

Extending the Use of Simulation Software

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The mechanics of why and how nations trade goods and services has long been a topic in the b-school curriculum, and has taken on additional importance in recent years. While some aspects of international trade are relatively intuitive, students tend to struggle with the numerical “terms of trade” example, based on production possibilities and comparative advantage. The authors have devised a computer simulation to assist students with terms of trade, and successfully tested the program on a traditional-age undergraduate program in a previous study. The purpose of this study is to see if the simulation software would also be useful to MBA students studying international trade.

INTRODUCTION

International trade has been a standard topic in business and economics courses for decades. This topic has been elevated in importance in recent years, with the passage of NAFTA, the development of the European community, the rise of the Chinese economy, and the outsourcing of US jobs to overseas locations. The United States is, by far, the most active country in international trading, with in excess of \$1 billion imported *and* exported annually. Today, students need to have a solid grasp of David Ricardo’s theory of comparative advantage (why countries trade goods and services with other countries), and how nations arrive at mutually beneficial terms of trade.

Although international trade is an important topic, our experience suggests that it is difficult for students to grasp, particularly the numerical “terms of trade” example. Repede and Burson (2004) demonstrated “TradeSim,” an interactive computer simulation that students could use to help master the terms of trade concept. Students could work through a series of exercises with the pre-trade information given, or generate additional problems with random information. The simulation also features text boxes and graphs to provide step-by-step assistance (see Teaching Notes in the appendix). Results from the previous study indicated that use of the simulation, and even exposure to the presentation of the simulation, improved the performance of students in an examination setting.

The student population tested in the previous study consisted largely of traditional-age undergraduates, in sophomore-level principles of macroeconomics classes. However, international trade and the terms of trade are recurring topics in business curriculum, also taught in advanced undergraduate and graduate classes. The research question in this study is whether use of this simulation software program would also have positive results in an advanced course with a completely different student population. The simulation software was recently tested in a Survey of Economics course in the university's professional MBA program, which features an average student who is 30 years old, with six years of professional experience. While the undergraduate student's focus is frequently on solving an exam problem, the adult MBA student is much more concerned with the application, and how the lessons learned can be personally applied. On the other hand, this particular student population may have had less exposure to computer simulations during their undergraduate careers, and may be more reluctant to attempt to download and use the program.

The Survey of Economics course is a "foundation" level course in the MBA curriculum, designed for students who did not take any economics courses as undergraduates, or students who either took principles level economics several years ago or did not achieve higher grades in more recent principles courses. Generally, the instructor assumes cursory incoming knowledge of economics on the part of the students, and gives a fast-moving summary of both microeconomics and macroeconomics in a one-semester course.

DATA AND METHODOLOGY

A group of MBA students took the class during the fall 2004 semester, and were not exposed to the software during lecture on international trade. Students taking the same class in the spring 2005 semester received a demonstration of TradeSim, as well as instructions for downloading and using the program. Each group was given a similar problem, with a value of 10 points, on a mid-term exam.

RESULTS AND CONCLUSIONS

The average control group score was 6.35 on a ten-point scale. The average treatment group score was 8.67. This 37% improvement in experimental group average score over the control group average score is significant at the .005 confidence level. (See Table 1)

TABLE 1

Control Group	Treatment Group	
6.35	8.67	
	Teaching Only	Teaching & Study
	8.8	8.6

Students in the treatment group were taught the material with the instructor using the simulation software. Additionally, the software was made available to students in the treatment group for independent study outside of class.

Sixty-seven percent of the treatment group students reported that they used the software for out-of-class study. All of these students reported that they felt the software helped them to better understand the topic.

Within the treatment group, there was no significant difference in mean scores between those students who used the simulation for practice and those who reported that they didn't use the simulation to study.

These results indicate a positive value of the TradeSim software as a classroom tool for instructor use. Additionally, sixty-seven percent of students used the tool for additional out-of-class study. The absence of a significant difference between scores of students in the treatment group who did and did not use the simulation for outside study is believed to be because, as one student wrote "I didn't use the tradesim software. It was good, but I was clear with the concept in class itself."

REFERENCES

Burson, T. & Repede, J. (2004). The Use of Simulation Software to Improve Undergraduate Business Students' Understanding of International Trade. Proceedings of the Southeast Decision Sciences Institute Thirty-Fourth Annual Meeting, Charleston, SC.

