Beliefs and Utility - Experimental Evidence on Preferences for Information

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Beliefs

- Standard economic approach to beliefs/information is instrumental.
- Information is required for taking decisions.

$\rightarrow$ We seek to hold precise beliefs.

$\rightarrow$ We prefer precise information sooner rather than later.

- Alternative view: beliefs are directly utility-relevant.
- Beliefs about future outcomes affect well-being in terms of positive or negative anticipatory utility.
  - Surgery in near future
  - Prospects of a nice holiday

Possible implications of anticipatory utility

- Important determinant of well-being.
- Systematic belief distortions.
- Preferences over information structures.
  - Determinant of demand for information.
  - Policy instrument: how to inform workers/patients/stakeholders?

Introduction

- Starting with Loewenstein (1987), theoretical work has made substantial progress in modeling the notion that beliefs about or the anticipation of future consumption has direct utility-consequences:
    - Pagel (2014, 2016), Golman, Loewenstein and Gurney (2016), Golman and Loewenstein (2015), Ely et al. (2015), Bénabou (2013), Schweizer and Szech (2013), Koszegi and Rabin (2009), Epstein (2008), Koszegi (2006), Brunnermeier and Parker (2005), Caplin and Leahy (2001, 2004)).

- Empirical knowledge lacks behind

This paper

- Empirical insights on anticipatory utility by exploring individuals' preferences for information.
- Informed by theory, we study four questions related to information preferences
    1. Sooner versus later information?
    2. What is the role of attention?
    3. Clumped versus piecewise information?
    4. Role of priors?

Experimental Set-up

Design Challenges

- Set-up where information is non-instrumental.
- Control over timing of information transmission - subjects need to realize information at time we want them to.
- Outcome that is likely to cause belief-based utility.

In the experiment

- A lottery determines whether or not a subject receives an aversive stimulus.

- Stimulus consists of a series of 30 electric shocks.

- Information about receiving vs. not receiving shocks.

Why electric stimulus?

- Prospect of imminent stimulus triggers negative anticipatory emotions (Berns et al. (2006), Schmitz and Grillon (2012)).

Design

Implementation of lotteries

- Subject is presented 10 sealed envelopes.
- 5 envelopes contain a red card and 5 contain a blue card.
- Subject picks 5 envelopes.
- Realization of outcome (shocks) depends on number of red cards in the 5 selected envelopes.
  - high ex-ante likelihood: shocks if at least 1 envelope contains a red card (> 99 percent)
  - medium: if at least 3 envelopes contain red cards (50 percent)
  - low: if all 5 envelopes contain red cards (< 1 percent)
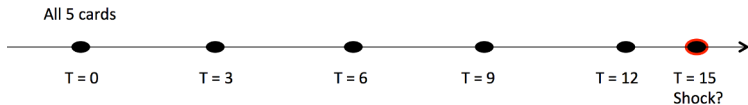
Dimension 1 - Sooner versus Later Information

Sooner versus Later

- At $t = 0$, subjects decide between sooner or later information about whether they receive aversive stimulus at $t = 15$.

- Three conditions (varying priors):
    - high ex-ante likelihood of shock
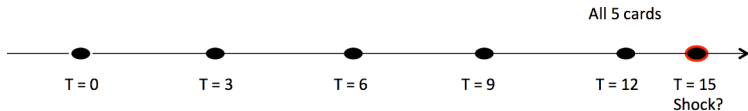   - medium ex-ante likelihood of shock
    - low ex-ante likelihood of shock

Sooner versus Later

Timing

„Sooner"

All 5 cards

T = 0 T = 3 T = 6 T = 9 T = 12 T = 15
Shock?

„Later"

All 5 cards

T = 0 T = 3 T = 6 T = 9 T = 12 T = 15
Shock?

Sooner versus Later
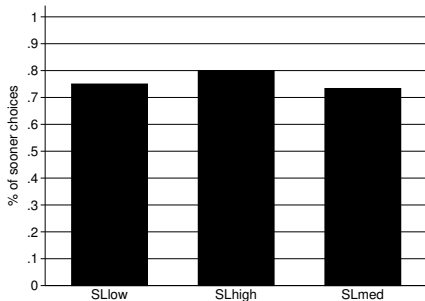
Predictions

- Key motive in Brunnermeier and Parker (2005) is that individuals should want information later.
- Koszegi and Rabin (2009) instead predict a (weak) preference for sooner information.

Sooner versus Later:

In all three conditions, significant difference from random choice (50-50) using binomial tests (p-values < 0.01).
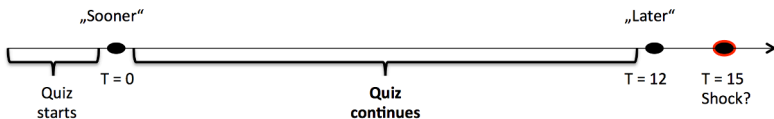
Dimension 2 - Attention

How does limited attention affect information choices?

