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by
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The Classical Comparative Cost Doctrine as Pseudo Theory

I. Introduction

In the standard textbooks on international trade, the Ricardian and Heckscher-Ohlin theories are viewed as alternative explanations of the pattern of trade. The fact that the Classical or Ricardian theory was really intended to show the gains from trade is duly noted, but everyone agrees that a theory of the pattern of trade can be derived from the classical analysis. Nevertheless, the classical theory is often considered as inferior to the Heckscher-Ohlin theory, and it is with this contention which is found in a number of introductory texts that we will take issue on the following pages. Our major conclusion will be that on the basis of the standard criteria for judging economic theories, the classical theory comes out ahead of the factor abundance theory of comparative advantage. However, the first step will be to discuss the presentation and criticisms leveled against the classical theory by a number of textbook writers.

II. Standard Treatment of the Comparative Cost Doctrine in Current Textbooks

In The International Economy by P. T. Ellsworth, the discussion of the pattern of trade begins with the classical doctrine of comparative cost and is subsequently followed by a "modern" theory of international trade--the latter being identified with the writings of Heckscher and Ohlin.¹ It should come as no surprise that in the age of progress the term "modern" indicates

¹P. T. Ellsworth, The International Economy, fourth edition (New York: Macmillan, 1969), chs. 4-6.

that the H-O theory is an improvement on previous theorizing in this area. Ellsworth concludes his discussion of the assumptions and implications of the classical theory in the following way:

What is implied is that among a number of industries in various countries, labor is combined with other factors in proportions that vary not only from industry to industry, but are different for the same industry in the two countries. This amounts to saying that comparative advantage and international specialization are ultimately to be explained by international differences in production techniques or processes. But this is a pseudo explanation; it leaves unanswered the question how and why production techniques--the relationship between inputs and outputs--come to differ in the same industry in different countries.² (Italics mine)

The discussion of comparative advantage found in Kindleberger's International Economics is in no way more favorable to the classical economists.³ Kindleberger first levels some well-known criticisms against the labor theory of value⁴ and then concludes that, "In answer to the question put by the classical economists, the law of comparative costs says that a country exports those products that are comparatively cheap in price at home and imports those that are comparatively expensive."⁵ Then, Kindleberger observes that in order to answer the question of what makes for differences in comparative costs the factor abundance theory must be brought into the

²Ibid., pp. 75-76.

³C. P. Kindleberger, International Economics, fifth edition, (Homewood, Illinois: Irwin, 1973), ch. 2.

⁴For a skeptical treatment of the view that the labor theory of value is invalid consult Martin Bronfenbrenner, "Samuelson, Marx and their latest Critics," Journal of Economic Literature, XI (March, 1973), pp. 58-61.

⁵Kindleberger, op. cit., p. 27.

analysis. To be sure, Kindleberger recognizes that "differences in factor efficiency which are not the same for all commodities and which are not offset by differences in tastes"⁶ can provide the basis of trade. However, this statement comes more as an afterthought and no indication is given that classical economists had anything to say about differences in efficiency in different directions among countries.

The discussion of the pattern of trade in Kreinin's International Economics: A Policy Approach comes to the same conclusions as Kindleberger.⁷ Kreinin notes the standard point that the classical economists were primarily interested in illustrating the gains from trade; nevertheless, it is apparent that on the determinants of international specialization,

The Ricardian model with one factor of production (labor) probes a little deeper [than the opportunity cost doctrine] and hypothesizes that each country exports the commodity that it can produce at lower average labor cost (or higher average labor productivity). In other words, differential labor productivity is said to be the cause of the price differences... . But supposing labor productivity were the determining factor of who exports what. It still begs the question of what determines labor productivity. In other words, the theorist wishes to go "behind" productivity to find the answer. Over the past several decades, economists have come to believe in a rather specific explanation of the commodity composition of trade, dubbed the factor proportions (or endowment) theory.⁸ (Author's italics)

Again there is the same conclusion that classical economists did not explain the causes of cost differences, and that the more recent H-O theory must be

⁶Ibid., p. 30.

⁷Mordechai E. Kreinin, International Economics: A Policy Approach, (New York: Harcourt, Brace, Jovanovich, 1971), ch. 12.

