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MEASURING AND MANAGING CONSUMERS' RISK PERCEPTION TOWARDS FOOD RELATED ISSUES

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To start with

New food technologies available
Relation between diet and health
Food scares

Mass media

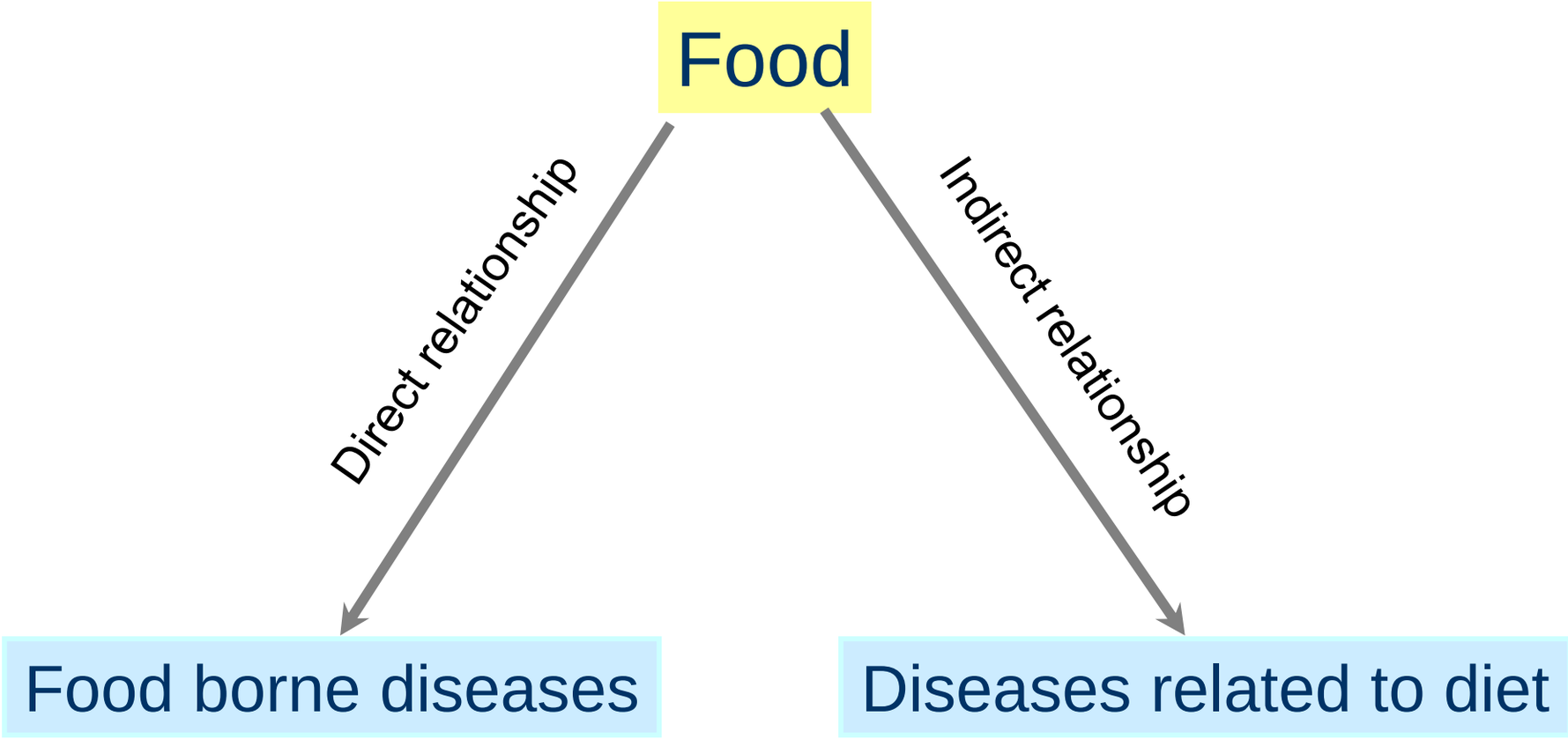
Increasing consumers concerns about food safety and health issues
Risk perception
Changing attitudes
Changing behavior

<u>Policy makers</u>
Regulation

<u>Industry</u>
Brands, HACCP
Health claims

<u>Social scientists</u>
Research
multidisciplinary

To start with



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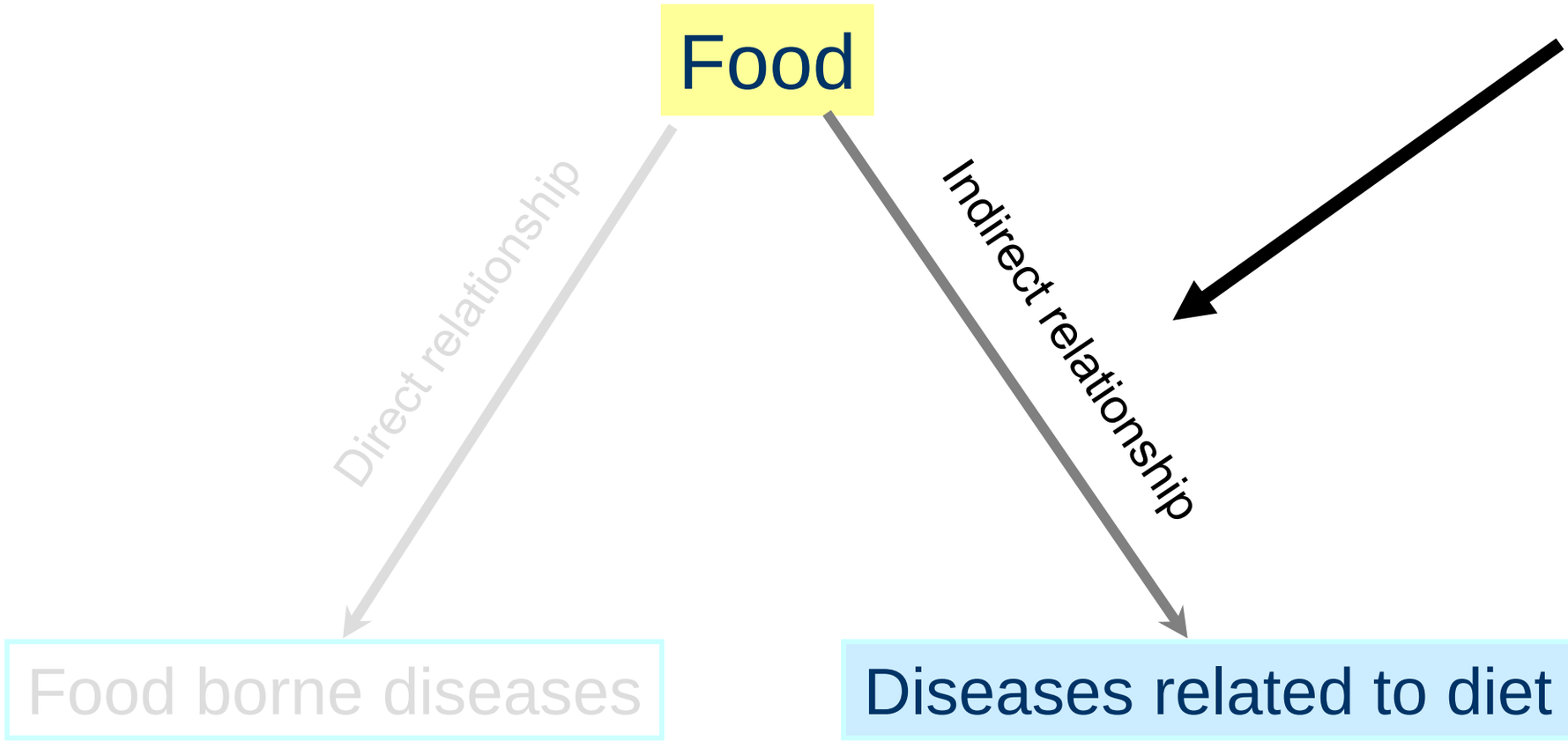

