy for relative prices for this reason.

It is assumed that relative labor productivities are not offset by differential wage or capital costs among the countries being examined. It is also assumed that prevailing exchange rates are at or near an optimum level and thus do not distort trade patterns. Technological levels are assumed to be similar enough to ensure that trade is based on relative factor productivity rather than on the absolute advantage of an advanced country.

The initial attempt to empirically verify the classical hypothesis was made by G. D. A. MacDougall.[1] For a sample of twenty-five industries, MacDougall sought to determine whether there was a relationship between relative labor productivity and relative export shares for the United States and the United Kingdom. The data he utilized were those compiled by Rostas for the year 1937.[2] MacDougall established the practice, followed by later investigators in the test of the two-country models, of eliminating trade between the countries being examined so that they faced identical barriers to trade. Thus, the market was the rest of the world.

MacDougall observed that during 1937, the average United States weekly wage in manufacturing industries was approximately double that in the United Kingdom. He hypothesized that there should be a substantial difference in the export performance of those goods in which United States labor productivity was more than twice that of the United Kingdom, as opposed to those in

---

[1] G. D. A. MacDougall, "British and American Exports: A Study suggested by the Theory of Comparative Costs, Part I," Economic Journal, LXI (Dec, 1951), pp. 697-724; and "Part II," Economic Journal, LXII (September, 1952), pp. 487-521.

[2] L. Rostas, Comparative Productivity in British and American Manufacturing (Cambridge: Harvard University Press, 1948)

which it was less than twice that of the United Kingdom. His reasoning was that labor productivity more than twice that of the United Kingdom was necessary for the United States to offset the disadvantage of paying higher wages, and thus to enable the United States to achieve a comparative advantage in the production of a good. If United States labor productivity was exactly twice that of the United Kingdom in any given good, in the absence of transport costs and any preferential tariffs, the two countries would have precisely the same selling price per unit of output in the world market, and thus neither would be able to secure a comparative advantage over the other in this particular good. If, however, either of the two countries were able to secure a comparative advantage in a particular good by having labor productivity which was more than high enough to offset the differential in wage rates, theoretically that country would capture the entire market for that good in third countries. However, this situation would never in fact occur, due to the imperfectly competitive nature of world markets, transportation costs, differential tariff barriers to be overcome, and the lack of homogeneity among most manufactured goods.

MacDougall found that the results of his analysis generally supported the hypothesis that export performance was a function

of differentials in labor productivity.[3] There was an approximately linear relationship between relative labor productivity and export ratios, and in addition a good inverse relationship between relative wage costs per unit of output and relative export performance. However, MacDougall found that there was a lack of exact correspondence between relative labor productivity and relative exports. He constructed a graph with relative labor productivity on the vertical axis, and relative exports on the horizontal axis, and noted that when plotted on a double logarithmic scale the regression line passed through the horizontal dividing line of two (the point at which United States output per worker was twice that of the United Kingdom) at a point well to the left of the vertical dividing line with a value of one (at which point United States and United Kingdom exports were equal). This showed that United States exports were only about 40 percent of those for the United Kingdom, even when output per worker was sufficient to offset the higher United States average wage rate. MacDougall believed that data measuring only direct labor productivity tended to overstate

---

[3]MacDougall, Part I, op. cit., p. 698.

the relative superiority of the United States. He felt that it was probable that United States efficiency in providing indirect services such as transportation and distribution was much less than twice that of the United Kingdom, and that if this factor could be taken into account the regression line would cut the horizontal line at a point much closer to equality of United States and United Kingdom export volume. On the whole, MacDougall concluded that his analysis had given support to the classical comparative cost hypothesis.

Robert M. Stern conducted an anlysis similar to that of MacDougall, and attempted to take into account additional variables.[4] He attempted to test the classical comparative cost hypothesis making use of output per worker, export quantities, unit wage costs, unit net costs, and export prices in a test of data for the United States and the United Kingdom. He utilized productivity data furnished by a study conducted by Paige and Bombach on forty-four selected manufacturing industries for the United States and the United Kingdom.[5]

---

[4]Robert M. Stern, "British and American Productivity and Comparative Costs in International Trade," Oxford Economic Papers, New Series, XIV (October, 1962), pp. 275-79.

[5]Deborah Paige and Gottfried Bombach, A Comparison of National Output and Productivity of the United States and the United Kingdom (Paris: The Organization for European Economic Cooperation, 1956) p. 64.

Making use of the Paige and Bombach estimate that in 1950 the average United States weekly wage in manufacturing industries was approximately 3.4 times that in the United Kingdom, Stern found that in those industries where United States output per worker exceeded United Kingdom output per worker by a factor greater than 3.4, the United States had larger exports than the United Kingdom; in those industries where United States output failed to exceed that of the United Kingdom by a factor of 3.4, the United Kingdom had larger exports. He also noted that what trade took place between the United States and the United Kingdom followed established comparative advantage lines.[6]

In addition to his test of the data for 1950, Stern compared relative labor productivity and export performance for the years 1937, 1950, and 1959 for the United States and the United Kingdom. In the comparison of the data for 1937 and 1950, he found that in the latter year there was a noticeable increase in the productivity of the United States industries which had been low-productivity

---

[6]Stern, op. cit., p. 284.

industries and operated at a comparative disadvantage in 1937. Likewise, in the industries in which United States productivity had been highest in 1937, by 1950 the United Kingdom had improved its relative export performance. Making a similar comparison of data for the year 1950 and 1959, Stern found a continuation of this trend, with the United States gaining in the exports of its industries which had in the past operated at a comparative disadvantage, and the United Kingdom gaining in exports in those industries which had formerly been characterized by high United States productivity. He concluded that there had been a trend toward the narrowing of comparative costs between the United States and the United Kingdom from 1937 to 1959.[7] This appeared to be accounted for by both continuing technological change and the appearance of different patterns of factor substitution.

Stern further tested the classical hypothesis using unit wage costs and export quantities. He utilized the data MacDougall had

---

[7] Ibid., p. 281.

used for 1937 and confirmed the latter's finding that there was a good inverse correlation between relative unit wage costs and relative export performance. This finding held for twelve of the thirteen industries tested. However, when he made the same test on the same industries using data for 1950, only nine of the industries fitted the inverse relationship. Since two of the four industries which did not fit this relationship appeared to be special cases,[8] only two were in fact exceptions. He therefore concluded that the alteration in the ratio of United States average weekly wages to those in the United Kingdom from 1937 to 1950 had not significantly effected the inverse relationship, and therefore this gave additional support to the classical hypothesis.

Utilizing the 1950 data, Stern attempted to see whether MacDougall's conclusions regarding factors other than labor productivity were still valid. His regression line cut the horizontal line (representing United States output per worker 3.4 times that of the United Kingdom) at approximately .8, indicating that the exports of the United States were only 80 percent of those

---

[8]That is, they had also failed to show good correlations between relative labor productivity and relative export performance.

of the United Kingdom even when United States productivity was high enough to offset the higher average weekly wages in the United States. Stern believed that this improvement over the 40 percent figure found by MacDougall was due to United States output in non-manufacturing industries having risen faster than that of the United Kingdom from 1937 to 1950, with the result that United States manufacturing industries were placed under less of a handicap than they had been in 1937. In addition to this test of the same thirteen industries tested by MacDougall, Stern selected a sample of thirty-nine industries from the Paige and Bombach data for 1950. For this larger sample, his regression line passed through the point of unity on the vertical line at almost exactly the 3.4 value, thus yielding a result consistent with the classical hypothesis without reference to anything but labor productivity.[9] However, in this larger sample, there were five industries which did not conform to the expected pattern. This result was quite similar to that obtained by examination of the output per worker and export performance.

---

[9]Stern, op. cit., p. 286.

Stern also investigated the desirability of using net unit cost (which includes capital cost and profit as well as unit labor cost) as the independent variable, and found less correlation than with the use of either output per worker or unit labor cost. He concluded from this test that relative costs among different countries for factors other than labor were subject to greater variability than were relative labor costs, and therefore net unit cost was unsatisfactory in a test of the classical theory of comparative costs.[10]

In the use of export price data, there are limitations, since export prices refer to gross values, but Stern used the data for 1950 and 1959 and found that a fairly good inverse relationship existed between export prices and export quantities.[11] This tended to support the classical hypothesis, since it was assumed that relative labor productivities were proportional to relative prices. This involved the implicit assumption that

---

[10] Ibid., p. 294.

[11] Ibid., p. 291.

other factor costs and the indirect costs of production did not offset labor productivity.

An additional test of the classical theory of comparative costs was performed by Bela Balassa.[12] There are differing explanations of the causes of international specialization. The classical theorists presupposed the existence of inter-country differences in production functions. Ohlin assumed identical production functions and qualitatively identical factors of production in the trading countries and attribute international specialization to differences in factor endowments. Leontief's tests revealed that this, at least, requies modification.[13]

Balassa's paper concerned the validity of the classical model. In the classical formulation, comparative advantage based on the relative productivity differentials determined international

---

[12]Bela Balassa, "An Empirical Demonstration of Classical Comparative Cost Theory," The Review of Economics and Statistics, XLV (August, 1963), pp. 231-38.

[13]W. W. Leontief, "Domestic Production and Foreign Trade; The American Capital Position Re-examined," Proceedings of the American Philosophical Society, XCVII (September, 1953), pp. 332-49.

specialization. Although intercountry differences in the wage structure and the capital/labor ratios of various industries may have compensated for productivity differentials, defenders of the classical theory, such as Taussig,[14] did not think these factors were important enough to significantly change the trade pattern as determined by relative differences in productivity.

Balassa sought to test the classical hypothesis in the following form:

Notation:

C = Unit Cost

A = Labor Input per Unit of Output

W = Wage Rate

T = Ratio of Capital plus Labor costs to Labor Costs

Subscripts I and II refer to two countries.

Capitals refer to commodity X, small letter to commodity Y.

---

[14]Frank W. Taussig, International Trade (Reprints of Economic Classics, New York: Augustus M. Kelley, 1966), pp. 43-60.

Modified classical hypothesis:

$$\text{If } \frac{A_I}{A_{II}} < \frac{a_I}{a_{II}}, \qquad (1)$$

It was likely also that

$$\frac{C_I}{C_{II}} < \frac{c_I}{c_{II}}, \qquad (2)$$

When the latter expression was equivalent to

$$\frac{A_I W_I T_I}{A_{II} W_{II} T_{II}} < \frac{a_I w_I t_I}{a_{II} w_{II} t_{II}} \qquad (3)$$

Consequently, country I would export commodity X, and country II would export commodity Y.

