

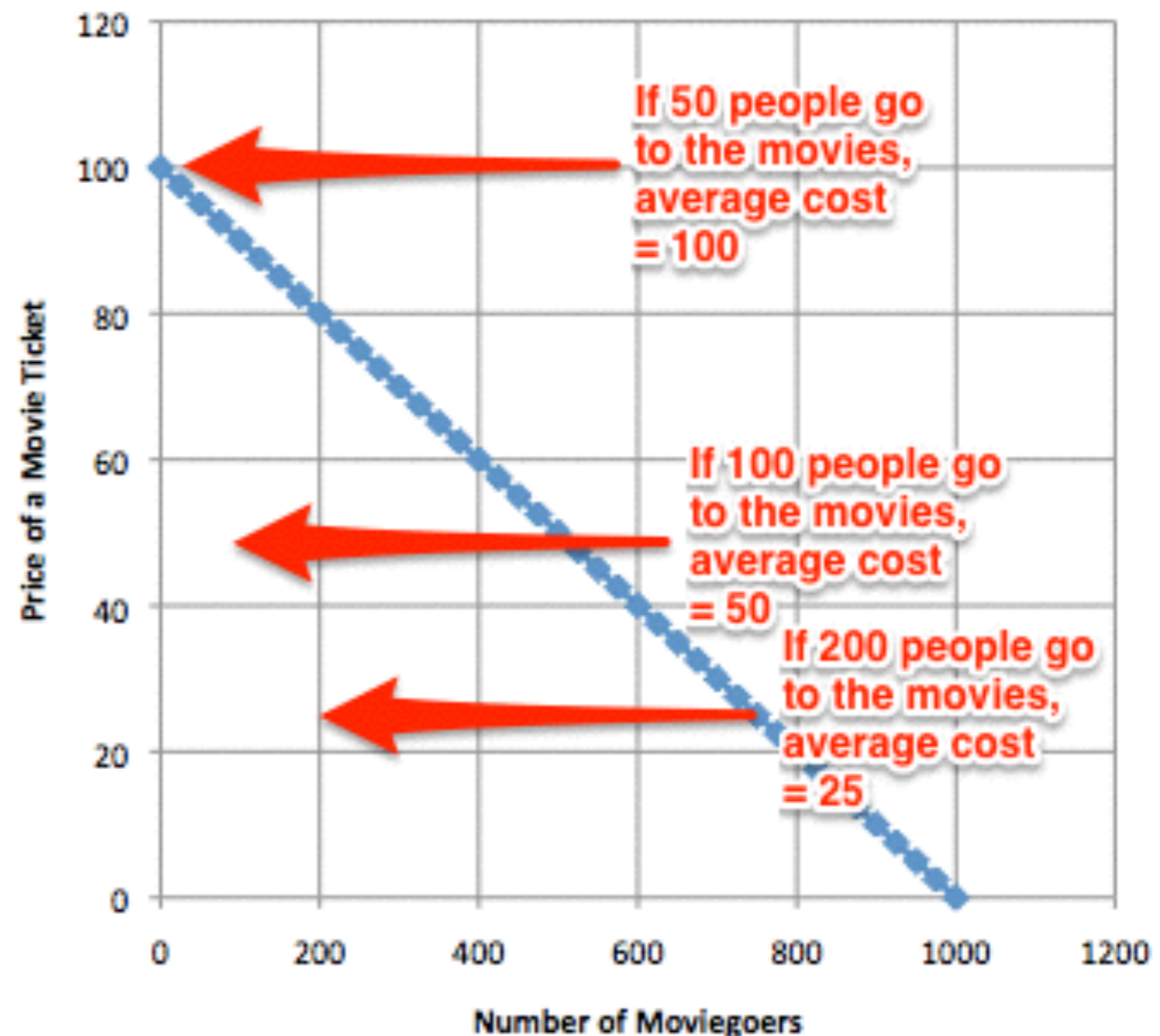
Principles of Economics  
When Competitive Markets Cannot  
Work Optimally  
**Duopoly, Etc.**

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# The Set-Up... I

- Every weekend new movie(s) are released
- Gotta release new movies every weekend!
  - The demand for new movies is different from the demand for old movies
- Demand for new movies:  $P_d = 100 - 0.1 \times Q$
- Each new movie costs 5000 to make
  - Those are the *only* costs of making a movie
- People don't care which new movie they see
- Ample space in theaters

