Production and Gains from Trade

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Abstract

This paper describes a classroom game in which students make production and trade decisions. Each student represents a country and decides how much of two goods to produce, how much to exchange with a partner country, and whether to specialize in the production of one of the two goods. In introductory level classes, the game helps students understand the notion of comparative advantage in production and distinguish between gains from pure exchange and gains from specialization and trade. Class discussion focuses on the concepts of production possibility frontier, marginal productivity of inputs, and on the determination of the price ratio at which trade may occur. In advanced classes, the exercise facilitates comparisons among different models of international trade and serves as a platform from which to introduce and discuss key issues in current research and public debate.

JEL Codes: F10, A22

Keywords: Classroom Experiment, International Trade, Comparative Advantage, Production Possibility Frontier, Price Ratio

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I.   Introduction

The theory of comparative advantage is one the first topics that students encounter in any Principles of Microeconomics class. The Ricardian idea that members of society benefit from specialization and trade is one of the most powerful in economics. According to the theory of comparative advantage, specialization and free trade will benefit all parties involved, even when one party is "absolutely" more efficient at producing than others. Indeed, specialization and trade act to raise productivity and ultimately to increase welfare in society. Even though specialization and trade are widespread in developed economies and students are very familiar with these ideas, the notions of comparative advantage, absolute advantage, and terms of trade are often hard concepts for them to grasp.

This paper provides the setup for a classroom game in which each student represents a country and has to decide how much of two goods to produce, how much to exchange with a partner country, and whether or not to specialize in production. The exercise leads the students through three different decisions: production decisions in a pure autarkic economy, pure exchange decisions when trade among countries is allowed, and specialization and exchange decisions in a global economy. Building on Bergstrom and Miller (2000) we begin with a simple Leontief preference structure (i.e., utility equals the minimum of the two consumption quantities). In a more advanced class, it is natural to consider preferences that have smoothly diminishing marginal utility, for which we use

a Cobb-Douglas function that requires students to multiply consumption quantities to calculate utility payoffs.

This exercise can be used to supplement chapters on the theory of comparative advantage and gains from trade in introductory microeconomics classes. The discussion from this exercise can also help to illustrate the notion of a production possibility frontier (PPF), the law of diminishing returns, the concept of marginal opportunity cost or productivity of an input, and the tradeoff induced by scarcity in the allocation of resources. The exercise can also be used in more advanced trade courses to facilitate comparisons among the models most often studied in undergraduate international trade courses and to stimulate discussion about current research and public debate in the area of international trade.

II.   The Basic Experiment

The following guidelines are designed for a 50-minute class with 20 to 40 students working individually or in small groups of 2 to 3 people per country. This experiment is easily modified for larger class sizes by increasing the number of countries or having students work in larger groups. The experiment can be modified for a longer lecture period by incorporating some of the extensions discussed below and by extending the duration of the discussion following the game.

Preparation requirements are minimal; the instructor needs one handout (from the Appendix) for each student. There are two handout types, one for each country type (A and B), which should be copied in equal numbers. Copy country A instructions on one color paper and country B instructions on a different color paper to facilitate country

pairings in a later phase of the exercise. Presentation of the experiment proceeds in five steps.

Getting Started (10-15 minutes). Begin by dividing the students into country-groups by distributing the first page of the instructions to each student. Little explanation is required (or advisable) at the outset. Simply read through the instructions with the students and request that they not talk with other students (unless, of course, they are working in groups). Each student (or group) is a country that is endowed with four units of labor, which may be used to produce one of two goods: wine or cheese. The full menu of production options for a type A country is listed in Table 1 and is on the first page of each set of instructions. The production possibilities for type B countries simply reverse the second and third column headings in Table 1, so that type B countries are relatively more productive at producing cheese.

Table 1: Production Possibilities for Type A Countries

LABOR ALLOCATION	WINE OUTPUT	CHEESE OUTPUT
All to Wine Production	26	0
3 to Wine, 1 to Cheese	24	4
2 to Wine, 2 to Cheese	18	6
1 to Wine, 3 to Cheese	10	8
All to Cheese Production	0	10

Production technology is a state secret, and therefore should not be shared with other countries. To ensure that students understand the production menu, ask them to answer the quiz question on the first page of instructions.

Preferences take a simple form; wine and cheese are perfect complements. That is, the two goods must be consumed in fixed proportions. Monetarily, you might let each

country earn $1 for every matched pair of goods.[2] Ask if there are any questions before proceeding to Phase 1.

