*Chapter 41*

# COMPARATIVE ADVANTAGE AND INTERNATIONAL TRADE

CHARLES R. PLOTT

The fundamental question addressed by this research is the degree to which the classical law of comparative advantage can be observed operating in experimental markets. The law holds that the local economic environments systematically influence, if not completely dictate, patterns of specialization and trade in this sense: local economies will experience economic pressures to specialize in the production and export of those commodities for which the local economy has a comparative advantage. This specialization is the engine that facilitates the gains from trade and the associated wealth that it produces. The issue is investigated in Noussair, Plott, and Riezman (1995).

Field evidence in support of the law is indirect at best. The law of comparative advantage predicts that countries will have a tendency to export the good that would have the lowest relative price in a situation of no international trade (autarky). Since autarkies do not exist, the theory cannot be tested directly in the field. Testing is further complicated by the fact that there are so many variables operating in the field that there are always many alternative explanations for any pattern of trade and specialization that might be observed. It is hard to reject the assertion that data in support of the law could simply be manifestations of some accident of history as opposed to being the footprint of a general and pervasive pattern of economic pressures.

The law of comparative advantage can be derived as a consequence of the competitive equilibrium model. In addition, the competitive equilibrium model can yield the property of factor price equalization. That is, if the economy is behaving as predicted by the competitive model then under certain parametric conditions, countries will specialize in predictable ways and the prices of factors of production among countries will be equalized by their flows of commodities even if the factors themselves cannot leave their home country. According to the model, the wages will be the same across all freely trading countries even though the countries produce different things and labor is not mobile.

The major results reported from experimental data are the following:

(1) The law of comparative advantage can be observed operating and the law accurately predicts trade patterns.
(2) Production and consumption output prices are observed moving toward the levels predicted by the competitive equilibrium. However, the levels of prices are not those predicted by the competitive equilibrium model.
(3) Within appropriate parametric conditions the property of factor price equalization predicted by the competitive model can be observed in operation.
(4) The imposition of tariffs restrict the volume of trade as predicted by the competitive model.

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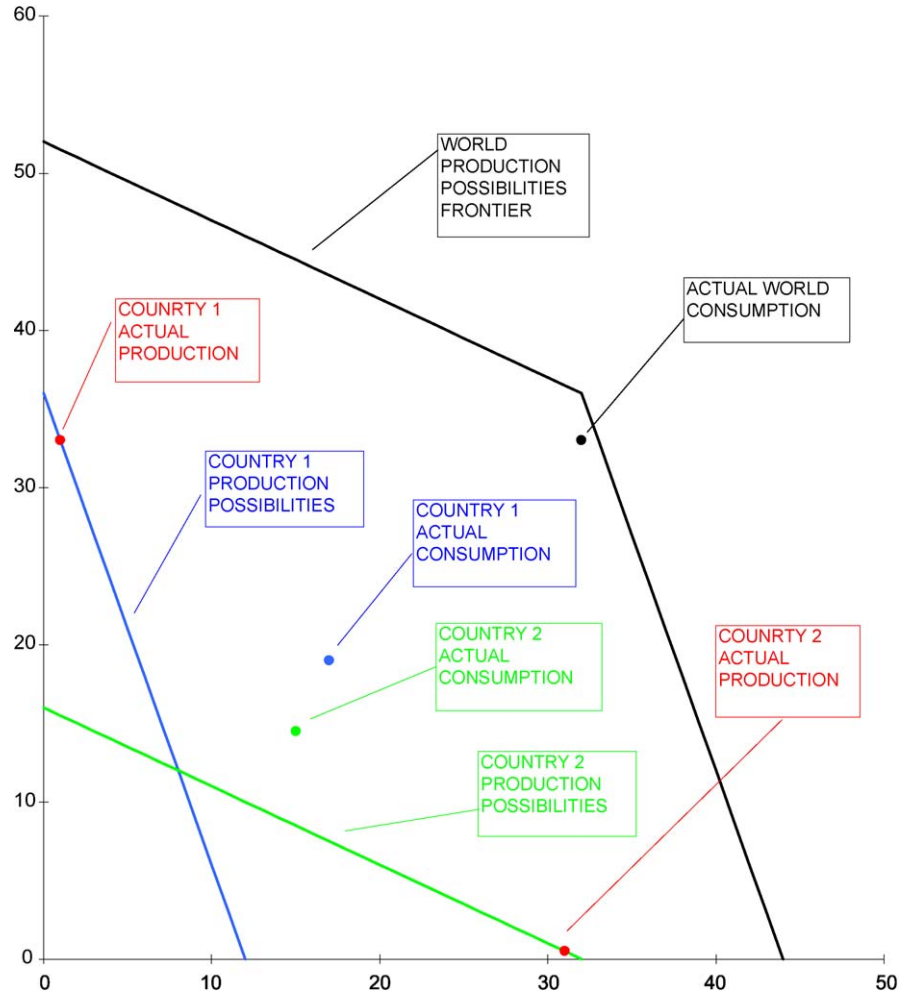


