“Optimized Reference-Dependent Utility” by Peter Wikman

Discussion prepared by Daniel L. Chen

June 2018

Koszegi Rabin (QJE 2006)

Personal Equilibrium

- Consider an option x
- What would I choose if x was my reference point?
- If it is x, then I will call x a personal equilibrium
- If I expect to buy x, then it should be my reference point
- If it is my reference point, then I should actually buy it

Example: Utility of earmuffs is 1, Price is p, Utility linear in money

- What would I do if my reference point was to buy earmuffs?
  - Utility from buying earmuffs is 0
  - Utility from not buying earmuffs is $p - \lambda$
  - Buy earmuffs if $p < \lambda$
- What would I do if my reference point was to not buy?
  - Utility from not buying earmuffs is 0
  - Utility from buying earmuffs is $1 - \lambda p$
  - Would buy the earmuffs if $p < 1/\lambda$

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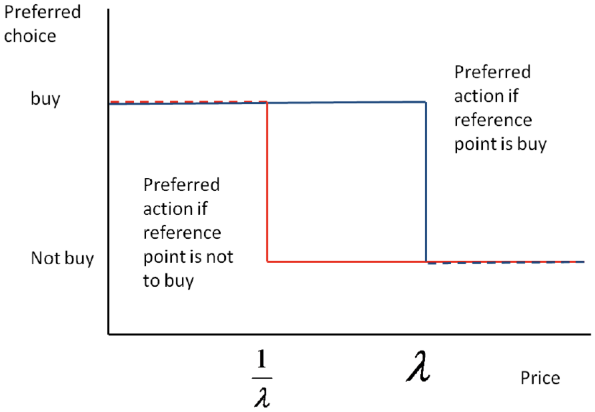
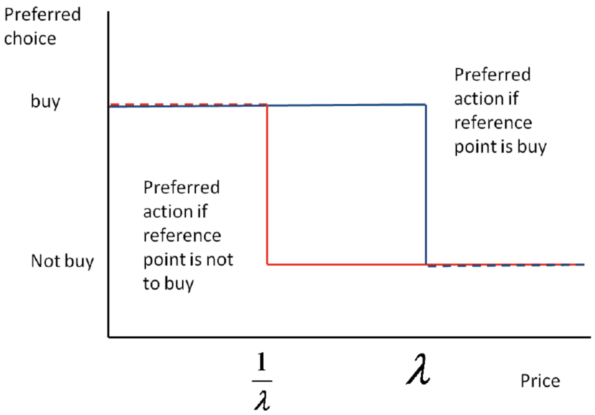


Between the two prices, personal equilibria depend on expectations

Example



Between the two prices, personal equilibria depend on expectations

KR Utility Function

- Consumption utility: $u(c)$
- Gain loss utility: $\mu((u(c) - u(r))$
- $U(F|G) = \int \int u(c|r) dG(r) dF(c)$

- Gain loss utility μ
  - continuous, $\nearrow$, twice differentiable away from 0, $\mu(0) = 0$
- Loss aversion 1:
  - $y > x > 0$ implies that $\mu(y) + \mu(-y) < \mu(x) + \mu(-x)$
- Loss aversion 2:
  - $\frac{lim_{x \to 0} \mu'(-|x|)}{lim_{x \to 0} \mu'(|x|)} = \lambda > 1$
- Diminishing sensitivity:
  - $\mu''(x) \leq 0$ for $x > 0$ and $\mu''(x) \geq 0$ for $x < 0$

- What is G? Agent's recent expectations about F.
  - Agents form these expectations rationally.

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Reference Point and Personal Equilibrium

Personal Equilibrium

- An action inducing F is a Personal Equilibrium if $EU(F|F) \geq EU(F'|F)$ for any F
- Preferred Personal Equilibrium is the PE that maximizes utility

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Example with Lotteries

- A risk neutral agent offered a lottery $\begin{cases} X & \frac{1}{2} \\ -Y & \frac{1}{2} \end{cases}$, where $X > Y$
- What is EU if agent expects to **accept** the lottery?
- If X occurs, $U = X + 0.5\mu(X + Y)$
If -Y occurs, $U = -Y + 0.5\mu(-(X + Y))$
- $EU(a|a) = 0.5(X - Y) + 0.5[\mu(X + Y) + \mu(-(X + Y))]$
  - $+$ from consumption and - from loss aversion
- What is EU of **reject** if expects to accept lottery?
  - $EU(na|a) = 0 + 0.5[\mu(0 - X) + \mu(0 - (-Y))] < 0$
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The Uncertainty Effect (Gneezy, List, and Wu QJE 2006)