Phase 1: Autarky (5-10 minutes). Distribute page 1 of instructions. In this first phase of the game, each country should choose the optimal labor allocation given the production technology and Leontief preferences.   The technology and preference assumptions are deliberately simple, such that that the optimal decision is unambiguous and easily determined. If students are working in groups, listen in as they are deliberating to be sure that everyone understands the game. Notice that every country can consume 8 matched units of wine and cheese, but type A countries will have 2 extra units of wine, and type B countries will have 2 extra units of cheese.

Phase 2: Exchange (5 – 10 minutes).   Distribute instructions for Phase 2 (page 2) of the game and announce that there has been an exciting discovery by explorers from each country: neighbors! In Phase 2, each country has a *single* trading partner. Trading partners can be "randomly" determined by announcing that each student (or group) should find a partner by looking for a student (or group) with a different color instruction sheet. Alternatively, trading partners can be pre-determined by numbering the instructions so that each type A country has a number corresponding to a type B partner's number. Given the production decisions from the previous phase, each country may trade with its partner. An optimal arrangement is for each country to trade one of its extra

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[2] To increase interest in the game, you can offer to pay one randomly chosen person 10 percent of his or her earnings at the end of the exercise. In most cases this will amount to around $3.

goods in exchange for one unit of the other good.[3]   Students will have no difficulty determining that all countries should now be able to consume 9 matched pairs of goods.

Phase 3: Long-Term Trade Agreements (10-15 minutes). In this final phase of the basic game, countries may enter into (binding) long-term trade agreements. Distribute the final page of instructions (page 3) and offer a scenario such as the following: trade negotiations were so successful in the previous round that you and your partner are ready to consider a long-term trade agreement. Before trading in this round, every country may reallocate its labor force to produce a different bundle of goods. Further, countries are free to share any information pertaining to production capabilities, preferences, and labor endowments.

In this phase, you should circulate around the room answering questions and offering advice. The experiment is constructed such that complete specialization is *not* optimal.[4] Notice from Table 1 that with trade each country should devote only 3 of its 4 units of labor to the good for which it has a comparative advantage. In general, students will realize this after only a few minutes. If a pair of negotiating countries does not notice that complete specialization is suboptimal, a hint or curious look should set them on the right track.   Finally, once each pair of negotiating countries has made a decision, ask all students to complete the worksheet for Phase 3. An equal division will result in 14 pairs of matched goods for each country. As soon as students are settled, move to evaluation and discussion of the results.

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[3] If you want students to have something to physically exchange in this stage of the game, you can distribute playing cards or colored index cards (e.g., pink for wine and yellow for cheese) to represent the goods produced by the countries in Phase 1.
[4] See Chapter 11 of Bergstrom and Miller (2000) for a variation of this exercise with complete specialization as the optimal outcome.

Class Discussion. Begin the discussion with an analysis of the results from the exercise. How much time you devote to the initial review of results should depend on the students' level and how much of the material is new. If you are teaching advanced students who are comfortable with the basics of trade models, move through this section quickly such that the majority of class time may be spent discussing more advanced topics. Alternatively, with an advanced class you might use the more complicated utility function for the exercise discussed in the next section.

Graph the production possibilities frontier for each country given the technology described in the instructions and Table 1. Ask representatives from each country to report the country's Phase 1 (autarky) output, consumption, and excess supply. We have used this exercise in several courses and consumption is always 8 pairs of wine and cheese in this phase. Illustrate these production and consumption bundles on the PPF and label them accordingly, as in Figure 1. If your students are advanced, you may wish to include the income expansion path (IEP) for the Leontief preferences (uniquely defined for any non-zero finite price ratio). Note that we use (C) to denote consumption and (P) to denote production, with each coordinate subscripted for the relevant phase of the game.

