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# Microeconomics: An experiment

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November 2008

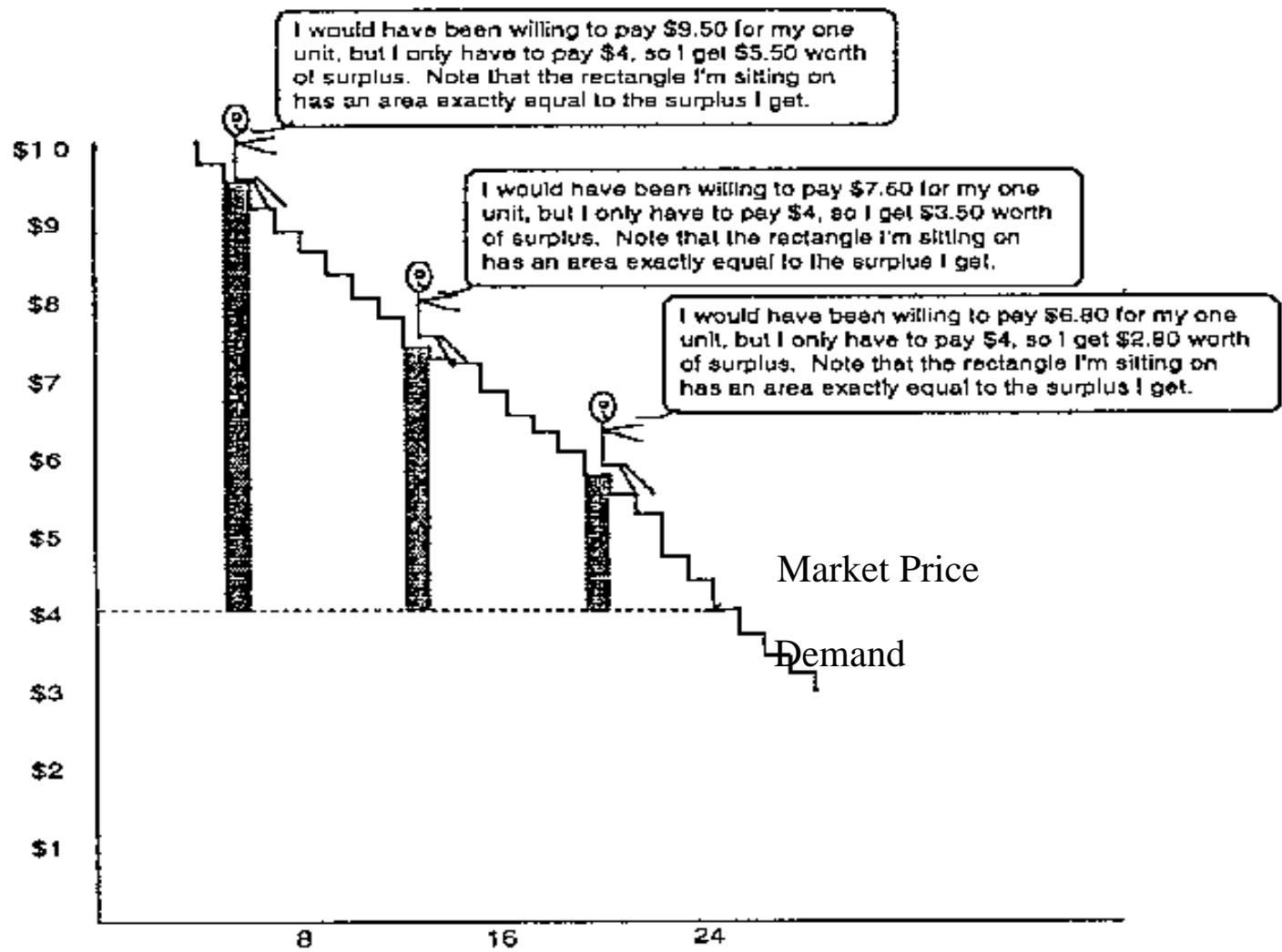
Albert Banal-Estanol

# Demand and supply

- Demand function represents...
  - willingness to pay of consumers, AND
  - quantity that can be sold at a given price AND
  - price that can be obtained per units produced

Quantity	1	2	3	4	5	6	7	8	9	10	11	12
Price	12	11	10	9	8	7	6	5	4	3	2	1

- Each group is a supplier company
  - You can supply any number of units at a cost of £1 per unit
- Prices are determined according to units produced



*Figure The surpluses enjoyed by three consumers.*

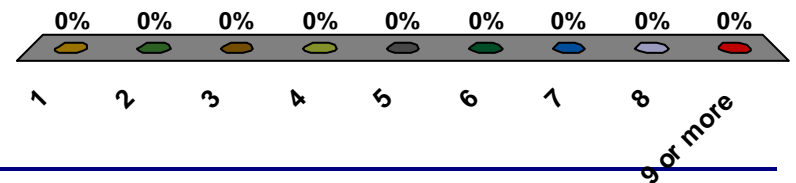
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# Quantity Choice Game

