Invest in advertising or in quality? Using an agent-based model to test budget strategies in the motion picture market

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November 25, 2011 (Thanksgiving week)

Buena Vista International

Sony Pictures Animation

December 2, 2011

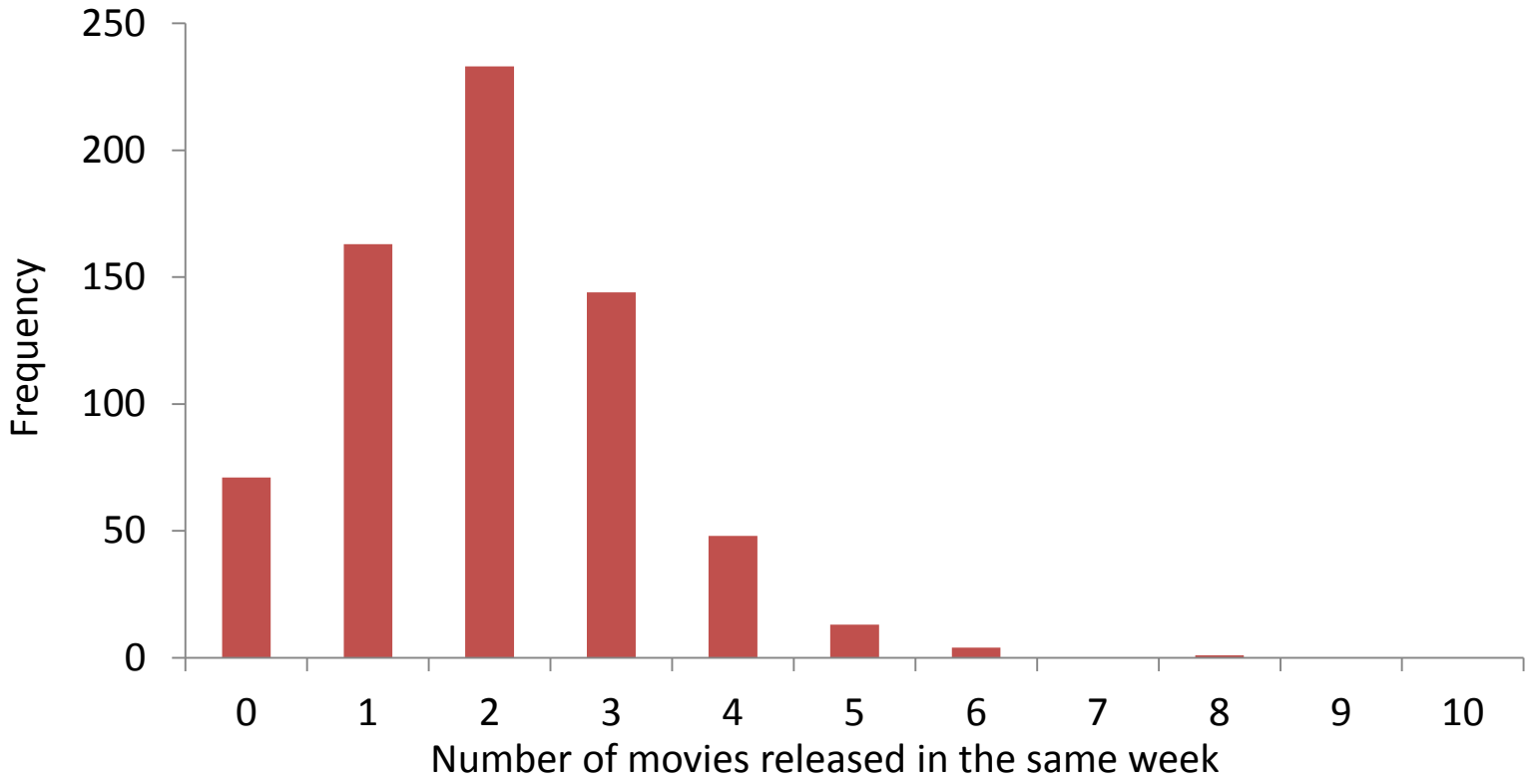
December 9, 2011

December 16, 2011

FILMAURO

MEDUSA
MEDIASET GROUP

Duels in Hollywood



1950 movies released with more than 2000 screens in US and Canada, from 1999 until 2011.

Investments in quality and in advertising

Year	QUALITY Production budgets (million US$)	ADVERTISING Advertising expenditures (million US$)
1999	48	16
2000	46	18
2001	47	19
2002	44	21
2003	50	22
2004	50	23
2005	50	23
2006	52	22
2007	61	22
2008	56	22
2009	56	21
2010	57	22
2011	54	23

Allocation ratio of big and small studios

STUDIOS	Investment in advertsing / Total investment	# Productions
Buena Vista	0.33	129
Fox	0.33	145
Paramount	0.35	146
Universal	0.35	165
WB	0.35	203
Sony/Columbia	0.32	139
Fox Searchlight	0.50	32
Lionsgate	0.40	43
New Line Cinema	0.36	63
Sony/Screen gems	0.43	40

Research questions

How do studios strategically compete to attract moviegoers? How much should they invest in advertising? How much in quality?