## The Weekly Market for New Movies

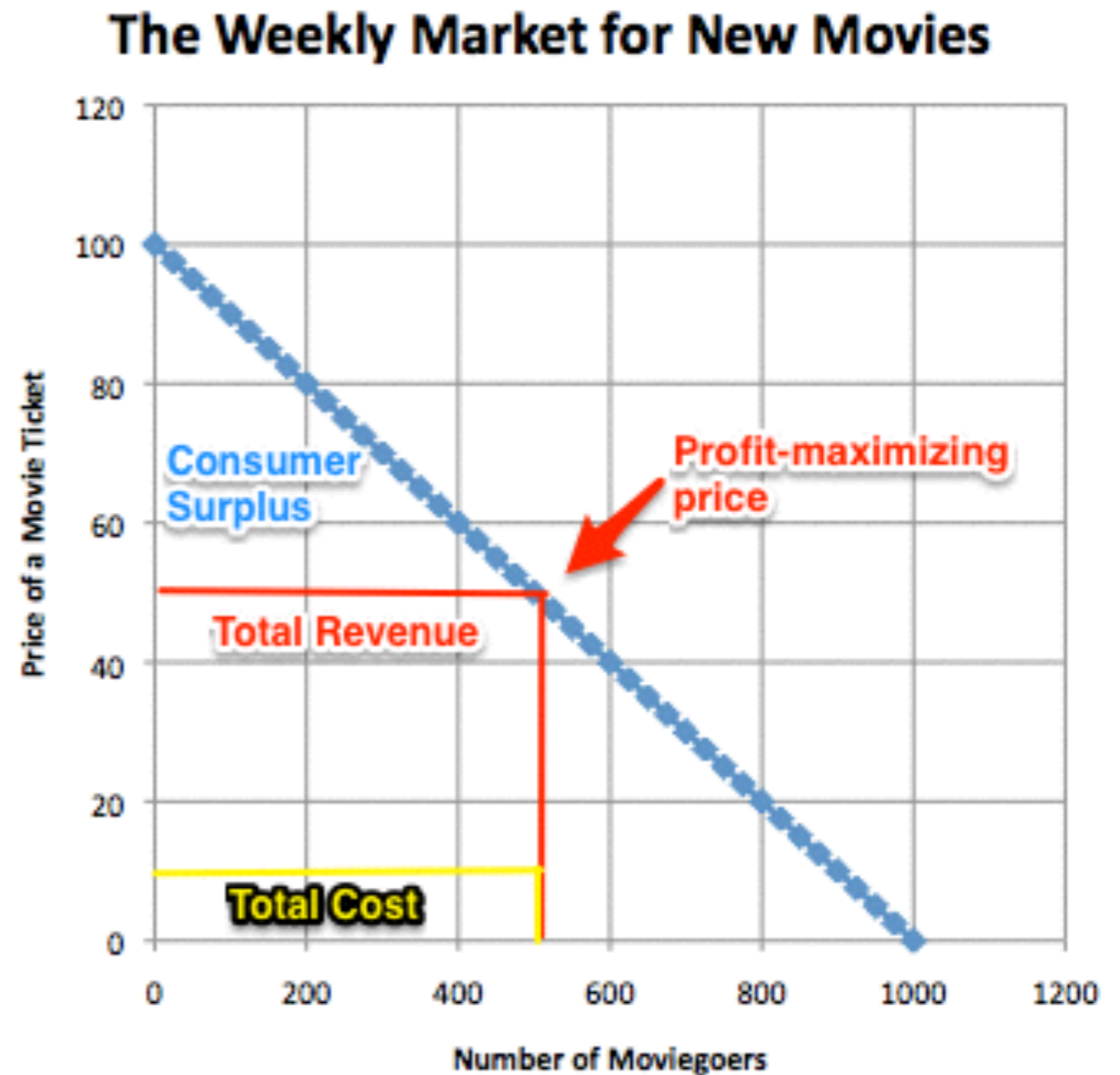


# We Don't Nationalize the Movie Industry...

- But we: don't trust bureaucracy, want to spur innovation, are in the pocket of the Hollywood lobby
- New movies are non-rival: you make it, and then can show it to as many people as are willing to pay that weekend
  - For no additional cost
- But you can charge a price
  - A ticket-taker
  - The first-run movie is excludible
- Consider the case of one new movie produced each week...

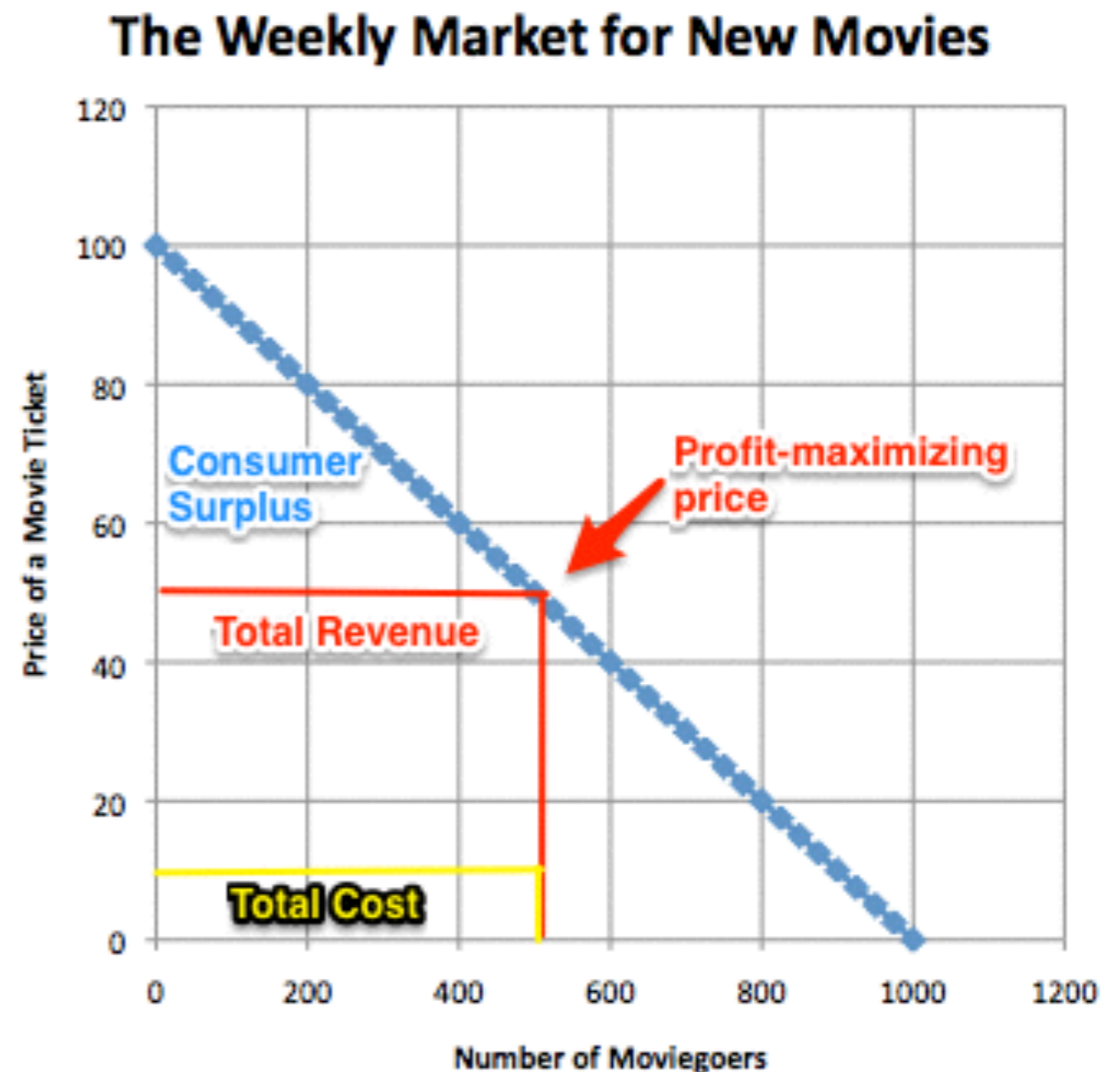
# What Does This Monopolist Do?

