Behavioural Economics and Housing Decisions

Lecture 2: Behavioural Science Toolbox

By Helen Bao

Session outline

- Behavioural sciences defined
- Behavioural theories and models
- Behavioural research methods
- Applications of behavioural insights in housing studies
- The way forward

Behavioural Sciences Defined

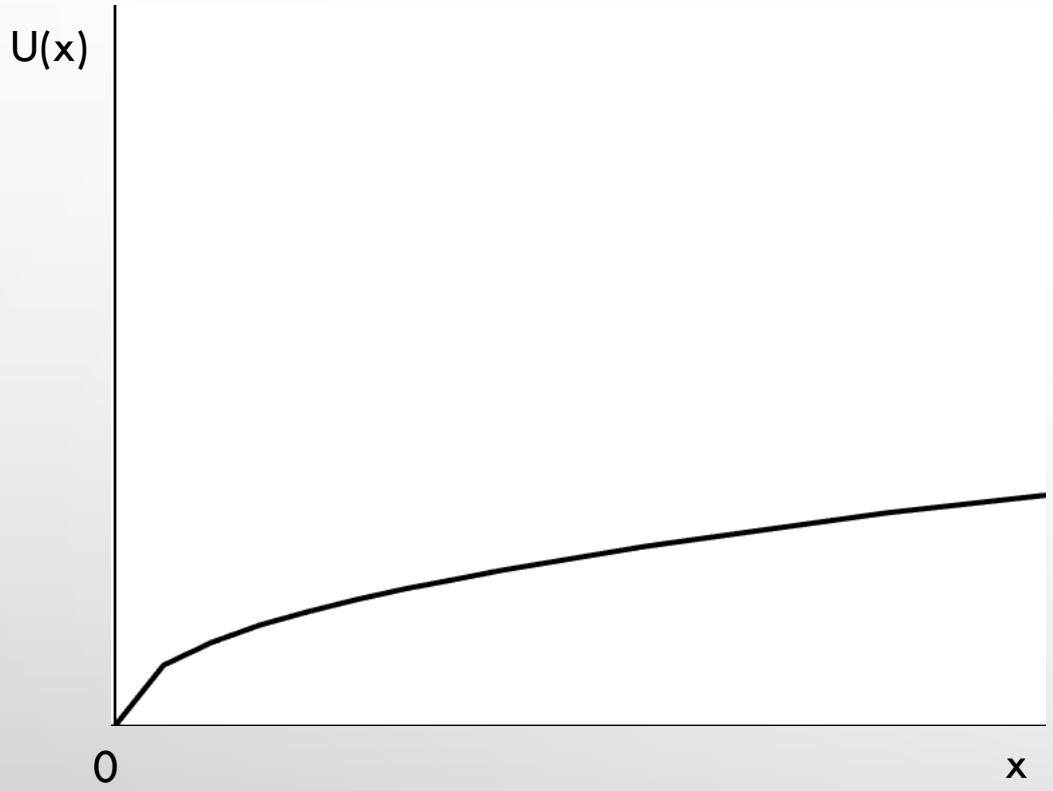
- A range of inter-related academic disciplines (behavioural economics, psychology, social anthropology, neuroscience, biology, …)
- Seek to understand how individuals take decisions in practice and how they are likely to respond to options
- Enable us to design policies or interventions that can encourage, support and enable people to make better choices for themselves and society.

Source: http://www.behaviouralinsights.co.uk/

Behavioural Sciences Defined

- Behavioural interventions are most useful when neither the visible hand nor the invisible hand is working
- Visible hand: government regulations and laws
- Invisible hand: economic incentives (financial incentives mainly)
- Behavioural interventions:
  - the empathetic hand, targeting the psychological and/or social aspects of decision making
  - Inevitably context-specific and idiosyncratic

Nature of the Standard Model



Example: What to drink before this lecture – coffee or beer?

Decision x	State of the World s_i	Probability $p(s_i)$	Payoff $U(x\|s_i)$
Coffee	Interesting	0.8	10
	Boring	0.2	2
Beer	Interesting	0.8	6
	Boring	0.2	4

- Expected Utility
  - Coffee: $\sum_{i=1}^{2} U(x|s_i)\times p(s_i) = 8.4$
  - Beer: $\sum_{i=1}^{2} U(x|s_i)\times p(s_i) = 5.6$

The expected utility theory: $Max \sum_{i=1}^{k} U(x|s_i)\times p(s_i)$

Limitations of the Standard Model

- Why are people delighted to hear they are going to get a 10% raise in salary, and then furious to find out that a colleague is going to get 15%? (Reference Dependence)
- Why do sellers often value their goods or assets much higher than buyers? (Endowment Effect)
- Why is someone unwilling to spend £500 for a product, but then delighted when their spouse buys them the same product for the same price using their joint bank account? (Mental Accounting)
- Why is the return on stocks so much higher on average than the return on bonds? (Equity Premium Puzzle)
- …

Behavioural Theories & Models – Prospect Theory

- Developed for simple prospects with monetary outcomes and stated probabilities
- Two phases: an early phase of editing and a subsequent phase of evaluation
- The editing phase consists of a preliminary analysis of the offered prospects, which often yields a simpler representation of these prospects.
- The evaluation phase: the edited prospects are evaluated and the prospect of highest value is chosen.

- *Kahneman, D. and A. Tversky (1979). "Prospect Theory: An Analysis of Decision under Risk." Econometrica* ***47****(2): 263-291.*
- *Tversky, A. and D. Kahneman (1992). "Advances in Prospect-theory - Cumulative Representation of Uncertainty." Journal of Risk and Uncertainty* ***5****(4): 297-323.*

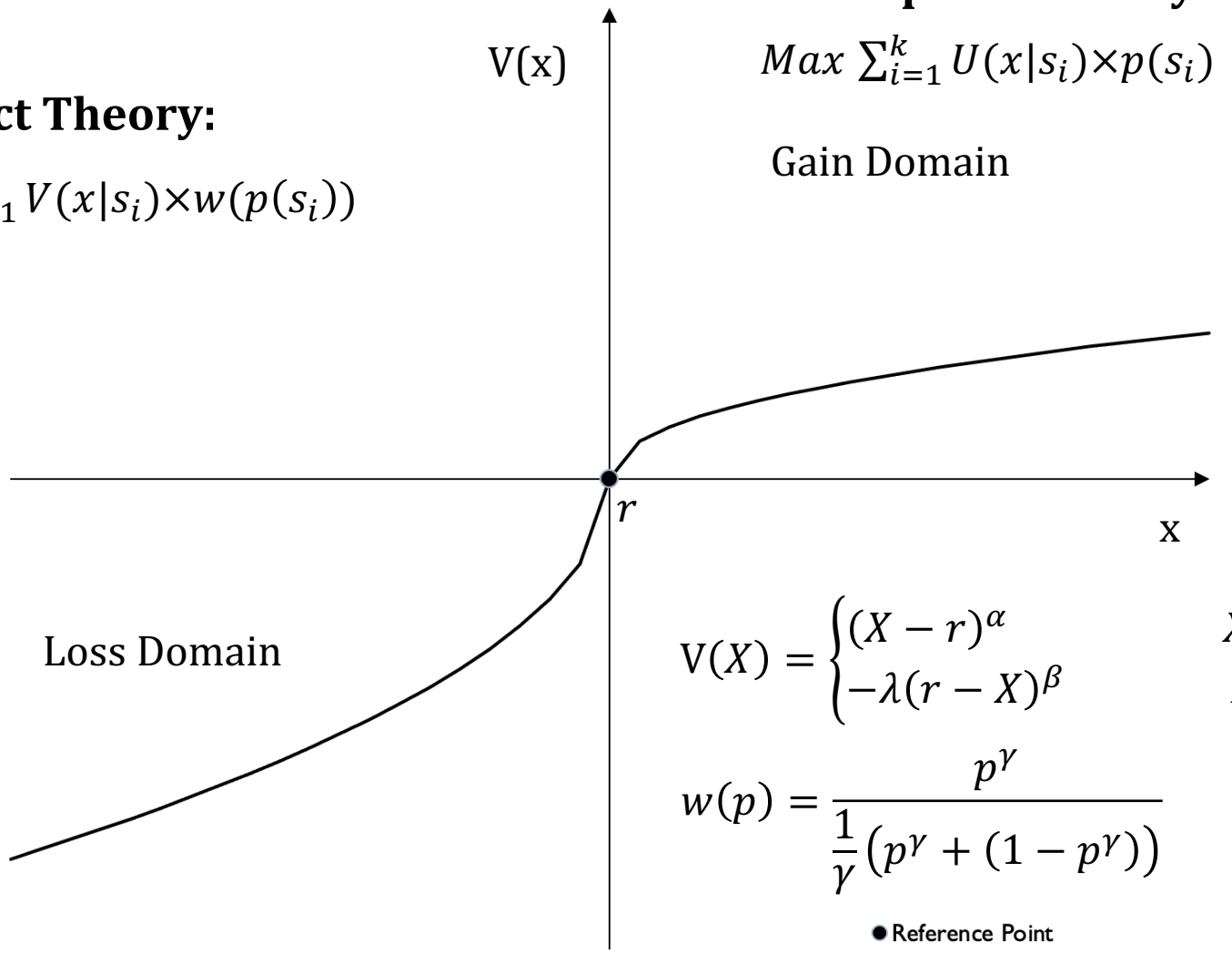
Prospect Theory

The expected utility theory:

$Max \sum_{i=1}^{k} U(x|s_i) \times p(s_i)$

Prospect Theory:

$Max \sum_{i=1}^{k} V(x|s_i) \times w(p(s_i))$



$$V(X) = \begin{cases} (X-r)^{\alpha} & X \geq r \\ -\lambda(r-X)^{\beta} & X < r \end{cases}$$

$$w(p) = \frac{p^{\gamma}}{\frac{1}{\gamma}\left(p^{\gamma} + (1-p^{\gamma})\right)}$$

Prospect Theory - Reference Points

- **Formation**
  - Expectation: expected status
  - Status quo: current status
  - Internal reference: aspiration, goals, experience, …
  - External reference: social comparison
- **Adaptation**
  - Happiness treadmill
  - We update our reference points constantly

$$\mathrm{V}(X) = \begin{cases} (X-r)^{\alpha} & X \geq r \\ -\lambda(r-X)^{\beta} & X < r \end{cases}$$

Prospect Theory – Loss Aversion

Nature – We hate to loss more than we love to win

$$V(X) = \begin{cases} (X - r)^{\alpha} & X \geq r \\ -\lambda(r - X)^{\beta} & X < r \end{cases}$$

Neuroeconomic foundation

- gains: ventral and dorsal striatum
- losses: insula, amygdala

Empirical evidence

- effect size: > 2
- asymmetric price elasticities
- asymmetric WTA and WTP (endowment effect)
- disposition effect

Prospect Theory – Decision Weighting

Nature

- reasons for difference between objective and subjective probabilities: estimation problems, weighting

$$w(p) = \frac{p^{\gamma}}{\frac{1}{\gamma}\left(p^{\gamma} + (1 - p^{\gamma})\right)}$$

Neuroeconomic foundation

- correlation between behavioural non-linearities in gambling tasks and non-linear striatal response

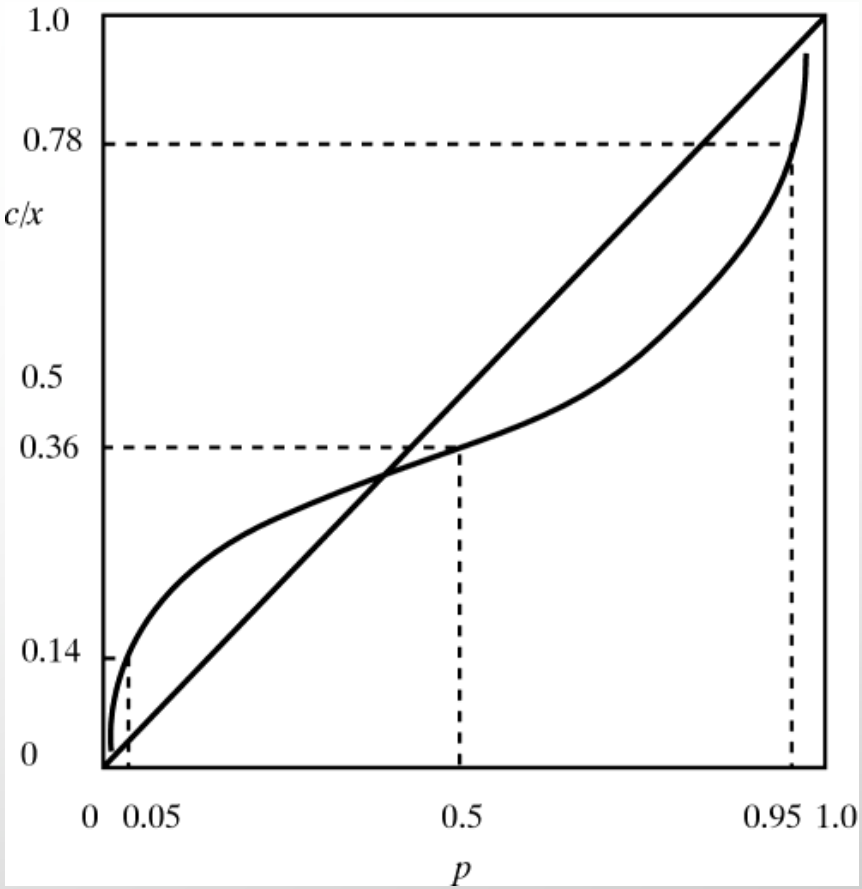
Empirical evidence

- Four – fold attitude to risk, according to gain/loss and low/high probability.

