

Chapter 8.

Application to Business: Competitive Decision Making

- Description of the Case
- Alternative Information Sets
- Enumerating the Possibilities
- Knowledge and Certainty

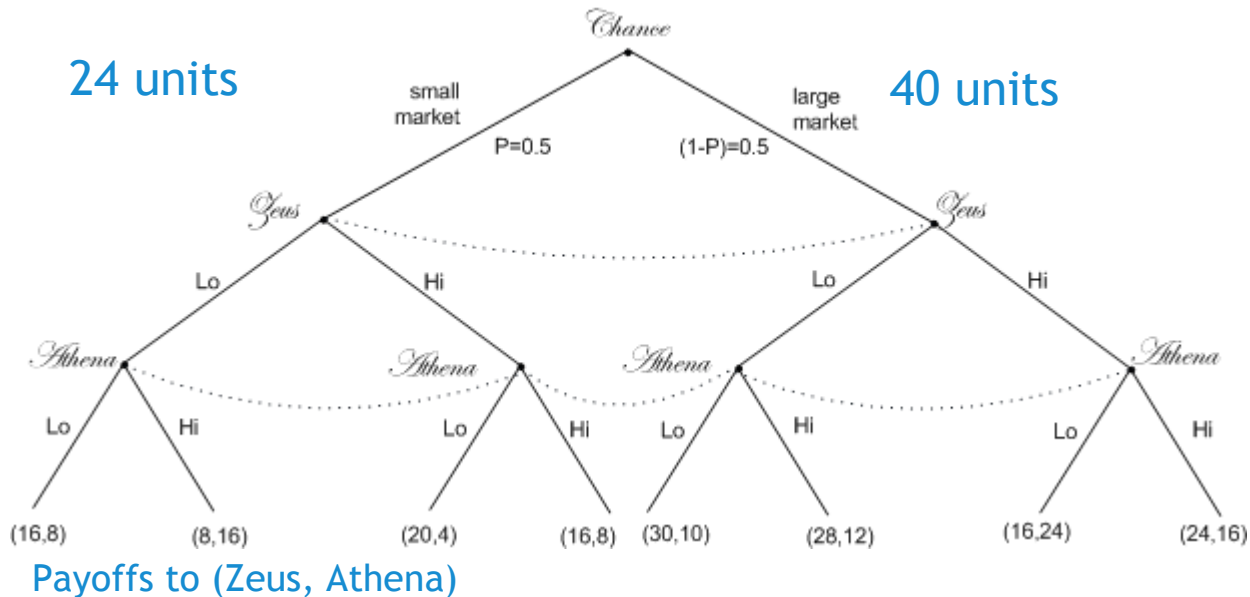
The Case



- A new stereo technology with an unknown market
- Technology development choices to develop either high quality “hi” or price competitive products “lo”
- Two companies, Zeus and Athena, attempting to split the market
- Companies are differentiated by information, leadership

Picture released into public domain by Idoshkedi.

Case 1: No Information



- Zeus doesn't know the market, and moves first, so doesn't know what Athena will do
- Athena doesn't know the market or what Zeus will do