- Profit maximized when:  $Q = P_{d0}/2a = 100/(2 \times 0.1) = 50$
- Revenue = 25000
- Profit = 20000
- CS = 12500
- TS = 32500
- Cf. FBS = 45000



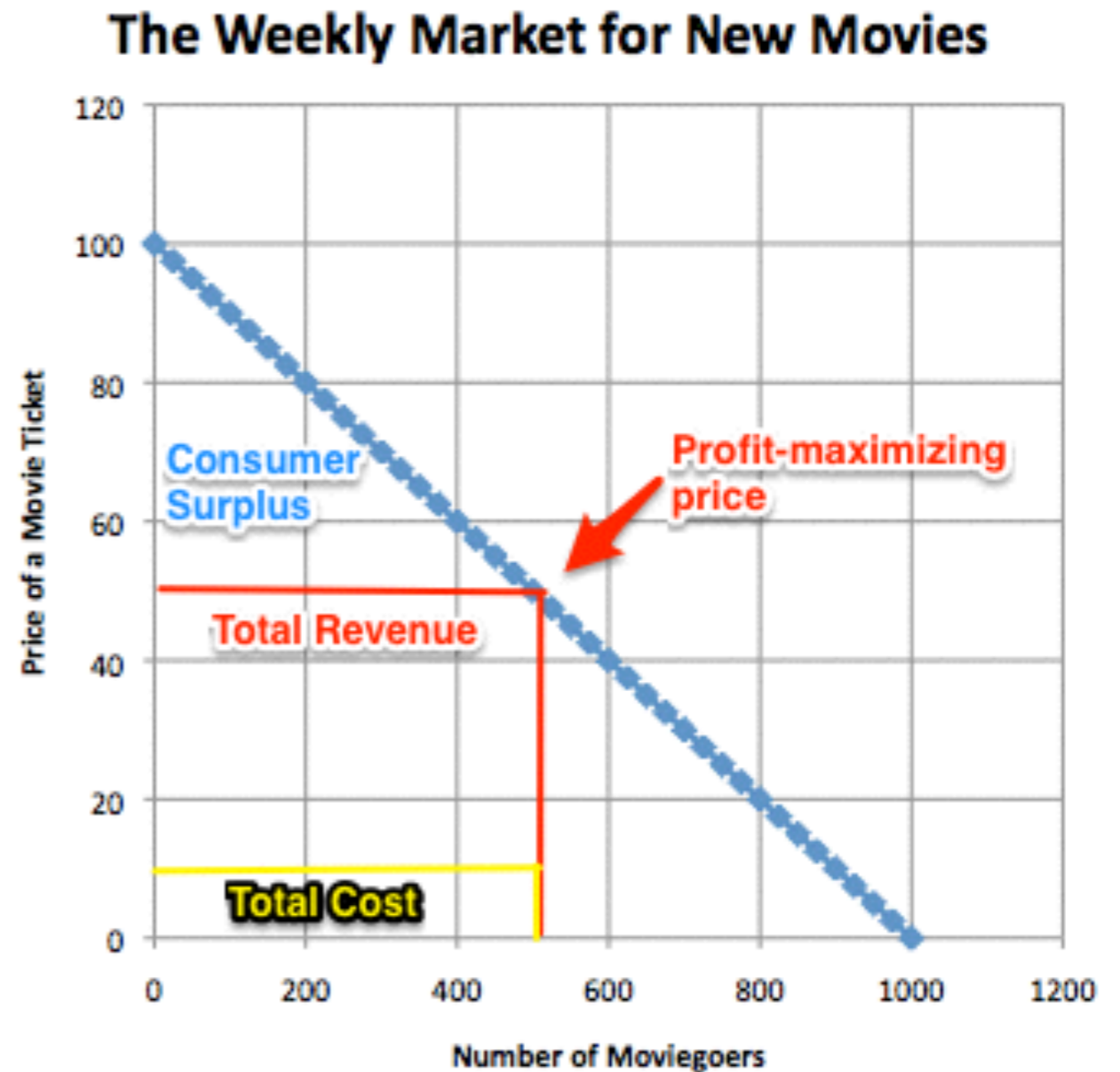
# Sony Pictures Says: WB Made 20K on 5K. Why Don't We Do a Movie too?

