Teaching an Inverted "Ricardian" Argument to Help Students Solve Comparative Advantage Problems

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ABSTRACT

The concept of opportunity cost is introduced in international economics (IE) as a nation's tradeoff between producing one good versus another in the "Ricardian" model, where students come to understand an economy as varying along the input of labor only. As simple as it sounds however, the idea turns out to be one of the most difficult concepts business students face. After being taught the simple "Ricardian" argument (i.e., labor as the only variable), students are taught the more "modern" theories of international trade where countries are modeled as "endowed" with varying degrees of land, capital, and labor (in terms of skilled or unskilled laborers), that require more elaborate arguments of trade under such conditions. But, without a solid foundation in Ricardo's "comparative advantage," students face tough challenges in any IE course. We offer a simple way of helping students makes sense of these basic IE concepts.

Keywords: opportunity cost, comparative advantage, international economics

INTRODUCTION

It is well known that the most challenging courses required of business students are the quantitative ones, and, traditionally, these are in four subject areas; statistics, economics, finance, and P/OM. For programs that may offer an economics concentration or minor as part of the business administration major, that normally means students are required to take one of the more challenging of the undergraduate economics courses, international economics (IE). It is difficult because the better part of any IE course involves understanding rather complex quantitative arguments about the benefits of trade between nations that at minimum require knowledge of spatial relations along with analytic geometry, and, even, differential calculus. Invariably, the most challenging concepts for students begin with David Ricardo's concept of comparative advantage that constitutes the first rationale for trade. More than that however, comparative advantage involves a counter-intuitive concept as students see it, because even though a country may be better at producing all goods, it is still better for that country to trade with another. That is, despite the evidence, most students continue to wonder: "why should I trade with someone else when I am better at producing everything?" As if that were not enough, we argue, understanding comparative advantage troubles even more students as the concept of opportunity cost is introduced as the justification for determining what product to export (i.e., what product to specialize in) and what product to import in a two country, two product scenario. Thereafter, having established opportunity cost and comparative advantage, textbook authors move on to derive from these foundational ideas the "modern" theories of trade that, truly, should require a foundation in calculus to fully appreciate the models (Gerber, 2014). However, since calculus-based economics courses are not the norm in most undergraduate business programs, instructors are left with the hard task of leading students through some rather challenging material.

CHALLENGES STUDENTS EXPERIENCE IN INTERNATION ECONOMICS

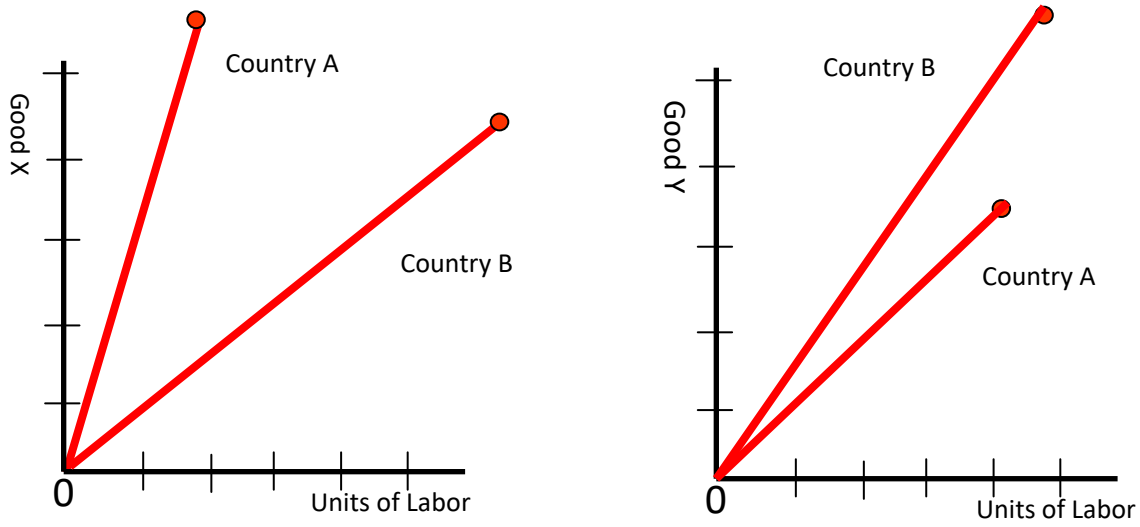
We argue students face challenges from problems inherent in the curriculum and problems in the subject of IE itself. Specifically, international economics is normally taught as an upper level course, thus students may be a semester if not a year or two away from having fulfilled their GENED mathematics requirements—a requirement the average student may have grudgingly completed with limited understanding. In our view, this level of mathematical "rustiness" is compounded by the fact that the concept of opportunity cost is really a counter-intuitive idea (to the mathematical modeling they learned) that basically says, each additional unit of good X produced "costs" a country χ units of another good Y that is not produced, in this case "forfeited." We argue this idea in and of itself is a hard concept to conjure, never mind comprehending it graphically. More to the point, whereas the average business student is taught productivity (and many other variables) as positive functions dependent on units of labor (or some other variable), opportunity cost sees production of one more unit of a good as the forfeited amount of production of another good. Thus, in order to understand, students face a "twisted logic" where productivity is a negative

function—greater productivity of one good, "costs" a relative reduction in production in another. We propose a way of leading students through a sequence of graphical exercises that should be more helpful in understanding and solving comparative advantage problems.