APPENDIX A TRADESIM© TEACHING NOTES

The opening screen of the TradeSim program is shown in Figure 1. It displays the first of two pre-defined trade problems that enable use of the complete tutorial package, including a full text explanation of the problem and its solution. After students are familiar with the problem format, they can randomly generate hundreds of additional trade problems to further test their knowledge. The text explanation is disabled for the random cases. Problem selection is made from the Case menu.

The lines on the graph represent pre-trade production possibilities for the two nations, and the "export" boxes indicate that there is currently no trade between the nations. In the absence of trade, production possibilities will equal consumption possibilities, so only one curve will appear on the screen for each country. When the students have actually entered a potential trade, a second graph, indicating consumption possibilities, will also display.

The slider controls in the consumption possibilities box are consistent with the slope of the production possibilities curves for the two countries. The U.S. slider indicates that the nation is dividing its resources equally between the two goods prior to trade, actually producing 25 apples and 50 oranges.

By moving the slider to the right, for example, the student can see that the U.S. gives up one apple to produce two additional oranges (Figure 2). This provides still another way that the student can identify the ratios that form the opportunity cost of one good to the other.

The opportunity costs, in terms of the other good, are provided (Figure 2). In this problem, the United States gives up two units of oranges for each additional unit of apples produced. This information will reinforce what the students have already been exposed to, either by reading the text or from classroom lectures, and will be particularly valuable in determining how resources should be allocated with trade in mind.

In this problem, the United States has comparative advantage in the production of oranges, since the United States gives up only .5 units of apples to produce an additional unit of oranges, while Canada gives up 3 units of apples per additional unit of oranges produced. Similarly, the ratios will invert to show that Canada has comparative advantage in production of apples. The student should then realize that the United States should specialize in production of oranges, and Canada should specialize in production of apples.

At any point in the working of the first two problems, the student can consult the tutorial for additional assistance. The students can access the tutorial by going to the upper left-hand portion of the screen, clicking on “View,” then clicking on “Explanation” (Figure 3).

The text provides an explanation for what the student may have trouble assimilating from merely viewing the graphs and data. The narrative explains the Production Possibilities, Opportunity Costs, Comparative Advantage, terms for Willingness to Offer trade, terms for the Willingness to Accept trade, and the Trade Benefits (if any) to each country as a result of the currently entered trade amounts. The text explanation is linked directly to any changes made in the problem inputs, such as trade amounts, and is immediately updated as a result of any changes.

It should be noted that the text will only display when the student is working on either of the first two problems. If the student has worked through the pre-defined problems, and wishes to test his/her skill level with randomly generated problems, the text explanation is not accessible, forcing the student to operate “without a net.” If help is still needed, however, the student can always access the text by returning to one of the first two problems.

At this point in the problem, the student should have determined that the United States wants to trade oranges to Canada for apples. If the student clicks “Oranges” in the “United States Export” box, a default number will appear in the “terms of trade” box, with the U.S. trading 35 oranges to Canada for 40 apples. (Figure 4).

TradeSim automatically calculates the trade ratio, that the U.S. will receive 1.14 units of apples for each unit of oranges traded. This information would be useful to the student who has already been exposed to the concept that a country would not accept less in trade than their domestic opportunity cost. In this example, the U.S. would not accept less than .5 units of apples for each unit of oranges traded, as this is the domestic tradeoff point. The student can experiment with different trade combinations, and TradeSim will immediately provide the new consumption possibilities curves and the respective trade ratios.

Since the consumption possibilities curves are each to the right of the production possibilities curve, this trade benefits both nations. The gains are also reasonably well divided between the two nations, also a desirable outcome.

If the student were to change the terms of trade, for example, 25 oranges for 40 apples, the student can easily see that while this trade still benefits both nations, the gains have swung heavily to the U.S. (Figure 5). The U.S. consumption possibilities curve has shifted much further to the right than the consumption possibilities curve of Canada. By entering different trade combinations, the student can identify not only trades that benefit both nations, but also identify trades that would be mutually acceptable from a standpoint of sharing the gains.

TradeSim was designed to be used either as an ancillary to your lecture presentation on Comparative Advantage and the Terms of Trade or as a student tutorial. Our experience suggests the greatest benefit is derived by using the program to demonstrate the concepts during lecture and then making the program available to students for additional review and homework assignments.

Many variations of the two pre-programmed cases are available by adjusting the production possibilities via the spin buttons (Figure 6).

These variations on the two pre-programmed cases also have the complete text explanation available. The random case selection generates many different combinations of countries, goods produced and production possibilities. The ability to modify the pre-programmed cases coupled with the random case selection provides you and your students with hundreds of different problem cases, with and without the text explanation, that you can assign for study or testing.