- What happens if two movies come out each week?
- Problems of small numbers strategic interaction
- Let's suppose that each movie company has to commit to printing a fixed number of tickets in advance...



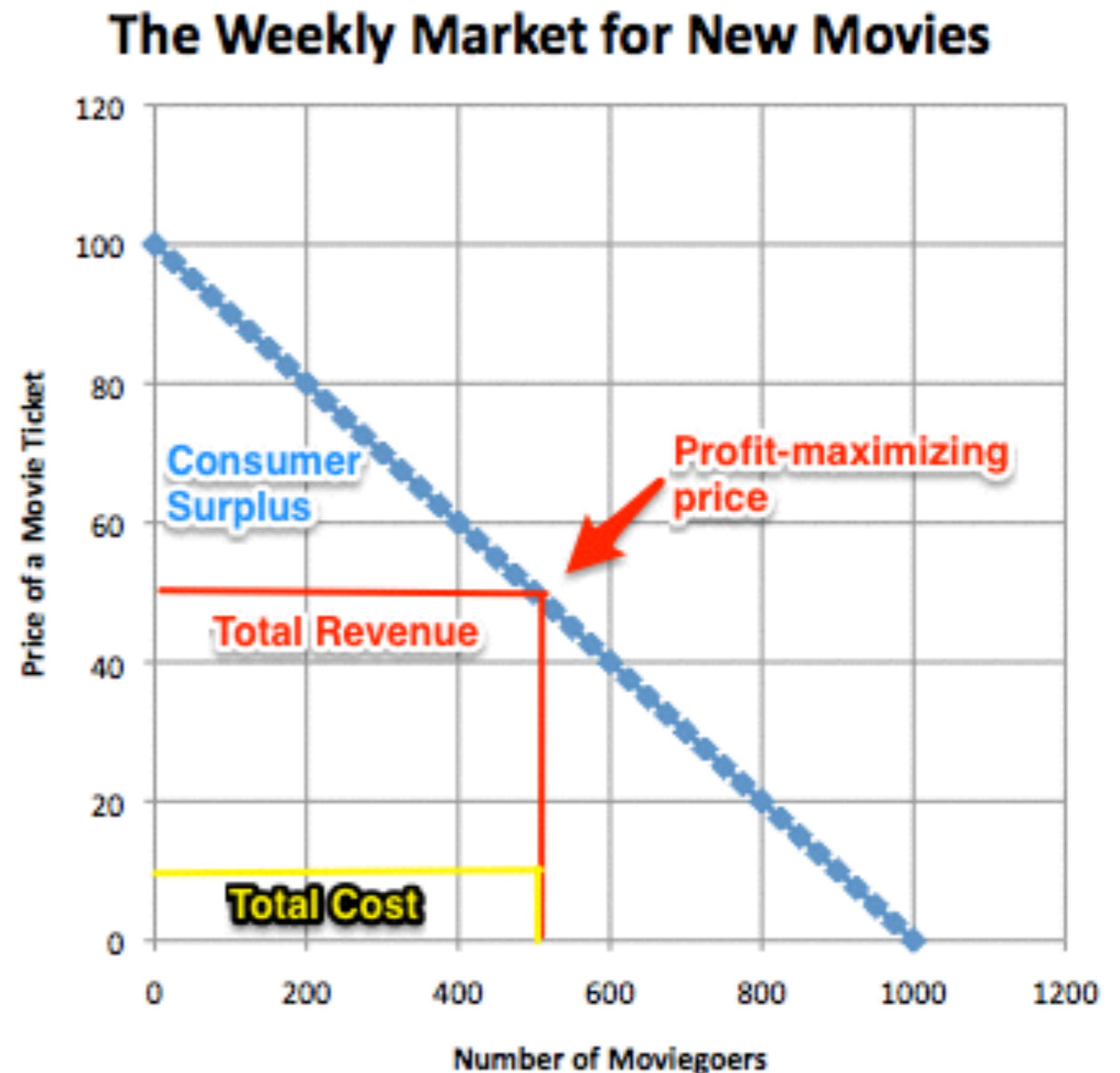
# Duopoly with Advance Choice of Number of Tickets Sold...

- $Q_s$  for Sony,  $Q_w$  for WB...
- Demand:
  - $P_d = 100 - 0.1(Q_s + Q_w)$
- Profits:
  - $Pr_s = Q_s(100 - 0.1(Q_s + Q_w)) - 5000$
  - $Pr_w = Q_w(100 - 0.1(Q_s + Q_w)) - 5000$



