



Paleoeconomics: A Classroom Game

Demonstrating How Trade May Explain the Rise of Humans and the Demise of Neanderthals

Economists agree that specialization and trade improve living standards, yet public skepticism toward trade is rising. This suggests economics instructors need innovative ways to present trade's benefits. This classroom game, inspired by research suggesting early humans outcompeted Neanderthals through trade, highlights trade's transformative power. Adaptable for various class sizes, the 50-minute activity is ideal for introductory economics courses and fosters discussion of outcomes and implications. By framing trade as a vital factor in human evolution, the game connects economic concepts with anthropology and evolutionary biology, enhancing student engagement and understanding of the benefits of trade historically and in today's world.

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1. Introduction

If you do what you are best at while I do what I'm best at, and we trade, we will both end up better off than if we tried to do everything ourselves. This insight, based on the concept of comparative advantage laid out by Ricardo (1817) more than two hundred years ago, is one every economist knows, and every introductory economics student is taught (e.g., Mankiw, 2012; Cowen & Tabarrok, 2018; Mateer & Coppock, 2024). But while "the consensus among mainstream economists on the desirability of free trade remains almost universal" (Mayda & Rodrik, 2005; see also Poole, 2004; Griswold, 2009, and Henderson, 2024), the proportion of Americans who view trade as an opportunity for economic growth is down sharply since 2020 (Jones, 2022).

Why so much skepticism? After all, the gains from specialization and trade are self-evidently true at the community level. Few of us, for example, would try to set a broken bone or repair the transmission on a car. Instead, we would pay a doctor or mechanic specializing in that kind of work.

However, when it comes to trade between nations, there is growing public skepticism, which both the Trump and Biden administrations channeled to justify new trade restrictions.¹ If economists want to preserve the gains society enjoys from trade, we must consider new ways of demonstrating these gains to economics students.

The classroom game presented in this paper comes at the issue from a novel anthropological direction, building on an article by Horan et al. (2005) provocatively titled "How trade saved humanity from biological exclusion: an economic theory of Neanderthal extinction." The authors argue that early modern humans may have outcompeted their Neanderthal cousins because these humans engaged in trade with one another while Neanderthals did not. The game presented here frames trade not just as a way for countries to benefit from exchanging wine for cloth (Ricardo, 1817) or computers for shirts (Cowen and Tabarrok, 2018), but as a force capable of transforming society for the better. And because the game incorporates anthropology and evolutionary biology, it may appeal to a wider range of students than the traditional textbook examples.

The game works in small or large classes and is suitable for introductory undergraduate or high school courses. It takes about 30 minutes to run, leaving time for the instructor to discuss the game's results, the implications these results have for the fate of Neanderthals once humans arrived in Eurasia, and the distributional impacts trade may have on society today. Gameplay plus discussion takes about 50 minutes of class time.

2. Background

Homo neanderthalensis was the most recent archaic human. Neanderthals first appeared in Eurasia about 400,000 years ago, where they lived successfully until their extinction about 40,000 years ago – just a few thousand years after the arrival of the first Cro-Magnons (Vaesen et al., 2021). While they have traditionally been caricatured as big, hairy, dumb, stooping brutes (Madison, 2020), scholars today believe Neanderthals stood erect (Haeusler et al., 2019), were capable of complex speech (Conde-Valverde et al., 2021), and had brains similar in size to humans' (Pearce et al., 2013). Neanderthals did, however, have a stocky physique which meant

¹ For example, the Trump administration imposed tariffs on \$380 billion worth of goods, including tariffs on most Chinese goods, a 25% tariff on most steel imports, and a 10% tariff on most aluminum imports (York, 2024). The Biden administration kept most of these Trump tariffs in place while placing additional tariffs on Chinese semi-conductors and electric vehicles (York, 2024), as well as Canadian lumber imports (Fowke, 2021).

they were likely better adapted to Eurasia's harsh winters (Klein, 2009).

How is it then that strong, smart Neanderthals who had been established in Eurasia for so long were so quickly shoved aside by humans who, relatively speaking, were completely new to the continent? Horan et al. suggest that division of labor and trade helped humans overcome their biological disadvantages, allowing them to flourish in Eurasia and gradually exclude Neanderthals. The authors present a model where both Neanderthals and humans derive utility from consuming meat and "other goods," and a population's growth rate is a function of its meat consumption. Members of each group are divided into those with a comparative advantage in producing meat and those with a comparative advantage in producing other goods. According to the model, humans who are at a biological disadvantage to Neanderthals – perhaps because their smaller size made them less efficient hunters – may still be able to outcompete Neanderthals if humans engage in trade with one another, while Neanderthals do not.²

In a well-written background section that should be accessible to most introductory students, Horan et al. survey the literature showing that, unlike Neanderthals, paleolithic humans developed sophisticated trading relationships. The authors point to abundant evidence that the earliest humans living in Eurasia traded shells, stones, and other raw materials over trade networks that stretched hundreds of miles. Horan et al. argue that humans' superior craftsmanship and higher pace of technological innovations in stonework suggest within-group specialization.