Figure 1. Comparative advantage at work: Specialization according to comparative advantage creates gains from trade and consumption by each country beyond its own production possibilities frontier. Total world consumption is near the efficient world production possibilities frontier.

The nature of the production and consumption data can be seen in Figure 1. In this experiment there are two countries, two different types of outputs ($Z$, $Y$) and one type of input (labor). $Z$ is shown on the horizontal axis and $Y$ is shown on the vertical axis. The labor is fixed in supply in each country and migration of labor is impossible. The labor can be used to produce either commodity according to a linear production function. The production possibilities curve for country 1 and the production possibilities curve for country 2 are shown in Figure 1. These country production possibility curves are

dictated by the quantity of labor resources that exists in the country and the production function technology that exists in the country. The world production possibilities curve that would result from efficient production and specialization is shown in black.

The money in all of the economies was a commodity-based currency. The same currency was used in all countries and this currency had consumption value. Thus, there were no issues of exchange rates operating. Local producers in a country had the ability to buy labor in the local market and use it to produce the two outputs $Y$ and $Z$ consistent with the production functions implicit in the production possibility curves in Figure 1. Local markets were populated by local producers, local consumers and foreigners who might want to purchase and send units to the markets in their home countries. The countries operated in a world in which agents from country $i$ could purchase commodities in country $j$ and costlessly import them in country $i$ and sell in the market in competition with goods that might have been produced in country $i$. Markets were organized by the multiple unit double auction.

Production took place in a country by purchasing labor in a home labor market and transforming it to one of the commodities ($Y$ or $Z$) that is then sold in the home market. The computer regulated and controlled this production activity to make sure that the production was fast and violated no constraints. Thus in each country there were three active markets: labor, $Y$, and $Z$ for a total of six active markets in the world. The buyers in these markets were agents from the home country, who could either consume the commodities or speculate for resale, and agents from the foreign country, who could either speculate by reselling or could ship commodities to their own home country for resale.

The law of comparative advantage holds that the countries would specialize. Given the production functions and preferences, country 1 should specialize in the production of $Y$ shown as the vertical axis and country 2 should specialize in the production of $Z$, shown along the horizontal axis. The averages of actual production across several experiments and periods are shown in Figure 1. The average production in country one is near the upper left corner of the production possibilities frontier of country 1 and the average production of country 2 is in the lower right of the production possibilities frontier for country 2. That is, country 1 specializes in the production of $Y$ and country 2 specializes in the production of $Z$, as is predicted by the law.

Country 1 is importing $Z$ and exporting $Y$, and its average consumption after export and import in several periods of several experiments is shown as the blue dot. The consumption of country 2 is shown as the green dot. The gains from specialization and exchange are evident, since both countries are consuming far beyond their own productive capacity. The gains from specialization that emerged from the trade that took place in these economies is near the maximum possible. The black lines in Figure 1 constitute the world production possibilities frontier. The black dot represents the average of world consumption that emerged after trade. The level of consumption is near the production possibility frontier, which indicates that the production efficiency of the system is near 100%. The natural pressure of the competition was to coordinate production efforts in the most efficient manner.

