

Trial by Battle Handout

Peter Leeson is a George Mason University economist who specializes in using game theory to explain why customs that look like historical curiosities were actually rational ways for people to solve problems in the absence of a well-functioning government. He has, for example, shown that seventeenth century pirates embraced diversity and democracy long before the rest of western society, and that a pirate's quality of life was markedly better than a merchant sailor's ([amzn.to/2qpBkGv](https://www.amazon.com/dp/B000APR000)). He's shown that the medieval Catholic Church's custom of trial by ordeal could produce a neat separating equilibrium where only the innocent agreed to undergo the trial (bit.ly/2pCxQgS). Even more provocatively, he's argued that wife sales in Industrial Revolution-era England empowered women by giving them a way to trade an abominable husband for one who was perhaps merely bad (bit.ly/2pUCA4w).

But we're interested in what Leeson has to say about the Norman England custom of trial by battle, where individuals settled land disputes by hiring champions to fight on their behalf (bit.ly/2E3R0rP).

Assume Ralph of Wicherler and Beatrice, his wife, own a piece of land they value at £1. Matthew, the son of William, and Emma, his wife, claim the land rightfully belongs to them. They value it at £2. To use Leeson's terminology, Ralph and Beatrice are the tenants, while Matthew and Emma are the demandants. Assuming both parties can convince a judge that they have a reasonable claim to owning the land, the judge will order both parties to hire a champion to fight on their behalf. Assume the probability the tenants win the battle is

$$p_T = \frac{t}{d+t}$$

where t is the amount the tenants spend on their champion, and d is the amount the demandants spend on theirs. Likewise, the probability the demandants win the battle is

$$p_D = 1 - p_T = \frac{d}{d+t}.$$

A) Use these probabilities and what you know about the value the tenants and demandants place on the land to express each party's expected payoff as a function of d and t .

B) The goal now is to find the values of d and t that maximize the tenants' and demandants' expected payoffs. The first step is to find the first-order conditions. Do this by using the quotient rule to take the derivative of the tenants' expected payoff with respect to t and setting it equal to zero. Solve for t to get the tenants' best-response rule.

C) Next, do something similar for the demandants.

D) Generally, you'd find the Nash equilibrium levels of d and t by substituting one of these best-response rules into the other and solving. That would be a bit of challenge in this example because of the square root in your best-response rules. You could get rid of it by squaring both sides of those equations, but you'd end up needing to use factoring or the quadratic formula. You can avoid that by equating the first-order conditions and solving for either d or t . This tells you the relationship between d and t at the Nash equilibrium.

E) Solve the expression from part D for d and substitute this into the tenants' best-response rule from part B. Rearranging and solving for t will give you the tenants' Nash equilibrium level of spending on their champion.

F) Next, find the demandants' Nash equilibrium level of spending on their champion.

G) Focusing on the Nash equilibrium where both parties spend a positive amount on their champions, find the probability that each party wins the violent auction and calculate each party's expected payoff at the Nash equilibrium.

H) Peter Leeson is an anarchist who's generally skeptical of government and government officials. Imagine that instead of hiring champions to determine who gets the land, the land would go to whichever party offered the local judge a larger bribe. What's the largest bribe the tenants would be willing to pay? That in mind, how large of a bribe would the demandants have to pay to get the land? Which system, trial by battle or bribery, is more costly? Which system is more likely to lead to rampant corruption where the judge encourages people to lay claim to land they don't own?