Lecture 4
The Logic of Rational Thought

Even when the Nash equilibrium is unique, the prediction is more compelling in some games than others. This lecture develops that theme, by explaining principles that are more powerful than Nash equilibrium in predicting game outcomes.

Key words and phrases:

dominant strategies, dominated strategies, iterative dominance.

Dominant strategies

- Strategies that are optimal for a player regardless of what the other players do are called dominant.
- Although a player's payoff might depend on the choices of the other players, when a dominant strategy exists, the player has no reason to introspect about the objectives of the other players in order to make his own decision.
- Similarly when a dominant strategy exists, the player does not need to know the behavior of the other players to form his or her best response to the probability distribution characterizing their choices.

Always play a dominant strategy if one exists.

Acquiring Federated Department Stores

- The prisoners' dilemma is clearly an artifice designed to illustrate some basic concepts. We turn now to an episode in the history of mergers and acquisitions.
- Robert Campeau and Macy's are competing for control of Federated Department Stores in 1988.
- If both offers fail, then the market price will be benchmarked at 100. If one succeeds, then any shares not tendered to the winner will be bought from the current owner for 90.
- The argument here is that losing minority shareholders will get burned by the new majority shareholders.

Campeau's offer . . .

- Campeau made an unconditional two tier offer. The price paid per share would depend on what fraction of the company Campeau was offered.

- If Campeau got less than half, it would pay 105 per share. If it got more than half, it would pay 105 on the first half of the company, and 90 on any remaining shares.

- Each share tendered would receive a blend of these two prices so that every share received the average price paid. If a percentage $x > 50$ of the company is tendered, then $50/x$ of them get 105, and $(1 - 50/x)$ of them get 90 for a blended price of:

$$105 * 50/x + 90(1 - 50/x) = 90 + 15(50/x).$$

Macy’s offer . . .

- Macy's offer was conditional at a price of 102 per share: it offered to pay 102 for each share tendered, but only if at least 50% of the shares were tendered to it.

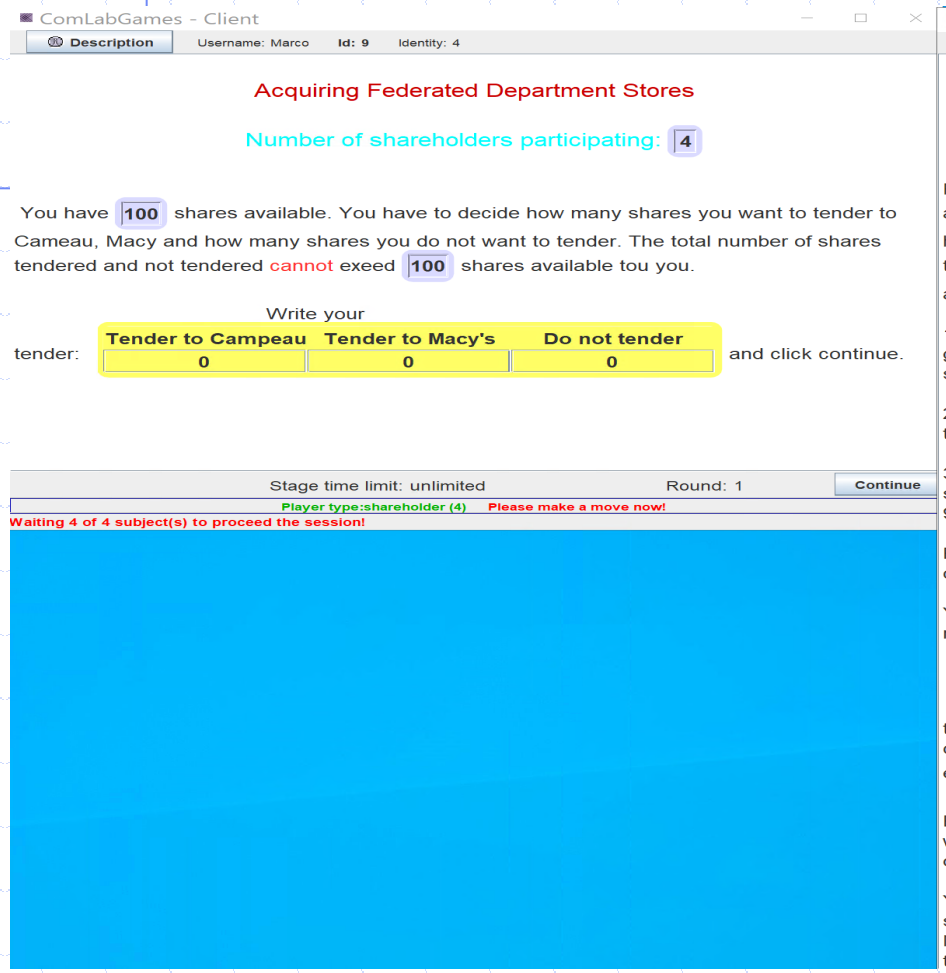
- Note that if everyone tenders to Macy's, they receive 102 per share, while if everyone tenders to Campeau, they receive 97.50. so, shareholders are collectively better off tendering to Macy's than to Campeau.

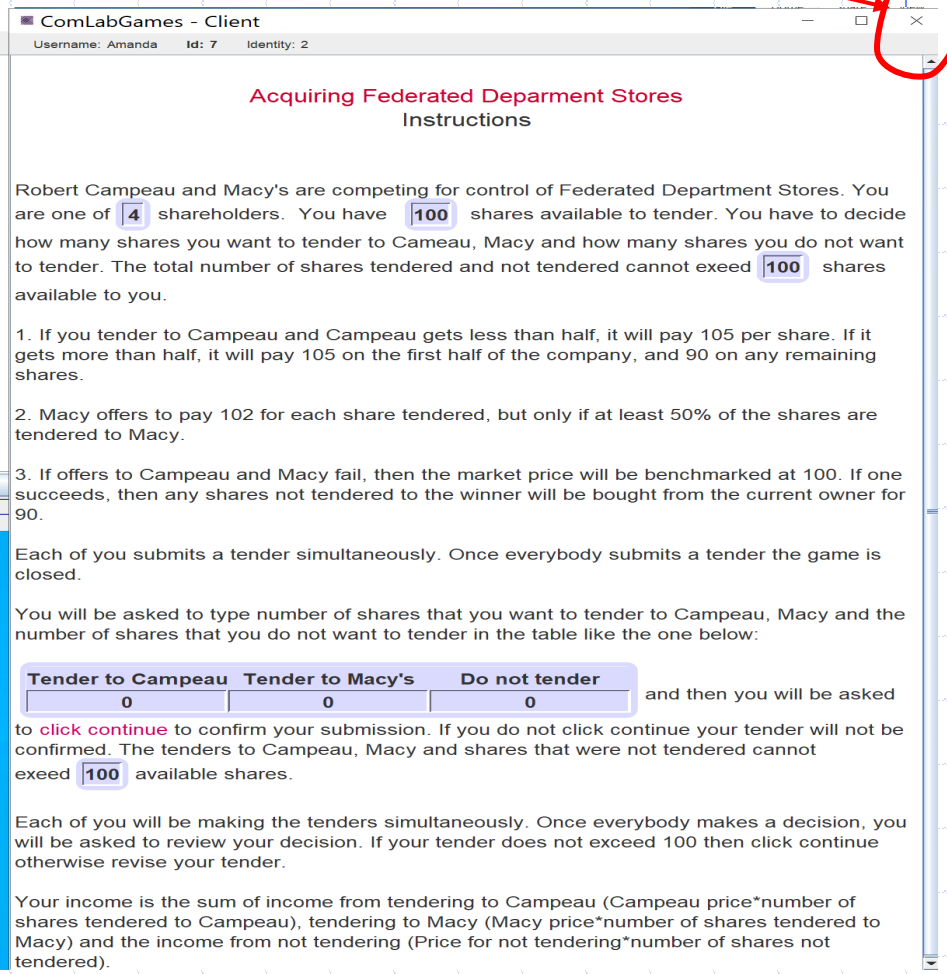
The game between shareholders

- After the offers are made, Federated shareholders play an acceptance/rejection game.
- Each shareholder asks what proportion of their shares should be:
  1. sold to Macy's
  2. sold to Campeau's
  3. retained.
- Note the payoffs received by each shareholder depend on what the other shareholders do.