- Fully rational benchmark (Symmetric Nash Equilibrium)
- ABM
  - Testing budget allocation strategies
  - Competition between big studios
  - Competition between small studios

Supply

Two studios (i =1,2) release their movies simultaneously.

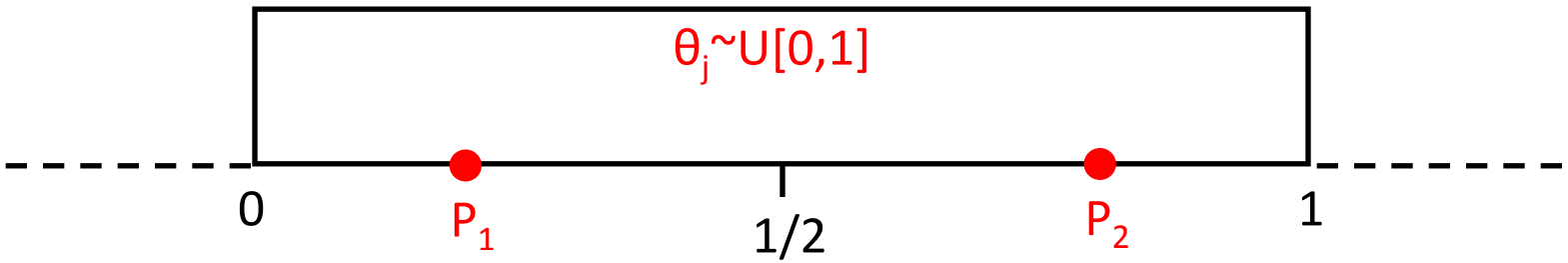
They choose:

- Investment in advertising, a_1 and a_2
- Investment in quality, b_1 and b_2
- Positioning of the movie, P_1 and P_2

(The ticket price p is fixed)

Demand

- N consumers, $j=1,2,\ldots N$
- Each consumer has a taste parameter $\theta_j \sim U[0,1]$
- A consumer's choice to visit movie i depends on:
  - The investment in advertising (ad expenditures) a_i
  - The investment in quality (production budget) b_i
  - The distance between θ_j and the movie type P_i