Figure 1: The PPF, Pattern of Trade, and Gains from Trade
Country A
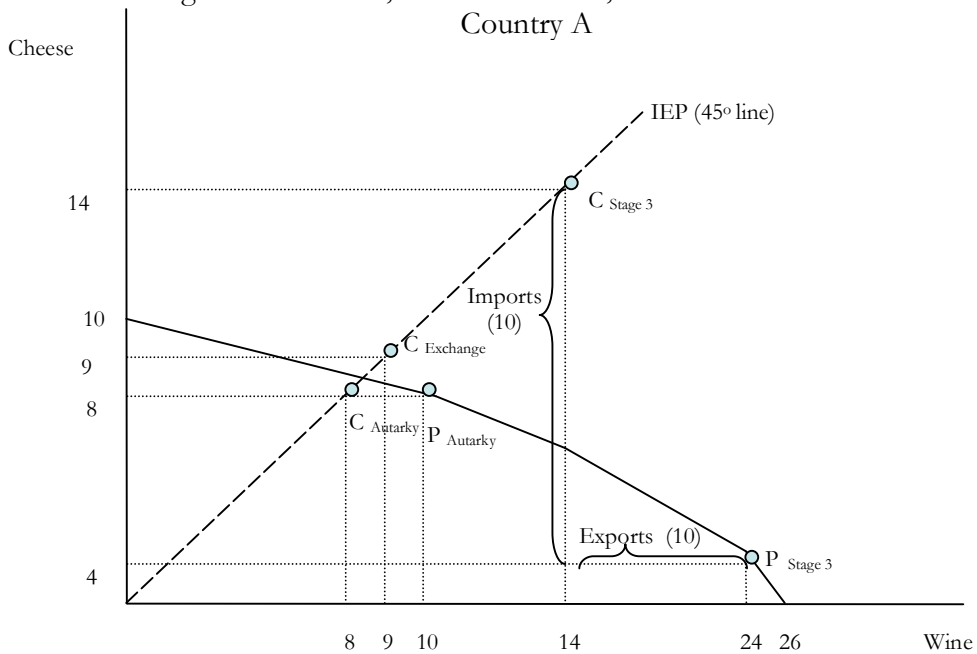
Continue with a discussion of Phase 2 by asking country representatives to report on the trades that occurred. Encourage discussion of why these trades took place and illustrate the new consumption bundles and trade triangles on the PPF. As in Phase 1, our students always realize the gain from exchanging 1 unit of wine for 1 unit of cheese (or vice versa) to increase consumption to nine matched pairs in Phase 2. Emphasize that both countries are better off, *even without any change in their production*. These are gains from exchange. You might also provide an example that students can easily relate to their own lives (for example, two friends trade compact discs).

Ask the representatives what happened in the final phase. Again, encourage students to discuss why production patterns changed, and how this made countries better off. Illustrate the new consumption and production bundles on the PPF along with the associated trade triangles (see Figure 1). Note that the increase in consumption from (9,9) to (14,14) represents the gains from production specialization, based on countries

producing those goods for which they have a comparative advantage. This is also an ideal opportunity to discuss diminishing marginal productivity, which you might tie to a discussion of why countries jointly maximized production by not completely specializing. In our experience, most students produce the optimal bundle of goods. A few students completely specialize, but other students are eager to explain why this is not the best outcome.

III.   A Modification with Cobb-Douglas Preferences

This section presents a richer but more complex version of the game for more advanced students. These modifications offer greater insight into price determination and the role of tariffs, and more closely parallel models used in coursework. The added richness comes at some cost, however, since determination of the autarkic price ratio requires that students are comfortable with the theory of utility maximization. Note that this version of the game is intended as a substitute for, rather than an addition to, that outlined in the previous section.

The structure of the advanced game closely parallels the earlier version, and the instructions in the appendix have options for both versions of the game. Technology is unchanged (see Table 1), but preferences are now given by the Cobb-Douglass utility function, $U = w * c$, where w represents units of wine consumed, and c represents units of cheese consumed.[5]   Thus, goods are imperfect substitutes and preferences may be represented by the smooth, convex indifference curves with which students are typically

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[5] As with the basic version of the game, you might increase interest by offering to pay one randomly chosen student her earnings based on the conversion rate of a penny-per-util, which will amount to about $4.50.

most familiar. The game proceeds in three phases, exactly as in the simpler version of the game presented in the previous section.

Phase 1: Autarky (5-10 minutes). Distribute page 1 of the instructions. This first part of the game asks students choose the optimal autarkic labor allocation given production technology and preferences. Advanced students should have little difficulty determining that the optimal production plan allocates 2 units of labor each to wine and cheese, yielding autarkic utility of 108. Table 2 demonstrates.

Table 2: Optimal Autarkic Production for Type A Countries

LABOR ALLOCATION	WINE OUTPUT	CHEESE OUTPUT	AUTARKIC UTILITY
All to Wine Production	26	0	0
3 to Wine, 1 to Cheese	24	4	96
2 to Wine, 2 to Cheese	18	6	108
1 to Wine, 3 to Cheese	10	8	80
All to Cheese Production.	0	10	0

Once students have completed the page 1 of the instructions, hand out page 2 to proceed to the next phase of the game.

Phase 2: Exchange (5 – 10 minutes). Phase 2 is again characterized by the discovery of neighbors with whom to trade. Ask each country to find a single country of the other type. (Again, you may ask students to do this on their own or predetermine trading partners by numbering the instructions 1A, 1B, 2A, 2B, etc.) Each country pair may negotiate a mutually beneficial exchange given the production decisions from the previous phase. It is important to circulate among the class at this point, since some students may need assistance in reaching trades. Most students quickly will realize the

opportunity for a 6-for-6 trade between countries, which leaves both countries able to consume 12 units of each good, with implied utility of 144.

