An Exterior Differential Calculus Approach to Jacques Lacan

Conference in Honor of Jean Michel Lasry's 70th Birthday

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Columbia University

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- And, last but not least, the wise man

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Normalize $y = 1 \longrightarrow$ envelope: $x(p)$ proportional to a gradient

$$D_p V = -\lambda(p)\, x(p) \Rightarrow D_p x(p) = \frac{1}{\lambda(p)} \left(x (D_p \lambda)' - D_p^2 V \right)$$

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- **But:** *there are two people in a couple!!!*

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- Testability: what does it imply for the *demand function?*

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- Therefore

$$\frac{1}{\lambda_m} D_p V_m = -x_m(p) + D_p \rho_m \Rightarrow x(p) = \sum_m x_m(p) = -\sum_m \frac{1}{\lambda_m} D_p V_m$$

and $x(p)$ is a linear combination of the gradients of increasing, concave functions

When can a given vector field in R^n be written as a linear combination of k gradients of increasing, concave functions ???

→ Jean-Michel's words of wisdom (part 1):

'Talk to Ivar'

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  - Additional conditions reflecting concavity; *sufficient!*

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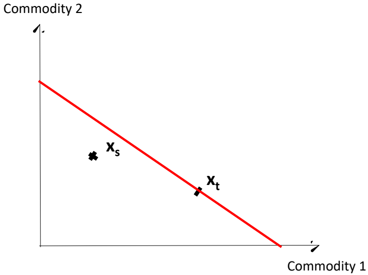
$$(x_{t_l})\ DRP\ (x_{t_{l+1}})\ , l = 0, ..., k-1$$



The RP approach (cont.)

- Two basic axiom:
  Weak Axiom of RP (WARP): *if* x_t *DRP* x_s *then* $p^{s\prime} x_t > y^s$
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- **Standard result** (Kihlstrom Mas Colell Sonnenschein): consider a smooth demand function $x(p, y)$, take any finite subsample $(p^t, y^t; x(p^t, y^t))$, $t = 1, ..., T$. Then
  WARP for all such finite subsample $\Longleftrightarrow$ *Slutsky negativeness*
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  - Testable conditions for the collective model
  - ... that depend on the number of decision makers (nested)

The collective model and Jacques Lacan

→ Jean-Michel's words of wisdom (part 2):

'Why do you expect an individual to be represented by a single utility?'

→ Jean Michel's exact words:

'What about le Grand Autre' ??

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- Recent paper: Cherchye, De Rock, Griffith, O'Connell, Smith, Vermeulen:
  'A new year, a new you? A two-selves model of within-person variation in food purchases' (2018)

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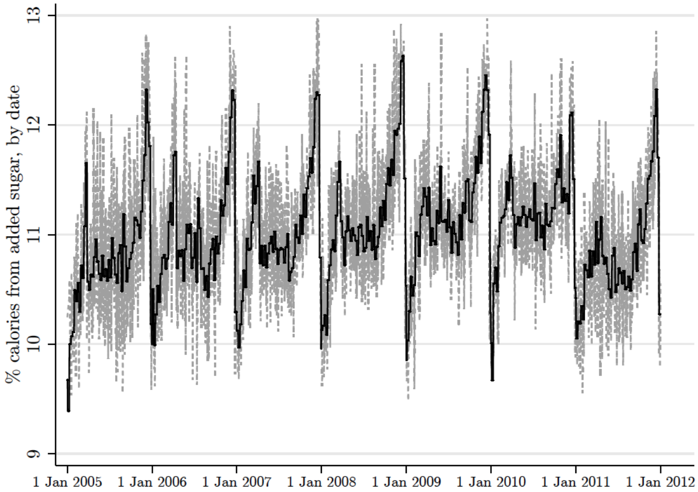
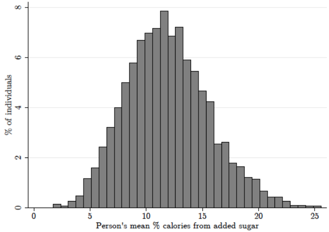
    - The nature of the remaining 27 goods is individual specific $\longrightarrow$ allows for a different perception across individuals

Typical consumption pattern

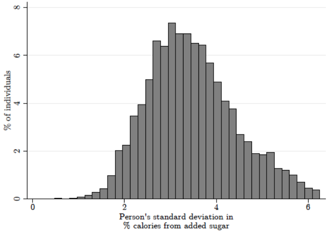


Striking within person variation: individual pattern

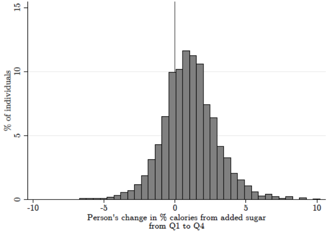
(a) Mean



(b) Standard deviation



(c) Change from Q1 to Q4



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Based on year-month data for each individual

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  $\longrightarrow$ Average 3.5 percentage points
- Deterioration throughout the year: Q1-Q4 ratio
  $\longrightarrow$ For 70% of the individuals the share increases

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Two-self collective model (cont.)

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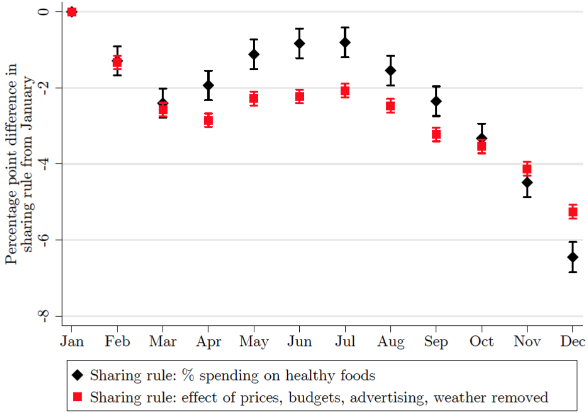
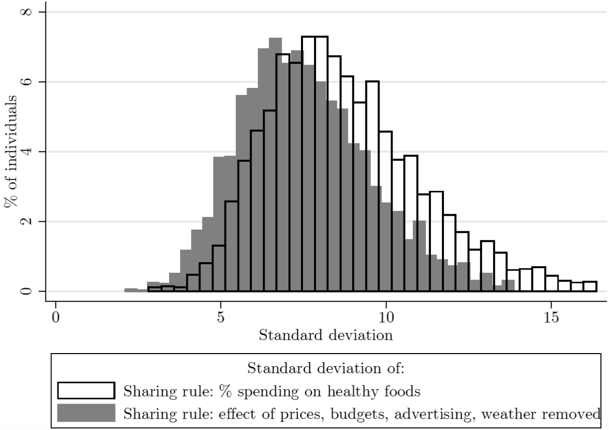
- Regress the sharing rule

Regressors:	Mean	25th	50th	75th
Price	0.06	0.01	0.03	0.08
Budget	0.06	0.01	0.03	0.08
Price and budget	0.12	0.03	0.09	0.17
Advertising	0.05	0.01	0.02	0.07
Weather	0.10	0.04	0.07	0.13
Price, budget, advertising, weather	0.23	0.13	0.21	0.30

Two-self collective model (cont.)



Two-self collective model: self-control



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- ... and are supported by the data!

Happy
Birthday
Jean Michel