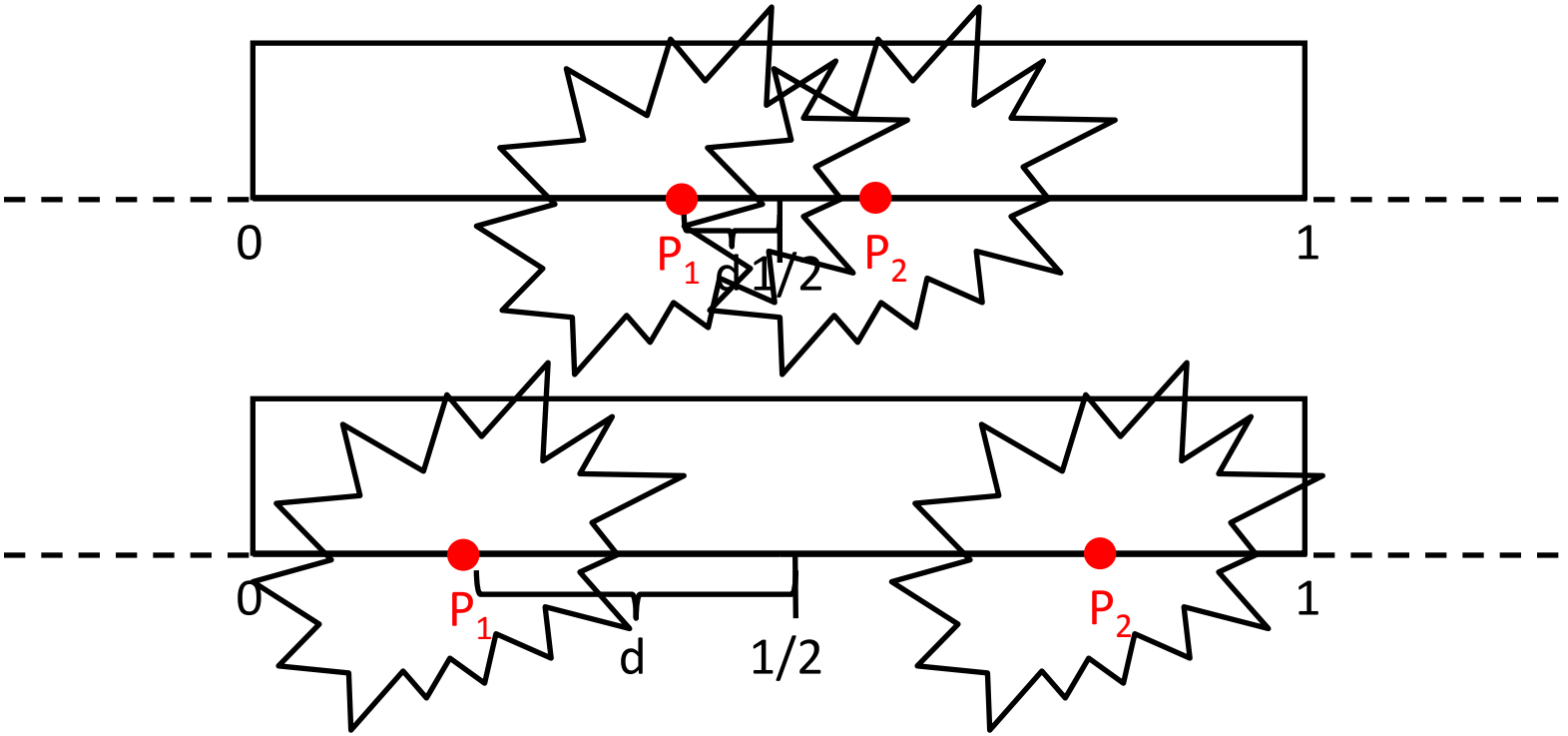


Desai (2001)
Moorthy (1988)
Vandenbosch & Weinberg (1995)

Hauser (1988)
Liu, Putler & Weinberg (2005)

Symmetric scenarios

When movies move towards the center of the target segment, they approach the mainstream, and aim at the mass market, i.e. the average preference of the market. When they move away from the center, they get away from the mainstream and approach more extreme preferences of the segment.



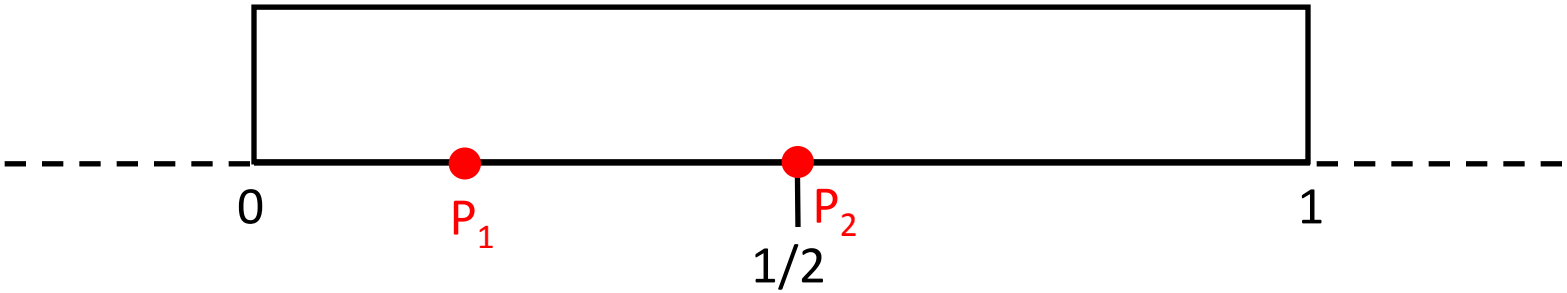
Gemser, Van Oostrum & Leenders (2007) JCE