Case 1: Pay-Offs Under Expected Utility

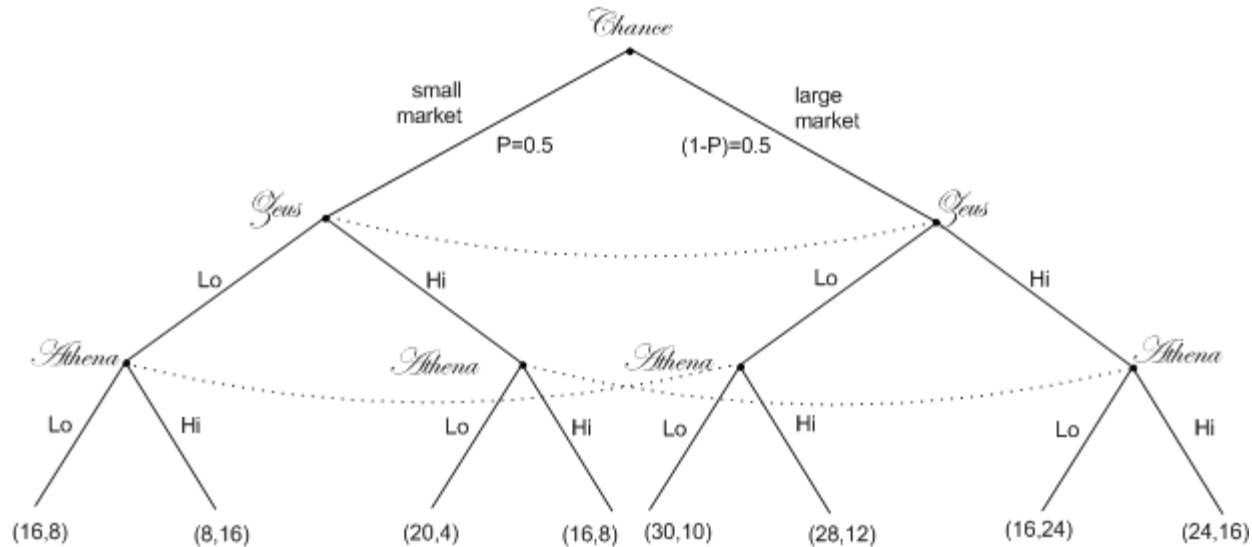
| Zeus's move | Athena's move | Strategy Name | Straffin's Name |
|--------------------|--------------------|------------------|-----------------|
| Goes Lo Goes Hi | Goes Lo Goes Lo | Always "lo" | Lo/Lo |
| Goes Lo Goes Hi | Goes Hi Goes Lo | Opposite of Zeus | Hi/Lo |
| Goes Hi Goes Lo | Goes Hi Goes Lo | Same as Zeus | Lo/Hi |
| Goes Hi Goes Hi | Goes Hi Goes Hi | Always "hi" | Hi/Hi |

Payoffs to Zeus

Payoffs calculated using expected values under selected strategies

| | | Athena | |
|------|----|----------|----------|
| | | Lo | Hi |
| Zeus | Lo | (23, 9) | (18, 14) |
| | Hi | (18, 14) | (20, 12) |

Case 2: Zeus Moves First



Payoffs to (Zeus, Athena)

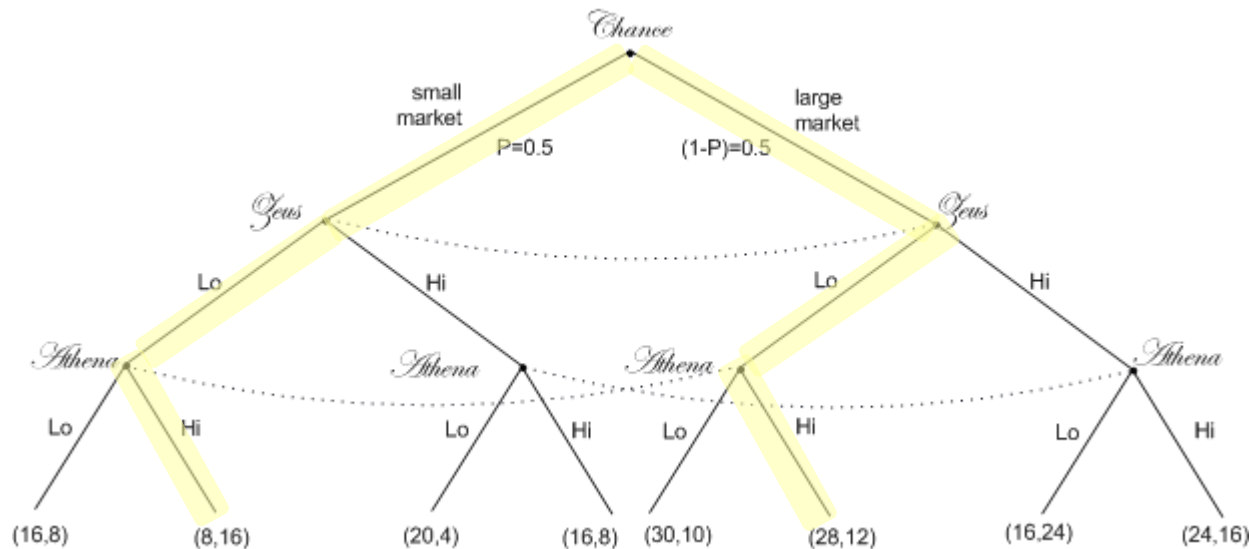
- Zeus doesn't know the market, and moves first, so doesn't know what Athena will do
- Athena doesn't know the market but moves second and so knows what Zeus will do