Prospect Theory – Decision Weighting

Prospect	Description	EV ($)	Median CE ($)	Risk Attitude
(0,.05; $100,.95)	Gain, high p	95	78	averse
(0,.05;-$100,.95)	Loss, high p	-95	-84	seeking
(0,.50; $100,.50)	Gain, med p	50	36	averse
(0,.50; -$100,.50)	Loss, med p	-50	-42	seeking
(0,.95; $100,.05)	Gain, low p	5	14	seeking
(0,.95; -$100,.05)	Loss, low p	-5	-8	averse

$$w(p) = \frac{p^{\gamma}}{\frac{1}{\gamma}\left(p^{\gamma} + (1 - p^{\gamma})\right)}$$



Empirically derived PT probability weighting (gain domain only)

Behavioural Theories & Models – Mental Accounting

Mental accounting: set of cognitive operations used to code, categorize and evaluate financial activities.

- **Framing and editing** - perception of outcomes
- **Budgeting and fungibility** - assignment of activities to specific accounts
- **Choice bracketing and dynamics** - determination of the time periods to which different mental accounts relate

- *Thaler, R. (1985). "Mental Accounting and Consumer Choice." Marketing Science **4**(3): 199-214.*
- *Thaler, R. H. (2008). "Mental accounting and consumer choice." Marketing Science **27**(1): 15-25.*
- *Thaler, R. H. (1999). "Mental accounting matters." Journal of Behavioral Decision Making 12(3): 183-206.*

Mental Accounting – Framing and Editing

Implications of Prospect Theory

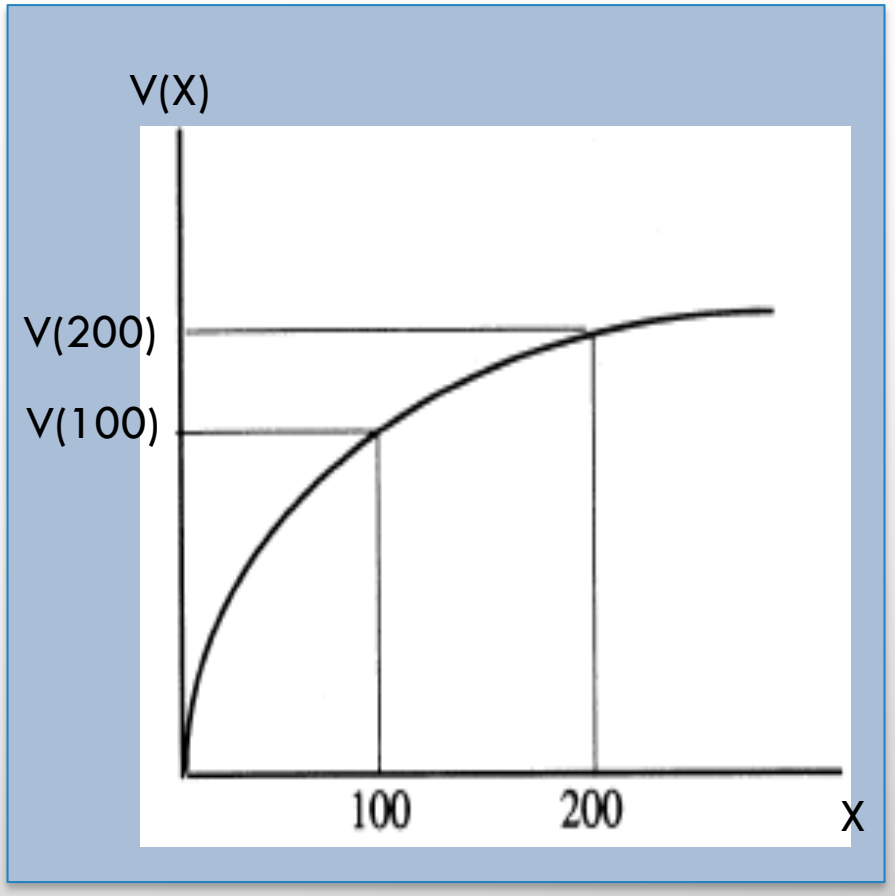
Many transactions are complex, involving several components, simultaneous or sequential; hence:

- **Segregate gains** (because the gain function is concave due to diminishing marginal sensitivity).
- **Integrate losses** (because the loss function is convex, due to diminishing marginal sensitivity).
- **Integrate smaller losses with larger gains** (to offset loss aversion).
- **Segregate small gains from larger losses** (value of a small gain may exceed that of slightly reducing a large loss, dimin. marginal sensitivity).

Mental Accounting – Framing and Editing

- **Segregate gains**
  - Gain function is concave due to diminishing marginal sensitivity

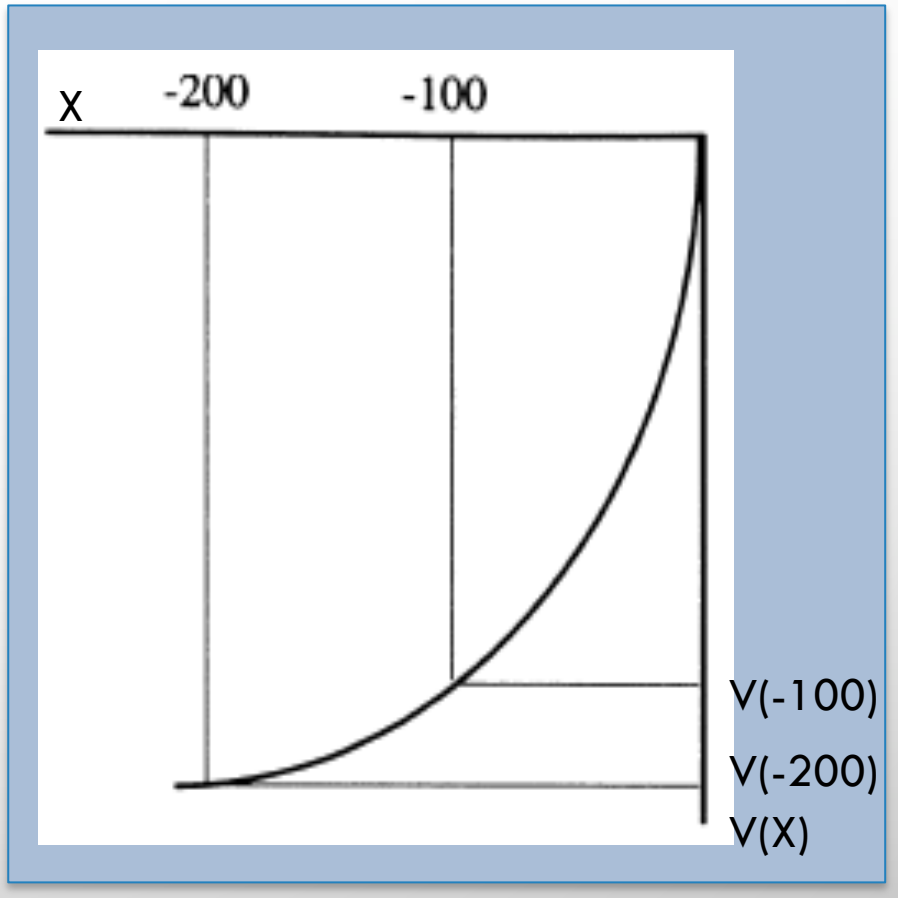
    $V(2X) < 2\,V(X)$
  - Example:
    - $V(200) < 2\,V(100)$
    - win two lotteries that pay \$50 and \$25 respectively, vs. win a single lottery paying \$75



Mental Accounting – Framing and Editing

- **Integrate losses**
  - Loss function is convex, due to diminishing marginal sensitivity

    V(2X) > 2 V(X)
  - Example:
    - V(-200) > 2 V(-100)
    - A parking ticket of $200 vs. two parking tickets of $100 each



Mental Accounting – Framing and Editing

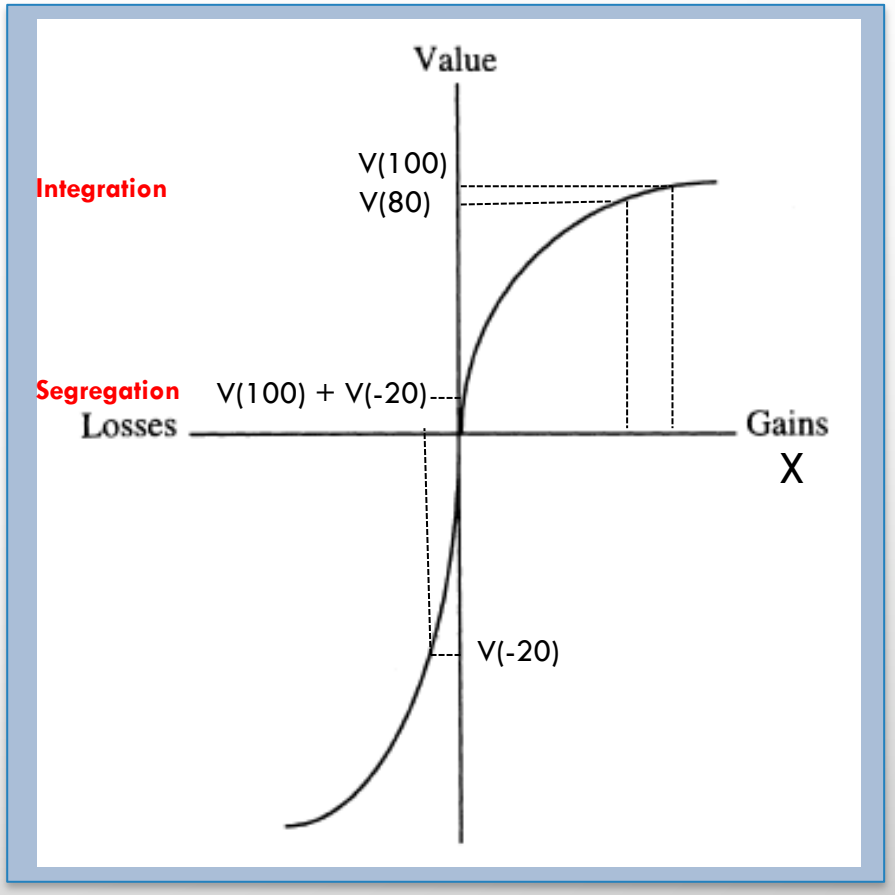
- **Integrate smaller losses with larger gains**
  - to offset loss aversion

    $V(X) > V(X - Y) - V(-Y)$

    $V(X - Y) > V(X) + V(-Y)$
  - Example:

    $V(80) > V(100) + V(-20)$
  - Example:

    Win a $100,000 lottery and pay 20% income tax afterwards vs. Win a $80,000 lottery but tax free