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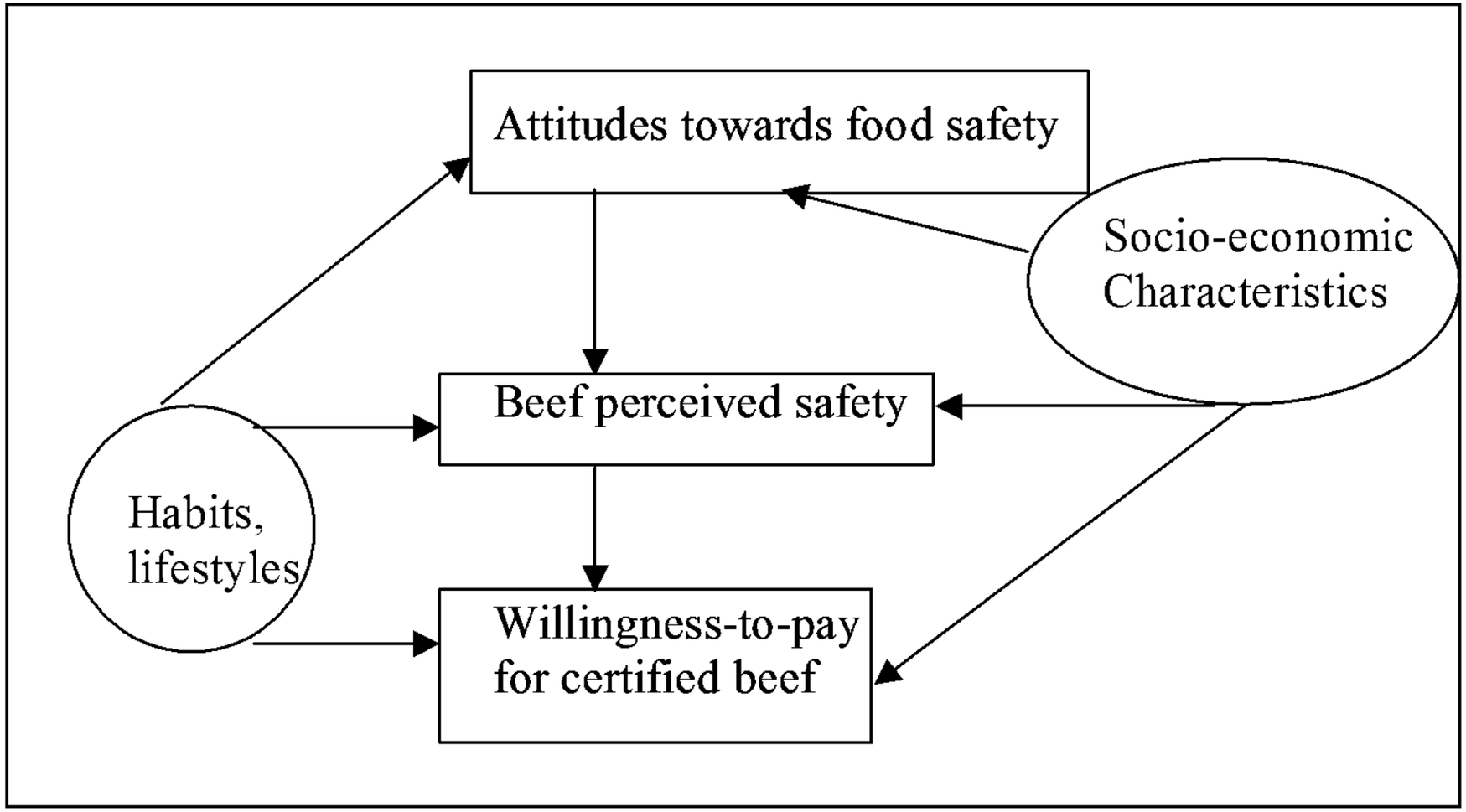
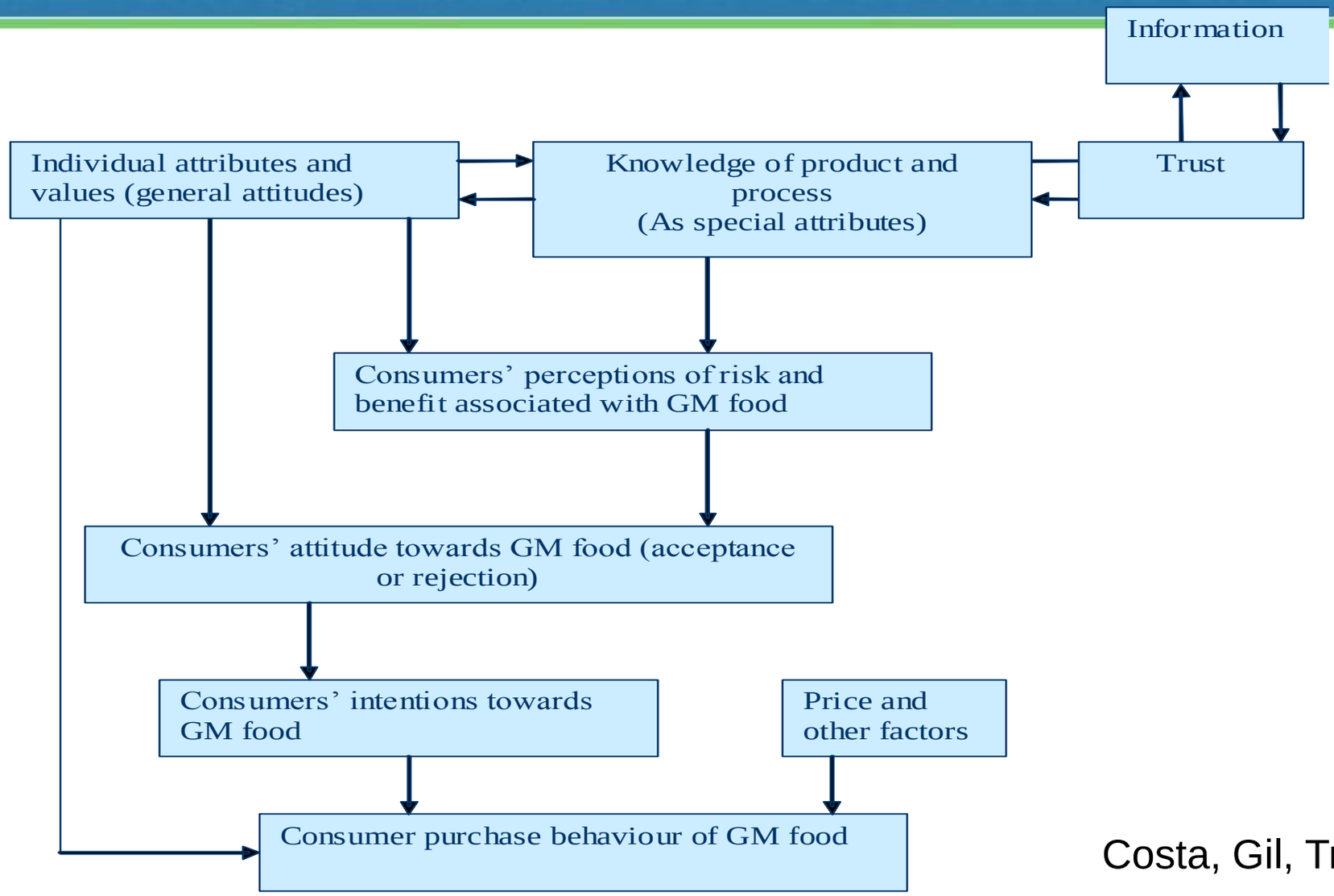