# Duopoly with Advance Choice of Number of Tickets Sold... II

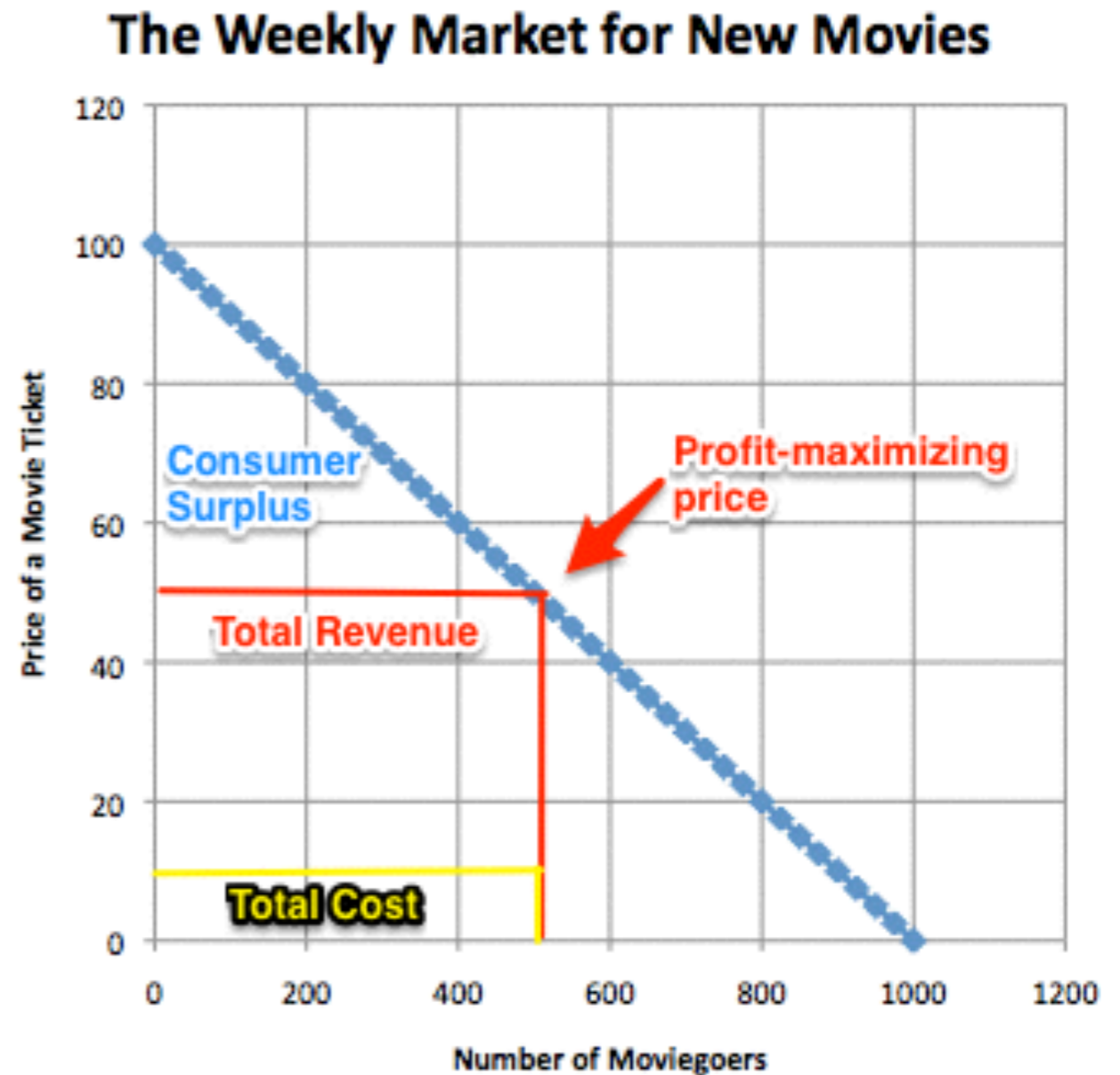
- Profits:
  - $Pr_s = 100Q_s - 0.1Q_wQ_s - 0.1Q_s^2 - 5000$
  - $Pr_w = 100Q_w - 0.1Q_wQ_s - 0.1Q_w^2 - 5000$