Eliashberg et al (2006) MS

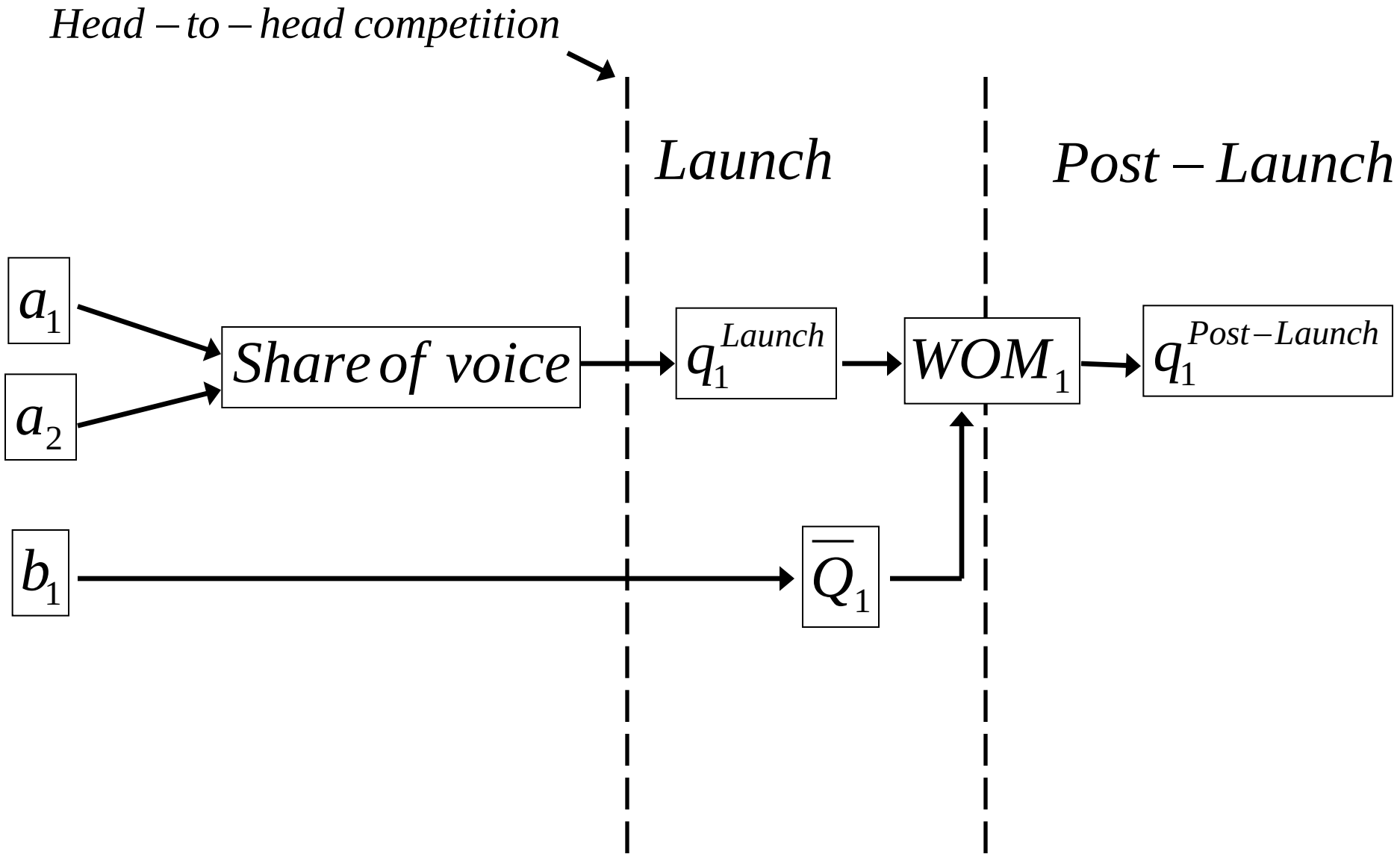
Zuckerman & Kim (2003) ICC

Ainslie et al (2005) MS

Asymmetric scenarios



Viewership (movie 1)



Profit

$$\pi_i = \left(q_i^{Launch} + q_i^{Post-Launch}\right) - a_i - b_i$$

Analytical benchmark: we solve the model computing viewership at launch and at post-launch and maximizing the profit function

The analytical benchmark

There exist a unique Symmetric Nash Equilibrium (SNE)

