
TEACHING COMPARATIVE ADVANTAGE AND INTERNATIONAL TRADE: PITFALLS AND OPPORTUNITIES

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ABSTRACT

This paper discusses pitfalls and opportunities in teaching (and writing about) comparative advantage at the introductory or "principles" level of instruction. We propose that instructors might improve their treatment of this topic by using fractions to represent relative opportunity costs, the true basis of comparative advantage. Using that simple instructional device can be a very effective way to convey the essence of comparative advantage and develop less-than-obvious implications for international trade, such as the fact that domestic firms compete against other domestic firms - not just their foreign counterparts - in the determination of comparative advantage, patterns of trade, and shares of global markets.

INTRODUCTION

A young schoolboy is struggling with his first-ever lesson on fractions. He cannot understand why $10/50$ is less than $\frac{1}{2}$.

"I just don't get it," he says. "Obviously 10 is bigger than 1."

"Of course," explains his teacher, "but you must also consider the denominator."

"Yes, I know," the student responds, "but 50 is really bigger than 2."

We might find such an exchange amusing, but economics principles students routinely make essentially the same mistake when they first encounter the theory of comparative advantage. Fortunately, grasping the essence of comparative advantage is as easy as understanding why $\frac{1}{2}$ is greater than $10/50$.

The fundamental axiom of comparative advantage is well known in the context of international trade: A country has a comparative advantage in the production of a good or service if its marginal opportunity costs of production are

lower than the marginal opportunity costs of another country producing the same good or service. Consider the following table depicting production possibilities for two countries.

Country A	Country B
Widgets 10	Widgets 8
(or)	(or)
Gadgets 3	Gadgets 2

The table indicates that Country A must forego production of 10 widgets to produce 3 extra gadgets, while Country B could produce 2 extra gadgets at an opportunity cost of 8 widgets. Thus Country B has the comparative advantage in producing widgets (and Country A in producing gadgets). Comparing the marginal opportunity costs of these two countries is analogous to comparing the values of two fractions, in this case $10/3$ relative to $8/2$. In order to see which has the larger value, one must compare entire fractions, not just numerator to numerator or denominator to denominator. When economics students first contemplate comparative advantage and international trade, they are apt to make the mistake of comparing like products across national boundaries, ignoring production of different products among domestic producers - widgets in Country A to widgets in Country B. But such comparisons say nothing about opportunity costs *within* a country, the true basis of comparative advantage. The mistake is exactly the same as that of the young schoolboy who compares numerators to numerators of fractions, or denominators to denominators.

This paper discusses pitfalls and opportunities in teaching (and writing about) comparative advantage at the introductory or "principles" level of instruction. The issues raised here have importance beyond academics and questions of pedagogy. Many policy debates revolve around the appropriate extent and form of government intervention in international trade. Various interested parties and constituencies argue that protectionism, in one form or another, is needed to save domestic jobs, nurture "infant industries," uphold environmental standards, or promote any number of other alleged benefits. To make informed judgments about the costs and benefits of protectionist policies, economics students must understand the rationale for free trade, and the consequences - obvious and subtle, intended and unintended -- of policies that would alter the nature of trade across national boundaries.

IN THE BEGINNING: THE RICARDIAN DISTINCTION BETWEEN ABSOLUTE AND COMPARATIVE ADVANTAGE

Scholars generally credit David Ricardo with first articulating the principle of comparative advantage and its implications for international trade. His 1819 discussion remains to this day one of the clearer statements of comparative and absolute advantage (not his terminology), and the distinction between the two. The following passages (pp. 115-16) from the chapter, "On Foreign Trade," are particularly germane:

The quantity of wine which [Portugal] shall give in exchange for the cloth of England, is not determined by the respective quantities of labour devoted to the production of each, as it would be, if both commodities were manufactured in England, or both in Portugal.

England may be so circumstanced, that to produce the cloth may require the labour of 100 men for one year; and if she attempted to make the wine, it might require the labour of 120 men for the same time. England would therefore find it in her interest to import wine, and to purchase it with the exportation of cloth.