Mental Accounting – Framing and Editing

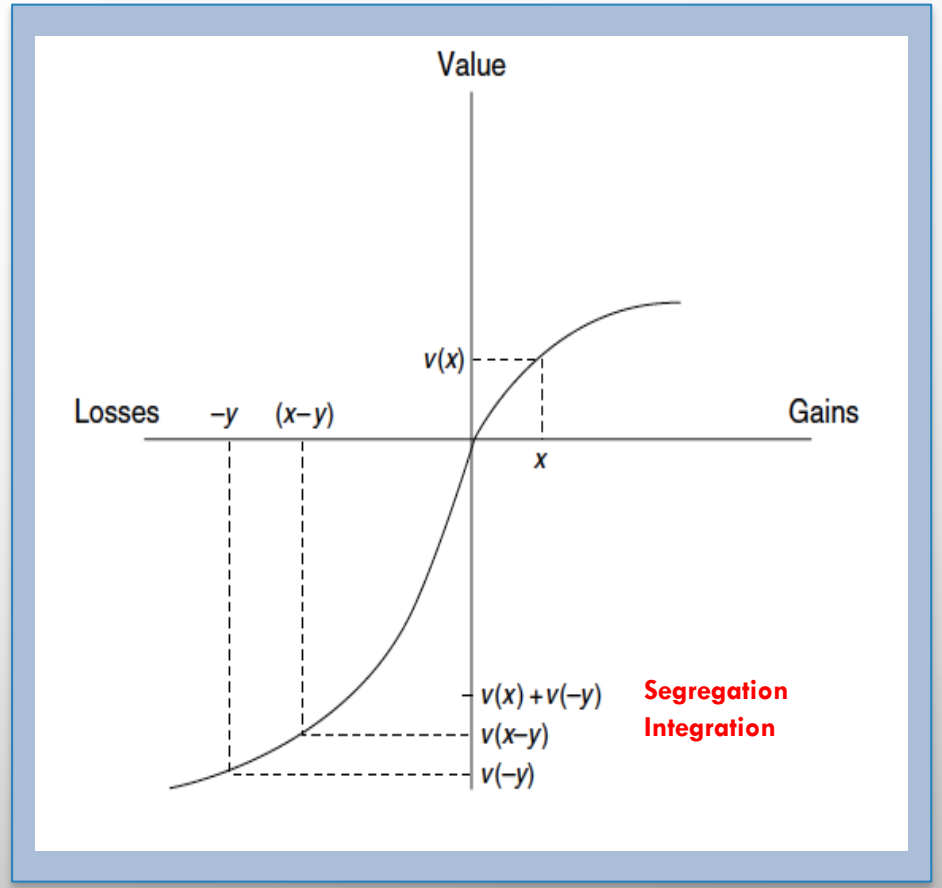
- **Segregate small gains from larger losses**
  - Value of a small gain may exceed that of slightly reducing a large loss, dimin. marginal sensitivity

    $V(X) > V(X - Y) - V(-Y)$

    $V(X) + V(-Y) > V(X - Y)$
  - Example:

    $V(20) + V(-100) > V(-80)$
  - Example:

    A $1000 necklace with a $100 coupon



Mental Accounting – Budgeting

- **Income budgeting**
  - Expenses on children‘s clothing are more sensitive to child benefits adjustments)
  - Tax rebate are not spent the same way as free cash

- **Wealth budgeting**
  - **Standard model:** income smoothing (life-cycle, Permanent Income Hypothesis - PIH) – young and old should dissave
  - **Empirical evidence:**
    - short time horizons
    - spending over-sensitive to current income
    - lack of fungibility, assets classified according to liquidity, corresponding marginal propensity to consume (MPC) – from 1 to nearly zero.

Mental Accounting – Fungibility

- **Lack of Fungibility in many real-life decision-making processes**

- **Credit cards vs cash**
  - higher willingness to pay (WTP) when using credit cards
  - concurrent credit card debt and savings

- **Emotional accounting with life insurance payment**
  - hedonic avoidance(don't buy fun)
  - Laundering (spend on good purposes, moral cleansing)

Mental Accounting – Choice Dynamics

- **Choice bracketing: individuals segregate or aggregate choices over time periods**

- **Opening and closing accounts**
  - Reluctant to close an account and realize losses: Disposition effect
  - Credit cards payment: salience and aggregation
  - Myopic loss aversion: equity premium puzzle
  - End-of-the-day effect (gambling): close mental account by the end of the day and loss averse. In lose domain so quite risk seeking. Bet on the long-shot
  - Diversification bias (1/n Heuristic) : simultaneous choices are much more diversified than sequential choices. Significant implication to public policy making such as retirement saving plans as people can be manipulated easily.

Behavioural Theories & Models – Nudges

- Nudge has two components: libertarian paternalism and choice architecture
- Paternalism: to help people make the choice they would select if they were fully informed and unaffected by arousal or temptation.
- Libertarian: no one is ever forced to do anything, free-will.
- Choice architecture: the environment in which people make decisions
- Nudges: features of the choice architecture that influence the decisions people make without changing either objective payoffs or incentives (neither the visible nor the invisible hands).

- *Thaler, R. H. and C. R. Sunstein (2008). Nudge : improving decisions about health, wealth, and happiness. New Haven, Yale University Press.*
- *Thaler, R. H. (2018). "From Cashews to Nudges: The Evolution of Behavioral Economics." American Economic Review 108(6): 1265-1287.*

Nudges – Applications and Impacts

- Behavioural Insights Team
- (UK, 2010)

- Behavioural Insights unit
- (NSW, Australia, 2014)

- Social and Behavioral Sciences Team
- (USA, 2015)

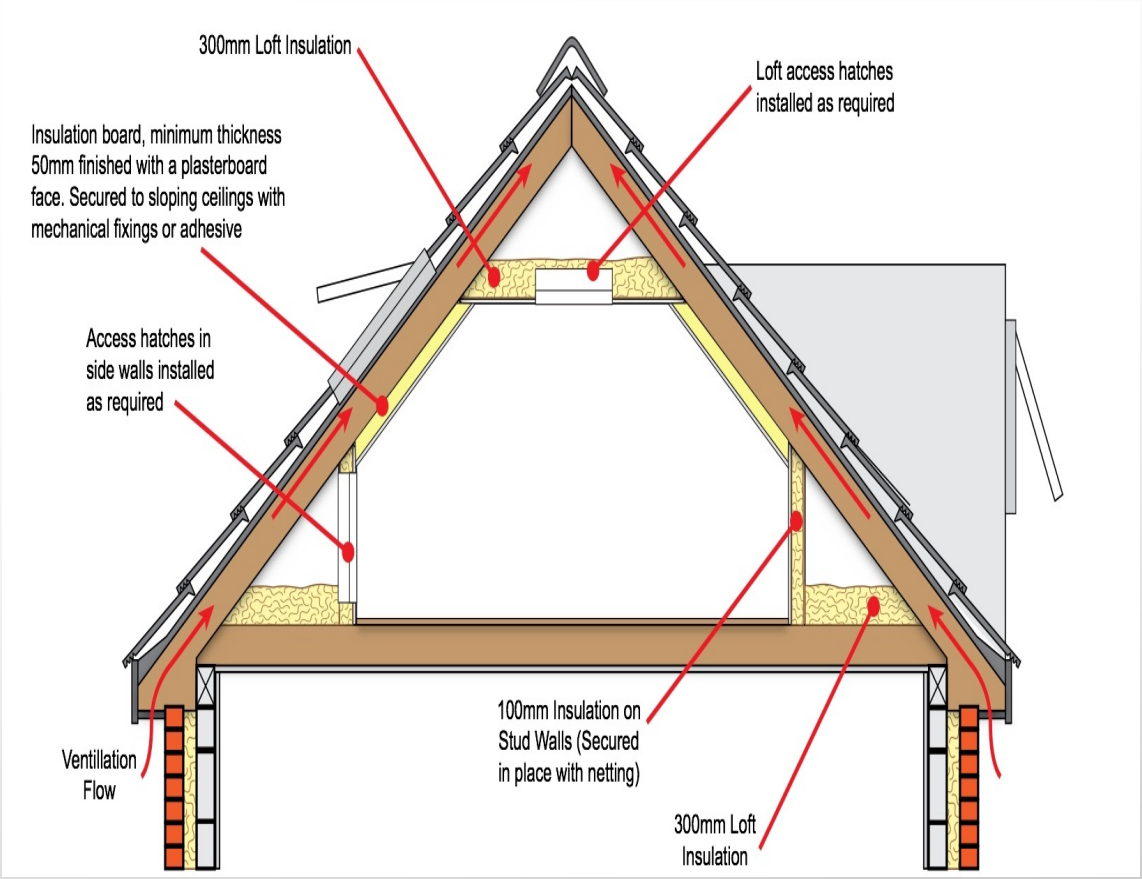
Behavioural Insight Units around the world (over 200 to date):

- Countries: UK, US, Australia, Canada, Netherlands, and Germany, India, Indonesia, Peru, Singapore, …
- International institutions: World Bank, UN agencies, OECD, and EU

Nudges – Applications and Impacts

- An UK Example:
- Increasing Loft Insulation Installation

1. Installation Only: £179
2. Installation + Clearance 1 (Discounted Price) : £369
3. Installation + Clearance 2 (Market Price) : £450



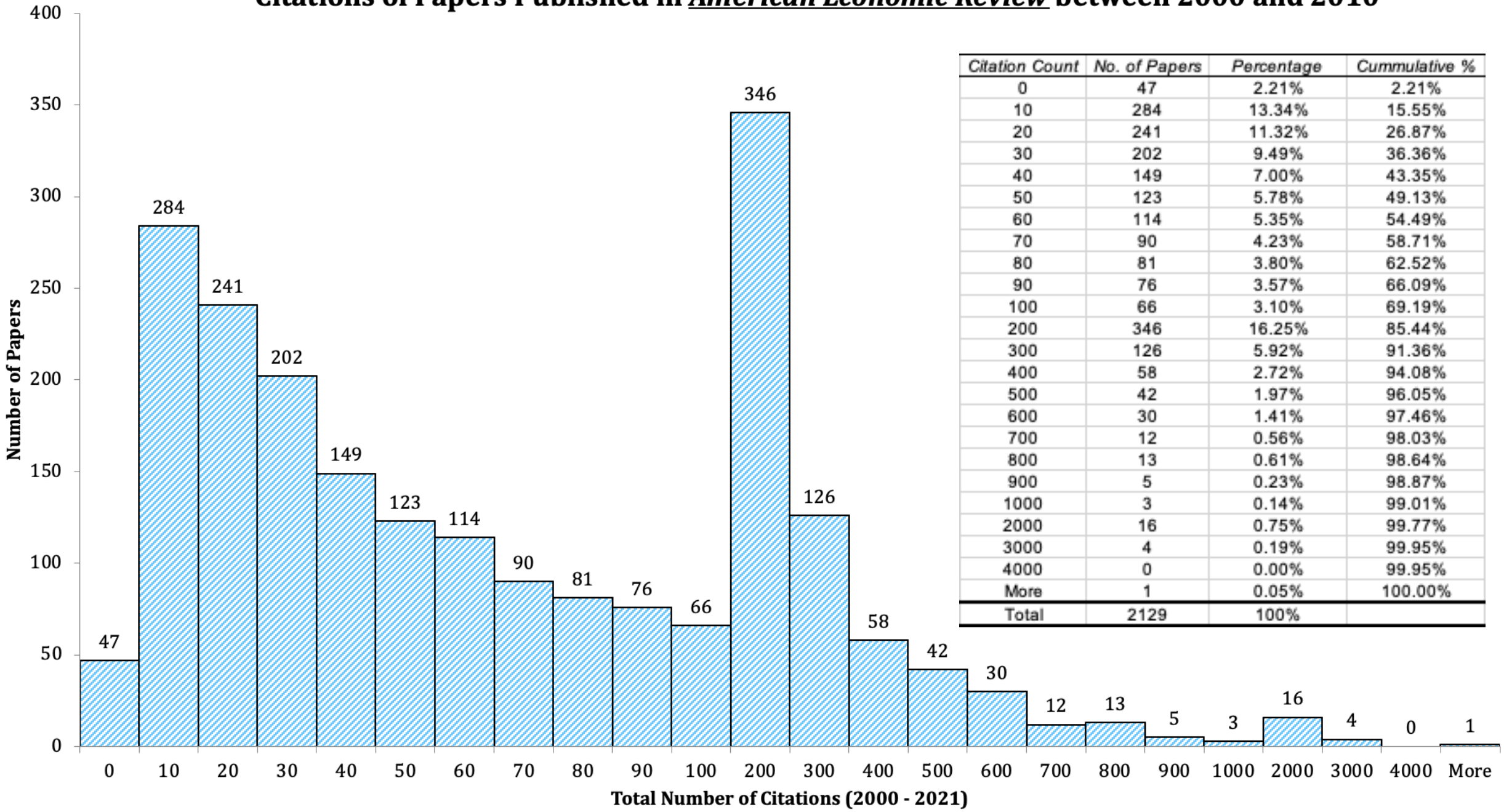
Picture source: http://wellingtoncountylistings.com