⁸Ibid., pp. 218-19.

introduced to provide a satisfactory and complete explanation of the patterns of trade.⁹

Is the classical theory of comparative cost a "pseudo" theory and did the classical economists fail to explain the how and why of labor cost differences? I believe that the answer to this question is negative. Furthermore, a considerable amount of empirical evidence exists which substantiates the predictions of the classical model. In addition, this model is extremely flexible and suggests a number of fruitful hypotheses which economists have only recently begun to examine.¹⁰

III. The Determinants of Labor Cost Differences in the Classical Model

It is important to recall what the classical economists actually did say on the subject of labor cost differences. Ricardo, as Ellsworth duly notes, suggests that the application of "greater skill" and "better

⁹A recent text by R. E. Caves and R. W. Jones provides, in my view, a more balanced discussion of the relative merits of the Ricardian and Heckscher-Ohlin theories. Caves and Jones give a careful presentation of both theories, discuss the criteria for accepting or rejecting a theory, and then, analyze the existing empirical evidence. In general, although my discussion tends to favor the classical position more strongly, I would support their point of view as summarized in the following statement: "Perhaps the empirical predictions of the Ricardian model, less rich but less complex, should not be thrust aside lightly." See their World Trade and Payments: An Introduction (Boston: Little Brown, 1973), p. 204.

¹⁰As Friedman has pointed out the predictive power of a model should be judged not on the basis of the fact that situations can be visualized which would contradict the predictions of the model, but whether or not the predictions are in fact contradicted. See M. Friedman, "Comments on the Critics," Journal of Political Economy, 80 (September/October, 1972), p. 908. Furthermore, the realm of validity, a second criterion for judging a model, can be widened in the case of the Ricardian model as will be illustrated subsequently. See also Caves and Jones, op. cit., pp. 187-89.

machinery"¹¹ will determine the range of exportables. In his chapter, "On Machinery" Ricardo is more explicit:

The prices of commodities, too, are regulated by their cost of production. By employing improved machinery, the cost of production of commodities is reduced, and consequently, you can afford to sell them in foreign markets at a cheaper price. If, however, you were to reject the use of machinery, while all other countries encouraged it, you would be obliged to export your money, in exchange for foreign goods, till you sunk the natural prices of your goods to the prices of other countries. In making your exchanges with those countries, you might give a commodity which cost two days labor, here, for a commodity which cost one, abroad, and this disadvantageous exchange would be the consequence of your own act, for the commodity which you export and which cost you two days labor, would have cost you only one if you had not rejected the use of machinery, the services of which your neighbors had more wisely appropriated to themselves.¹² (Italics mine)

Furthermore, in the Notes on Malthus's Principles of Political Economy, Ricardo emphasizes again that England has obtained a competitive edge in commodities produced "with considerable facility by the invention and use of machinery, and by the great ingenuity of our people."¹³ Not that Malthus disagreed with this analysis since he only wanted to point out that labor saving machines might create difficult adjustment problems if industry could not rely on expansion into foreign markets.¹⁴ All of the other important classical economists also stressed the importance of machines in improving labor productivity. Smith does not wish to belabor the obvious since

¹¹The Works and Correspondence of David Ricardo, ed. by Piero Sraffa, (9 vols.; Cambridge: University Press, 1951), I, 142.

¹²Ibid., I, 397.

¹³Ibid., II, 360.

¹⁴Ibid., II, 168, 359-67.

"everybody must be sensible how much labor is facilitated and abridged by the application of proper machinery".¹⁵

One of the key contributions of the classical economists was their emphasis not on the discovery or occasional use of a new machine or process but on its widespread acceptance and diffusion throughout the industry. Perhaps Malthus expresses this point most clearly when he writes:

When a machine in manufactures is invented, which will produce more finished work with less labour and capital than before, if there be no patent, or as soon as the patent has expired, a sufficient number of such machines may be made to supply the whole demand, and to supersede entirely the use of old machinery. The natural consequence is, that the price is reduced to the price of production from the best machinery, and if the price were to be depressed lower, the whole of the commodity would be withdrawn from the market.¹⁶