To produce wine in Portugal, might require only the labour of eighty men for one year, and to produce ...cloth in the same country, might require the labour of ninety men for the same time. It would therefore be advantageous for her to export wine in exchange for cloth. This exchange might even take place, notwithstanding the commodity imported by Portugal could be imported could be produced there with less labour than in England. Though she could make the cloth with the labour of ninety men, she would import it from a country where it required the labour of 100 men to produce it because it would be advantageous to her rather to employ her capital in the production of wine, for which she would obtain more cloth from England, than she could produce by diverting a portion of her capital from the cultivation of vines to the manufacture of cloth.... Thus England would give the produce of the labour of 100 men for the produce of the labour of 80.

Portugal could produce the same amounts of both cloth and wine as England could produce, but with less labor devoted to each product. Thus Portugal enjoyed what we today would term "absolute advantage" in the production of each good.

And yet, it would be in Portugal's interests to trade with England according to the principle of "comparative advantage," since the opportunity costs of foregone output would be greater if Portugal produced cloth, than if England produced cloth (and vice-versa for wine).

The distinction between comparative advantage and absolute advantage in the Ricardo's illustration is essentially this: Absolute advantage is about production of like products in different countries, whereas comparative advantage is about production of different commodities in the same country. Absolute advantage is a matter of comparing the labor costs of producing wine in Portugal, for instance, with the labor costs of producing wine in England. Comparative advantage is more complicated, inasmuch as it involves a comparison of the opportunity costs of producing two different goods - labor employed in the production of wine or, alternatively, in the production of cloth - within each country.

Returning to the mathematics analogy, absolute advantage is a matter of comparing the values of numerators to numerators of fractions, or denominators to denominators. Comparative advantage, on the other hand, is about the value of one entire *fraction* relative to another *fraction*, not just numerators to numerators or denominators to denominators. We shall see that this pedagogical device, this use of fractions, is enormously helpful both in conveying the essence of comparative advantage, and in drawing important implications for international trade.

CURRENT PEDAGOGY: PITFALLS AND OPPORTUNITIES

Authors of economics principles textbooks must treat comparative advantage under constraints on the number of pages allowed by publishers, as well as the level of technical difficulty, given the lack of prior knowledge on the part of principles students. Unfortunately, these constraints can lead to truncated discussions lacking in depth and subtlety, especially in developing the implications for international trade. Instructors may therefore wish to elaborate the textbook discussion, both to avoid certain pitfalls and to develop important insights in teaching comparative advantage and international trade.

For their part, textbook authors must endeavor to avoid the kinds of phrasing that jumbles concepts and adds confusion to an inherently confusing subject. We recently surveyed leading economics principles texts (including Arnold, 2004; Ayers and Collinge, 2004; Bade and Parkin, 2004; Case and Fair, 2002; Ekelund and Tollison, 2000; Friedman, 1990; Gwartney, Stroup, Sobel and McPherson, 2003; Mankiw, 1998; McConnell and Brue, 2002; McEachern, 2000;

Miller, 2004; O'Sullivan and Sheffrin, 2001; and Parkin, 2003) and found passages that could muddle the distinction between absolute advantage and comparative advantage (especially if one reads them in the wrong context, as students are wont to do), and discussions that could be extended in ways that provide additional insights into policy regarding international trade and government regulation of it.

The authors surveyed define comparative advantage and absolute advantage in theoretical terms that are entirely consistent with Ricardo. But when they move on to more concrete issues of international trade, they sometimes use language that could confuse these two concepts in the mind of the beginning student. For example, Bade and Parkin (2004:494) define absolute advantage correctly as "When one person is more productive than another person in several or even all activities." They then state that "The activities in which the U.S. workers are relatively more productive *than their Mexican counterparts* are those in which the U.S. has a comparative advantage" (emphasis added). Do they really mean *comparative* advantage or, in keeping with their own definition of it, *absolute* advantage? Students will have trouble seeing the crucial distinction between absolute and comparative advantage. The fact that U.S. workers are more productive than their Mexican counterparts does not by itself explain comparative advantage, any more than the value of a numerator alone establishes the value of a fraction.