Angulo and Gil (2007). Food Quality and Preference

To start with



Costa, Gil, Traill (2008). Food Policy

Outline of the presentation

- Risk Perception & Risk Aversion
- Linking Risk Perception & Risk Attitudes
- Measuring Risk Attitudes: Simple Methods
- Expected Utility Framework
- Prospect Theory Framework
- Measuring Risk Attitudes: Complex Method
- Empirical Application
- Estimating Prospect Theory Parameters
- Preliminary Results 1
- Relating Risk Attitudes & BMI
- Preliminary results 2

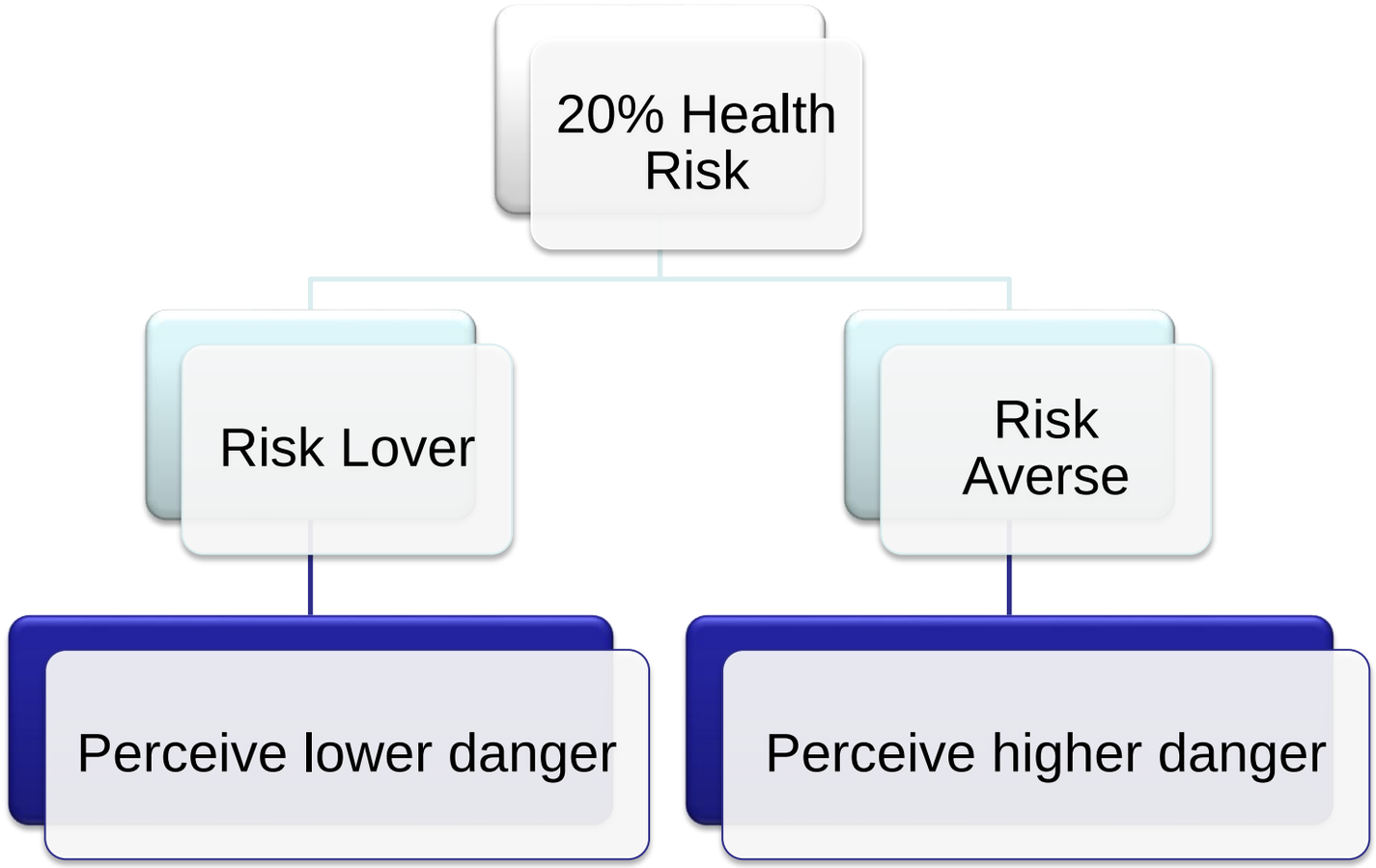
Risk Perception & Risk Aversion 1

- In Business:
- A person's risk propensity influences evaluation of risky situation.
- Risk propensity may impact risk perception (Brockhaus 1980; Vlek and Stallen 1980).
- Risk propensity has an inverse effect on risk perception (Keil et al.,2000; Forlani et al. (2002).

Risk Perception & Risk Aversion 2

- Food Safety
- Less risk averse consumers perceive food safety risk to be very low in case of an outbreak (Schroeder et al. 2017; Weller, Andrea and Caleb (2012).
- Consumption only reduces when the risk perception is relatively high
- Consequently, less risk averse people rarely reduce consumption

Linking Perception & Attitudes 1



Based on results from Schroeder et al. (2017) Weller, Andrea and Caleb (2012)

Linking Perception & Attitudes 2

So,

- Risk attitudes negatively affect risk perceptions
- Risk attitudes are inherent to consumers
- Risk perceptions are more conjectural (measurement is ad hoc and case specific) and depend on information, the technology itself, mass media or social networks and risk attitudes

- Other presentations on risk perception
- We focus on risk attitudes and, more specifically, **how to measure them?**

Measuring Risk Attitudes 1

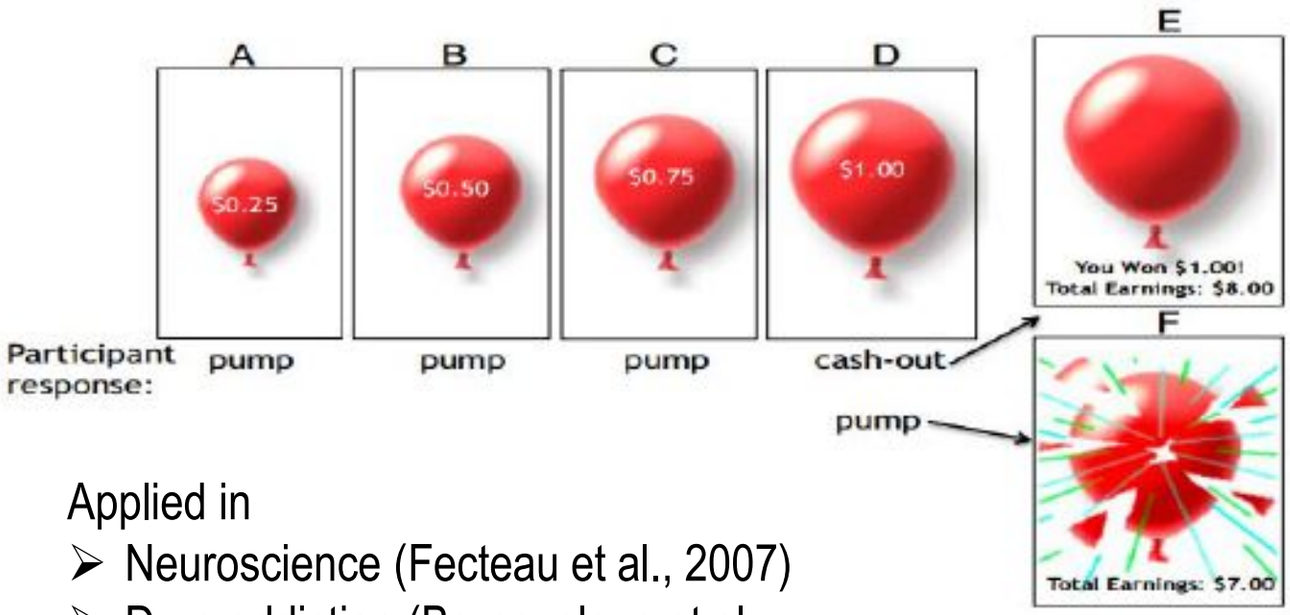
- Respondents give a global assessment of their willingness to take risks.
- Framing
  - “How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks”
- Respondents are assessed on the scale of 0 - 10:
  - 0 => not at all willing to take risks
  - 10 => very willing to take risks

(Dohmen et al., 2011)