Behavioural Models Summary

Paper	1 July 2014	25 July 2015	6 June 2016	8 July 2017	19 July 2018	29 Sept 2019	28 July 2021	11 July 2022	4 July 2023
Original PT	9645	10889	12512	13875	17242	19196	23132	25534	27518
Kahneman & Tversky (1979)	(29524)	(36276)	(40407)	(45503)	(50766)	(55470)	(68613)	(73058)	(78572)
Cumulative PT	2436	2815	3182	3511	4412	4898	6099	6833	7461
Tversky & Kahneman (1992)	(6804)	(8044)	(9026)	(10528)	(11905)	(13472)	(16660)	(18221)	(19724)
Third Generation PT	43	52	64	73	85	93	119	138	155
Schmidt et al (2008)	(90)	(113)	(140)	(170)	(200)	(233)	(281)	(309)	(337)
Mental Accounting	--	--	--	--	--	--	--	--	--
Thaler (1985)	(3758)	(4333)	(4887)	(5661)	(6105)	(6454)	(7767)	(8386)	(8935)
Over-reaction	919	1006	1092	1220	1562	1786	2130	2315	2471
De Bondt and Thaler (1985)	(5285)	(6175)	(6839)	(7616)	(8228)	(9001)	(10684)	(11519)	(12197)
Heteroskedasticity Test	7888	7910	8364	9021	10481	10481	12337	13006	13562
White (1980)	(--)	(21265)	(22817)	(24666)	(26187)	(27698)	(30955)	(32274)	(33619)

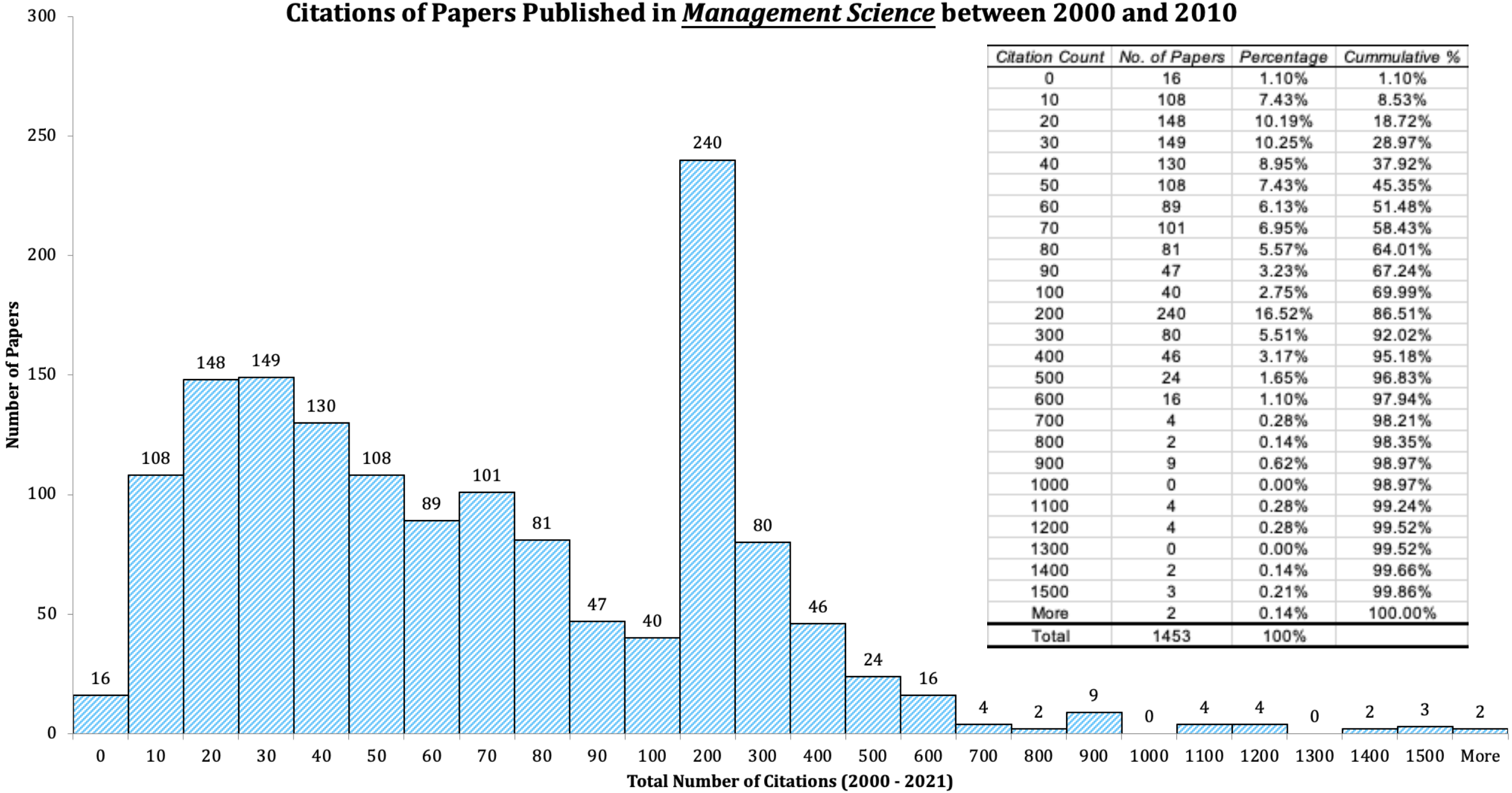
Note: Web of Sciences Citation Statistics (Google Scholar in brackets)

Citations of Papers Published in *American Economic Review* between 2000 and 2010



Citation Count	No. of Papers	Percentage	Cummulative %
0	47	2.21%	2.21%
10	284	13.34%	15.55%
20	241	11.32%	26.87%
30	202	9.49%	36.36%
40	149	7.00%	43.35%
50	123	5.78%	49.13%
60	114	5.35%	54.49%
70	90	4.23%	58.71%
80	81	3.80%	62.52%
90	76	3.57%	66.09%
100	66	3.10%	69.19%
200	346	16.25%	85.44%
300	126	5.92%	91.36%
400	58	2.72%	94.08%
500	42	1.97%	96.05%
600	30	1.41%	97.46%
700	12	0.56%	98.03%
800	13	0.61%	98.64%
900	5	0.23%	98.87%
1000	3	0.14%	99.01%
2000	16	0.75%	99.77%
3000	4	0.19%	99.95%
4000	0	0.00%	99.95%
More	1	0.05%	100.00%
Total	2129	100%	

Citations of Papers Published in *Management Science* between 2000 and 2010



Citation Count	No. of Papers	Percentage	Cummulative %
0	16	1.10%	1.10%
10	108	7.43%	8.53%
20	148	10.19%	18.72%
30	149	10.25%	28.97%
40	130	8.95%	37.92%
50	108	7.43%	45.35%
60	89	6.13%	51.48%
70	101	6.95%	58.43%
80	81	5.57%	64.01%
90	47	3.23%	67.24%
100	40	2.75%	69.99%
200	240	16.52%	86.51%
300	80	5.51%	92.02%
400	46	3.17%	95.18%
500	24	1.65%	96.83%
600	16	1.10%	97.94%
700	4	0.28%	98.21%
800	2	0.14%	98.35%
900	9	0.62%	98.97%
1000	0	0.00%	98.97%
1100	4	0.28%	99.24%
1200	4	0.28%	99.52%
1300	0	0.00%	99.52%
1400	2	0.14%	99.66%
1500	3	0.21%	99.86%
More	2	0.14%	100.00%
Total	1453	100%	

Behavioural Research Methods

- Experiments
  - Testing under ceteris paribus condition
  - Reduces confounds
  - Potential design problems
  - Interpretation of results: ecological validity, cherry-picking
  - Issues: Undergraduate students, hypothetical settings, consumption goods…

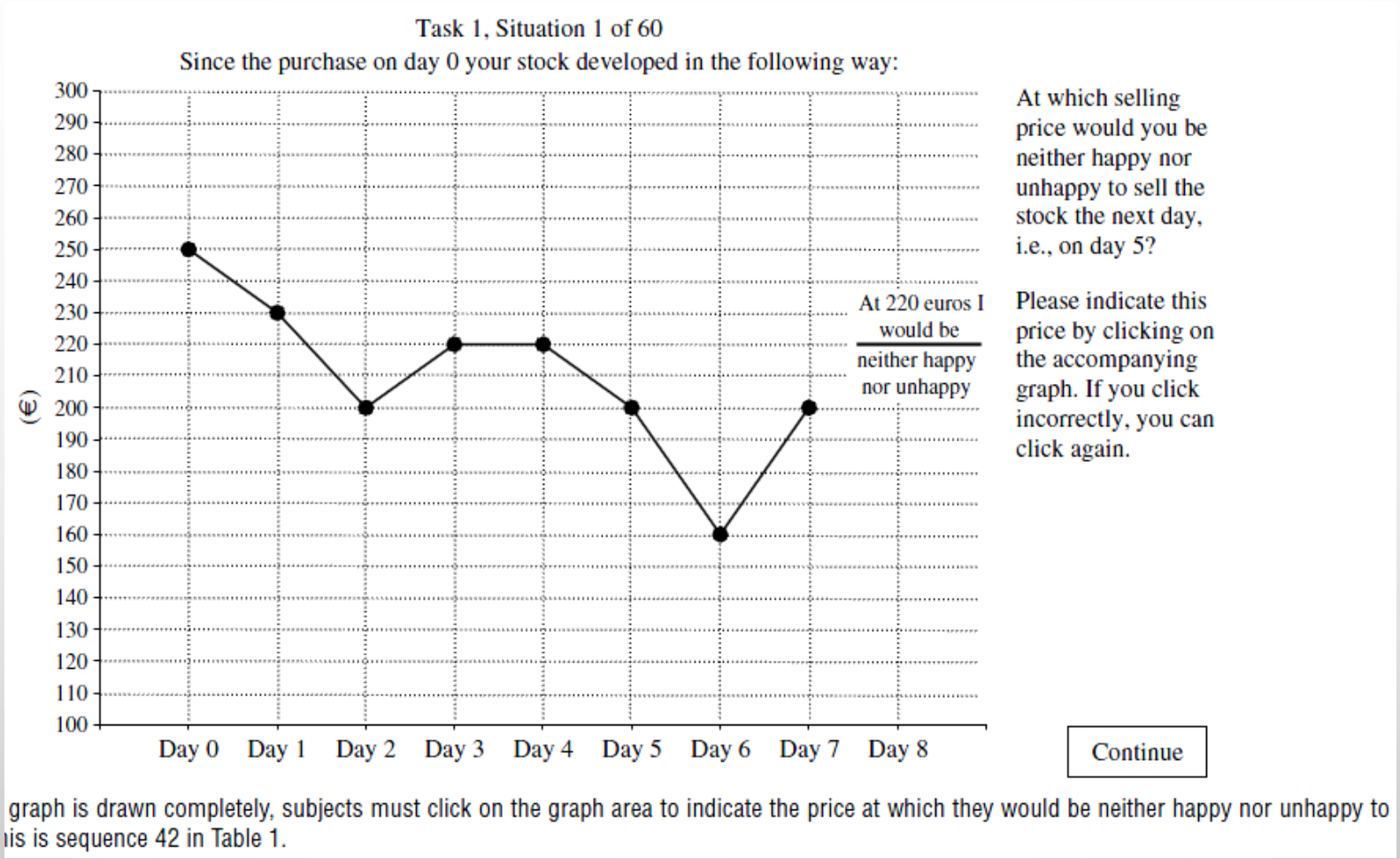
Behavioural Research Methods

- Example: Baucells, M., Weber, M., Welfens, F., 2011, Reference-Point Formation and Updating. *Management Sciences*, 57, 506-519.
  - 55 (20 female) undergraduate students
  - 8 Euros for participation
  - Computer lab