Consider also McEachern's discussion (2000:391) of labor, capital and international trade: "A well-educated and well-trained labor force is more productive than an uneducated and unskilled one... Some countries, such as the United States and Japan, have an educated work force and an abundant stock of modern capital. Both resources result in *greater productivity per worker*, making each nation quite competitive in producing goods that require skilled labor and sophisticated capital" (emphasis added). McEachern comes close to equating comparative advantage with worker productivity, which is to say, *absolute* advantage. His "well-educated and well-trained" workers in the U.S. and Japan are more productive than workers in other countries, just as Portugal's workers were more productive than England's in Ricardo's illustration above. The crucial point, as Ricardo went on to explain, is that such comparisons do not explain why nations should, and do, trade with one another.

Students new to the subject of comparative advantage are especially likely to compare an industry in one country to its counterpart in another country, given the intuitive appeal of the approach. Authors and instructors should therefore be careful to avoid language that invites a simple comparison of like industries. The ability to produce goods and services depends upon resource endowment,

technology, capital accumulation and many other factors. But when one merely compares the productive efficiency of a firm in one nation with the productive efficiency of its *counterpart* firm in another nation, one is, by *definition*, drawing a comparison of absolute advantage, not comparative advantage. To do so is in effect to compare numerators to numerators of fractions. And while one may even be able to explain why one numerator is larger than the other, that does not fully explain which fraction has the larger value.

The pitfall of comparing like industries across borders can be easily avoided by presenting comparative advantage in the context of comparing fractions. Furthermore, this device presents an opportunity to extend the theory of comparative advantage to in a way seldom found in principles-level textbooks. The following section addresses this issue.

A MOST SURPRISING TRUTH ABOUT INTERNATIONAL TRADE

Comparative advantage in international trade is determined by countries' marginal opportunity costs, and those costs depend upon the productivity of domestic producers relative to the productivity of other *domestic* producers in each country. It follows that domestic workers and firms compete in a very real sense with other domestic workers and firms in alternative domestic production. David Friedman discusses this aspect of comparative advantage in his intermediate microeconomics textbook, *Price Theory* (1990). He asks his readers to consider the following (p. 140):

There are two ways we can produce automobiles. We can build them in Detroit or we can grow them in Iowa. Everyone knows how we build automobiles. To grow automobiles, we begin by growing the raw material from which they are made - wheat. We put the wheat on ships and send the ships out into the Pacific. They come back with Hondas on them.

While there are no machines out in the Pacific turning wheat into automobiles, the effect would be the same for U.S. consumers if there were. More to the point, it would be the same for U.S. auto makers if such a machine really did exist. What actually happens on the other side of the ocean does not alter the fact that U.S. auto workers compete in a very real way against U.S. wheat producers, not just against Japanese auto workers: *To have a comparative advantage in producing*

automobiles, U.S. firms in Detroit must be able to build cars cheaper than farmers in Iowa can grow them.

If U.S. auto manufacturers thus compete with U.S. farmers, then trade restrictions in the form of tariffs or import quotas on Japanese automobiles protect U.S. auto workers from (and at the expense of) U.S. wheat producers. All of the textbooks in our survey address the costs of protecting jobs, as indeed they should do, but the discussions focus on the protected industry and the effect on prices for domestic consumers. Other domestic industries not affected directly may be affected indirectly, however. If the U.S. trades wheat to Japan in exchange for automobiles, then fewer autos coming from Japan means less wheat going the other way. Auto tariffs thus protect U.S. auto makers at the expense of wheat producers by reducing the demand for wheat.

Perhaps less obviously, but no less importantly, auto tariffs also protect U.S. auto makers from U.S. wheat producers by preventing them from "growing cars in Iowa." As Friedman (1990:140) points out, "Tariffs are indeed a way of protecting American workers - from other American workers." On this aspect of protectionism current pedagogy could be improved. Not one of the books in our sample suggests that imposing quotas and tariffs might protect domestic producers from other domestic producers, albeit perhaps indirectly and unintentionally. More generally, none of the textbooks in our sample establishes explicitly the connection between domestic, intra-national competition and international trade.