The charges of the critics about a "pseudo" theory would seem to hinge on the question of whether or not the classical economists offered a satisfactory explanation of the determinants of the diffusion of cost reducing machines or processes since this will largely determine labor productivities and (along with money wages) labor costs and finally prices. An illustration of the chain of reasoning involved may be helpful especially since Ricardo's discussion suggests two different cases--a country may use better machinery in all lines of endeavor or it may use better machinery in the production of some tradable commodities and inferior machinery in other tradable commodities relative to another country.¹⁷

¹⁵ Adam Smith, An Inquiry into the Nature and Causes of the Wealth of Nations, ed. by Edwin Cannon (New York: Random House, 1937), p. 9.

¹⁶ The Work and Correspondence of David Ricardo, II, 168.

¹⁷ For detailed comments and data on the diffusion of new techniques of production since the industrial revolution in Europe by country and by industry consult David S. Landes, The Unbound Prometheus (Cambridge: University Press, 1969).

Case I

<u>Country</u>	<u>Product</u>	<u>Process or Machine</u>	<u>Efficiency Factor</u>	<u>Output per man per day</u>
England	cloth	power loom	7	70 yds.
	iron	coke	2	2 tons
Germany	cloth	hand loom	1	10 yds.
	iron	charcoal	1	1 ton

Case II

<u>Country</u>	<u>Product</u>	<u>Process or Machine</u>	<u>Efficiency Factor</u>	<u>Output per man per day</u>
England	cloth	power loom	7	70 yds.
	iron	charcoal	1	1 ton
Germany	cloth	hand loom	1	10 yds.
	iron	coke	2	2 tons

In both cases, when trade takes place, England will export cloth and import iron (wrought or malleable) from Germany. However, the level of money wages (as well as prices) which brings about balance of payments equilibrium will differ as Ricardo makes clear in the following passage:

If two countries having precisely the same population, and the same quantity of land of equal fertility in cultivation, with the same knowledge too of agriculture, the prices of raw produce will be highest in that where the greater skill, and the better machinery is used in the manufacture of exportable commodities. The rate of growth of profits will probably differ but little; for wages, or the real reward of labourer, may be the same in both; but those wages, as well as raw produce, will be rated higher in money in that country, into which, from the advantages attending their skill and machinery, an abundance of money is imported in exchange for their goods.

Of these two countries, if one had the advantage in the manufacture of goods of one quality, and the other in the manufacture of goods of another quality, there would be no decided influx of the precious metals into either; but if the advantage very heavily preponderated in favour of either that effect would be inevitable.¹⁸

¹⁸The Works and Correspondence of David Ricardo, I, 142.

This passage clearly indicates that Ricardo recognized the two cases illustrated above and further suggests that the causes of technological backwardness or progressiveness for the economy as a whole and particular industries may differ. However, Ricardo, himself, only appears to have been interested in general backwardness since he refers to the "advantages of skill and machinery" possessed by all the manufacturing industries of a particular country and the "general cheapness of commodities arising from the use of machinery."¹⁹ Undoubtedly, his primary interest in the distribution of the national product encouraged this particular approach. Moreover, it must be admitted that isolated, although frequent, references to the "advantages attending skill, industry, and climate"²⁰ do not add up to an explanation of the diffusion of new machinery.

However, Ricardo's predecessor Adam Smith made a number of important contributions on this subject. He observed that "the invention of all those machines by which labor is so much facilitated and abridged seems to have been originally owing to the division of labor" since "men are much more likely to discover easier and readier methods of attaining any object, when the whole attention of their minds is directed towards that single object, than when it is dissipated among a great variety of things."²¹ This explanation of technological progress is somewhat difficult to accept since increased specialization may eventually reach the point where workmen can no longer make a major contribution in discovering new machines. However, a more important difficulty from the theoretical point of view arises from the fact that the reasoning is circular. The division of labor promotes the

¹⁹ Ibid., p. 388.

²⁰ Ibid., p. 145.