Note that although a 6-for-6 trade is both optimal and focal, it is not the only mutually beneficial possibility. Some students may achieve a different trade ratio (i.e. 6-for-3). A few trades of this sort among the class are ideal from a pedagogical perspective; if a few country pairs reach a different trade ratio than simple 1-for-1 exchange, this provides an easy introduction of the idea that a range of price ratios can be efficient, and that each country's welfare improves with its terms-of-trade. (This is discussed later in the paper.)

Phase 3: Long-Term Trade Agreements (10-15 minutes). After every country pair has reached a trade agreement and completed the second sheet of instructions, distribute the last page of instructions to continue to Phase 3. In this final phase, each country pair can negotiate a binding long term trade agreement. Under such an agreement, each country can reallocate its labor force to produce a different bundle of goods before trade. Additionally, countries are free to share information about their technologies, preferences, and labor endowments.

Just as in the simpler version of the game, complete specialization is not optimal. Most country pairs will find quickly the optimal production plan in which each country devotes 3 of 4 units of labor to the good in which it has comparative advantage, and will then settle on the outcome in which both countries consume 14 units of each good and achieve utility of 196. Again, however, it may be necessary to offer hints or advice to struggling students. Once each pair of countries has made production and trade decisions, ask the class to complete the worksheets for Phase 3.

Class Discussion. The discussion phase for this version of the game includes the determination of autarky and trade price ratios. First, use Table 1 to draw a PPF. Note that you may (but need not) draw a smooth, curved PPF through the points given by the table to make the analysis more comparable to standard models that students encounter in texts and class work. Ask representatives from each country type to report Phase 1 output and consumption. As in Figure 2a, show the production and consumption bundles on the PPF and draw the indifference curve through this optimal point, being careful to illustrate tangency if you have elected to draw a curved PPF.

Figure 2a: Autarky
Country A
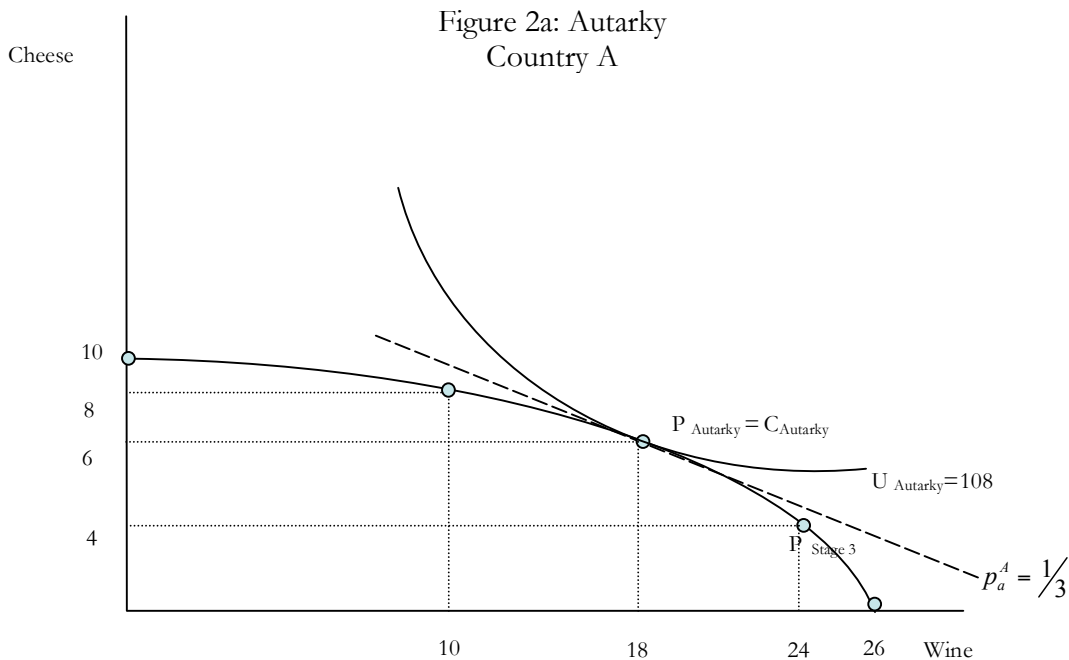
Depending on the level and backgrounds of your students, you may need to provide strong guidance in helping students determine the implied autarkic price ratio. (It is also possible to skip this price discussion entirely.) Explain to students that you have already found the optimal outcome (it was easy in this framework), and that you now want to work backward to find the local price ratio that would make this point an

