HOW TO MEASURE RISK AND TIME PREFERENCES OF SAVERS ?

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Des goûts et des richesses…

The objectives of the talk

- Build an empirical methodology to measure risk & time preferences of French savers
- Explain wealth behaviour of French households :
  - **Wealth inequalities** : why some people are richer than others
  - **Wealth accumulation profile** : why some people save (for precaution, for retirement…), other not
  - **Portfolio choice, risky asset demand** : why people have little diversified portfolio, why some people invest in risky portfolio and other not, …
- Build a typology of French savers according to risk and time attitudes (more or less risk-averse, short-sighted, far-sighted)

Outline of the talk

- Theoretical background : the standard theory of saving
  - Which preference parameters do we have to measure?
- Measuring preferences towards risk & time
  - A method of scoring derived from many questions
- Results : preferences explained and preferences explaining savers' behaviors
  - Who is who ?
  - Effects of preferences on wealth inequality
- Crossing risk & time preferences
- Conclusions

A perplex economist

- For the economist : savers' choices should be *rational*
  - i.e. optimal, as in his models
  - and quite homogeneous, as in his models
  - so that he could predict them
- => "bias", "anomalies", "errors" in HH wealth behaviors
- => large heterogeneity of observed behaviors
- Due to imperfect or incomplete markets or to "irrational" preferences ?

Standard theory (starting point) : which preferences, for which savings ?

Standard : EU + DU + homothetic preferences

The *standard* economic theory of savings and of portfolio choice leads to a description of behaviour through three main parameters :

- **Risk aversion (prudence, temperance)**
  - Risk aversion allows to explain precautionary savings (self insurance against future uncertain events), portfolio composition (arbitrage between risky assets and risk free asset), insurance behavior…
- **Time preference (preference for the present)**
  - Time preference allows to explain why some households save for retirement and other not, why some investors own long term assets and other not…
- **Household altruistic behaviour (inter vivos transfers & bequests)**
  - Altruism allows to explain why some households save for their children, other not.

Some empirical puzzles

- **Inadequacy of saving** (some individuals have not enough saving to finance their retirement needs)
- **"Too much" saving for retirement** (of individuals with limited altruism)
- **Wealth accumulation of the very rich** (top 1% own 25% of total wealth)
- **Limited asset participation** (little diversification of portfolio)
- **Stock participation puzzle** (few people invest in risky portfolio) & **Equity premium puzzle** (under-investment in stocks)
- **Portfolio managing** (Home bias puzzle, naïve diversification, disposition effect, status quo bias, portfolio inertia, excessive trading…)
- **Little demand for life annuities…**

The behavioral (non-standard) approach : to account for limited rationality

- Limited rationality towards *time* (time inconsistency) :
  - Lack of foresight (insufficiency of propensity to plan)
  - Lack of self-control
- Limited rationality towards *uncertainty*
  - Loss aversion
  - Preference for flexibility (against irreversibility)
  - Ambiguity aversion
- “Limited” altruism

Non standard model : a profusion of preference parameters for realism

- **Non DU**
  - Short term impatience (hyperbolic discounting)
  - Habits
  - Savouring, dread
  - Propensity to plan
- **Non EU**
  - Loss aversion
  - « Optimism » or « pessimism »
  - Ambiguity aversion

Measuring preferences : what economists usually do

- Ask one or two abstract questions (too theoretical)
  - placing the subject in an artificial situation
  - in only one domain of life (job for instance)
  - directly linked, under suitable assumptions, to a specific preference parameter of the theory
    - **Risk** :choice between lotteries => standard theory : relative risk aversion
    - **Time** : choice between consumption life profiles of the same discounted value
  - in order to get a cardinal, precise measure of this parameter
- Indicator poorly explained by HH characteristics
- Indicator has little explanatory power of savers' behaviors

Surveys (representative samples for France)

- Insee wealth survey (1998) : basic study (interviews)
- Insee wealth survey (2004) : some questions only
- TNS Sofres (2002) : posted questionnaire, preferences measured over two adult generations
  - new variables : religious education, political opinion…
  - Comparison with Insee 1998 survey : very similar results on scores
- TNS Sofres (2007) : in progress
  - Contains a panel (2002-2007) with comparable questions to check the stability of our measures over time
  - Separate questionnaires for the spouses in couples : who marries whom ?
  - Contains an experimental extension to check the validity of scores

How to measure risk preference

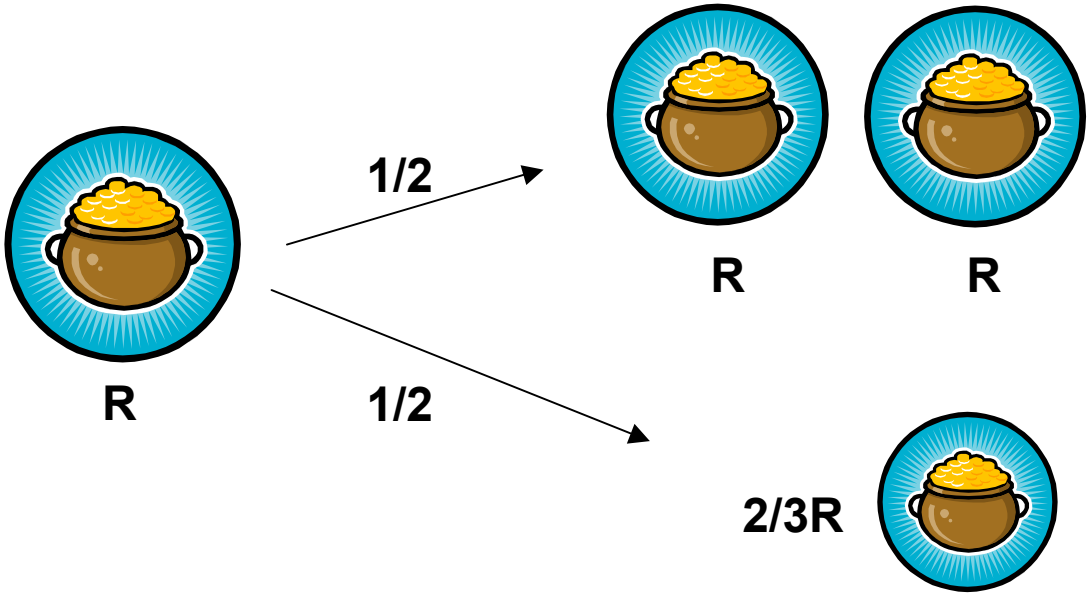
Barsky, Juster, Kimball and Shapiro (1997)

- Suppose that you have a job which guarantees for life your household's current income R. Other companies offer you various contracts which have one chance out of two (50%) to provide you with a higher income and one chance out of two (50%) to provide you with a lower income. Do you accept?