²¹ Adam Smith, op. cit., p. 9.

invention of new machines which lower costs and permit the exportation of manufactured goods, and this in turn, widens the extent of the market on which the division of labor ultimately depends. This chain of events would appear to be damaging to the causal nature of the classical model since the exogenous theory of cost has become endogenous, but nevertheless, there is wisdom in their reluctance to assume that technology and costs were independent of trade opportunities. Moreover, this is not the whole story as Smith notes in the following passage:

All the improvements in machinery, however, have by no means been the inventions of those who had occasion to use the machines. Many improvements have been made by the ingenuity of the makers of the machines, when to make them became the business of a peculiar trade; and some by those who are called philosophers or men of speculation, whose trade it is not to do anything, but to observe everything; and who, upon that account, are often capable of combining together the powers of the most distant and dissimilar objects.²²

A generous interpretation of these sentences would suggest that the efficiency of the capital goods sector as well as the number of persons involved in inventive activity determine the adoption of cost reducing methods. This is in accordance with modern views which stress the importance of technological sophistication, or the lack thereof, in a few key sectors such as machine tools, computers and testing laboratories as well as the number of R and D personnel as determinants of comparative advantage.

The above quotations from Smith do not distinguish between the invention and diffusion of techniques, but his emphasis on the latter is shown in his discussion of the effect of competition on technological progress. He contrasts the situation in agriculture with that of the manufacturing sector

²²Ibid., p. 10.

in the following manner:

Farmers and country gentlemen, on the contrary, are generally disposed rather to promote than to obstruct the cultivation and improvement of their neighbours' farms and estates. They have no secrets, such as those of the greater part of manufacturers, but are generally fond of communicating to their neighbours, and of extending as far as possible any new practice which they have found advantageous.²³

Here one can see the starting point for all of those studies which seek to relate differences in the market structure of industries to technological progressiveness. Moreover, the later remark of Malthus on the likelihood that patents will hold up the adoption of new machines should be recalled. The inevitable conclusion which emerges is that the diffusion of known techniques is stimulated by the absence of monopoly elements whether these are the result of natural processes or encouraged by the state.

At least two further determinants of the widespread adoption of new methods can be derived from the following passage:

The corn-lands of England, however, are better cultivated than those of France, and the corn-lands of France are said to be much better cultivated than those of Poland. But though the poor country, notwithstanding the inferiority of its cultivation, can, in some measure, rival the rich in the cheapness and goodness of its corn, it can pretend to no such competition in its manufactures; at least if those suit the soil, climate and situation of the rich country. The silks of France are better and cheaper than those of England, because the silk manufacture, at least under present high duties, upon the importation of raw silk, does not so well suit the climate of England as that of France. But the hardware and coarse woollens of England are beyond all comparison superior to those of France, and much cheaper too, in the same degree of goodness.²⁴

²³ Ibid., pp. 428-29.

²⁴ Ibid., pp. 6-7.

Obviously the wealth of a country imposed a constraint on the number and quality of the labor saving devices in use. The process of capital accumulation could only proceed at a rapid pace in those countries where a significant part of the annual revenue could be set aside and invested. Smith reasoned that the potential for machine processes was greater in manufacturing than agriculture although we might question this observation. Nevertheless, this meant that he had to explain why machinery was successfully applied in the cotton textile and not in the silk manufacturing in England. The major reason for this phenomenon appears to be that the high cost of material inputs made silk manufacturing unprofitable in England.

It has been suggested that Ricardo had little to say on the determinants of the adoption of new methods of production and one may surmise that his primary interest on the distribution of national income and his emphasis on analytical rigor called for the elimination of anything which was more speculative in nature. But he cautions that "the employment of machinery could never be safely discouraged in a State,"²⁵ and hence, gives the impression that government policies may either promote or retard technological progress.

Some further evidence on the determinants of the adoption of machinery, and hence, the cause of comparative cost differences is presented by Taussig who faithfully followed the classical model in respect to its most important features. It is quite incorrect to conclude that Taussig saw comparative advantage as being based mainly on "climate, soil, the stores of minerals";²⁶

²⁵Ricardo, op. cit., I, 396.