Balassa, in his test of the classical comparative cost hypothesis, utilized the Paige and Bombach data which Stern also used for the United States and the United Kingdom for 1950.[15] Balassa's export figures were for 1951, and referred to export values rather than to quantity, because while the use of export

---

[15] Page and Bombach, loc. cit.

quantities was theoretically preferable it was difficult to separate export prices and quantities. He utilized export figures for 1951 because he considered 1950 an abnormal year since the full effects of the 1949 devaluation of the British pound had not yet made themselves apparent. His sample included twenty-eight industries which accounted for approximately forthy-two percent of the manufacturing output of both the United States and the United Kingdom. Each industry included represented at least one third of one percent of the total manufacturing output in each country. He excluded passengar cars and also electrical household equipment from the sample because during the period under consideration a number of countries discriminated against United States consumer durables as opposed to those of the United Kingdom. As in the other tests of the classical comparative cost hypothesis, trade between the two countries was excluded in order to test their performance in the same market. It was implicitly assumed that the elasticity of substitution between United States and United Kingdom exports of any given commodity was greater than unity. Balassa's hypothesis was that a positive correlation existed between labor productivity and export performance.

Balassa found that there was, as hypothesized, a good positive correlation.[16] He also tested the 1950 productivity data with 1954-56 export values (justified by the assumption that year-to-year changes in productivity were small, and showed up in exports only after a time lag), and found that a similar result was obtained. This later sample included passenger cars and household electrical equipment since discrimination against United States consumer durables had largely ended by 1954. Balassa also plotted the regression line for twenty-seven industries on a logarithmic scale and found that the correlation was somewhat improved. Inclusion of the wool industry in the regression reduced the correlation somewhat; this appeared to be due to the strong differentiation which United Kingdom woolens enjoyed due to their reputation for high quality. Since this was therefore a non-homogeneous good, this reduced correlation did not tend to invalidate the classical hypothesis.

Balassa attempted to determine whether the inclusion of unit labor costs improved the correlation, through the inclusion of

---

[16] Balassa, op. cit., p. 235.

relative wage ratios as an additional explanatory variable. He utilized a multiple regression equation with the productivity ratios and wage ratios as independent variables and the export ratio as the dependent variable. The results were not significantly better than with the use of the productivity ratio alone, although the logarithms of the ratios produced a slight improvement in the correlation. He therefore concluded that productivity differences alone, without consideration of wage ratios, accounted for most of the observed differences in export performance.[17] This directly conflicted with MacDougall's analysis, which found a close relationship between relative wage ratios and export ratios for the United States and the United Kingdom.

Balassa also attempted to determine whether consideration of unit costs improved correlation. As Balassa used the term, net costs were equal to value added plus depreciation; the latter term was used to reflect the capital costs involved in production. The resulting correlation was very similar to that obtained with the use of labor productivity alone, indicating that any variations

---

[17] Ibid., p. 236.

in capital cost among industries had little influence on export performance. Relative labor productivity remained the best explanatory variable in the examination of export performance.

The only finding of Balassa's which appeared to be in contradiction to the findings of the studies discussed earlier is the fact that the correlation between wage ratios and export shares is quite low. He presented two possible explanations of this. One was that of Taussig, who believed that wage structures were similar among different countries, since competition was largely within groups working in similar circumstances. A hierarchy of non-competing groups, essentially similar in all countries, existed due to such factors as skill requirements, the disutility of work, and other factors which have a similar effect in all countries.[18] The other possible explanation was that of Kravis,[19] who pointed out that the assumption of non-competing groups in different countries was not really necessary,

---

[18] Taussig, loc. cit.

[19] Irving B. Kravis, "Wages and Foreign Trade", The Review of Economics and Statistics, XXXVIII (February, 1956), pp. 14-30.

since, compared with productivity differences, wages paid in different industries tended to cluster around the national averages. Thus there was no particular reason to expect that there would be a good correlation between wage ratios and export performance. Balassa pointed out that this tended to cast doubt on the widely held idea that cheap wages were a significant factor in determining the export patterns of a country's manufacturing industries. There also appeared to be little empirical basis for the belief that high wages and high productivity necessarily go together, as was generally assumed.

In discussing the lack of additional explanatory power when considering capital costs per unit of output, Balassa pointed out that what he considered was not the same thing as a high capital-to-labor ratio, or capital intensity. There may well be a hierarchy of capital intensity in different countries. Sophisticated technological methods may enable the use of higher capital intensity to reduce the capital costs per unit of output, and thus no correlation with export performance would necessarily exist.

Jagdish Bhagwati[20] believed that the evidence developed by MacDougall, Stern, and Balassa was not really adequate to provide a complete test of the classical theory of comparative advantage. He did not agree that the relation of labor productivity (or wage costs per unit) to export performance was all that was needed to validate the classical theory, although these relations did to some extent overlap the classical theory.

Bhagwati believed that the correct method of testing the classical hypothesis would be through examination of the ranking of relative productivity and/or unit wage costs by industry for each of the countries, although it would be difficult to obtain data to permit such a test.[21] His concern was that, while comparative labor productivities may provide a good index of pre-trade prices, the opening up of trade may lead to changes in the profits of the country's export industries, which would have no impact on labor productivities. If this occured, it might be possible to find evidence that export performance correlated well

---

[20]Jagdish Bhagwati, "The Pure Theory of International Trade: A Survey," Economic Journal, LXXIV (March, 1964), pp. 1-78.

[21]Ibid., p. 14.

with labor productivity, but labor productivity would no longer correspond to the relative prices of goods traded. In this situation, favorable results would not constitute a valid test of the classical hypothesis. The results would appear to be favorable to the classical hypothesis, but upon closer examination it would be revealed that we had finished up by measuring something different than that which we had started measuring. In view of this possibility, Bhagwati contended that to preclude the possibility of having made an invalid test for this reason, the studies referred to should have gone on to verify that labor productivity ratios were indeed closely correlated with price ratios. Bhagwati's test of the classical hypothesis thus centered upon an attempt to verify the implicit assumption of the earlier studies, that comparative labor productivities or comparative unit wage costs provided a good approximation of relative prices.

In conducting this test he made use of f.o.b. export prices. There were two sets of data; one of them consisted of twenty-two industries for which he related relative labor productivities and relative export prices for the United States and the United Kingdom for the years 1937 and 1950. The other set consisted of twenty-five industries from the Paige and Bombach sample for

1950.[22] In a linear regression of export ratios on labor productivity ratios for both of these sets of data, there was no significant correlation, even when the logarithms of the numbers were used.[23] For the sample of twenty-five industries, Bhagwati was also able to make a regression of export ratios on unit labor cost ratios, and once again found no significant correlation, although the result was somewhat better than those obtained in the regression utilizing the labor productivity ratios.[24] In a multiple correlation, Bhagwati also used both labor productivity ratios and unit wage cost ratios as independent variables and export ratios as the dependent variable, and was able to obtain no significant correlation.[25] In summary, Bhagwati's results indicated that he may have entered a valid objection to the empirical testing done by previous authors, and his findings cast doubt on the validity of the classical model.

---

[22] Paige and Bombach, op. cit., p. 64.

[23] Bhagwati, op. cit., p. 15.

[24] Ibid., pp. 15-16.

[25] Ibid., p. 16.

CHAPTER IV

EMPIRICAL TEST

The present study makes use of the basic technique developed by Balassa in his test of the classical theory of comparative advantage.[1] Briefly, this technique consists of constructing for every industry a ratio of the labor productivity figures and another ratio of the export figures for the pair of countries being tested. In the construction of both of these sets of ratios, the same country is used as the base. A linear regression of the export ratios is then done on the labor productivity ratios, and a coefficient of correlation is computed. Another regression is done on the logarithms of the ratios, and a coefficient of correlation is again computed.

The study is based on thirteen industries which conform to the manufacturing section of the International Standard Industrial Classification (ISIC), as described below. All data are taken from United Nation sources, and therefore it is assumed are consistent betwen countries.

---

[1] Balassa, op. cit., pp. 231-32.

Value added per production worker in manufacturing industries has been used as the measure of relative labor productivity, which in turn is considered to be a proxy for all costs of production. No attempt has been made to take into account the differences between countries in capital intensity productivity. Thus the analysis confines itself to the test of the hypothesis that relative export performance is a function of relative labor productivity. The selection of the thirteen industries utilized in this test was based on the availability of this value added data on an internationally consistent basis, although it was recognized that a larger sample of industries would have been desirable.

The following is a list of the industries utilized in the present study:

Industry No.	ISIC Code	Description
1	20-22	Food, beverages, and tobacco
2	23	Textiles
3	24	Clothing, footwear, and made-up textiles
4	25-26	Wood Products and Furniture
5	27	Paper and Paper Products

Industry No.	ISIC Code	Description
6	28	Printing and Publishing
7	29	Leather and Leather Products (except wearing apparel)
8	30	Rubber Products
9	31-32	Chemicals and Chemical, Petroleum, and Coal Products
10	33	Non-metallic mineral products
11	34	Basic Metals
12	35-38	Metal Products
13	39	Other manufacturing

Detailed reporting of commodity imports and exports is not done by the United Nations on a basis directly comparable to the breakdown by industry given above. However, data at the commodity level which show each country's exports of a particular commodity with, in many cases, the country of destination, are available based on the Standard International Trade Classification (SITC). It was possible to make a comparison of ISIC industry categories with SITC commodity categories which resulted in a set of

commodities which make up each of the industries listed above.[2] This detailed comparison is presented in Appendix A.

Value added data were available for the years 1939, 1947, 1954, and 1958, with data for the largest number of countries available for 1958; this, combined with the availability of commodity export data for 1958, led to the choice of this as the year for which this test would be conducted. For 1958, commodity export data were available for all trade of a total of twenty-four countries, all of which were included in the test.[3]

Appendix B contains a complete list of value added data[4] and total export data,[5] in United States dollars, for each of thirteen indsutries for all twenty-four countries used in the present study. In addition, it was possible to eliminate trade between particular

---

[2]Harold T. Goldstein, The International Standard Industrial Classification and the U. S. Standard Industrial Classification (Washington, D.C.: Bureau of the Census, 1965). A complete list of SITC commodity codes was obtained from United Nations, Commodity Trade Statistics - 1958 (New York: United Nations, 1959)

[3]There are a few minor exceptions in the value added data for the year 1958; these are noted in Appendix B.

