

FIELD EXPERIMENTS

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Outline

- ▶ What are field experiments?
- ▶ Brief history of field experiments
- ▶ Types of field experiments:
 - ▶ Artefactual field experiments
 - ▶ Framed field experiments
 - ▶ Natural field experiments
- ▶ Natural experiments
- ▶ Summary: how field experiments compare with other kinds of experiments?



Experiments in Economics

Thought Experiments

In 1738 Daniel Bernoulli was the first to run a thought experiment – St. Petersburg Paradox.

Laboratory Experiments

Laboratory experiments were pioneered by Edward Chamberlin (1948) and popularized by Vernon Smith and Charles Plott.

Field Experiments

One of the first examples of field experiments in economics was conducted by Michael Levine and Charles Plott (1977).

Natural Experiments

The youngest and a rapidly developing approach in experimental economics.

Experiments in Economics



Thought Experiments

Laboratory Experiments

Field Experiments

Natural Experiments

Pros: hypothetical problem with suggested solution

Pros: controlled experimental conditions; easy to replicate

Pros: more representative subject pool; field context

Pros: naturally randomized treatments, large stakes, representative subject pool

Cons: hypothetical incentives; one subject (reader)

Cons: non-representative subject pool; low incentives; abstract context

Cons: loss of (some) control over treatments

Cons: loss of (some) control over treatments



What Are Field Experiments?

- ▶ **Field experiment** refers to a study which makes use of the **natural environment** or specific **attributes of natural environment** to investigate a phenomenon of interest.

Harrison & List (2004)

- ▶ Like laboratory experiments, “...**field experiments** use randomization, but do so in **naturally-occurring** settings, in certain cases using experienced subjects who might not be aware that they are participants in an experiment...”

Levitt & List (2009) p. 2



Why Field Experiments?

- ▶ Starting from 1980s laboratory experiments became criticized by skeptics who argued that it is not correct to make conclusions about the “real world” phenomena from laboratory experiments because:
 - ▶ These experiments are conducted in a “sterile environment” [**critique of environment**]
 - ▶ With commodities and stakes which are not realistic and often do not vary [**critique of context**]
 - ▶ With undergraduate students who are not “real people” [**critique of subject pool**]



Critique of the Laboratory Experiments

- ▶ Cross (1980) has famously written:
“it seems to be extraordinarily optimistic to assume that behavior in an artificially constructed “market” game would provide direct insight into actual market behavior.”
- ▶ Numerous skeptics have pointed out that laboratory experiments use unrealistically low monetary stakes, cannot impose time variations (short-run versus long-run).
- ▶ A White House official has once written a famous comment on one of John List’s field studies:
“even though [your] results appear prevalent, they are suspiciously drawn.....by methods similar to scientific numerology.....because of students.....who are not ‘real’ people”



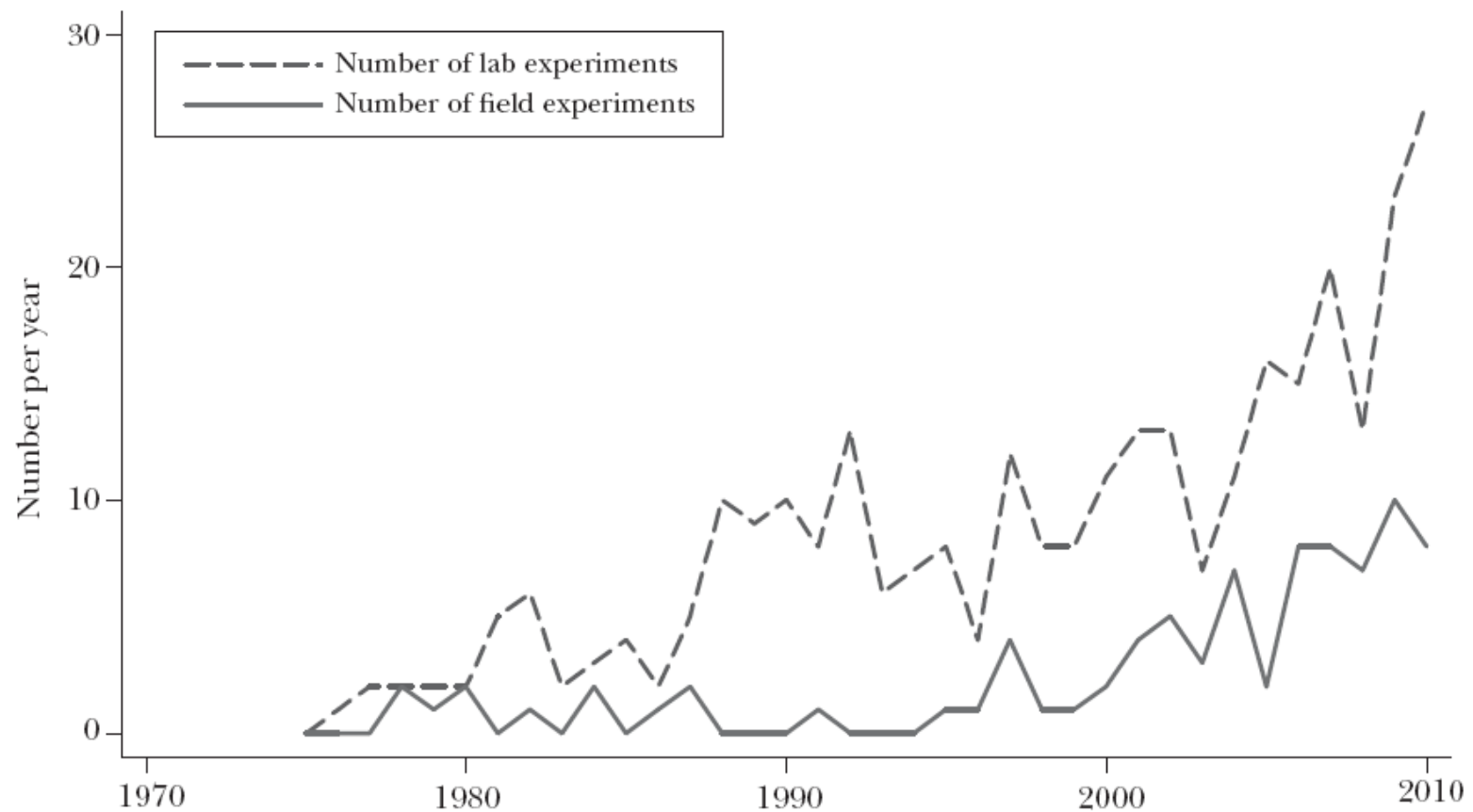
The Birth of the Field Experiment

- ▶ Smith responded to all three critiques (1980 AER):
“Experiments are sometimes criticized for not being ‘realistic’ ...are there field data to support the criticism, i.e., data suggesting that there may be differences between laboratory and field behavior? If not, then the criticism is pure speculation.”
- ▶ Therefore, it was necessary to test empirically whether laboratory is different from the field
- ▶ To answer the criticisms, field experiments were conducted