Table 1 The 60 Price Sequences Used in the Experiment

Sequence k	y_1	y_2	y_3	y_4	y_5	y_6	y_7	y_8	y_9	y_{10}	Avg. R_k
1	250	200	150	200							**235.0**
2	150	200	250	200							**182.2**
3	200	150	200								**198.1**
4	150	200	200								**177.9**
5	250	200	200								**235.2**
6	200	250	200								**208.3**
7	250	200	150	200	160	200	240	200			**230.4**
8	150	200	250	200	240	200	160	200			**186.1**
9	250	200	150	210	190	210	200				**232.4**
10	150	200	250	210	190	210	200				**185.7**
11	200	150	200	250							**216.1**
12	200	250	200	150							**193.1**
13	200	200	150								**193.6**
14	200	200	250								**219.1**
15	200	150	170	200	250	230					**211.5**
16	200	250	230	200	150	170					**197.6**
17	170	220	270	220	190	220	250				**211.1**
18	170	220	270	220	250	220	190				**193.3**
19	200	250	250	200							**211.8**
20	200	150	150	200							**200.7**
21	200	250	200	250	200						**213.7**
22	200	150	200	150	200						**193.6**
23	150	150	200	250	200						**185.4**
24	150	200	200	200	200						**181.4**
25	200	250	200	150	150						**193.0**
26	200	200	200	200	150						**191.5**
27	200	190	190	190	190	190	200	250	200	190	**201.6**
28	200	200	200	200	200	200	200	200	200	190	**200.5**
29	190	200	250	200	190	190	190	190	190	200	**199.2**
30	190	200	200	200	200	200	200	200	200	200	**195.0**
31	200	150	200	160	200	240	200				**202.3**
32	200	150	200	190	200	210	200				**200.2**
33	250	200	200	200	200						**228.1**
34	250	250	200	150	200						**237.6**
35	200	200	200	200	250						**217.0**

Behavioural Research Methods



Source: Baucells, M., Weber, M., Welfens, F., 2011, Reference-Point Formation and Updating. *Management Sciences*, 57, 506-519.

Behavioural Research Methods

Table 2 **Each Entry Indicates a Pair of Sequences $j - k$, as Labeled in Table 1**

Factor or pattern	Pairs of sequences				
Purchase price	1-2	3-4	5-6	7-8	9-10
Current price	11-12	3-13	14-6	15-16	17-18
Avg. (intermediate) prices	5-43	4-44	45-46	47-48	49-50
Highest price	23-24	25-26	27-28	29-30	31-32
Lowest price	33-34	35-36	37-38	39-40	41-42
Dashed hope vs. false alarm	6-3	19-20	21-22		
Early vs. late	51-52	53-54	55-56	57-58	59-60

Note. The pairs are designed to study the effect of the factor or pattern in the corresponding row.

Source: Baucells, M., Weber, M., Welfens, F., 2011, Reference-Point Formation and Updating. *Management Sciences*, 57, 506-519.

Behavioural Research Methods

Table 3 **Each Entry Indicates a Pair of Sequences $j - k$, the Unit Effect That a Change in the Row Factor Has on $R_j - R_k$, and the p-Values of a Matched-Pairs Sign Test**

Factor	Pairs of sequences, unit effect and p-value					Avg.
Purchase price	1-2	3-4	5-6	7-8	9-10	
	0.528	0.403	0.537	0.443	0.466	0.48
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Current price	11-12	3-13	14-6	15-16	17-18	
	0.230	0.090	0.215	0.231	0.295	0.21
	(0.000)	(0.035)	(0.000)	(0.000)	(0.000)	
Avg. (intermediate) prices	5-43	4-44	45-46	47-48	49-50	
	0.059	0.142	0.039	0.107	0.118	0.09
	(0.229)	(0.006)	(0.009)	(0.000)	(0.291)	
Highest price	23-24	25-26	27-28	29-30	31-32	
	0.081	0.029	0.022	0.084	0.071	0.06
	(0.049)	(0.090)	(0.864)	(0.522)	(0.585)	
Lowest price	33-34	35-36	37-38	39-40	41-42	
	−0.190	−0.047	−0.008	−0.008	−0.186	−0.09
	(0.126)	(0.627)	(0.871)	(0.090)	(0.001)	

Note. The last column reports the average unit effect.

Source: Baucells, M., Weber, M., Welfens, F., 2011, Reference-Point Formation and Updating. *Management Sciences*, 57, 506-519.

Behavioural Research Methods

➢ Field Studies

- Ecological validity vs. conceptual validity
- Impact of confounds
- Examples:
  - Barseghyan, L., F. Molinari, et al., 2013. The Nature of Risk Preferences: Evidence from Insurance Choices. *American Economic Review,* 103(6): 2499-2529.
  - DellaVigna, S., Malmendier, U., 2006. Paying not to go to the gym. *American Economic Review*, 96, 694-719.
  - List, J.A., 2011. Does Market Experience Eliminate Market Anomalies? The Case of Exogenous Market Experience. *American Economic Review*, 101, 313-317.
  - Pope, D.G., Schweitzer, M.E., 2011. Is Tiger Woods Loss Averse? Persistent Bias in the Face of Experience, Competition, and High Stakes. *American Economic Review*, 101, 129-157.

Behavioural Research Methods

- **Example:** Pope, D.G., Schweitzer, M.E., 2011. Is Tiger Woods Loss Averse? Persistent Bias in the Face of Experience, Competition, and High Stakes. *American Economic Review*, 101, 129-157.
  - Par: a salient reference point
  - Putts: the final shots players take to complete a hole in PGA tours
  - Sample size: 2.5 million putts from 239 tournaments completed between 2004 and 2009
  - Quality of data:
    - Laser measurements of initial and final ball placement (x, y, z coordinates)
    - Restricted to putts attempted for eagle, birdie, par, bogey, or double bogey only
    - Restricted to players who had at least 1,000 putts
    - Included more than 300,000 fixed effects

Behavioural Research Methods

TABLE 3—THE EFFECT OF DIFFERENT SHOT VALUES ON PUTT SUCCESS–ROBUSTNESS CHECKS

	Dependent variable equals 1 if putt was made (OLS estimation)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Putt for eagle	−0.040***	−0.039***	−0.030***	−0.042***	−0.039***	−0.036***	−0.036***	−0.064***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Putt for birdie	**−0.036*** **	**−0.036*** **	**−0.026*** **	**−0.029*** **	**−0.028*** **	**−0.028*** **	**−0.028*** **	**−0.030*** **
	(0.001)	**(0.001)**	**(0.001)**	**(0.001)**	**(0.001)**	**(0.001)**	**(0.001)**	**(0.001)**
Putt for bogey	0.004***	0.005***	0.001	0.003***	0.002***	0.002***	0.002***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Putt for double bogey	−0.007***	−0.006***	−0.005**	−0.003	−0.003	−0.003	−0.002	0.001
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Putt distance: seventh-order polynomial	X	X	X	X	X	X	X	X
Player fixed effects		X	X	X	X	X	X	X
Previous-putts-on-green effects			X	X	X	X	X	X
Tournament-round-hole effects				X				
4 hole-location effects					X			
8 hole-location effects						X		
16 hole-location effects							X	
Score-on-hole-if-make-putt effects								X
R^2	0.598	0.598	0.599	0.603	0.612	0.626	0.646	0.670
Observations	2,525,161	2,525,161	2,525,161	2,525,161	2,525,161	2,525,161	2,525,161	2,525,161

Source: Pope, D.G., Schweitzer, M.E., 2011. Is Tiger Woods Loss Averse? Persistent Bias in the Face of Experience, Competition, and High Stakes. American Economic Review, 101, 129-157.

Behavioural Research Methods

TABLE 7—UNDERSTANDING THE COSTS OF MISSING BIRDIE PUTTS

2007 Rank	Golfer	Tournaments played	Scoring average (72 holes)	Tournament earnings (2007)	Additional earnings if scored 1 stroke better	% earnings increase if scored 1 stroke better
1	Tiger Woods	16	69.1	$10,867,052	$945,532	8.70
2	Vijay Singh	27	70.39	$4,728,376	$584,550	12.36
3	Jim Furyk	23	70.21	$4,154,046	$1,530,232	36.84
4	Phil Mickelson	22	70.39	$5,819,988	$659,750	11.34
5	K. J. Choi	25	70.4	$4,587,859	$362,450	7.90
6	Rory Sabbatini	23	70.49	$4,550,040	$902,567	19.84
7	Zach Johnson	23	70.95	$3,922,338	$347,000	8.85
8	Charles Howell III	26	71.47	$2,832,091	$374,500	13.22
9	Brandt Snedeker	29	70.5	$2,836,643	$393,650	13.88
10	Adam Scott	19	70.96	$3,413,185	$221,400	6.49
11	Scott Verplank	23	70.56	$3,114,289	$490,750	15.76
12	Steve Stricker	23	70.19	$4,663,077	$1,077,000	23.10
13	Sergio Garcia	19	70.45	$3,721,185	$784,807	21.09
14	Woody Austin	27	70.84	$2,887,596	$399,066	13.82
15	Hunter Mahan	27	70.78	$2,858,995	$339,533	11.88
16	John Rollins	29	70.97	$2,488,891	$1,005,300	40.39
17	Boo Weekley	29	70.95	$2,613,211	$883,633	33.81
18	Aaron Baddeley	23	70.96	$3,441,119	$277,040	8.05
19	Ernie Els	16	70.5	$2,705,715	$734,633	27.15
20	Mark Calcavecchia	28	71.11	$2,993,332	$504,533	16.86
Average		23.85	70.6	$3,959,951	$640,896	17.6

Source: Pope, D.G., Schweitzer, M.E., 2011. Is Tiger Woods Loss Averse? Persistent Bias in the Face of Experience, Competition, and High Stakes. American Economic Review, 101, 129-157.

Behavioural Research Methods

- **Simulations**
  - Ecological validity and Conceptual validity
  - Computationally intensive
  - Simulation design is crucial
  - Examples:
    - Li, Y., Yang, L.Y., 2013. Prospect theory, the disposition effect, and asset prices. *Journal of Financial Economics*, 107, 715-739.