# Duopoly with Advance Choice of Number of Tickets Sold... III

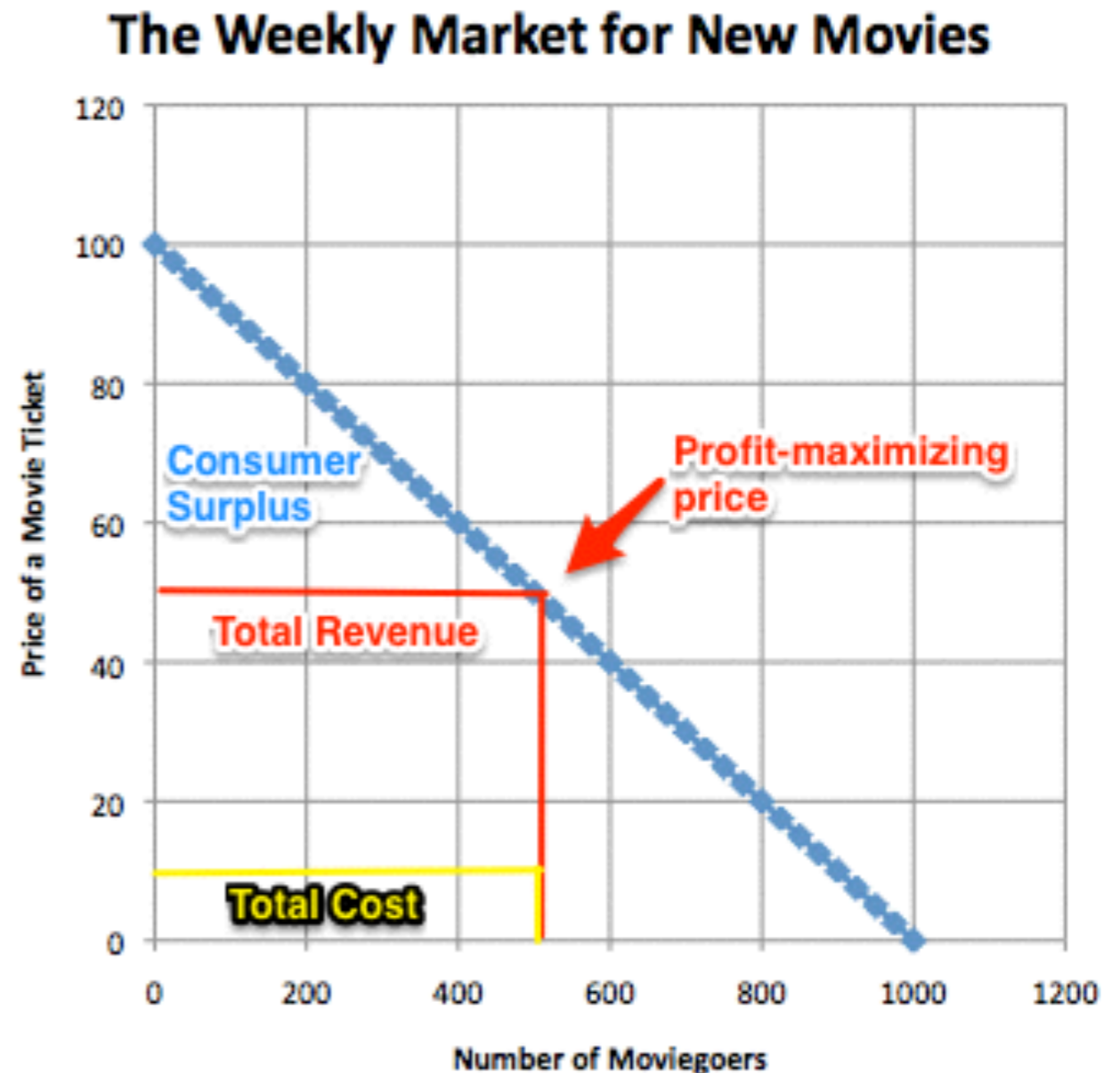
- Profits:
  - $Pr_s = 100Q_s - 0.1Q_wQ_s - 0.1Q_s^2$
  - $Pr_w = 100Q_w - 0.1Q_wQ_s - 0.1Q_w^2$
- Profit maximization:
  - $0 = (d/dQ_s)Pr_s$   
 $= 100 - 0.1Q_w - 0.2Q_s$
  - $0 = (d/dQ_w)Pr_w$   
 $= 100 - 0.1Q_s - 0.2Q_w$





# Duopoly with Advance Choice of Number of Tickets Sold... IV

- Profit maximization:
  - $0 = 100 - 0.1Q_w - 0.2Q_s$
  - $0 = 100Q - 0.1Q_s - 0.2Q_w$
- $0.2Q_s = 100 - 0.1Q_w$
- $Q_s = 500 - Q_w/2$
- And:  $Q_w = 500 - Q_s/2$



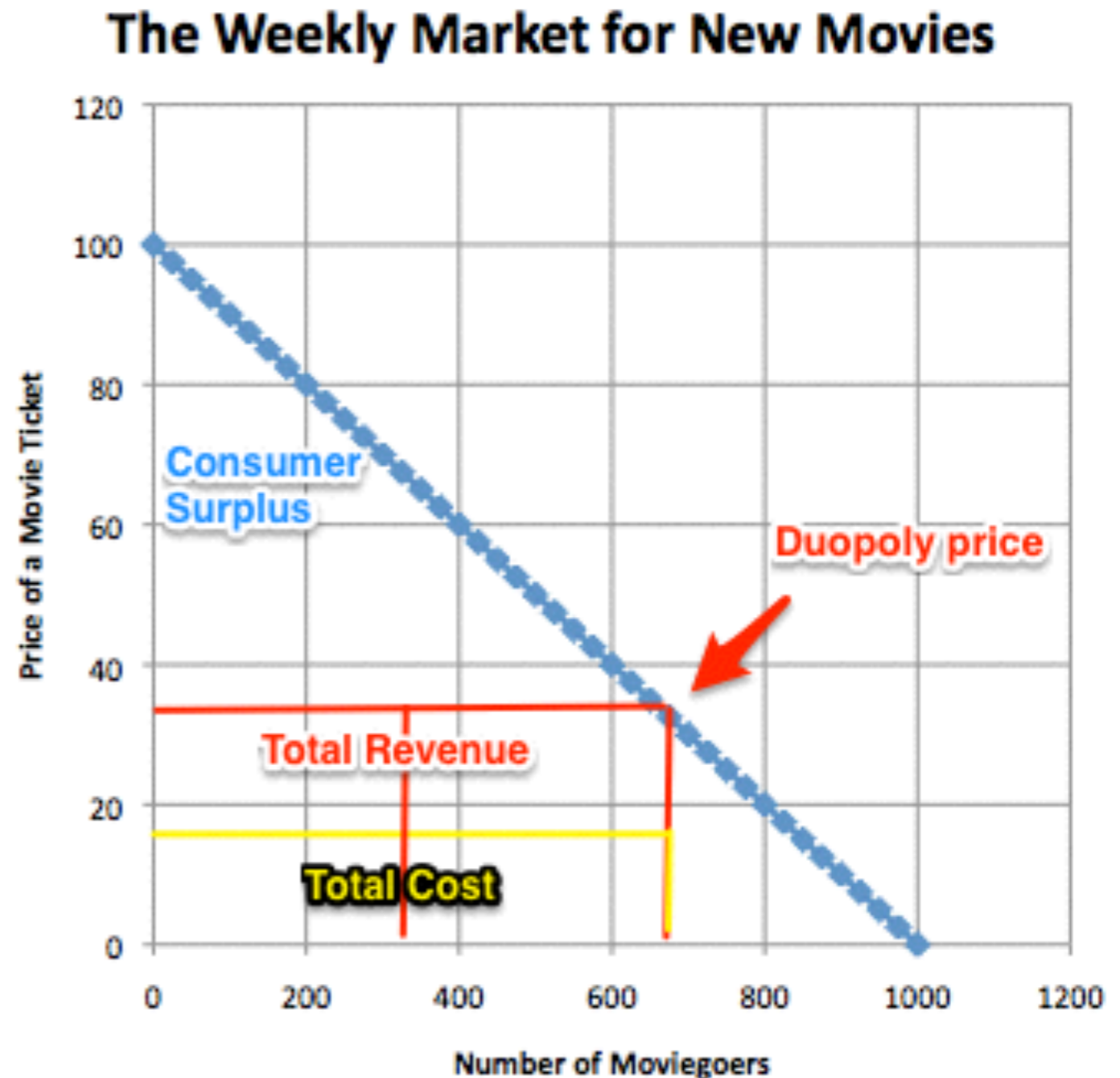
# Duopoly with Advance Choice of Number of Tickets Sold... V