RE-CONCEPTUALIZING THE FUNDAMENTALS IN INTERNATION ECONOMICS

To start with, we establish that the comparative advantage of country A over B can be easily visualized by plotting production of some good as a function of units of labor as shown in Figure 1. On a per unit basis, students see it is the slope of the production line that defines the advantage for a given country. Thus, students can clearly see why country A would want to focus production on good X (figure 1a), while country B may have an advantage in the production of some good Y (figure 1b). In plotting this relationship the instructor can easily lead students to not only see the incremental benefits of production, but also to conclude that country A (or B, depending on the good) should expend more and more units of labor into "infinity" (obviously, a fallacy) to gain more and more benefits. In doing so, students are "primed" to have to re-conceptualize the "advantage" they now easily understand.

Figure 1. Absolute Advantage between Countries



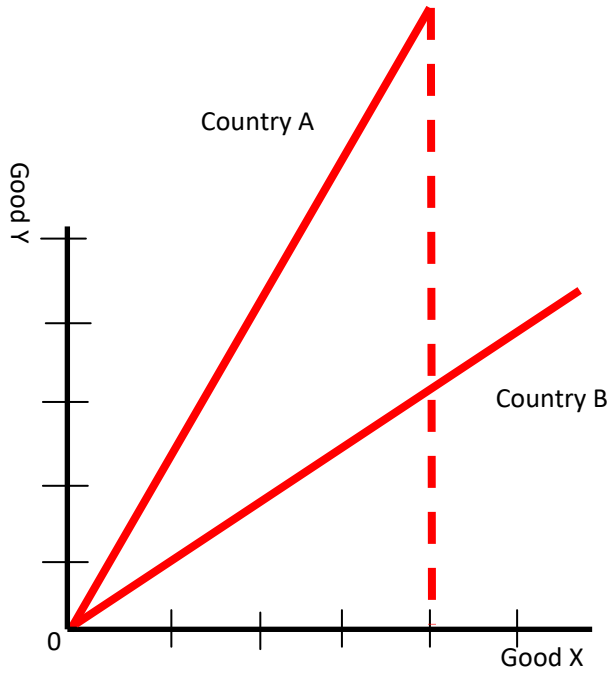
Moreover, by discussing the differences in the gain in expending the next unit of labor, students can easily come to understand the need/desire (through the differences in slopes) for country A to specialize in good X and trade for good Y, or *vice versa* when speaking of country B. With these simple curves modeling trade under Ricardo's assumptions, namely, that production knowledge and technology are constant, (hence the constant slope) the instructor can easily lead students to consider what the effects of improvements/innovations introduced by labor or the application of technology (i.e., relaxing Ricardo's assumption) might have on the curves. Students should conclude that improvements in production translate to more units produced per man-hour, thus, they should come to realize that the slopes must become steeper as more and more is "learned" and applied and technology is improved over time. As the instructor details such improvements, say, in the production of wheat, students should see that the path traced by the "advantage" curve becomes more and more "curved." Indeed, Wheat is a perfect example where production yield could be improved by first, better knowledge of soil and water management prior to and during planting, use of more effective fertilizers and pesticides, and better, bigger, more effective machinery at harvest time. In this example, students easily see that as each improvement is introduced yield must be higher over time. These effects on the curves in making production more "real" are important points for students to understand for the discussion of the "modern" theories that are part of any IE course.

The second, more important point of visualizing production this way, is that the same arguments made for a curve, say, units output of Y/units of labor, can be couched as units output of Y/units output of X (see figure 2). The students can easily follow the same logic as the advantage still holds. There is the risk however that particularly facile students will see through the absurdity of such a plot, but at this point the instructor can ask; 'what are we saying with this plot'? Obviously, that increasing production of X results in increasing production of Y, again, "*ad*

infinitum." Most students should be able to conclude that such a situation is nonsensical and impossible given that resources (i.e., land, labor, capital) are finite.

Having established that conceiving absolute advantage this way, while useful, leads to a conundrum, the instructor can demonstrate that the solution is a simple transformation of the curves, say the line $\mathbf{F}(\chi)$ is converted to $\mathbf{G}(\chi) = -1/\mathbf{F}(\chi)$. That is to say, with this transformation the advantage is still discernible but now the better country's advantage lies in the curve with the smallest slope (see figure 3). Most importantly, the curves now make more sense and the instructor can now easily launch into a discussion of opportunity cost.

Figure 2. Absolute Advantage of country A over country B in Terms of Y/X



SOLVING COMNPARATIVE ADVANTAGE PROBLEMS WITH POSITIVE SLOPED CURVES

The traditional comparative advantage problem can be simplified to its essentials as; 'who has a comparative advantage in some good X'? Alternatively, the question can be**:** 'what country should specialize in producing good X'? Or, more generally, the question can be asked; 'what should each country specialize in and what should they import'? No matter the wording, the fundamental problem in turn can be reframed to take advantage of positive functions by asking; 'does country A have an advantage over country B in producing good Y over good X'?