[4]United Nations, Growth of World Industry - National Tables 1938-61 (New York: United Nations, 1964)

[5]United Nations, Commodity Trade Statistics - 1958, op. cit.

countries for twenty-two of the twenty-four countries examined;[6] due to the very large volume of data it was decided to eliminate the exports of each of the twenty-one countries in turn to the United States, leaving exports to the world excluding the United States. These data are also presented in Appendix B. Exports from the United States to each of these twenty-one countries were eliminated in turn from United States export figures; the resulting data are presented in Appendix C. This made possible a comparison of correlations obtained for the United States paired with each of the other twenty-one countries with trade between them both included and excluded, and an evaluation of the impact this adjustment has on the results obtained. It would have been desirable to eliminate trade between each pair of countries before computing correlation coefficients, but it would have been possible to do this accurately only by examining the destination of every commodity exported by every country. This would have multiplied an already considerable volume of paperwork several times over, and it was not considered practical to do so. However, an evaluation of the significance

---

[6]This was not possible for Mexico or Israel.

of the technique indicates that for the present study this probably introduced an insignificant amount of error. Correlation coefficients for each country in the study paired with the United States, for both total trade and trade to third countries, are presented in Appendix E. The results generally show no significant change in either direction in the coefficients obtained. The changes which do take place exhibit no apparent pattern, with both slight increases and slight decreases occuring.

For nineteen of the countries included in the study, data were available for all thirteen industries listed above. For the remaining five countries, value added data for from one to three industries were unavailable.[7] For this latter group of countries, a separate approach was utilized. For the countries for which data were available for all industries, value added and total exports by industry were compared for every possible pair of countries. Using value added as equivalent to labor productivity, labor productivity was taken as the independent variable and a regression of export values on labor productivity was done. As

---

[7]These countries were Belgium, Ireland, Turkey, Trinidad, and Tobago, and Yuogoslavia. Industries for which data were unavailable are noted in Appendix B.

mentioned above, this was done by comparing the ratio of labor productivities with the ratio of exports for each industry. Since it was found that the results varied widely depending on which country was used as the base in the construction of these ratios,[8] correlations were done for all possible pairs of ninetten countries, that is, for three hundred forty-two combinations. In addition to these regressions, regressions were done on the logarithms of the ratios. Results of both of these regressions are presented in tabular form in Appendix D.

For the remaining five countries in the study, for which value added data were not available for from one to three industries, it was difficult to make comparisons with all others. Regressions were done for these countries on ratios computed using the appropriate industries for the United States only. The results of these regressions are included in Appendix E.

In order to analyze the correlation coefficients which appear in Appendices D and E, it was necessary to consider factors which

---

[8]This point was not brought out by Balassa in his study. His choice of the United Kingdom as the base country (=100) was based on the fact that United States relative figures were greater than 100, which simplified manipulation of the numbers.

might provide a theoretical basis for expecting patterns to emerge when considering various countries. The following factors will be used in analyzing the results:

Per capita income

Average labor productivity

Average wage level

Appendix F gives average per capita income for the countries in this study for 1958.[9] These have been divided into the following groups:

Per capita income greater than $1200

Per capita income from $800 to $1200

Per capita income from $500 to $800

Per capita income less than $500.

The following tables display the linear correlation coefficients for the countries in each of these groups compared to other countries in the same group. As mentioned in Chapter II above, Linder argues that trade should be most intensive among countries with similar

---

[9]United Nations, Yearbook of National Accounts Statistics - 1966 (New York: United Nations, 1967). The figures given are defined as per capita gross domestic product at factor cost. Figures for Malaya and Trinidad and Tobago were not available and are estimates of the present writer.

per capita incomes, other things being equal.[10] His preliminary empirical testing of this hypothesis, utilizing data for 1958, indicated that this appeared to be the case. With such high-intensity trade, it would be reasonable to expect it to follow lines indicated by the operation of comparative advantage. Thus one would expect to find about the same degree of correlation within the following groups of data.

TABLE I

COUNTRIES WITH PER CAPITA INCOME GREATER THAN $1200

Compared to:	United States	Canada	Sweden	New Zealand	Australia
Base Country					
United States	--	.356	.422	.038	.460
Canada	.038	--	.124	.133	.357
Sweden	.023	-.020	--	-.244	.094
New Zealand	.313	.003	.120	--	.264
Australia	.390	-.032	-.143	.614	--

[10] Linder, op. cit., p. 94.

TABLE II

COUNTRIES WITH PER CAPITA INCOME FROM $800 TO $1200

Compared to:	Denmark	United Kingdom	Norway	West Germany	Finland
Base Country					
Denmark	----	-.433	.207	-.437	.586
United Kingdom	-.272	----	.054	-.567	.477
Norway	.418	.467	----	-.230	.302
West Germany	-.591	-.701	-.219	----	.608
Finland	-.261	.037	.179	-.012	----

Belgium was not included in the above table since data for several of its industries were not available; consequently, it was compared only with the United States.

TABLE III

COUNTRIES WITH PER CAPITA INCOME FROM $500 TO $800

Compared to:	Netherlands	Austria	Israel	Italy
Base Country				
Netherlands	----	-.348	.362	-.476
Austria	-.376	----	-.603	-.049
Israel	.752	-.142	----	.446
Italy	-.119	-.101	-.127	----

TABLE IV

COUNTRIES WITH PER CAPITA INCOME LESS THAN $500

Compared to:	Greece	Japan	Mexico	Malaya	India
Base Country					
Greece	----	-.110	.449	-.320	-.063
Japan	-.274	----	-.094	-.074	-.192
Mexico	-.301	-.217	----	-.078	-.227
Malaya	-.108	.085	-.031	----	-.172
India	.219	-.014	.559	-.386	----

Ireland, Yugoslavia, Trinidad and Tobago, and Turkey were not included in the above table because data for from one to three

industries were unavailable for each. Consequently, they were compared only with the United States.

An inspection of the data in Tables I through IV reveals no tendency for a particularly strong or consistent correlation of relative export performance with relative labor productivity. Only in a few isolated cases are correlation coefficients significant. These include New Zealand when compared to Australia, Finland when compared to either Denmark or West Germany, the Netherlands when compared to Israel, and Mexico when compared to India. In addition, there are significant negative correlations for both Denmark and the United Kingdom when compared to West Germany, and for West Germany when compared to Austria. However, in general, significant correlations are not found. Thus, the present study appears to provide no indirect support to the Linder hypothesis, as it would have if correlations had been generally good.

In contrast to the tables above, which examine pairs of countries with similar per capita incomes, Table V examines pairs of countries in the highest (greater than $1200) per capita income group as well as the lowest (less than $500) per capita

income group. This is done in an effort to detect any tendency toward stronger correlations when examining countries with highly dissimilar per capita incomes, than when examining those with similar per capita income.

Table V is divided into quadrants; the upper left and lower right quadrants are the same as Tables I and IV respectively, and are reproduced here for comparison purposes. The lower left quadrant represents exports of high per capita income countries compared to those of low per capita income; the upper right compares low per capita income countries to those with high per capita income. The only unusually good results are the correlations obtained when comparing New Zealand to either Greece of Malaya; this is not sufficient to show any general tendency, since the balance of the results are not good.

In view of the prevalence of various factors such as tariff barriers and less than optimum exchange rates, it is apparent that the effects could easily be overwhelmed by such influences. It is therefore likely that those countries with the greatest differentials in labor productivity would also be those most likely to exhibit

TABLE V

HIGHEST AND LOWEST PER CAPITA INCOME COUNTRIES

Compared to:	United States	Canada	Sweden	New Zealand	Australia	Greece	Japan	Mexico	Malaya	India
Base Country										
United States	----	.356	.422	.038	.460	.047	-.416	.318	.057	-.061
Canada	.038	----	.124	.133	.357	.510	-.165	.006	.010	.085
Sweden	.023	-.020	----	-.244	.094	.072	-.426	-.127	-.047	-.265
New Zealand	.313	.003	.120	----	.264	.074	-.093	.099	.493	.319
Australia	.390	-.032	-.143	.614	----	-.135	-.309	-.116	.508	.042
Greece	.254	.228	.299	.760	-.541	----	-.110	.449	-.320	-.063
Japan	-.551	.004	.064	.073	-.182	-.274	----	-.094	-.074	-.192
Mexico	-.118	.154	.118	.509	-.335	-.301	-.217	----	-.078	-.227
Malaya	.149	.423	.403	.872	.329	-.108	.085	-.031	----	-.172
India	-.062	-.144	-.209	.327	-.432	.219	-.014	.559	-.386	----

its effects on their export performance. To test this supposition, average value added figures were computed for each country from the data in Appendix C. These data are presented as Appendix G. An examination of this Appendix shows that a comparison of the five highest and five lowest average value added countries would involve the same countries as in Table V above.[11] A conclusion similar to that reached in considering countries with dissimilar per capita incomes is therefore justified; that is, there is no marked tendency for large dissimilarities in average value added per production worker in manufacturing industries to result in improved correlation of relative labor productivity and relative export performance.

One of the considerations in testing the comparative cost hypothesis is the assumption that disparities in wage rates do not offset relative labor productivity sufficiently to prevent it from governing exports. The use of Balassa's technique for correlating labor productivity ratios rather than absolute values should minimize this difficulty. However, average annual wages in

---

[11] An exception is the high average value added for Turkey; however, Turkey was among the countries with fewer than thirteen industries which were compared with the United States only. In addition, it is felt that the value for Turkey is misleadingly high, in view of its position in Appendix F as twenty-third out of twenty-four countries in per capita income. For these reasons, it was not felt that modification of Table V was justified.

manufacturing industries for 1958, which are presented in Appendix H,[12] were considered in the analysis for this study. Table IV presents correlation coefficients for four countries with average wages in the $1600-$1800 range. If there is any distortion due to differences in wage rates, the rates for these four countries should be similar enough that it would have little effect on their exports when compared to each other.

TABLE VI

COUNTRIES WITH AVERAGE ANNUAL MANUFACTURING WAGE RATE BETWEEN $1600 AND $1800

Compared to: Base Country	Israel	Denmark	Norway	United Kingdom
Israel	----	.183	.615	.260
Denmark	.376	----	.207	-.433
Norway	.201	.418	----	.467
United Kingdom	-.205	-.272	.054	----

With the single exception of Norway when compared with Israel, no significant correlations are found; therefore, it is concluded

---

[12]United Nations, Growth of World Industry - National Tables 1938-61, op. cit.

that wage rate disparties probably do not account for the generally low correlation coefficients found in this study.

To summarize, the present study has failed to provide support for the classical theory of comparative advantage, and no economic basis for explaining patterns among the correlation coefficients has proved to be helpful. Possible explanations for the failure to confirm the classical theory will be considered in Chapter V.