TABLE II
SUMMARY STATISTICS FOR REAL-STAKES PRICING STUDIES

Good	Willingness-to-pay (dollars)			
	Mean	Median	Standard deviation	*N*
Book Store				
$100 gift certificate (GC)	66.15	69.00	24.28	20
50 percent chance at $100 GC, 50 percent chance at $50 GC	28.00	25.00	16.73	20
$50 gift certificate (GC)	38.00	40.00	9.86	20

- These agents really dislike uncertainty
- Kőszegi Rabin (2007) show that if an agent has time to plan and if gain-loss utility is sufficiently important relative to consumption utility, an agent can choose a dominated lottery

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Optimized Reference-Dependent Utility

Problem

- KR's stochastic reference point does not satisfy FOSD
- DM has rational expectations (no surprise or changing mind)
  - expectations can be self-fulfilling
  - time inconsistent

ORD Model

- DM ex ante chooses reference point
- Higher the reference point, the more **anticipation utility**
- Lower the reference point, the less likely to be disappointed (i.e. suffer extra due to loss aversion)
- Autoregressive law of motion for reference points

Explains

- status quo bias
- ex ante preference for increasing consumption profiles
- asymmetric reference point adaptation that is more sensitive to gains than to losses

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Assumptions

- A.2: Time Consistency
  - $W(F,r) \geq W(G,r) \Longleftrightarrow \Phi(F|r) \geq \Phi(G|r)$
- A.3: Acclimation
  - $\frac{W(\delta_x,r)}{\partial r} \geq 0$ if $r < x$, $\frac{W(\delta_x,r)}{\partial r} \leq 0$ if $r > x$, $\frac{W(\delta_x,r)}{\partial r} = 0$ if $r = x, \lambda = 1$
- Say a bit more on what is ruled out in the KR space
  - Gneezy et al. 2006?
  - What else?
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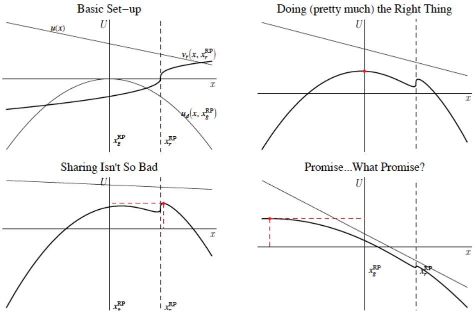
- Normative reference points
    - fairness and justice
    - are these also endogenous and optimal?



Justice: equal treatment before the law $(y = f(X) + \varepsilon, a \to X)$
equality based on recognition of difference
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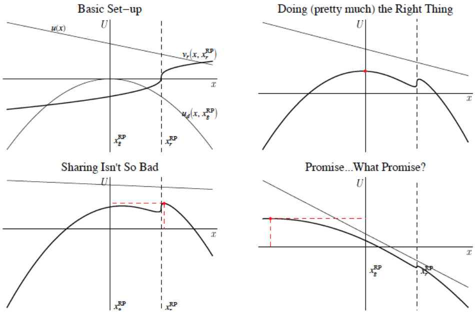

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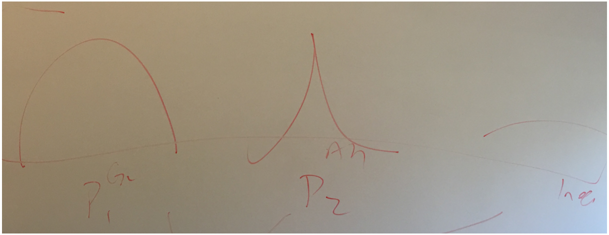
  - lab experiments typically vary reference points
  - not cheap talk
  - loss aversion with respect to the reference point



Identify curvature by randomly varying the cost of votes

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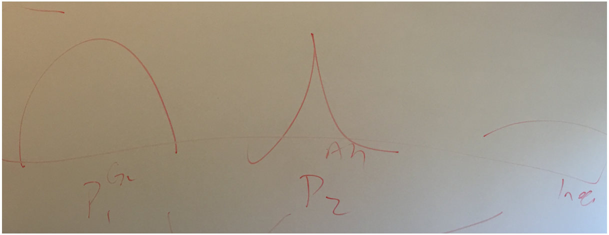

Identify curvature by randomly varying the cost of votes

Model of protests and change?