Acquiring Federated Department Stores and instruction window

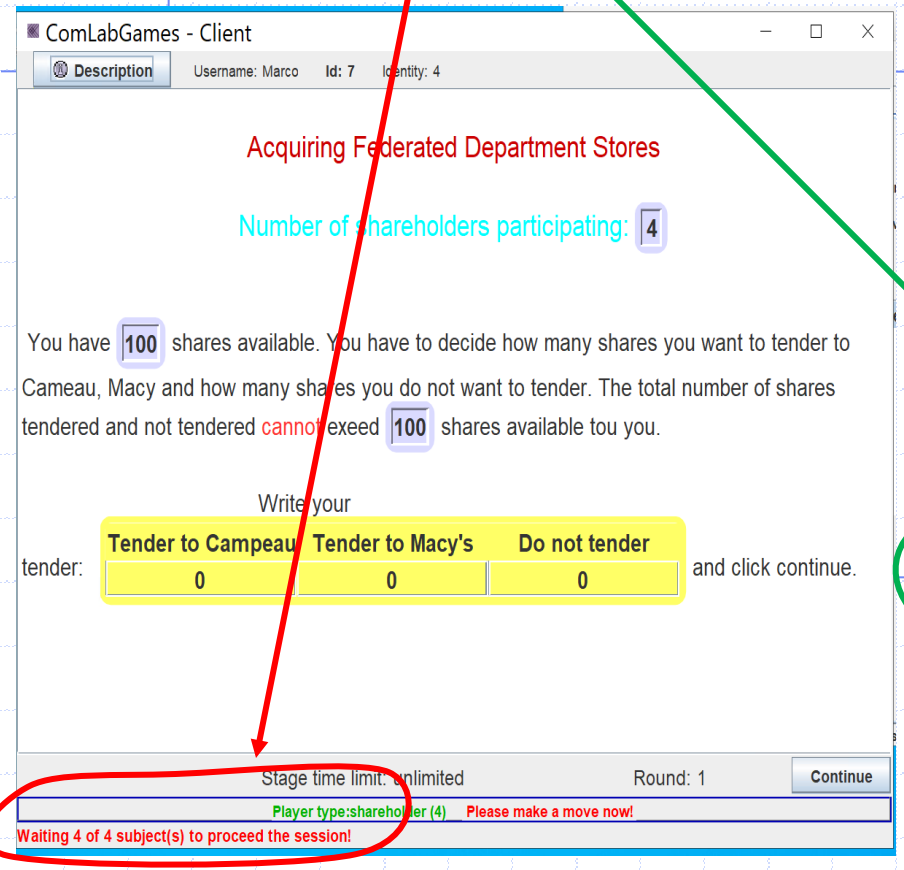
1. Instruction and tender window appears on your screen.
2. To close the instruction window click on "x". To retrieve it click on "Description".

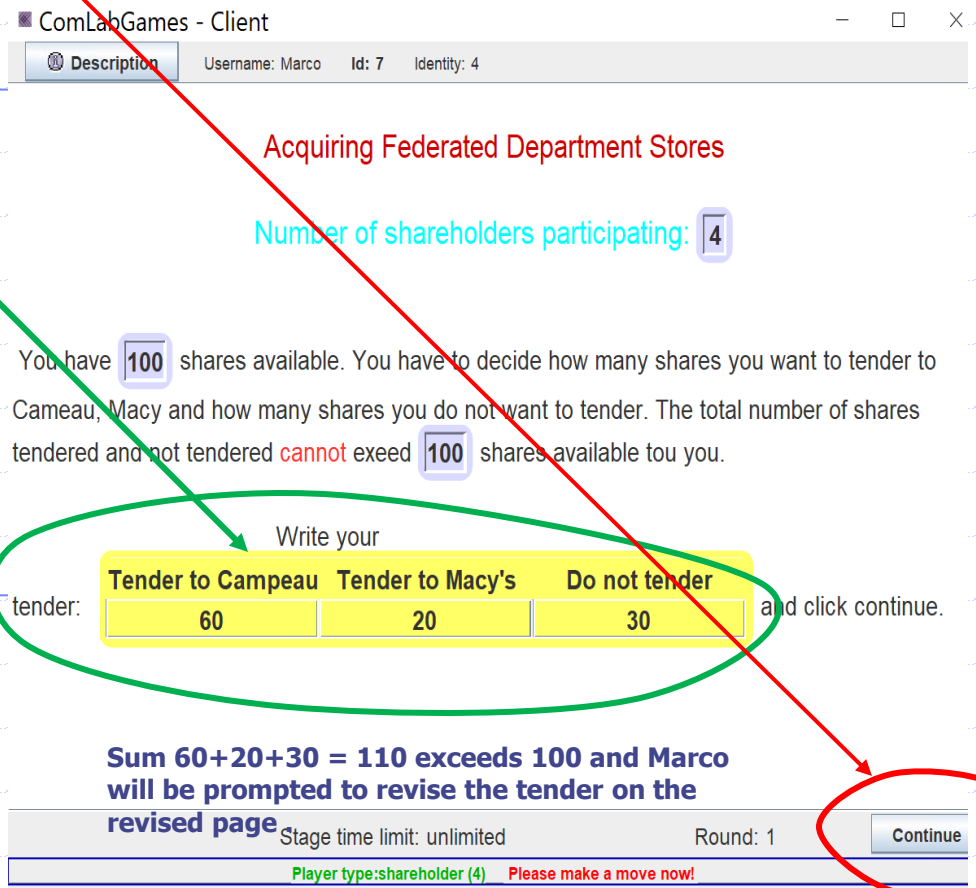




Write number of shares to tender

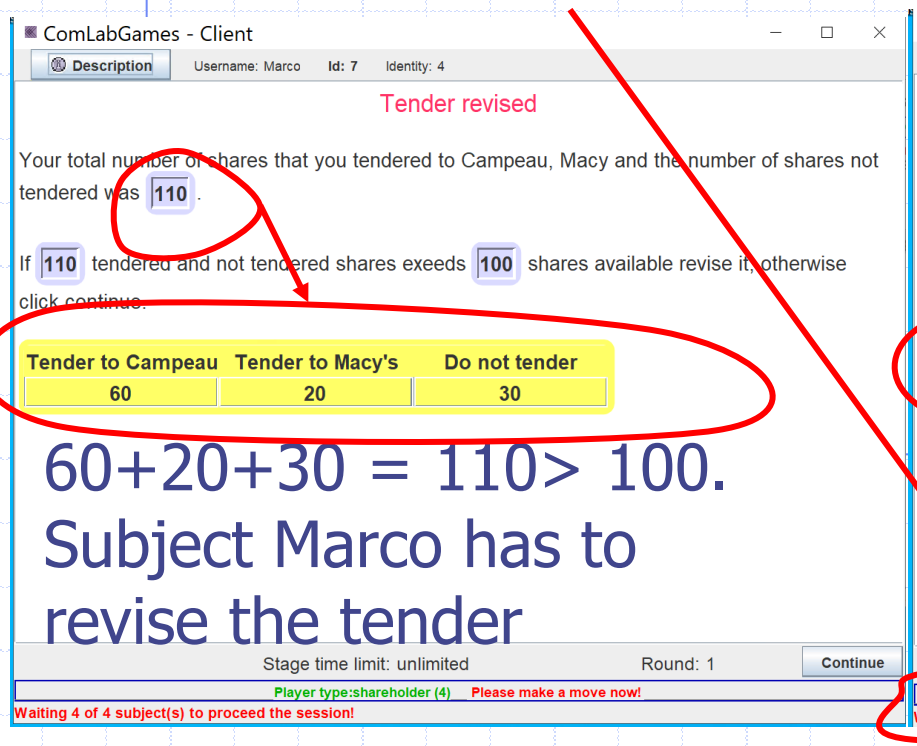
1. Write numbers for Campeau, Macy and for "Do not tender" and click "Continue".
2. Total number of shares tendered cannot exceed 100. You will have a chance to revise the tender after you click "Continue".
3. Wait for all players in your session to submit tender.