²⁶Cf. Ellsworth, op. cit., p. 75.

for, "side by side with the physical causes of comparative advantage stand others which are often quite as effective" and "it is not merely the natural resources which have told but the manner in which they were used."²⁷ The U.S. comparative advantage in agricultural products illustrates this argument because "the skill of the makers of agricultural implements, and the intelligence of the farmers who use the implements were factors not less important than the great stretches of new land."²⁸ Then, Taussig goes on to give a more complete explanation of his theory:

It has already been pointed out that when the effectiveness of labor is spoken of, the effectiveness of all the labor needed to bring an article to market is meant; not merely that of the labor immediately and obviously applied (like that of the farmer), but that of the inventor and maker of threshing-machines and gangplows, and that of the manager and worker on the railways and ships. In other industries, even more markedly than in agriculture, the labor of the directing heads, of the planners and designers, tells in high degree for the final effectiveness of the labor which is applied thru all the successive stages. But in agriculture as practiced in the United States the guilding and contriving mind tells more than in the agriculture of any other country.²⁹

By way of a summary of the classical authors one can list the determinants of the diffusion of new methods which cause labor productivity differences among countries as follows: (i) the extent of the division of labor, (ii) the rate of capital accumulation, (iii) the progressiveness of the capital goods sector, (iv) the amount of inventive activity (v) the quality of entrepreneurship, (vi) the market structure of industries and the

²⁷F. W. Taussig, International Trade, (New York: Macmilland, 1933), pp. 180-81.

²⁸Ibid., p. 181.

²⁹Ibid., pp. 181-82.

degree of competition (vii) relative material input prices and finally (viii) the policies of government. When we compare this list of determinants of the diffusion of new technology to those found in recent econometric and qualitative studies a remarkable similarity becomes evident. The voluminous work of Edwin Mansfield on the diffusion of new techniques in American industries indicates that the relative profitability of process innovations determines their rate of diffusion.³⁰ In an international context, this raises the question of what determines differences in the profitability of a particular technique from one country to the next. Obviously, material input costs play a role in this regard. For example, the basic oxygen furnace for steelmaking tends to be more profitable where low phosphorus iron ore is cheap while the open hearth furnaces profitability is more dependent on cheap scrap prices.³¹ Thus, the adoption of the cost reducing basic oxygen may proceed less slowly where high phosphorus iron ores and scrap are cheap.

The empirical results on the relationship between market structure and the adoption of new techniques tend to be more ambiguous. Mansfield concludes his studies by stating that "the rate of imitation is higher for the more competitive industries, but there are too few data to warrant any real conclusions on this score."³² In an international context, one might

³⁰ See His Industrial Research and Technological Innovation (New York: Norton, 1968), p. 153.

³¹ On the determinants of the diffusion of the basic oxygen process (which includes almost all the determinants mentioned above) consult G. S. Maddala and P. T. Knight, "International Diffusion of Technical Change - A Case Study of the Oxygen Steelmaking Process," Economic Journal LXXVII (September, 1967), pp. 531-58. See also J. R. Meyer and Guy Herregat, "The International Diffusion of the Basic Oxygen Steel Process," National Bureau of Economic Research, April, 1971, mimeographed.

³² Mansfield, op. cit., p. 144.

hypothesize that the rate of imitation or interfirm rate of diffusion of new processes might be greater for the same industry in different countries depending on the degree of competition. This hypothesis has been examined as well, especially in the case of the basic oxygen process mentioned above.³³

The discussion of recent empirical work on two or three of the list of determinants of the diffusion of new techniques does not present the complete picture. Nor would one wish to claim that current studies in this field have derived their inspiration from the classical economists, but only that they are in accordance with classical ideas. In concluding a theoretical paper on the Ricardian and H-O theories of comparative advantage, one author wrote: "More fundamental causes (of comparative cost differences) may have to be sought in the latent forces which govern both the extent and the direction of technological advancement."³⁴ Considerable progress has been made in recent years in identifying and measuring the quantitative importance of these "fundamental causes," but for an individual somewhat acquainted with the classical literature the actual variables involved have that *déjà vu* appearance.

IV. The Predictive Power of the Classical Model

This is not the place for a complete summary of the empirical evidence on the H-O and Classical models especially since a number of excellent

³³ See Walter Adams and Joel B. Dirlam, "Big Steel, Invention, and Innovation," Quarterly Journal of Economics, LXXX (May, 1966), pp. 167-89. Also compare H. G. Baumann, "The Diffusion of the Basic Oxygen Process in the U.S. and Canadian Steel Industries, 1955-71," unpublished paper.