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equilibrium. Remind students of the two criteria for any given outcome to be an autarkic equilibrium: producers must want to produce at that point given prices, and consumers must want to consume at that same point. Explain that you have simplified the model considerably by allowing each country to simply choose the production plan (like a dictator) and that the only question is then to find prices that make consumers willing to consume at this production point. Ask students how consumers decide how much of each good to consume given prices; hopefully, some will answer "by equalizing marginal utility per-dollar across goods." This observation in hand, note that you can easily find the marginal utility for each good at the given point from the utility function (either ask students to take the appropriate partial derivatives of the utility function, or if necessary, just tell them the marginal utility of each good at the point), so that it is simply a matter of solving to find the autarkic price ratio; i.e. $\dfrac{MU_w}{p_w} = \dfrac{MU_c}{p_c}$ where $MU_w \equiv \dfrac{\partial U}{\partial w} = c$

and $MU_c \equiv \dfrac{\partial U}{\partial c} = w$, which evaluated for country Type A in autarky (where w=18 and c=6) yields $p_a^A \equiv \dfrac{p_w}{p_c} = \dfrac{1}{3}$. Draw this autarky price line as in Figure 2a (denoted p_a).

Repeating the entire process for Type B countries reveals that $p_a^B = 3$. Draw both graphs and show how comparative advantage is reflected by the autarkic price ratios.

Continue with a discussion of Phase 2 by asking country representatives to report on the trades that occurred. We suggest starting with an illustration of the focal case of trading 6 for 6, which implies a relative "world" price of 1. To illustrate each country's consumption possibilities (national budget constraint) after trade, draw the world price line, p^W=1, passing through the Phase 1 production point as in Figure 2b. Note that this

allows each country to consume outside its PPF. Draw a new indifference curve tangent to the world price line and passing through the new consumption point (12,12) as illustrated below. Mark the trade triangles as indicated. Encourage discussion of why these trades took place, emphasizing that both countries are now better off *without any change in production*. Each country's increase in utility (from 108 to 144) represents the gains from exchange.

Figure 2b: Gains from Exchange
Country A
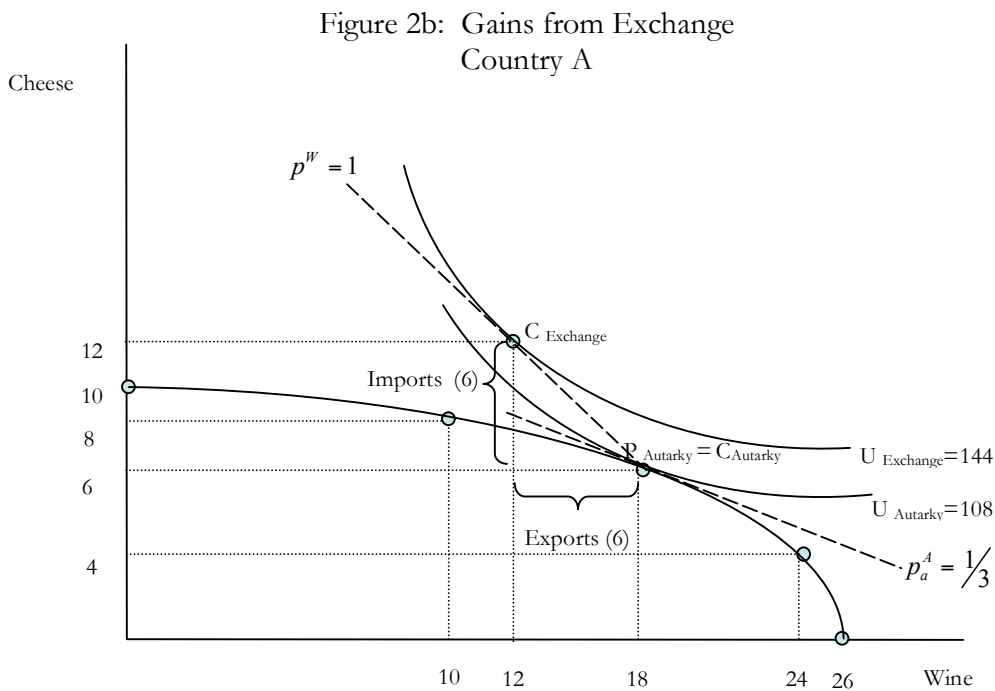
With more advanced students, you may wish to discuss the world price ratio further at this point. Depending on what you have already covered in class, you may be able to ask simply "what range of world price ratios would allow both countries to (weakly) gain from exchange?" ($1/3 \leq p^W \leq 3$). Alternatively, you can get at the same point indirectly by asking students which country would be better off if the world price had been lower or higher (easy examples are 1/3, 1/2, 2, and 3). Use the graphs to

illustrate how each country gains with an increase in its terms of trade (p^W for Country A and $1/p^W$ for Country B), holding the production level fixed.

