STATIC AND DYNAMIC COMPARATIVE ADVANTAGE: MULTI-PERIOD ANALYSIS WITH DECLINING TERMS OF TRADE

by James M. Cypher and James L. Dietz

There is no body of economic theory that has achieved greater professional acceptance than David Ricardo's theory of comparative advantage and the modern emendations of Ricardo's "law." Criticisms of comparative advantage and its extensions from a theoretical perspective have not resulted in any substantial weakening of the overall strength of this body of theory nor of its corollary, a free trade regime.

Certain special-case exceptions to the law of comparative advantage have been demonstrated. Jagdish Bhagwati showed that under unrestricted free trade "immiserizing growth" could occur [Bhagwati 1958]. More recently, the "new" trade theorists have focused on the policy implications of trade under conditions of increasing returns and imperfect competition, arguing that under such conditions violations of free trade policy could be optimal.

Our purpose is not to revisit these issues. Rather, we intend to reconsider the theory of comparative advantage from a more dynamic perspective than is found in the literature. We believe it is possible to demonstrate that the basic Ricardian theory of comparative advantage, including its extensions, is too static a theory on which to rest a first-best argument in favor of free trade in quite a number of realistic scenarios. Especially for poor, less-developed nations, we show that the generalized argument in favor of free trade policy derived from trade theory cannot be sustained once one takes the long-term historical trend of the terms of trade into consideration. When comparative advantage is understood as a dynamic concept and process, violations of free trade may be desirable, necessary, and, perhaps most controversially, first-best for some nations.

The authors are Professor of Economics, California State University, Fresno, and Professor of Economics and Latin American Studies at California State University, Fullerton, respectively. This paper was presented at the annual meeting of the Association for Evolutionary Economics, Chicago, Illinois, January 3-5, 1998. The comments of P. Sai-wing Ho are gratefully acknowledged.

The Traditional Theory Of Comparative Advantage

The theory of comparative advantage, of course, argues that unrestricted exchange between countries will increase the total amount of world output if each country tends to specialize in those goods that it can produce at a relatively lower cost compared to potential trading partners. Each country then will trade some of those lower-cost goods with other nations for goods that can be produced elsewhere more cheaply than at home. At the end of the day, with free trade among nations, all countries will find that their consumption possibilities lie outside their domestic production possibilities .

The basic theory assumes that all the factors of production are immobile and that both (all) countries have the capacity to produce both (or all) goods. Any imports are perfectly balanced by an equivalent-valued export flow; thus, neither country incurs a trade deficit ,which must be financed. Further, it is assumed that perfect competition,

and not monopoly production, prevails and that all resources in each country are fully employed. The last is an especially important assumption, particularly for less-developed nations, since with less-than-fully employed resources, tariffs or other forms of protection (including subsidies) to block imports and to increase domestic employment could well be the preferred policy. With less-than-fully employed resources, the key allocative issue becomes an internal mobilization of domestic resources to their full use, rather than a reallocation among alternative uses. To be reasonably confident in applying the basic Ricardian analysis and its conclusions to any country or situation, it seems sensible, in practice, to inquire to what degree the assumptions of the theory conform to the reality of the economy under investigation.

While these are important considerations having to do with the validity of assumptions in practice, there are other concerns about a blanket endorsement of the comparative advantage argument and free trade recommendations for less-developed nations. Joan Robinson's comment on the real-time effect of following free trade and specialization, at least as far as Portugal was concerned in Ricardo's original example, remains provocative and presages our reformulation.

> ... the imposition of free trade on Portugal killed off a promising textile industry and left her with a slow-growing export market for wine, while for England, exports of cotton cloth led to accumulation, mechanisation and the whole spiraling growth of the industrial revolution [Robinson 1978, 103].

This passage provides us with a valuable historical and dynamic hint about the impact of pursuing comparative advantage. It may not be specialization per se that is so important for a country's future as is the choice of what to specialize in. The production of some goods may be more likely to have expanding world demand in the future, as England did with cloth production at the time Ricardo formulated his example. Some types of production may be more likely to benefit from the application of science and technology over time. And, what is the impact of the trend of the terms of trade for a country on the gains from specialization? It is this more dynamic approach to the theory of comparative advantage and to the nature of the ensuing path dependence that accompanies decisions to produce particular goods or services for the world market that form the basis of our argument.