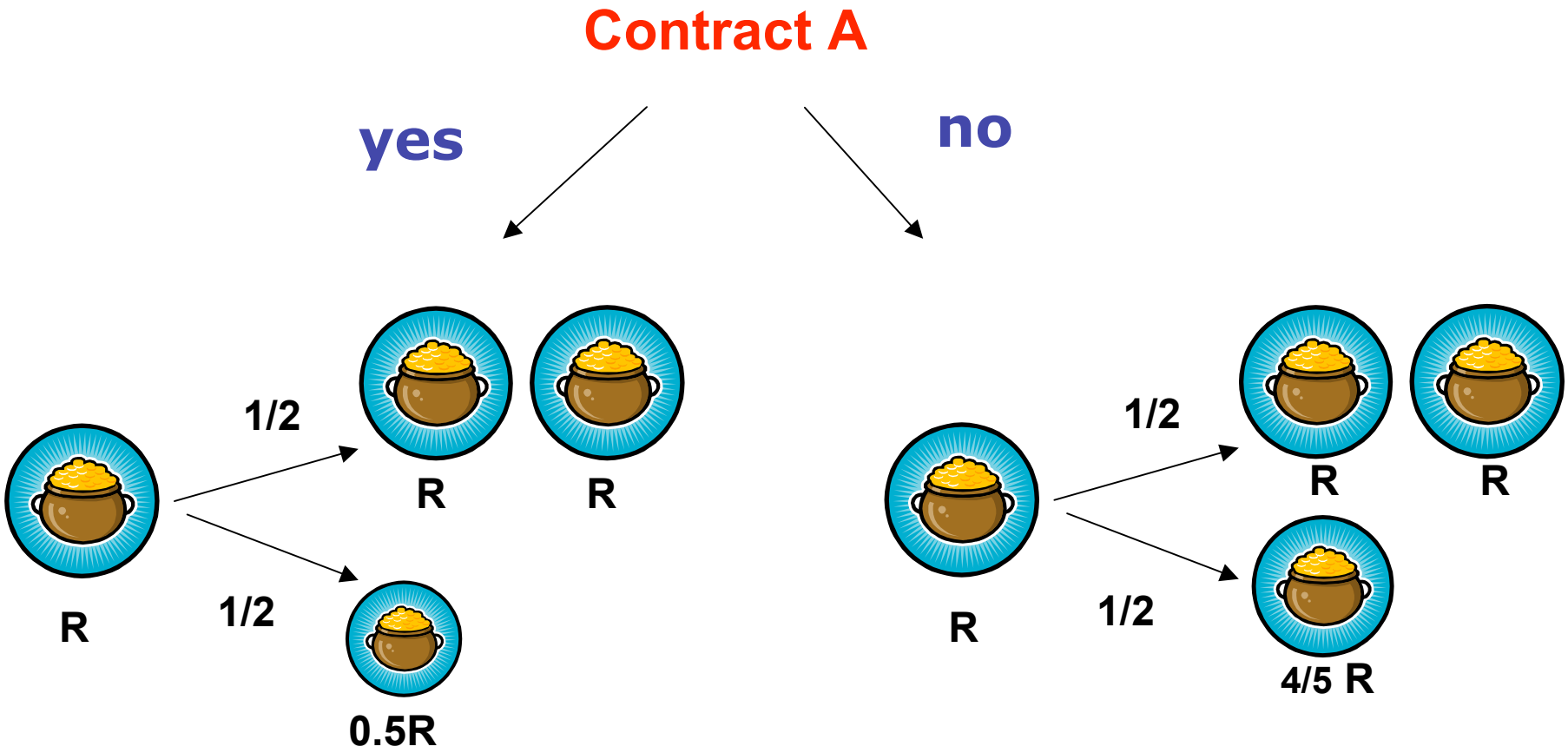
Measuring relative risk aversion : the lottery (first contract)

R : current (lifetime) income

Contract A



The lottery (continuation)



Interpretation of the lottery in the case of France

- The rational consumer chooses the contract if

$$u(2c)+1/2\ u\ (\lambda c) \geq u\ (c)$$

Hypothesis: expected utility maximization, *u* is CRRA

	Rejection of Contract A		**Acceptance of Contract A**	
	Rejection of contract **C**	Acceptance of contract **C**	Rejection of contract **B**	Acceptance of contract **B**
Relative risk aversion	**3.76=<γ**	**2=<γ<3.76**	**1=<γ<2**	**γ<1**
France 1998 (total sample) %	43,1	39,4	11,2	6,3
France 2004 (total sample) %	58,4	26,5	10,3	4,8

Our alternative approach (1)

- We try only to build in small touches the psychological profile of the saver with respect to risk and time…
  - We ask various questions: lotteries, opinions and intentions, possible scenarios, self-reported scales…
  - …on different areas of life: consumption, leisure, health, investments, work, retirement, family…
  - by multiplying the number of real life and direct questions (over 85)
  - by considering different kinds of risks (big, small, gains, losses…) and different time-horizons
- … in order to get synthetic measures of her preferences towards risk and time and family : **scores**

No one question is fully satisfactory (1)

- Only a few questions have no problem of interpretation…

Lotteries

The question : You are offered to buy for 500 Francs a lottery ticket that has one chance in a thousand to win 1 million Francs. Do you buy it ?

8%	Yes, certainly
11%	Yes, maybe
33%	No, it is too risky
48%	No, I never play

Risk

Delaying holidays

“ Following a peak, your employer asks employees whether some would like to volunteer to postpone a week’s holidays to the following year. Volunteers will benefit from negotiable extra holidays besides the week itself. You have no previous commitment. Would you accept the principle of this offer? (yes/no, what is the threshold of extra holidays you would consider appropriate?) «

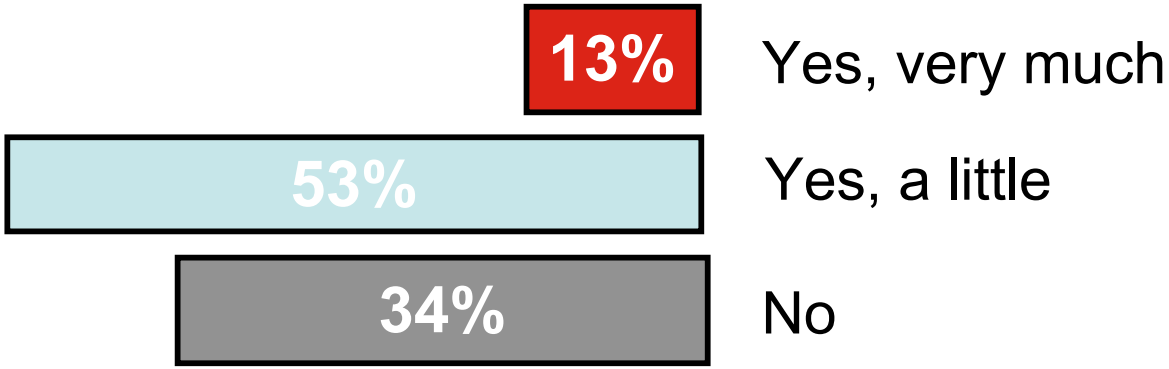
20% **(19% in 2004)** refuse (strong preference for the present)

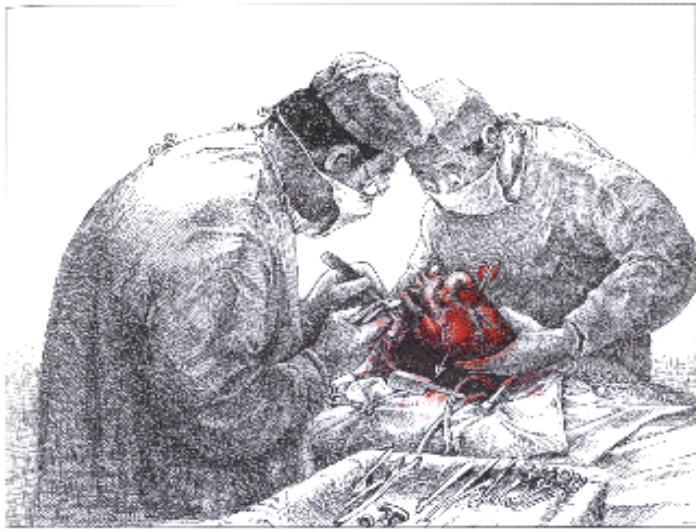
11% **(10% in 2004)** accept with less than two days bonus (weak preference for the present)

Time preference

The Health Care System

The question : Are you interested in the debate about how to finance the Health Care System ?