- Read instructions carefully
- In each round, select production level, assuming that...
  - You are the only producer in the market (monopoly)  
(rounds 1, 2)
  - You and another producer compete (duopoly)  
(rounds 3, 4, 5, 6)
  - You and two other producers compete (oligopoly)  
(rounds 7, 8, 9, 10)

# How many units do you want to produce?

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9 or more



# Economic Analysis

Quantity	1	2	3	4	5	6	7	8	9	10	11	12
Price	12	11	10	9	8	7	6	5	4	3	2	1
Total Revenue	12	22	30	36					36	30	22	12
Total cost	1	2	3	4					9	10	11	12
Profit	11	20	27	32					27	22	11	0
Marginal Revenue	12	10	8	6					-4	-6	-8	-10
Marginal Cost	1	1	1	1					1	1	1	1

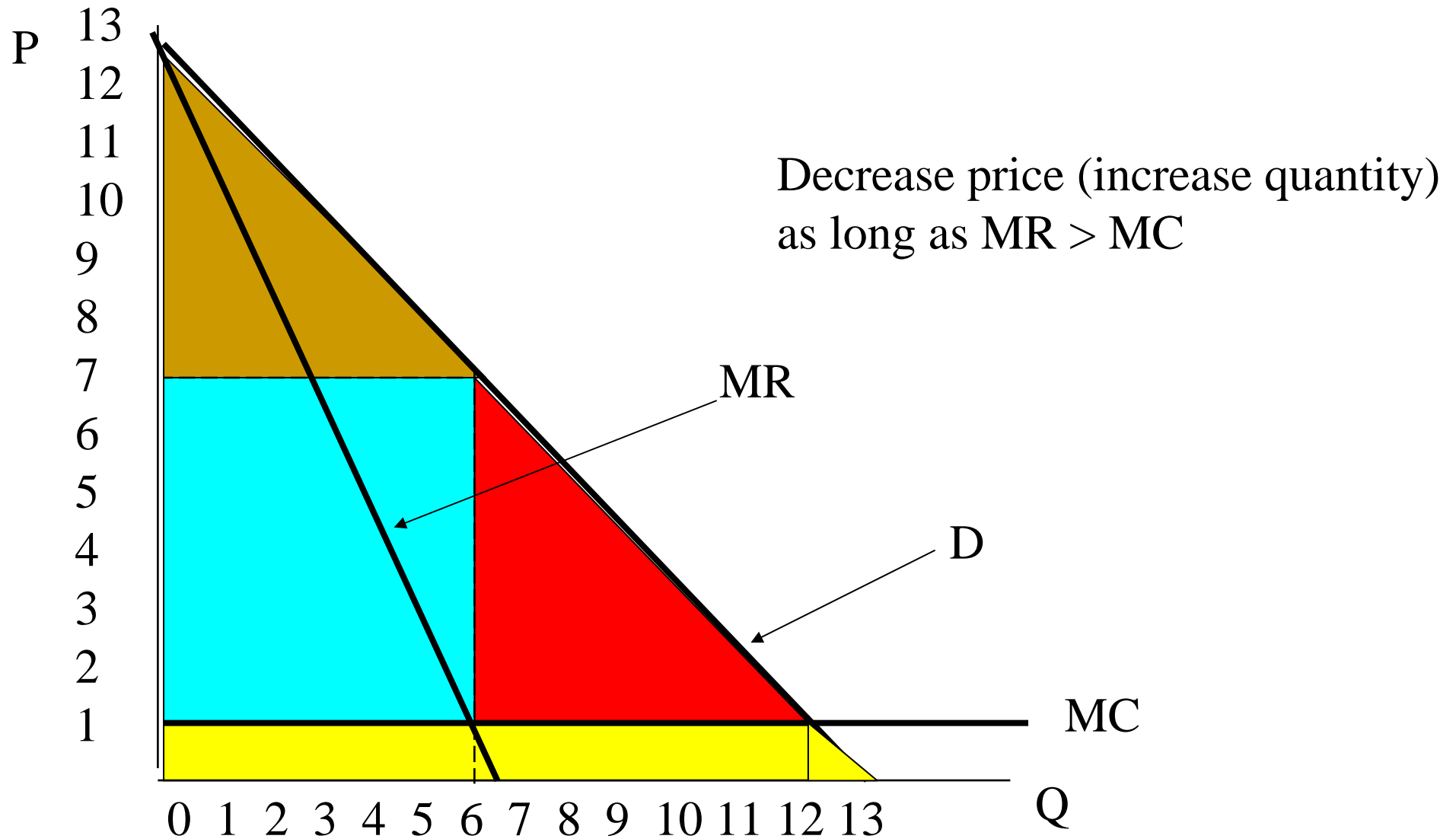
# Economic Analysis

WHAT YOU CARE ABOUT!