Multi-Period Comparative Advantage And Declining Term Of Trade

Our argument can be summarized as follows. Following Ricardian comparative advantage and specializing offers an unambiguous one-time increase in world productivity and an increase in the level of consumption beyond that level possible given each country's production capabilities. Once such specialization occurs, however, any future gains from trade for the individual countries depend on the evolution of the international trade price, that is, on the terms of trade. And the evolution of the terms of trade depends on factors such as changes in technology, institutional structures of the trade partners, and other factors to be mentioned below.

While we do not present a full-blown abstract theoretical model here to prove our case, we do present a Ricardian-type numerical example to support our contention that following comparative advantage and specializing can, under reasonable conditions, result in a lower level of economic development, as measured both by GNP and by

physical output, than a less-than-free trade regime. In other words, when a country faces declining terms of trade for its export(s), specialization and free trade may well be the sub optimal policy choice for some countries. The response to such a dilemma is not to withdraw from the trading system, but rather to recreate a basis for comparative advantage This process of acquiring and abandoning specializations, or climbing skill and product "ladders," can be achieved through a national development strategy based in the concept of dynamic comparative advantage. As a large body of research--primarily on East Asia--demonstrates, successful development hinges on such a strategy, which relegates trade to a functional role in development through promotion of an export-investment nexus [UNCTAD 1996, 72-169].

Raul Prebisch, the late Argentine economist and original director of the Economic Commission for Latin America, planted the seed for this analysis. In his 1950 study, he argued that the secular decline in the terms of trade for primary product exporting, manufactured-good importing nations — a characteristic shared by all less-developed nations early in their process of development — provided a refutation of the Ricardian theory of comparative advantage [Prebisch 1950]. However, that connection was never convincingly made, and such an assertion seemed, if not heretical, at least ill-informed to most economists of the time. The following example, however, does provide a firmer connection between declining terms of trade and Prebisch's insight on the implication for traditional comparative advantage.

The Model

We utilize a case based upon Ricardo's original numerical model, for simplicity assuming constant returns. Table 1 shows the number of hours required to produce one unit of each good. Country N is a developed nation (North); Country S is a less-developed nation (South). Good M is a manufactured good; Good P is a primary product.

Table 1
Hours Required to Produce One Unit of Each Good

	Good M	Good P	
Country N	100	120	Internal opportunity cost: 1P: 1.2M
Country S	90	80	Internal opportunity cost: 1P: 0.88M

Assume Country N begins with 400,000 worker/hours divided 3/4 in M, 1/4 in P and Country S begins with 300,000 worker/hours divided 1/4 in M, 3/4 in P. Given the labor hours required to produce one unit of each good shown above, production prior to specialization and trade will be as described in Table 2, below.

Table 2
Period 1: Pre-Specialization, No Trade

	Good M	Good P
Country N	3,000	833.33
Country S	833.33	2812.5
	3,833.33	3,645.83

Table 3 is divided into two parts. On the left-hand side, we show the evolution of consumption for both countries assuming specialization based on comparative advantage. Following the spirit of the famous Prebisch-Singer hypothesis, we allow technological change for each good. Productivity in the production of good M, produced by Country N, which has comparative advantage in that good, occurs at the rate of 5 percent per year, while productivity grows at the rate of 3 percent per year for good P, produced by Country S. Further, after beginning with a mutually beneficial initial trade price of 1M for 1P, we let the terms of trade deteriorate at the rate of 1 percent per year against country S (thus in "year" 2, the terms of trade are 1M:1.01P; in "year" 2, 1M:1.02P, etc.).

The Prebisch-Singer hypothesis explains declining terms of trade as the consequence of structural differences of importance between manufactured goods exporters (like Country N) and primary product goods exporters (Country S). In particular, the competitive international market in which (most) primary products are produced combined with a labor surplus in producing such goods conspire to push down market prices with technological progress. Given that such conditions are presumed not to hold, or to be weaker for the manufactured goods produced in the N, or developed, countries, technological change there does not push market prices downward (or at least not to the full extent of increased productivity).