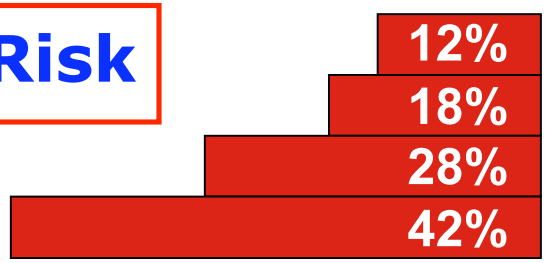


Risk attitudes

The Family

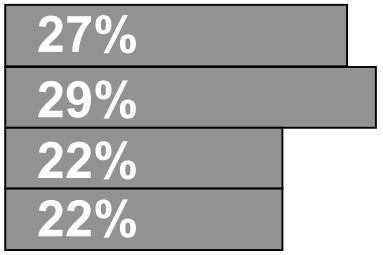
Marriage is an insurance

Risk



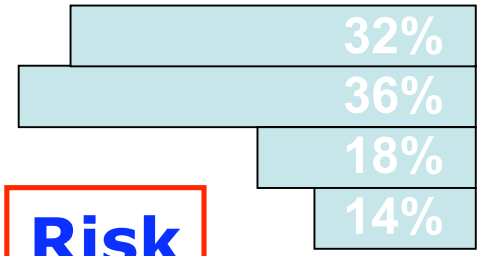
Perfectly agree
Rather agree
Not really agree
Utterly disagree

To decide to have children is to take risks



Risk

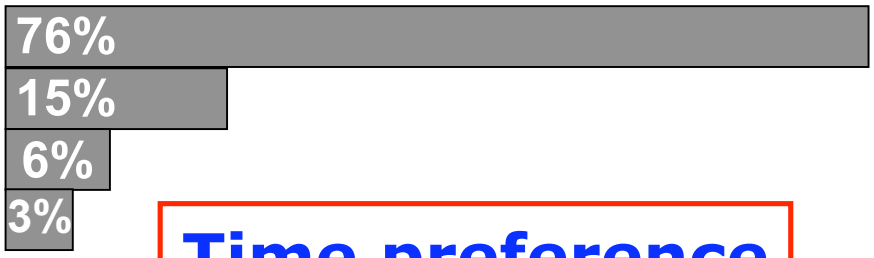
To choose a partner is to take risks



Risk

Perfectly agree
Rather agree
Not really agree
Utterly disagree

To decide to have children is to take a life-time commitment



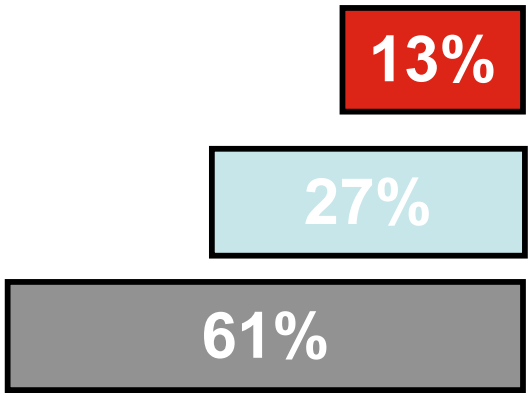
Time preference

No one question is fully satisfactory (2)

- Some questions could reveal more than one type of preference, e.g. both towards risk and time (future is uncertain)…

The French and being in good shape

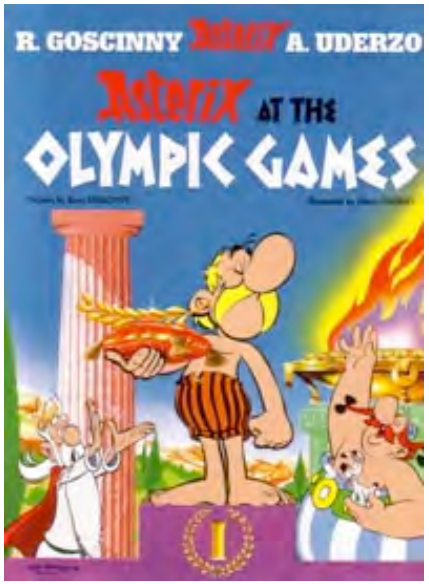
Do you worry about being in good shape (exercises, weight and diet watching…)



Yes, a lot

Not at all

A little



Risk *and* time preference

Retirement

The question : As an alternative to the present retirement system you are offered the following option : a greater annuity until age 85, but, in exchange, only a minimum after 85. How would you, a priori, evaluate this offer ?

19% This proposition is scandalous

36% This system is not interesting

26% This system is interesting though

19% This system is very interesting

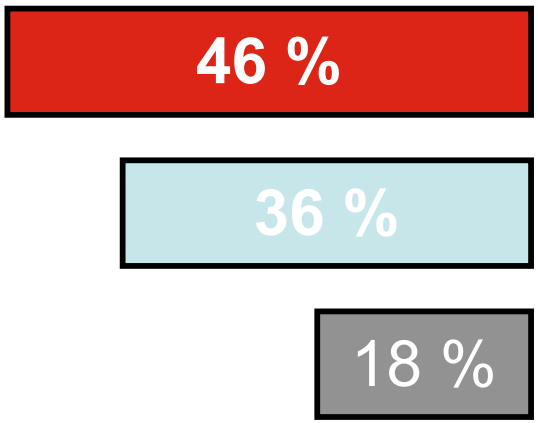
Risk *and* time preference

No one question is fully satisfactory (2)

- There is a lot of framing and other effects that cannot be controlled…

The French and their car

The question : Does it happen to you to park your car for a short period of time in a pay zone without having put your coins in the machine, or to park out of the authorized zone?



Risk attitudes or/and civic feeling ?

No one question is fully satisfactory (3)

- **We do not even know if the (risk or time) preference measured is rational or not…**

The French and the « Mad Cow »

The question : Have you modified or reduced your meat consumption after learning about the disease?

1998

2004

(31%)

- **14%** Yes, I reduced it
- **14%** Yes, I chose other kinds of meat
- **1%** I used the price reduction to increase my beef consumption

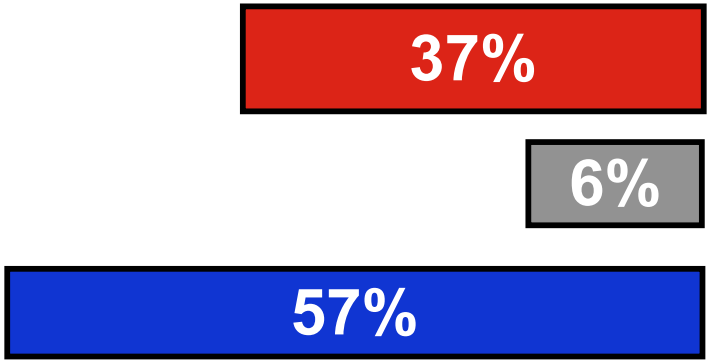
67% (68% en 2004) No I changed nothing

4% I don't eat meat

Risk aversion, aversion to ambiguity, or irrational fears ?

Children and risk

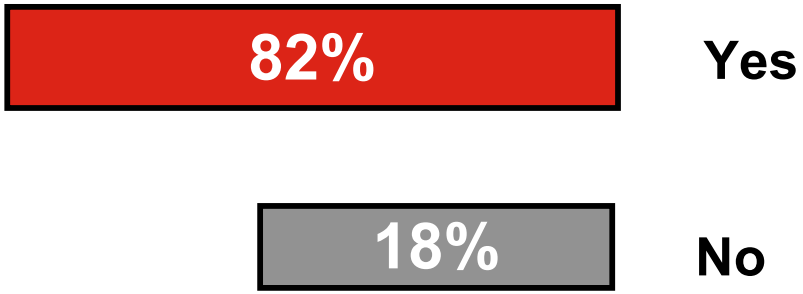
The question : «Towards your younger or teen-age children are you (or would you be) the kind of parents encouraging them to take risks? »

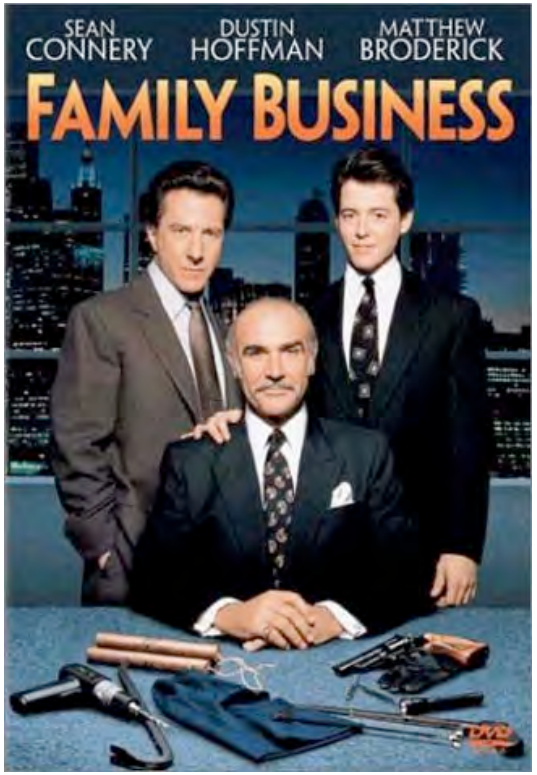


Risk aversion or aversion to ambiguity ?