Brief History of Field Experiments

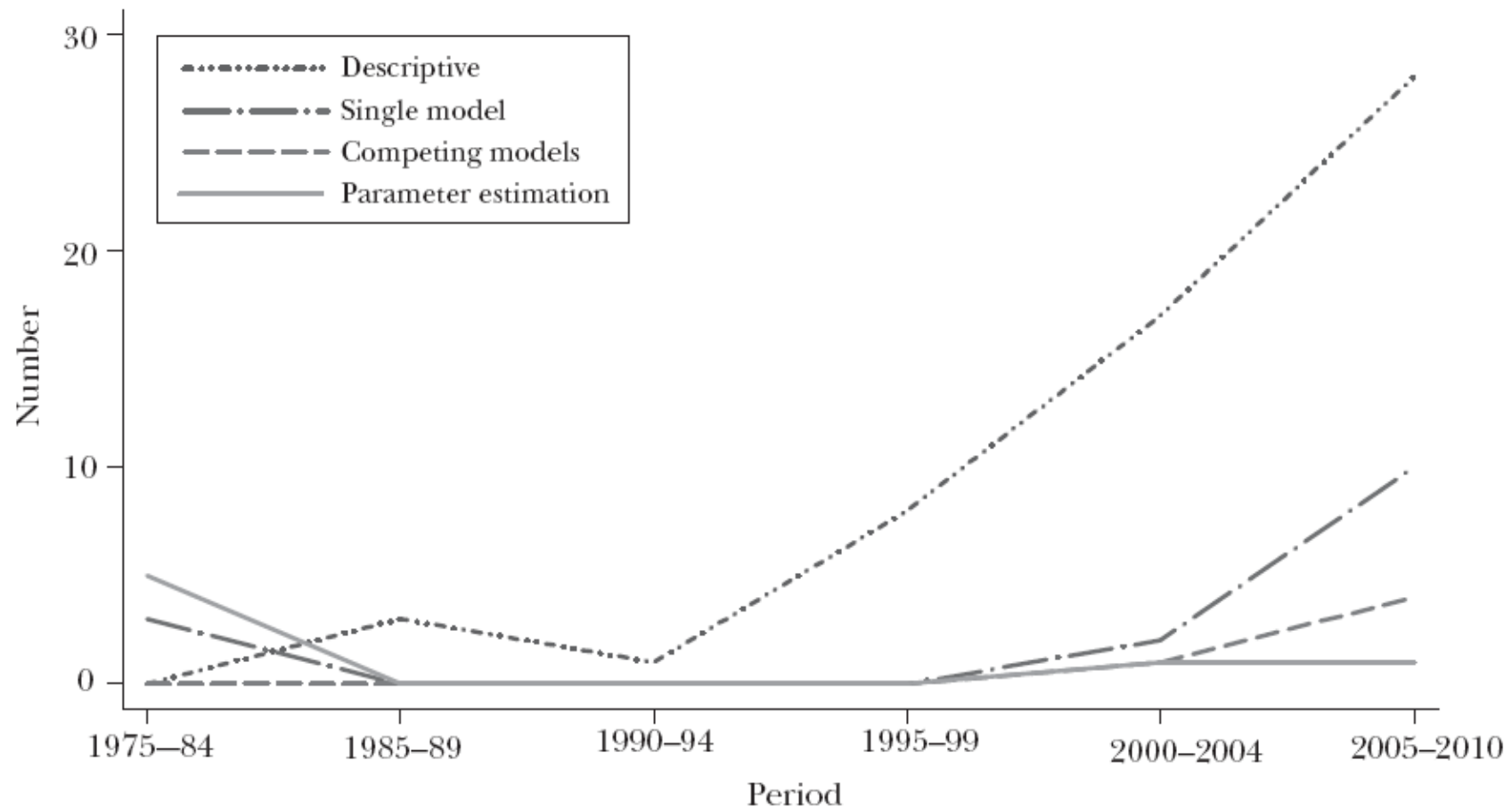
Number of Laboratory and Field Experiments Published in Five Top Economics Journals from 1975 to 2010



from Card et al. (2011)

Main Concentration of Field Experiments

Field Experiments by Theoretical Content



from Card et al. (2011)

How can field experiments be identified?

- ▶ In order to identify a field experiment we need to consider the following 6 factors (Harrison & List, 2004):
- ▶ **Subject pool** (Who are the study participants?)
- ▶ **Information** which subjects bring to the task (Which specific experiences participants have?)
- ▶ **Experimental commodity** (What is used as a commodity to incentivize the task?)
- ▶ **Task** (What are participants asked to do?)
- ▶ **Stakes** (How does the incentive mechanism work?)
- ▶ **Decision architecture** (What are the features of the environment that participants operate in?)



Types of Field Experiments

- ▶ Harrison & List (2004) identify three main types of field experiments in comparison with the conventional laboratory experiments:
- ▶ **Conventional laboratory experiment (LAB)** uses a standard subject pool of students, an abstract framing, and an imposed set of rules.
- ▶ **Artefactual field experiment (AFE)** is the same as LAB but with a non-standard subject pool
- ▶ **Framed field experiment (FFE)** is the same as AFE but with field context in the commodity, task, information, stakes, time frame, etc.
- ▶ **Natural field experiment (NFE)** is the same as FFE but where the environment is the one that the subjects naturally undertake these tasks, such that the subjects do not know that they are in an experiment.



Artefactual Field Experiments (AFE)

- ▶ In AFE researchers usually conduct a laboratory experiment but instead of inviting university students, they invite subjects from a pool they are interested in.
- ▶ For example, Haigh & List (2004) conducted an AFE where they have invited traders to the laboratory and asked them to participate in a simple investment task to test whether traders exhibit myopic loss aversion.
- ▶ They have found that traders were more myopically loss averse than undergraduate students.



Framed Field Experiments (FFE)

- ▶ Bohm (1984) conducted an FFE for a local government in Stockholm that was considering expanding a bus route to a major hospital and a factory.
- ▶ The goal of the experiment was to elicit valuations from people who were affected by the route, and to test whether their contributions would make the project cost-effective.
- ▶ A key feature of the experiment was that the subjects would have to be willing to pay for the public good if it was to be provided for a trial period of six months.
- ▶ Everyone who was likely to contribute was informed about the experiment, but when it came time for the experiment virtually noone turned up...
- ▶ The local trade unions had decided to boycott the experiment and expressed several concerns about the new bus service.



Natural Field Experiments (NFE)

- ▶ Ausubel (1999) conducted a large scale experiment using a credit card company.
- ▶ In this experiment, subjects received a task but did not know they were participating in an experiment.
- ▶ Ausubel compared 3 groups of subjects:
 - ▶ **Control group** received an offer of 6.9 percent interest rate for six months and 16 percent thereafter;
 - ▶ **“Pre” group** received a lower preteaser rate (4.9 percent followed by 16 percent)
 - ▶ **“Post” group** received a lower postteaser rate (6.9 percent followed by 14 percent).
- ▶ Response rate and twenty-one months of history of borrowing for each subject was collected.



Natural Field Experiments (NFE)

- ▶ The average balance borrowed in the first six months was about \$2,000, while the average balance in the subsequent fifteen months was about \$1,000.
- ▶ The standard theory predicts that the increase in response rate for treatment “Pre” (relative to the control group) should be smaller than for treatment “Post”: neglecting compounded interest, $6/12 \times 2$ percent \times \$2,000 is smaller than $15/12 \times 2$ percent \times \$1,000 (the comparison would only be more favorable for the “Post” if we could observe the balances past twenty-one months).
- ▶ However, the increase in take-up rate for the “Pre” treatment (386 people out of 100,000) is 2.5 times larger than the increase for the “Post” treatment (154 people out of 100,000).
- ▶ Individuals overrespond to the preteaser interest rate. Ausubel’s interpretation of this result is that individuals (naïvely) believe that they will not borrow much on a credit card past the teaser period.



Natural Field Experiments (NFE)

- ▶ In both NFE and Natural Experiments subjects do not know that they are participating in an experiment.
- ▶ But Natural Field Experiments (NFE) are NOT the same as Natural Experiments.
- ▶ NFE use “manmade” treatments: treatments are constructed by experimenter to test a theoretical hypothesis.
- ▶ Natural Experiments use naturally created randomness across treatments or a naturally created decision problem. Natural experiments allow a researcher to analyze and draw conclusions from naturally occurring data, organized by a neutral force. As a result, in Natural Experiments researchers have less control than in NFE.



Pearls Before Breakfast

- ▶ In 2007 Washington Post came up with an interesting idea
- ▶ They have decided to test whether skill matters more than context or context matters more than skill
- ▶ What did they do?



Pearls Before Breakfast

- ▶ They have asked one of the top-skilled top-earning musician in the world



Joshua Bell to play a gig on the subway!!!



Pearls Before Breakfast

- ▶ What was the point?
- ▶ Washington Post wanted to see
 - ▶ How many people would stop to listen to the music?
 - ▶ How much would he earn?
- ▶ What happened?
- ▶ Let us see...