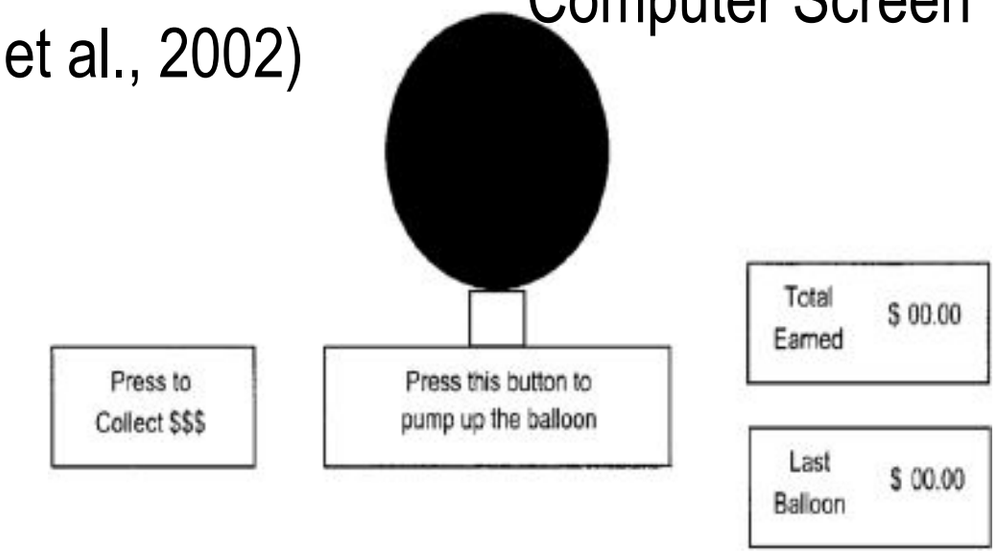
Measuring Risk Attitudes 2

Experimental Methods - Simple

1. Balloon Analogue Risk Task (Lejuez et al., 2002)



Computer Screen



Applied in

- Neuroscience (Fecteau et al., 2007)
- Drug addiction (Bornovalova et al., 2005) and
- Psychopathology (Hunt et al., 2005).

WEAKNESS

- It is not clear if risk preferences extend to other domains
- Requires a computer and multiple trials to implement

Measuring Risk Attitudes 3

Healthy & Safety	8 items
Ethical	8 items
Recreational	8 items
Social	8 items
Gambling	4 items
Investment	4 items

very unlikely	unlikely	not sure	likely	very likely
1	2	3	4	5

- Simple to understand method

Critics:

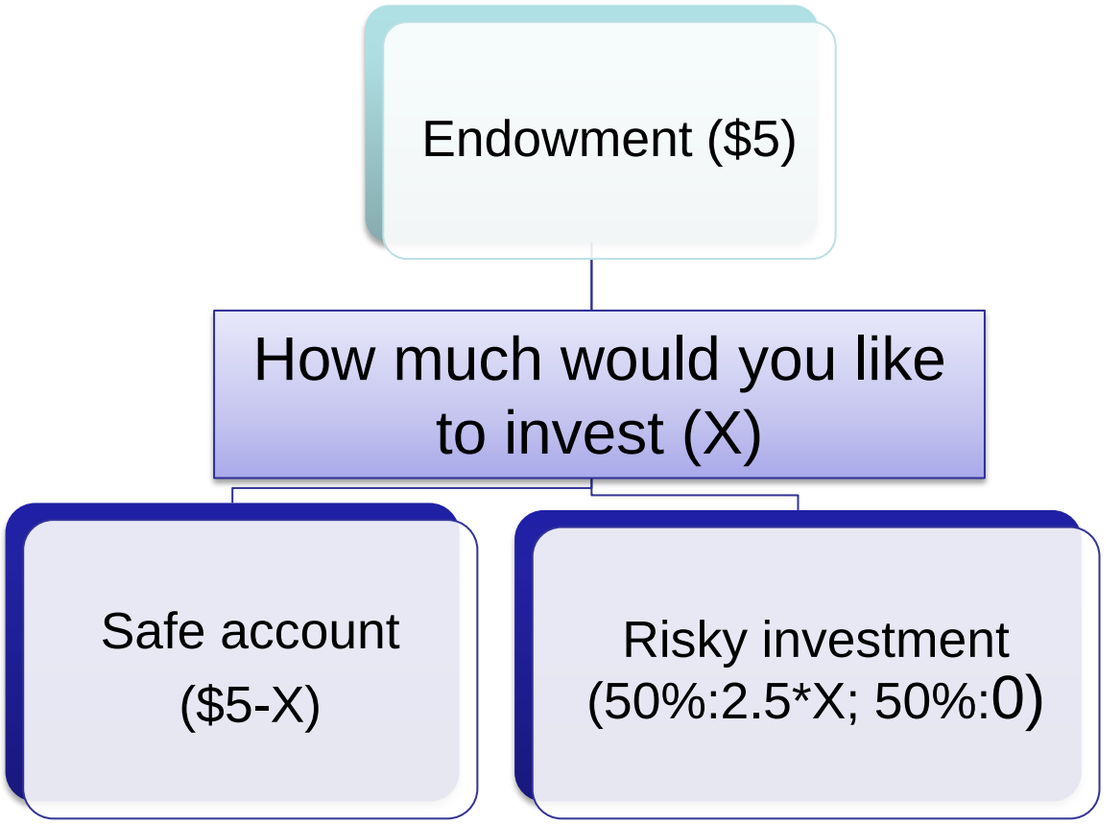
- Questionnaires are not incentivized:
  - Hence, elicited risk preferences may partially reflect an individual's true attitudes toward risk

- Hanoch et al. (2006) used the DOSPERT to demonstrate the domain-specific nature of risk preferences.

Preference (X) = a*Expected Benefit (X) + b*Perceived Risk (X) + c

Measuring Risk Attitudes 4

3. The Gneezy and Potters method



- Used to elicit myopic loss aversion in the financial decisions among
  - students (Gneezy and Potters, 1997),
  - professional traders (Haigh and List, 2005)
- Compare gender differences in risk attitudes (Charness and Gneezy, 2012).
- Risk preferences of bridge players

Critics:

- Does not distinguish between risk-seeking and risk-neutral preferences

The Investment game risk-elicitation method: from certain to uncertain

Measuring Risk Attitudes 5

4. Eckel-Grossman Task

The Eckel and Grossman measure.