Time preference and education

The question : «As regards your young or teenaged children, are you (or would you be) the type to inculcate a savings mentality in them ?»





Time preference or taste for saving ?

No one question is fully satisfactory (4)

- **Most questions show, alone, little explanatory power of wealth behaviour ...**

The French and the « weather forecast »

A question : « When you leave home and the weather forecast is uncertain do you take your measures (umbrella, raincoat…)? »

Risk

63% **Yes**

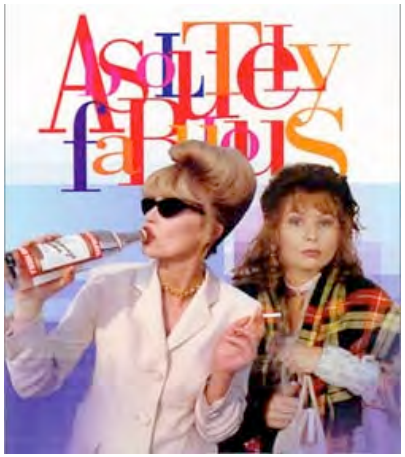
37% **No**

« Cigarettes, whisky… »

« Do you believe it is worth, for gaining a few more years of life, to give up what you may consider your pleasures of life (eating well, drink, smoke, have an exciting life ?... »

65% **(57% in 2004)** **No**
(strong preference for the present)

34% **(43% in 2004)** **Yes**
(weak preference for the present)



Risk *and* time preference

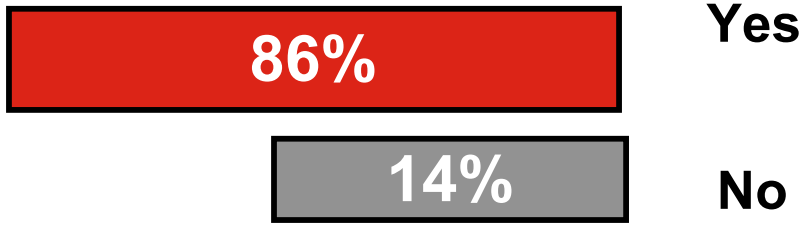
No one question is fully satisfactory (5)

- The causation may run in the opposite direction : wealth explaining the answer given...

Protecting the partner

Life insurance is a luxury good

The question : « In a couple where there is only one breadwinner, do you think it is important to cover financially the risk of his (or her) death (through life-insurance, appropriate savings…) ? »



Risk *and* time preference and altruism

Budgeting consumption

The question : « Have you ever run into difficulties in balancing your budget because of debts contracted to acquire household goods (Hi-Fi, car...) or to pay for your holidays, etc. ? »

78% **No**

22% **Yes**

Time preference

Our alternative approach (2)

- Aggregation in synthetic scores could be the answer if only *relative* measures of preferences are considered
- Data have the final word as to the number of scores to be introduced…
- Conclusion : our approach is at the same time…
  - Piecemeal (how many questions should be asked?)
  - Empirical (number of scores)
  - Agnostic (which parameter of preference is measured?)

Building the scores

1998 scores:

adding 53 items for risk, 34 for time, 13 for impatience, 10 for altruism

- **Attribution** of questions to preference parameters: the issue of possibly multiple interpretations
- **Coding** the questions (-1, 0, 1): the scores are the sum of the answers given (such “aggregation” diminishes framing effects and endogeneity biases)
- **Validation** and measure of the consistency of ordinal measures (PCA, Cronbach alpha, correlation of “sub-scores” in different life domains)
  - Questions retained (internal consistency) : 54/56 for risk, 25/34 for time, 8/13 for impatience, 9/10 for altruism
  - How many different scores for each preference ?

The risk-score

- Only one risk parameter aimed at representing:
  - Risk-aversion
  - Prudence
  - Temperance
  - Loss-aversion
  - And many others (pessimism/optimism, ambiguity aversion…)

Average of risk-taking behavior in various areas of life :

consumption, health, work, financial management, family, retirement, other…

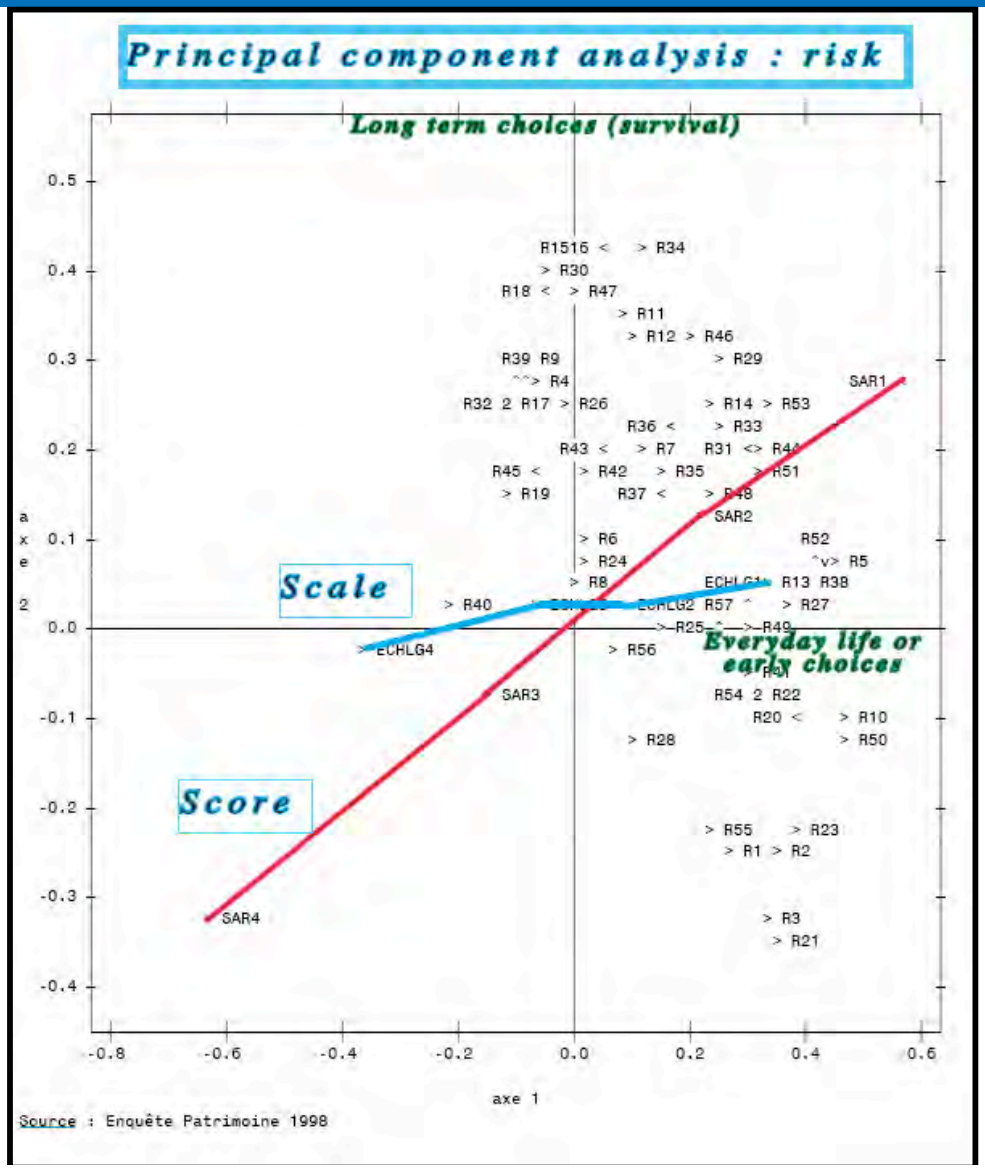
3 preference parameters concerning time

- Time preference for the present over the life-cycle
- Altruistic behavior (towards children)
- Short-term impatience