- In treatments above, attention is very focused on outcome.
- We change experimental environment by offering subjects an entertaining and distracting activity during experiment (a quiz).
- Choice is again between sooner and later information.
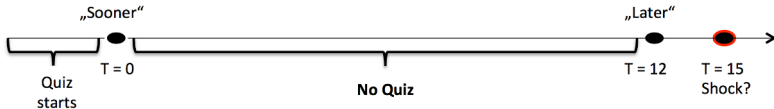- In a control condition, we take the distracting activity away.

Timing

„Attention Main"

„Sooner"   „Later"

T = 0   T = 12   T = 15
                                                                       Shock?
Quiz   Quiz
starts   continues

„Attention Control"

„Sooner"   „Later"

T = 0   T = 12   T = 15
                                                                       Shock?
Quiz   No Quiz
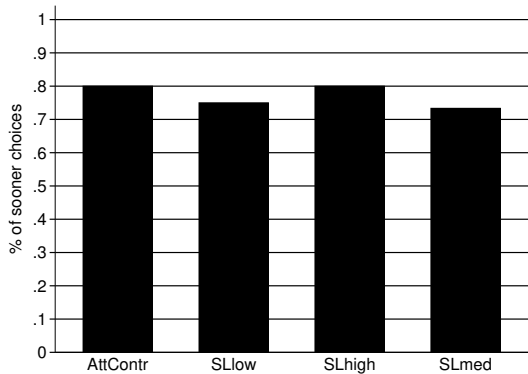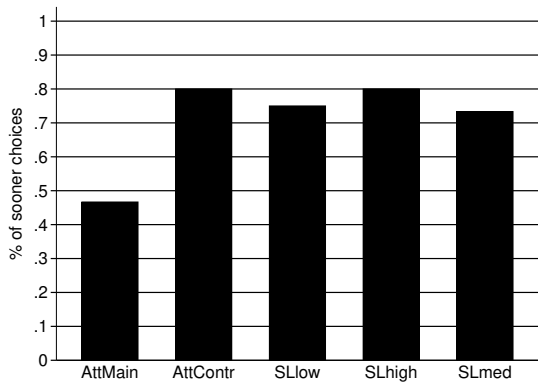starts

Prediction

- Golman and Loewenstein (2015): subjects in the main attention treatment should be more likely to choose later information, compared to attention control treatment
- Quiz absorbs attention and allows Ss not to focus on outcome.

Attention Management

Results

Probit regressions:

| | Attention treatments | | |
	(1)	(2)	(3)
AttMain	-0.952***	-0.966***	-0.965***
	(0.350)	(0.354)	(0.353)
Additional Controls	No	Yes	Yes
Implementation left/right			-0.137
			(0.378)
Constant	0.842***	0.229	0.155
	(0.263)	(1.503)	(1.527)
Observations	60	60	60
(Pseudo R^2)	0.094	0.107	0.109

Results

- Maybe differences between AttMain and AttControl merely reflect a motive to stay focused on the quiz?

- People might not want to obtain *any* information during the interruption of the quiz in AttMain, because they want to concentrate on the quiz.

- We conducted two placebo conditions identical to AttMain and AttControl, except that we removed the electric shock component - information was on whether subjects won or lost in a monetary lottery.

- No effect of attention for placebo conditions...

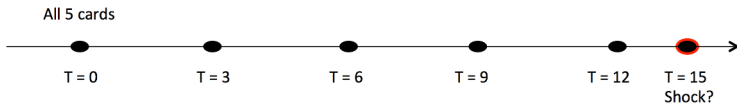# Dimension 3 - Clumped versus Piecewise

Clumped versus Piecewise

Treatment Variations - Clumped versus Piecewise

- at t = 0, subjects decide between clumped and piecewise information about whether they receive aversive stimulus at t =15.

- Three conditions (varying priors):
    - high ex-ante likelihood of shock
    - medium ex-ante likelihood of shock
    - low ex-ante likelihood of shock

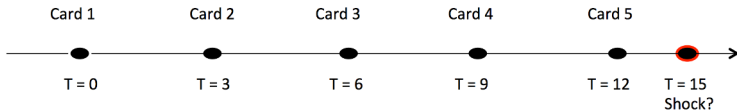# Clumped versus Piecewise

Timing

„Clumped"

All 5 cards

T = 0   T = 3   T = 6   T = 9   T = 12   T = 15
Shock?

„Piecemeal"

Card 1   Card 2   Card 3   Card 4   Card 5

T = 0   T = 3   T = 6   T = 9   T = 12   T = 15
Shock?