Choice (50/50 Gamble)	Low payoff	High payoff	Expected return	Standard deviation	Implied CRRA range
Gamble 1	28	28	28	0	$3.46 < r$
Gamble 2	24	36	30	6	$1.16 < r < 3.46$
Gamble 3	20	44	32	12	$0.71 < r < 1.16$
Gamble 4	16	52	34	18	$0.50 < r < 0.71$
Gamble 5	12	60	36	24	$0 < r < 0.50$
Gamble 6	2	70	36	34	$R < 0$

- Results correlated significantly with those elicited through the other methods (Reynaud and Couture, 2012)
- Produced significantly less noisy estimates of risk preferences more than complex (Dave et al., 2010)
- Relatively easy for individuals to understand

Critics:

- it cannot differentiate between different degrees of risk-seeking behaviour

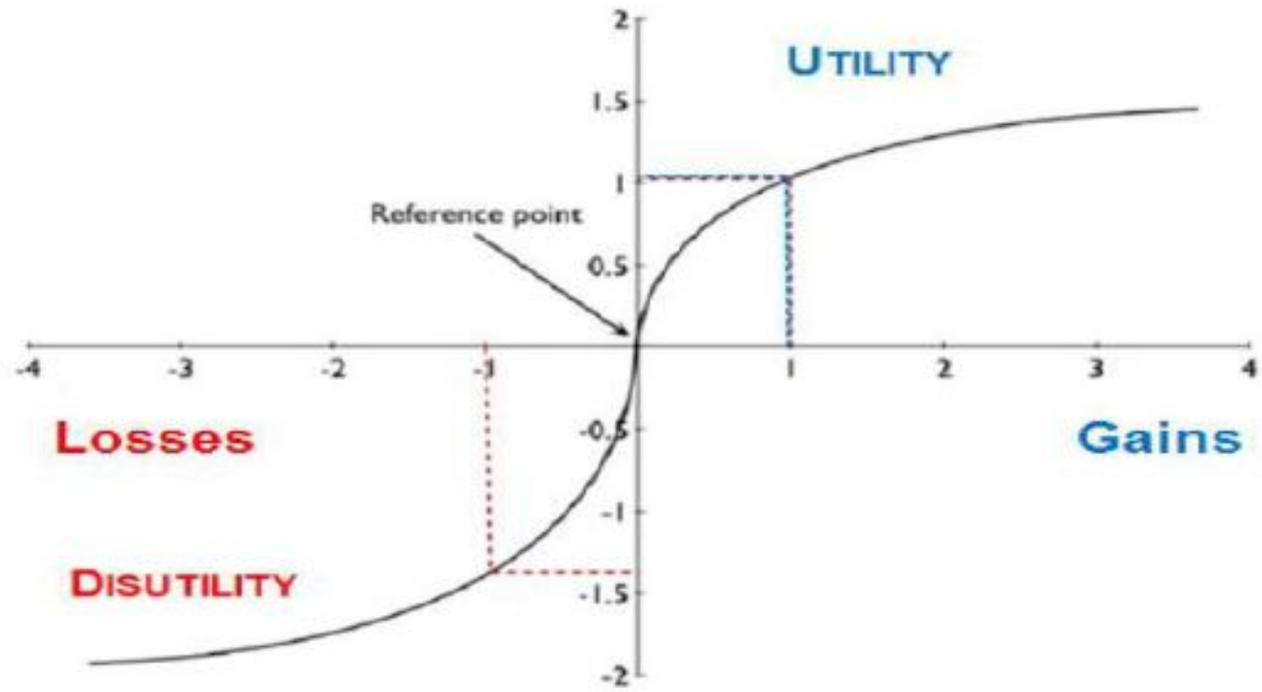
Expected Utility

- Preferences towards risky choices are represented by utility function (ordinal, not cardinal) U(a)
  - von Neumann Morgenstern utility function
- Decisions are made to maximize expected utility EU(a)
  - E is the expectation operator based on subjective probability distributions of a
- Independence assumption violated (assumption of linearity in probabilities may not hold).
- Risk preference characterized by expected utility (EU) assume that,
  - Risk aversion is the sole parameter for determining the curvature of the utility function.

Prospect Theory 1

- In Prospect Theory (PT) losses are valued more heavily than gains
  - Presence of loss aversion
- PT postulate
  - risk aversion for gains, concave utility function
  - risk seeking to avoid losses, convex utility function