Having established that the slope is what determines the extent of the advantage using production functions, the solution to the problem is simply verifying if some country's slope is bigger than some other country's slope. The following example demonstrates this logic.

Table 1. The Typical Ricardian Problem

Country	Cloth	Wine
England	3	2
Portugal	3	3

Figure 3. Comparative Advantage of England over Portugal in the Production of Cloth

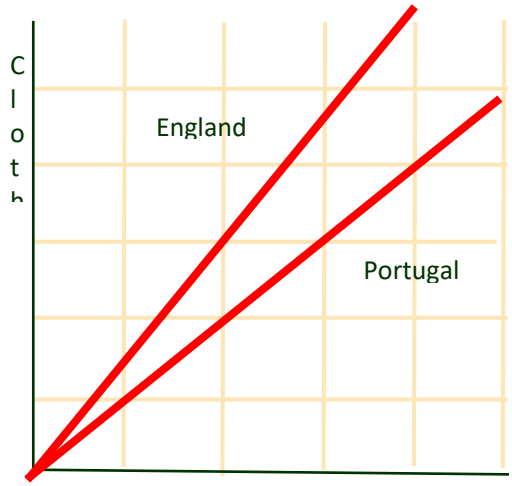


Figure 3a

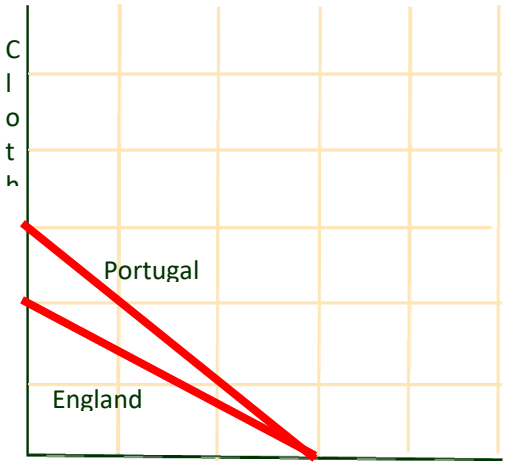


Figure 3b

In the example above, any question that references 'opportunity cost' can be reframed to ask; 'does England have an advantage over Portugal in producing Cloth over Wine?' In which case the answer would be obtained by testing if England's slope is bigger than Portugal's in terms of Cloth/Wine. In this case the answer is, 3/2 > 3/3, which is true; England does have an advantage over Portugal producing Cloth versus producing Wine. It is easy to ascertain that if the countries were reversed in the question above, the answer to the question would in this case be 'no' since 3/3 < 3/2. This illustrates the fact that fundamentally we are testing the veracity of an inequality stated as: is $C_E/W_E > C_P/W_P$ true? The reader should note that this example was carefully chosen so that both (opportunity cost) lines would emanate from the same production of X, thus making it easier to make the point that comparative advantage is essentially taking a graphical representation of the answer above (see figure 3a) and rotating it ninety degrees to the left about some point in the middle of the graph. The result would be as shown in Figure 3b, where the graphic now shows comparative advantage in terms of opportunity cost and the curves are termed the Production Possibility Frontiers (PPFs).

CLASSROOM ASSESSMENT APPLYING NOVEL APPROACH

As likely happens for any innovation in the classroom, approaches are discovered as an alternative to a lesson that students may be having trouble understanding, or perhaps may not understand at all, prompting the instructor to rethink concepts. This was the case in a section of the IE course taught to seniors at UAPB. Students struggled mightily to understand comparative advantage as presented in the textbook. It became obvious that the trouble was in the graphical argumentation for trade in the basic two-country two-good model. In an effort to improve understanding, the approach above was introduced to the students in the next meeting of the class, with 100% comprehension on a two-problem comparative advantage quiz. The following semester the approach above was introduced prior to introducing the traditional approach presented in the book, again with 100% comprehension on a two-problem comparative advantage quiz.

CONCLUSION

As pointed out earlier, the foregoing discussion required the specific example of production of one good be the same for both countries, thus leading to a clearer graphical explanation (as in figure 3). But comparative advantage normally includes two additional cases; a) countries with an absolute advantage in respective goods, and, b) one country with an absolute advantage in both goods—neither of which impacts our logic, but leads to messy graphs that are harder to explain. Thus, the caveat to the instructor is to choose his/her examples carefully, especially since we often device these extemporaneously in the midst of a lecture, often prompted by a student question.
Lastly, while there remain many more trials of our approach to confirm the soundness of our logic, the trials so far are encouraging. More importantly, the discussion of comparative advantage using these graphs, actually led

students to understand better the arguments of "modern" trade theory, overcoming the student limitations discussed in notes 1 and 2.

Bibliography

Gerber, J. (2014). *International Economics*, 6th edition. Pearson: Upper Saddle River, N.J.