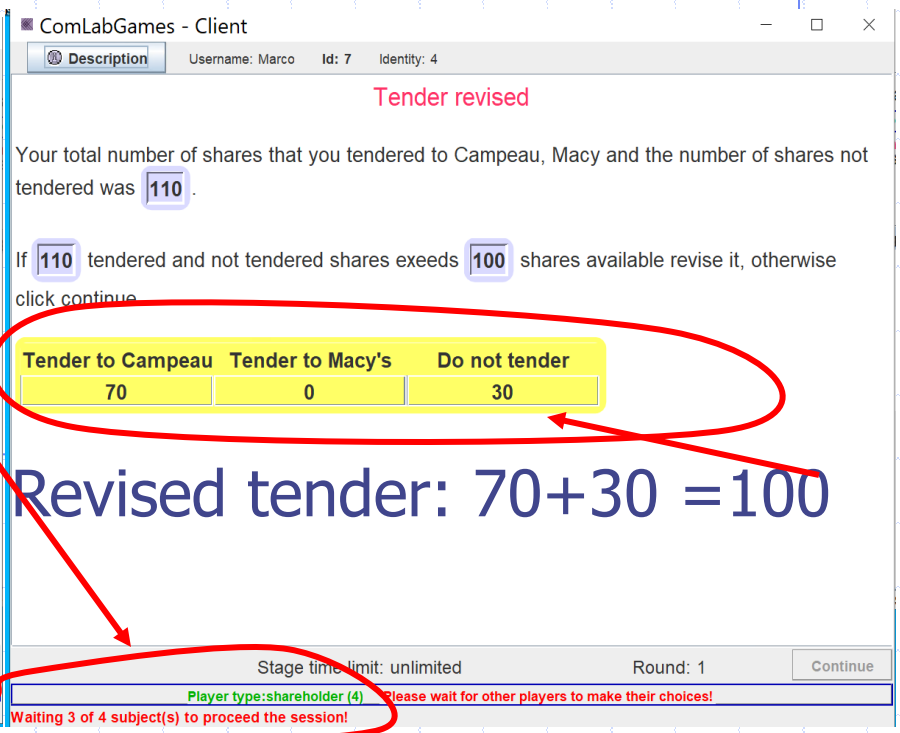




Tender revised

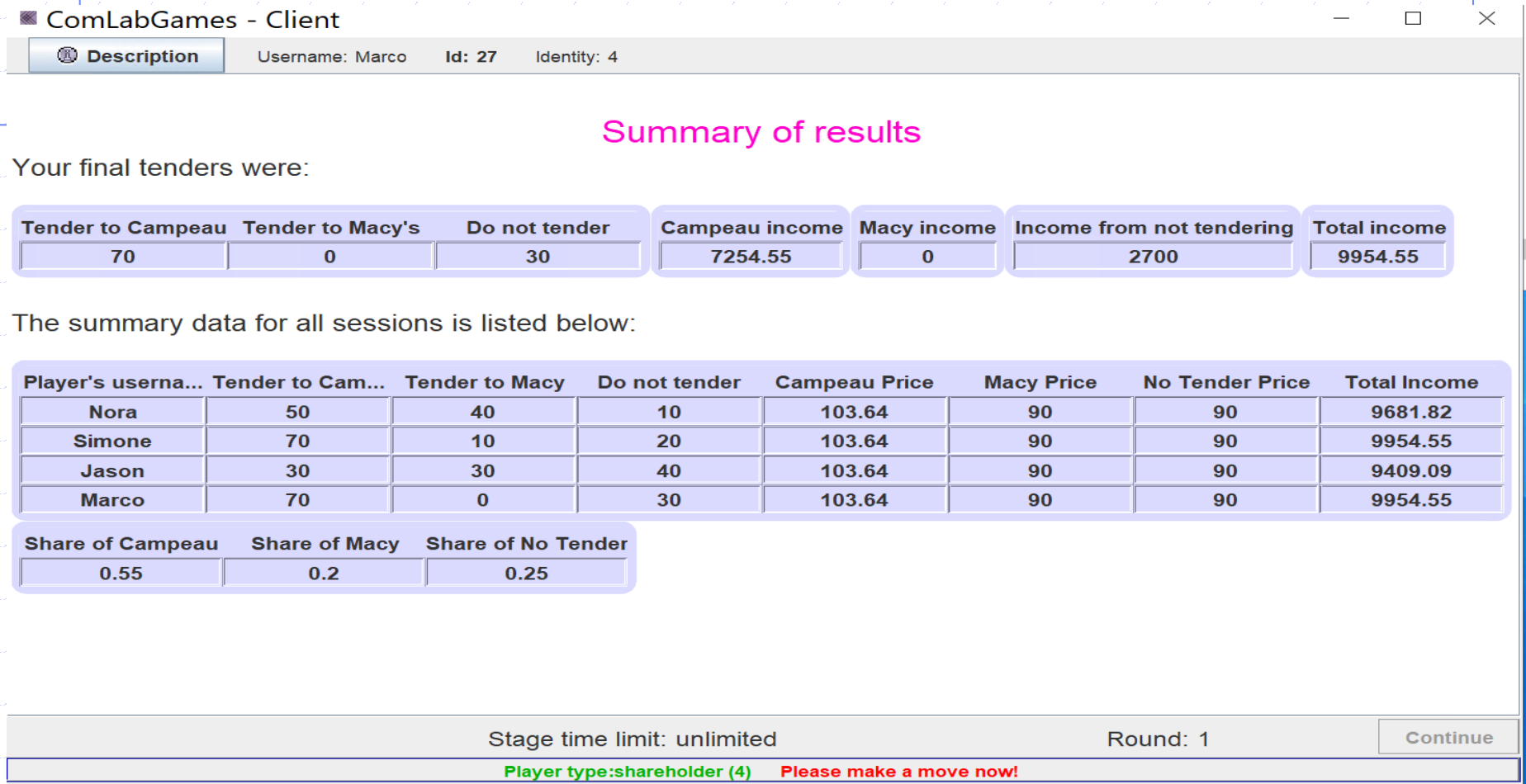
1. Update numbers for Campeau, Macy and for "Do not tender" if your total numbers of shares tendered **exceeds 100** and click "Continue".
2. If your total numbers of shares tendered equals 100 click "Continue".
3. Wait for all players in your session to submit tender.





Summary of results

1. Results show your own final number of shares tendered, Income for each tender and total income earned.
2. Summary for your own session.



The payoff matrix to a stockholder

	Campeau succeeds	Macy's succeeds	Both fail
Tender to Campeau	90+15(50/x)	105	105
Tender to Macy's	90	102	100
Do not tender	90	90	100

The beauty of coordination

- Collectively shareholders are better off tendering to Macy's.
- But if individual shareholders cannot affect who wins, each is better off tendering to Campeau, regardless of what the other players do.
- That caveat aside, each shareholder has a dominant strategy to induce a Nash equilibrium that makes all shareholders worse off than they could be (just like the prisoners' dilemma).
- Can the shareholders coordinate?
  - Suppose Macy's receives 50 percent plus one share and the remaining shares are tendered to Campeau
  - If any shareholder offers more than the agreed amount, then Campeau wins, and instead receiving 102 for the extra shares sold to Campeau, the deviating shareholder only receives 90.
  - In this (tacit) agreement, each shareholder is pivotal.
  - This proves that an agreement between shareholders could be struck to extract the maximal gains for selling their shares. It constitutes another NE.

Governance

- This case study also illustrates the costs of diffuse ownership:
  - Individual shareholders can reduce their risk exposure by owning small stakes in many firms, rather than large stakes in a few.
  - However, if there are many owners in a firm, each with a small stake, then no one has much incentive to tend to the firm's profitability.
  - Similarly, if an asset management firm holds a large portfolio, it faces internal challenges capitalizing on proprietary research it undertakes to increase the value of its fund.

Dominated strategies

- If a player has a dominant strategy, then her other strategies are called dominated.
- More generally, a strategy is called dominated if there exists some other strategy yielding a higher expected payoff regardless of the strategies that the other players pick.

A person should never play a dominated strategy.

- She can earn more by choosing another strategy without knowing the choices of the other players.

Solving games of perfect information

- Games of perfect information are solved by backwards recursion.
- At the bottom node aren't we just eliminating those strategies that are dominated by any strategy that picks out the best move at the very end of the game?
- This insight leads us to the following theorem (easily proved by an induction):

Games of perfect information can be solved by writing down their strategic form and applying iterated dominance.

Walmart and Kmart

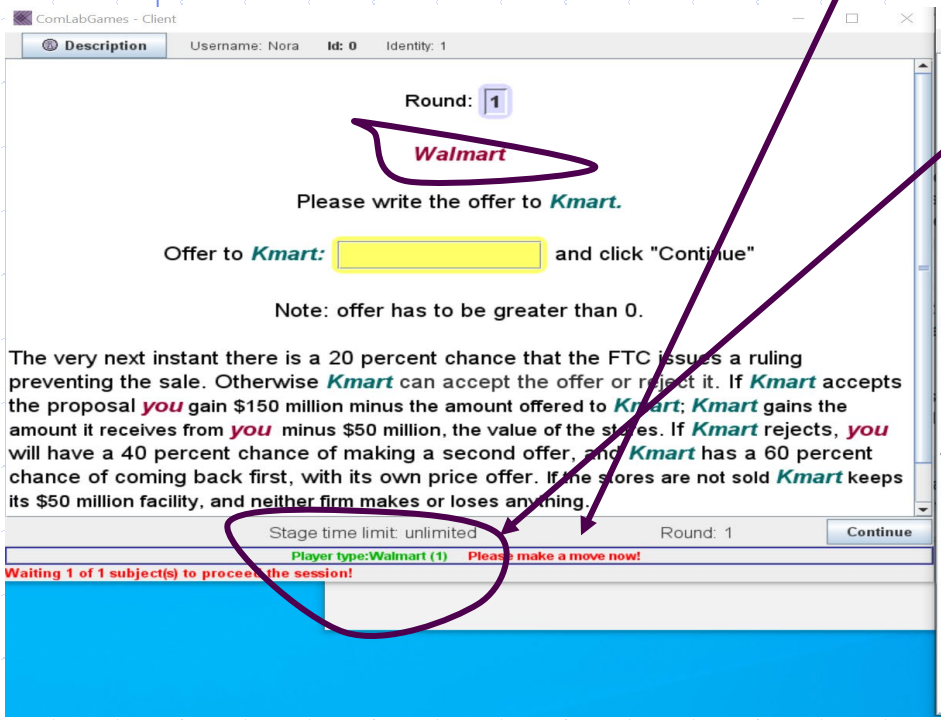
- Consider a two round acquisition game in which Walmart may buy some of Kmart's outlets to help "rationalize" geographical sales regions.
- Insider experts agree that the sum of the increase in value to both firms from transferring ownership of these stores from Kmart to Walmart is worth $100 million.
- Also the physical assets themselves are valued at another $50 million.
- To summarize: if the stores are sold, the two parties Kmart and Walmart split $150 million, but otherwise they both net zero.