Prospect Theory 2

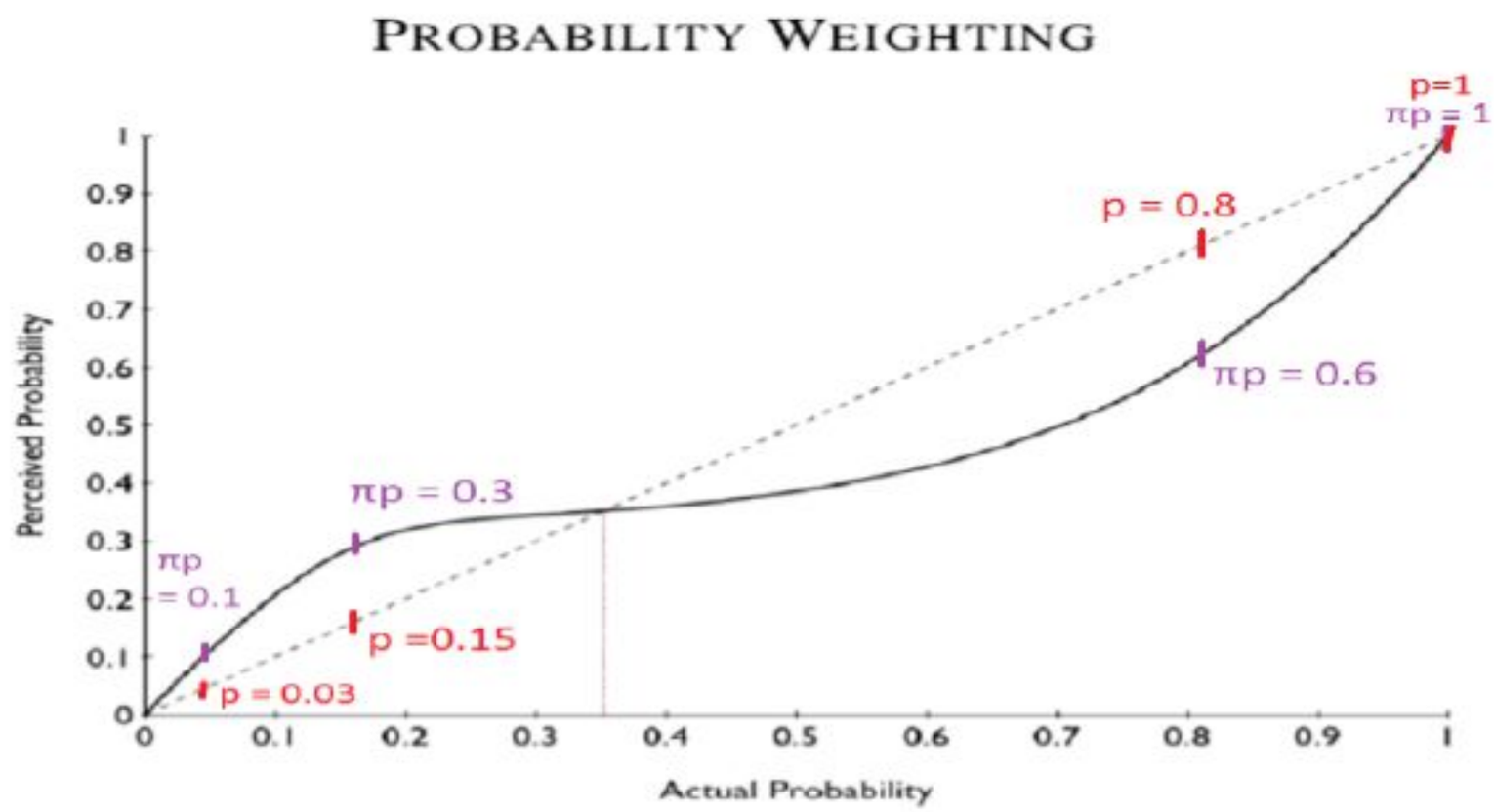


Loss aversion and Risk Aversion in Prospect Theory

Prospect Theory 3

- In PT the shape of the utility function is jointly determined by
  - risk aversion,
  - loss aversion (which measures one's sensitivity to loss compared to gain),
  - and nonlinear probability weighting (the individual tendency of overweighting small (large) probabilities and underweighting large (small) probabilities).

Prospect Theory 4



Probability Weighting in the Prospect Theory

Prospect Theory 5

- The MPL was designed to allows the researcher to estimate models that
  - nest both EU and PT
- Also MPL allows the results from the experiment to determine whether EU or PT better fits the data.

Measuring Risk Attitudes 1

Complex Method: Holt–Laury measure of risk aversion

MPL method.

Option A	Option B	Option A	Option B
1/10 of $2, 9/10 of $1.60	1/10 of $3.85, 9/10 of $0.10	☐	☐
2/10 of $2, 8/10 of $1.60	2/10 of $3.85, 8/10 of $0.10	☐	☐
3/10 of $2, 7/10 of $1.60	3/10 of $3.85, 7/10 of $0.10	☐	☐
4/10 of $2, 6/10 of $1.60	4/10 of $3.85, 6/10 of $0.10	☐	☐
5/10 of $2, 5/10 of $1.60	5/10 of $3.85, 5/10 of $0.10	☐	☐
6/10 of $2, 4/10 of $1.60	6/10 of $3.85, 4/10 of $0.10	☐	☐
7/10 of $2, 3/10 of $1.60	7/10 of $3.85, 3/10 of $0.10	☐	☐
8/10 of $2, 2/10 of $1.60	8/10 of $3.85, 2/10 of $0.10	☐	☐
9/10 of $2, 1/10 of $1.60	9/10 of $3.85, 1/10 of $0.10	☐	☐
10/10 of $2, 0/10 of $1.60	10/10 of $3.85, 0/10 of $0.10	☐	☐

From Holt and Laury (2002).

- Participants are typically informed that one decision will be selected at random and the chosen gamble will be played for real.
- Subjects are then paid according to that outcome.

- Study relationship between
  - risk aversion and cognitive ability (Dohmen et al. 2010)

Measuring Risk Attitudes 2

- Modified/Double Multiple Price List Method all 3 prospect theory parameters
  - concavity,
  - loss aversion,
  - and weighting function parameters.

Measuring Risk Attitudes 3

- Modified MPLs

Option A	Option B	Expected payoff difference (A-B)
Series 1		
3/10 of 40,000 and 7/10 of 10,000	1/10 of 68,000 and 9/10 of 5,000	7,700
3/10 of 40,000 and 7/10 of 10,000	1/10 of 75,000 and 9/10 of 5,000	7,000
3/10 of 40,000 and 7/10 of 10,000	1/10 of 83,000 and 9/10 of 5,000	6,200
3/10 of 40,000 and 7/10 of 10,000	1/10 of 93,000 and 9/10 of 5,000	5,200