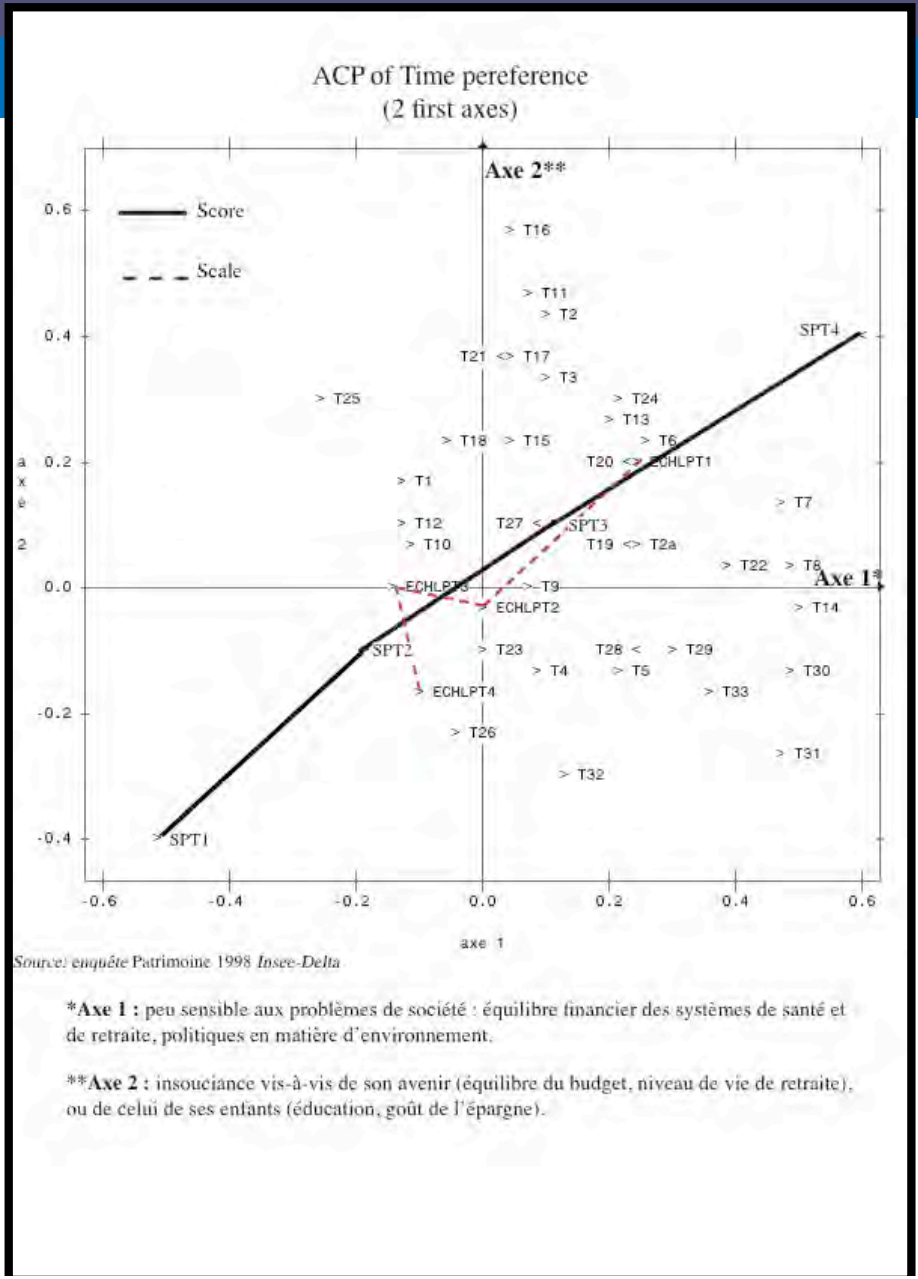
Average in the various areas of life :

consumption, health, work, financial management, family, retirement, other…

Risk score : Principal component analysis



Time preference score : Principal component analysis



Source: enquête Patrimoine 1998 *Insee-Delta*

***Axe 1 :** peu sensible aux problèmes de société : équilibre financier des systèmes de santé et de retraite, politiques en matière d'environnement.

****Axe 2 :** insouciance vis-à-vis de son avenir (équilibre du budget, niveau de vie de retraite), ou de celui de ses enfants (éducation, goût de l'épargne).

Scores properties

Scores	Cronbach's Alpha			Final Items/Initial Items
	Total population	*<= 40 years old*	*> 40 years old*	
Risk	0,65	0,62	0,62	54/56
Time Preference	0,53	0,44	0,56	25/34
Impatience	0,27	0,22	0,32	8/13
Familial Altruism	0,29	0,23	0,33	8/9

Source: Patrimoine 1998, *Insee-Delta survey.*

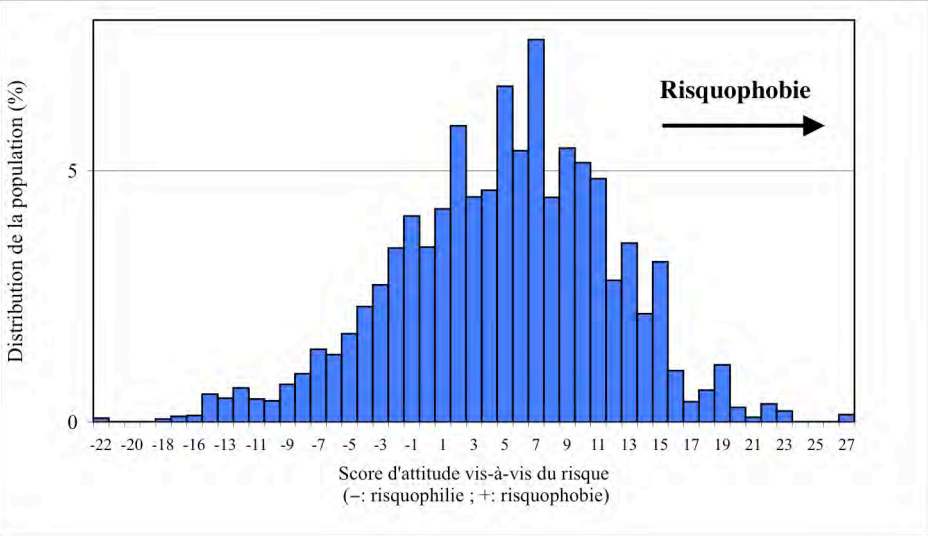
Risk score : Correlations between sub-scores

	Global score	*Consumption*	*Labour*	*Financial managing*	*Health*	*Family*	*Retirement*	*Others*
Global score	1,00	0,56	0,48	0,44	0,56	0,68	0,49	0,56
Consumption		1,00	0,22	0,10	0,12	0,19	0,11	0,21
Labour			1,00	0,03	0,08	0,20	0,14	0,22
Financial managing				1,00	0,21	0,23	0,23	0,11
Health					1,00	0,22	0,25	0,21
Family						1,00	0,29	0,18
Retirement							1,00	0,23
Others								1,00