CHAPTER V

ANALYSIS OF RESULTS

As we have seen in the previous chapter, the analysis conducted in the present study has been unable to provide evidence which verifies the classical theory of comparative costs. This indicates that either the theory is invalid, or there are other factors which can explain the generally poor results obtained without bringing the theory itself into doubt. In view of the generally favorable results obtained in the empirical examinations of the classical theory cited in Chapter III above, it is felt that the latter is the case. The present chapter discusses some of the problems encountered in testing the classical theory in the real world, and relates these problems to the present study.

A shortcoming of the present study is the level of detail to which it was restricted by the availability of data for labor productivity. In dealing with thrteen highly summarized categories for manufacturing output, the value added figures used in this study as proxies for the cost of production represent averages taken over

a very wide range of commodities. These figures would be truly comparable only if the composition of the output of each of these industries were the same for each country in the study. This is, of course, not the case. The figures for each industry for each country are unavoidably weighted by the volume of output of the various commodities included. Since the greater part of the production of most commodities is destined for consumption on the home market, the output weighting the productivity figures most heavily is not necessarily that in which productivity is the highest. Thus it is not possible to safely assume that there is a good degree of international comparability for the labor productivity figures used. In addition, export values are weighted by the particular commodities within each industry which are most heavily exported. This weighting can be expected to vary considerably from country to country, and perhaps in a good number of cases reflect advantages in factor endowments or the state of technology rather than in labor productivity. There is therefore a great likelihood that both labor productivity and export values are not sufficiently comparable to permit a fully valid test of the classical theory of comparative advantage.

Aside from this problem, there are a number of implicit assumptions contained in the classical model which do not necessarily hold true in the real world. Where these situations occur, there are additional reasons to accept the findings of this study with caution.

The classical theory of comparative advantage contained the underlying assumption that the exchange rates of the countries involved were at an optimum level; that is, they did not lead to distortions in the international comparison of relative prices. An exchange rate which is too high may boost the price of a good when sold in a foreign market until the comparative advantage it would otherwise possess is offset or more than offset; in such a case, trade for this good would flow in the direction opposite to the one predicted by the theory of comparative advantage. A balanced trade situation would not emerge and trade could be sustained only if there were offsetting capital flows. Although such an unrealistic exchange rate would eventually be adjusted in the direction of the optimum, such an adjustment may not take place for an extended period of time. As long as the unrealistic rate was in effect, no significant correlation could be expected in an empirical examination of relative labor productivity and

relative exports. Only when the optimum rate prevailed could trade patterns be expected to conform to relative labor productivities and therefore to relative prices. As Linder[1] pointed out, since the range of tradable products between countries of widely differing per capita incomes is small, the exchange rate under which this trade is conducted will probably be inappropriate for comparison of relative prices of most of the products of the countries involved. It is possible that the overlapping demands of the countries could be limited to capital goods, in which the underdeveloped country could not establish a comparative advantage, or that most trade could be taking place in raw material exports from the underdeveloped country, used to purchase relatively sophisticated manufactured goods from the more advanced country. In either event, the exchange rate might settle at a level which would completely offset any relative productivity advantage possessed by the underdeveloped country.

Another problem connected with inappropriate exchange rates can arise when inflation is proceeding at a differential rate in different countries, so that even an optimum rate would, over a

---

[1] Linder, op. cit., p. 91.

period of time, become inappropriate. With the relative inflexibility of the prevailing system of fixed exchange rates, it would be somewhat surprising if this were not a common problem in the world today. This is probably a major contributing factor to relatively poor correlations even among countries which otherwise appear ideally suited for a pattern of trade conforming to relative labor productivity differentials.

An additional problem with regard to exchange rates is the existence of the practice of some countries of setting preferential rates for certain exports, which are in effect subsidies, and penalty rates for certain imports; these can constitute major barriers to trade. The basic intent of this practice is to prevent patterns of trade from adjusting to underlying factors such as labor productivity, because it is feared that such adjustment may lead to undesirable disruptions and dislocations in the domestic economy. Whatever the success of such practices in achieving these goals, there can be little doubt that they are successful in distorting trade patterns to a substantial extent, and thus preventing conformity of trade patterns to relative labor productivity.

In the original Ricardian formulation of the theory of comparative advantage, based as it was on the labor-embodied theory of value, differentials in labor productivity furnished the basis for trade among nations. This implicity assumed that a common level of technology prevailed in the countries under consideration. A situation described by Kindleberger could very well account for relatively poor correlations occuring, particularly between the United States and Western Europe on the one hand and the rest of the world on the other.[2] This was the situation where a technological gap exists; the innovating economy was able to exploit a technological breakthrough and achieve economies of scale in a new product or new production technique, and other nations could arrive at a competitive position only after a period of time had elapsed, during which they adopted the innovation and achieved economies of scale themselves. In the interim, trade was in effect based upon an absolute advantage of the innovating country. Only after the technologies of other countries had caught up would

---

[2]Charles P. Kindleberger, International Economics (fourth edition; Homewood: Richard D. Irwin, Inc., 1968), pp. 64-67.

trade be based upon labor productivity differentials. Thus a technological gap could account for a lack of correlation of trade with labor productivity. In general, it is probable that this gap will occur only between countries with substantially differing per capita incomes, since this implies that the countries are at fairly well separated stages of economic growth.

The development of a technological breakthrough by a country has different implications for its trading partners depending upon whether they are at a similar stage of economic development. If the countries are at widely different stages, and the developed country develops an innovation leading to a technological gap, the more backward country may not have a demand for the more sophisticated product. By the same token, the consumers in the more developed country may experience a shift in their desires toward more sophisticated products in general. Thus the development of an innovation could lead to the withering of trade between a developed and an underdeveloped country, particularly if the innovation is a more sophisticated product rather than simply a more efficient means of producing a previously existing product. If the innovation

is one of more efficient production, the less developed country may be able to fairly rapidly adopt the process to its own use, and begin to narrow the technological gap and thus reduce the absolute advantage gained by the innovating country. If, on the other hand, two countries are at similar points in terms of economic growth and one of them introduces an innovation, even if it is a more sophisticated product, the other country's per capita income and demand structure are probably similar enough to make it an immediate market for the new product. Initially the exports of the non-innovating country will suffer, and it will be necessary for it to either imitate the process and thus eliminate the technological gap, or to develop an innovation of its own to offset the advantage gained by the first country.

At any given moment, many countries are in the process of adjusting to technological breakthroughs in one way or another; since their trade patterns cannot be expected to conform to relative labor productivity, this will necessarily unfavorably affect the results of a study such as the present one.

If the countries being examined are at substantially different stages of development, it is possible that the market ..

they face imposes unequal tariff barriers. This is true because there are differences between the typical tariff structure imposed by developed countries and that imposed by underdeveloped countries.[3] Frequently, developed countries, for example, impose higher tariffs on simple manufactures than they do no more sophisticated products. The main reason for this appears to be that simple manufacturing industries are declining industries in the developed countries, due to their typically using larger amounts of hand labor; to ease the pains of transition of the resources utilized in other fields, these industries are frequently protected by high tariffs by the developing country. In contrast, more sophisticated industries are typically better able to compete with the corresponding foreign industries without tariff protection, and the level of the tariff on such goods is relatively low. Underdeveloped countries typically have not entered the production of the more sophisticated goods, and must import at least some of them for their own needs; in consequence, they impose relatively low tariff barriers on such goods. Thus it can be seen that the "typical" export of any underdeveloped country to a developed country faces a higher tariff

---

[3]Sidney Weintraub, "The Foreign Exchange Gap of the Developing Countires," Essays in International Finance, Number 48, Princeton University, September, 1965, p. 15.

barrier than does the "typical" export from the developed country to the underdeveloped country. As consequence of this, the underdeveloped country must have a greater labor productivity advantage than otherwise would be required to achieve an absolute advantage over the developed country in the production of manufactures. It is open to question how many underdeveloped countries are able to overcome this disadvantage and conduct their trade as would be expected solely from an examination of relative labor productivities.

Another possible explanation of a lack of correlation of exports with labor productivity is imperfections in the market, such as imperfect knowledge of the relatively low cost of products of a distant or very small country. In such a case, the presence of even very substantial differences in labor productivity may have practically no effect on the pattern of international trade.

Linder pointed out that an important characteristic of underdeveloped countries was their relative lack of reallocative ability;[4] poorly trained workers who were living at a subsistence level could

---

[4] Linder, op. cit., p. 32

not readily be shifted from one industry to another in response to changing domestic and foreign market conditions. It may therefore be that many underdeveloped countries are not trading in the manner which could be expected from their relative labor productivity, due to this lack of reallocative ability. Such a situation violates the assumptions of classical trade theory, which postulated prompt and correct responses to the "signals" of the market place in the allocation of resources. Kindleberger[5] has pointed out that countries may have reallocative ability at one stage of their economic development, but perhaps lose it and then regain it at later times. In any event, it is clear that unless the countries involved are capable of timely reallocation of resources, empirical testing may be unable to reveal any good correlation between relative labor productivity and exports.

It is probable that all of the factors considered above have played a roled in determining the unfavorable results of this study, and that the primary factor was the highly summarized nature of the data utilized.

---

[5]Charles P. Kindleberger, The Terms of Trade: A European Case Study (New York: John Wiley and Sons, Inc., 1956), p. 307.

CHAPTER VI

CONCLUSIONS

This study has been unable to provide empirical verification of the classical theory of comparative costs. However, in view of the success of several earlier attempts at empirical verification, it appears likely that the fault lies in the nature of the data utilized and in various imperfections in international markets rather than in the classical theory itself.

It is believed that the primary factor leading to the unfavorable results of this study was the use of data which was too highly summarized to permit testing of truly comparable items. The data used in this study was selected because it was the only known source of values for a large number of countries which had been compiled on a consistent basis. In view of the results of this study, it appears that more conclusive testing of the classical theory of comparative costs for a large number of countries will not be possible until considerably more detailed data are available.