- $Q_s = 500 - Q_w/2$
- $Q_w = 500 - Q_s/2$
- 500 -> 250
- 250 -> 375
- 375 -> 312.50
- 312.50 -> 343.75

	500	
	250	
	375	
	312.5	
	343.75	
	328.125	
	335.9375	
	332.03125	
	333.984375	
	333.007813	
	333.496094	

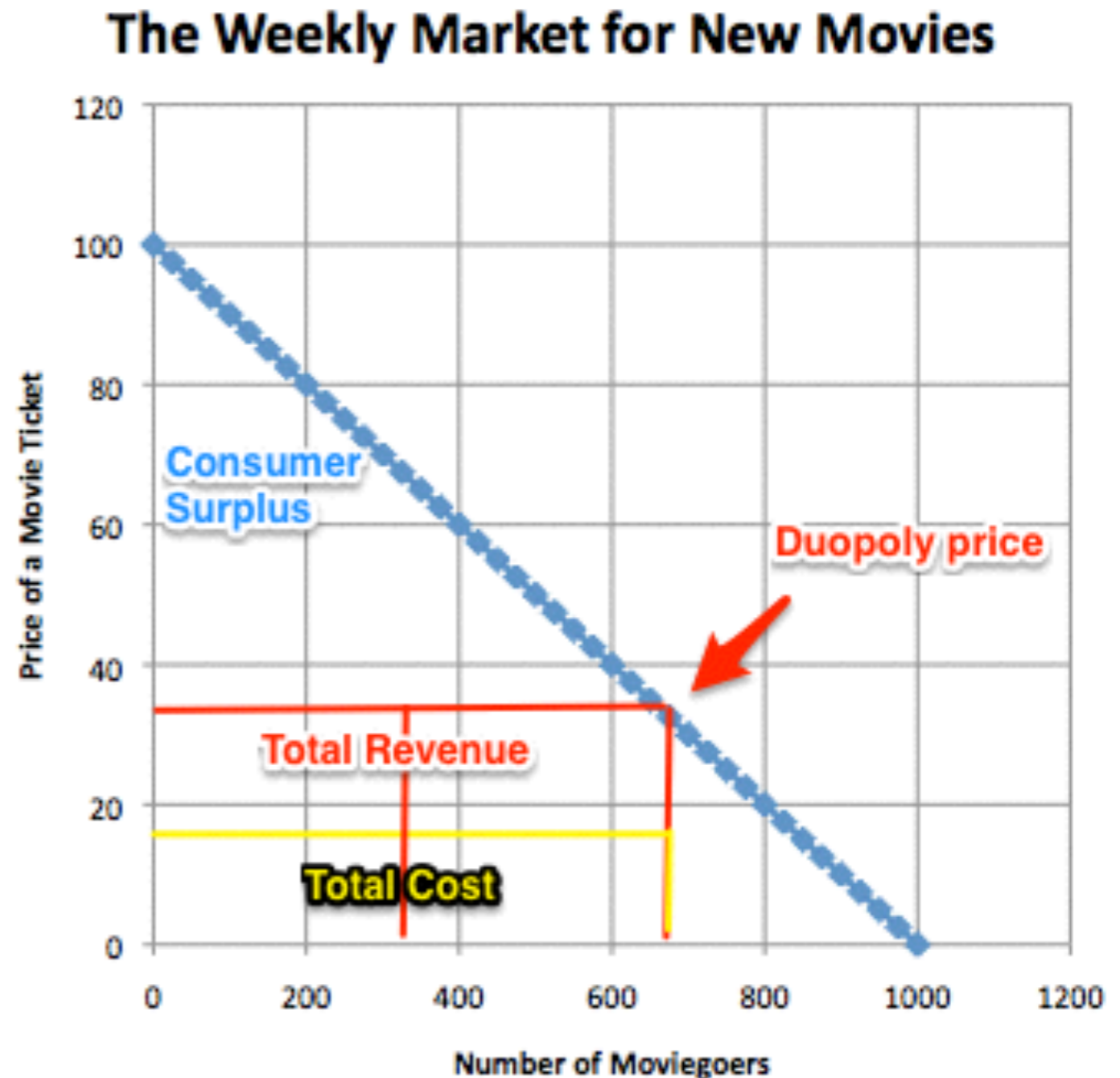
# Duopoly with Advance Choice of Number of Tickets Sold: Solution

- $Q_s = Q_w = 333$
- $P = 33.33$
- Per-movie profits =  $333 \times 33.33 - 5000 = 6109$
- Consumer surplus =  $33.33 \times 667 = 22,222$
- Total surplus = 34441.78



# Duopoly with Advance Choice of Number of Tickets Sold: Solution II

- $Q_s = Q_w = 333$
- $P = 33.33$
- Per-movie profits =  $333 \times 33.33 - 5000 = 6109$
- Consumer surplus =  $33.33 \times 667 = 22,222$
- Total surplus = 34441.78
- Cf:
  - Monopoly surplus: 32,500
  - FBS: 45,000



# Would a Third Competitor Enter?

- $Q_s, Q_w, Q_d$
- Let's make the same assumptions about strategic interaction as before...
- That only one film company gets to change its quantity each week...
- And each picks the quantity best for it for that week
  - This is naive...
  - Limit pricing...