Behavioural Research Methods

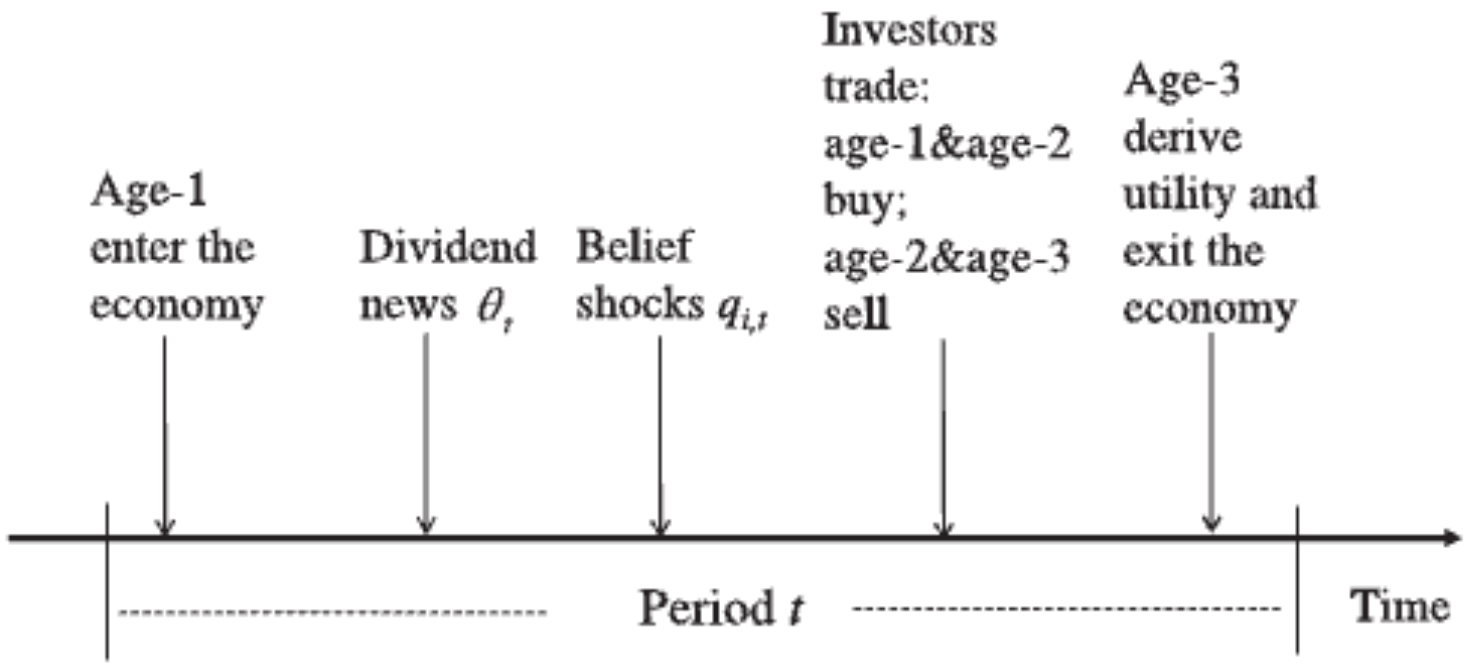


Fig. 1. This figure plots the order of events in period t.

$$U_t^i = E_t^i[v(X_{3,i})], \tag{4}$$

where

$$X_{3,i} = W_{3,i} - R_f^2 W_{1,i}, \tag{5}$$

$$v(x) = \begin{cases} x^\alpha & \text{if } x \geq 0, \\ -\lambda(-x)^\alpha & \text{if } x < 0, \end{cases} \tag{6}$$

with $0 < \alpha \leq 1$ and $\lambda \geq 1$.

Table 1
Baseline technology parameter values.

We take one period to be six months. In each period, a good dividend shock and a poor dividend shock are equally likely; that is, $\pi = 0.5$. Parameters θ_H and θ_L are calibrated to generate an *annualized* dividend growth rate with a mean of 2.24% and a volatility of 25.97%.

Parameters	Values
Risk-free rate	
R_f	1.0191
Dividend parameters	
π	0.5
θ_H	1.1913
θ_L	0.8310

Source: Li, Y., Yang, L.Y., 2013. Prospect theory, the disposition effect, and asset prices. Journal of Financial Economics, 107, 715-739.

Behavioural Research Methods

Variables	$\alpha = 0.3$	$\alpha = 0.5$	$\alpha = 0.88$	$\alpha = 1$
Disposition effect				
PGR	0.55	0.56	0.51	0.50
PLR	0.28	0.35	0.45	0.50
DispEffect	1.93	1.61	1.13	1.00
Momentum effect				
$E(R_{t+1} \mid \theta_t = \theta_H)$	1.0628	1.0508	1.0322	1.0191
$E(R_{t+1} \mid \theta_t = \theta_L)$	1.0066	1.0180	1.0246	1.0191
MomEffect	5.62%	3.28%	0.76%	0.00%
WML	5.48%	3.21%	0.76%	0.00%
Turnover				
$Corr(R_t, Q_t)$	0.65	0.81	0.92	0.00
Mean & volatility of excess returns				
$E(R_t - R_f)$	1.57%	1.54%	0.93%	0.00%
$\sigma(R_t - R_f)$	16.45%	16.77%	17.66%	18.16%
Stock holdings				
$E[H_1(S_t)]$	0.45	0.47	0.49	0.50
$E[H_{20}(S_t)]$	0.29	0.28	0.27	0.25

Source: Li, Y., Yang, L.Y., 2013. Prospect theory, the disposition effect, and asset prices. Journal of Financial Economics, 107, 715-739.

Behavioural Research Methods

Variables	$\lambda = 1$	$\lambda = 2.25$	$\lambda = 3$	$\lambda = 4$
Reversed disposition effect				
PGR	0.50	0.41	0.36	0.31
PLR	0.50	0.42	0.41	0.39
DispEffect	1.00	0.95	0.89	0.81
Reversal effect				
$E(R_{t+1} \mid \theta_t = \theta_H)$	1.0191	1.0555	1.0723	1.0932
$E(R_{t+1} \mid \theta_t = \theta_L)$	1.0191	1.0580	1.0779	1.1034
MomEffect	0.00%	−0.25%	−0.56%	−1.03%
WML	0.00%	−0.23%	−0.54%	−0.91%
Turnover				
$Corr(R_t, Q_t)$	0.00	−0.95	−0.96	−0.96
Mean & volatility of excess returns				
$E(R_t - R_f)$	0.00%	3.77%	5.61%	7.91%
$\sigma(R_t - R_f)$	18.16%	18.93%	19.39%	20.08%

Source: Li, Y., Yang, L.Y., 2013. Prospect theory, the disposition effect, and asset prices. Journal of Financial Economics, 107, 715-739.

Behavioural Research Methods

Table 4
Quantitative analysis.

The table reports model-implied trading, asset prices, and volume for various empirical values of parameter α, while parameter λ is set at 2.25, the value estimated by Tversky and Kahneman (1992). One period is taken to be six months. The technology parameter values are fixed at the values in Table 1. PGR and PLR are the simulated "proportion of gains realized" and "proportion of losses realized." We define, $DispEffect = PGR/PLR$, and if $DispEffect > 1$, then a disposition effect exists. R_t and Q_t are stock returns and turnover (or aggregate selling) in period t. $MomEffect = (R_{t+1}|\theta_t = \theta_H) - E(R_{t+1}|\theta_t = \theta_L)$. WML is the simulated average momentum portfolio return in the multi-stock setting. If $MomEffect > 0$ and $WML > 0$, then a momentum effect exists. $E(\cdot)$, $Corr(\cdot,\cdot)$, and $\sigma(\cdot)$ denote the mean, correlation, and standard deviation, respectively. The empirical values of PGR/PLR and momentum are taken from Dhar and Zhu (2006) and Jegadeesh and Titman (1993). The empirical values of $Corr(R_t,Q_t)$, $(R_t - R_f)$, and $\sigma(R_t - R_f)$ are computed based on NYSE/Amex data from 1926–2009.

	Wu and Gonzalez (1996)	Liu (in press)	Wu and Gonzalez (1996)	Tanaka, Camerer, and Nguyen (2010)	Tversky and Kahneman (1992)	Empirical
Variables	$\alpha = 0.37$	$\alpha = 0.48$	$\sigma = 0.52$	$\alpha = 0.61$	$\sigma = 0.88$	value
Disposition effect						
PGR	0.40	0.41	0.41	0.41	0.40	0.38
PLR	0.19	0.23	0.24	0.28	0.37	0.17
DispEffect	2.15	1.79	1.68	1.49	1.07	2.24
Momentum effect						
$E(R_{t+1}\|\theta_t = \theta_H)$	1.0948	1.0878	1.0861	1.0805	1.0673	–
$E(R_{t+1}\|\theta_t = \theta_L)$	1.0451	1.0519	1.0545	1.0573	1.0638	–
MomEffect	4.97%	3.59%	3.16%	2.32%	0.34%	–
WML	4.86%	3.52%	3.10%	2.28%	0.34%	5.27%
Turnover						
$Corr(R_t,Q_t)$	0.85	0.88	0.89	0.91	0.95	0.16
Mean & volatility of excess returns						
$E(R_t - R_f)$	5.09%	5.08%	5.02%	4.99%	4.63%	3.84%
$\sigma(R_t - R_f)$	17.21%	17.70%	17.84%	18.12%	18.84%	32.16%

Source: Li, Y., Yang, L.Y., 2013. Prospect theory, the disposition effect, and asset prices. Journal of Financial Economics, 107, 715-739.

Behavioural Research Methods

- **Mixed methods and the focus on external validity**
  - Combinations of multiple methods: lab experiment, survey, field experiment, simulations, games, …
    - Galizzi, M. M. and D. Navarro-Martinez (2019). "On the External Validity of Social Preference Games: A Systematic Lab-Field Study." *Management Science* 65(3): 976-1002.

Behavioural Research Methods

- Galizzi, M. M. and D. Navarro-Martinez (2019). "On the External Validity of Social Preference Games: A Systematic Lab-Field Study." *Management Science* 65(3): 976-1002.
  - Self-reported social behaviours performed in the past, decisions in seven experimental social preference games, and behaviours in five naturalistic field situations that we created.
  - Survey: Self-Report Altruism (SRA) scale, 20 items (questions)
  - Lab experiments: dictator game (2), ultimatum game (2), trust game (2), and public good game (1)
  - Field experiments: help moving boxes, lend mobile phones, and donate to children's charity, environmental charity, and lab donation.
  - The extent to which the games can explain the self-report measures and the field behaviours
  - The overarching conclusion is that the games do a poor job explaining both the self-report measures and the field behaviours

Survey Questions

Table B.1. The Self-Report Altruism (SRA) Scale (Instructions: Tick the Category on the Right That Conforms to the Frequency With Which You Have Carried Out the Following Acts)

	Never	Once	More than once	Often	Very often
1. I have helped push a stranger's car out of the snow.					
2. I have given directions to a stranger.					
3. I have made change for a stranger.					
4. I have given money to a charity.					
5. I have given money to a stranger who needed it (or asked me for it).					
6. I have donated goods or clothes to a charity.					
7. I have done volunteer work for a charity.					
8. I have donated blood.					
9. I have helped carry a stranger's belongings (books, parcels, etc.).					
10. I have delayed an elevator and held the door open for a stranger.					
11. I have allowed someone to go ahead of me in a lineup (at Xerox machine, in the supermarket).					
12. I have given a stranger a lift in my car.					
13. I have pointed out a clerk's error (in a bank, at the supermarket) in undercharging me for an item.					
14. I have let a neighbour whom I didn't know too well borrow an item of some value to me (e.g., a dish, tools, etc.).					
15. I have bought "charity" Christmas cards deliberately because I knew it was a good cause.					
16. I have helped a classmate who I did not know that well with a homework assignment when my knowledge was greater than his or hers.					
17. I have, before being asked, voluntarily looked after a neighbour's pets or children without being paid for it.					
18. I have offered to help a handicapped or elderly stranger across a street.					
19. I have offered my seat on a bus or train to a stranger who was standing.					
20. I have helped an acquaintance to move households.					

Altruism Games

1. Dictator Game (DG1): Two-player game in which player 1 decides how to divide £10 between the self and player 2. Player 2 simply receives the allocation established by player 1. Half of the participants were player 1 and the other half player 2.
2. Dictator Game (DG2): Like Dictator Game 1, but switching the roles (and matching people with different partners).
3. Ultimatum Game (UG1): Two-player game in which player 1 decides how to divide £10 between him/her and player 2. player 2 decides whether to accept the allocation or not. If the allocation is rejected, both players get nothing. Half of the participants were player 1 and the other half player 2.
4. Ultimatum Game (UG2): Like Ultimatum Game 1, but all of the participants were player 2 and had to respond to the same allocation of £3 for player 2, which was determined by a participant who was player 1 in a preliminary pilot session.
5. Trust Game (TG1): Two-player game in which player 1 has an endowment of £10 and decides how much of it to send over to player 2. The amount sent over is multiplied by three and given to player 2, who has to decide how much of it to send back to player 1. Half of the participants were player 1 and the other half player 2.
6. Trust Game (TG2): Like Trust Game 1, but all of the participants were player 2 and all of them had to respond to the same amount of £4 sent over by player 1, which was determined by a participant who was player 1 in a preliminary pilot session.
7. Public Good Game (PGG): Four-player game in which all of the players have an endowment of £10 and have to decide simultaneously how much of it to contribute to a common group fund. The overall money in the group fund is then multiplied by two and split between the four players.