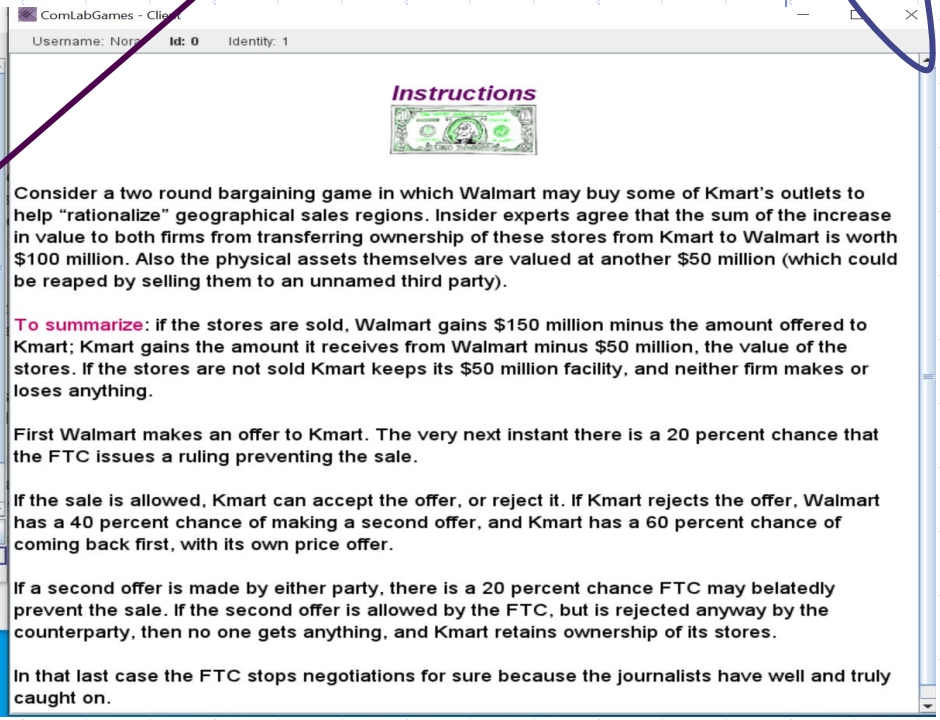
Time line for acquisition game

- First Walmart makes an offer to Kmart.
- The very next instant there is a 20 percent chance that the FTC issues a ruling preventing the sale.
- Otherwise Kmart can accept the offer, or reject it.
- If Kmart rejects, Walmart has a 40 percent chance of making a second offer, but with chance, Kmart has a 60 percent of coming back first, with its own price offer.
- If a second offer is made by either party, there is a 20 percent chance FTC may belatedly prevent the sale.
- If the second offer is allowed by the FTC, but is rejected anyway by the counterparty, then no one gets anything, and Kmart retains ownership of its stores.
- In that last case the FTC stops negotiations for sure because the journalists have well and truly caught on.

Acquisition game for Walmart and instruction window

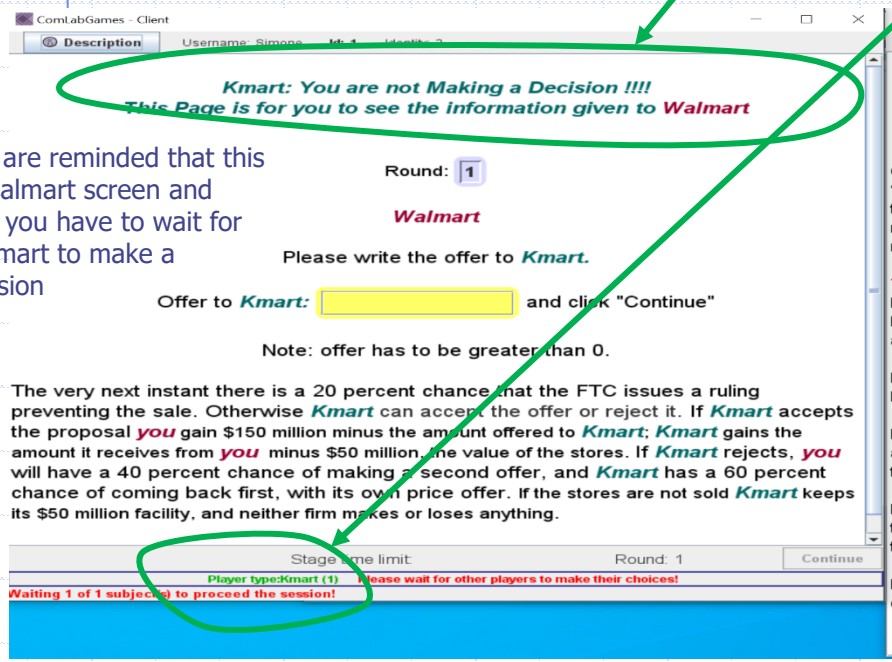
1. Instruction and acquisition window appears on your screen
2. Your role is shown at the bottom of the screen.
3. Walmart makes the offer first.
4. To close the instruction window click on "x". To retrieve it click on "Description".



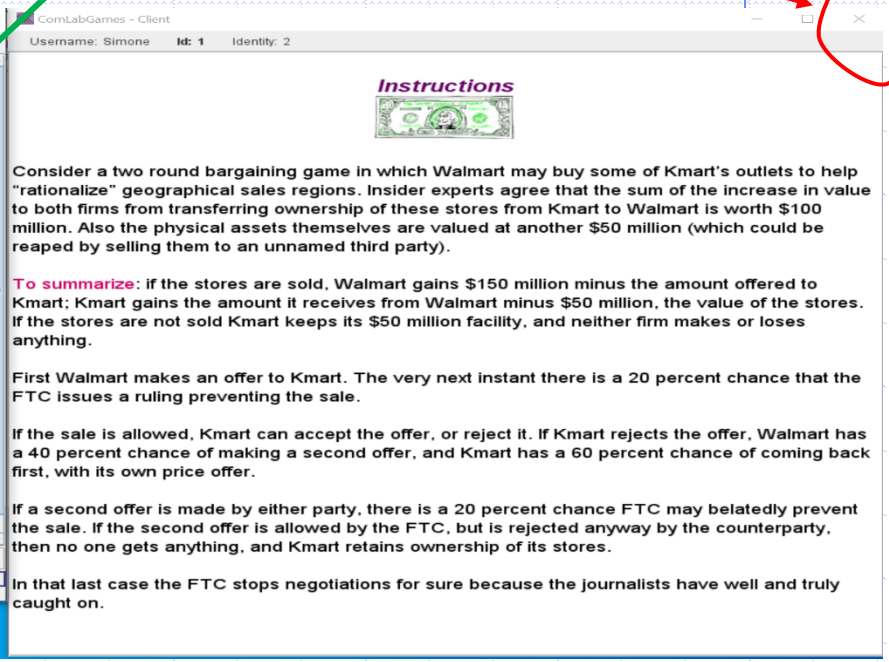


Acquisition game window for Kmart

1. Instruction and acquisition window appears on your screen
2. Your role is shown at the bottom of the screen.
3. Kmart does not make a decision. Kmart just see how Walmart windows looks like.
4. To close the instruction window click on "x". To retrieve it click on "Description".