Moving to Phase 3, ask the representatives to report on their production and trade decisions when they were allowed to reallocate their labor forces. Again encourage students to discuss why production patterns changed, and how this made countries better off. Illustrate the new consumption and production bundles on the PPF, and draw in the implied world price line[6] as shown in Figure 2c. The increase in utility from 144 to 196 represents gains from production specialization, based on countries producing those goods for which they have a comparative advantage.

Figure 2c: Gains from Specialization
Country A

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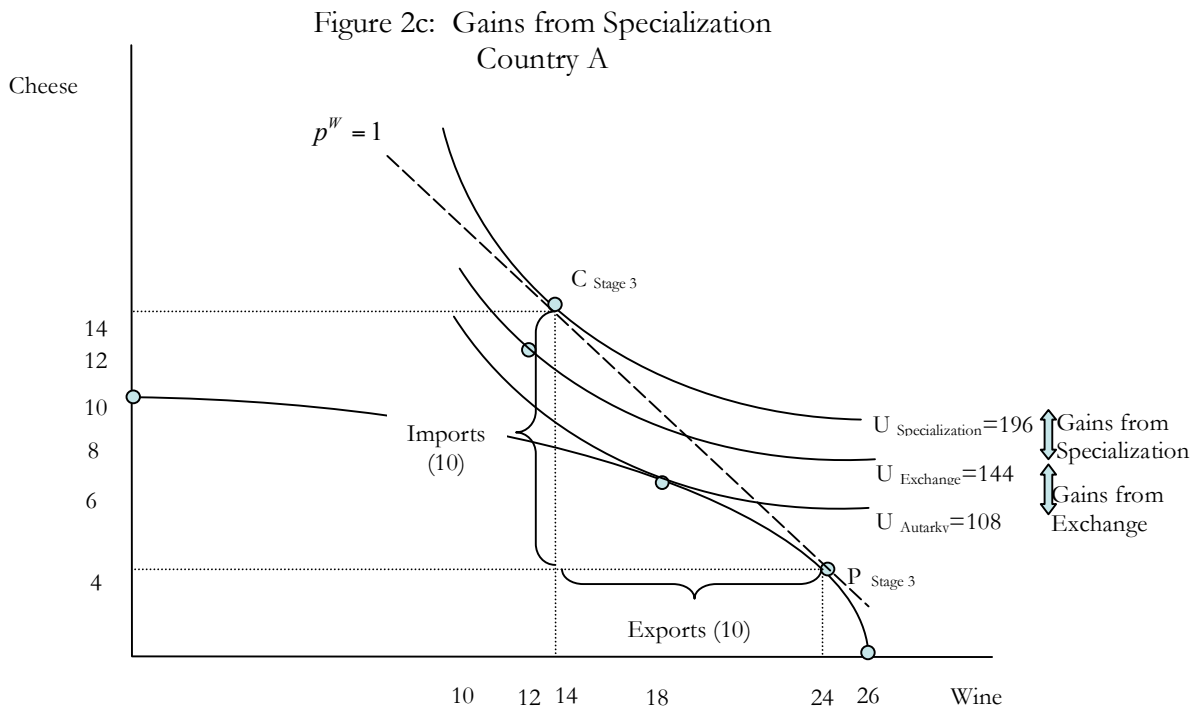
[6] Generally, countries again will have traded at a 1-1 ratio.

IV.   General Discussion and Extensions for Both Versions of the Game

Having reviewed the results from the exercise itself, you can now move to a broader discussion of concepts in international trade that are reinforced or introduced by the game.   The discussion could take a variety of directions; here we suggest several that are particularly suited to intermediate or advanced level students taking an international trade course.

First, the classroom game may be used to facilitate comparisons among the models most often studied in undergraduate international trade courses. Remind students that the Ricardian, specific factors, and Hecksher-Ohlin models are differentiated by their assumptions regarding three primary elements of any trade model: preferences, technology, and endowments. Ask students which models are consistent with each of the game's assumptions and why. For instance, in the classroom experiment all gains from trade stem from differences in technology, since preferences and endowments are the same across countries. You might ask students which "textbook" models are consistent with this structure (Ricardian, and sometimes Specific Factors), or, alternatively, which assumptions could be changed to reflect other model structures (i.e. Hecksher-Ohlin or monopolistic competition). Another question to pose to students is why countries did not specialize in Phase 3, and how this contrasts with the predictions of the Ricardian model. Finally, you might ask whether students believe that differences in technology across countries (such as in the classroom game) are likely to persist in the long run, given the potential for technology transfer. That is, what do students predict might occur if the two countries could teach each other their production technologies? You could ask students to

construct new PPFs and predicted trade patterns under the assumption of shared technology as a homework problem.