³⁴ Akihiro Amano, "Determinants of Comparative Costs: A Theoretical Approach," Oxford Economic Papers, XVI (November, 1964), p. 400.

surveys already exist.³⁵ Most empirical studies cast serious doubt on the predictive power of the H-O model and Kreinin who favors the H-O theory over the Classical theory of comparative advantage makes the following candid observation: "With all these virtues, one may ask, is there anything wrong with the (H-O) model? The answer is that empirical tests to date have failed to verify it."³⁶ Only Ellsworth retains his faith in the empirical validity of the factor abundance theory. After reviewing several studies he concludes that, "The balance of evidence is about even: out of the seven tests cited, three (Tarshis, Tatemoto and Ichimura, Stolper and Roskamp) seem to lend it some support, while in addition to Leontief, three (MacDougall, Wahl, Bhardawaj) give inconsistent results."³⁷ This reading of the empirical results does not correspond with that of other writers,³⁸ and his subsequent conclusion as presented in the paragraph quoted below seems unwarranted:

With respect to manufacturing industries, or more accurately, processing industries, the two factor model of labor and capital serves quite well. The inputs consist of labor and capital plus materials. The former are assumed immobile internationally, while the latter are mobile. Hence with materials costs the same everywhere (transport costs and tariffs aside), the cost advantage in manufacturing rests on the suitability of domestic factor proportions to the factor intensity of the production function. Exports of manufactures from countries abundantly endowed with capital will tend to be capital intensive, while processed articles that are labor intensive will come from nations in which labor is abundant.³⁹

³⁵For example, Ronald Findlay, Trade and Specialization (Baltimore: Penguin, 1970), pp. 87-106; Caves and Jones, op. cit., pp. 186-204.

³⁶Kreinin, op. cit., p. 225.

³⁷Ellsworth, op. cit., p. 129.

³⁸Cf. the sources cited in footnote 35.

³⁹Ellsworth, op. cit., p. 39.

To be sure Ellsworth includes human capital with physical capital in his discussion, and Kenen has shown that U.S. exports tend to be physical plus human capital intensive relative to import competing industries but just barely.⁴⁰ This one study, especially in the light of problems connected with the measurement of human capital, is hardly sufficient to rehabilitate the H-O theory. As Caves and Jones note: "But in restoring the toppled Heckscher-Ohlin theorem to its throne (by adding up the influence of labor skills, natural resource scarcities, and United States tariffs excluding labor intensive imports), we have robbed it of much of its empirical simplicity: two factors of production are not enough, and the absence of factor-intensity reversals between countries cannot be assumed."⁴¹

Even more damaging to the H-O model is the discovery by Finger that the factor intensity of the export and import bundles may be equal.⁴² On the basis of a review of several studies in the Leontief tradition, he concludes that: "The tests...suggest that the export and import sectors of the four countries for which data are available do not employ significantly different capital-labor ratios."⁴³ Since the theorems derived from the H-O model depend on different factor use ratios, we are left in a very

⁴⁰P. B. Kenen, "Nature, Capital and Trade," Journal of Political Economy, 73 (October, 1965), pp. 437-60.

⁴¹Caves and Jones, op. cit., p. 204.

⁴²J. M. Finger, "Factor Intensity and 'Leontief Type' Tests of the Factor Proportions Theory," Economia Internazionale, 22 (August, 1969), pp. 405-21.

⁴³Ibid., p. 419.

uncomfortable position, both with respect to the theoretical and empirical implications of the H-O theorem.

The lack of empirical support for the H-O model may be contrasted with the failure of researchers such as MacDougall and his followers to disprove the Ricardian comparative cost doctrine. The only exception in this regard are the tests on the theory performed by Bhagwati who suggests that while MacDougall may have shown a correlation between relative labor productivity and relative export shares no correlation exists between relative labor productivity and relative export prices, and hence, the Ricardian theory has been refuted.⁴⁴ But Bhagwati's test is inappropriate since countries selling the same product in foreign markets will presumably sell it at the same price. Moreover, in a dynamic, imperfectly competitive world, countries with a productivity advantage will be encouraged to increase their market share with the use of non-price competition.