Pearls Before Breakfast



salary

unknown but > than 6
digits a year; min ticket
price \$100

listeners

concerts are always
sold out



\$32 in 43 minutes

1,097 people
passed by only 7
stopped and 27
gave money



Pearls Before Breakfast

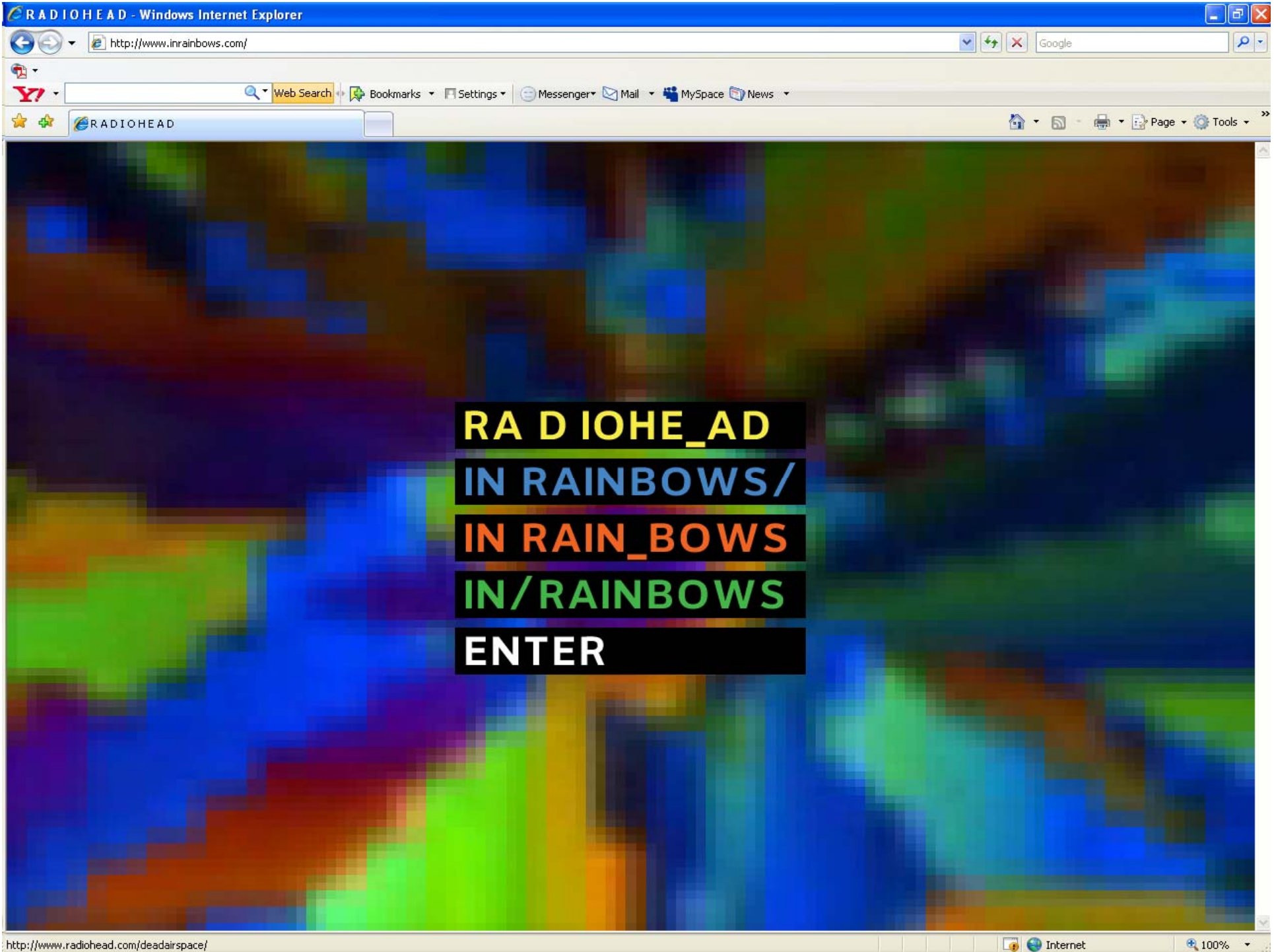
- ▶ The big question is:
- ▶ WHAT KIND OF EXPERIMENT IS THAT?
- ▶ ANSWER: Natural Field Experiment (NFE)
- ▶ The small question is:
- ▶ is there anything wrong with it?