Quantity	1	2	3	4	5	6	7	8	9	10	11	12
Price	12	11	10	9	8	7	6	5	4	3	2	1
Total Revenue	12	22	30	36	40	42	42	40	36	30	22	12
Total cost	1	2	3	4	5	6	7	8	9	10	11	12
Profit	11	20	27	32	35	36	35	32	27	22	11	0
Marginal Revenue	12	10	8	6	4	2	0	-2	-4	-6	-8	-10
Marginal Cost	1	1	1	1	1	1	1	1	1	1	1	1

WHAT YOU SHOULD LOOK AT!

# Economic Happiness





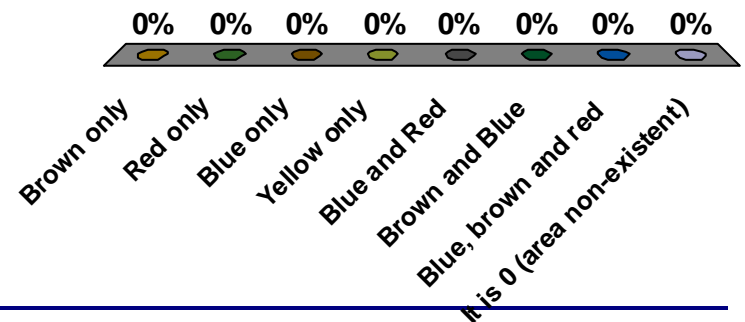
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# Review

- Monopoly pricing:
  - Which area represents the consumer surplus?
  - And producer surplus?
  - And social surplus or social welfare?
- What would happen if there was “perfect” competition?
  - Price, quantity?
  - Consumer, producer and social surplus?
- What has happened in duopoly and oligopoly?
  - Compare deadweight loss with that of previous cases

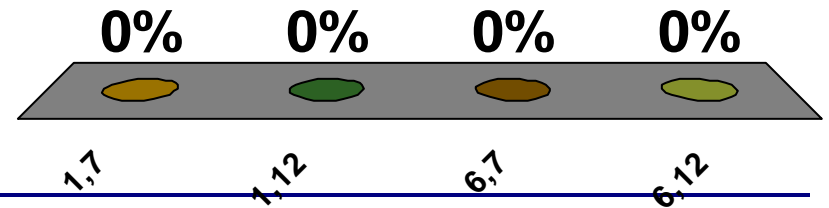
# Monopoly: Which areas represents (a) consumer surplus? (b) Producer surplus? (c) Social surplus?

1. Brown only
2. Red only
3. Blue only
4. Yellow only
5. Blue and Red
6. Brown and Blue
7. Blue, brown and red
8. It is 0 (area non-existent)



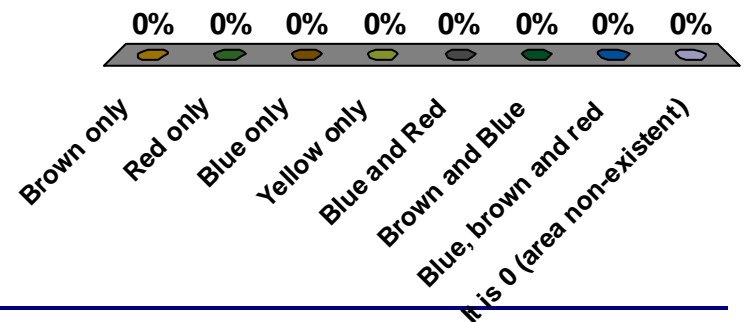
Perfect competition: What would have been the price and quantity levels, respectively?

1. 1,7
2. 1,12
3. 7,6
4. 6,12



# Perfect Competition: Which areas represents (a) consumer surplus? (b) Producer surplus? (c) Social surplus?

1. Brown only
2. Red only
3. Blue only
4. Yellow only
5. Blue and Red
6. Brown and Blue
7. Blue, brown and red
8. It is 0 (area non-existent)



# Economic analysis in oligopoly? Game Theory!

## ■ What is Game Theory?

- Set of tools to understand behaviour in the presence of interaction
- Decision-maker well-being depends not only on her own actions but also on the actions of others
- In our example, sales of your firm (and therefore profits) depend not only on the price you set but also on the price set by the others
- More general than a "game" in the everyday sense (in which players contend with each other according to a set of rules)

## ■ Applications:

- Firms competing for business
- Political candidates competing for votes
- Threats and punishments in long-term relationships
- Many other economic, political, sociological, biological phenomena

