

# Psychology and Economics<sup>1</sup>

## 14.13 Lecture 17: State-dependent preferences, projection and attribution bias

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<sup>1</sup>These lecture slides are partially based on notes by Botond Köszegi and Devin Pope. I would like to thank them, without implicating them in any way, for sharing their materials with me.

## Plan for today

- (1) Preference changes
- (2) Predicting preference changes
- (3) Projection bias (Loewenstein et al., 2003)
- (4) Attribution bias (Haggag and Pope, 2016) [recitation]

# Preference Changes

- Although not typically emphasized in economics, a simple and obvious fact is that our preferences change over time:
  - (1) Short-term temporary fluctuations (state-dependent preferences)
    - Could be due to changes in our physiological state (e.g. hunger) or psychological state (e.g. mood).
  - (2) Long-term systematic changes
    - A broad category; could be due to own choices (e.g. addiction) or independent of own choices (e.g. aging).
  - (3) Adaptation to changes
    - Happens for both big changes (e.g. standard of living) and small changes (e.g. mug ownership).

## Minnesota starvation experiment (1944-1945)

- As expected, people get extremely focused on food.
- But they also lose interest in *other* activities.
- Reports of decreased alertness, lack of self-control, general apathy

## Some testimonies from the Minnesota experiment

*“The acquisition of [food related items was] as a reasonable extension of [their heightened interest in food.] Much less reasonable was the buying of old books, unnecessary secondhand clothes, knickknacks, and other 'junk.' Often after making such purchases, which could be afforded only with sacrifice, the men would be puzzled as to why they had bought such more or less useless articles.”*

*“Then came the day when I lost my 'will to activity.' I no longer cared to do anything that required energy, and days began to drag.”*

*“There is nothing that can hold my interest for long. I wait for meal time.”*

## Shopping on an empty stomach: Nisbett and Kanouse (1969)

- Folk wisdom: shopping on empty stomach leads people to buy more.
- Studies randomly vary how hungry people are while shopping:
  - Give random sample of individuals entering supermarket a candy bar.
  - Vary the timing of last meal before shopping
- Monitor how much and what kind of food they buy:
  - People tend to buy more.
  - People buy more junk food.

## Shopping on an empty stomach

See [Oatmeal cartoon](#) about shopping on an empty stomach.

# Sleep

- Almost everything in life is different when you are tired.
- Example: sleep deprivation often associated with lack of self-control
  - Muraven and Baumeister (2000) hypothesize that self-control is a muscle that replenishes over night.
  - Lack of self-control may also cause poor sleep.
- Suggestive evidence
  - Sleep deprivation associated with weight gain (Spaeth et al., 2013)
  - Tired people engage more in 'cyberloafing' (Wagner et al., 2012)
  - Some evidence of effect on ethical behavior (Barnes et al., 2011)



## Addiction: Badger et al. (2007)

- Study with 13 recovering heroin addicts (small-sample alarm!)
  - Elicited WTP for *second* dose of heroin substitute BUP<sup>2</sup>
  - All individuals regularly received single dose of BUP.
  - Also experience with receiving additional dose
- Vary state of 'deprivation':
  - More deprived: 2 hours before scheduled dose
  - Less deprived: right after scheduled dose
- Vary timing of (potential) second dose:
  - Second dose later today
  - Second dose next week

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<sup>2</sup>Buprenorphine hydrochloride (BUP) is used in the treatment of substance abuse. It prevents withdrawal symptoms.

## WTP systematically varies with state and delay.

- Median WTP for second dose later today
  - \$50 in satiated state
  - \$75 in deprived state
- Median WTP for second dose next week
  - \$35 in satiated state
  - \$60 in deprived state

## Anesthesia: Schelling (1984)

- Controversial question: use of anesthesia during childbirth
  - Reduced pain, but side effects; change in experience
- Preferences change predictably over time:
  1. Ex ante, many women prefer not to use anesthesia.
  2. Once they are in pain, they request anesthesia from their doctor.
  3. Ex post, they regret their choice.
- Patterns hold even for women who have given birth before.
- Ethical dilemmas and legal issues
  - To which patient is a physician obligated? The one asking for anesthesia or the one who asked that it be withheld?
  - Can the physician enter a contract with the patient ex ante?
  - Do we want policies that make such contracts possible?