FIGURE 1

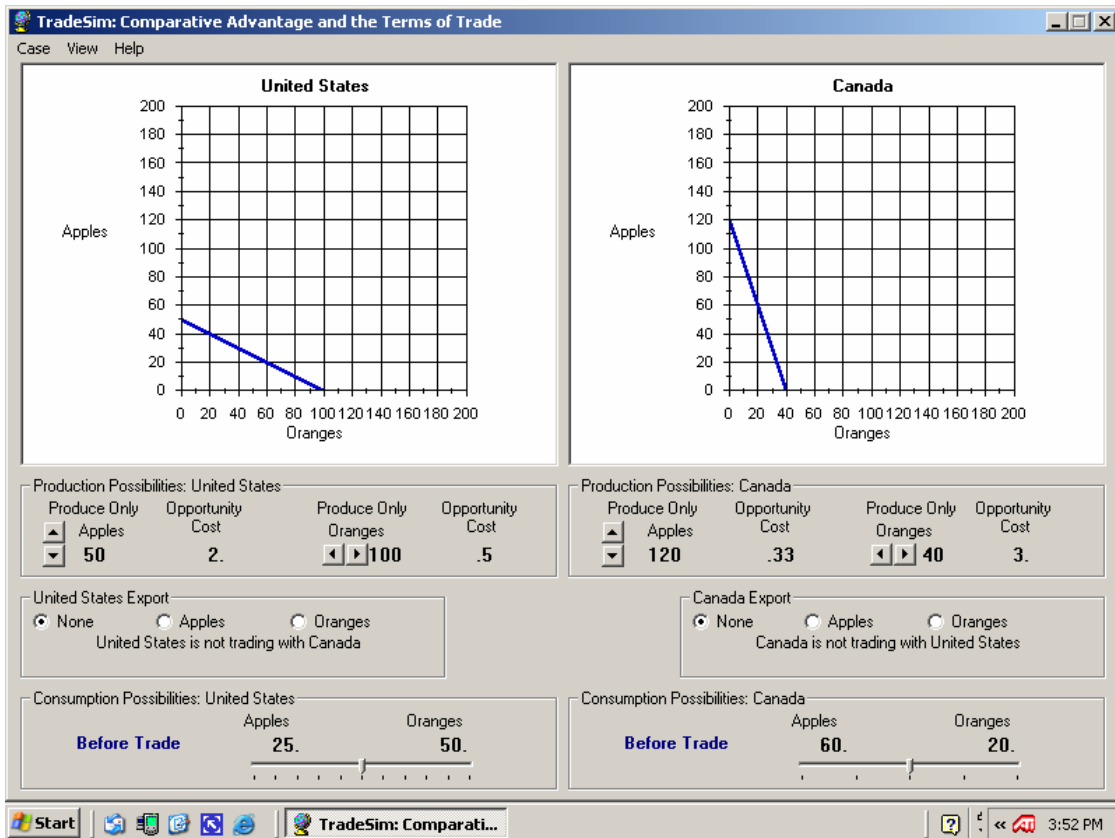


FIGURE 2

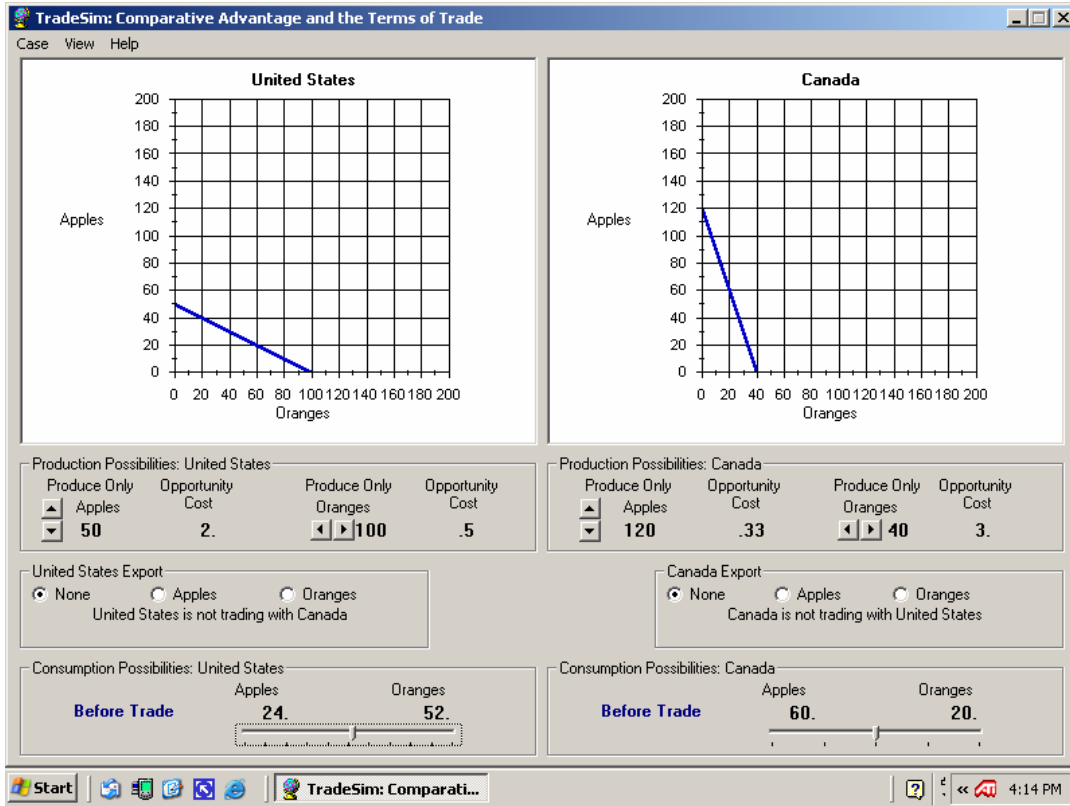