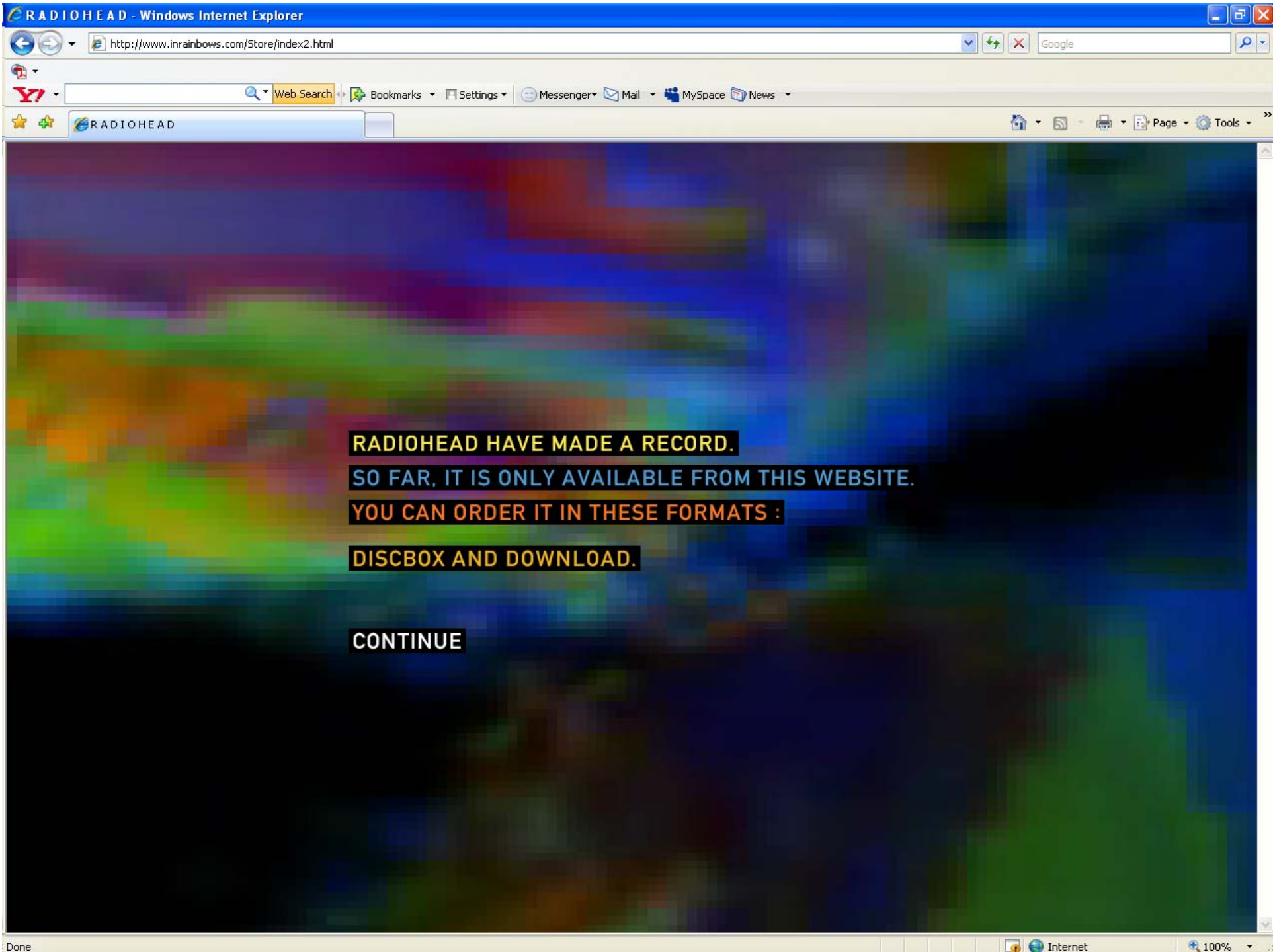


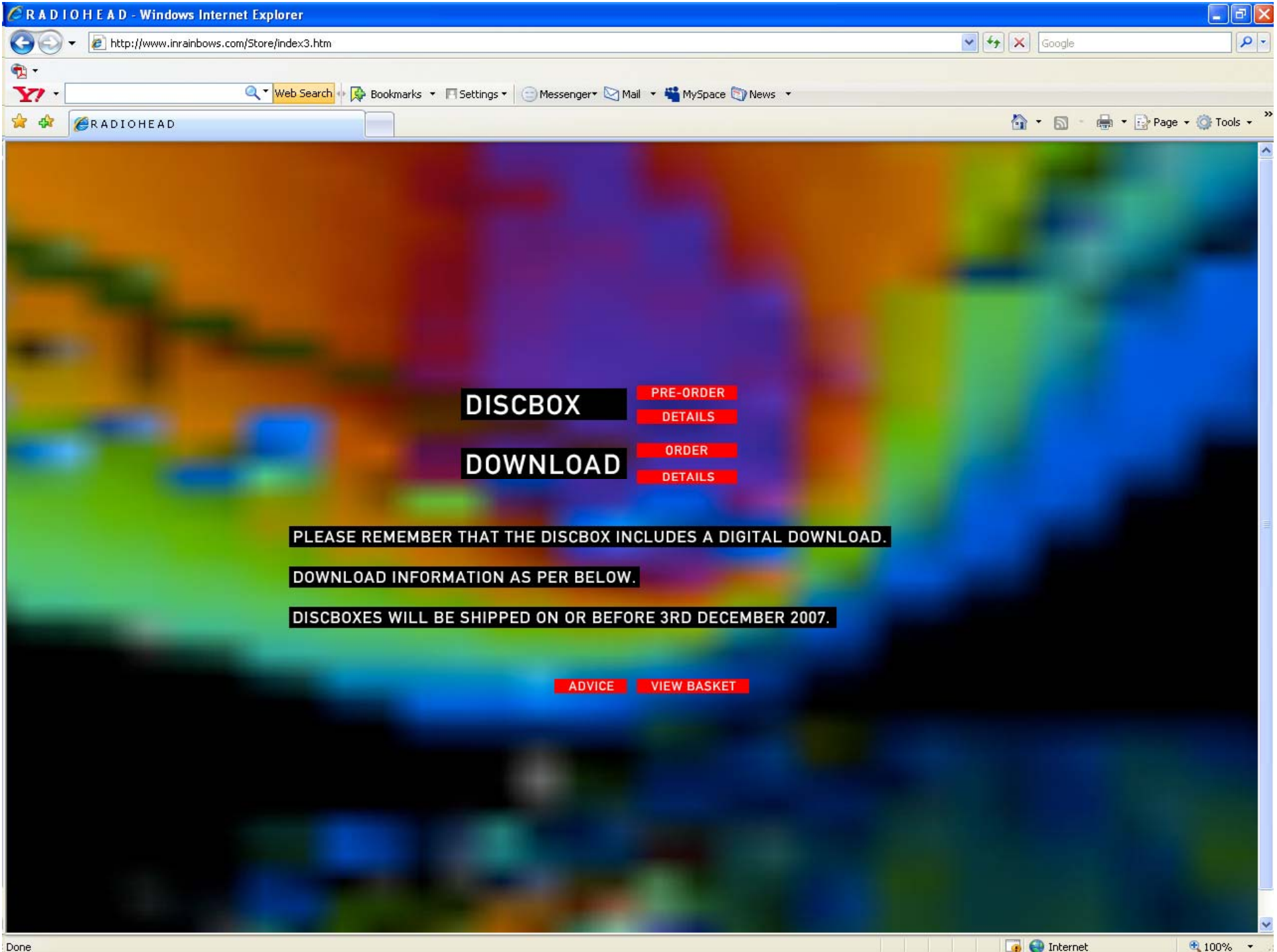
Radiohead's "In Rainbows"

- ▶ Classical economic theory postulates that tipping (e.g., in restaurants) is irrational.
- ▶ Indeed, why pay if you can get something for free?
- ▶ Famous band **Radiohead** asked their fans to pay any amount of money for their album "In Rainbows"









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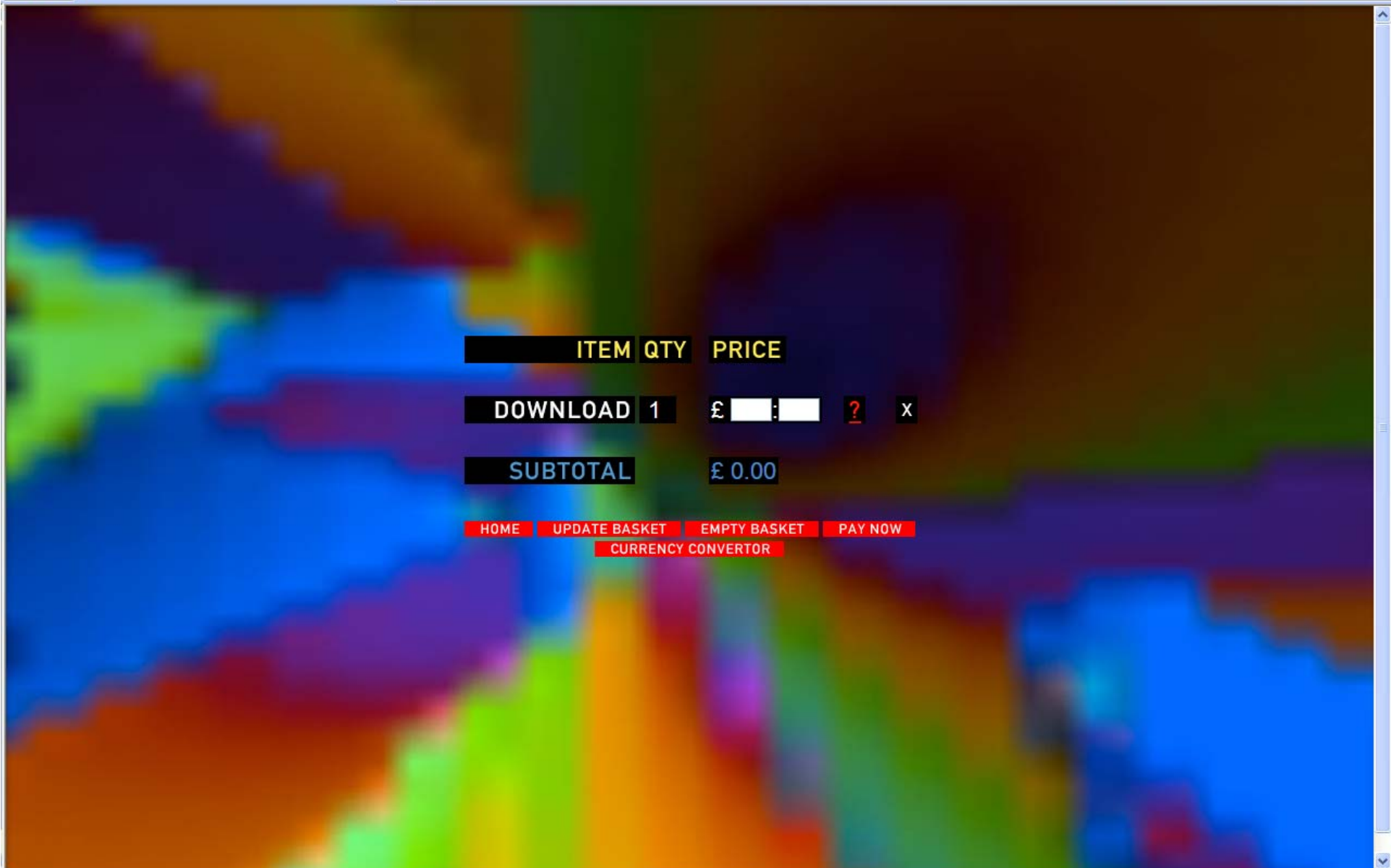
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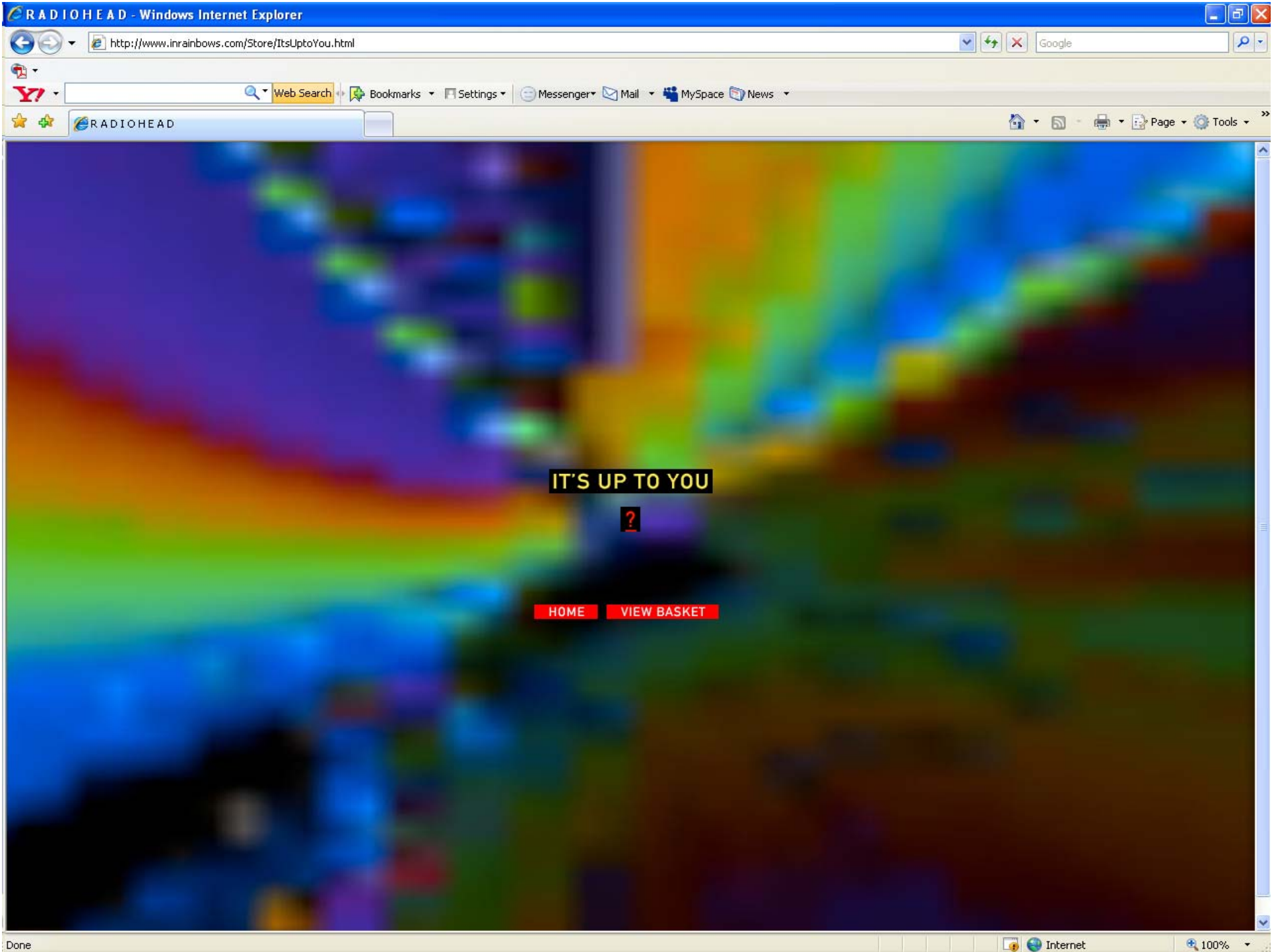
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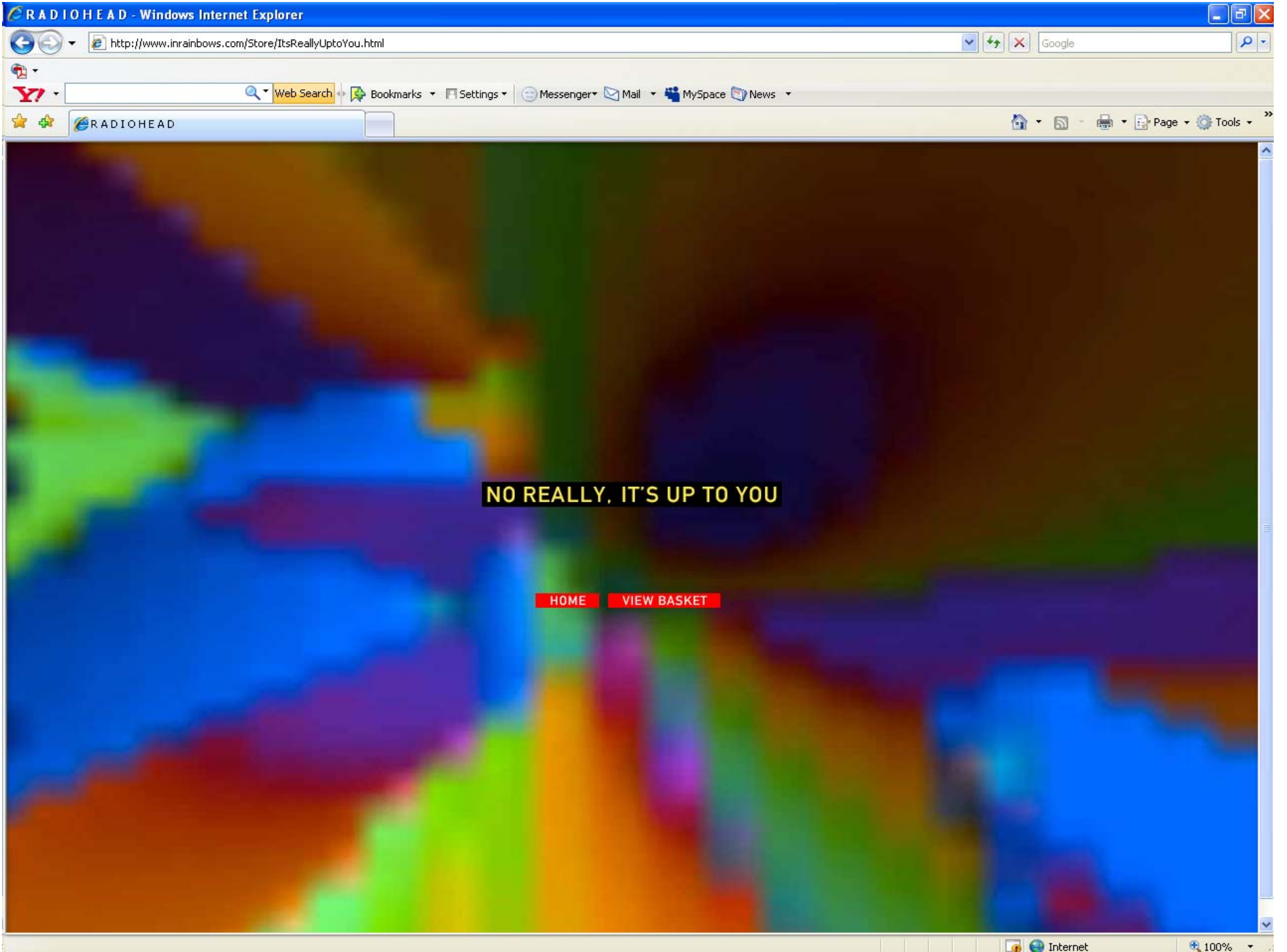