Here again, the use of fractions is helpful as a device for understanding the implications of comparative advantage as they relate to the ever-changing patterns of global trade and the consequences of protectionist policy. Consider McConnell and Brue's (2002:99-101) hypothetical situation involving the United States and Mexico. Each country is capable of producing both avocados and soybeans as depicted in the following tables:

Table 1a: U.S Production Alternatives					
Product	R	S	T	U	V
Avocados	0	30	33	60	90
Soybeans	30	20	19	10	0

Table 1b: Mexico's Production Alternatives

Product	A	B	C	D	E
Avocados	0	20	24	40	60
Soybeans	15	10	9	5	0

Each country must forgo some (constant) amount of one product in order to produce more of another. Since this example assumes constant marginal opportunity costs, the following fractions for the U.S. and Mexico represent each country's production alternatives at all levels of output:

U.S	Mexico
90 Avocados	60 Avocados
30 Soybeans	15 Soybeans

Computing fractions allows us to compare opportunity costs directly. In terms of forgone production, the U.S is shown to be the least-cost producer of soybeans, and Mexico the least-cost producer of avocados. Therefore the U.S. has a comparative advantage in the production of soybeans, and Mexico in the production of avocados. This is true despite the fact that the U.S. can produce more of both products.

Now let us extend the soybean/avocado illustration beyond the discussion in McConnell and Brue. Assume that new technology is made available to U.S. avocado producers, allowing them to be more productive than before. The U.S. production alternative table thus becomes (let us assume) the following:

Table 2a: U.S Production Alternatives

Product	R	S	T	U	V
Avocados	0	50	55	100	150
Soybeans	30	20	19	10	0

Table 2b: Mexico's Production Alternatives

Product	A	B	C	D	E
Avocados	0	20	24	40	60
Soybeans	15	10	9	5	0

And the fractions become:

U.S	Mexico
150 Avocados	60 Avocados
30 Soybeans	15 Soybeans

The U.S. has now gained the comparative advantage in the production of avocados, and lost the comparative advantage in soybeans. The reason for the gain of comparative advantage is not that the U.S. can now produce 150 avocados to Mexico's 60 avocados, even though this might seem to be the obvious explanation. The U.S. could already produce more avocados in the original illustration - 90 avocados (Table 1.a) as compared to Mexico's 60. Avocado producers in the U.S. became more productive *relative to U.S. soybean producers*, and therein lies the reason for their gaining the comparative advantage. (Likewise, and the loss of comparative advantage in the production of soybeans had nothing to do with developments in that industry.)

Without adding a lot to the standard treatment of comparative advantage, instructors have the opportunity to develop an important and surprising truth about international trade: namely, that domestic firms compete against other domestic firms - not just their foreign counterparts - in the determination of comparative advantage, patterns of trade, and shares of global markets. Developing this insight would require the extra pages that editors might be reluctant to add to an already-voluminous principles book. But instructors could easily handle it within the usual textbook structure.

CONCLUSION

Authors and instructors might improve their treatment of comparative advantage and international trade if they would present these subjects explicitly in terms of comparative values of fractions. Using that simple instructional device can

be a very effective way to convey the essence of comparative advantage and develop less-than-obvious implications for international trade.

In particular, we would emphasize that important truths about comparative advantage and international trade will elude students who commit the fundamental error of comparing like industries in different countries. Such comparisons not only ignore domestic opportunity costs, the true basis of comparative advantage, but they also cast the entire discussion of international trade in inappropriate language. Too easily the student comes to think of international trade issues in terms of "us" versus "them." This sort of perspective is simplistic and, at least for some students, probably provides a (false) rationality in defense of various protectionist policies whose costs may outweigh their benefits.

An improved treatment of comparative advantage at the principles level would better prepare students to understand the complexities of global economics, and to recognize when policies to restrict or otherwise alter free trade are potentially harmful. Students deserve no less from an introductory course in economics.

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