According to Horan et al., Neanderthals did not transport raw materials over distances of more than a few miles, did not trade with other groups of Neanderthals, and did not engage in division of labor to the extent that early humans did.

Of course, the idea that specialization and trade can boost living standards is not new nor limited to Stone Age hominids. Ricardo (1817) introduced the concept of comparative advantage and used the example of trade between England and Portugal to illustrate how specialization could benefit both countries even when one of them (Portugal, in this case) was better, in an absolute sense, at producing both wine and cloth. At the time, this was uncommon sense. While academics since Smith (1776) had understood that exchange could be mutually beneficial, most policymakers in the early 19th century viewed trade through a zero-sum mercantilist lens, believing one nation could gain from trade only at the expense of a trading partner.³ Although the belief in mutually beneficial trade was unusual in Ricardo's time, it is now a central concept in every introductory economics textbook (e.g., Coppock & Mateer, Cowen & Tabarrok, Mankiw). These texts typically use numerical examples and production possibility frontiers to demonstrate that parties can consume more of both goods if they specialize in producing the good for which they have the lowest opportunity cost and then trade with one another.

Instructors looking for a classroom game that gives students firsthand experience with gains from specialization and trade have many to choose from (e.g., Hauptert, 1996; Holt, 2009; Hong, 2019). Bergstrom and Miller's (2000) "Two Island Economies" is an especially nice

² There are at least a dozen competing theories explaining Neanderthals' extinction (Vaesen et al., 2021). Some of the most common explanations include demographic factors, such as inbreeding within small, isolated communities (Vaesen et al., 2019) or declining fertility rates (Degioanni et al., 2019); environmental factors, such as climatic instability (Jiménez-Espejo et al., 2007); and competitive exclusion by modern humans, who may have had technological (Shea & Sisk, 2021) or economic advantages (Fa et al., 2013).

³ For example, Britain's Corn Laws imposing tariffs on imported grains were in force from 1815 to 1846 (Ward, 2004).

example of the genre and is the basis for the game presented in this paper. In Bergstrom and Miller's game, students are assigned to one of two countries – Richland and Poorland – on the aptly named Ricardo Island. Students in either country can produce fish or loaves of bread in each of several rounds. Each country has the comparative advantage in producing one of the goods, though Richlanders have the absolute advantage for both goods. A student's payoff at the end of a round is equal to the number of fish-and-bread sandwiches they consume (i.e., they have Leontief preference). In the first set of rounds, students can only consume what they produce themselves. In the second set of rounds, students can trade with other students from either country. Specialization and international trade allow students to increase their payoff by 20% compared with autarky.

3. The Paleoeconomics Game

The instructions for this game lay out the research question that motivated Horan et al. – How did humans manage to displace Neanderthals in Eurasia, given that Neanderthals were already well established there and were presumably better adapted to the climate? – and present the authors' thesis that trade may be the answer.⁴

The instructions explain that Neanderthals and humans living in two different regions can divide 24 hours between producing meat or berries, as described in Table 1. Similar to the model presented by Horan et al., Neanderthals needed more hours to produce meat or berries after humans' arrival due to increased competition for resources.

Table 1: The number of hours Neanderthals and humans need to produce meat or berries

	Neanderthals (before humans arrive)	
	Meat	Berries
Uplanders	5 hours per pound	1 hour per pound
Lowlanders	1 hour per pound	5 hours per pound
	Neanderthals (after humans arrive)	
	Meat	Berries
Uplanders	6 hours per pound	2 hours per pound
Lowlanders	2 hours per pound	6 hours per pound
	Humans	
	Meat	Berries
Uplanders	9 hours per pound	3 hours per pound
Lowlanders	3 hours per pound	9 hours per pound

⁴ All materials referenced in this paper, along with a lesson plan, slides, and answer keys for the pre-game quiz and post-game assignment, are available in the online appendix. Individual files are available for download here: <https://bit.ly/3AqQSzl>.

