Non-standard Preferences

Risk preferences

Advanced course in Behavioural and Psychological Economics

Tampere University

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Link to updated version

Bibliography:

- DellaVigna, S. (2009). 'Psychology and Economics: Evidence from the field'. *Journal of Economic Literature*, 47(2): 315-372.
- O'Donoghue, T., & Sprenger, C. (2018). 'Reference-dependent Preferences'. *In Handbook of Behavioral Economics-Foundations and Applications* (Vol. 1, pp. 1-77)

Topics

Introduction

Endowment Effect

Housing

Finance

Insurance

Labor

Introduction

Standard theory poses:

$$\max_{x_{i,t} \in X_t} \sum_{t=0}^{\infty} \delta^t \sum_{s_t \in S_t} p(s_t) U(x_{i,t} \mid s_t) \tag{1}$$

- $U(x \mid s)$: utility
- x_t: period t payoffs
- $p(s)$: probability of state s
- δ: (time-consistent) discount factor

Introduction

Standard theory poses:

$$\max_{x_{i,t} \in X_t} \sum_{t=0}^{\infty} \delta^t \sum_{s_t \in S_t} p(s_t) U(x_{i,t} \mid s_t) \tag{1}$$

- $U(x \mid s)$: utility
- x_t: period t payoffs
- $p(s)$: probability of state s
- δ: (time-consistent) discount factor

$\ldots$ but utility is **not standard**

Risk Preferences

Empirical Evidence

- **Kahneman & Tversky (1979):**
  - `T0`: We give you \$1000 +
    - → **A:** \$1000 with 50% chance.
    - → **B:** \$500 for sure (100% chance).
  - `T1`: We give you \$2000 -
    - → **C:** \$1000 with 50% chance.
    - → **D:** \$500 for sure (100% chance).
  - Evidence:
    - → 16% choose A and 84% choose B
    - → 69% choose C and 31% choose D
    - → However, $A = C$ and $B = D$!

Prospect Theory

Following Kahneman & Tversky (1979)

We consider a reference-dependent model of preferences that explains the observed deviations from the standard model:

1. **Reference Dependence**
2. **Loss Aversion**
3. **Diminishing Sensitivity**
4. **Probability Weighting**
5. **Narrow Framing**

Theoretical Framework

Suppose that an individual evaluates a lottery $(y, (p)\,;\; z, (1-p))$:

Win y with probability (p), win z with probability $(1-p)$

$$U = \pi(p)v(y-r) + \pi(1-p)v(z-r) \tag{4}$$

- r: reference point
- v: value function
- π: probability weighting function

Theoretical Framework

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- r: reference point
- v: value function
  1. **Reference Dependence:** defined over differences with reference point (r)
  2. **Loss Aversion:** kink at the reference point, steeper for losses than for gains
  3. **Diminishing Sensitivity:** concave over wins and convex over losses
- π: probability weighting function

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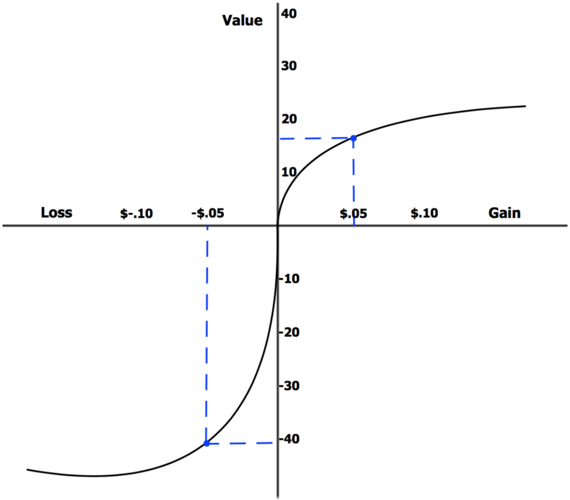
  3. **Diminishing Sensitivity:** concave over wins and convex over losses
- π: probability weighting function
  4. **Probability Weighting:** overweighting small (and underweighting large) probabilities

Prospect Theory In One Image



Narrow Framing

- Decision-Makers **Evaluate Risks In Isolation**
  - Ignoring background risks
    - → e.g., *earnings or wealth fluctuations*
- *Standard* Theory Predicts Individuals to Aggregate Risks
  - e.g., *individuals with risky income sources should aggregate them into encountered lotteries*
    - → e.g., *consider compounded probability of winning lottery and earning more from other sources*
- Empirical Evidence
  - **Lab behavior coherent with narrow framing** (Barberis et al., 2006)
- Usefulness
  - **Each lottery or risk** is evaluated as if it were the **only determinant** of consumption utility
  - Applications
    - → Often used to recover preferences, ignoring outside income
    - → Plays a key role in experimental and empirical studies