This exercise also serves as a platform from which to introduce and discuss key issues in current research and public debate, such as the political economy of trade protection. You might ask students for possible explanations for why we rarely see free trade in practice even though the classroom game suggests that trade is optimal. Together with your class, you could list several popular political arguments for protection, then ask the students to identify assumptions within the classroom game that cause these issues to be overlooked. For example, often cited concerns of "decreased wages/job losses" in import competing sectors are overlooked in the classroom game because we assume that labor can be instantly and costlessly reallocated to the sector in which each country has comparative advantage. A nice follow up question is to ask which trade models seem better equipped to address this sort of question (for instance, a specific factors model in which labor is sector specific).

Another interesting line of discussion follows John McLaren's (1997) paper, "Size, Sunk Costs, and Judge Bowker's Objection to Free Trade." The game can be used to demonstrate hold-up problems in international trade. For an informal discussion of the idea, ask students to return to their Phase 3 handouts, and ask what would happen if each country's trading partner reneged on its agreement to trade. Students should have no trouble determining that they would be worse off then they were under autarky, able to consume only 4 units of paired wine and cheese in the basic version of the game, or to reach utility of only 96 in the advanced version of the game. Explain that fear of future policy changes of trading partners might cause some countries to specialize less than

standard trade theory would suggest. For a challenging homework exercise for advanced students, you could assign part of McLaren's paper as a reading assignment.

This exercise also provides an opportunity to begin a discussion of the World Trade Organization (WTO) as a multilateral institution designed both to promote freer trade and to discourage opportunistic behavior. You might begin with an overview of the WTO mission, and ask students if they think the WTO is effective in its aims. Though many students know little about the organization, it is likely that at least a few have strong feelings on the subject. Note that some people accuse the WTO of serving the "rich" or developed world; for instance, with respect to intellectual property rights, the slow reform of U.S. and E.U. agricultural policies, and the exploitation of developing countries' labor and natural resources. Depending on the time you choose to devote to this discussion in the course, you might foreshadow future topics in the class during which you will examine some of these issues in greater detail. Though somewhat tangentially related to this classroom game, discussion of these "hot" topics is a great way to get students excited about economics in general, and your course in particular. If you are not planning to spend additional lecture time on the topic but want students to examine the WTO further, you might ask them to visit the WTO website, www.wto.org, and to write a brief summary of a current dispute, recent accessions, or an outline of settlement procedures for homework.

V. A Tariff Extension

The game can be adapted to include tariffs on imports or exports. Announce that in Phase 4 you will collect a tax that is based on the number of units each country imports

(or exports). Each country can reallocate its labor or repeat its Phase 3 production levels. If you start by announcing a small tax, say 25% of each unit imported, production levels should stay the same as in Phase 3. You can discuss what changed as a result of the tariff (just a decrease in consumption, but no production distortion.) Repeat Phase 4 with a higher tariff, say 80% of each unit imported. In this case, production should return to the Phase 1 level, but countries will still exchange one unit of wine for one unit of cheese, as the consumption gain from the extra pair of goods net of the tariff is still positive. After several different tariffs, students should be able to deduce the prohibitive tariff level. Another interesting variation is to impose a tariff on just one of the two goods or to put a quota on the level of imports or exports allowed. Alternatively, you could assign these extended tariff and quota exercises as homework to be completed individually or in small groups.

VI. Further Reading

Noussair *et al.* (1995) present results from an experimental study of international trade patterns. Their research experiment, which is significantly more complicated than the exercise presented here, reveals that trades are consistent with comparative advantage and factor price equalization occurs. While prices and quantities move toward the competitive equilibrium over time, the competitive prediction is generally rejected.

References

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Production and Exchange Experiment

Each person (or group) in this class has been randomly assigned to represent either Country A or Country B. You are a member of Country A. Your country is endowed with four units of productive labor. Each unit of labor can be allocated to the production of wine or cheese.

Possible Allocations of Your 4 Units of Labor

LABOR ALLOCATION	WINE OUTPUT	CHEESE OUTPUT
All to Wine Production	26	0
3 to Wine, 1 to Cheese	24	4
2 to Wine, 2 to Cheese	18	6
1 to Wine, 3 to Cheese	10	8
All to Cheese Production	0	10

To be sure you understand this setup, answer the following question in the blank provided:

_____ If you currently have one unit of labor allocated to cheese production, how much **more** cheese would you produce if you were to allocate a second unit of labor to cheese production?