A P P E N D I X

APPENDIX A

COMPARISON OF INTERNATIONAL STANDARD INDUSTRIAL CLASSIFICATION AND STANDARD INTERNATIONAL TRADE CLASSIFICATION

Industry Number	Description	ISIC Code	Description	SITC Code	Description
	ISIC Codes 0 and 1 are not manufacturing industries and were not included in this study.	0	AGRICULTURE, FORESTRY, HUNTING, AND FISHING		
		01	Agriculture		
		011	Agriculture and Livestock Production	001	Livestock
				041	Wheat, unmilled
				043	Barley, unmilled
				044	Maize, unmilled
				045	Cereals, unmilled NEC
				121	Tobacco, unmanufactured
				211	Hides, crude
				212	Fur skins, crude
				221	Oil seeds, etc.
				231	Crude rubber
				291	Animal material NEC
				292	Vegetable matter, NEC
				921	Live animals, NEC
		012	Agricultural Services	None	
		02	Forestry and Logging		
		021	Forestry	None	
		022	Logging	None	
		030	Hunting, Trapping and Game Propagation	None	

Industry Number	Description	ISIC Code	Description	SITC Code	Description
		04	Fishing		
		041	Ocean and Coastal Water Fishing	None	
		042	Factory - Vessel Fishing	None	
		043	Inland, Water Fishing	None	
		1	MINING AND QUARRYING		
		110	Coal Mining	None	
		12	Metal Mining		
		121	Iron Ore Mining	281	Iron Ore, etc.
				272	Minerals, crude, NEC
		122	Metal Mining, except Iron Ore	283	Ore, basic metals, NEC
				285	Silver ore, etc.
		130	Crude Petroleum and Natural Gas	312	Crude petroleum
		140	Stone Quarrying, Clay, and Sand Pits	None	
		19	Other Nonmetallic Mining and Quarrying		
		191	Salt Mining and Quarrying	None	
		192	Chemical and Fertilizer Mineral Mining	None	
		199	Nonmetallic Mining and Quarrying, NEC	None	

Indsutry Number	Description	ISIC Code	Description	SITC Code	Description
		2 - 3	MANUFACTURING		
1	Food, Beverages, and Tobacco	20	Food Manufacturing, Except Beverages		
		201	Slaughtering, Preparing, and Preserving Meat	011	Fresh Meat
				012	Dried Meat
				013	Meat, canned
		202	Manufacture of Dairy Products	021	Milk, Cream, fresh
				022	Milk, dried
				023	Butter
				024	Cheese and curd
				025	Eggs
				026	Honey
				029	Dairy Products NEC
		203	Canning and Preserving of Fruits and Vegetables	051	Fruits, Nuts, fresh
				052	Fruit, dried
				053	Fruit, prepared or preserved
				054	Vegetables, fresh or dry
				055	Vegetables, prepared or preserved

Industry Number	Description	ISIC Code	Description	SITC Code	Description
		204	Canning and Preserving Fish and other Sea Foods	031	Fresh Fish, packaged
				032	Preserved Fish
		205	Manufacture of Grain Mill Products	042	Rice, prepared
				046	Wheat, flour, etc.
				047	Flour, etc, NEC
				048	Cereal preparations
		206	Manufacture of Bakery Products	None	
		207	Sugar Factories and Refineries	061	Sugar, refined
		208	Manufacture of Cocoa, Chocolate, and Sugar Confectionary	062	Sugar, preparations and confectionary
				072	Cocoa and preparations
				073	Chocolate and preparations
		209	Manufacture of Miscellaneous Food Preparations	071	Coffee preparations
				074	Mate preparations
				075	Spices
				081	Fodder NEC
				091	Margarine
				099	Food preparations NEC
		21	Beverage Industries		

Industry Number	Description	ISIC Code	Description	SITC Code	Description
		211	Distilling, Rectifying, and Blending Spirits	112	Beverages, alcoholic
		212	Wine Industries	Included above	
		213	Breweries and Manufacturing of Malt	Included above	
		214	Soft Drinks and Carbonated Water Industries	111	Beverages, non-alcoholic
		220	Tobacco Manufactures	122	Tobacco Manufactures
2	Textiles	23	Manufacture of Textiles		
		231	Spinning, Weaving, and Finishing Textiles	262	Wool
				263	Cotton
				264	Jute, including waste
				651	Yard and thread
				652	Cotton fabrics
				653	Miscellaneous Fabrics
				657	Rugs, etc.
		232	Knitting Mills	Included above	
		233	Cordage, Rope and Twine Industries	Included above	

Industry Number	Description	ISIC Code	Description	SITC Code	Description
		239	Manufacture of Textiles, NEC	261	Silk
				265	Vegetable Fibers, NEC
				267	Textile Waste
				655	Special Fabrics
3	Clothing, Footwear, and Made-up Textiles	24	Manufacture of Footwear, other Wearing Apparel, and made-up Goods		
		241	Manufacture of Footwear	851	Footwear
		242	Repair of Footwear	None	
		243	Manufacture of Wearing Apparel, except Footwear	654	Ribbons, etc.
				831	Handbags, etc.
				841	Clothes not fur
				842	Fur Apparel NEC
		244	Manufacture of made-up Textile Goods	656	Made-up Textiles
4	Wood Products and Furniture	25	Manufacture of Wood and Cork, except Furniture		
		251	Sawmills, Planing Mills, and other Wood Mills	241	Fuelwood
				242	Wood, round, etc.
				243	Wood, shaped, etc.
				631	Boards, Plywood, etc.
		252	Wooden and Cane Containers and Cane Smallware	Included below	
		259	Manufacture of Cork and Wood Products, NEC	244	Cork, raw waste

Industry Number	Description	ISIC Code	Description	SITC Code	Description
				632	Wood Manufacturing, NEC
				633	Cork Manufacturing
		260	Manufacture of Furniture and Fixtures	812	Building Fixtures
				821	Furniture
5	Paper and Paper Products	27	Manufacture of Paper and Paper Products		
		271	Manufacture of Pulp, Paper, and Paperboard	641	Paper, Paperboard
		272	Manufacture of Articles of Pulp, Paper, and Paperboard	251	Pulp Wastepaper
				642	Paper, etc., Manufactures
6	Printing and Publishing	280	Printing, Publishing, and Allied Industries	892	Printing and Publishing
7	Leather and Leather Products (except wearing apparel)	29	Manufacture of Leather, and Leather and Fur Products, except Footwear and other Wearing Apparel		
		291	Tanneries and Leather Finishing Plants	611	Leather
		292	Manufacture of Fur Products, except Wearing Apparel	613	Dressed Furs

Industry Number	Description	ISIC Code	Description	SITC Code	Description
		293	Manufacture of Leather Products, except Footwear and Other Wearing Apparel	612	Leather Manufactures
8	Rubber Products	300	Manufacture of Rubber Products	621	Rubber, semi-finished
				629	Rubber manufactures, NEC
9	Chemicals and Chemical, Petroleum, and Coal Products	31	Manufacture of Chemicals and Chemical Products		
		311	Basic Industrial Chemicals, including Fertilizers	266	Synthetic fibers
				271	Crude fertilizers
				511	Inorganic chemicals
				512	Organic chemicals
				561	Manufactured fertilizers
				591	Explosives
				599	Chemical materials and products, NEC
		312	Vegetable and Animal Oils and Fats	411	Animal oils and fats
				412	Vegetable Oils and fats
				413	Oils and fats, processed, NEC
				551	Essential oils

Industry Number	Description	ISIC Code	Description	SITC Code	Description
		313	Manufacture of Paints, Varnishes, and Lacquers	533	Paints, etc.
		319	Manufacture of Miscellaneous Chemical Products	541	Drugs, etc.
				552	Soaps, cosmetics, etc.
		32	Manufacture of Products of Petroleum and Coal		
		321	Petroleum Refineries	313	Petroleum products
		329	Manufacture of Miscellaneous Products of Petroleum and Coal	311	Coal, coke
				521	Tar and coal chemicals
				531	Coaltar, dyes, etc.
10	Nonmetallic Mineral Products	33	Manufacture of Nonmetallic Mineral Products, except Products of Petroleum and Coal		
		331	Manufacture of Structural Clay Products	662	Bricks, tiles, etc.
		332	Manufacture of Glass and Glass Products	664	Glass
				665	Glassware
		333	Manufacture of Pottery, China, and Earthenware	666	Pottery
		334	Manufacture of Cement (hydraulic)	661	Lime, cement, etc.
		339	Manufacture of Nonmetallic Mineral Products, NEC	663	Mineral manufactures NEC

Industry Number	Description	ISIC Code	Description	SITC Code	Description
11	Basic Metals	34	Basic Metal Industries		
		341	Iron and Steel Basic Industries	282	Scrap iron and steel
				284	Scrap metal, NEC
				681	Iron and Steel
		342	Nonferrous Metal Basic Industries	671	Silver, etc., metal
				682	Copper
				683	Nickel
				684	Aluminum
				685	Lead
				686	Zinc
				687	Tin
				689	Base metals NEC
12	Metal Products	350	Manufacture of Metal Products, except Machinery and Transport Equipment	691	Ordnance
				699	Metal Products, NEC
				811	Prefab buildings, etc.
		360	Manufacture of Machinery, except Electrical Machinery	711	Power machinery, etc.
				712	Agricultural machinery
				713	Tractors, non-steam
				714	Office machinery
				715	Metalworking machinery
				716	Machinery NEC

Industry Number	Description	ISIC Code	Description	SITC Code	Description
		370	Manufacture of Electrical Machinery, Apparatus, Appliances, and Supplies	721	Electrical machinery, etc.
		38	Manufacture of Transport Equipment		
		381	Ship Building and Repairing	735	Ships and boats
		382	Manufacture of Railroad Equipment	731	Railway vehicles
		383	Manufacture of Motor Vehicles	732	Road motor vehicles
		384	Repair of Motor Vehicles	None	
		385	Manufacture of Motorcycles and Bicycles	733	Road vehicles, NEC
		386	Manufacture of Aircraft	734	Aircraft
		389	Manufacture of Transport Equipment, NEC	None	
13	Other Manufacturing	39	Miscellaneous Manufacturing Industries		
		391	Manufacture of Professional, Scientific, Measuring and Controlling Instruments	861	Instruments, etc.
		392	Manufacture of Photographic and Optical Goods	862	Photo goods
		393	Manufacture of Watches and Clocks	864	Watches and Clocks

Industry Number	Description	ISIC Code	Description	SITC Code	Description
		394	Manufacture of Jewelry and Related Articles	672	Gems, etc.
				673	Worked Gold, Silver, Gems
		395	Manufacture of Musical Instruments	891	Musical instruments, etc.
		399	Manufacturing Industries, NEC	863	Exposed movie film
				899	Manufactured goods, NEC
				911	Postal packages, NEC
				931	Special shipments
	ISIC Codes 4-8 are not manufacturing industries and were not included in this study.	4	CONSTRUCTION	None	
		5	ELECTRICITY, GAS, WATER, AND SANITARY SERVICES	314	Natural Gas
				315	Electric energy
		6	COMMERCE	None	
		7	TRANSPORT, STORAGE, COMMUNICATION	None	
		8	SERVICES	None	