Theoretical Framework

A simplified prospect theory model adopts *(1) reference dependence* and *(2) loss aversion*:

$$v(x \mid r) = \begin{cases} x - r & \text{if } x \geq r, \\ \lambda(x - r) & \text{if } x < r \end{cases} \tag{5}$$

- λ: loss aversion parameter, restricted to $\lambda > 1$

Theoretical Framework

Consider the lottery $(-5, .5\,;\, 8, .5)$ from Fehr & Goette (2007):

Lose 5 *with probability* $(.5)$, *win* 8 *with probability* $(.5)$

- For $r = 0$

$$U = ((.5) \times \lambda(-5)) + ((.5) \times (8))$$

$$U = -\frac{5}{2}\lambda + \frac{8}{2} = 0 \Leftrightarrow \boxed{\lambda = \frac{8}{5} = 1.6}$$

  - Indifferent between options only if losses are valued 60% more than gains

Theoretical Framework

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  - Indifferent between options only if losses are valued 60% more than gains
    - → Kahneman & Tversky (1992) estimate even higher loss aversion: $\lambda = 2.25$

Cases

1. Endowment Effect
2. Housing
3. Finance
4. Labor
5. Insurance
6. Employment

Topics

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Endowment Effect

Definition
Asymetric willingness to pay (WTP) and willingness to accept (WTA)

Endowment Effect

Kahneman, Knetsch, & Thaler (1990): Randomized experiment with mugs

Endowment Effect

Kahneman, Knetsch, & Thaler (1990): Randomized experiment with mugs

- Setup:
  - `T0`: No mug
  - `T1`: Receive a mug
  - `T2`: Choose between a mug and money
- Evidence:
  - Indifference point in `T2`: $3.12
  - WTP in `T0` is $2.87 vs. WTA in `T1` is $7.12

Endowment Effect

Plott & Zeiler (2005): Extension to investigate potential confounding factors (e.g., experience, anonymity)

- Setup:
    - Replication of Kahneman, Knetsch, & Thaler (1990) with:
        - → WTP/WTA training sessions
        - → Ensured anonymity

- Evidence:
    - WTP in `T0` is \$5.56 vs. WTA in `T1` is \$6.62

Endowment Effect

List (2003): Baseball cards exchange

Endowment Effect

List (2003): Baseball cards exchange

- Setup:
  - At a sports card fair, participants endowed with card A or B
    - → All participants have familiarity with object
      (in contrast to Kahneman, Knetsch, & Thaler, 1990; Plott & Zeiler, 2005)
  - Asked if they wanted to switch, distinguishing by experience
    - → Above-average trading experience: trade 6-time per month
- Evidence:
  - Below-average trading experience: 6.8% switched
    - → WTP is \$3.32 vs. WTA is \$18.53
  - Above-average trading experience: 46.7% switched
    - → WTP is \$6.27 vs. WTA is \$8.15
  - List (2004): Extended results to mug trade

Endowment Effect

List (2003): Baseball cards exchange

- Interpretation:
  - Endowment effect reflects trading behavior but is tempered by experience

    → Why?

    1. Experience reduces naïveté, increasing awareness of loss aversion
    2. Experience affects reference point formation

       Individuals interiorize that reference point is determined by random factors

       They decide taking into account their stochastic reference point

Endowment Effect

Consider a stochastic reference point for having card A:

- For $r = 0$ with probability $.5$ and $r = 1$ with probability $.5$
  - Keeping card A:

    $$.5 \times [(u(1) - u(0))] + .5 \times [(u(1) - u(1))] = \boxed{.5\,[(u(1) - u(0))]}$$

  - Selling card A:

    $$.5 \times [(u(0) - u(0)) + p_{WTA}] + .5 \times [\lambda(u(0) - u(1)) + p_{WTA}] = \boxed{.5\,[\lambda(u(0) - u(1))] + p_{WTA}}$$

  - Indifference between keeping and selling card A:

    $$.5\,[(u(1) - u(0))] = .5\,[\lambda(u(0) - u(1))] + p_{WTA}$$

    $$\Leftrightarrow p_{WTA} = .5\,[(u(1) - u(0))] - .5\,[\lambda(u(0) - u(1))] = \boxed{p_{WTA} = .5(1 + \lambda)\,(u(1) - u(0))}$$