Field Experiments

1. **Boxes:** A research assistant stood in an area out- side of the lab and told the participants that he needed help carrying two voluminous (but light) boxes to the basement of the university building where the lab was located. He explicitly asked the participants one by one after they exited the lab if they could help. If the participants said yes, they actually helped him carry the boxes downstairs.
2. **Phone:** A research assistant stood outside of the lab and said to the participants that he needed to make a quick phone call but that his phone was out of battery. He explicitly asked the participants if they could lend him their phone for a minute to make the call. If the participants lent him the phone, he simply made a call, hung up, and said that there was no answer.
3. **Children's Charity:** A research assistant stood outside of the lab collecting money for a leading charity dedicated to helping children in developing countries. He explicitly asked the participants if they wanted to contribute money to the charity. The research assistant was wearing an official university T-shirt and a professional (sealed) charity bucket of the type commonly used to collect donations, with a large sticker with the logo of the charity. He also had color-printed leaflets with a brief description of the charity and its activities. The money given by people was then actually sent to the charity.
4. **Environmental Charity:** This situation was exactly like the previous one, but with a different charity. This organization was a leading charity dedicated to protecting the environment. The money donated was actually sent to the charity.
5. **Lab Donation:** This situation was analogous to situations 3 and 4, but this time the research assistant was asking for money to support research projects conducted in our lab. The money given by people was actually added to the research funds of the lab.

Behavioural Research Methods

- Galizzi, M. M. and D. Navarro-Martinez (2019). "On the External Validity of Social Preference Games: A Systematic Lab-Field Study." *Management Science* 65(3): 976-1002.

Table 1. Pairwise Correlations Between Game Decisions (Spearman's ρ)

	DG1&2 P.1	UG1 P.1	UG1 P.2	UG2 P.2	TG1 P.1	TG1 P.2	TG2 P.2	PGG
DG1&2 P.1	1.00***	0.48***	−0.09	−0.18***	0.26***	0.32***	0.50***	0.36***
UG1 P.1	0.48***	1.00***	—	−0.20**	0.26***	—	0.35***	0.25***
UG1 P.2	−0.09	—	1.00***	0.09	—	0.00	0.05	0.00
UG2 P.2	−0.18***	−0.20**	0.09	1.00***	−0.02	−0.11	−0.15**	−0.09
TG1 P.1	0.26***	0.26***	—	−0.02	1.00***	—	0.43***	0.25***
TG1 P.2	0.32***	—	0.00	−0.11	—	1.00***	0.38***	0.30***
TG2 P.2	0.50***	0.35***	0.05	−0.15**	0.43***	0.38***	1.00***	0.34***
PGG	0.36***	0.25***	0.00	−0.09	0.25***	0.30***	0.34***	1.00***

Notes. —: correlation cannot be computed because there is no overlap between participants in the pair of variables. DG1&2 P.1 stands for player 1 in Dictator Games 1 and 2; UG1 P.1 for player 1 in Ultimatum Game 1; UG1 P.2 and UG2 P.2 for player 2 in Ultimatum Games 1 and 2, respectively; TG1 P.1 for player 1 in Trust Game 1; TG1 P.2 and TG2 P.2 for player 2 in Trust Games 1 and 2, respectively; and PGG for the Public Good Game.

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Behavioural Research Methods

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Table 2. Correlations Between Game Decisions and SRA Scores (Spearman's ρ)

	SRAtotal	*SRAmoney*
DG1&2 P.1	0.20***	0.04
UG1 P.1	0.16*	0.06
UG1 P.2	−0.05	0.07
UG2 P.2	−0.05	0.02
TG1 P.1	0.03	0.03
TG1 P.2	0.06	−0.01
TG2 P.2	0.20***	0.15**
PGG	0.14**	0.00

Notes. *SRAtotal* stands for the total Self-Report Altruism (SRA) score, and *SRAmoney* for a score including only the SRA items related to money. DG1&2 P.1 stands for player 1 in Dictator Games 1 and 2; UG1 P.1 for player 1 in Ultimatum Game 1; UG1 P.2 and UG2 P.2 for player 2 in Ultimatum Games 1 and 2, respectively; TG1 P.1 for player 1 in Trust Game 1; TG1 P.2 and TG2 P.2 for player 2 in Trust Games 1 and 2, respectively; and PGG for the Public Good Game.

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Behavioural Research Methods

- Galizzi, M. M. and D. Navarro-Martinez (2019). "On the External Validity of Social Preference Games: A Systematic Lab-Field Study." *Management Science* 65(3): 976-1002.

Table 3. Correlations Between Game Decisions and Field Behaviors (Spearman's ρ)

	Boxes	Phone	Children's charity	Environ. charity	Lab donation	All helping	All donations	All conditions
DG1&2 P.1	0.04	0.06	−0.25*	0.20*	−0.05	0.05	−0.06	−0.06
UG1 P.1	0.18	0.27	0.18	0.04	0.15	0.21	0.15	0.12
UG1 P.2	−0.09	0.14	0.22	−0.05	−0.06	0.08	0.04	0.07
UG2 P.2	−0.13	0.11	0.02	−0.13	0.06	0.05	−0.04	−0.01
TG1 P.1	0.15	0.28	0.54***	0.00	−0.12	0.22	0.15	0.13
TG1 P.2	0.35	−0.08	0.05	−0.12	−0.24	0.1	−0.11	−0.07
TG2 P.2	0.18	0.27*	−0.18	0.13	0.29*	0.21*	0.03	0.03
PGG	0.14	−0.04	−0.03	0.02	−0.08	0.04	−0.02	0
Average 1	0.10	0.13	0.07	0.01	−0.01	0.12	0.02	0.03
Average 2	0.19	0.15	0.05	0.05	−0.01	0.14	0.02	0.03

Notes. DG1&2 P.1 stands for player 1 in Dictator Games 1 and 2; UG1 P.1 for player 1 in Ultimatum Game 1; UG1 P.2 and UG2 P.2 for player 2 in Ultimatum Games 1 and 2, respectively; TG1 P.1 for player 1 in Trust Game 1; TG1 P.2 and TG2 P.2 for player 2 in Trust Games 1 and 2, respectively; and PGG for the Public Good Game. "All helping," "All donations," and "All conditions" group together, respectively, the two conditions related to helping, the three conditions related to giving money, and all conditions. Average 1 is the overall average of the column; Average 2 is the average excluding the variables related to player 2 in the ultimatum games.

*, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

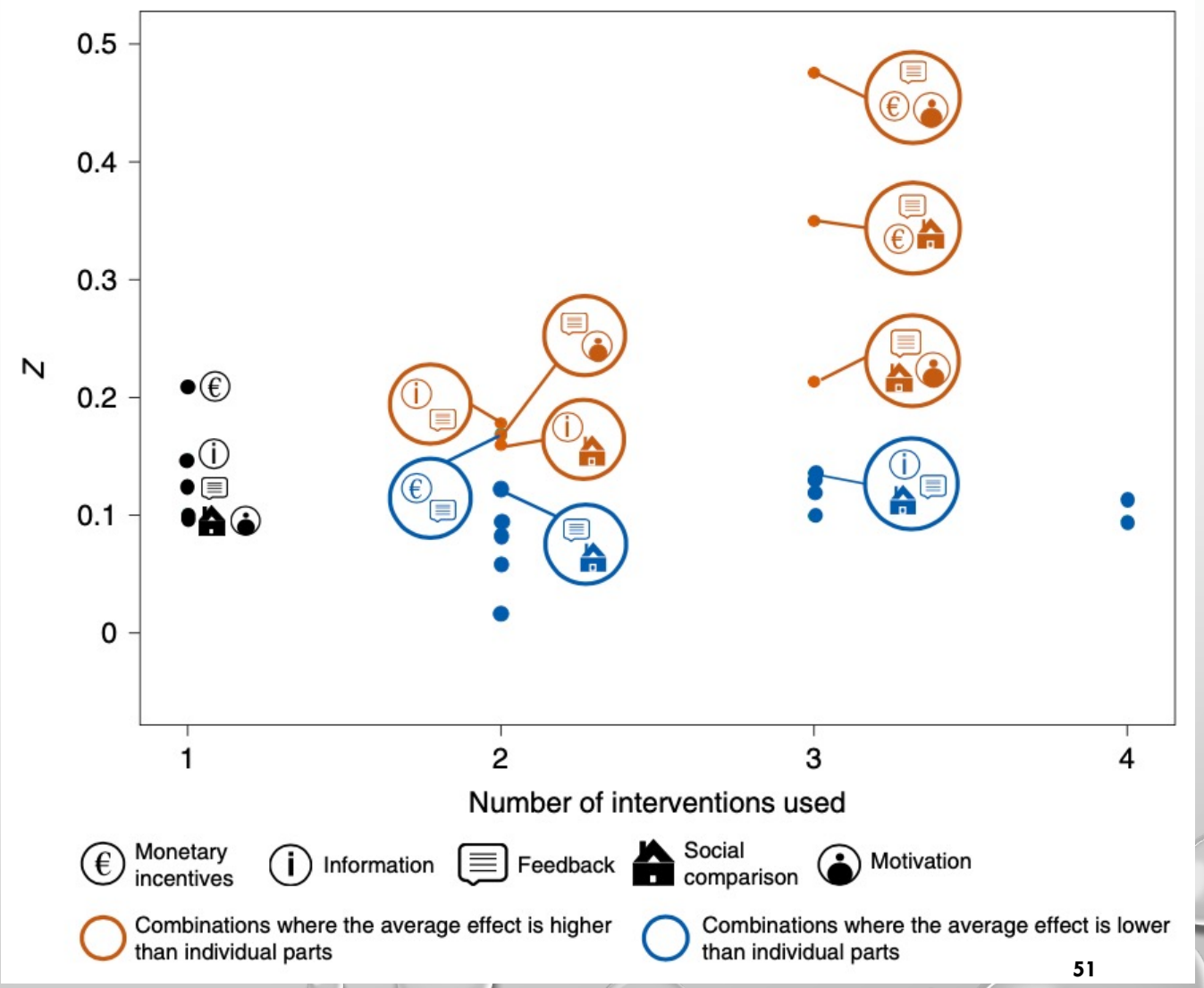
Behavioural Interventions

- **Classification of tools**
  - Nudges (Thaler and Sunstein, 2008):
    - Choice architecture to induce desirable actions for both the individual and the society, such as using green electricity defaults to increase the uptake of renewable energy.
    - Manipulating tools. Easy and quick to implement, but the effects tend to be short-lived (Khanna, T. M., et al., 2021).
  - Boosts (Grune-Yanoff and Hertwig, 2016),
    - Focus on changing existing behavioural heuristics or establishing new ones, such as providing home energy report with personalised energy use feedback and energy conservation information to encourage energy savings (Allcott and Rogers, 2014).
    - Empowering tools. Require more time and resources to affect behaviours, but tend to remain effective for a longer term because 'they have become routinised and have instilled a lasting competence in the user" (Lorenz-Spreen et al., 2020, page 1106).

Behavioural Interventions

- **Applications of behavioural interventions in urban studies**

Khanna, T. M., et al. (2021). "A multi-country meta-analysis on the role of behavioural change in reducing energy consumption and CO2 emissions in residential buildings." *Nature Energy* 6(9): 925-932.