S	W	D
333	333.00	167
250	291.50	229.25
239.625	265.56	247.40625
243.515625	254.54	250.972656
247.244141	250.89	250.932129
249.088135	249.99	250.460999
249.774567	249.88	250.171608
249.973087	249.93	250.04963
250.011359	249.97	250.009568
250.010463	249.99	249.999776
250.00512	250.00	249.998664
250.001892	250.00	249.999193
250.000542	250.00	249.999663
250.000103	250.00	249.99989
249.999996	250.00	249.999973
249.999985	250.00	249.999997
249.999991	250.00	250.000002



# Would a Third Competitor Enter? II

- $Q_s = Q_w = Q_d = 250$
- $P = 25$
- Profits when the situation settles down...
  - $250 \times 25 - 5000 = 1250$

S	W	D
333	333.00	167
250	291.50	229.25
239.625	265.56	247.40625
243.515625	254.54	250.972656
247.244141	250.89	250.932129
249.088135	249.99	250.460999
249.774567	249.88	250.171608
249.973087	249.93	250.04963
250.011359	249.97	250.009568
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250.000103	250.00	249.99989
249.999996	250.00	249.999973
249.999985	250.00	249.999997
249.999991	250.00	250.000002

# Would a Third Competitor Enter? III

- $Q_s = Q_w = Q_d = 250$
- $P = 25$
- Profits when the situation settles down...
  - $250 \times 25 - 5000 = 1250$
- $CS = 28125$
- $PS = 3 \times 1250 = 3750$
- $TS = 31,875$

S	W	D
333	333.00	167
250	291.50	229.25
239.625	265.56	247.40625
243.515625	254.54	250.972656
247.244141	250.89	250.932129
249.088135	249.99	250.460999
249.774567	249.88	250.171608
249.973087	249.93	250.04963
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250.001892	250.00	249.999193
250.000542	250.00	249.999663
250.000103	250.00	249.99989
249.999996	250.00	249.999973
249.999985	250.00	249.999997
249.999991	250.00	250.000002



# Would a Third Competitor Enter? IV

- $Q_s = Q_w = Q_d = 250$ .  $P = 25$ .  
Profits = 1250
- $CS = 28125$ .  $PS = 3 \times 1250 = 3750$ .  $TS = 31,875$
- Cf:
  - Monopolist: 32500
  - Duopoly: 34442
  - FBS: 45000
  - RM: 44859

S	W	D
333	333.00	167
250	291.50	229.25
239.625	265.56	247.40625
243.515625	254.54	250.972656
247.244141	250.89	250.932129
249.088135	249.99	250.460999
249.774567	249.88	250.171608
249.973087	249.93	250.04963
250.011359	249.97	250.009568
250.010463	249.99	249.999776
250.00512	250.00	249.998664
250.001892	250.00	249.999193
250.000542	250.00	249.999663
250.000103	250.00	249.99989
249.999996	250.00	249.999973
249.999985	250.00	249.999997
249.999991	250.00	250.000002

# Would a Fourth Competitor Enter?

- **NO**

# Would a Third Competitor Really Enter?

- Suppose Sony and WB credibly commit to keep  $Q_s = Q_w = 333$
- Then  $Q_d = 167$
- $\text{Profits}_d = 167 \times 16.7 - 5000$
- $\text{Profits}_d = -2211$
- $\text{Profits}_{s,w} = + 561$

S	W	D
333	333.00	167
250	291.50	229.25
239.625	265.56	247.40625
243.515625	254.54	250.972656
247.244141	250.89	250.932129
249.088135	249.99	250.460999
249.774567	249.88	250.171608
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250.000103	250.00	249.99989
249.999996	250.00	249.999973
249.999985	250.00	249.999997
249.999991	250.00	250.000002

# Summing Up...

Outcome	Consumer Surplus	Producer Surplus	Remarks
First-Best	50000	-5000	Who pays for movies?
Regulated monopoly	44840	19	Need good regulators
Monopoly	12500	20000	It's good to be the monopolist
Duopoly	22222	12218	Questions of strategy
Triopoly	28125	3750	Limit pricing to prevent?

- Three potential sources of social waste here, two market and one government: (i) not letting “the right” number of people (i.e. 1000) see movies because of *price*; (ii) making “too many” movies because of *profits*; (iii) bureaucratic inefficiencies because of regulation/public provision

# Summing Up... II

<b>Outcome</b>	<b>Consumer Surplus</b>	<b>Producer Surplus</b>	<b>Remarks</b>
First-Best	50000	-5000	Who pays for movies?
Regulated monopoly	44840	19	Need good regulators
Monopoly	12500	20000	It's good to be the monopolist
Duopoly	22222	12218	Questions of strategy
Triopoly	28125	3750	Limit pricing to prevent?

- It's a matter of "pick your poison" when commodities are non-rival/returns-to-scale are increasing...