3/10 of 40,000 and 7/10 of 10,000	1/10 of 106,000 and 9/10 of 5,000	3,900
3/10 of 40,000 and 7/10 of 10,000	1/10 of 125,000 and 9/10 of 5,000	2,000
3/10 of 40,000 and 7/10 of 10,000	1/10 of 150,000 and 9/10 of 5,000	-500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 185,000 and 9/10 of 5,000	-4,000
3/10 of 40,000 and 7/10 of 10,000	1/10 of 220,000 and 9/10 of 5,000	-7,500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 300,000 and 9/10 of 5,000	-15,500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 400,000 and 9/10 of 5,000	-25,500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 600,000 and 9/10 of 5,000	-45,500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 1,000,000 and 9/10 of 5,000	-85,500
3/10 of 40,000 and 7/10 of 10,000	1/10 of 1,700,000 and 9/10 of 5,000	-155,500
Series 2		
9/10 of 40,000 and 1/10 of 30,000	7/10 of 54,000 and 3/10 of 5,000	-300
9/10 of 40,000 and 1/10 of 30,000	7/10 of 56,000 and 3/10 of 5,000	-1,700
9/10 of 40,000 and 1/10 of 30,000	7/10 of 58,000 and 3/10 of 5,000	-3,100
9/10 of 40,000 and 1/10 of 30,000	7/10 of 60,000 and 3/10 of 5,000	-4,500
9/10 of 40,000 and 1/10 of 30,000	7/10 of 62,000 and 3/10 of 5,000	-5,900
9/10 of 40,000 and 1/10 of 30,000	7/10 of 65,000 and 3/10 of 5,000	-8,000
9/10 of 40,000 and 1/10 of 30,000	7/10 of 68,000 and 3/10 of 5,000	-10,100
9/10 of 40,000 and 1/10 of 30,000	7/10 of 72,000 and 3/10 of 5,000	-12,900
9/10 of 40,000 and 1/10 of 30,000	7/10 of 77,000 and 3/10 of 5,000	-16,400
9/10 of 40,000 and 1/10 of 30,000	7/10 of 83,000 and 3/10 of 5,000	-20,600
9/10 of 40,000 and 1/10 of 30,000	7/10 of 90,000 and 3/10 of 5,000	-25,500
9/10 of 40,000 and 1/10 of 30,000	7/10 of 100,000 and 3/10 of 5,000	-32,500
9/10 of 40,000 and 1/10 of 30,000	7/10 of 110,000 and 3/10 of 5,000	-39,500
9/10 of 40,000 and 1/10 of 30,000	7/10 of 130,000 and 3/10 of 5,000	-53,500
Series 3		
5/10 of 25,000 and 5/10 of -4,000	5/10 of 30,000 and 5/10 of -21,000	6,000
5/10 of 4,000 and 5/10 of -4,000	5/10 of 30,000 and 5/10 of -21,000	-4,500
5/10 of 1,000 and 5/10 of -4,000	5/10 of 30,000 and 5/10 of -21,000	-6,000
5/10 of 1,000 and 5/10 of -4,000	5/10 of 30,000 and 5/10 of -16,000	-8,500
5/10 of 1,000 and 5/10 of -8,000	5/10 of 30,000 and 5/10 of -16,000	-10,500
5/10 of 1,000 and 5/10 of -8,000	5/10 of 30,000 and 5/10 of -14,000	-11,500
5/10 of 1,000 and 5/10 of -8,000	5/10 of 30,000 and 5/10 of -11,000	-13,000