Enumerating Strategies

- Zeus has no information, so must use the standard “lo, hi” strategy
- Athena has the standard “lo, hi” from perfect information
- Athena can “see” the results of Zeus’ move
- Athena can also use this information if it is advantageous
- Therefore two more strategies: do what Zeus does, do the opposite of Zeus

| Zeus’s move | Athena’s move | Strategy Name | Straffin’s Name |
|--------------------|--------------------|------------------|-----------------|
| Goes Lo Goes Hi | Goes Lo Goes Lo | Always “lo” | Lo/Lo |
| Goes Lo Goes Hi | Goes Hi Goes Lo | Opposite of Zeus | Hi/Lo |
| Goes Hi Goes Lo | Goes Hi Goes Lo | Same as Zeus | Lo/Hi |
| Goes Hi Goes Lo | Goes Hi Goes Hi | Always “hi” | Hi/Hi |

Calculating Payoffs: When Zeus Goes Lo, Athena Goes Hi



Payoffs to (Zeus, Athena)

- Note that Athena must still operate under uncertainty
- Pay-offs are $(0.5)8+(0.5)28 = 18$ for Zeus
- Pay-offs are $(0.5)16+(0.5)12 = 14$ for Athena

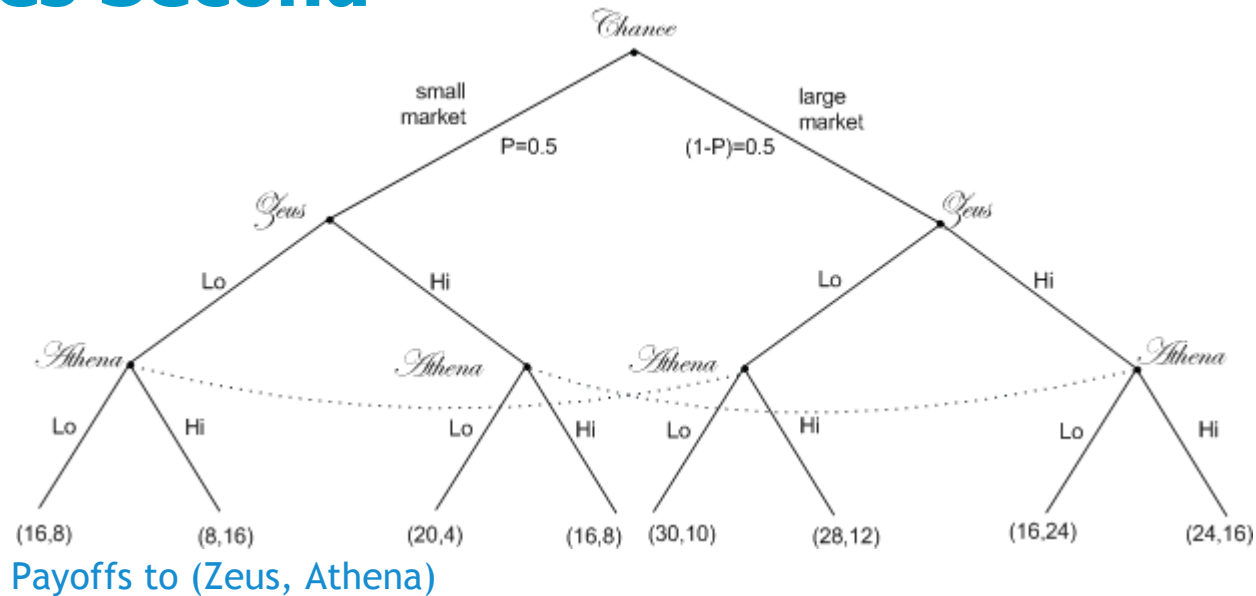
Confirming Payoff Calculations

| | | Athena | | | |
|------|----|--------|-------|-------|-------|
| | | Lo/Lo | Lo/Hi | Hi/Lo | Hi/Hi |
| Zeus | Lo | 23 | 23 | 18 | 18 |
| | Hi | 18 | 20 | 18 | 20 |

- This confirms one of the eight entries in the payoffs as provided by Straffin
- Note his naming convention for the strategies
- Proceed to analyze using game theory
- Athena's strategic flexibility in this case is worth \$1.43 million!