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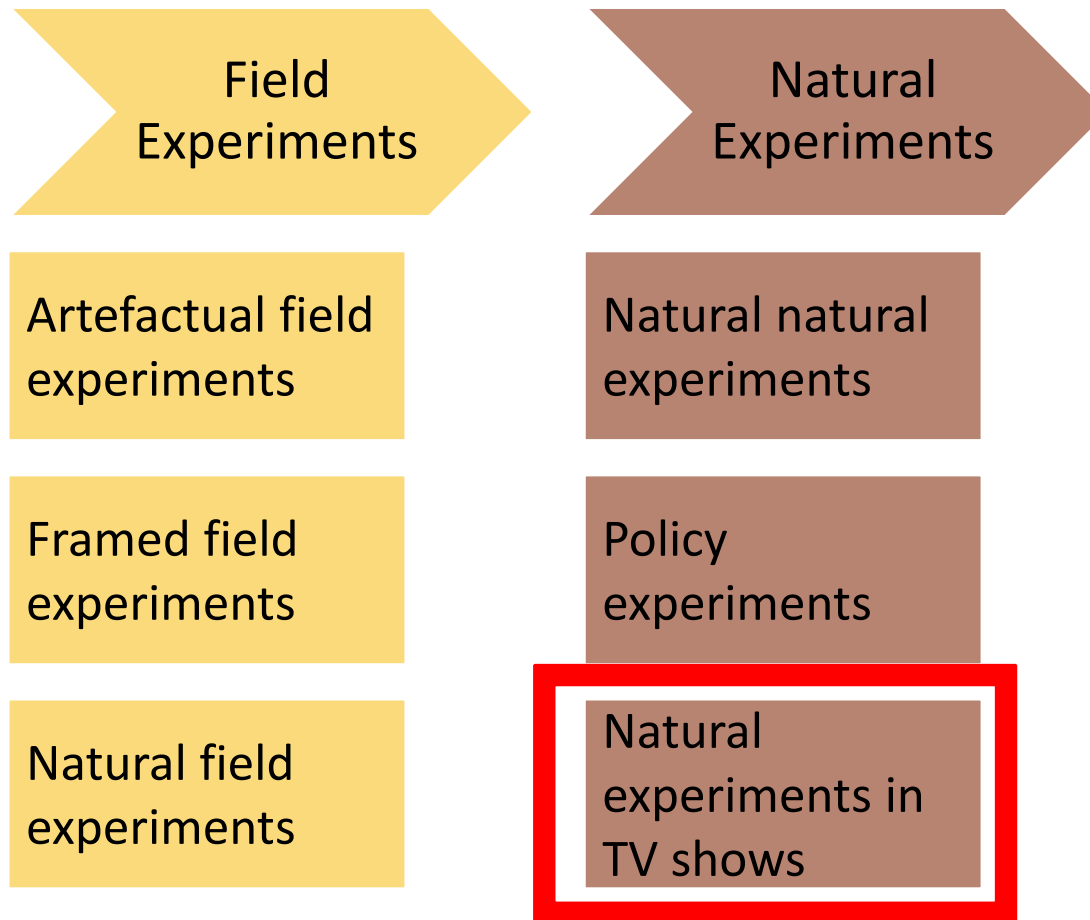


Radiohead's "In Rainbows"

- ▶ The big question is:
- ▶ WHAT KIND OF EXPERIMENT IS THAT?
- ▶ ANSWER: Natural Experiment
- ▶ The small question is:
- ▶ is there anything wrong with it?