On the left-hand side of Table 3, we show the evolution of production for both goods for both countries, with output of the M good rising by 5 percent and of the P good by 3 percent in each country. There is no specialization and no trade between countries N and S on the RHS of the table.

Table 3
Welfare Effects of Trade versus Non-Trade Regime with Technological Progress
With Specialization and Trade Without Specialization and Trade

Period 1 Good M Good P Country N 3,100 900 Country S 900 2,850 4,000 3,750	Good M Good P Country N 3,000 833.33 Country S 833.33 2,812.5 3,833.33 3,645.83
Period 2 Good M Good P Country N 3,250 959.5 Country S 950 2,903 4,200 3,862.5	Good M Good P Country N 3,150 858.32 Country S 874.99 2,896.87 4,024.99 3,755.20
Period 3 Good M Good P Country N 3,435 994.60 Country S 975 2,983.77 4,410 3,978.37	Good M Good P Country N 3,307.5 884.08 Country S 918.74 2,983.78 4,226.24 3,867.86
Period 4 Good M Good P Country N 3,630.5 1,030.30 Country S 1,000 3,067.42	Good M Good P Country N 3,472.87 910.60 Country S 964.68 3,073.29 4,437.56 3,983.89

4,630.5 4,097.72	
Period 5 Good M Good P Country N 3,837.03 1,066.62 Country S 1,025 3,154.03 4,862.02 4,220.65	Good M Good P Country N 3,646.52 937.92 Country S 1,012.91 3,165.49 4,659.44 4,103.41
Period 6 Good M Good P Country N 4,055.12 1,103.56 Country S 1,050 3,243.71 5,105.12 4,347.27	Good M Good P Country N 3,828.84 966.06 Country S 1,063.56 3,260.45 4,892.40 4,226.51

In Period 1, with specialization and trade, the physical output available for consumption for each country, as well as GNP, is greater than in the pre-specialization, no-trade situation shown in Table 2. This, of course, is the essential point of comparative advantage theory and what gives it such a powerful place in the economist's theoretical toolbox. However, a comparison of the two sides of Table 3 reveals that, after the initial gains from specialization, with declining terms of trade, the following results hold:

- By Period 3 (and more clearly by Period 4), the quantity of good P available for consumption in Country S without trade exceeds what is available with trade; the quantity of good M available to Country S is less without trade.
- By Period 6, however, a switch point has been reached. The quantities of both goods M and P produced domestically in Country S without specialization and without trading now exceed what would be available to it for consumption with specialization and trade, given the presence of declining terms of trade. Of course, in subsequent periods, this gap between the no-trade regime and the trade regime widens for Country S in favor of the domestic production of both goods over specialization and trade.

Thus, within a relatively short span of time, when facing declining terms of trade, Country S is soon better-off producing both goods for itself rather than specializing and trading. Any short-term welfare losses in the early periods of no trade for Country S must surely, at any reasonable rate of time discount, be overwhelmed by the gains in welfare from the increase in goods available for consumption over the medium to long run.

On the other hand, the no-trade regime is not the first-best policy for Country N. The physical quantities available to Country N for domestic consumption are significantly smaller in all periods without specialization and trade. Total world output also is less without specialization, since there are continued global inefficiencies resulting from not following comparative advantage. But it is precisely this fact that makes this exercise interesting and thought provoking at the level of welfare economics, of economic policymaking, and for economic development.

With specialization and trade in Period 6, the world level of production of both goods is greater than it is without specialization and trade; with trade, however, Country N's welfare is improved at the cost of Country S's potential welfare compared to the no-

specialization, no-trade scenario. Just the opposite is the case without specialization and trade; Country S is better-off, while Country N is worse-off (in terms of the physical quantities available for consumption).