Endowment Effect

Consider a stochastic reference point for having card A:

- For $r = 0$ with probability $.5$ and $r = 1$ with probability $.5$
  - Not having card A:

    $$.5 \times [(u(0) - u(0))] + .5 \times [\lambda\,(u(0) - u(1))] = \boxed{.5\,[\lambda(u(0) - u(1))]}$$

  - Buying card A:

    $$.5 \times [(u(1) - u(0)) - p_{WTP}] + .5 \times [(u(1) - u(1)) - p_{WTP}] = \boxed{.5\,[(u(1) - u(0))] - p_{WTP}}$$

  - Indifference between not having and buying card A:

    $$.5\,[\lambda(u(0) - u(1))] = .5\,[(u(1) - u(0))] - p_{WTP}$$

    $$\Leftrightarrow p_{WTP} = .5\,[(u(1) - u(0))] - .5\,[\lambda(u(0) - u(1))] = \boxed{p_{WTP} = .5(1 + \lambda)\,(u(1) - u(0))}$$

Endowment Effect

Consider a stochastic reference point for having card A:

- For $r = 0$ with probability $.5$ and $r = 1$ with probability $.5$
  - Willingness to accept for card A:

    $$p_{WTA} = .5(1+\lambda)\left(u(1) - u(0)\right)$$

  - Willingness to pay for card A:

    $$p_{WTP} = .5(1+\lambda)\left(u(1) - u(0)\right)$$

    $$\therefore \boxed{p_{WTA} = p_{WTP}}$$

    There Is No Endowment Effect!

Topics

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Endowment Effect

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Housing

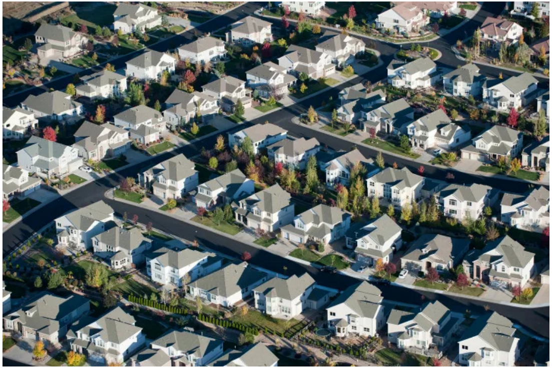
Observation

Homeowners use their buying price as a reference point.

- When the actual price is lower, loss aversion makes homeowners ask for higher prices

Housing

Genesove & Mayer (2001): House sales in Massachusets, United States



Housing

Genesove & Mayer (2001): House sales in Massachusets, United States

- Setup:
  - `T0`: Boom in 1983–87
    - → Homeowners bought houses at high prices
  - `T1`: Slump in 1989–92
    - → Homeowners bought houses at low prices
- Evidence:
  - Listing prices for houses predicted to sell at a loss are higher than predicted prices:
    - → 1% predicted loss ⇒ .25% higher listing price
    - → Effect is stronger for individuals than companies, showing an experience effect
  - Higher listing prices lead to:
    - → Longer waiting times
    - → Higher final selling prices

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Finance

Equity Premium Puzzle

Equity outperforms bonds by approximately 4% annually

... but why doesn't the market even out this premium?

Finance

Bernartzi & Thaler (1995): Premium is consistent with loss-averse investors evaluating over short-term horizons

Finance

Bernartzi & Thaler (1995): Premium is consistent with loss-averse investors evaluating over short-term horizons

- Short-Term:
  - Premium is required to invest in equity
  - Higher probability that equity underperforms bonds in the short term
- Long-Term:
  - Premium is not required to invest in equity
  - Lower probability that equity underperforms bonds over the long term
- Conclusion
  - Short-term evaluation of investments explains the observed equity premium

Finance

Disposition Effect

People tend to sell ‘winners’ and hold ‘losers’

... but capital gain taxation incentivize to hold ‘winners’ and liquidate ‘losers’ sooner

Finance

Odean (1998): Individual trading data from a brokerage house for 1987–93

- Evidence:
  - Realized gains: 14.8% over purchase price
  - Realized losses: 9.8% over purchase price
  - Difference is not due to:
    - → Portfolio rebalancing
    - → Transaction costs
- Prospect Theory Interpretation:
  - Concavity over **gains** induces less risk taking
    - → Then, more sale of 'winners'
  - Convexity over **losses** induces more risk taking
    - → Then, more purchases of 'losers'