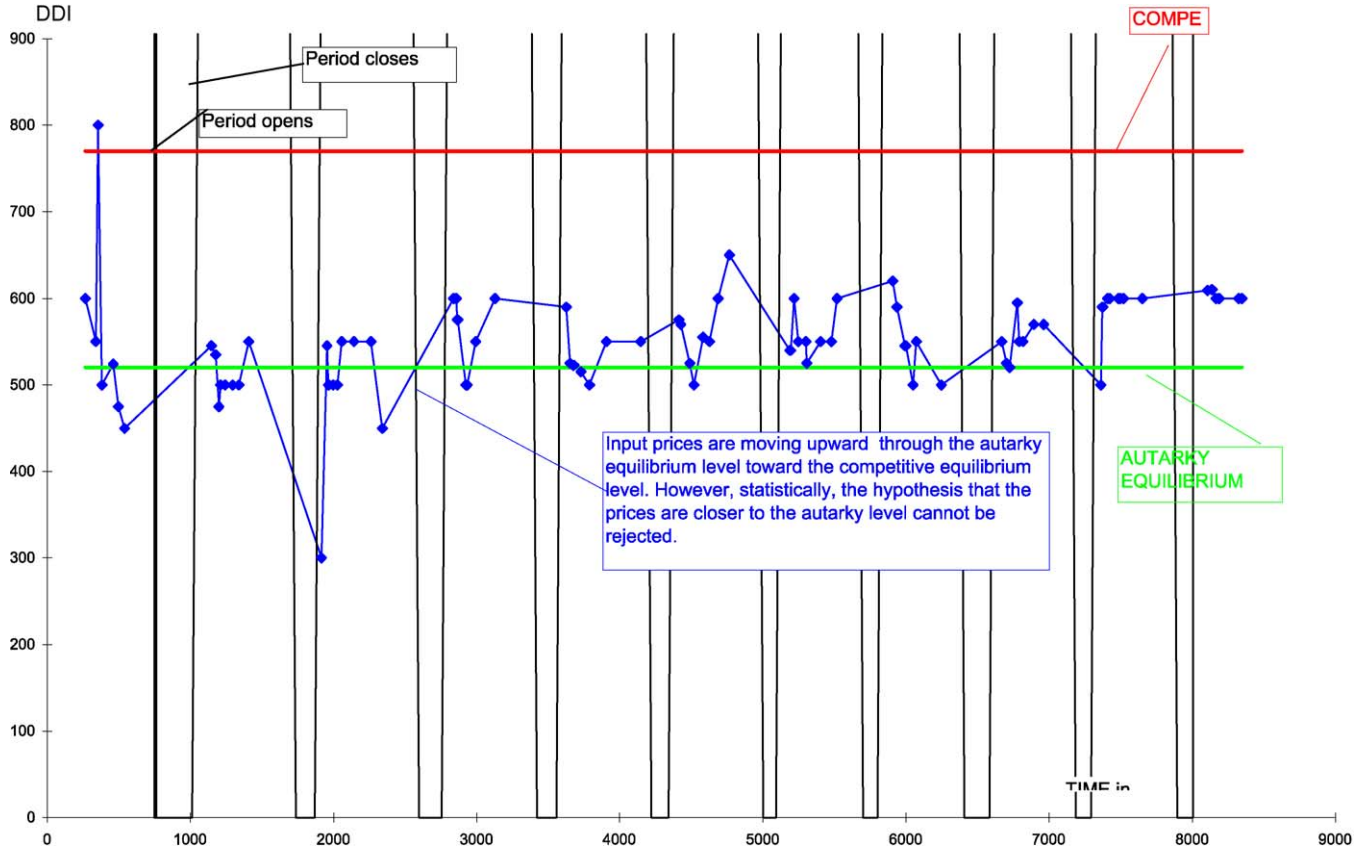


Figure 2. Time series of input prices in country 2.