$$a^e = (c+d)\cdot x$$

$$b^e = x$$

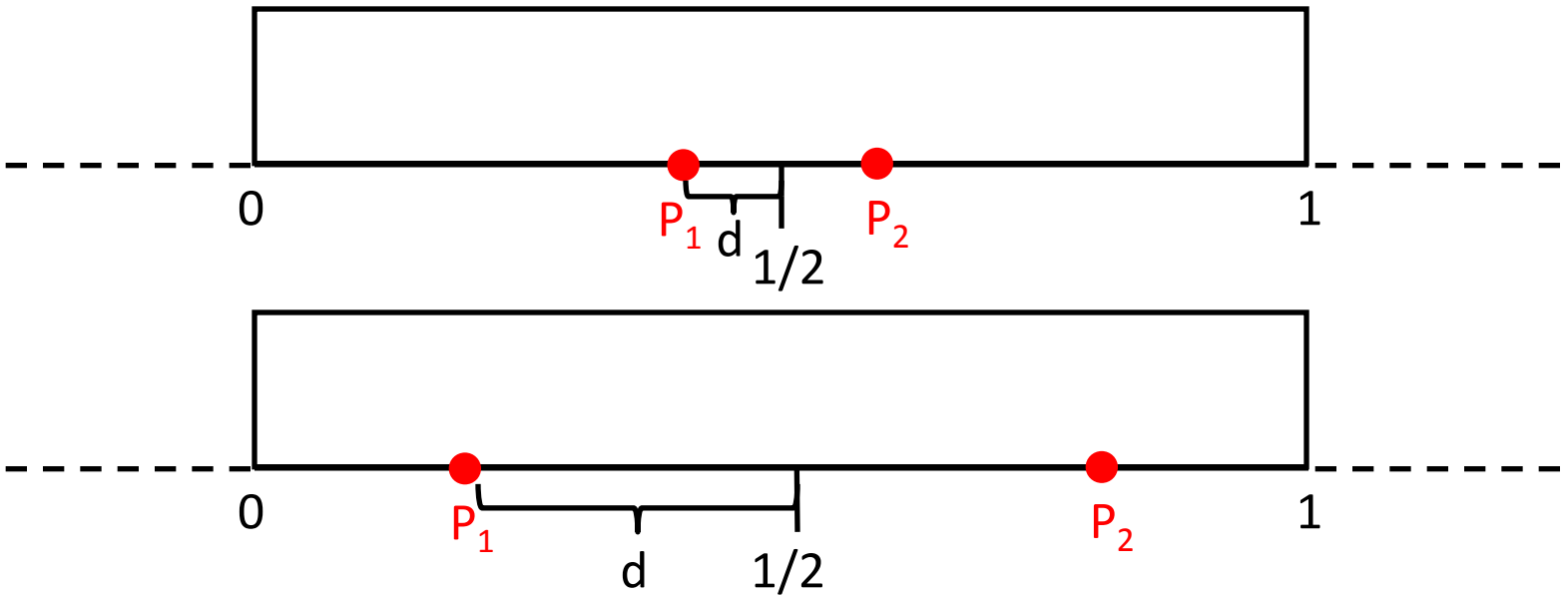
$$\pi^e = (1-c-d)\cdot x + \left(\frac{1}{2}-c-d\right)\cdot N$$

$$with \quad x = \left(\frac{\delta \cdot N^2}{4\gamma}\right)^2$$

The analytical benchmark

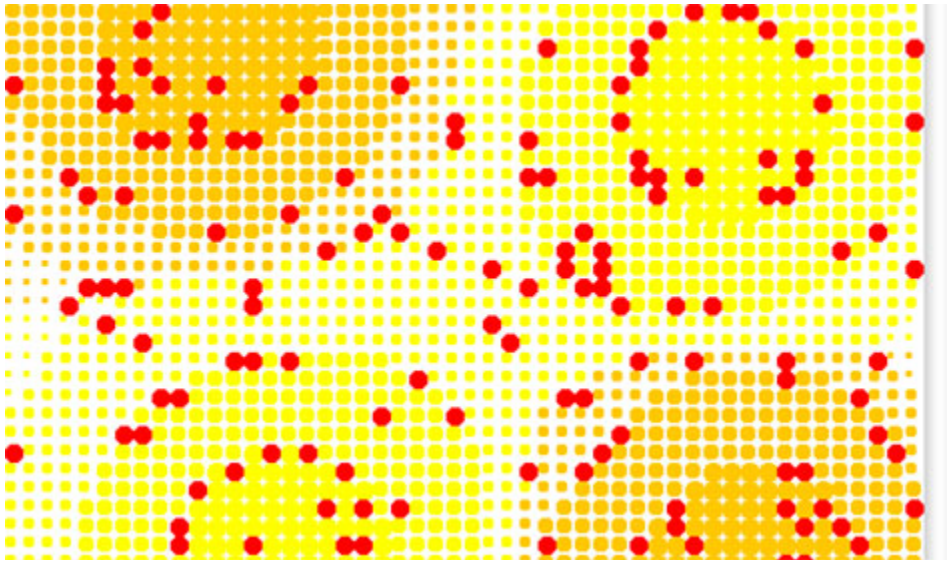
When movies move away from the mainstream,

$$d \uparrow \qquad a^e \uparrow \qquad b^e = \qquad \pi^e \downarrow$$



- FIRST INSIGHT: When movies move away from the mainstream, they invest proportionally more in advertising than in quality and profit less.

ABM: Two decision rules



Decision rule #1: the imitation rule

Decision rule #2: the trend rule

ABM. Decision rule #1: the imitation rule

$$a_{it} = \begin{cases} if\ \pi_{it-1} >= \pi_{-it-1} \quad then \quad a_{it-1} \\ otherwise \qquad\qquad a_{it-1} - \dfrac{a_{it-1} - a_{-it-1}}{N} a_{it-1} \end{cases}$$

$$b_{it} = \begin{cases} if\ \pi_{it} >= \pi_{-it} \quad then \quad b_{it-1} \\ otherwise \qquad\qquad b_{it-1} - \dfrac{b_{it-1} - b_{-it-1}}{N} b_{it-1} \end{cases}$$