Experiments in Economics



Natural Natural Experiments

- ▶ Natural natural experiments employ biological and climate mechanisms to construct randomized treatments. Random outcomes such as twin births, birth dates, gender or weather events are typically used in natural natural experiments in labor economics.
- ▶ Advantage:
 - ▶ Naturally created randomness across treatments (as opposed to “manmade” treatments).
- ▶ Disadvantage:
 - ▶ Natural random events exploited in these experiments are often compounded by numerous behavioural, social and technological factors that might be difficult to control.
- ▶ Rosenzweig and Wolpin (2000) provide a detailed description of methodology of natural natural experiments.



Policy Experiments

- ▶ Policy experiments refer to studies that investigate the effect of policy changes or economic reforms on selected groups of population.
- ▶ Advantages:
 - ▶ Very high monetary incentives and large fractions of population that are involved in the experiment.
- ▶ Disadvantages:
 - ▶ These experiments are typically very expensive and, therefore, rare.
- ▶ Examples of policy experiments are given in Meyer (1995).

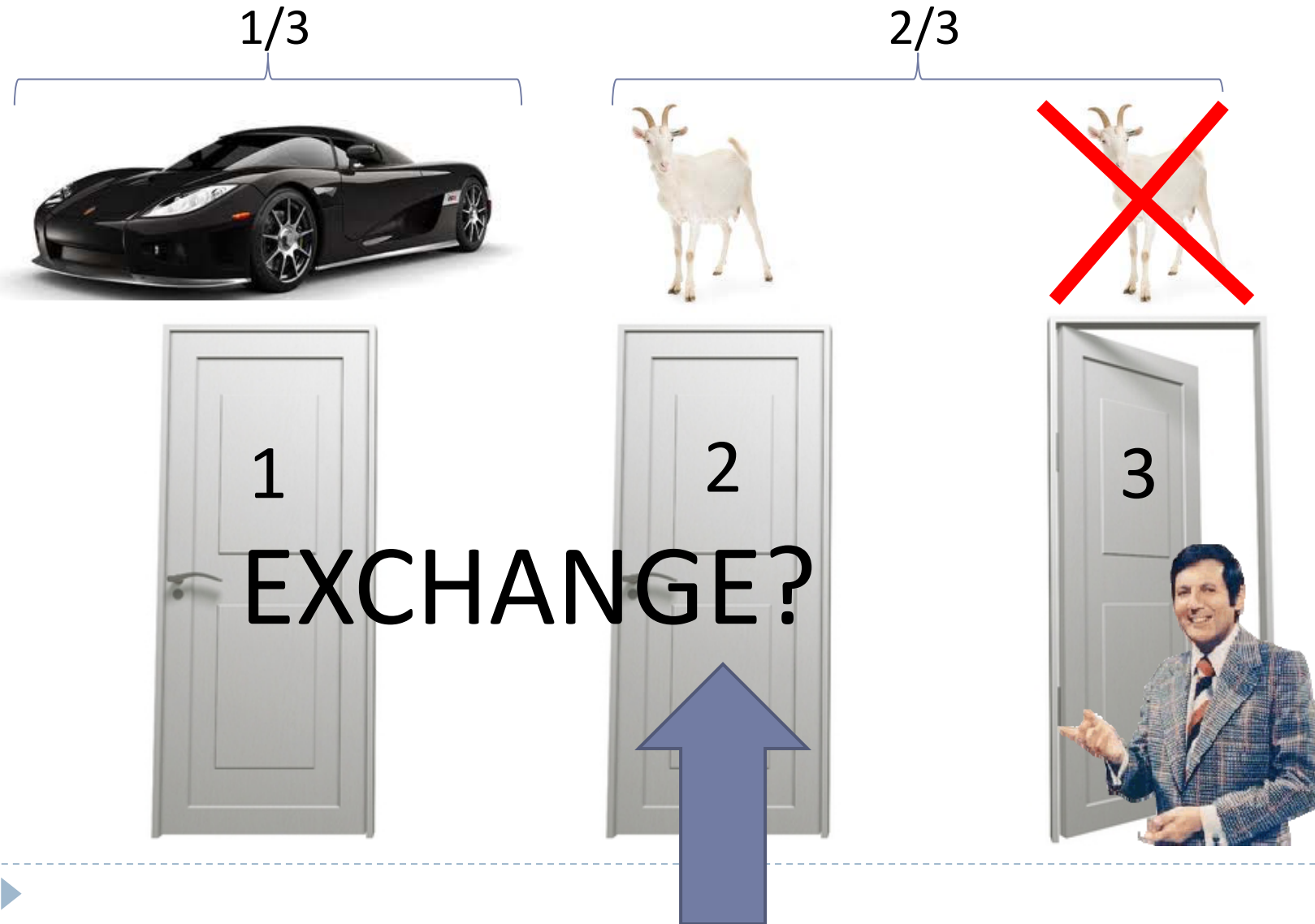


Natural Experiments in TV Shows

- ▶ TV shows:
 - ▶ structured as well-defined decision problems or strategic games
 - ▶ provide an interesting research material for economists (Metrick, 1995)
- ▶ Advantages:
 - ▶ *Really* large monetary incentives
 - ▶ More representative subject pool
- ▶ Disadvantages:
 - ▶ Experimenter has no control over treatments (not all hypotheses can be readily tested on the data from television shows)



The Monty Hall Problem



Natural Experiments in TV Shows

Objective	Study	TV show
Measure individual risk attitudes	Gertner (1993)	<i>Card Sharks</i>
	Metrick (1995)	<i>Jeopardy!</i>
	Beetsma and Schotman (2001)	<i>Lingo</i>
Study of discrimination	Levitt (2004)	<i>The Weakest Link</i>
	Antonovics et al. (2005)	
Information updating	Bennett and Hickman (1993)	<i>The Prize is Right</i>
Bidding strategies	Berg et al. (1996)	



Deal or No Deal

- ▶ Game television show
- ▶ Aired six days a week on national television
- ▶ All contestants self-select into the show
- ▶ 20 (IT)/22 (FR)/22 (UK) contestants participate in each episode
- ▶ Contestants are randomly assigned sealed boxes, numbered from first to last
- ▶ Each box contains one of twenty monetary prizes ranging from €0.01 to €500,000 (IT, FR)/ from £0.01 to £250,000 (UK)
- ▶ Independent notary company allocates prizes across boxes and seals the boxes





Deal or No Deal: French Version



Deal or No Deal: Italian Version



* Prize 5,000 Euro was replaced with prize 30,000 Euro starting from January 30, 2006

Deal or No Deal: British Version



Deal or No Deal: Game

- ▶ One contestant is selected to play the game (selection procedure/ by producers)
- ▶ Game: contestant keeps her own box and opens the remaining boxes one by one
- ▶ Once a box is opened, the prize sealed inside is publicly revealed and deleted from the list of possible prizes