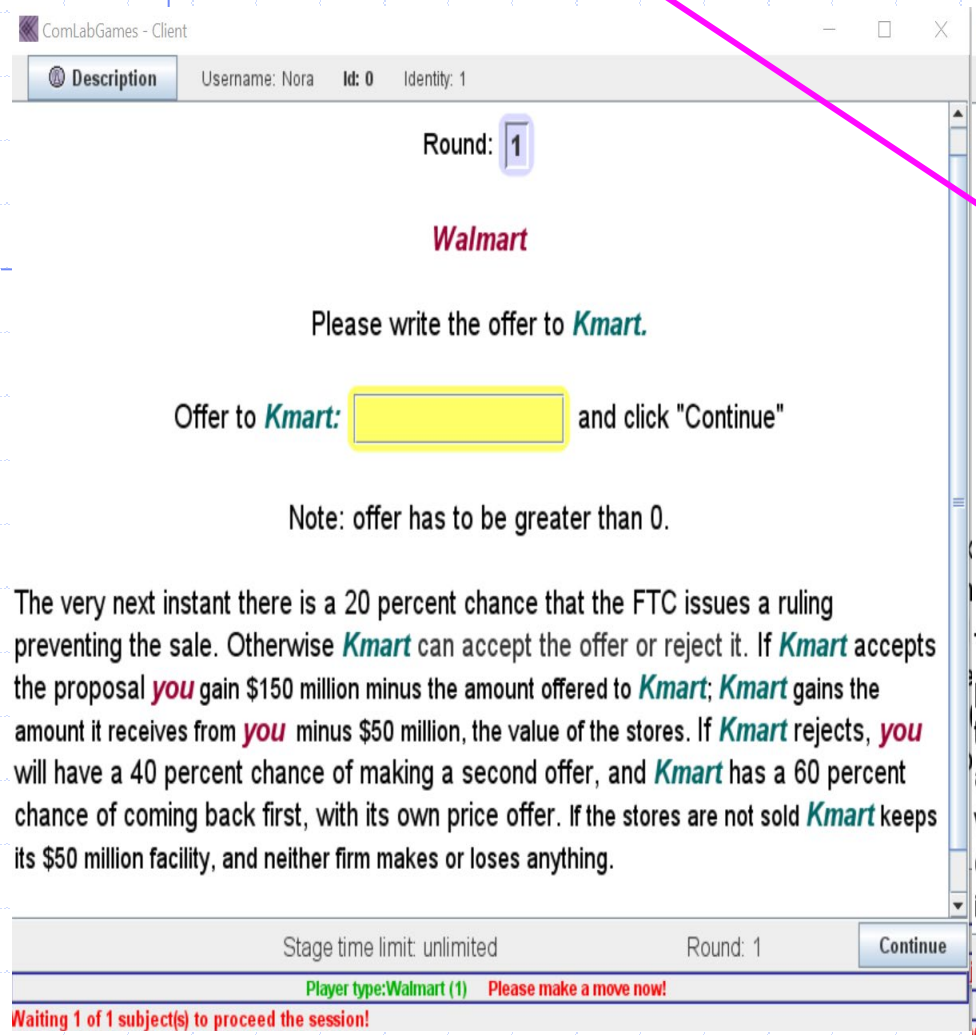


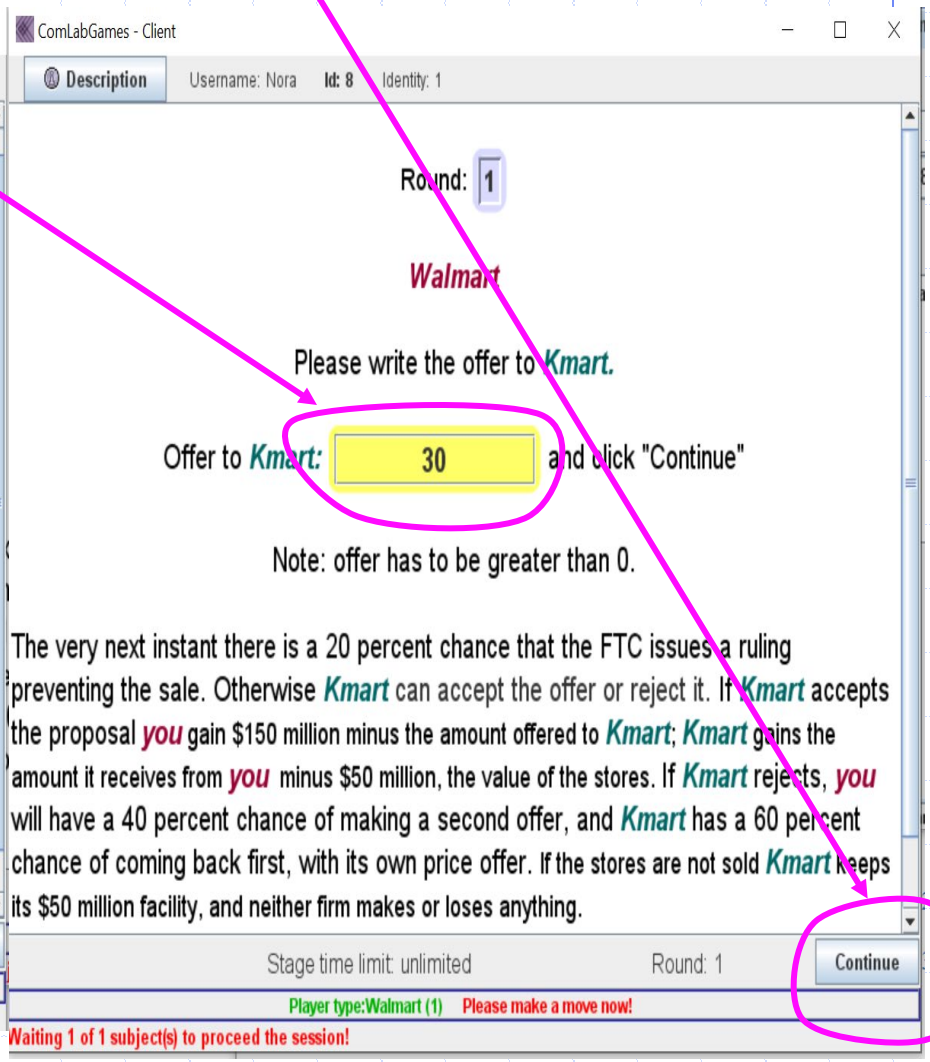
You are reminded that this is Walmart screen and that you have to wait for Walmart to make a decision



Walmart writes an offer to Kmart

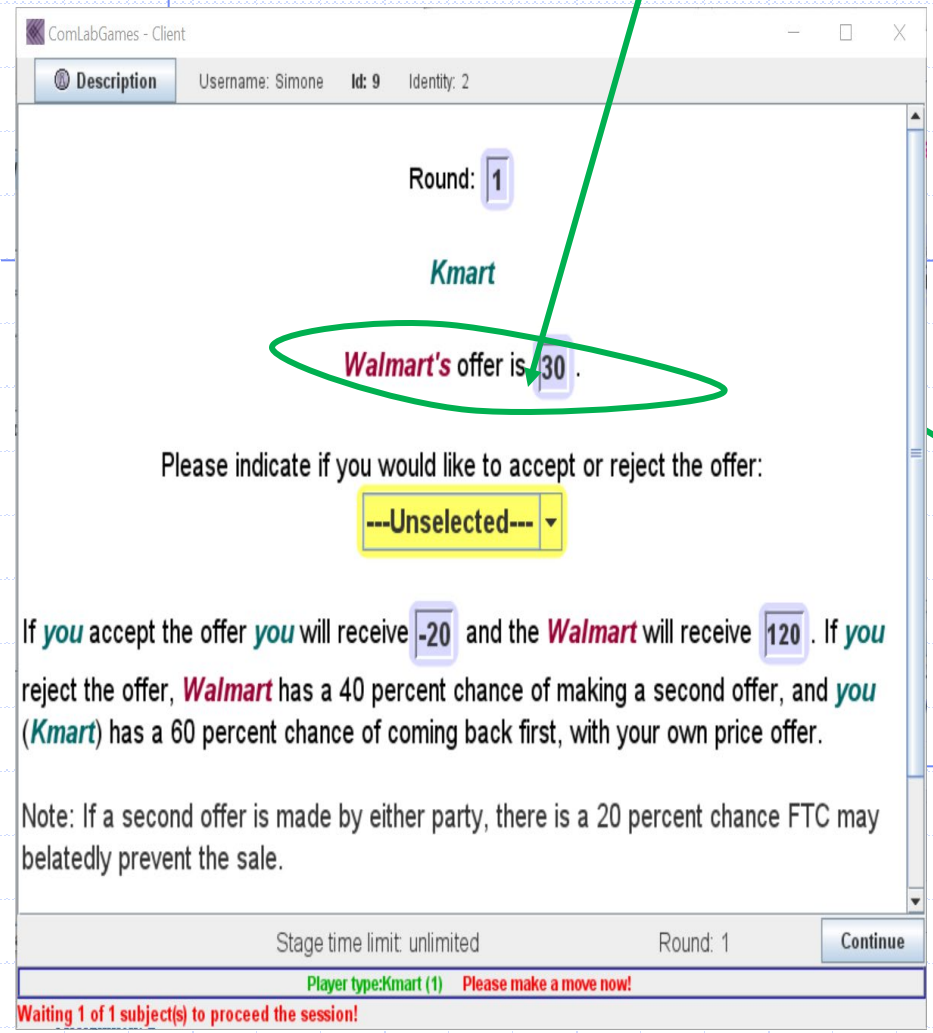
1. Write an offer to Kmart and click "Continue".
2. Offer has to be greater than 0.