APPENDIX B

VALUE ADDED AND EXPORT DATA COMPILED FOR USE IN STUDY

COUNTRY	INDUSTRY NUMBER	VALUE ADDED (1) (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U.S. (U.S.DOLLARS IN THOUSANDS)
United States	1	10,598	1,284,436	
	2	5,387	1,111,419	
	3	5,078	177,858	
	4	6,021	242,359	
	5	10,276	300,452	
	6	9,169	112,944	
	7	6,316	35,756	
	8	10,141	148,461	
	9	16,585	2,750,865	
	10	9,980	188,706	
	11	10,645	1,028,444	
	12	9,360	6,947,954	
	13	8,440	1,295,799	
Canada	1	8,421	473,133	184,946
	2	4,965	19,955	11,529
	3	4,102	7,868	3,272
	4	5,164	412,482	88,638
	5	10,140	1,041,311	165,842
	6	7,268	5,440	1,142
	7	4,757	12,358	6,233
	8	9,054	8,128	3,940
	9	16,610	253,569	136,950
	10	9,218	14,767	6,322
	11	11,196	655,379	332,914
	12	7,221	472,581	250,331
	13	6,180	76,975	27,723

COUNTRY	INDUSTRY NUMBER	VALUE ADDED[1] (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U.S. (U.S.DOLLARS IN THOUSANDS)
United Kingdom	1	3,550	506,956	400,179
	2	1,988	864,076	792,757
	3	1,638	181,829	154,131
	4	2,358	69,111	67,515
	5	2,960	111,816	107,513
	6	3,016	74,077	65,303
	7	2,248	58,183	49,321
	8	2,674	103,317	101,044
	9	4,584	1,136,941	1,113,309
	10	2,766	178,518	163,201
	11	3,399	833,762	763,009
	12	2,780	4,239,112	3,883,209
	13	2,570	514,893	453,280
Austria[2]	1	3,323	21,124	19,808
	2	1,528	65,066	62,398
	3	1,321	32,235	27,656
	4	1,434	138,839	138,747
	5	1,668	82,574	82,161
	6	2,381	6,487	6,101
	7	1,686	3,917	3,744
	8	2,230	7,400	7,192
	9	2,633	62,645	57,593
	10	1,690	55,460	44,106
	11	1,838	178,099	175,093
	12	1,787	184,496	173,046
	13	1,555	23,141	19,857

COUNTRY	INDUSTRY NUMBER	VALUE ADDED(1) (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U.S. (U.S.DOLLARS IN THOUSANDS)
Belgium	1	2,421	142,262	139,740
	2	1,738	366,450	334,225
	3	1,335	70,537	68,273
	4	1,940	23,894	23,216
	5	2,574	31,847	31,771
	6	No data	---------	---------
	7	1,790	11,823	11,174
	8	2,351	15,439	15,192
	9	3,659	438,737	425,696
	10	3,382	118,124	98,774
	11	No data	---------	----------
	12	2,730	548,619	511,035
	13	No data	---------	----------
Denmark	1	3,694	659,697	591,867
	2	2,567	17,875	14,949
	3	2,134	16,207	14,654
	4	2,458	26,901	20,811
	5	3,352	5,258	5,031
	6	3,410	4,223	3,916
	7	2,733	2,189	1,985
	8	2,546	3,114	2,974
	9	4,353	53,488	50,282
	10	3,474	13,185	10,854
	11	5,574	18,910	10,955
	12	2,931	247,726	239,565
	13	3,062	20,461	17,837

COUNTRY	INDUSTRY NUMBER	VALUE ADDED[1] (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U. S. (U.S.DOLLARS IN THOUSANDS)
Finland	1	3,439	27,792	27,198
	2	1,748	3,445	3,355
	3	1,758	1,154	1,144
	4	2,109	239,799	236,282
	5	4,373	360,037	332,235
	6	2,676	446	435
	7	1,818	1,044	1,044
	8	2,582	103	103
	9	5,586	12,288	12,268
	10	2,462	2,333	1,744
	11	2,958	9,972	9,777
	12	2,317	97,649	96,523
	13	2,325	1,878	1,800
West Germany[3]	1	5,203	173,950	154,965
	2	1,977	315,468	301,430
	3	1,614	124,002	110,555
	4	1,973	104,798	99,467
	5	3,068	66,376	62,311
	6	2,380	52,333	47,972
	7	1,992	43,755	38,586
	8	2,799	69,499	66,469
	9	4,561	1,575,999	1,523,592
	10	2,412	191,502	169,187
	11	3,162	1,026,508	967,496
	12	2,268	4,358,388	4,006,424
	13	2,015	607,070	525,467

COUNTRY	INDUSTRY NUMBER	VALUE ADDED (1) (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U. S. (U.S.DOLLARS IN THOUSANDS)
Italy	1	2,938	470,473	434,482
	2	1,156	283,755	258,519
	3	440	152,044	125,302
	4	841	25,586	20,549
	5	1,547	10,967	10,555
	6	2,492	8,692	7,941
	7	581	19,487	13,336
	8	1,960	21,192	20,836
	9	4,097	364,352	344,897
	10	1,037	35,978	22,121
	11	3,572	173,678	165,485
	12	1,571	758,407	683,536
	13	927	99,135	83,652
Nether-lands (5)	1	2,519	859,318	802,783
	2	1,725	254,174	241,435
	3	1,343	62,976	62,009
	4	1,880	41,410	40,066
	5	3,305	62,742	62,476
	6	2,360	18,881	17,515
	7	1,890	15,214	13,935
	8	1,890	18,786	18,246
	9	3,325	742,888	730,103
	10	2,105	26,354	25,686
	11	4,715	236,634	213,510
	12	2,215	603,307	569,053
	13	1,968	104,877	99,758

COUNTRY	INDUSTRY NUMBER	VALUE ADDED (1) (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U. S. (U.S.DOLLARS IN THOUSANDS)
Norway	1	4,167	135,229	122,857
	2	2,615	7,978	7,966
	3	2,166	3,004	2,751
	4	2,625	91,801	87,148
	5	4,041	145,286	141,133
	6	3,095	227	187
	7	2,613	1,121	1,108
	8	3,405	2,679	2,666
	9	4,903	117,134	113,076
	10	3,478	2,605	1,681
	11	4,836	177,880	142,856
	12	3,262	75,814	72,544
	13	3,357	8,913	6,879
Sweden	1	5,399	55,941	53,798
	2	2,923	20,702	20,334
	3	2,524	7,548	6,710
	4	3,106	534,666	507,045
	5	5,124	483,571	459,643
	6	4,080	3,431	3,209
	7	2,993	5,521	5,239
	8	4,233	9,617	9,069
	9	6,172	77,634	73,333
	10	4,083	13,910	11,191
	11	4,545	180,971	164,399
	12	3,875	716,124	666,594
	13	3,510	37,533	34,255

COUNTRY	INDUSTRY NUMBER	VALUE ADDED (1) (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U. S. (U.S.DOLLARS IN THOUSANDS)
Australia (6)	1	4,424	444,455	422,090
	2	3,241	688,101	665,108
	3	2,455	1,904	1,599
	4	3,497	10,768	10,639
	5	5,410	2,885	2,867
	6	3,844	3,099	3,010
	7	3,122	7,673	7,603
	8	4,036	1,493	1,493
	9	7,094	83,604	80,416
	10	4,458	2,185	2,141
	11	5,026	121,485	97,912
	12	3,389	62,666	60,781
	13	4,005	15,791	14,009
New Zealand (7)	1	4,534	394,875	327,614
	2	3,325	224,423	199,656
	3	2,225	28	28
	4	4,009	4,140	4,140
	5	8,400	15,780	15,780
	6	4,227	118	118
	7	3,360	129	70
	8	5,793	232	198
	9	5,900	17,782	14,754
	10	5,851	52	52
	11	4,980	2,571	2,571
	12	3,894	817	769
	13	3,903	120	120

COUNTRY	INDUSTRY NUMBER	VALUE ADDED[1] (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U. S. (U.S.DOLLARS IN THOUSANDS)
Japan	1	1,436	232,292	159,115
	2	909	698,169	595,640
	3	687	219,185	115,486
	4	840	112,913	44,083
	5	1,670	31,982	27,971
	6	1,742	5,570	4,551
	7	1,176	1,023	739
	8	1,465	23,858	23,219
	9	2,701	187,672	164,705
	10	1,419	106,992	70,949
	11	2,013	283,562	231,009
	12	1,723	716,163	616,317
	13	1,043	230,869	109,697
Greece	1	1,467	39,380	37,633
	2	1,369	29,178	29,096
	3	953	785	761
	4	1,079	404	382
	5	1,560	137	137
	6	1,617	574	552
	7	1,023	1,807	1,347
	8	1,726	29	29
	9	1,854	10,718	8,234
	10	1,540	1,042	1,002
	11	2,864	1,260	1,260
	12	1,232	1,223	1,213
	13	1,425	344	327

COUNTRY	INDUSTRY NUMBER	VALUE ADDED (1) (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U.S. (U.S.DOLLARS IN THOUSANDS)
India (8)	1	507	406,999	393,185
	2	358	355,520	294,905
	3	381	106,586	105,255
	4	443	5,053	5,053
	5	804	1,533	1,533
	6	444	1,776	1,776
	7	402	38,908	38,908
	8	1,171	456	456
	9	835	47,175	47,175
	10	480	4,039	4,039
	11	944	29,659	29,659
	12	540	6,025	6,025
	13	458	24,559	24,559
Ireland	1	2,628	127,923	115,631
	2	1,450	18,037	15,574
	3	1,208	9,041	8,625
	4	1,369	1,534	1,286
	5	2,228	6,041	6,041
	6	1,984	2,884	2,832
	7	2,066	4,311	4,311
	8	No data	---	---
	9	2,675	2,528	2,452
	10	2,391	2,998	2,880
	11	No data	---	---
	12	1,960	10,553	8,470
	13	2,177	33,548	31,673

COUNTRY	INDUSTRY NUMBER	VALUE ADDED[1] (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U.S. (U.S.DOLLARS IN THOUSANDS)
Israel[9]	1	2,937	62,764	It was not possible to separately identify Israeli exports to the United States
	2	3,146	[illegible],528	
	3	1,918	6,035	
	4	2,158	3,498	
	5	3,096	980	
	6	3,096	2,258	
	7	2,018	336	
	8	4,042	5,855	
	9	4,346	7,408	
	10	3,471	3,065	
	11	2,730	697	
	12	2,730	3,336	
	13	2,107	39,132	
Malaya[10][11]	1	1,245	120,788	113,526
	2	490	35,169	35,153
	3	915	13,158	13,158
	4	1,123	11,983	11,883
	5	968	1,529	1,529
	6	1,276	486	486
	7	968	319	319
	8	1,272	3,213	3,144
	9	2,399	151,372	151,317
	10	1,537	4,805	4,805
	11	968	101,898	62,431
	12	1,069	33,615	33,583
	13	968	18,085	17,657