In terms of the analysis presented in Section III one might suggest that MacDougall should have gone even further in his analysis and related the causes of productivity differences such as differences in the efficiency of labor and/or methods of production to export shares. A number of studies have been carried out along these lines. For example, Ault was able to show that the normalized net trade position in world steel trade of a sample of countries is related to their use of various types of steelmaking furnaces in the 1957 to 1966 period.⁴⁵ Thus, the use of the basic oxygen and basic

⁴⁴J. Bhagwati, "The Pure Theory of International Trade: A Survey," Economic Journal, 74 (March, 1964), pp. 10-17.

⁴⁵D. Ault, "The Determinants of World Steel Exports: An Empirical Study," Review of Economics and Statistics, LIV (February, 1972), pp. 38-46.

Bessemer process tended to improve the net trade position of a country while relatively greater employment of the open hearth and acid Bessemer process had the opposite effect. Ault concludes that he has established the validity of the Posner technology gap theory, but his findings may also be interpreted as support for the classical doctrine of comparative advantage on the assumption that different methods of production are the main element in labor productivity differences among countries. This interpretation is supported by the empirical evidence which has failed to unearth any substantial differences in the effectiveness of labor which otherwise could be considered as another major component of labor productivity differences. Thus, Kreinin, in trying to evaluate this particular explanation for the Leontief paradox, found that differences between the United States and Europe were no larger than 20 or 25% in the effectiveness of labor.⁴⁶ Moreover, John Stuart Mill suggests that there may be equalizing differences in the effectiveness of labor with the English workmen being the better specialist while workers of other countries are more adaptable. He quotes a study which comes to the following conclusion:

As workmen only, the preference is undoubtedly due to the English; because, as we find them, they are all trained to special branches, on which they have had comparatively superior training, and have concentrated all their thoughts. As men of business or of general usefulness, and as men with whom an employer would best like to be surrounded, I should, however, decidedly prefer the Saxons and the Swiss, but more especially the Saxons, because they have had a very careful general education, which has extended their capacities beyond any special employment, and rendered them fit to take up, after a short preparation, any employment to which they may be called.⁴⁷

⁴⁶M. Kreinin, "Comparative Labor Effectiveness and the Leontief Scarce-Factor Paradox," American Economic Review, 55 (March, 1965) pp. 131-40.

⁴⁷J. S. Mill, Principles of Political Economy, ed. by Sir W. J. Ashley, (New York: Augustus M. Kelley, 1965), p. 109.

This, of course, does not mean that the effectiveness of labor plays no role in the pattern of trade since it is conceivable that the production functions in different industries and with different techniques in the same industry require different types of labor. Nevertheless, the support for concentrating on labor productivities as being caused by differences in the methods of production appears to be strong and is consistent with the classical literature.

V. The Realm of Validity of the Classical Model

A major problem with the Ricardian comparative cost doctrine is its apparent restrictiveness in terms of the class of phenomena to which it can usefully be applied. First it focuses on the supply side, and on the basis of the interpretation presented above, would appear to be suitable only for explaining manufactured goods trade in process industries. Second, it is incapable of explaining intraindustry trade or the problem of trade overlap, i.e., both the exportation and the importation by a country of the "same" product. This failure is connected with the underlying assumption of a perfectly competitive market structure in the theory. Finally, the classical model is essentially static in nature. However, these unrealistic elements which the Ricardian theory shares with the H-O theory are less damaging to the former because they can be taken into account to some extent, and they are less damaging to its empirical validity.⁴⁸

⁴⁸The reader may correctly feel that here I am mixing up two different methodologies--one which insists on the predictive power of a theory (Friedman) and the other which insists on the realism of assumptions (Samuelson). However, it has recently been shown that neither position, narrowly interpreted, is defensible, and that a theory should be explanatory and informative providing a tentative answer to the question, "Why". I would argue that the classical doctrine succeeds on this basis to a remarkable extent. See, also, S. Wong, "The 'F-Twist' and the Methodology of Paul Samuelson," American Economic Review, 63 (June, 1973), pp. 312-25.