Critics:

- Most subjects will fail to understand the procedure
  - reduces the reliability of estimates
- Some participants may make inconsistent decisions
  - Solved by imposing strict monotonicity and enforcing transitivity.
- No consensus about the application in other domain
- Applied to examine the preferences of Vietnamese villagers (Tanaka et al. 2010)

Empirical Application 1

- Many researchers have applied the MPL to elicit risk preferences (Dohmen et al. 2011; Charness and Viceisza, 2011; Anderson and Mellor, 2009; Lonnqvist et al., 2011; Reynaud and Couture, 2012; Dave et al., 2010).
- Applied to sample population that include:
  - Students, Farmers, rural villagers and residents
- No study yet on consumer behaviour
  - area of food/health policy

Empirical Application 2

- We study risk attitudes of consumers by
  - Analysing correlation between risk aversion and BMI
- We used the
  - cumulative prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992)
  - and the one-parameter form of Prelec's (1998) axiomatically derived weighting function

Estimating Prospect Theory Parameters

- Under the PT, Utility function is modelled by
  - $PT(x, y; p) =$

$$pv(x) + (1-p)v(y); \qquad \mathrm{x} > \mathrm{y} > 0 \text{ or } \mathrm{x}<\mathrm{y}<0$$

$$\mathrm{w}(p)v(x) + w(p)v(y); \qquad \mathrm{x}<0<\mathrm{y}$$

- Value Function:

$$v(x) = \begin{cases} x^{\sigma} & for\ x \geq 0 \\ -\lambda(-x^{\sigma}) & for\ x < 0 \end{cases}$$

- Weighting function:

$$w(p) = exp[-(-\ln p)^{\gamma}]$$

Estimating Prospect Theory Parameters

- Series 1 and series 2 were used to estimate
  - the curvature of the utility function (σ)
  - and the nonlinear probability weighting parameter (γ) for each respondent
- Using σ, γ estimated from above and the switching point of series 3,
- we estimated the loss aversion parameter (λ)

Preliminary Results 1

- Average risk aversion parameter to be 0.5875,
  - Consumers are in general risk averse.
- The average loss aversion parameter is 3.67,
  - In general consumers are loss averse.
- Average of the probability weighting parameter is 0.69,
  - In general consumers have the tendency to overweight low probabilities.
- Since σ is not equal to 1 and γ is not equal to 1
  - We reject expected utility framework

Relating Risk Attitudes and BMI

- Past studies suggest that
  - increase in risk aversion will lead to a decrease in BMI,
  - an increase in loss aversion will lead to an increase in individual´s BMI.
- As such we postulate that risk aversion and loss aversion correlate with an individual´s BMI.

Relating Risk Attitudes and BMI

- We estimate linear regression model (with robust standard errors):
  - relate risk preference parameters to BMI and other socioeconomic characteristics
- $\sigma_i = \delta_0 + \delta_1 BMI_i + \delta_3 \gamma_i + \delta_4 gender_i + \delta_5 Age_i + \delta_6 mar_i + \delta_7 + prim_i + \delta_8 sec_i$
  - Mar implies the person is married
  - *prim* is 1 if the individual´s highest level of education is primary,
  - *sec* is 1 if the individual´s highest level of education is secondary education and 0 if otherwise.

Preliminary Results 2

	ersion	Aversion
BMI	0.01*	0.03
Age	-0.01**	0.06***
Probability weighting	0.05	-2.12
Married	-0.05	0.79
Gender	0.08	-0.73
Primary education	0.09	-0.10
Secondary education	0.10**	-0.85
Constant	0.50*	2.05

Obese persons are less risk averse

Older People are more risk averse

Older People are less loss averse

Secondary school leavers are less risk averse than university graduates

*,**,*** respresent significant at 10%, 5%, 1%, respectively.

Preliminary Results 2

- We performed a robustness check by
  - excluding all individuals who did not switch from A to B or chose option B throughout.

Obese persons are less risk averse

Older People are more risk averse

Increase in BMI increases loss aversion

	Risk Aversion	Loss Avers
BMI	0.01*	-0.125**
Age	-0.010***	0.042
Probability weighting	0.049	-0.733
Married	-0.045	-0.088
gender	0.081	-0.653
Primary education	0.094	-0.673
Secondary education	0.096**	0.214
Constant	0.499*	4.327**

Secondary school leavers are less risk averse than university graduates

*,**,*** respresent significant at 10%, 5%, 1%, respectively.

Measuring Risk Attitudes

Thank you