COUNTRY	INDUSTRY NUMBER	VALUE ADDED[1] (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U. S. (U.S.DOLLARS IN THOUSANDS)
Mexico[12]	1	1,267	171,596	It was not possible to separately identify Mexican exports to the United States
	2	904	156,155	
	3	752	3,542	
	4	745	4,338	
	5	1,455	1,039	
	6	926	3,514	
	7	1,165	282	
	8	1,570	101	
	9	2,084	41,548	
	10	1,100	4,454	
	11	3,640	97,733	
	12	1,388	13,251	
	13	1,087	5,577	
Trinidad & Tobago[13][14]	1	2,064	33,792	28,204
	2	1,021	417	417
	3	826	656	620
	4	729	52	52
	5	4,666	296	296
	6	1,203	124	124
	7	No data	---	---
	8	4,666	4	4
	9	No data	---	---
	10	2,916	2,258	2,253
	11	No data	---	---
	12	1,069	260	260
	13	4,666	577	577

COUNTRY	INDUSTRY NUMBER	VALUE ADDED (1) (U.S.DOLLARS)	EXPORTS TO WORLD (U.S.DOLLARS IN THOUSANDS)	EXPORTS TO WORLD EXCLUDING U.S. (U.S.DOLLARS IN THOUSANDS)
Turkey	1	5,136	72,066	68,354
	2	4,072	30,703	30,596
	3	3,695	1	1
	4	4,458	1,146	1,146
	5	No data	----------	----------
	6	6,485	47	47
	7	4,598	2,231	2,180
	8	No data	---------	----------
	9	8,225	1,463	1,458
	10	3,481	90	90
	11	6,960	6,465	5,935
	12	3,158	7	7
	13	3,590	73	58
Yugoslavia (15)	1	3,379	86,512	83,418
	2	3,300	11,329	11,268
	3	3,300	11,737	11,685
	4	1,339	65,897	62,508
	5	6,974	5,479	5,479
	6	2,143	299	299
	7	2,324	6,212	5,856
	8	8,469	3	3
	9	3,346	19,312	19,229
	10	1,943	7,471	7,168
	11	4,231	58,968	45,874
	12	3,186	55,621	54,441
	13	No data	---------	---------

FOOTNOTES TO APPENDIX B

(1) Average value added per employee. Given in United Nations, Growth of World Industry - National Tables 1938-61, in local currency; converted to United States dollars by use of factor for 1958 given in United Nations Yearbook of National Accounts Statistics, 1966.

(2) Austrian value added data for 1954 were the latest available.

(3) West German value added data for 1954 were the latest available.

(4) For Italy, average value added data were computed using total value added for 1958 and number of employees for 1961.

(5) Netherlands value added data for industries 7 and 8 were reported together.

(6) Australia value added data were for the period July 1, 1958 to June 30, 1959.

(7) New Zealand value added data were for the period July 1, 1958 to June 30, 1959.

(8) India value added data for 1957 were the latest available.

(9) For Israel, industries 5 and 6 and industries 11 and 12 were reported together.

(10) For Malaya, value added data for 1959 were the latest available.

(11) For Malaya, industries 5, 7, and 11 were reported with industry 13.

(12) For Mexico, value added data for 1955 were the latest available.

(13) For Trinidad and Tobago, value added data for 1957 were the latest available.

(14) For Trinidad and Tobago industries 5 and 13 were reported with industry 8.

(15) For Yugoslavia, industries 23 and 24 were reported together.

APPENDIX C

UNITED STATES EXPORTS TO WORLD EXCLUDING EACH COUNTRY IN STUDY
(U. S. Dollars in thousands)

Industry Number:	1	2	3	4	5	6	7	8	9	10	11	12	13
United States Exports to World excluding:													
Canada	1,073,237	996,157	147,379	159,342	246,405	60,598	30,789	127,140	2,307,276	123,136	785,777	5,683,422	1,100,679
United Kingdom	1,218,236	1,033,795	177,031	232,531	260,862	106,615	35,335	147,629	2,652,196	186,181	930,543	6,848,806,	1,285,186
Austria	1,282,139	1,103,640	177,743	242,054	299,983	112,926	35,703	148,403	2,737,073	188,587	1,026,215	6,937,397	1,292,686
Belgium	1,259,237	1,093,071	176,407	240,589	296,822	*	34,113	147,481	2,659,681	186,350	*	6,879,408	*
Denmark	1,277,977	1,109,088	177,609	242,106	299,819	112,824	35,689	148,243	2,735,713	188,257	1,027,279	6,935,416	1,293,669
Finland	1,282,173	1,108,424	177,858	242,296	300,389	112,907	35,756	148,399	2,747,301	188,431	1,028,134	6,933,381	1,294,989
West Germany	1,218,313	1,046,966	174,555	236,443	286,644	111,356	34,081	146,850	2,577,210	185,479	953,177	6,852,985	1,275,054
Italy	1,244,836	1,037,029	177,627	239.135	294,015	112,459	35,122	147,367	2,589,320	185,369	960,076	6,861,010	1,282,914
Netherlands	1,249,903	1,090,981	174,071	240.865	294,596	112,310	35,082	147,653	2,618,609	186,297	1,004,631	6,896,426	1,288,380
Norway	1,277,441	1,108,252	177,360	241,937	300,101	112,846	35,650	148,144	2,737,254	187,952	1,023,086	6,932,340	1,294,189
Sweden	1,266,152	1,096,110	177,125	241,518	297,938	112,673	34,876	146,975	2,717,718	183,500	1,016,543	6,880,592	1,286,382
Australia	1,281,492	1,100,148	177,706	236,492	296,726	111,386	35,756	147,733	2,722,800	184,941	1,024,457	6,863,402	1,290,922
New Zealand	1,282,682	1,109,100	177,710	241,383	300,231	112,562	35,706	148,233	2,742,315	188,522	1,027,848	6,931,641	1,294,496
Japan	1,266,922	987,241	177,501	233,451	294,378	111,767	35,591	146,479	2,568,438	186,078	983,213	6,756,921	1,278,062
Greece	1,271,647	1,110,184	177,676	241,561	299,993	112,844	34,110	142,598	2,739,550	188,526	1,027,367	6,928,107	1,292,255
India	1,274,351	1,099,913	177,743	241,388	299,294	111,955	35,696	147,487	2,725,251	187,145	1,016,141	6,867,854	1,292,027
Ireland	1,281,371	1,109,917	177,560	241,779	299,859	112,737	35,701	*	2,743,970	188,687	*	6,945,207	1,295,003
Israel													
Malaya	1,278,127	1,108,879	176,681	242,213	299,818	112,664	35,716	148,370	2,745,541	188,454	1,027,177	6,937,831	1,292,625
Mexico													
Trinidad & Tobago	1,278,893	1,109,582	176,929	241,545	300,214	112,863	*	148,412	*	188,569	*	6,937,601	1,294,196
Turkey	1,281,715	1,104,983	177,794	241,240	*	112,688	35,756	*	2,708,177	188,532	1,026,267	6,909,903	1,293,020
Yugoslavia	1,260,279	1,096,065	177,823	242,359	300,364	112,899	35,756	148,433	2,731,435	188,688	1,026,743	6,938,523	*

*Not included in study due to lack of productivity data for foreign country.

APPENDIX D

CORRELATION COEFFICIENTS OF LOGARITHMS

BASED ON TOTAL EXPORTS

	United States	Canada	United Kingdom	Austria	Denmark	Finland	West Germany	Italy	Netherlands	Norway	Sweden	Australia	New Zealand	Japan	Greece	India	Israel	Malaya	Mexico
United States	-----	.284	.021	-.125	.089	.619	-.596	-.269	.241	.282	.299	.404	.363	-.532	.150	-.152	.162	.142	.144
Canada	.284	-----	.075	.107	.189	.505	-.254	-.060	-.294	-.191	.102	.180	-.003	-.207	.257	-.114	.570	.108	-.022
United Kingdom	.021	.075	-----	-.444	-.369	.396	-.661	-.216	-.029	.163	.136	-.155	.147	-.623	-.232	-.426	.037	.009	-.179
Austria	-.125	.107	-.444	-----	-.663	.373	-.252	-.093	-.508	.156	.294	-.490	-.231	-.429	-.542	-.657	-.488	-.257	-.218
Denmark	.089	.189	-.369	-.663	-----	.266	-.645	-.207	.418	.224	-.019	-.226	.257	-.297	-.127	-.393	.377	-.298	-.071
Finland	.619	.505	.396	.373	.266	-----	.195	.246	-.059	.193	.352	.351	-.170	.179	.349	.015	.418	.226	.282
West Germany	-.594	-.254	-.661	-.252	-.645	.195	-----	-.382	-.586	-.399	.008	-.551	-.277	-.680	-.437	-.609	-.146	-.483	-.410
Italy	-.269	-.060	-.216	-.093	-.207	.246	-.382	-----	-.350	-.153	.043	-.407	-.238	-.155	-.113	.034	.154	-.404	-.512
Netherlands	.241	-.294	-.029	-.508	.418	-.059	-.586	-.350	-----	-.406	-.322	-.255	.110	-.336	.080	-.352	.511	.052	-.315
Norway	.282	-.191	.163	.156	.224	.193	-.399	-.153	-.406	-----	.119	-.205	.035	-.187	.157	-.487	.452	.164	-.208
Sweden	.299	.102	.136	.294	-.019	.352	.008	.043	-.322	.119	-----	-.115	-.252	-.245	.039	-.410	.261	.078	-.020
Australia	.404	.180	-.155	-.490	-.226	.351	-.551	-.407	-.255	-.205	-.115	-----	.391	-.290	-.331	-.216	.113	.436	-.226
New Zealand	.363	-.003	.147	-.231	.257	-.170	-.277	-.238	.110	.035	-.252	.391	-----	.070	.353	.183	.119	.579	.343
Japan	-.532	-.207	-.623	-.429	-.297	.179	-.680	-.155	-.336	-.187	-.245	-.290	.070	-----	-.303	-.307	.037	-.021	-.137
Greece	.150	.257	-.232	-.542	-.127	.349	-.437	-.113	.080	.157	.039	-.331	.353	-.303	-----	.049	.026	-.091	-.018
India	-.152	-.114	-.426	-.657	-.393	.015	-.609	.034	-.352	-.487	-.410	-.216	.183	-.307	.049	-----	-.200	-.273	.111
Israel	.162	.570	.037	-.488	.377	.418	-.146	.154	.511	.452	.261	.113	.119	.037	.026	-.200	-----	-.162	.367
Malaya	.142	.108	.009	-.257	-.298	.226	-.483	-.404	.052	.164	.078	.436	.579	-.021	-.091	-.273	-.162	-----	.081
Mexico	.144	-.022	-.179	-.218	-.071	.282	-.410	-.512	-.315	-.208	-.020	-.226	.343	-.137	-.018	.111	.367	.081	-----