Table adapted from Game Theory and Strategy (Straffin 1993) p.46

Case 3: Zeus Conducts a Market Survey, Athena Moves Second



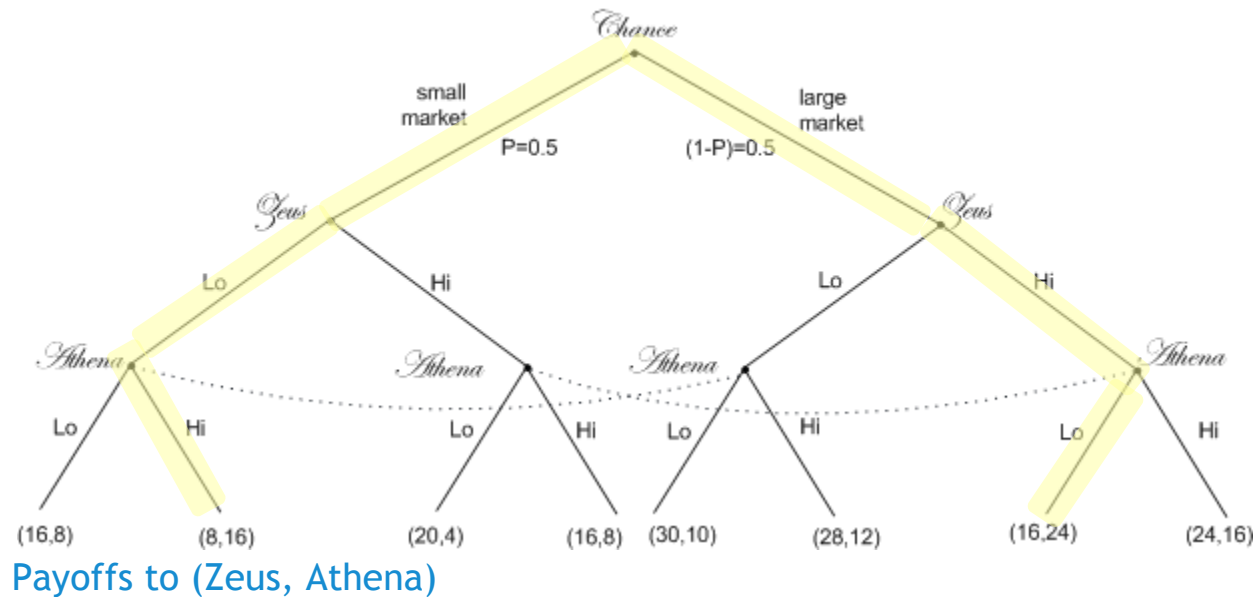
- Zeus knows the market but moves first, so doesn't know what Athena will do
- Athena doesn't know the market but moves second and so knows what Zeus will do

Enumeration of Strategies

| Nature's move | Zeus' move | Strategy Name | Straffin's Name |
|--------------------------|--------------------|--------------------|-----------------|
| Goes Small Goes Large | Goes Lo Goes Lo | Always "lo" | Lo/Lo |
| Goes Small Goes Large | Goes Hi Goes Lo | Opposite of Nature | Hi/Lo |
| Goes Small Goes Large | Goes Lo Goes Hi | Same as Nature | Lo/Hi |
| Goes Small Goes Large | Goes Hi Goes Hi | Always "hi" | Hi/Hi |

- Zeus has standard strategies "lo" and "hi"
- Zeus also has the survey
- Straffin models the survey as 100% accurate
- The survey tells you the state of nature, not what to do
- Analogously to case 2, there are two additional strategies
- Go with nature, go against nature

Enumeration of Strategies:



- Zeus follows Nature, Athena goes against Zeus
- Payoffs (still expected utility!)
 $0.5 (8) + 0.5 (16) = 12$ for Zeus and 30 goes to Athena
- Run game theory analysis, survey affords Zeus \$4 million in profit

Confirming Payoffs

- This confirms one of the 16 outcomes

| | | Athena | | | |
|------|-------|--------|-------|-------|-------|
| | | Lo/Lo | Lo/Hi | Hi/Lo | Hi/Hi |
| Zeus | Lo/Lo | 23 | 23 | 18 | 18 |
| | Lo/Hi | 16 | 20 | 12 | 16 |
| | Hi/Lo | 25 | 23 | 24 | 22 |
| | Hi/Hi | 18 | 20 | 18 | 20 |

- Lo/Hi from Zeus means “follow nature”
- Hi/Lo from Athena means “go counter to Zeus”