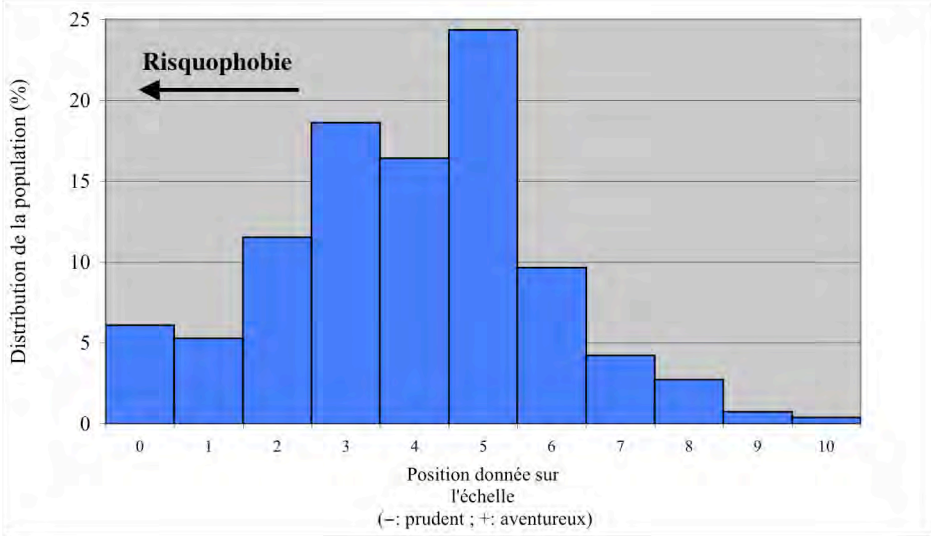
Source: Patrimoine 1998, *Insee-Delta survey.*