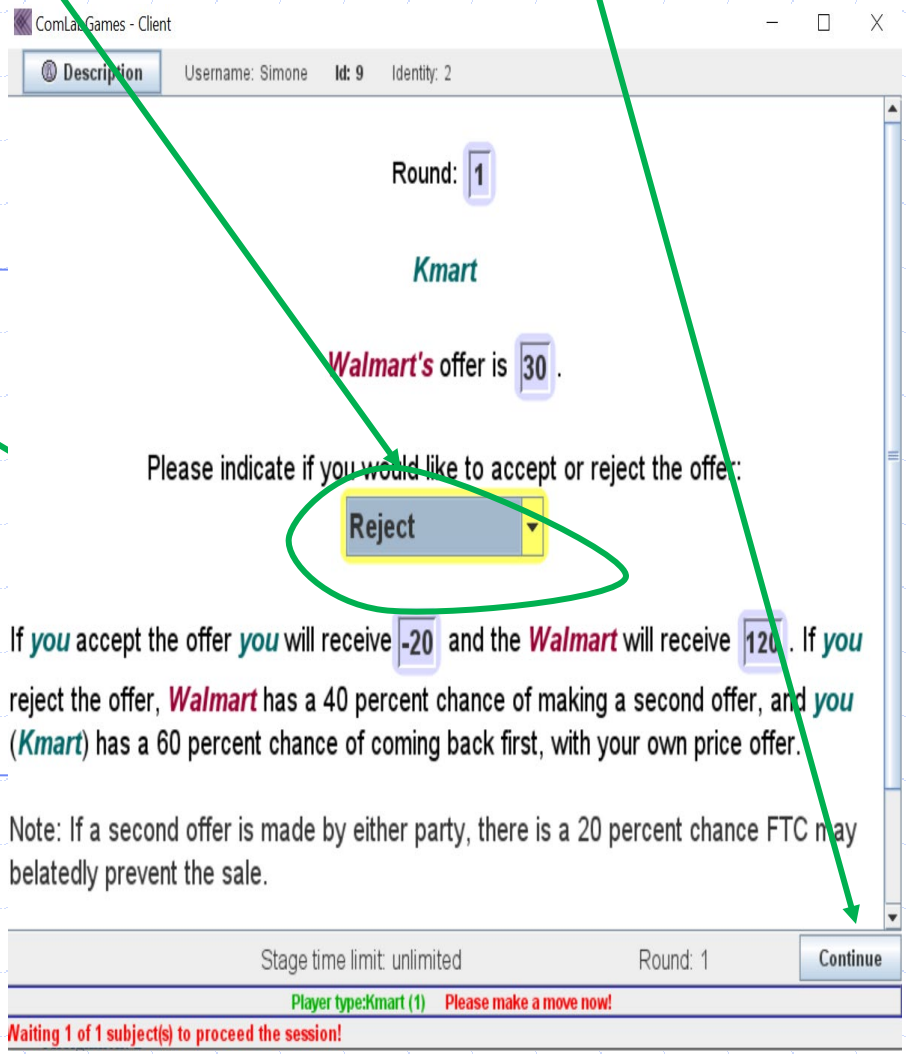




Kmart makes a decision

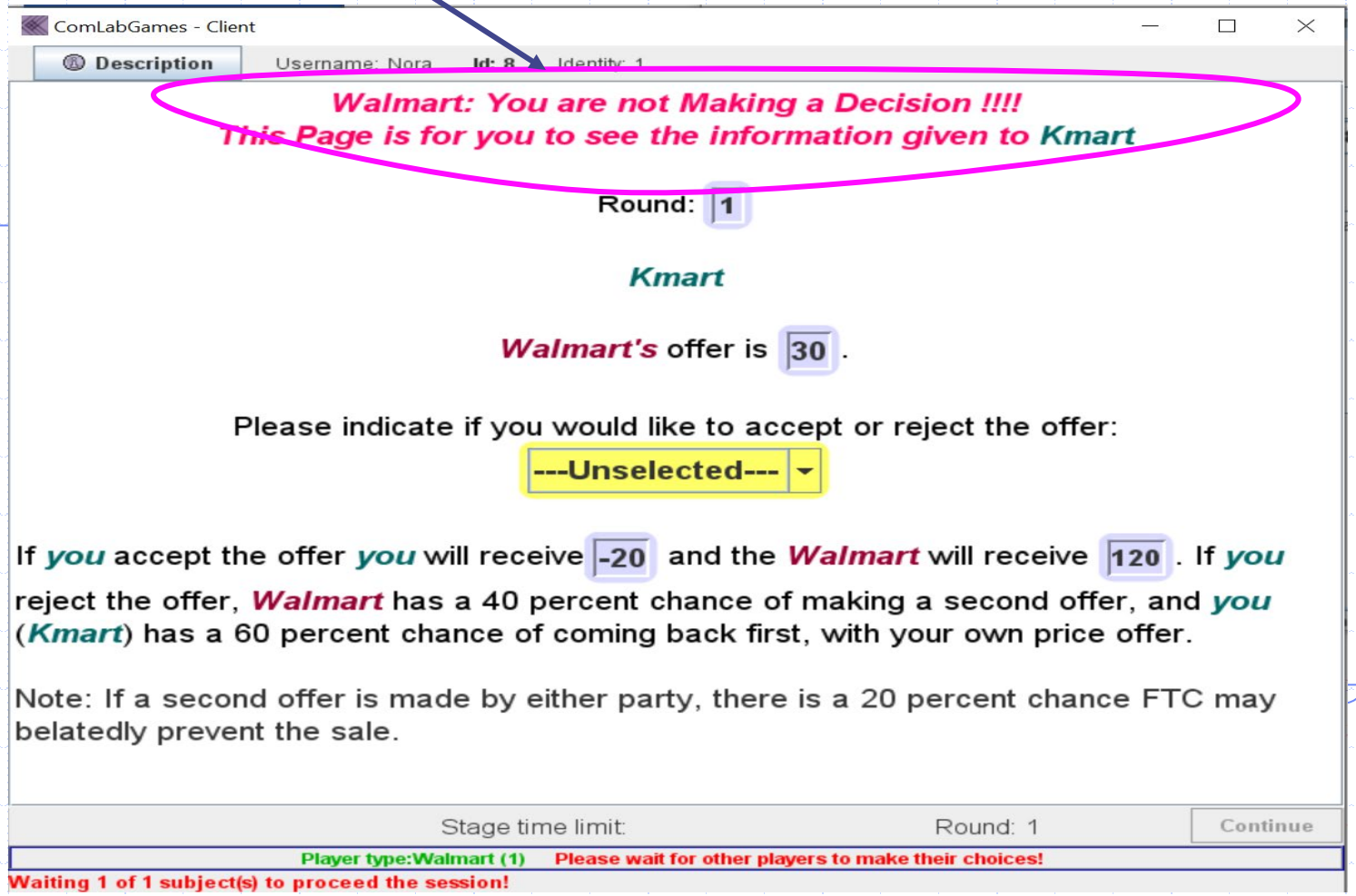
1. Kmart observes Walmart's offer.
2. Kmart selects to "accept" or "reject" an offer and Click "Continue"