Thus, process innovations often occur simultaneously with product innovations or at least improvements in product quality. Clearly, Adam Smith already recognized this point when he stated that "the hardware and coarse woollens of England are beyond all comparison superior to those of France, and much cheaper too, in the same degree of goodness."⁴⁹ A recent study on the diffusion of ten new processes in nine industries finds that, in eight out of the ten cases examined, the process innovation involved a quality improvement in the commodities produced.⁵⁰ Moreover, the simultaneous nature of process and product innovations is also apparent from Tilton's work on the semiconductor industry.⁵¹ Of course, it would be incorrect to argue that new products cannot be produced without process innovations, but neither does it mean that the classical model is only relevant where process innovations alone occur.

In the classical model, a country will either export or import a tradable product but not do both, and hence, it is not suitable for explaining the trade overlap phenomenon which is largely connected with the creation of new product varieties.⁵² In order to rehabilitate the theory one could always

⁴⁹Smith, op. cit., pp. 6-7.

⁵⁰G. F. Ray, "The Diffusion of New Technology: A Study of Ten Processes in Nine Industries," National Institute Economic Review, No. 48 (May, 1969), pp. 40-83.

⁵¹See his International Diffusion of Technology: The Case of Semiconductors (Washington: Brookings, 1971), p. 15.

⁵²For an attempt to deal with the trade overlap phenomenon consult J. M. Finger, "A New Model of International Commodity Trade," unpublished paper presented at the Detroit Meetings of the Econometric Society, December, 1970.

define every new product variety as a new product with its own production function, but then the theory would lose much of its simplicity and predictive power and, in fact, it would become tautological. This is analogous to the problem which arises when the H-O theory, in an attempt at greater realism, is expanded to include many factors of production.

Although a major transformation of the classical theory would be required to deal with the problem of trade overlap this is less true of the case where intraindustry trade of industrial materials of a standardized nature is involved. In general, the introduction of new methods of production by oligopolists in these industries will increase domestic output in a lumpy way both because of the greater efficiency and the substantial economies of scale of these new techniques. Thus, for the technologically progressive oligopolist, the foreign market can serve as a 'vent for surplus' for the additional output without bringing forth aggressive reactions from rivals. As long as imports form a small part of domestic consumption, the progressive firms in different countries may find it profitable in the long run to be involved in a cross shipment exercise because this poses no direct threat to the market share of domestic, backward rivals. The classical model's prediction of an improved trade balance with improvements in comparative costs based on the introduction of cost saving methods will be upheld, but perhaps only at the firm level.

Nevertheless, it must be admitted that the classical model is essentially static since it is based on the use of one type of production function in the entire industry of one country, and another type of production function in the entire industry of another country. In fact, recent theories in international trade have tried to be more explicit about the time path of adjustment of variables such as production, consumption, exports and imports

given a particular pattern of adoption of new processes or products.⁵³ It is not clear whether these theories will eventually entirely replace the older H-O and Ricardian theories, but the latter theory is their true antecedent. The empirical support for the new theories of international trade is not yet overwhelming, and although one can find many a priori reasons for rejecting the Ricardian theory it still remains valid as long as it is not contradicted by new evidence of a decisive nature.

However, the H-O model would appear to have a lesser chance of survival over the long run, and while one might not agree with one author who calls for the replacement of the entire analytical apparatus,⁵⁴ a rewriting of the textbooks which would give a more central role to the classical theory as a starting point of a better, more comprehensive theory of trade would be desirable.

⁵³ By recent or new theories, I mean the product cycle theory and its derivatives. The distinction between static and dynamic trade theory is based on Caves who writes: "Many models have been put forth as dynamic on the basis of the slender novelty of treating all variables as growth rates rather than levels. Other writers, more naively still, have branded their work dynamic because it deals with technological change or other fashionable variables. This study has been consciously stingy about recognizing models as dynamic. It has sought to admit only those which say significant things about the timepath of economic variables... ." See his Trade and Economic Structure: Models and Methods, (Cambridge, Mass.: Harvard University Press, 1960), pp. 242-43.

⁵⁴ Finger, "Factor Intensity and 'Leontief Type' Tests...", p. 405.