Di Maggio and Powell (1983) ASR
Lux (1995) EJ Rivkin (2000) MS
Camerer (2003) Greve (2003) AMJ Schnaars (2002)

ABM. Decision rule #2: the trend rule

$$a_{it} = \begin{cases} if\ \pi_{it-1} = \pi_{it-2}\ then\ a_{it-1} \\ if\ \pi_{it-1} > \pi_{it-2}\ then\ a_{it-1} + \dfrac{a_{it-1} - a_{it-2}}{a_{it-2}} a_{it-1} \\ if\ \pi_{it-1} < \pi_{it-2}\ then\ a_{it-1} - \dfrac{a_{it-1} - a_{it-2}}{a_{it-2}} a_{it-1} \end{cases}$$

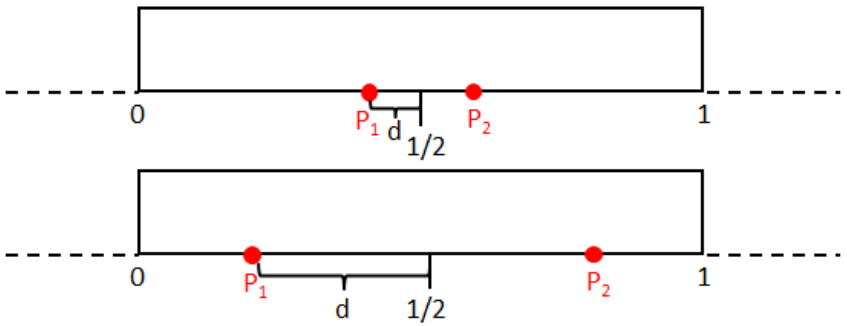
$$b_{it} = \begin{cases} if\ \pi_{it-1} = \pi_{it-2}\ then\ b_{it-1} \\ if\ \pi_{it-1} > \pi_{it-2}\ then\ b_{it-1} + \dfrac{b_{it-1} - b_{it-2}}{b_{it-2}} b_{it-1} \\ if\ \pi_{it-1} < \pi_{it-2}\ then\ b_{it-1} - \dfrac{b_{it-1} - b_{it-2}}{b_{it-2}} b_{it-1} \end{cases}$$

Hannan and Freeman (1984)
Manns and March (1978)
Brock et al. (1992)
de Bondt and Thaler (1985)
Jegadeesh and Titman (1993)
Barberis et al. (1998)
Hommes (2001)

ABM. Experimental set-up

Parameter	Name	Default value	Rationale / Validation
N	Number of consumers	100	We simulate a sufficiently high number of consumers to obtain enough variety in consumers' preferences.
θj	Consumers' preferences	U[0,1]	We refer to the most general case where consumers' preferences for movie types are equally likely.
d	Movie's differentiation	0.25	The two studios launch movies which are symmetrical and equally positioned with respect to the target segment, i.e. P_1=0.5-d and P_2=0.5+d. We initially set d=0.25 and then simulate different scenarios with different values of d.
c	Practical constrains of movie consumption	0.25	We refer to the general case where the practical constrains of the movie fruition lays in the middle between the highest and the lowest utility the agent can obtain from fruition of a movie.
γ	Outside good, i.e. other means of leisure	1	Full coverage at launch and existence of viewership and post-launch.
δ	WOM's persuasiveness	$\sqrt{6}/ 100^3$	Full coverage at launch and existence of viewership and post-launch.
MAX_a MAX_b	Budget constraints	100	We constrained investments in advertising and in quality to the maximum of the expected demand.
MIN_a MIN_b	Budget constraints	1	We constrained investments in advertising and in quality to a minimum investment.

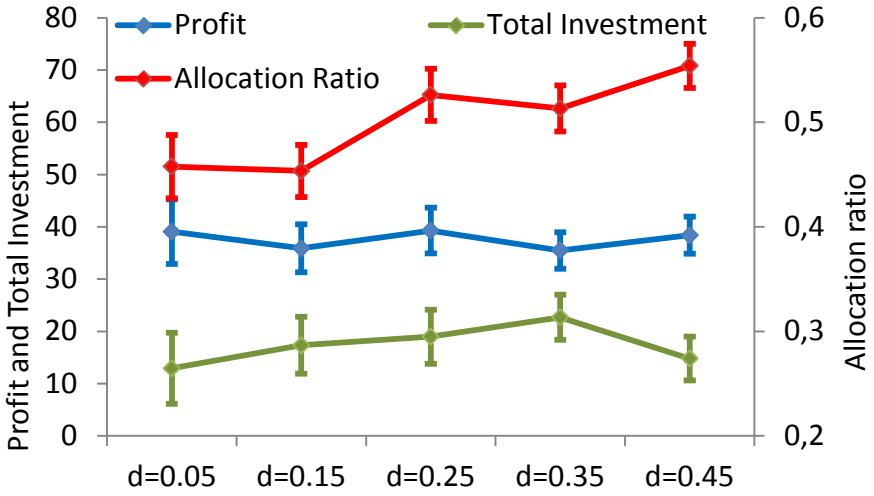
Experiment 1
Symmetric scenarios with big studios



d=0.25; MAX_a = MAX_b = 100.