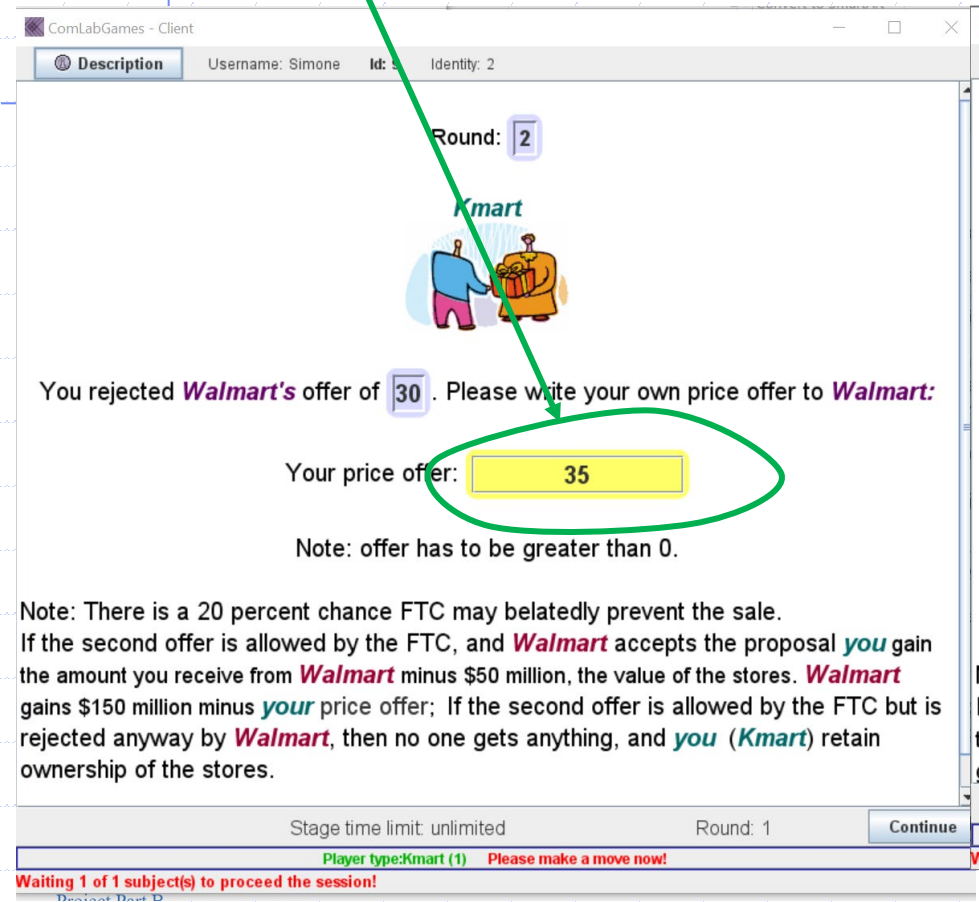
Walmart observes Kmart decision Window

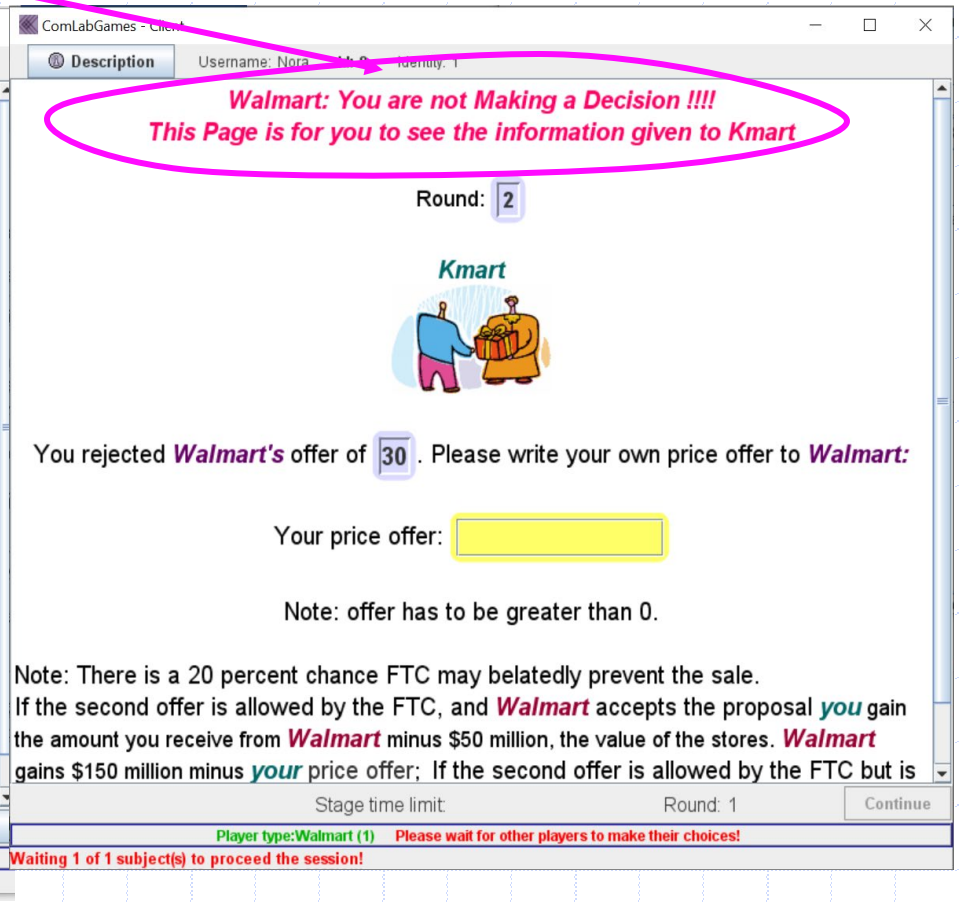
1. Walmart cannot make a decision.
2. Walmart sees the same window as Kmart.



Kmart makes an offer

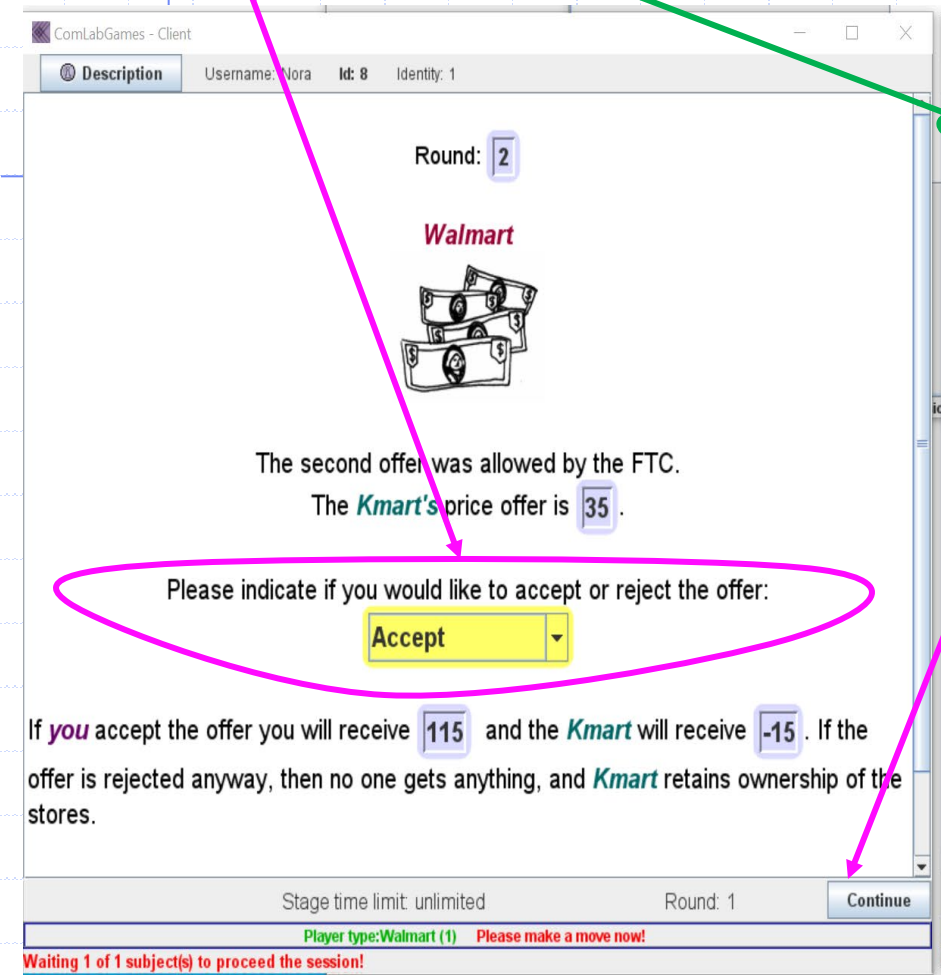
1. ~~Kmart writes an offer to Walmart and clicks Continue.~~
2. Walmart observes the Kmart window and waits for Kmart to make an offer.