(*Leontief Preferences*) You have very particular tastes, in that you consume wine and cheese only in equal proportions. That is, for each unit of wine consumed, you must consume exactly one unit of cheese and vice versa (i.e., wine and cheese are perfect complements). You will add $1 to your class earnings for each pair of wine and cheese units that you have at the end of each phase, but you will earn nothing for unmatched wine or cheese.

(*Cobb-Douglas Preferences*) You have very particular tastes, in that you must consume some wine and some cheese to receive any utility. Specifically, your utility is equal to the amount of cheese you consume times the amount of wine you consume. You will add $1 to your class earnings for every unit of utility you earn.

There will be three phases to this game. You can not carry unused production over from one phase to the next.

Production and Exchange Experiment

Each person (or group) in this class has been randomly assigned to represent either Country A or Country B. You are a member of Country B. Your country is endowed with four units of productive labor. Each unit of labor can be allocated to the production of wine or cheese.

Possible Allocations of Your 4 Units of Labor

LABOR ALLOCATION	WINE OUTPUT	CHEESE OUTPUT
All to Wine Production	10	0
3 to Wine, 1 to Cheese	8	10
2 to Wine, 2 to Cheese	6	18
1 to Wine, 3 to Cheese	4	24
All to Cheese Production	0	26

To be sure you understand this setup, answer the following question in the blank provided:

_____ If you currently have one unit of labor allocated to cheese production, how much **more** cheese would you produce if you were to allocate a second unit of labor to cheese production?

(*Leontief Preferences*) You have very particular tastes, in that you consume wine and cheese only in equal proportions. That is, for each unit of wine consumed, you must consume exactly one unit of cheese and vice versa (i.e., wine and cheese are perfect complements). You will add $1 to your class earnings for each pair of wine and cheese units that you have at the end of each phase, but you will earn nothing for unmatched wine or cheese.

(*Cobb-Douglas Preferences*) You have very particular tastes, in that you must consume some wine and some cheese to receive any utility. Specifically, your utility is equal to the amount of cheese you consume times the amount of wine you consume. You will add $1 to your class earnings for every unit of utility you earn.

There will be three phases to this game. You can not carry unused production over from one phase to the next.

Phase 1

In this phase of the game, you will consume only your own production. You have to decide how to allocate your four units of labor between the production of wine and cheese.

Indicate your decision below:

_____ units of labor to cheese production, producing _____ units of cheese;

_____ units of labor to wine production, producing _____ units of wine.

(*Leontief Preferences*) Therefore, you can consume _____ matched units of wine and

cheese, with an excess of _____ units of wine/cheese (circle one).

(*Cobb-Douglas Preferences*) Therefore, your utility is equal to the product of _____

units of cheese and _____ units of wine, which equals a total utility of _____.

Phase 2

In this phase of the game, given your production decision from Phase 1, you are free to exchange with your trading partner. Your trading partner has been assigned the same number as you, but a different letter (for example, 1A and 1B are trading partner).

Record your production decision from Phase 1 here:

_____ units of cheese produced

_____ units of wine produced

At this point, you may exchange goods with your trading partner as long as you do not commit to provide more units of a commodity than are listed above.

Record trades here:

You traded _____ units of (circle one) wine/cheese for _____ units of (circle one)

wine/cheese.

(*Leontief Preferences*)You can now consume _____ matched units of wine and cheese,

with an excess of _____ units of wine/cheese (circle one).

(*Cobb-Douglas Preferences*)You can now consume _____ units of wine and _____

 units of cheese. Your utility is the product of these two quantities which equals _____.

Phase 3

In this final phase of the game, you will undertake another round of production, knowing that you may trade after production has occurred. You may share any information, or make binding agreements with your trading partner before making your production decision.

Indicate your decision below:

_____ units of labor to cheese production, producing _____ units of cheese;

_____ units of labor to wine production, producing _____ units of wine.

Record trades here:

You traded _____ units of (circle one) wine/cheese for _____ units of (circle one)

wine/cheese.

(*Leontief Preferences*) With trade you will consume _____ matched units of wine and

cheese, with an excess of _____ units of wine/cheese (circle one). Given your own

production decision, in the absence of trade you could consume _____ matched units of

wine and cheese, with an excess of _____ units of wine/cheese (circle one).

(*Cobb-Douglas Preferences*) With trade you will consume _____ units of wine and

_____ units of cheese, for a total utility equal to the product of the two which is _____.

Given your own production decision, in the absence of trade you could consume _____

units of wine and _____ units of cheese, for a total utility of _____.