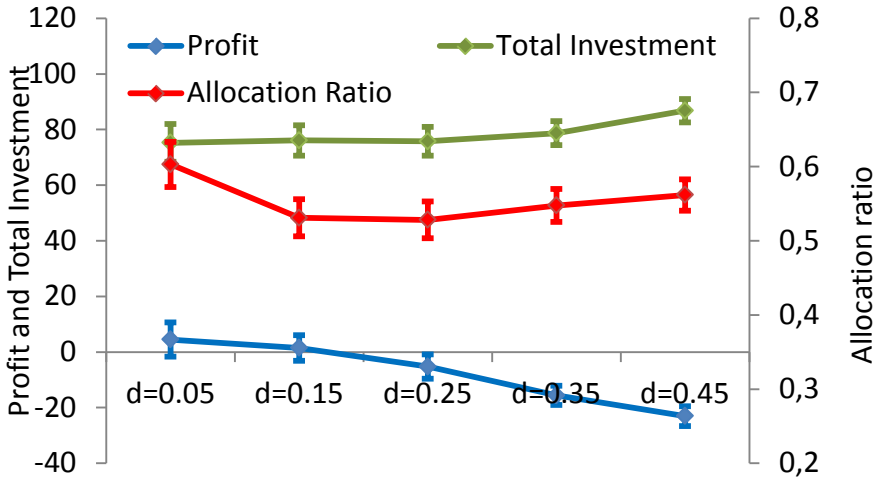
	Profit	Allocation ratio	Total investment
Imitation rule	-5.25 (0.43)	0.53 (0.002)	75.73 (0.52)
Trend rule	39.28 (0.86)	0.53 (0.006)	18.97 (0.66)
Fully rational benchmark	18.75	0.33	56.25

Experiment 1
Symmetric scenarios with big studios



d={0.05, 0.15, 0.25, 0.35, 0.45};
MAX_a=MAX_b=100.

Trend rule



Imitation rule

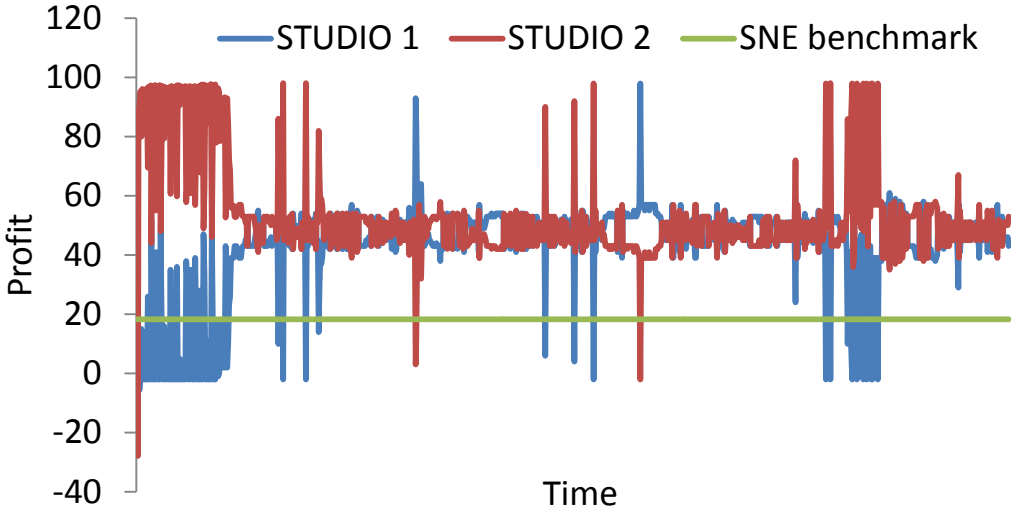
Experiment 2
Asymmetric scenarios with big studios

Runs=100; MAX_a=MAX_b=100.