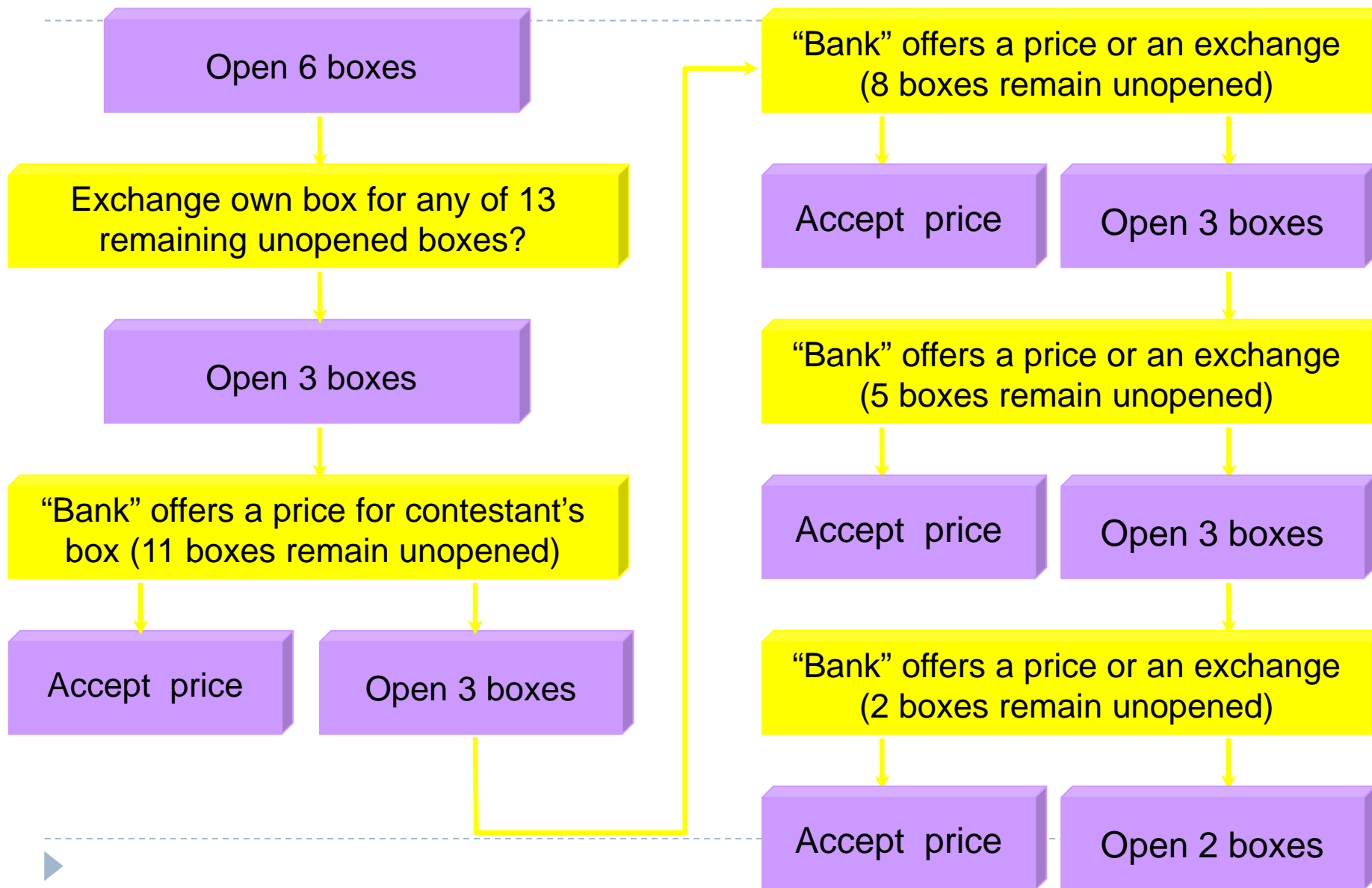


Deal or No Deal: “Bank” Offers

- ▶ After opening several boxes contestant receives an offer from the “bank”:
 - ▶ a monetary price for the content of her box
 - ▶ the possibility to exchange her box for any of the remaining sealed boxes
 - ▶ we concentrate on exchange offers
- ▶ The game terminates when:
 - ▶ contestant accepts the price offered by the “bank”
 - ▶ all boxes are opened (contestant leaves with the content of her box, which is opened last)



Deal or No Deal: Game

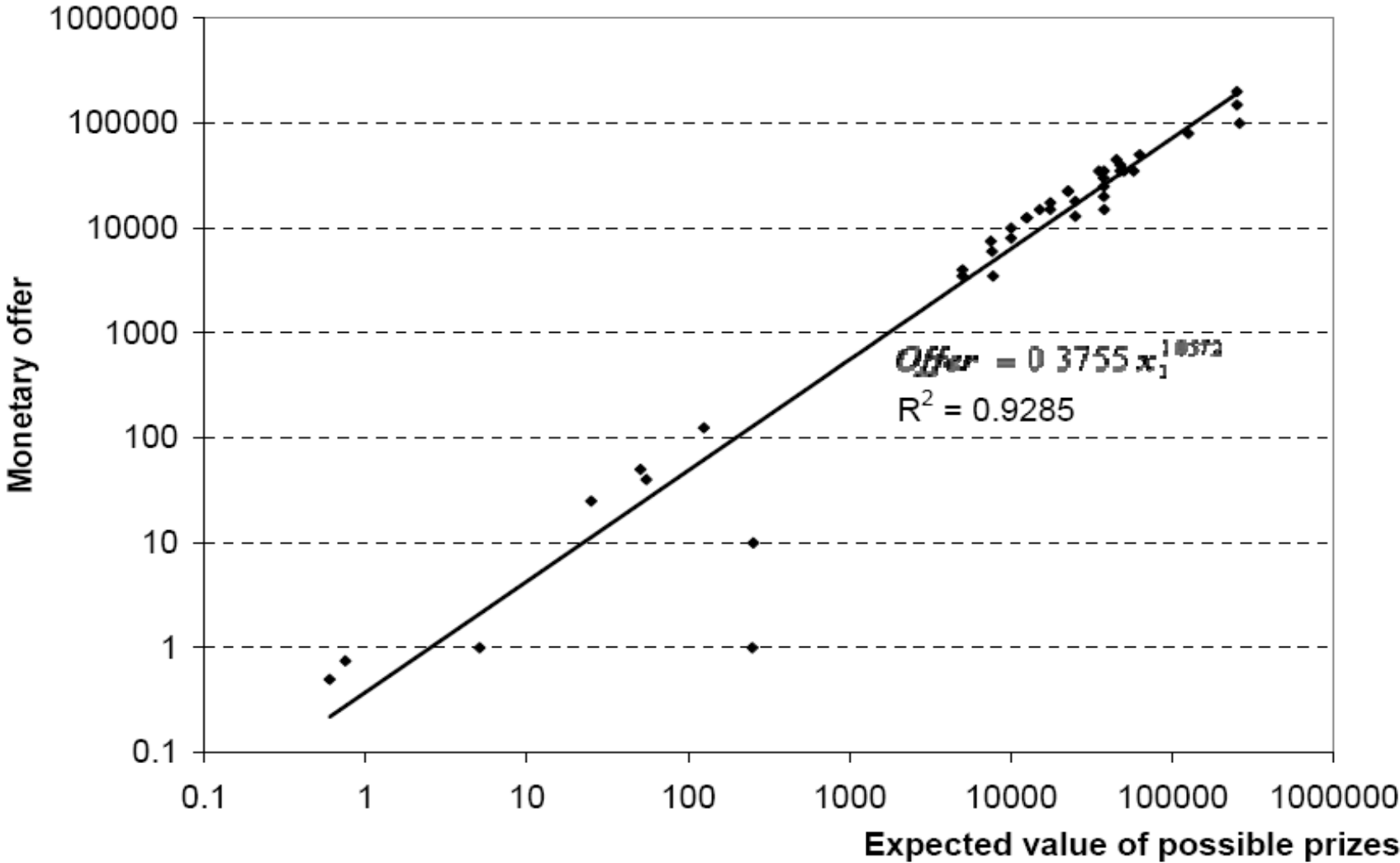


Deal or No Deal: Bank Offers

- ▶ “Bank” monetary offers are fairly predictable across episodes
- ▶ In early stages of the game, they are smaller than EV of possible prizes
- ▶ As the game progresses, the gap between EV and the monetary offer decreases and often disappears when there are two unopened boxes left.



Deal or No Deal: Bank Offers



Deal or No Deal: Sample

- ▶ French version - 49 episodes from January 2006 to April 2006
- ▶ Italian version – 100 episodes from September 2005 to February 2006
- ▶ British version – 355 episodes from October 2005 to January 2007



Deal or No Deal: Data Statistics

Descriptive Statistics	French version	Italian version	British version
Percent of female	71%	55%	50%
Average age (years)	28	47	41
Percent of married	39%	81%	51%
Average earnings	€71,579	€30,363	£16,763
Median earnings	€50,000	€20,000	£12,900
Average number of exchange offers per contestant	1.86	1.29	0.18



Deal or No Deal: Test of Loss Aversion

- ▶ Consider an individual who is offered an exchange when N boxes are sealed
- ▶ Possible prizes $x_1 < x_2 < \dots < x_N$
- ▶ EUT: should be exactly indifferent
- ▶ Keeping own box yields expected utility

$$\frac{1}{N} \sum_{i=1}^N u(w + x_i)$$

where $u(\cdot)$ is v. N. M.
utility function,
 w is private wealth



Deal or No Deal: EUT Prediction

- ▶ If contestant exchanges her box, she obtains expected utility

$$\begin{aligned} \frac{1}{N} \sum_{i=1}^N \frac{1}{N-1} \sum_{\substack{j=1 \\ j \neq i}}^N u(w + x_j) &= \\ &= \frac{1}{N} \sum_{i=1}^N u(w + x_i) \end{aligned}$$

- ▶ Contestant receives exactly the same EU after exchanging her box as after keeping her initial box
 - ▶ There is no reason why contestant should accept or reject an exchange offer
-



Deal or No Deal: CPT Prediction

- ▶ An individual derives utility from changes in wealth rather than absolute wealth levels
- ▶ Changes in wealth are measured relative to reference point – current asset position (Kahneman and Tversky, 1979)
- ▶ If an individual keeps her own box, she obtains utility $v(0)=0$ because her asset position remains unchanged