The instructions also explain that meat and berries must be consumed in a fixed one-to-one proportion (a “prehistoric Happy Meal”), meaning a student’s payoff at the end of a round equals \$1 times the minimum of the number of pounds of meat and pounds of berries they acquire through either production or trade. Research shows that students take in-class games more seriously when money is at stake (Rousu et al., 2015). To keep the cost down, an instructor may choose to randomly select one student at the end of class and pay them 50% of their total earnings.

Ideally, the instructor should hand out the instructions for the game at the class meeting preceding the one when they plan to play the game. Experience suggests students are more likely to read the instructions if they are given a paper copy rather than being asked to find the instructions on the course webpage, though providing students with both paper and digital copies is probably the best strategy.⁵

Before class, students answer four questions via an online or paper quiz to ensure they have read the instructions and understand the game’s basic outlines (available in the online appendix). These questions focus on how Neanderthals should allocate their time before and after humans arrive.

On the day of the game, the instructor may want to start class by spending a few minutes restating the research question that motivated Horan et al. and summarizing the rules of the game. Importantly, the instructor should display a table showing the number of hours it takes humans in each clan to produce meat and berries. Students will need to reference this table during the game.

Next, the instructor hands out color-coded score sheets (available in the online appendix), assigning students to either the human Uplander or the human Lowlander clan. The instructor should ensure that about half of the students receive Uplander payoff sheets and about half receive Lowlander payoff sheets.⁶

In Round 1, students are allowed to trade but only with members of their own clan. The instructor should encourage students to talk with potential trading partners in their own clan before making their individual production decisions. Once students have decided how many pounds of meat and berries to produce, they come to the front of the room to collect meat and berry tickets from the instructor. (A template for these tickets is available in the online appendix.) Handing out the tickets in Round 1 is not strictly necessary, as most students will simply consume what they produce. However, it helps set the stage for between-clan trading in Round 2.⁷

Once students have made their production decisions and carried out any trades in Round 1, the instructor could start the discussion by asking students to raise their hand if they

⁵ An alternative is to go over the instructions and review the answers to the pre-game quiz in class on the day of the game. While this ensures that everyone understands the rules and how to calculate payoffs, it reduces the time available for end-of-class discussion.

⁶ Readers of an earlier draft suggested that some students should be assigned the role of non-trading Neanderthals. While this is feasible, it would not be engaging for students because Neanderthals have no opportunity to trade in any round. However, instructors might consider introducing the game’s Leontief preferences by having all students play non-trading Neanderthals in a warm-up round. The post-game assignment allows students to compare the payoffs of humans with those of Neanderthals.

⁷ Handing out tickets is a bottleneck in this game. Instructors with large classes may want to enlist a teaching assistant to help with this. Alternatively, if there are an odd number of students in a class, a student volunteer could help distribute tickets.

earned a \$2 payoff, suggesting they consumed only what they produced themselves. Almost all students should raise their hands. Next, the instructor can ask students to raise their hands if they earned a payoff other than \$2. A few students may raise a hand, and the instructor can ask those individuals to talk about their experiences. One or two students will often choose to specialize, hoping to trade within their clan, but fail to find a partner, resulting in a \$0 payoff. Finally, the instructor can ask students why there is no possibility for mutually beneficial within-clan trade. Students tend to recognize that there is no sense in trading with someone who is just like them.

Round 2 differs from Round 1 in that students can trade with anyone in the class. The instructor should again encourage students to talk to potential trading partners before deciding what they will produce themselves. This is a good time to ask students to return their meat and berry tickets from Round 1, as it allows students from the two clans to mingle and discuss trades. Once students have decided how much to produce in Round 2, they return to the front of the room to ask for meat and berry tickets. This round will be more raucous because more students will opt to trade. Experience suggests most students will specialize in producing only the good for which they have a comparative advantage, while a few will hedge and specialize only partially, and a few will again choose to consume what they produce themselves. After students have traded tickets, they should return to their seats.

The instructor can start the discussion after Round 2 by asking students to raise their hand if they earned a payoff of at least \$2. Most students should raise their hands. The instructor could ask students to keep their hands in the air if they earned a payoff of at least \$3, at least \$4, or at least \$5. This way, the instructor can quickly identify the students who did the best in Round 2, and then ask them to explain their strategy. The most common outcome will likely be for Uplanders to produce eight pounds of berries and no meat and Lowlanders to produce eight pounds of meat and no berries. Most students will trade four pounds of berries for four pounds of meat with a member of the other clan, earning a \$4 payoff, double their earnings from Round 1. However, some students may negotiate a more favorable trade, such as three-for-five, giving them a \$5 payoff.

The author has played versions of this game more than a dozen times in class. This experience suggests that while not every student instantly grasps the rules, the results are consistent with the predictions of theory. Namely, specialization and between-clan trade lead to higher payoffs than autarky.