APPENDIX D

CORRELATION COEFFICIENTS

BASED ON TOTAL EXPORTS

	United States	Canada	United Kingdom	Austria	Denmark	Finland	West Germany	Italy	Netherlands	Norway	Sweden	Australia	New Zealand	Japan	Greece	India	Israel	Malaya	Mexico
United States	-----	.356	.133	-.142	-.045	.730	-.420	-.346	.069	.264	.422	.460	.038	-.416	.047	-.061	-.041	.057	.318
Canada	.038	-----	.107	.103	.230	.433	-.223	-.271	-.002	-.229	.124	.357	.133	-.165	.510	.085	.361	.010	.006
United Kingdom	-.095	.135	-----	-.346	-.272	.477	-.567	-.099	-.156	.054	.068	-.160	-.121	-.768	-.274	-.314	-.205	-.010	-.024
Austria	-.039	-.057	-.366	-----	-.410	.661	-.068	-.049	-.376	-.220	.509	-.484	-.378	-.564	-.465	-.560	-.603	-.247	-.259
Denmark	.141	.236	-.433	-.550	-----	.586	-.437	-.155	.482	.207	.319	-.124	.047	-.425	.055	-.262	.376	-.342	.153
Finland	.391	.572	.037	.247	-.261	-----	-.012	-.042	-.267	.179	.246	.430	.071	-.179	.307	-.091	.356	-.013	.111
West Germany	-.683	.023	-.701	-.333	-.591	.608	-----	-.251	-.551	-.219	.190	-.616	-.517	-.715	-.511	-.583	-.533	-.508	-.360
Italy	-.147	.132	-.297	-.101	-.246	.298	-.466	-----	-.119	.012	.118	-.235	.079	.014	-.071	.253	-.127	-.318	-.456
Netherlands	.335	-.259	.123	-.348	.286	.073	-.402	-.476	-----	-.478	-.213	-.048	-.010	-.324	.075	-.170	.362	-.058	-.027
Norway	.247	-.106	.467	.322	.418	.302	-.230	-.219	.035	-----	.334	.067	-.106	-.361	.389	-.242	.201	-.019	-.251
Sweden	.023	-.020	-.030	.124	-.247	.432	-.185	-.232	-.342	-.110	-----	.094	-.244	-.426	.072	-.265	-.130	-.047	-.127
Australia	.390	-.032	-.098	-.453	-.007	.453	-.289	-.387	-.213	-.349	-.143	-----	.614	-.309	-.135	.042	.359	.508	-.116
New Zealand	.313	.003	.190	.004	.249	-.155	-.157	-.321	.087	.470	.120	.264	-----	-.093	.074	.319	.033	.493	.099
Japan	-.551	.004	-.232	-.230	-.024	.468	-.293	-.356	-.222	-.071	.064	-.182	.073	-----	-.274	-.192	-.180	-.074	-.094
Greece	.254	.228	-.024	-.323	.011	.498	-.165	-.037	.043	.163	.299	-.541	.760	-.110	-----	-.063	.040	-.320	.449
India	-.062	-.144	-.200	-.491	-.216	.114	-.219	-.086	-.350	-.327	-.209	-.432	.327	-.014	.219	-----	-.335	-.386	.559
Israel	.315	.608	.260	-.142	.188	.549	.082	.446	.752	.615	.394	-.053	-.199	.406	-.047	-.150	-----	-.138	.857
Malaya	.149	.423	-.072	-.138	-.235	.730	-.345	-.359	.048	.269	.403	.329	.872	.085	-.108	-.172	-.146	-----	.031
Mexico	-.118	.154	-.337	-.230	-.469	.419	-.302	-.227	-.463	.015	.118	-.335	.509	-.217	-.301	-.227	.063	-.078	-----

APPENDIX E

RESULTS OBTAINED BY ELIMINATING TRADE BETWEEN THE UNITED STATES AND EACH COUNTRY IN TURN

Country	Exports to World		Exports to World excluding the United States	
	Correlation	Log Correlation	Correlation	Log Correlation
Canada	.356	.234	.417	.329
United Kingdom	.133	.021	.103	-.012
Austria	-.142	-.125	-.127	-.117
Belgium (ten industries)			.335	.207
Denmark	-.045	.089	-.058	-.002
Finland	.730	.619	.724	.632
West Germany	-.420	-.596	-.409	-.583
Italy	-.346	-.269	-.235	-.141
Netherlands	.069	.241	.046	.216
Norway	.264	.282	.244	.273
Sweden	.422	.299	.425	.313
Australia	.460	.404	.466	.403
New Zealand	.038	.363	.071	.376
Japan	-.416	-.532	-.267	-.396
Greece	.047	.150	.082	.172
India	-.061	-.152	-.059	-.153
Ireland (eleven industries)	.743	.787	.731	.779
Malaya	.057	.142	.214	.203
Trinidad & Tobago (ten indsutries)	-.165	-.176	-.151	-.168
Turkey (eleven industries)	.268	.490	.253	.477
Yugoslavia (twelve industries)	-.312	-.402	-.307	-.394

APPENDIX F

AVERAGE PER CAPITA INCOME FOR 1958
(U. S. Dollars)

United States	$2370
Canada	1766
Sweden	1317
New Zealand	1300
Australia	1264
Denmark	1090
United Kingdom	1086
Norway	1035
Belgium	1031
West Germany	931
Finland	824
Netherlands	767
Austria	662
Israel	571
Italy	528
Ireland	477
Greece	338
Japan	320
Mexico	292
Yugoslavia	285
Malaya	approximately 250
Trinidad and Tobago	approximately 250
Turkey	187
India	68

APPENDIX G

AVERAGE VALUE ADDED PER PRODUCTION WORKER IN MANUFACTURING INDUSTRIES IN 1958

(U. S. Dollars)

United States	$9077
Canada	8023
Turkey	4896
New Zealand	4646
Australia	4154
Sweden	4044
Yugoslavia	3661
Norway	3428
Denmark	3257
Israel	2907
United Kingdom	2810
Finland	27[illegible]
West Germany	2725
Netherlands	2403
Belgium	2352
Trinidad and Tobago	2383
Ireland	2012
Austria	1929
Italy	1781
Greece	1508
Japan	1448
Mexico	1391
Malaya	1169
India	597

APPENDIX H

AVERAGE ANNUAL WAGE IN MANUFACTURING INDUSTRIES FOR 1958
(U. S. Dollars)

United States	$4798
Canada	3836
Sweden	2281
New Zealand	2179
Australia	2076
Israel	1776
Denmark	1755
Norway	1742
United Kingdom	1610
Turkey	1464
Finland	1391
Belgium	1367
West Germany	1255
Netherlands	1161
Ireland	1068
Trinidad and Tobago	688
Austria	666
Greece	624
Yugoslavia	570
Japan	552
Italy	514
Malaya	482
Mexico	435
India	309

BIBLIOGRAPHY

Balassa, Bela. "An Empirical Demonstration of Classical Comparative Cost Theory," The Review of Economics and Statistics, XLV (August, 1963), 231-38.

Bhagwati, Jagdish. "The Pure Theory of International Trade: A Survey," Economic Journal, LXXIV (March, 1964), 1-78.

Goldstein, Harold T. The International Standard Industrial Classification and the U. S. Standard Industrial Classification. Washington, D.C.: Bureau of the Census, 1965.

Kindleberger, Charles P. International Economics. Fourth edition. Homewood: Richard D. Irwin, Inc., 1968.

Kindleberger, Charles P. The Terms of Trade: A European Case Study. New York: John Wiley and Sons, Inc., 1956.

Kravis, Irving B. "Availability and Other Influences on the Commodity Composition of Trade," Journal of Political Economy, LXIV (April, 1956), 146.

Kravis, Irving B. "Wages and Foreign Trade," The Review of Economics and Statistics, XXXVIII (February, 1956), 14-30.

Leontief, W. W. "Domestic Production and Foreign Trade; The American Capital Position Re-examined," Proceedings of the American Philosophical Society, XCVII (September, 1953), 332-49.

Linder, Staffan Burenstam. An Essay on Trade and Transformation. New York: John Wiley and Sons, 1961.

MacDougall, G. D. A. "British and American Exports: A Study suggested by the Theory of Comparative Costs, Part I," Economic Journal, LXI (December, 1951), 697-724; and "Part II," Economic Journal, LXII (September, 1952), 487-521.

Mill, John Stuart. Principles of Political Economy, Volume II. Fifth edition. New York: D. Appleton and Co., 1894.

Olin, Bertil. Interregional and International Trade. Cambridge: Harvard University Press, 1952.

Paige, Deborah, and Gottfried Bombach. A Comparison of National Output and Productivity of the United States and the United Kingdom. Paris: The Organization for European Economic Cooperation, 1956.

Ricardo, David. The Principles of Political Economy and Taxat[illegible]. Third edition. Reprinted, London: J. M. Dent and Sons, 1965.

Rostas, L. Comparative Productivity in British and American Manufacturing. Cambridge: Harvard University Press, 1943.

Stern, Robert M. "British and American Productivity and Comparative Costs in International Trade," Oxford Economic Papers, New Series, XIV (October, 1962), 275-79.

Taussig, Frank W. International Trade. Reprints of Economic Classics, New York: Augustus M. Kelley, 1966.

Torrens, Robert. An Essay on the Production of Wealth. Reprints of Economic Classics, New York: Augustus M. Kelley, 1965.

United Nations. Commodity Trade Statistics - 1958. New York: United Nations, 1959.

United Nations. Growth of World Industry - National Tables 1938-61. New York: United Nations, 1964.

United Nations. Yearbook of National Accounts Statistics - 1966. New York: United Nations, 1967.

von Haberler, Gottfried. The Theory of International Trade. London: William Hodge and Co., Limited, 1936.

Weintraub, Sidney. "The Foreign Exchange Gap of the Developing Countries," Essays in International Finance, Number 48, Princeton University (September, 1965), 1-22.