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Insurance

Observation

Pervasiveness of small-scale insurance (e.g., policies on kitchen appliances)

... but potential losses are much small

Insurance

Sydnor (2006): Random sample of insurance company customers

Insurance

Sydnor (2006): Random sample of insurance company customers

- For required home insurance, choices narrow down to deductibles:
  - \$250 / \$500 / \$1000
- Evidence:
  - 83% (61% new customers) choose lower than \$1000 deductible
    - $\rightarrow$ Modal choice is \$500
  - Implies an additional premium of \$100
    - $\rightarrow$ With a claim rate of 5%, value is: $25 = (1000 - 500) \times 5\%$.
    - $\rightarrow$ This incurs a loss of \$75 (= $100 - 25$) to insurance against a maximum loss of \$500
- Explanation:
  - Overweighting small probability of accident
  - Loss aversion to future losses
  - Social pressure from salesmen

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Labor

Response of labor supply to wage fluctuations

- Complex combination of *income* and *substitution* effects
- Focus on simpler institutional contexts:
  - Jobs in which workers **decide the labor supply daily**
    - → Long-term income does not change substantially from day-to-day labor decisions
    - → Any *income effect* on labor supply becomes negligible compared to *substitution effects*

    - → e.g., *drivers*
    - → e.g., *delivery workers*
    - → e.g., *day laborer (agriculture, warehouse)*
    - → e.g., *free-lance workers*

Labor

Response of labor supply to wage fluctuations: NYC taxi drivers

Labor

Following O'Donoghue & Sprenger (2018)

Consider a taxi driver choosing her daily work effort:

$$\max_{e} U = y(e) - c(e) \tag{6}$$

- U: utility
- e: effort level
- $y(e)$: generated outcome
- $c(e)$: cost of effort

Labor

Following O'Donoghue & Sprenger (2018)

Consider a taxi driver choosing her daily work effort:

$$\max_{e} U = y(e) - c(e) \tag{6}$$

F.O.C.: $MB(e^*) = MC(e^*) \quad \Leftrightarrow \quad \boxed{y'(e^*) = c'(e^*)}$

Labor

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$$\max_{e} U = y(e) - c(e) \tag{6}$$

F.O.C.: $MB(e^*) = MC(e^*) \quad \Leftrightarrow \quad \boxed{y'(e^*) = c'(e^*)}$

- For $y(e) = w \times e$ (*with w being an hourly wage*)

  F.O.C.: $\boxed{w = c'(e^*)}$

Labor

Following O'Donoghue & Sprenger (2018)

Consider taxi driver experiences *(1) reference dependence* and *(2) loss aversion*:

$$\max_e U = \begin{cases} (y(e) - r_y) - c(e) & \text{if } y(e) \geq r_y, \\ \lambda(y(e) - r_y) - c(e) & \text{if } y(e) < r_y \end{cases} \tag{6}$$

- λ: loss aversion parameter, restricted to $\lambda > 1$
- r_y: reference point for income

Labor

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- λ: loss aversion parameter, restricted to $\lambda > 1$
- r_y: reference point for income

We assume reference dependence and loss aversion only for income, not for effort!