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# Elements of a "Game"

- **Players: who is involved?**
  - For example, two firms: your firm and your competitor's firm
- **For each player, a set of actions: what can you play?**
  - E.g. Quantity levels you can sell
- **Outcomes: for each set of actions, what happens?**
  - E.g. for each pair of quantity levels, the price we get
- **Payoffs: what are the preferences over these outcomes?**
  - E.g. prefer high sales and high price, i.e. high profits

# Game Representation

Options for Firm 2

Options for Firm 1

Firm A \ Firm B	0	1	2	3	4	5	6
6							
5							
4							
3							
2							
1							
0							

# Firm A's profits

Firm A \ Firm B	0	1	2	3	4	5	6
6	£ 36	£ 30	£ 24	£ 18	£ 12	£ 6	
5	£ 35	£ 30	£ 25	£ 20	£ 15	£ 10	
4	£ 32	£ 28	£ 24	£ 20	£ 16	£ 12	£ 8
3	£ 27	£ 24	£ 21	£ 18	£ 15	£ 12	£ 9
2	£ 20	£ 18	£ 16	£ 14	£ 12	£ 10	£ 8
1	£ 11	£ 10	£ 9	£ 8	£ 7	£ 6	£ 5
0	£ 0	£ 0	£ 0	£ 0	£ 0	£ 0	£ 0



# Both firms' profits

Profits for Firm 1

Profits for Firm 2

Firm A \ Firm B	0	1	2	3	4	5	6
6	36,0	30,5	24,8	18,9	12,8	6,5	
5	35,0	30,6	25,10	20,12	15,12	10,10	
4	32,0	28,7	24,12	20,15	16,16	12,15	8,9
3	27,0	24,8	21,14	18,18	15,20	12,20	9,18
2	20,0	18,9	16,16	14,21	12,24	10,25	8,24
1	11,0	10,10	9,18	8,24	7,28	6,30	5,30
0	0,0	0,11	0,20	0,27	0,32	0,35	0,36

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# What would we expect to happen?

- But first, what we would expect *not* to happen?
- What would be the “best” outcome?
- What are the “best responses”?
- What would we expect to happen?
- How good is our prediction?

# Dominated strategies

NO MATTER WHAT YOU THINK  
THE OTHER WILL PLAY, IT IS  
BETTER TO PLAY 3 RATHER  
THAN 0, 1 OR 2

Firm A \ Firm B	0	1	2	3	4	5	6
6	36,0	30,5	24,8	18,9	12,8	6,5	
5	35,0	30,6	25,10	20,12	15,12	10,10	
4	32,0	28,7	24,12	20,15	16,16	12,15	8,9
3	27,0	24,8	21,14	18,18	15,20	12,20	9,18
2	20,0	18,9	16,16	14,21	12,24	10,25	8,24
1	11,0	10,10	9,18	8,24	7,28	6,30	5,30
0	0,0	0,11	0,20	0,27	0,32	0,35	0,36

# Joint maximising profits

JOINT  
MAXIMISING AND  
FAIR?

Firm A \ Firm B	0	1	2	3	4	5	6
6	36,0	30,5	24,8	18,9	12,8	6,5	
5	35,0	30,6	25,10	20,12	15,12	10,10	
4	32,0	28,7	24,12	20,15	16,16	12,15	8,9
3	27,0	24,8	21,14	18,18	15,20	12,20	9,18
2	20,0	18,9	16,16	14,21	12,24	10,25	8,24
1	11,0	10,10	9,18	8,24	7,28	6,30	5,30
0	0,0	0,11	0,20	0,27	0,32	0,35	0,36

# Best response and Nash

FIRM A'S BEST RESPONSE TO FIRM B PLAYING 0 IS 6

FIRM B'S BEST RESPONSE TO FIRM A PLAYING 3 IS 4 or 5

Firm A \ Firm B	0	1	2	3	4	5	6
6	36*,0	30,5	24,8	18,9	12,8	6,5	
5	35,0	30,6	25,10	20,12	15,12	10,10	
4	32,0	28,7	24,12	20,15	16,16	12,15	8,9
3	27,0	24,8	21,14	18,18	15,20*	12,20*	9,18
2	20,0	18,9	16,16	14,21	12,24	10,25	8,24
1	11,0	10,10	9,18	8,24	7,28	6,30	5,30
0	0,0	0,11	0,20	0,27	0,32	0,35	0,36

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# Nash Equilibrium

- We (economists) expect players to play...  
...the Nash equilibrium!
- The Nash equilibrium is an outcome (or a set of actions) in which...
  - player 1's action is optimal given player 2's action
  - player 2's action is optimal given player 1's action
- Nobody would want to change behaviour if he/she knew that the others play their Nash action
- What is the Nash equilibrium in our examples?