Risk score and risk scale : Histograms

Score

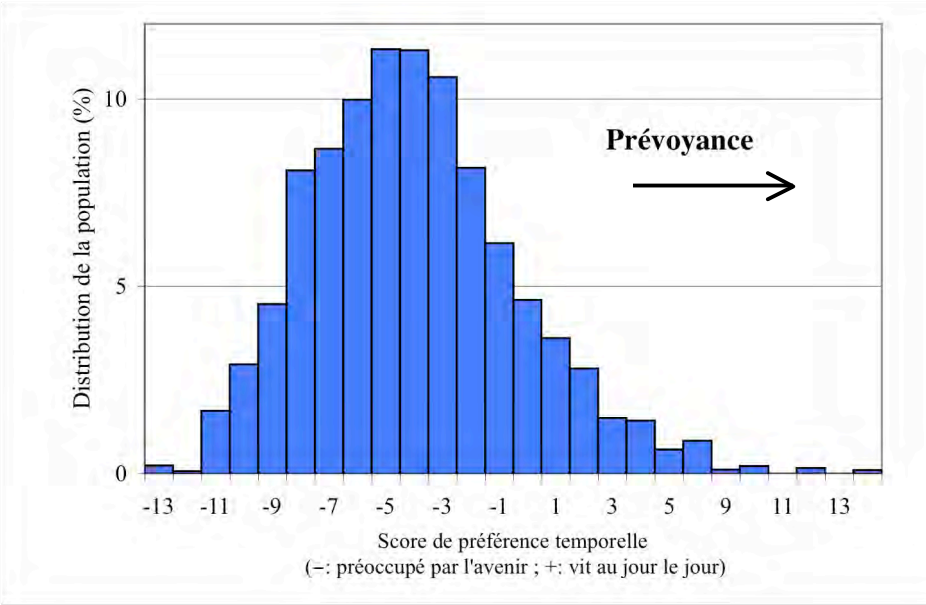


Scale

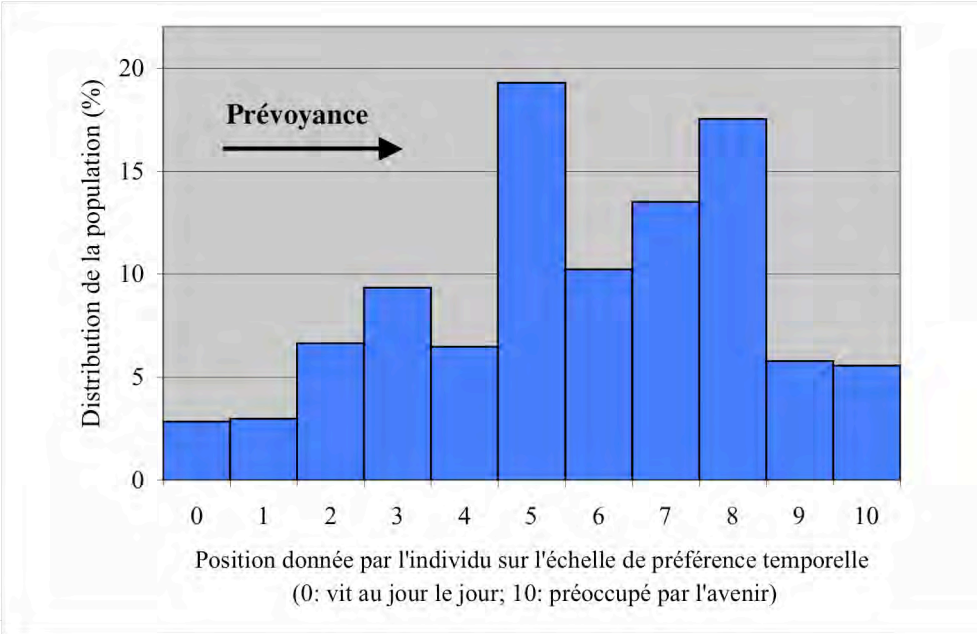


Time preference score and scale: Histogram

Score

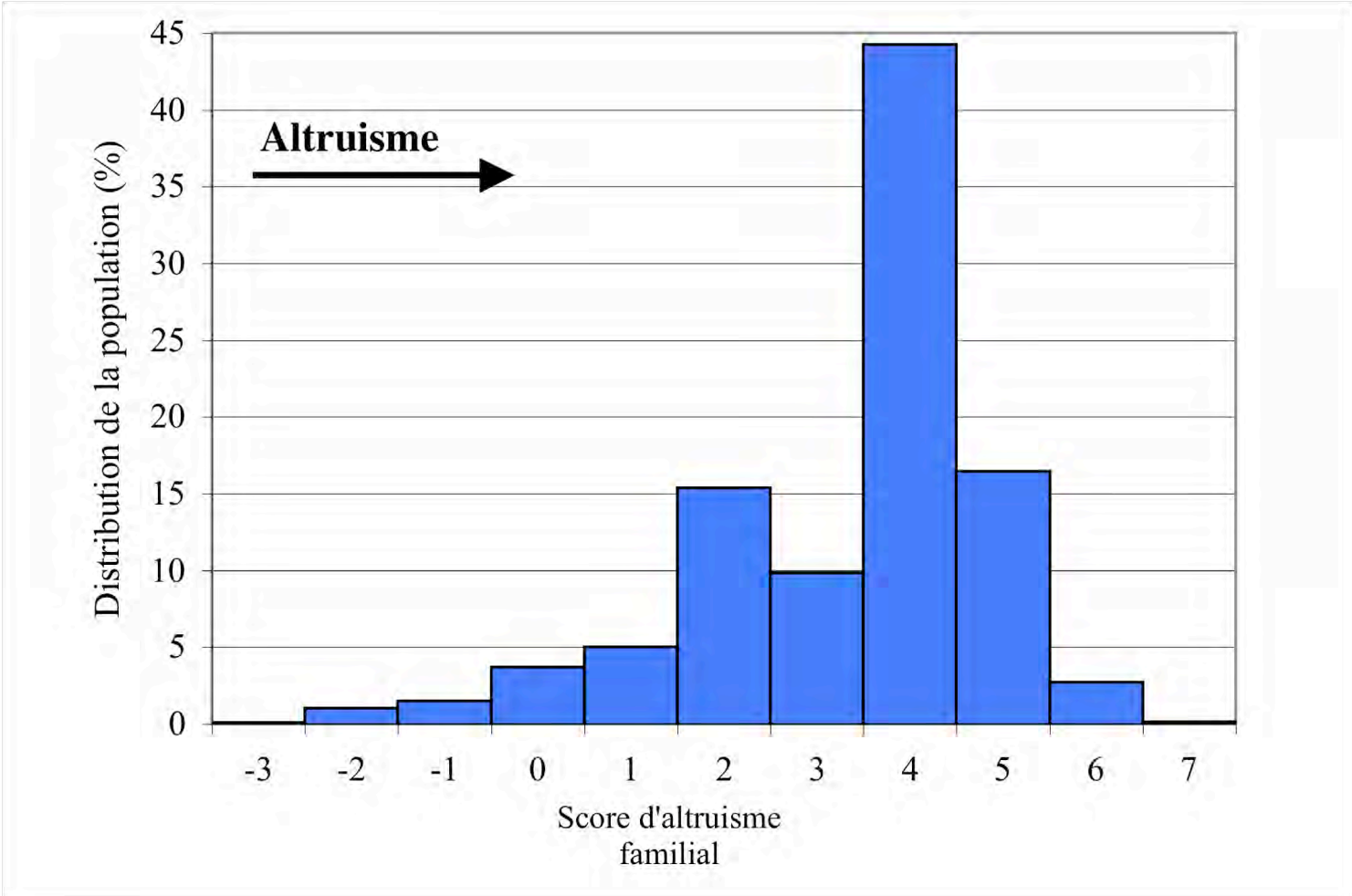


Scale



Altruism score : Histogram

No self-reported scale… Not enough questions for the score



Who takes more risks (score) ?

Every thing being equal

- The young
- Men

➢ as found in any study

- Those who come from entrepreneurial or self-employed professional families or from executive or middle-management employee families (excluding teachers)
- Those with at least a high school degree
- High income earners
- Singles

Who are the most far-sighted (score) ?

Every thing being equal

- The over fifties
- Married couples with children
- The more educated (with at least a high-school degree)
- With a far-sighted mother
- No income effect, social origin effect

➢ … but no gender effect

Who are the altruists (score) ?

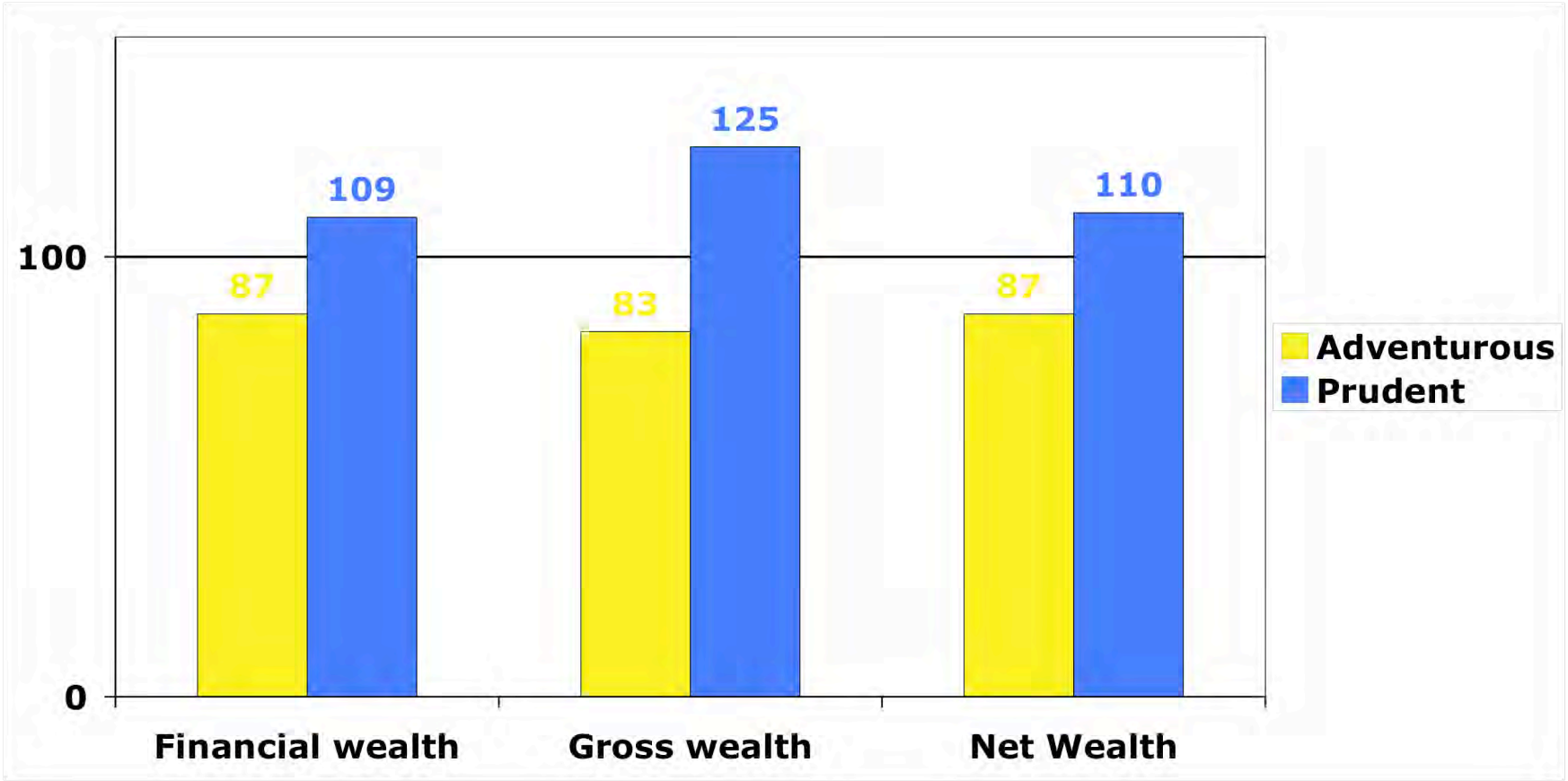
Every thing being equal

- Higher income earners
- The over 40
- Those with higher education
- Households with independent children
- Those who have inherited wealth

➢ … but no gender effect

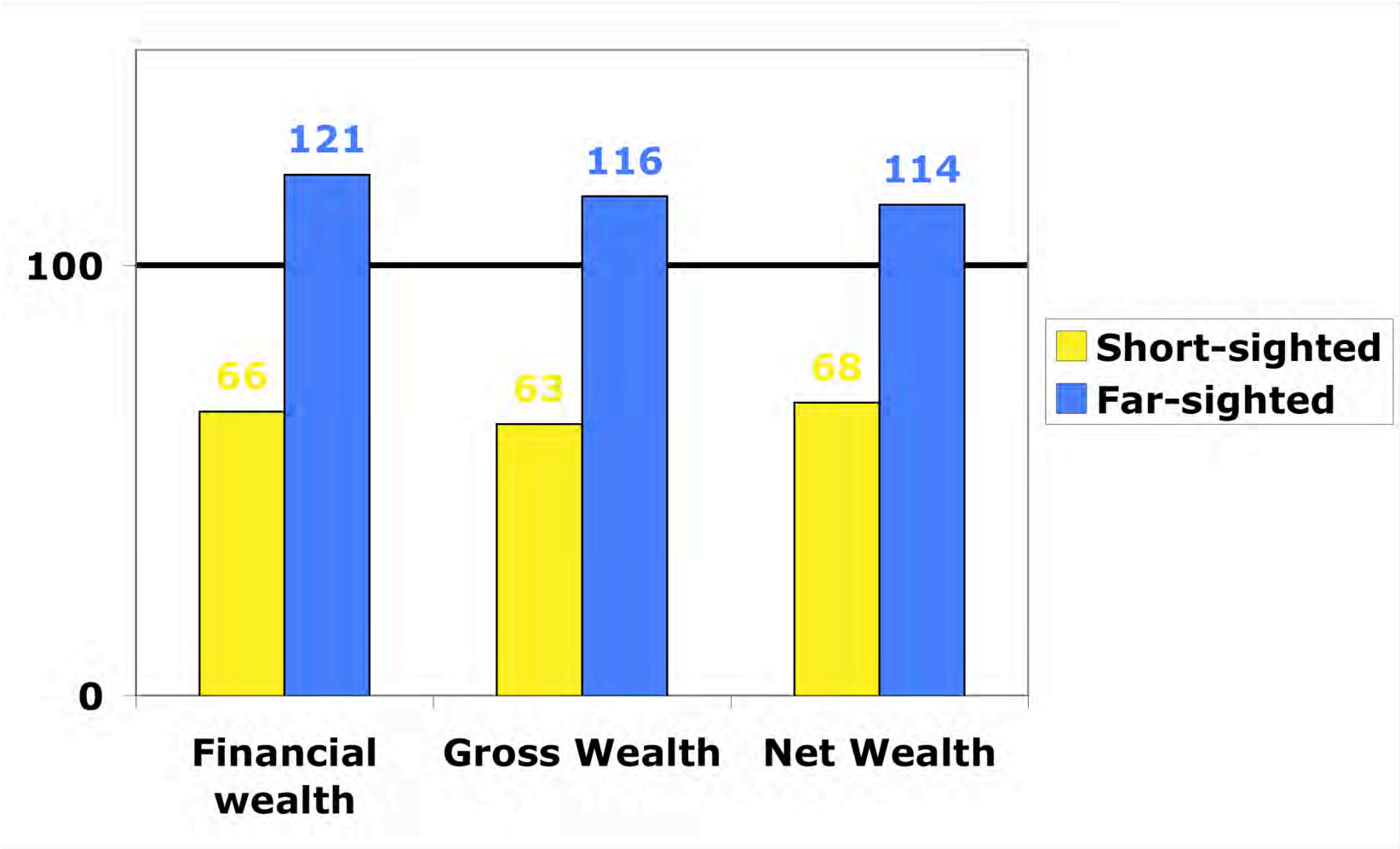
Do attitudes towards risk explain portfolio behaviour?