Labor

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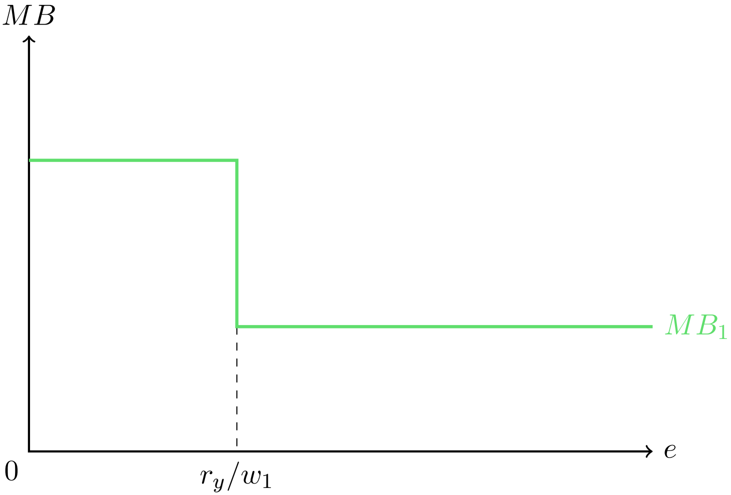
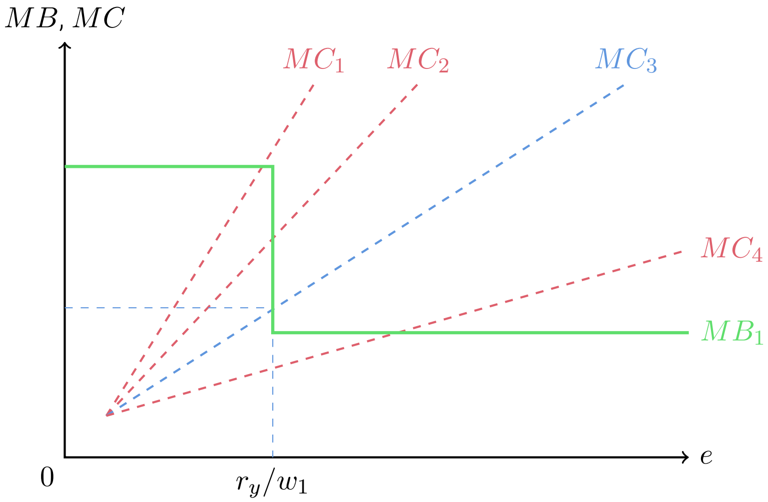
$$MB(e) = \begin{cases} y'(e) & \text{if } y(e) \geq r_y, \\ \lambda(y'(e)) & \text{if } y(e) < r_y \end{cases}$$

Labor



Labor



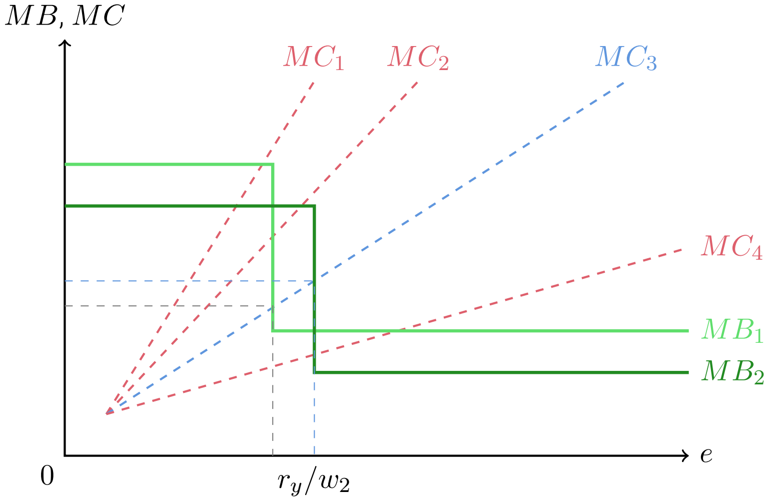
Labor

- For $D = \{1, 2, 3, 4\}, \quad w = w_1, \quad MB_i = MB_j \quad \forall i, j \in D$

  (Taxi drivers differ only in their MC)

  - **Driver 1:** Fails to reach income reference point
  - **Driver 2:** Reaches income reference point and stops working
  - **Driver 3:** Reaches income reference point and stops working
  - **Driver 4:** Fulfills income reference point and works more

Labor



Labor

- For $D = \{1, 2, 3, 4\}$, $\quad w = w_2$, $\quad MB_i = MB_j \;\; \forall i, j \in D$
  (Taxi drivers differ only in their MC)

  Taxi drivers effort response to $w_1 \rightarrow w_2$ (wage decline)

  - **Driver 1:** Decreases work and fails to reach income reference point
  - **Driver 2:** Increases work, but fails to reach income reference point
  - **Driver 3:** Increases work to reach income reference point
  - **Driver 4:** Decreases work, but not as much to don't fall from income reference point

Labor

Camerer et al. (1997): Taxi drivers in NYC

Labor

Camerer et al. (1997): Taxi drivers in NYC

- Data:
  - Three different datasets of taxi drivers daily working hours and earnings
  - Computes average daily wages

    $\rightarrow$ Problematic measure, which can potentially cause biases

- Evidence:
  - Consistent evidence of negative wage elasticity

    $\rightarrow$ Taxi drivers work less hours when daily earnings are higher

    $\rightarrow$ ... but more experienced drivers behave more in line with *standard* theory