Behavioural Interventions

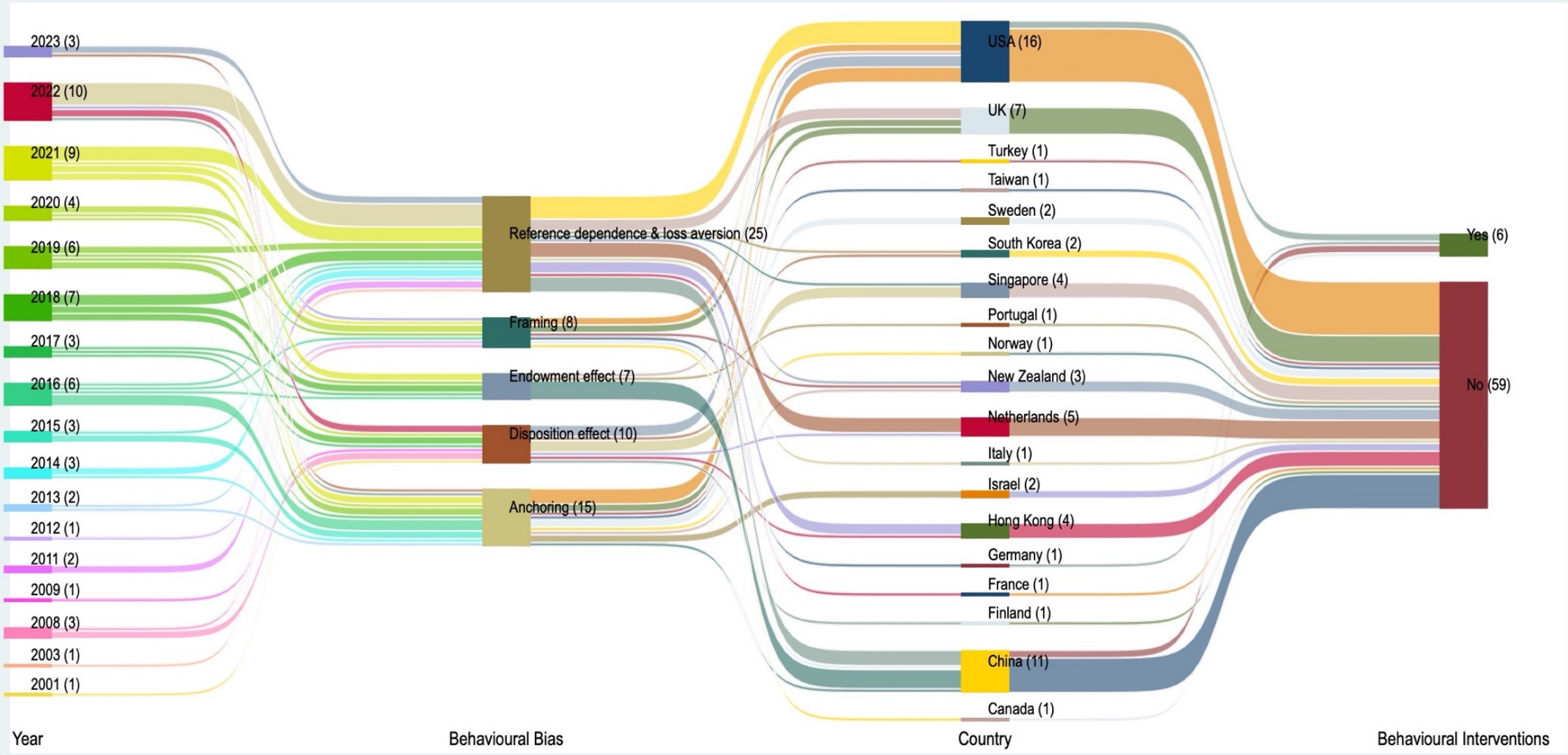
- **Applications of behavioural interventions in urban studies**

Nisa, C. F., et al. (2019). "Meta-analysis of randomised controlled trials testing behavioural interventions to promote household action on climate change." Nature Communications **10**:4545.

Table 1 Effect sizes per key moderators

Moderator		*k*	*N*	Effect size *d* (CI)
Overall effect size		144	3,092,678	−0.093 (−0.160, −0.055)
Sensitivity analysis				
Sample type	Households	66	724,792	−0.112 (−0.221, −0.057)
	Individuals	78	2,367,886	−0.118 (−0.221, −0.060)
Sample size per condition	≤100	82	5709	−0.335 (−−0.555, −0.190)
	]100, 500[	45	22,840	−0.141 (−0.280, −0.063)
	≥500	17	3,074,121	−0.028 (−0.106, −0.006)
Self-selection	Self-selected	79	12,550	−0.279 (−0.465, −0.161)
	Naïve	65	3,080,128	−0.040 (−0.103, −0.016)
Region	Europe	43	2,333,441	−0.210 (−0.446, −0.093)
	US/Canada	78	750,854	−0.108 (−0.208, −0.054)
	Rest World	23	8383	−0.059 (−0.407, −0.013)
Behaviour[a]				
Energy		47	719,059	−0.094 (−0.133, −0.055)
	Appliances	12	108,077	−0.036 (−0.129, 0.058)
Transportation		29	2,245,972	−0.136 (−0.183, −0.089)
	Car use	21	2,242,781	−0.036 (−0.039, −0.034)
Water		42	124,082	−0.052 (−0.079, −0.025)
	Towel	18	8909	−0.168 (−0.271, −0.064)
Food waste		4	218	−0.231 (−0.518, 0.056)
Meat		7	666	−0.239 (−2.81, 0.008)
Recycling		23	2766	−0.457 (−0.595, −0.319)
Intervention				
Information		53	2,354,243	−0.048 (−0.075, −0.021)
Social comparison		32	719,756	−0.077 (−0.108, −0.046)
Engagement		38	10,486	−0.253 (−0.336, −0.170)
	Commitment	10	1446	−0.480 (−0.704, −0.255)
Appeals		10	5952	−0.266 (−0.445, −0.086)
Nudges		11	795	−0.352 (−0.492, −0.212)

Behavioural Studies in the housing market



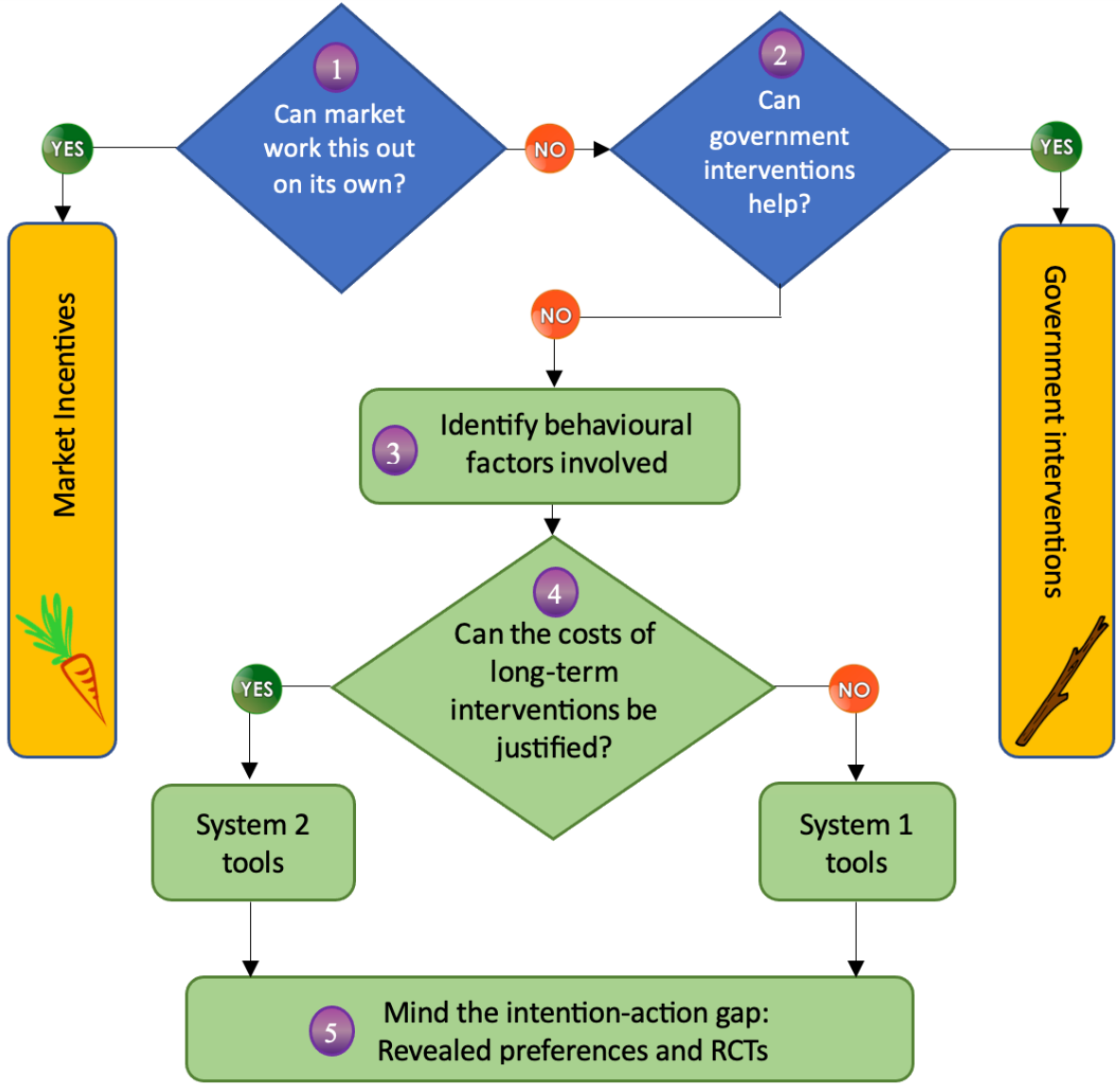
Source: Helen X. H. Bao (2023) Between Carrots and Sticks, from Intentions to Actions: Behavioural Interventions for Housing Decisions. Available at SSRN: https://ssrn.com/abstract=4325333 or http://dx.doi.org/10.2139/ssrn.4325333

Applications in Land and Housing Studies

- More residential than commercial
- More individuals than institutions (micro- vs macro- behaviours)
- Lab experimental data are common (but not recommended)
- Geographical focus uneven: early evidence mainly from the US; lack of studies from the UK; growing number of papers using data from Asia.
- Advantages of using data from China: ethic approval; privacy; information protection; …
- Standard economic theory is a special case; there may be a day when all economics studies are behavioural.

Behavioural Interventions in the housing market

Classification	Relevant Behavioural Factors	Examples
System 1 Tools		
Nudge	Present bias Status quo bias Inertia	The combination of ordering and partitioning of insurance policy options improves health insurance decisions (Dellaert et al., 2023).
Social influence	Reference dependence Peer pressure Social norms Social comparison	Participants saved more when information about the progress toward their self-set savings goal is shared with another village member (Breza & Chandrasekhar, 2019).
Commitment device & reminders	Status quo bias Inertia Self-control Hyperbolic discounting	A simple commitment device (an individual lockbox) helps households to save more and to cope with the negative impacts of a health shock (Aker et al., 2020).
Appeals	Social norms Peer pressure	Messages regarding the public benefits of increased residential density reduced local residents' NIMBYism by four times the control message (Doberstein et al., 2016).
System 2 Tools		
Education & Awareness	Representative bias Status quo bias Present bias	Providing real-time feedback on the quantity of electricity consumption reduced electricity usage by 8 to 22 percent (Jessoe & Rapson, 2014).
Visualisation	Narrow framing Cognitive overloading Inattention Lack of attention	Interactive visualization of commute options is used as a behavioural intervention to increase home renters' willingness to travel more sustainably. Those in the visualization treatment group had significantly higher reported well-being after the move as well (Bhattacharyya et al., 2019).
Gamification	Short-termism NIMBYism Intention-action gap Inertia	A gamified app influenced energy-saving behaviours and word-of-mouth, and resulted in significant monetary savings compared to a control group (Mulcahy et al., 2020).



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My contribution to the literature

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The Way Forward

"Perhaps the greatest challenge facing behavioral economics is demonstrating its applicability in the real world. In nearly every instance, the strongest empirical evidence in favor of behavioral anomalies emerges from the lab. Yet, there are many reasons to suspect that these laboratory findings might fail to generalize to real markets."

- Levitt, S. D., and J. A. List. 2008. "Homo Economicus Evolves." *Science*, 319(5865): 909–10.

The Way Forward

One Swallow Doesn't Make a Summer: New Evidence on Anchoring Effects†

By Zacharias Maniadis, Fabio Tufano, and John A. List*

Some researchers have argued that anchoring in economic valuations casts doubt on the assumption of consistent and stable preferences. We present new evidence that explores the strength of certain anchoring results. We then present a theoretical framework that provides insights into why we should be cautious of initial empirical findings in general. The model importantly highlights that the rate of false positives depends not only on the observed significance level, but also on statistical power, research priors, and the number of scholars exploring the question. Importantly, a few independent replications dramatically increase the chances that the original finding is true. (*JEL* D12, C91)

Source: *The American Economic Review*, Vol. 104, No. 1 (JANUARY 2014), pp. 277-290

Session Summary

- Behavioural sciences defined
- Behavioural theories and models
- Behavioural research methods
- Applications of behavioural insights in housing studies
- The way forward