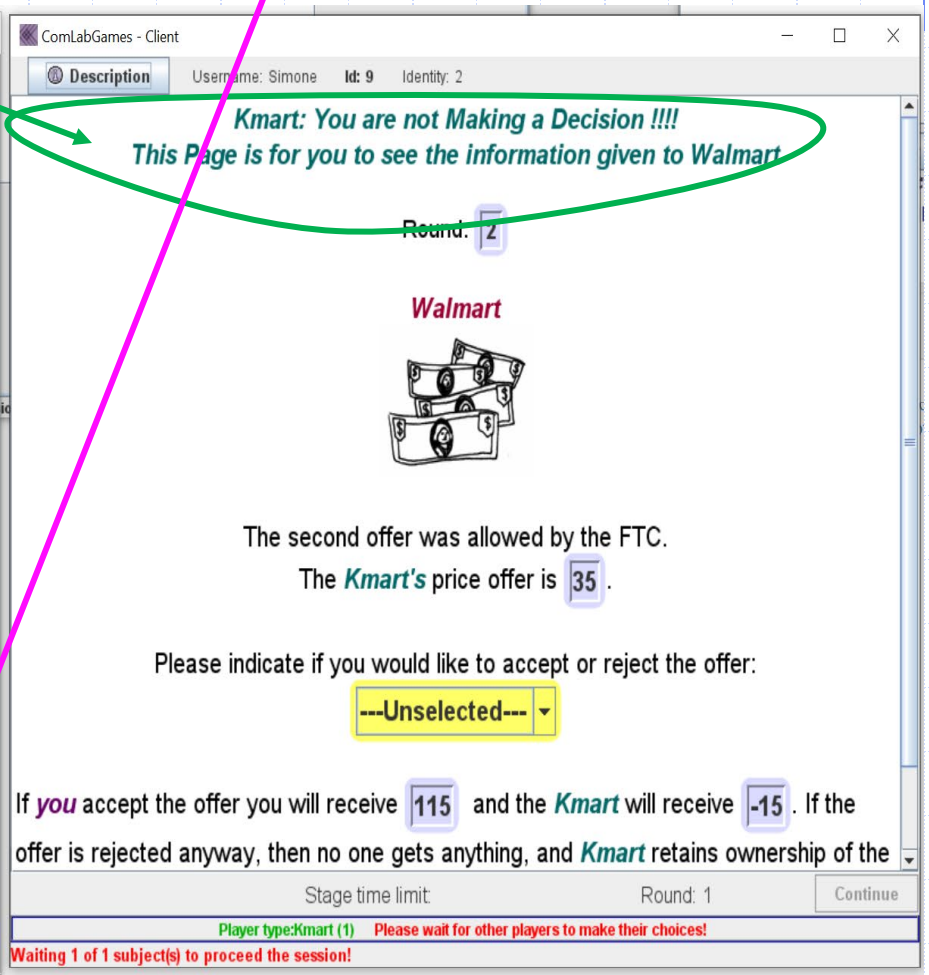




Walmart makes a decision

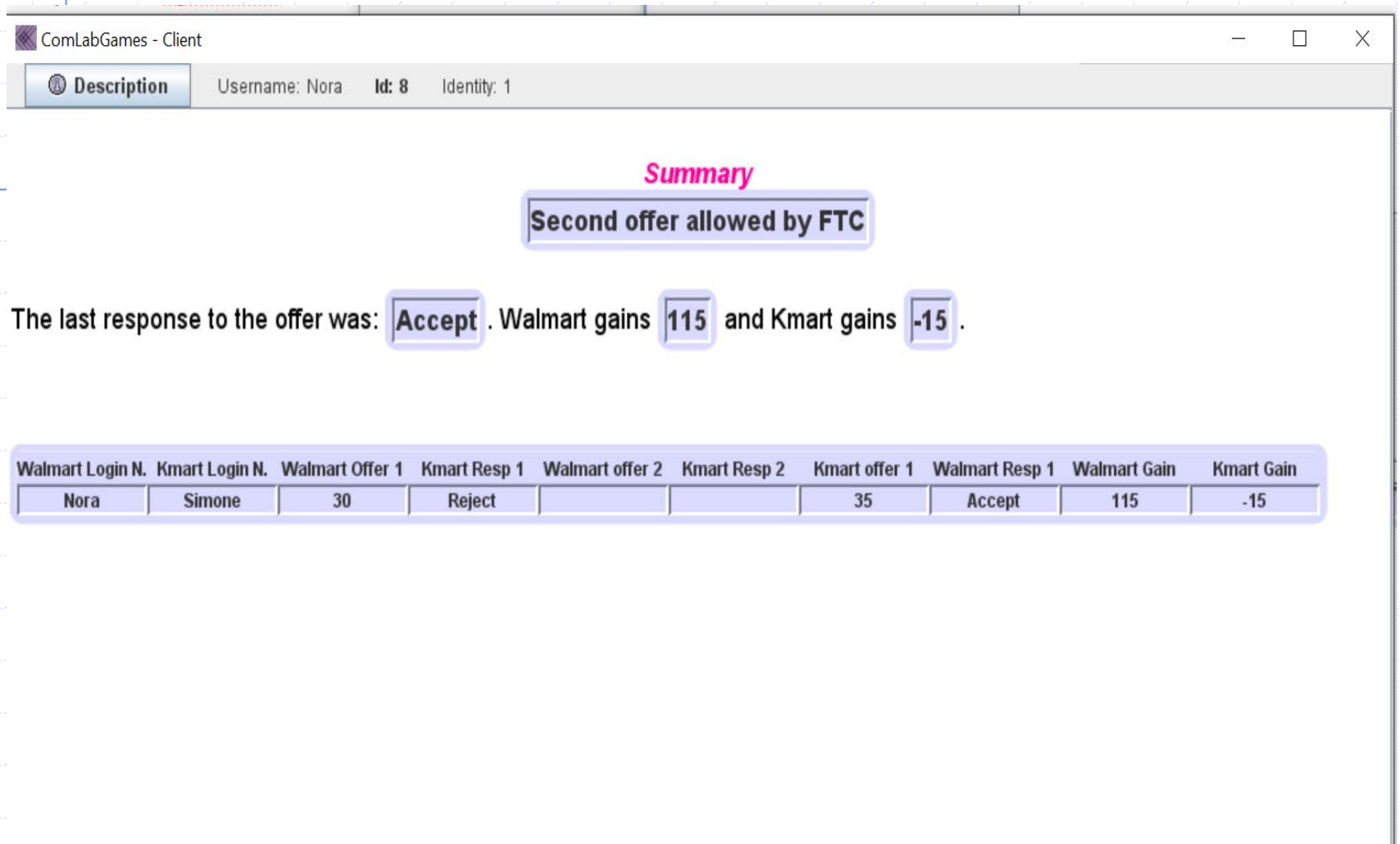
1. Walmart makes a decision and clicks "Continue.
2. Kmart sees the same window as Walmart.

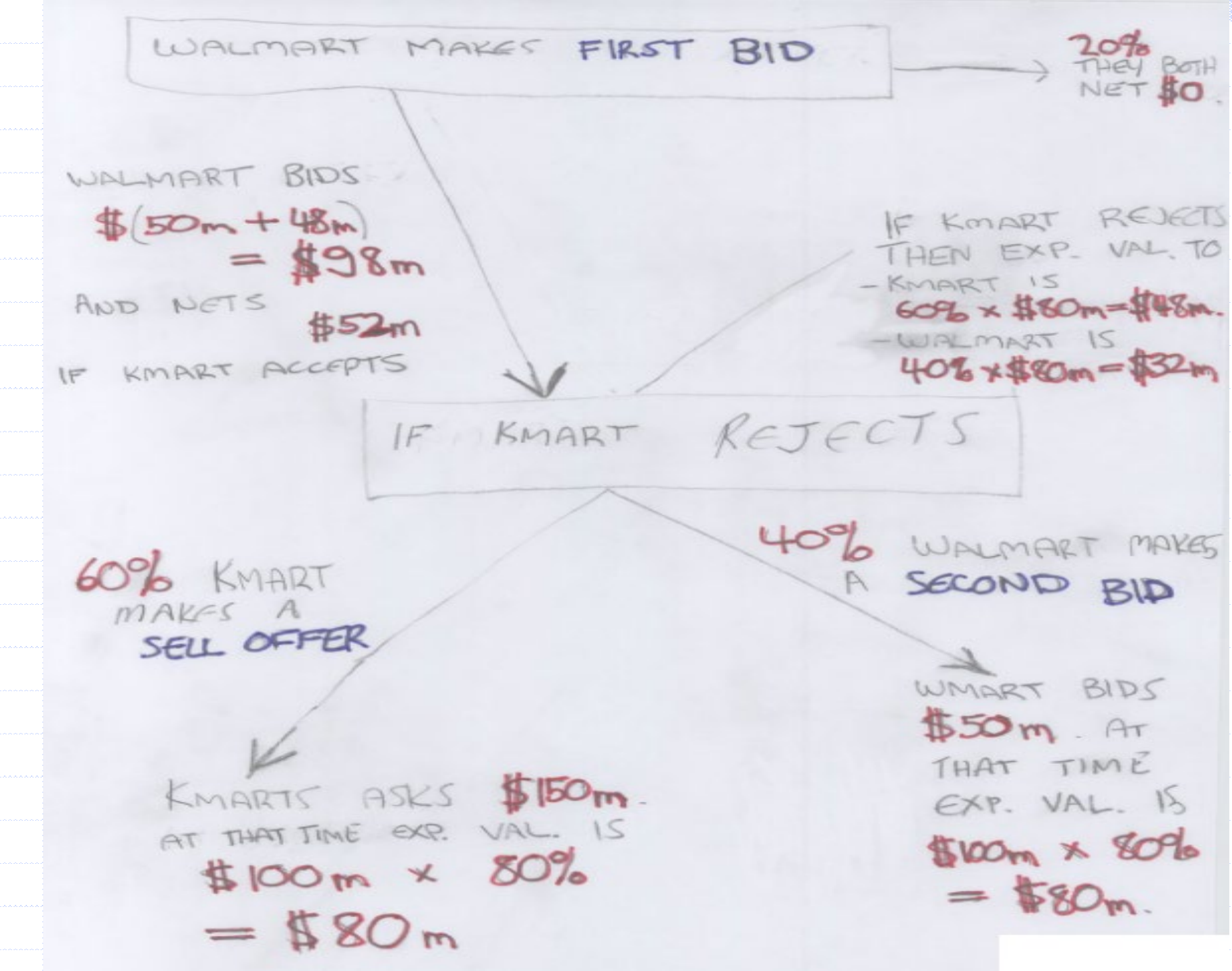




Summary of Results

1. Results show the paired subject in a session.
2. Results for the first round and final gains for both subjects.




WALMART MAKES FIRST BID
20% THEY BOTH NET $0.
WALMART BIDS $(50m + 48m) = $98m
AND NETS $52m
IF KMART ACCEPTS
IF KMART REJECTS THEN EXP. VAL. TO
- KMART IS 60% x $80m = $48m.
- WALMART IS 40% x $80m = $32m
IF KMART REJECTS
60% KMART MAKES A SELL OFFER
40% WALMART MAKES A SECOND BID
KMARTS ASKS $150m.
AT THAT TIME EXP. VAL. IS
$100m x 80% = $80m
WMART BIDS $50m. AT THAT TIME EXP. VAL. IS
$100m x 80% = $80m.

Iterative dominance

- We solved perfect information games by successively eliminating those strategies that do end with the best choice in the very last step.
- This is an application of iterative dominance.
- Suppose that a player believes their rival (or more generally another player) is rational, and would :
  - always play a dominant strategy if she has one
  - (more generally) never play a dominated strategy.
- Then the player should simplify the game by banking on her rival:
  - playing her dominant strategy for sure (if it exists)
  - never playing a dominated strategy.

How sophisticated are the players?

- Applying iterative dominance assumes players are more sophisticated than only applying dominance.
- The dominance principle is a compelling unilateral strategy.
- In contrast, a player who follows the principle of iterative dominance does so because s/he believes the other players also choose according to that principle.
- Each player must recognize all the dominated strategies of every player, reduce the strategy space of every player as called for, and then repeat the process.
- If all the players think logically about strategic interaction, the principle of iterative dominance is very persuasive.

Summary

- This lecture introduced a very powerful principle for strategic play: dominance.
- It has three parts:

1. Dominant strategies (You should always play these.)
2. Dominated strategies (Never play these.)
3. Iterative dominance (If the other players in the game are moderately sophisticated, simplify the game by exploiting the fact that they are smart.)