FIGURE 3

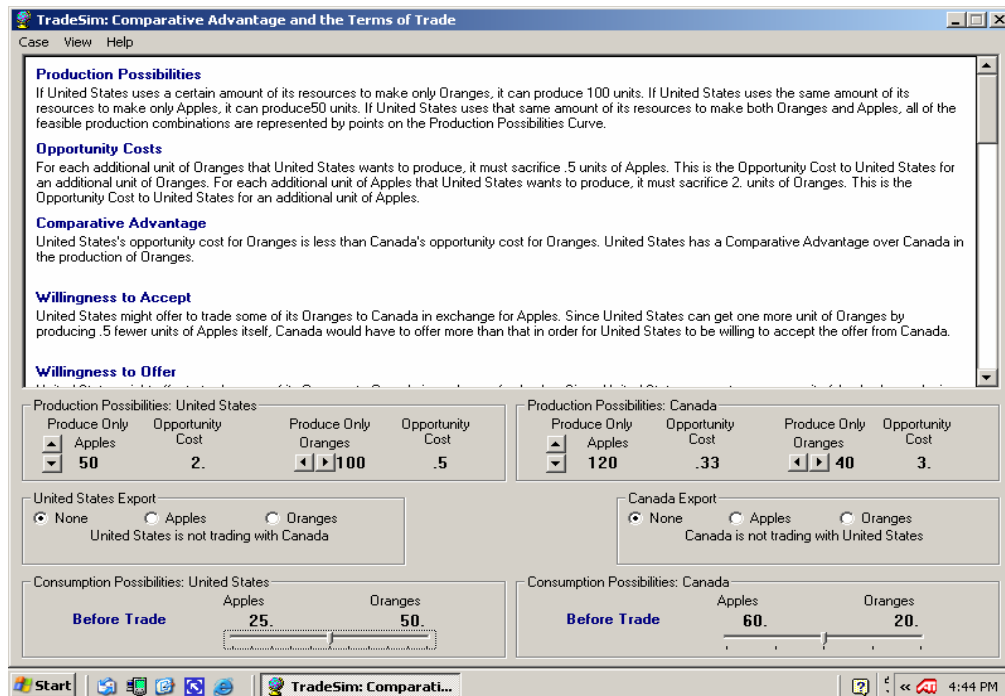


FIGURE 4