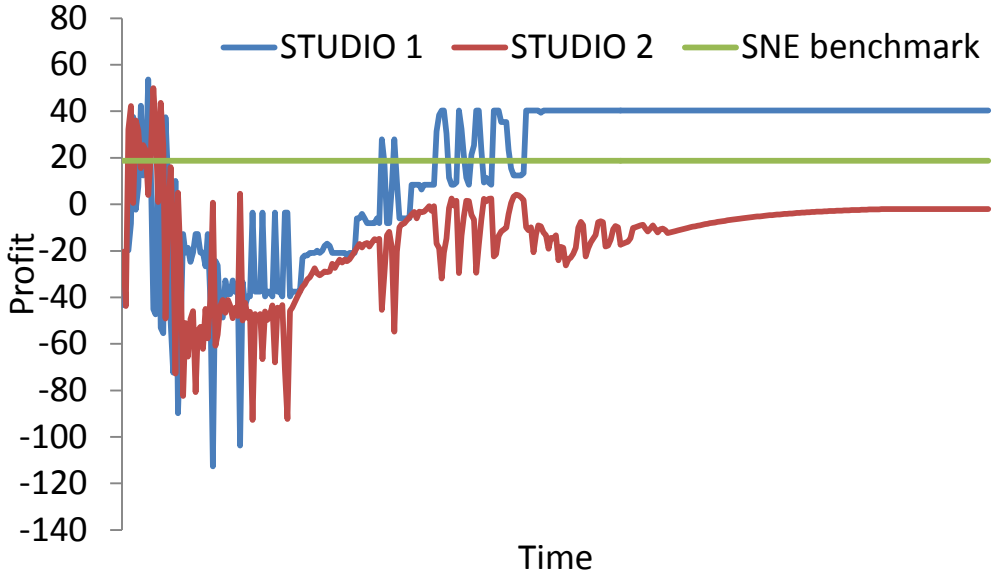
FOCAL STUDIO	COMPETITOR	Profit	Allocation ratio	Total investment	Positioning
Imitation rule	Imitation rule	-3.59 (0.21)	0.57 (0.000)	94.09 (0.83)	0.00 (0.000)
Trend rule	Trend rule	41.06 (1.29)	0.46 (0.004)	9.69 (0.47)	0.00 (0.000)
Imitation rule	Trend rule	30.93 (0.49)	0.61 (0.001)	66.07 (0.32)	0.01 (0.000)
Trend rule	Imitation rule	-7.89 (0.42)	0.50 (0.004)	15.75 (0.55)	0.01 (0.000)

Results (typical runs)

Both studios use the trend rule



Studio 1 uses the imitation rule and studio 2 uses the trend rule.



Experiment 2
Asymmetric scenarios with big studios

FOCAL STUDIO	COMPETITOR	Profit & Allocation ratio	Profit and Total investment	Profit and positioning
Imitation rule	Imitation rule	0,05	0,09*	-0,86*
Trend rule	Trend rule	0,20*	-0,25*	-0,17*
Imitation rule	Trend rule	0,03	-0,59*	-0,44*
Trend rule	Imitation rule	0,27*	-0,49*	-0,08*

Notes: *p<0.01.

Experiment 3
Asymmetric scenarios with small studios

Runs=100; MAX_a=MAX_b=10.

FOCAL STUDIO	COMPETITOR	Profit	Allocation ratio	Total investment	Positioning
Imitation rule	Imitation rule	4.16 (0.08)	0.58 (0.002)	10.24 (0.024)	0.00 (0.000)
Trend rule	Trend rule	4.62 (0.16)	0.52 (0.006)	4.57 (0.113)	0.00 (0.000)
Imitation rule	Trend rule	6.19 (0.12)	0.63 (0.003)	13.57 (0.076)	0.00 (0.000)
Trend rule	Imitation rule	2.20 (0.11)	0.58 (0.006)	8.58 (0.147)	0.00 (0.000)

Experiment 3
Asymmetric scenarios with small studios

FOCAL STUDIO	COMPETITOR	Profit & Allocation ratio	Profit and Total investment	Profit and positioning
Imitation rule	Imitation rule	0,33*	0,44*	-0,04
Trend rule	Trend rule	0,22*	0,11*	-0,06*
Imitation rule	Trend rule	0,19*	0,25*	-0,23*
Trend rule	Imitation rule	0,26*	0,31*	0,03

Notes: *p<0.01.

Conclusions and take aways

- Competition pushes big studio producers to overspend and to invest proportionally more in advertising than in quality.

- A trend strategy can attenuate this force by driving studios towards lower budgets and higher profits.

- Competition pushes both big and small studio producers to approach the mainstream as much as possible.

- Competition pushes small more than big studios to imitate the competitors and to invest in advertising.

Implications and extentions

- Warning1: In a very competitive market, the pre-launch advertising campaigns are crucial because movies' profitability highly depends on them. However, studios largely overspend in advertising.

- Warning2: Small studios (subsidiaries) feel more pressure to imitate and to allocate money on advertisement. But that conflicts with their mission!

- How about competition between a small and a big studio?

- Ecology of strategies in which many studios "learn" profitable budget allocations and/or different strategies can also be "tested".

Thank you!