- Protest = "spend"
- Organize = "save/invest"
  - expect future to be better = "anticipation utility"
  - civil rights law change = "increasing consumption profile"
- Police brutality affects today's consumption, and tomorrow's reference points
  - Have past governments used optimal reference point formation policies?
- Sexual harassment and reference points
  - Optimal reference point policies: Gradual or sharp?
- Disintegration / detachment from civic institutions = "disappointment"
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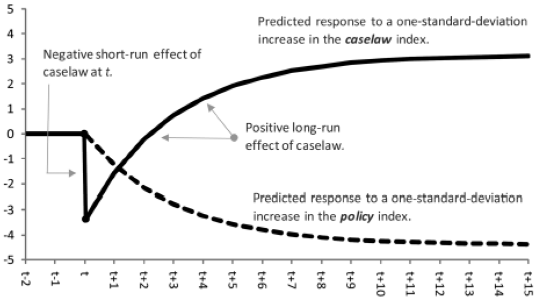
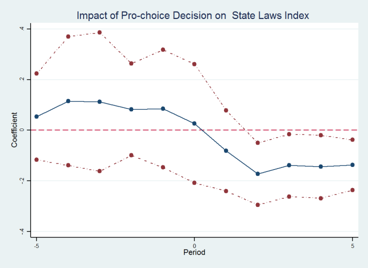
Backlash and Legitimization (Ura AJPS 2014)

Figure 2 Predicted Responses in Mood to One Standard Deviation Increases in Caselaw and Policy



Instantaneous backlash, then countervailing long-run effect that follows the law

Policies Affect Preferences (r?)



	Republicans				
	OLS	Naive IV	LIML	LASSO	N
Z-score index	0.110	0.456	0.127	0.176	2000
P-value	0.038	0.016	0.023	0.009	
Simple average index	0.048	0.216	0.056	0.089	2000
P-value	0.041	0.014	0.025	0.004	

Republicans strongly increase pro-life attitudes in response to pro-choice decisions, especially for "Should it be illegal for a woman to obtain abortion for any reason?" Results on Democrats not as sharp, perhaps because pro-life decisions are not perceived as morally repugnant (i.e., smoother gain-loss curvature)

Abortion Attitudes 2 Years Later

	Republicans				
	OLS	Naive IV	LIML	LASSO	N
Z-score index	-0.012	-0.333	-0.012	-0.028	2004
P-value	0.824	0.025	0.829	0.768	
Simple average index	-0.006	-0.154	-0.006	-0.008	2004
P-value	0.804	0.021	0.811	0.836	

- Reject hypothesis of persistent backlash
- Ura (2014) also finds instantaneous backlash and immediate decay (acclimation?)

Model (of dynamic r?)

2 periods, actions at $t = 0$ that may result in abortion at $t = 1$

- $U(no\_abortion) = 0; U(abortion) = -u_a < 0$
- After an abortion, no subsequent change to utility from additional abortions ("What the hell", concave cost to deviating from duty, diminishing sensitivity)

- $q \rightarrow \uparrow$Pr(abortion) exogenous laws/access to abortion
- $p \rightarrow \downarrow$Pr(abortion) *endogenous* attitudes, donations

- $c(p) \geq 0$, $c' > 0, c'' > 0$
- $P(q-p)$, $P' > 0$, $P'' > 0$

$$\max_p \{(P(q-p))(-u_a) - c(p)\}$$

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Dynamics of Law and Norms

- $P'(q-p) = c'(p)$
  - unless already had an abortion, $p^* = 0$
- s_0 share of the population have not had an abortion
- Assume share of abortions in the society is at steady-state
  - $s = P(q-p)$ will have an abortion at $t = 1$
  - share α of new people enter; β exit
  - $s_0(1-s)(1-\beta)+\alpha$ is share without abortion at $t = 1$
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Equilibrium Effect of Laws

- Implicit Function Theorem yields:
$$\frac{\partial p^*(q)}{\partial q} = \frac{P''(q-p^*)}{P''(q-p^*)+c''(p^*)}$$

- Since $P'' > 0$, and $c'' > 0$:
$$0 < \frac{\partial p^*(q)}{\partial q} < 1$$

- Pro-choice decision at $t = 0$ stimulates p: initial backlash
  - Overall anti-abortion attitude is: $s_0 p$
- At $t = 1$, both p^* and s_0 change, so anti-abortion attitude is:
$$s_0 p^* = \frac{\alpha p^*}{s^* + \beta - s^* \beta} = \frac{\alpha p^*}{P(q-p^*) + \beta - P(q-p^*)\beta}$$

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- q increases both the numerator and the denominator

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  - Otherwise, at $t=1$, the overall effect of a pro-choice decision reduces negative attitudes, i.e. expressive
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