## Predicting preference changes: projection bias

- So far: preferences change predictably (due to changes in underlying states)
- Additional stylized fact: people make *systematic* mistakes at *predicting* preference changes.
- **Projection bias:** People under-appreciate changes in their preferences, projecting current preferences onto future preferences
  - Projection bias is *not* just a random mis-prediction, but a mis-prediction with a systematic direction.
  - Understand *direction* of preference change, but not *magnitude*.

## Under-appreciation of effects of hunger on preferences

- Not so important economically, but two reasons to consider evidence:
  - (1) Perhaps the clearest evidence of projection bias
  - (2) People have had lots of experience with changes in levels of hunger, so any mis-prediction isn't due to lack of opportunity to learn.
- Buying more on an empty stomach
  - Can be interpreted as manifestation of projection bias: hungry people act as if their future taste for food will reflect current hunger.
  - But not completely clean evidence of projection bias

## Food choices: Read and van Leeuwen (1998)

- Office workers asked to choose:
  - Healthy snack
  - Unhealthy snack
- Variation in timing of choices
  - when hungry (late in the afternoon)
  - when satiated (immediately after lunch)
- Snacks to be received in one week
  - when hungry (late in the afternoon)
  - when satiated (immediately after lunch)

## Interpret main diagonal as reflecting true preferences

TABLE I  
PERCENTAGE OF SUBJECTS CHOOSING UNHEALTHY SNACK  
(FROM READ AND VAN LEEUWEN [1998])

		Future hunger	
		Hungry	Satiated
Current	Hungry	78%	42%
Hunger	Satiated	56%	26%

- Late in the afternoon (when people are hungry), 78% of people choose the unhealthy snack for the late afternoon (when they will be hungry).
- Immediately after lunch (when people are satiated), 26% of people choose the unhealthy snack for immediately after lunch (when they will be satiated).

## Data fits the pattern of projection bias

TABLE I  
PERCENTAGE OF SUBJECTS CHOOSING UNHEALTHY SNACK  
(FROM READ AND VAN LEEUWEN [1998])

		Future hunger	
		Hungry	Satiated
Current	Hungry	78%	42%
Hunger	Satiated	56%	26%

- People who are currently hungry but expect to be satiated
  - 42% choose the unhealthy snack.
  - People understand direction in which tastes change as they become satiated.
  - But they underestimate the magnitude of this change.
- People who are currently satiated but expect to be hungry
  - 56% choose the unhealthy snack.
  - People understand direction in which tastes change as they become hungry.
  - But they underestimate the magnitude of this change.



## Catalog orders: Conlin et al. (2007)

- Scenario
  - Imagine a cold evening and you are shopping online (Conlin et al. study catalog orders).
  - You buy a warm jacket.
  - It is 30 degrees warmer when the jacket arrives.
- Hypothesis
  - Projection bias leads to an increase in purchases of cold-weather items on cold-weather days.
  - Controlling for receive-date temperature, likelihood of *returning* a cold-weather object is higher when the day of ordering was cold.

## Car purchases on a sunny day



[Image](#) is in the public domain.

- Imagine it's a nice sunny day and you go car shopping.

*"Why, I guess I never thought of the Audi TT."*

- You go for a test drive. The wind whips through your hair.

*"I would love a car like this!"*

## Car purchases on an icy day



Image is in the public domain.

- Imagine you go car shopping around the time of a freak snow storm.

*“Why, I guess I never thought of the Jeep Grand Cherokee.”*

- You go for a test drive. You maintain traction on black ice. You jump the curb with ease.

*“I would love a car like this!”*

## Car purchases: Busse et al. (2015)

- How does weather impact automobile purchases?
  - Weather on day of car purchase should have no influence on type of car bought.
  - Do idiosyncratic weather conditions, controlling for time of year, predict car sales?
  - Convertibles vs. four-wheel drives
- Buying patterns consistent with projection bias:
  - People buy more convertibles on good-weather days...
  - ...and more four-wheel drives on bad-weather days.
  - People are also more likely to return their convertible (four-wheel drive) if they bought it on a good (bad) weather day.
- How does the market react to such behavior?