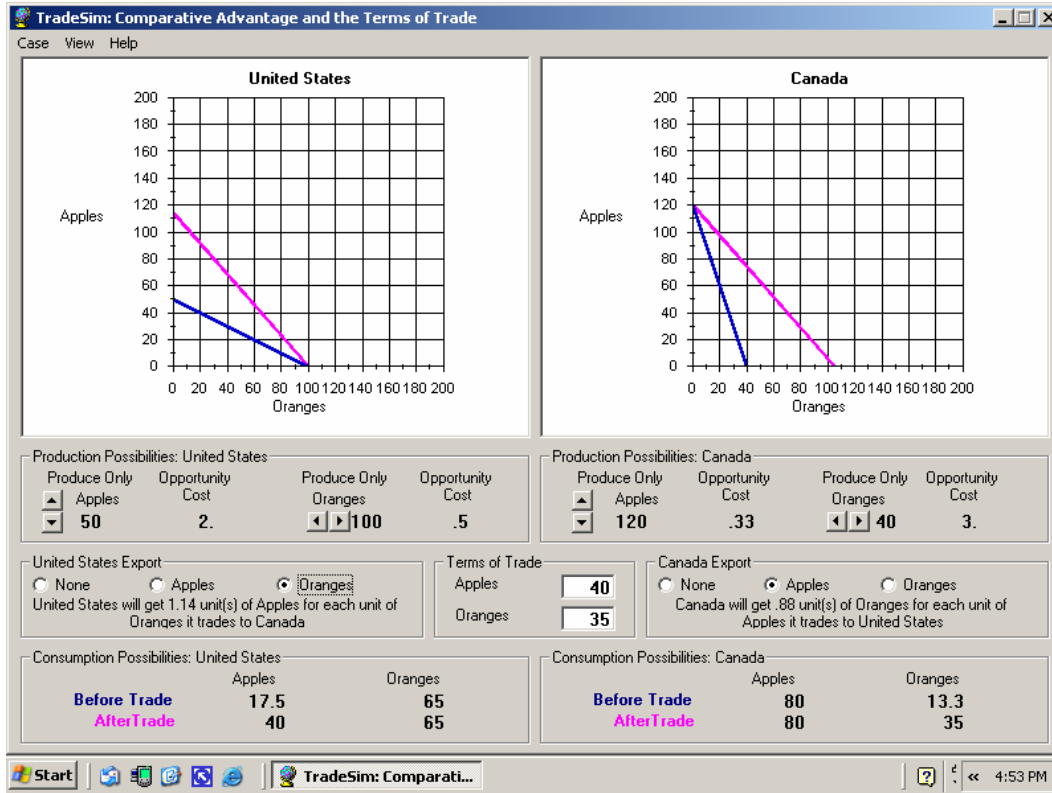


FIGURE 5

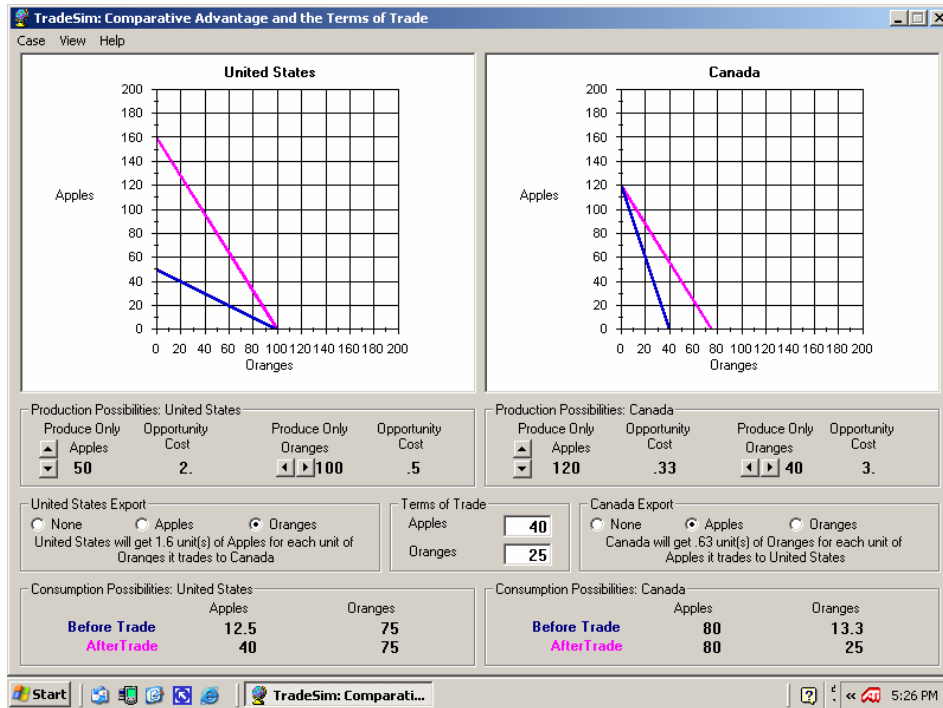


FIGURE 6