Labor

Camerer et al. (1997): Taxi drivers in NYC

- Critiques
  - Wage changes may be related to supply
    - → e.g., *rain (which makes taxi driving more unpleasant)*
    - → Camerer et al. controls for plausible supply shifters and interview taxi drivers to show price changes are more related to demand
  - Wage measure suffers division bias
    - → Measurement errors in hours mechanically induce downward bias on the elasticity
    - → Camerer et al. use other taxi drivers wage as instrument and find consistent results

- Academic debate:
  - Do NYC taxi drivers show reference dependent behavior?
  - **Main issue:** Lack of instruments for wage changes limits more robust results

Labor

Farber (2015): Taxi drivers in NYC

Labor

Farber (2015): Taxi drivers in NYC

- Data:
  - Driver's trip sheets
    - → Drivers are required to fill out each trip with (1) fare, (2) start and end times, and (3) locations
- Prior evidence:
  - Drivers more likely to stop working as daily cumulative earnings are higher (Farber, 2005)
    - → In line with reference dependence
  - Direct test of reference dependence are weakly in line with hypothesis (Farber, 2008)
    - → While it may occur, it has limited value for predicting behavior

Labor

Farber (2015): Taxi drivers in NYC

- Data:
  - All trips in 2009-2013 from a subsample of $\sim$9,000 drivers

    $\rightarrow$ $\sim$13% of all NYC taxi drives, amounts to $\sim$115 million trips
- Evidence:
  - Little support for income reference dependence
- Interpretation:
  - Why wouldn't drivers target reference points?

    $\rightarrow$ Because it would lead to inefficiency
  - What happens then?

    $\rightarrow$ New drivers learn to take advantage of strong earnings opportunities (working more on high-wage days and less on low-wage days)

    $\rightarrow$ Drivers who start with negative or small positive labor supply elasticities quit the business

Labor

Thakral & Tô (2021): Taxi drivers in NYC

- Data:
  - All NYC taxi trips in 2013
- Evidence:
  - Drivers more likely to stop working as daily cumulative earnings are higher
  - Effect changes depending on when the previous earnings were made

    → Probability of stopping is less sensitive to earnings made earlier in the shift
- Interpretation:
  - Reference points adjusts over the course of a shift in response to realized earning

    → e.g., *by the eight hour, earnings from the first few hours of the shift are mostly incorporated into the reference point and have no impact on behavior*

Labor

Fehr & Goette (2007): Bike messengers

Labor

Fehr & Goette (2007): Bike messengers

- Setup:
  - Messengers in two companies working across two months
  - `T0`: Month 1 with 0% additional commission. Month 2 with 25% additional commission
  - `T1`: Month 2 with 25% additional commission. Month 2 with 0% additional commission
- Evidence:
  - Messengers work 30% more shifts on months with higher commission

    → Consistent with *standard* theory

    (more effort when wage is higher)

    → Consistent with reference dependence theory

    (easier to reach daily target)

Labor

Fehr & Goette (2007): Bike messengers

- More evidence:
  - Messengers do 6% less deliveries on shifts during months with higher commission

    → Inconsistent with *standard* theory

    (more effort when wage is higher)

    → Consistent with reference dependence theory

    (daily targets)

- Explanation:
  - Workers get tired from working more shifts and exert less effort within shifts?
  - Reference dependence behavior

    → Independent loss aversion lab measurements predict negative response in within-shift effort

    → Consistent with reference dependence, but not with tired workers

Labor

Mas (2006): Policemen in New Jersey, United States

Labor

Mas (2006): Policemen in New Jersey, United States

- Setup:
  - 9% of contracts reach a non-agreement between policemen and municipality
    - → Both parties submit their offer and an arbitrator chooses one
  - `T0`: Chooses municipality offer
  - `T1`: Chooses employee offer
- Evidence:
  - 12% lower crimes solved in `T0` vs. `T1` (i.e., *less policemen effort*)
- Explanation:
  - Reciprocity plays a role in the decision-making process:
    - → Reference-point mediates the effect
    - → Mas (2006) computes the predicted reference point for policemen wages
    - → Response is higher when policemen experience a loss compared to a gain

Main Takeaways

- People take into account **reference points** in decision-making
    - Utility due to outcomes depend on comparison to reference points
- **Losses loom larger than gains**
    - Disutility due to loses is greater than utility due to same-magnitude gains
    - Resulting in **endowment effect**
- Experience helps dealing with reference points
    - More acknowledging of the randomness of reference points
    - Resulting in subdued endowment effect, increasing optimality