# Taking advantage of projection bias?

Why winter is the best time to buy a convertible

Buying a convertible in winter isn't an act of madness, it's the time when you're most likely to bag a bargain



Image by [Armin Frick](#) on flickr. CC BY-NC-SA

## Thirst: VanBoven & Loewenstein (2003)

- Ask visitors before or after vigorous cardiovascular workout to complete short survey:

*Imagine that three vacationers in Colorado this past August embarked on a short, 6 mile hike. . . . As the day wore on, they realized that they were hopelessly lost. . . . Worse, because they had packed lightly for a short hike, they had not carried much in the way of food or water. . . .*

*In the space below, please take the perspective of one of the three hikers and describe your situation—how you got into it, how you feel now, both physically and mentally, and what you are hoping will happen.*

## Thirsty subjects have more empathy for others' thirst.

	Before Exercising (Not Thirsty)	After Exercising (Thirsty)	Significance of Difference
Thirst mentioned before hunger in essay	19%	50%	$P < 0.05$
Thirst more unpleasant for hikers	57%	88%	$P < 0.02$
Hikers would regret more not packing water	52%	92%	$P < 0.01$
Thirst more unpleasant for self	61%	92%	$P < 0.02$
Oneself would regret more not packing water	61%	88%	$P < 0.05$

# Taking stock

- Evidence of projection bias for many short-run changes in preferences
  - Hunger, thirst
  - Pain, sleep
  - Weather
  - Addiction
  - Arousal, anger, sadness
  - ...
- Why do people not learn?
  - People have had lots of experience with these changes.
  - Mis-prediction is not due to lack of opportunity to learn.
  - Yet they believe that “this time is different” over and over again.



## People underestimate adaptation to long-run changes.

- Dan Gilbert (*Stumbling on Happiness*) gives many examples of underestimation of adaptation (“immune neglect”).
- How does a positive or negative tenure decision affect wellbeing?
  - Current assistant professors at UT forecasted.
  - Former UT assistant professors recalled.
- Professors relatively accurate in predicting immediate impact of tenure decision, but overestimated long-term impact.
- Similar mis-predictions for other life events such as paraplegia and lottery wins

## A model of projection bias

- True utility at time  $t$  depends on both consumption  $c_t$  at time  $t$  and the state  $s_t$  at time  $t$ :  $u(c_t, s_t)$ .
  - State could be anything that affects utility from consumption: level of hunger or addiction, past consumption, etc.
- Prediction at time  $t$  of future utility at time  $\tau > t$  from consuming  $c_\tau$  in state  $s_\tau$ :

$$\hat{u}(c_\tau, s_\tau) = \alpha u(c_\tau, s_t) + (1 - \alpha) u(c_\tau, s_\tau).$$

## A model of projection bias

- Prediction at time  $t$  of future utility at time  $\tau > t$  from consuming  $c_\tau$  in state  $s_\tau$ :

$$\hat{u}(c_\tau, s_\tau) = (1 - \alpha)u(c_\tau, s_\tau) + \alpha u(c_\tau, s_t)$$

- Person predicts how she'd feel about consuming  $c_\tau$  in the future partly by how she'd feel about consuming it now.
- $\alpha$  is the degree of projection bias:
  - $\alpha = 0$ : correct understanding of future utility (no projection bias)
  - $\alpha = 1$ : full projection bias
- Person optimizes according to her perceived (future) preferences,  $\hat{u}(c_\tau, s_\tau)$ , and is an exponential discounter.

## An example with hunger

- Two states, hungry (H) and not hungry (N)
- Consumption  $c_t$  is over burgers and money:

$$u(c_t, H) = 5 \cdot (\# \text{ of burgers}) + \$$$

$$u(c_t, N) = (\# \text{ of burgers}) + \$.$$

- She's willing to pay \$5 for a burger when hungry, \$1 when full.
- Suppose  $\alpha = 3/4$ , and the person isn't hungry right now.
  - What is her WTP for a burger tonight, when she'll be hungry?
  - She thinks her utility function will be

$$\frac{3}{4}u(c_t, N) + \frac{1}{4}u(c_t, H) = 2 \cdot (\# \text{ of burgers}) + \$.$$

- So she is willing to pay at most \$2 for a burger.

## Why should we care about projection bias?

- Good evidence of projection bias in many settings
- Consequences in some settings relatively unimportant
  - Car purchases
  - Catalog orders
- Actions are often reversible.
- So why should we care about projection bias?
  - Addiction
  - Depression and hope
  - Marriage
  - Other important implications?