Deal or No Deal: CPT Prediction

- ▶ If an individual exchanges her own box with prize x_i for a box with a lower prize x_j

$$\sum_{j=1}^{i-1} v(x_j - x_i) \cdot [w_-(\text{prob}(\delta \leq x_j - x_i)) - w_-(\text{prob}(\delta < x_j - x_i))]$$

- ▶ If an individual exchanges her own box with prize x_i for a box with a higher prize x_j

$$\sum_{j=i+1}^N v(x_j - x_i) \cdot [w_+(\text{prob}(\delta \geq x_j - x_i)) - w_+(\text{prob}(\delta > x_j - x_i))]$$



Deal or No Deal: CPT Prediction

- ▶ Since all prizes are randomly distributed across the boxes...
- ▶ ...every positive change in wealth is equally likely as a negative change in wealth of the same absolute amount
- ▶ Ex ante utility from exchanging the boxes:

$$U = \sum_{i=1}^N \sum_{j=1}^{i-1} \left\{ v(x_j - x_i) \cdot \left[w_-(\text{prob}(\delta \leq x_j - x_i)) - w_-(\text{prob}(\delta < x_j - x_i)) \right] + v(x_i - x_j) \cdot \left[w_+(\text{prob}(\delta \geq x_i - x_j)) - w_+(\text{prob}(\delta > x_i - x_j)) \right] \right\}$$



Deal or No Deal: CPT Prediction

- ▶ Assumption of loss aversion implies that

$$v(x_i - x_j) < -v(x_j - x_i) \text{ for all } x_j < x_i$$

- ▶ Thus, utility from exchange is

$$U < \sum_{i=1}^N \sum_{j=1}^{i-1} v(x_j - x_i) \cdot [w_-(\text{prob}(\delta \leq x_j - x_i)) - w_-(\text{prob}(\delta < x_j - x_i)) - w_+(\text{prob}(\delta \leq x_j - x_i)) + w_+(\text{prob}(\delta < x_j - x_i))]$$

- ▶ Probability weighting function is more linear for losses and more curved for gains => RHS <= 0



Deal or No Deal: CPT Prediction

- ▶ Contestant derives a strictly negative utility from exchanging her box for one of the remaining sealed boxes
- ▶ A loss averse individual expects more aggravation from losses than the pleasure from gains of the same amount
- ▶ Therefore, the prediction of CPT is
- ▶ Not to exchange own box



Results: first (or only) exchange offer

First (or only) exchange offer	Number (percentage) of episodes		
	French version	Italian version	British version
Accepted	19 (46%)	40 (40%)	27 (43%)
Rejected	22 (54%)	60 (60%)	36 (57%)



EUT Prediction: first (or only) exchange offer

- ▶ Interpretation 1: if an individual is indifferent between two lotteries, then any choice pattern is consistent with EUT – no testable implication
- ▶ Interpretation 2: if an individual is indifferent between two lotteries, then each lottery is chosen with probability 50% (The chi-squared statistics are $\chi^2=0.286$ ($p=0.593$), $\chi^2=2.722$ ($p=0.099$) and $\chi^2=1.286$ ($p=0.257$) correspondingly for French, Italian and British contestants).
- ▶ Contestants appear to be largely indifferent between accepting and rejecting the exchange.



Summary: first (or only) exchange offer

- ▶ In all three versions of *Deal or No Deal* a higher proportion of contestants reject the exchange offer.
- ▶ This is consistent with certain degree of “stickiness” that Friedman (1998) finds in the Monty Hall problem
- ▶ and with the “reluctance to switch” that Charness and Levin (2005) observe in a simple Bayesian updating game.
- ▶ You have also discussed the literature on endowment effect last week...



Results: second exchange offer

First exchange offer	Second exchange offer	Number (percentage) of episodes	
		French version	Italian version
Accepted	Accepted	1 (4%)	3 (11%)
	Rejected	12 (44%)	8 (28%)
Rejected	Accepted	11 (41%)	7 (25%)
	Rejected	3 (11%)	10 (36%)



Summary: second exchange offer

- ▶ The hypothesis that these contestants are equally likely to accept or reject the exchange cannot be rejected in the Italian dataset but it is rejected at 1% significance level in the French dataset.
- ▶ Multiple exchange opportunities increase the number of contestants who exchange boxes once (in violation of the assumption of loss aversion).
- ▶ However, multiple exchange opportunities cause no sizable increase in the number of contestants who exchange boxes more than once.



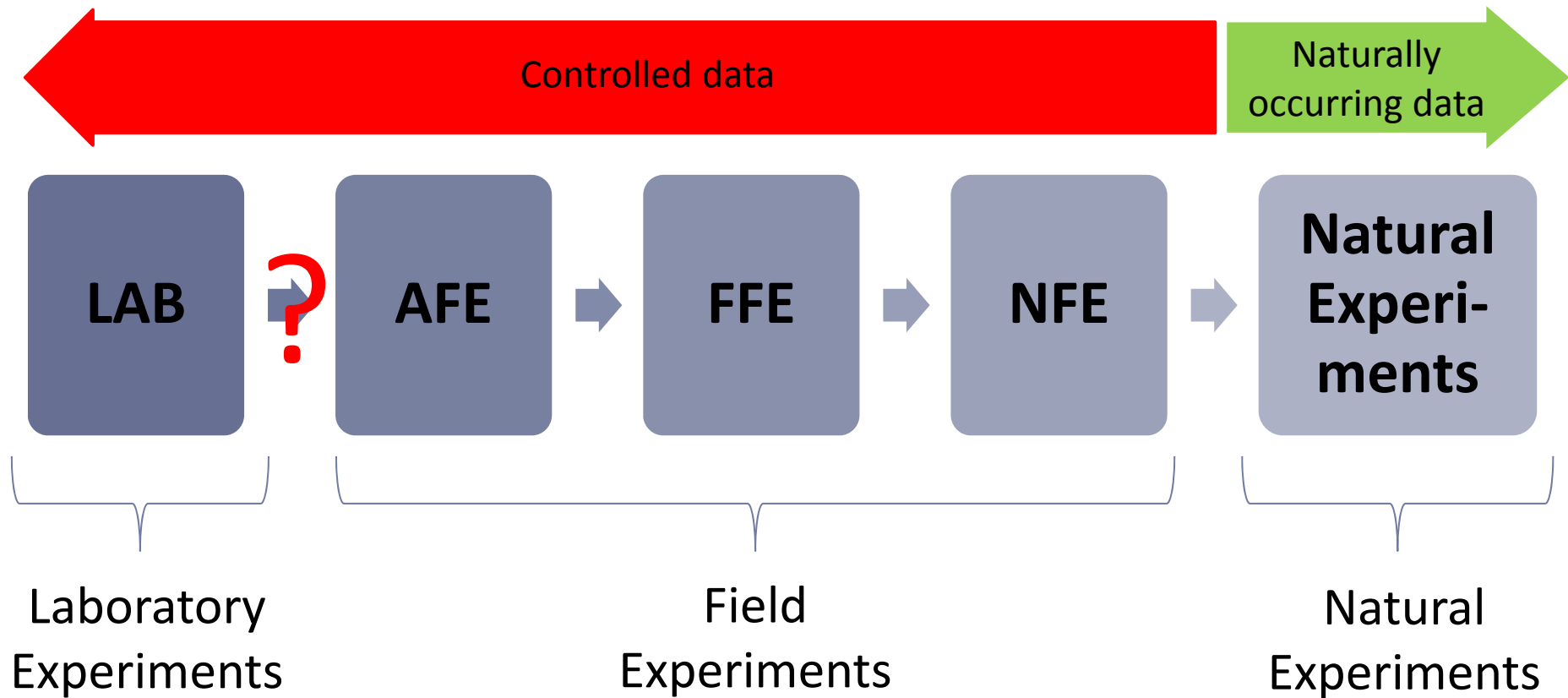
Conclusion: Deal or No Deal Exchange

- ▶ EUT - an individual is exactly indifferent between accepting and rejecting the exchange offer;
- ▶ CPT - an individual should always reject the exchange offer due to the assumption of loss aversion.
- ▶ We find that the assumption of loss aversion is violated by 73%, 47% and 43% of contestants who receive exchange offers in the French, Italian and British version of the show respectively.
- ▶ Thus, contestants do not appear to be predominantly loss averse when dealing with lotteries involving large stakes.



Summary

- ▶ We have looked at field experiments and natural experiments and their place in Experimental Economics



▶ *Control Axis based on Levitt & List (2009)*

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If you want to know more

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