Neither scenario is Pareto optimal, then, in the presence of systematic deteriorating terms of trade for one country. One outcome, specialization and trade, is better for country N; the other, the no-specialization, no-trade regime is better for country S. Of course, one could argue that the specialization/trade regime is potentially welfare maximizing for both countries, but that would only be the outcome if the welfare/income losses resulting from Country S's declining terms of trade in the specialization/trade scenario were to be compensated for by an income transfer from Country N that exceeded the terms of trade loss. However, in the field of development economics, such compensation cannot be taken for granted.

The outcome shown in Table 3 conforms with Prebisch's view that the more advanced countries (N) reaped the gains from international trade, growth, and technological change at the expense of the less-developed countries (S). In fact, according to the Prebisch-Singer hypothesis, the N nations gain doubly from new technology and trade with the periphery, while the periphery becomes worse off as a result of a deterioration in their terms of trade. This is because the benefits of new technology, no matter where they occur, accrue to the manufactured good exporters as their incomes rise and the prices of what is imported from the periphery fall.

Historical Evolution Of The Terms Of Trade

It is, perhaps, reasonable to ask how likely the terms of trade are to decrease at the rate posited in our example. Since Prebisch's original publication, and given the critical implications of the issue he posed, there has been a continuing flow of empirical research seeking to determine if there is any systematic variation in the terms of trade. As Table 4 summarizes, since the beginning of this century the terms of trade for primary products have decreased over the long run as the prices of primary products relative to manufactured goods fell for less-developed nations.

Other studies, such as those of Spraos [1983] and Sarkar [1986], support the basic hypothesis of Prebisch on long-term declining terms of trade for primary product exporters. Spraos [1980, 121-26] for example, found that from 1950 to 1970, the terms of trade for primary products (in relation to manufactured products) decreased 25 per cent. In a more recent study, Sapsford [1985] found a 1.2 percent decline per year in the net barter terms of trade from 1900 to 1982. Thus, the 1 percent annual deterioration in the terms of trade we used in Table 3 seems to be consistent with the existing body of empirical research.

Table 4
Trends in the Terms of Trade

Primary Export Nations		% Change per year,
(1)	1801-1881	0.87
(2)	1882-1913	-0.42
(3)	1876-1938	-0.95
(4)	1900-1986	-0.52 to -0.84a

a Grilli and Yang [1988] break down the trend in the terms of trade for various subcategories of primary

product exports (for example, raw material, fuels, cereals, foodstuffs). They find a long-term downward trend for the terms of trade for all primary products in international trade with the exception of tropical drinks (e.g., coffee), which had an upward trend of 0.63.

Implications of the Model

Prebisch believed that with declining terms of trade, a successful development program for less-developed nations would, of necessity, require an emphasis on internal changes that could expand the production of manufactured goods and other secondary production activities and reduce the significance of the export of traditional raw materials, foodstuffs, and other primary products that formed the core of their exports. Import substitution thus became an essential building-block for less-developed nations wishing to become more developed.

Abandoning primary exports, or de-emphasizing them, so as to produce manufactured goods in which a country does not have comparative advantage is often viewed as a radical and theoretically unfounded step. However, our example clearly shows how, even though there is a one-time gain from pursuing comparative advantage, which improves the welfare of both countries immediately, the adverse impact of declining terms of trade on Country S makes this a sub optimal policy choice very soon thereafter. Thus what is optimal in a one period model (specialization and trade) is revealed to be dynamically sub optimal in subsequent periods.

Further, extending the implications of the analysis, optimizing static comparative advantage is no substitute for a more future-oriented analysis of dynamic or created comparative advantage. Violating current comparative advantage and operating within the framework of a less-than-free-trade policy may allow expansion of the future level of economic welfare for less-developed nations far beyond what any free trade policy might promise. This would seem to be one of the underlying implications of endogenous growth theory and its emphasis on the positive externalities to be gained from human capital accumulation and technological competence.

Our simple example shows how specialization and trade can be sub optimal policy when one country faces declining terms of trade for its export(s). This does not mean that all trade is bad in its impact on a nation’s welfare, of course. But too often it is presumed that the opposite is true: that free trade is welfare enhancing. Unfortunately, it would appear that for a wide range of possible scenarios, this is quite untrue as well.