## Addiction: initiation

- Define the relevant state as the person's level of addiction.
  - In an un-addicted state, cigarettes aren't hard to resist.
  - In an addicted state, it's very hard to resist cigarettes.
- Un-addicted person:
  - Thinks experimenting with cigarettes is fun . . .
  - . . . but does not want to get addicted for the rest of her life.
- False sense of control
  - Projecting her current non-addicted preferences into the future, she thinks she can stop smoking if necessary.
  - She might try cigarettes, get addicted, and consume much of her life, . . . whereas she wouldn't do so if she knew she couldn't quit.

## Addiction: quitting and restarting cycles

- (1) Addicts often express desire to stop using substance permanently, but are unable to follow through (not so surprising—quasi-hyperbolic discounting predicts both).
- (2) Short-term abstinence is common, while long-term abstinence is rare.
  - In 2000, 41% of smokers stopped for at least one day trying to quit.
  - But only 4.7% successfully abstained for more than three months.
  - Doesn't sound like quasi-hyperbolic discounters; wouldn't go through pointless short-term pain.
  - Especially surprising given that withdrawal symptoms are on average strongest at start of quit attempt.
- (3) Recidivism rates especially high when addicts are exposed to occasional cues related to past drug consumption.
  - Treatment programs advise recovering addicts to move to new locations and to avoid places where previous consumption took place.

## Projection bias can explain quit and recidivism cycles.

- Define the state as the strength of cravings at the moment, and suppose this varies randomly (or with exposure).
- How do we explain starting a quit attempt?
  - Suppose an addict is currently consuming regularly.
  - She experiences period of low cravings, when it's easy to resist.
  - She thinks it'll always be easy to resist, so she thinks it's worth trying to quit, and starts a quit attempt.
- How do we explain abandoning a quit attempt?
  - Suppose an addict is currently on a quit attempt.
  - Something triggers strong cravings, so she feels it's very hard to resist drugs.
  - She thinks drugs will always be hard to resist, so she thinks the quit attempt is impossible to carry through. She abandons it.



## Projection bias, depression, and suicide

- Depressed individuals have tendency to project depressed feelings not only to the future, but also to the past.
  - May (1969): *“Depression is the inability to construct a future.”*
  - Solomon (1998): *“When you are depressed, the past and the future are absorbed entirely by the present. . . . You can neither remember feeling better nor imagine that you will feel better.”*
- Life feels particularly hopeless if there is no scope for future improvements

## Projection bias vs. naive quasi-hyperbolic discounting

- Both naivete in quasi-hyperbolic discounting and projection bias entail mis-prediction
- Example: smoker who wants to quit
  - (1) Naive quasi-hyperbolic discounting:
    - Overestimate future patience
    - Will sign up for commitment contract to stop smoking
    - Might fail due to overestimation of usefulness of commitment device
  - (2) Projection bias:
    - Underestimate influence of (altered) future states
    - Might also sign up for commitment contract to stop smoking
    - Will fail due to underestimation of changes in future cravings
- Another example: anesthesia during childbirth

## Can we tell projection bias and naivete regarding $\beta$ apart?

- Projection bias is a *state-dependent* mis-prediction.
  - More likely to predict future temptation to overeat when hungry.
  - More likely to predict future smoking when you haven't had a cigarette for a while.
- What variation is needed to disentangle the two explanations?
  - Variation in timing
  - Variation in states
- When should we offer people commitment devices?

## Projection bias: summary

- State-dependent preferences
  - Preferences vary systematically with states (e.g. hunger)
  - Food is tastier when hungry. Going on a date is less enjoyable while sick. Seminars are best when well rested.
- People *know* that preferences vary with states.
- Biases in state-dependent decision-making
  - Both intuition and psychology suggest that we fail to appreciate the extent to which our preferences change with states.
  - Projection bias is a specific psychological error of this type.
  - Overestimate extent to which future tastes resemble current tastes
  - Underestimate influence that the state has on their utility

## Attribution bias (see recitation)

- Understanding the influence of future vs. past states
  - Projection bias: mis-prediction of influence of future states
  - Attribution bias: mis-prediction of influence of past states
- Definition
  - When judging the value of a good, people are overly influenced by the state in which they previously consumed it.
- Examples
  - More likely to return to a restaurant first tried when hungry
  - More likely to negatively rate a movie seen while tired
  - Less likely to recommend a zoo to a friend if it rained during last visit

## What's next?

- No class on Monday (April 20)!
- Wednesday (April 22): Gender, discrimination, and identity
- Please read Sarsons (2019) sections I

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