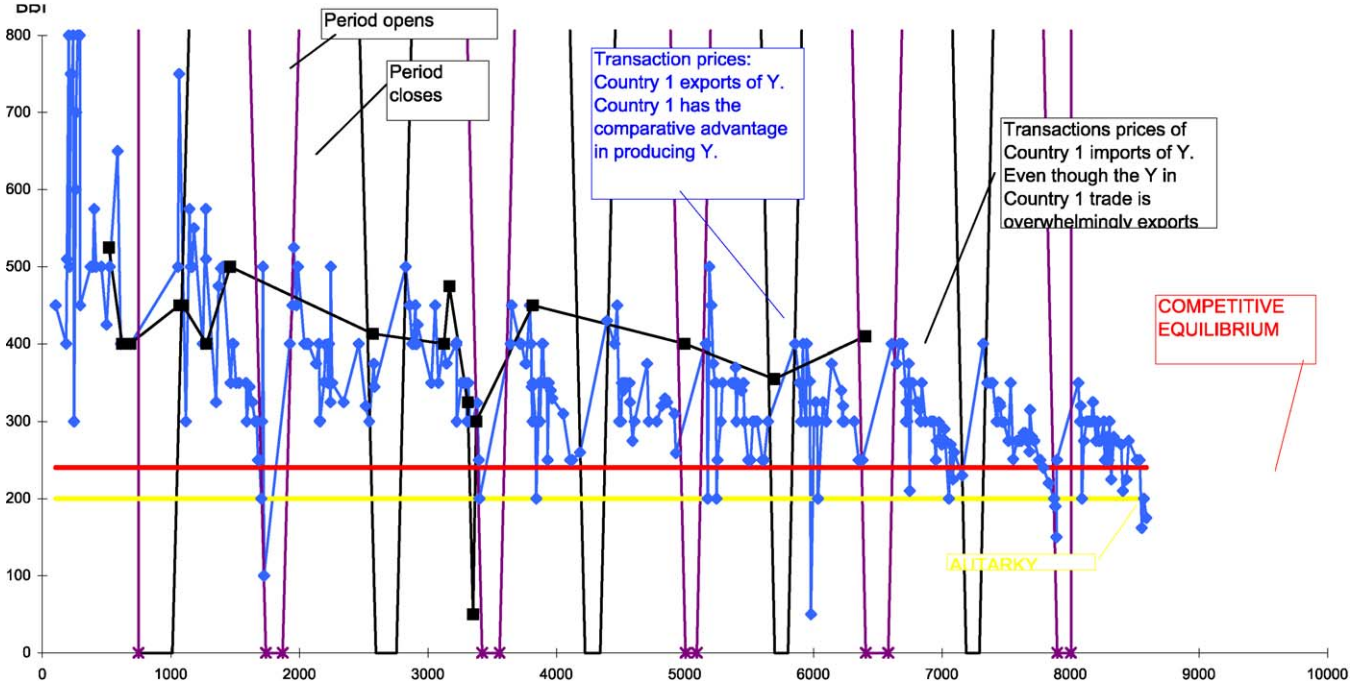


Figure 3. Prices in an output market. The time series for output $Y$ is shown converging toward the competitive equilibrium prices. Prices start high but with time the variance of prices decrease and the prices get near the competitive equilibrium prices. Almost all trading takes place in country 1, which has a comparative advantage in producing $Y$ but some product and trades take place in country 2, the volume is low and ultimately stops. This time series, like the input time series, was chosen to illustrate the difficulty that is occasionally encountered when attempting to test the predictions of the competitive model against autarky. While prices in the output market are closer to competitive equilibrium than the autarky, these data could also be used to support the autarky model. Consumption and production patterns clearly reject autarky.

While specialization occurred as predicted, the price predictions of the competitive model were not as accurate. The price time series from some representative markets are shown in Figures 2 and 3. Figure 2 shows the time series of labor in country 2 and Figure 3 contains the price time series for $Z$ in both country 1 and country 2. The vertical lines are experimental "periods" that are similar to days. The parameters stayed constant for all periods, so the economies were like stationary systems of supply and demand. The lines on the figures correspond to the competitive equilibrium and to the autarky equilibrium, the equilibrium that theoretically exists if there is no international trade. As can be seen in both countries, the prices are moving in the direction of the competitive equilibrium; but, in the case of labor in country 2, the movement away from the autarky equilibrium toward the competitive equilibrium is very slow. In both cases the autarky prices receive very little support but the slow movement in country 2's labor market indicates that while the resource flows might well have been efficient, the prices that support those flows as equilibria may not have been "discovered" by the markets.

Overall, the competitive model predicted better than the autarky model. Several impacts of tariffs were observed to be consistent with the predictions of the competitive model. However, the competitive model was not completely accurate. The inaccuracies were conjectured to be due to risk aversion on the part of the producers. The producers of commodities bore some risk if they purchased labor and transformed it into $Y$ or $Z$ for sale. If the markets were not "deep," in the sense that the seller had difficulty moving product at expected prices, then the producer could lose money. This risk reduced demand for labor relative to the demand as reported in the risk neutral competitive model and thus depressed wages below those predicted by the risk neutral competitive model. This risk due to the natural randomness that exists in markets is not part of the competitive model, and so the errors remain somewhat a mystery until appropriate features are incorporated.

## Reference

Noussair, Charles N., Plott, Charles R., Riezman, Raymond G. (1995). "An experimental investigation of the patterns of international trade". American Economic Review 85 (3), 462–491.