4. Class Discussion

An instructor can go in many directions with the discussion following the game. One possibility is to talk about the distributional impacts of trade. It should be clear after playing the game that trade has the potential to make every player better off. But what if there were hunting specialists and gathering specialists in each clan? In the absence of between-clan trade, an Upland hunter might get three pounds of berries in exchange for one pound of meat. But between-clan trade means Upland gatherers can get a pound of meat from a Lowland hunter in exchange for just one pound of berries. What does this mean for the Upland hunter? Should he move to the Lowlands, where the hunting is better? Should he learn how to gather? Or should he learn to get by with a much lower income? While it is still true that between-clan trade makes both clans better off on the whole, that does not necessarily mean every individual benefits. The instructor can then ask students to suggest policies that help the Upland hunter (or the Lowland gatherer) while preserving the gains from trade. This parallels current debates about the impact trade with China has had on the traditional manufacturing centers in the United States (Autor et al., 2021).

An instructor may also want to revisit the puzzle motivating this game. How do the results from this game relate to the extinction of the smart, strong Neanderthals who were well-adapted to life in Eurasia? Horan et al. assume there is a “minimum quantity of food that Neanderthals need to support themselves” (p. 8). Before humans arrived, Neanderthals, who we assume did not trade, could earn a \$4 payoff. After humans arrive, this falls to \$3. If the minimum quantity of food Neanderthals needed to support themselves is four Happy Meals, the arrival of humans pushes Neanderthals below this threshold, leading to population decline. What about humans? Assuming they have the same subsistence threshold, they will be well below that if they do not trade with one another (two Happy Meals versus four), but trade between human clans allows them to achieve the minimum quantity of food needed to support themselves. In a world where food is the factor limiting population growth (as Horan et al. assume), what does that mean for the relative proportion of Neanderthals and humans in Eurasia in the next generation? And what does that mean for Neanderthals’ prospects over the span of a few thousand years?⁸

If time allows, an instructor may want to talk about the implications the game’s results have for the world today. Suppose one nation enthusiastically embraces specialization and trade with the rest of the world. Another chooses to go it alone, only consuming what it produces domestically. What will that mean for average incomes in the two countries over time? The cleanest example of this dichotomy is South Korea versus North Korea. The two countries share the Korean peninsula, speak a common language, and share a common history and culture. After the Korean War, the South pursued export-led growth (Haggard et al., 1991) while the North pursued self-sufficiency (Kim, 1967). Today, the difference in living standards across the two countries is so stark that it is easily visible from satellite images that show South Korea lit up as brightly at night as any rich country, while North Korea is dark except for a speck of light in Pyongyang (Economist, 2019).

5. Assignment

The assignment based on this game (available in the online appendix) asks students to summarize the main results from the rounds with and without trade between clans, to think about how opportunity cost and comparative advantage determine which good a clan should specialize in producing, and to compare humans’ payoffs with and without trade to what Neanderthals would earn. The assignment also gives students practice using Microsoft Excel. Personal experience suggests most students come to college with little to no background in using Excel, though almost all go on to use Excel in the workplace after graduation. By incorporating Excel work into regular assignments, instructors can ease students into this kind of data work and give students another line to include on their resume.

6. Closing Thoughts

The idea that both parties benefit from specialization and trade may be uncommon sense, but it has been understood by economists since the early 19th century. Indeed, this concept is so widely accepted in our profession that the gains from trade appear in every introductory textbook and are covered in most introductory courses. However, as a discipline, we need to do a better job of explaining the benefits of trade to the public. It is telling, for example, that Jonathan Sacks, one of the 21st century’s most persuasive advocates for the

⁸ Instructors who want to provide even more information about early humans and Neanderthals can refer students to the first five-and-half pages of Horan et al., which are accessible and unusually well written. For a shorter treatment of the same topics, instructors can point students to The Economist’s (2005) summary of Horan et al.

benefits of trade, was not trained as an economist but was the chief rabbi of Britain and the British Commonwealth. In Sacks' words, "It is through exchange that difference becomes a blessing, not a curse" (2003).

The classroom game described in this paper presents the gains from trade through a novel anthropological lens meant to complement more traditional textbook examples like trading oil for corn (Shapiro et al., 2022). Together with the discussion prompts and the assignments described in this paper, this game may help students understand that specialization and trade do not merely allow us to consume a combination of goods outside of our production possibility frontier but have the potential to improve human well-being to such an extent that it may help explain enduring puzzles such as why humans were able to outcompete Neanderthals in the Paleolithic era, or, more recently, why some nations grow rich while others remain poor.

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