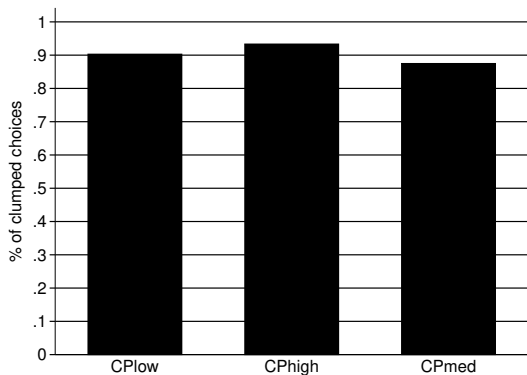# Clumped versus Piecewise

Predictions

- Koszegi and Rabin (2009) predict an aversion to piecemeal information.
- Ely, Frankel and Kamenica (2015) model consequences of pleasure from suspense and surprise on information preferences and show that if people like suspense they should prefer piecemeal information.

Results - Clumped versus Piecewise

But, distinct aversion towards piecemeal information?

Results - Clumped versus Piecewise

Identification of attitude towards piecemeal information

- Problem: variation of clumped versus piecewise necessarily implies variation in sooner versus later.
- Solution
  - use observations from sooner versus later choices as benchmark
  - analyze if we can find a preference for clumped or piecemeal information on top of attitudes towards sooner or later information.

Results - Clumped versus Piecewise
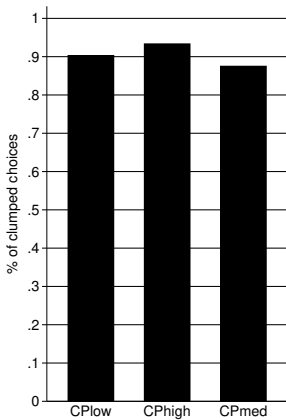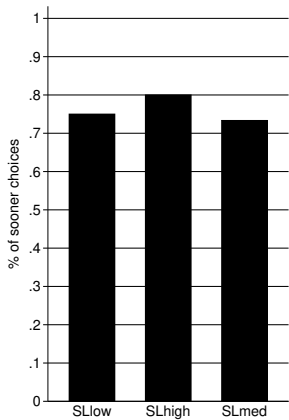
Results

Probit regression analysis

	SL- and CP-treatments		
	(1)	(2)	(3)
SL	-.591**	-.617***	-.619***
	(0.230)	(0.221)	(0.220)
Additional Controls	No	Yes	Yes
Implementation left/right			-.054
Constant	1.300***	1.775	1.805
	(.179)	(1.161)	(1.188)
Observations	185	185	185
(Pseudo R^2)	0.041	0.054	0.054

Dimension 4 - Variations in Prior

Variations in Prior

- Both for choices between sooner and later information, and for choices between clumped and piecewise information we varied the prior.

Predictions

- Most existing theories predict that the sign of information preferences should not depend on priors.
- Exception is Epstein (2008)

Results - Variations in Prior

Probit regression analysis

	Sooner vs. later			Clumped vs. piecemeal		
	(1)	(2)	(3)	(4)	(5)	(6)
SLmed	-.219	-.114	-.107			
	(0.360)	(0.366)	(0.367)			
SLlow	-.167	-.071	-.069			
	(0.357)	(0.361)	(0.365)			
CPmed				-.351	-.307	-.334
				(0.455)	(0.488)	(0.476)
CPlow				-.201	-.512	-.552
				(0.472)	(0.483)	(0.462)
SL						
AttMain						
Additional Controls	No	Yes	Yes	No	Yes	Yes
Implementation left/right			.254			-.569
			(0.295)			(0.370)
Constant	.842***	2.086	1.873	1.501***	.255	-.182
	(.262)	(1.374)	(1.435)	(.354)	(2.760)	(2.947)
Observations	92	92	92	93	93	93
(Pseudo R^2)	0.004	0.029	0.037	0.010	0.172	0.201

Conclusion

In a set-up with information about a real and aversive consumption event, we find that

- Preferences for sooner or later information are not uniform but depend on context.
    - in baseline choices, most subjects preferred sooner over later information.
    - but in the presence of an alternative activity, subjects use information to steer attention.
    - makes later information more attractive.
- Subjects are averse to piecemeal information.
- Ex-ante likelihoods do not affect information choices.

$\Rightarrow$ evidence for key intuitions developed in Koszegi and Rabin (2009) and Golman and Loewenstein (2015)

Thank You

3 additional control treatments

① we elicit the willingness to pay to NOT obtain shock series

- 25 participants
- average WTP is 8.3 euros
- median = 8, Std. Dev. = 5.40

② we ask for subjects perception of shock series after experiencing it - scale from "1" (not at all unpleasant) to "7" (very unpleasant)

- 24 participants
- average = 5.5
- median = 5, Std. Dev. = 1.27

③ we check for strategic underreporting in calibration phase

- 24 participants in add. treatment
- no significant diff. between calibration in main treatments compared to add. treatment (t-test, $t = -0.85$, $p = 0.40$; Ranksum-test, $z = -0.77$, $p = 0.44$)

Probit regressions:

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