Between first and last quartiles of the score



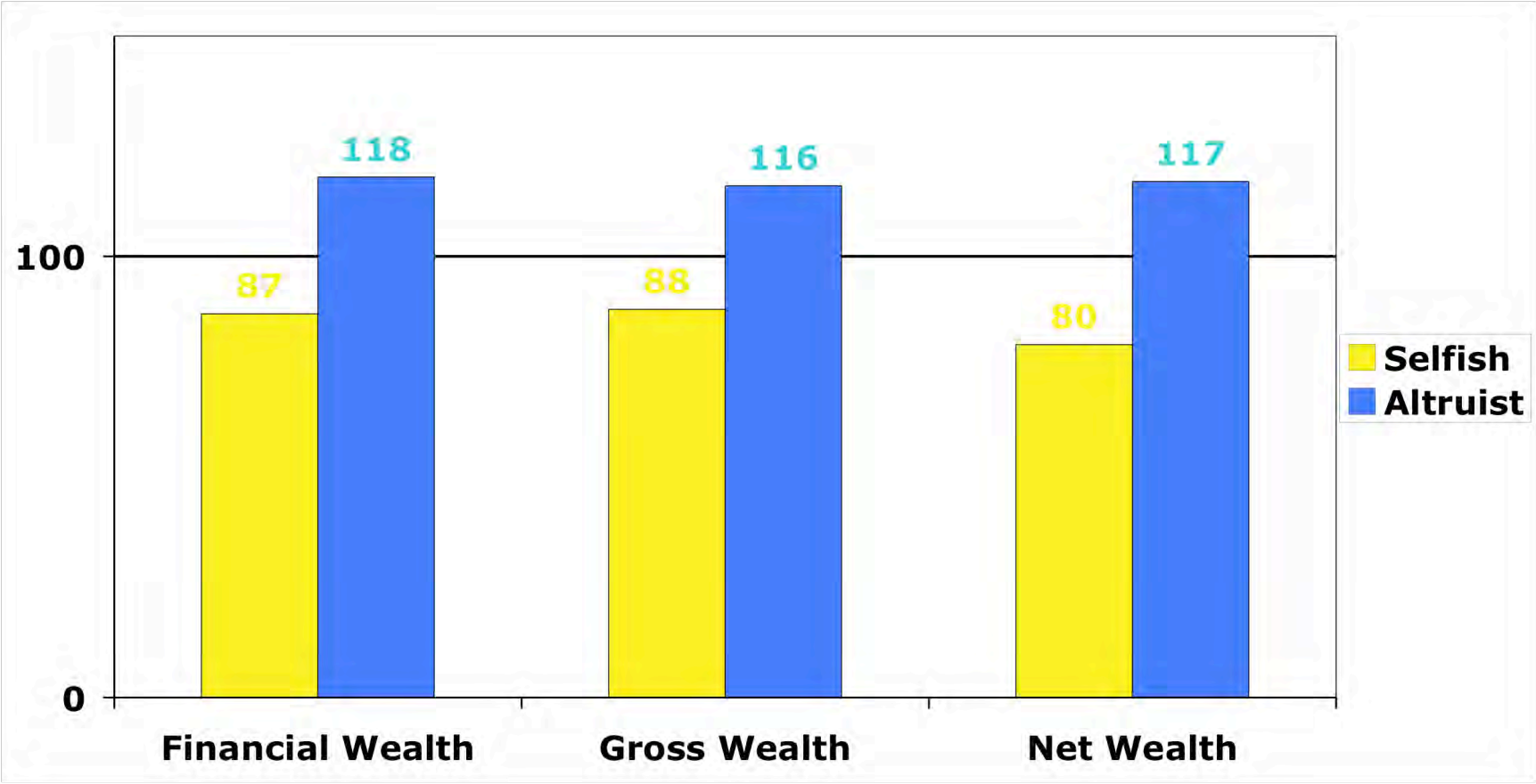
Does time-preference explain portfolio behaviour?

Between first and last quartiles of the score



Does family altruism explain portfolio behaviour ?

Between first and last quartiles of the score



Individual preference and wealth accumulation : the problem of causality

- Preference scores can be considered as exogenous, so that the previous econometric effects are not significantly affected by causality bias.
- Not surprising : scores are the sum of a number of elements which can be considered as "natural" instruments (scores=good instruments for other measures of preferences)
  - The question about whether the individual "takes his/her umbrella if there is a chance of rain", which appears strongly correlated with the risk score, has no direct effect on the amount of wealth.
  - Similarly, the "ability to forego current pleasure in order to live longer", which is strongly correlated with the time discount score, does not explain household assets

Contribution of variables to wealth inequalities (% Theil) : total population

Variables	*Financial Wealth*	*Gross Wealth*	*Net Wealth*
Social Class (10 levels)	16.7	28.5	27.1
Bequests (Amount: 4 levels)	22.1	24.2	24.8
Current (non property) Income (in deciles)	11.8	20.7	18.2
Age	15.1	17.4	19.2
Income*Age (24 levels)	24.8	28.8	30.2
Bequests Received (dummy)	14.9	16.9	17.3
Wealth Gains or Losses (4 levels)	8.1	12.5	11.2
Preferences (Risk-aversion-Time preference-Family altruism: 21 levels)	**7.6**	**10.2**	**10.4**
Parents' Social Class (9 levels)	8.4	7.3	7.7
Household Type (7 levels)	3.0	5.3	4.2
Education (6 levels)	7.5	5.1	5.2
Employment interruptions (unemployment, health: 4 levels)	3.1	4.5	4.7
Town Size (6 levels)	7.3	3.6	3.9
Liquidity Constrained (dummy)	2.9	1.7	1.2
Theil	1.32	0.82	0.82

Contribution of variables to wealth inequalities (%) : wage-earning population

Variables	*Financial Wealth*	*Gross Wealth*	*Net Wealth*
Current non property income (in deciles)	27,1	36,0	33,4
Permanent Income (in deciles)	15,1	20,0	18,2
Age (12 levels)	28,8	29,5	29,5
Permanent Income*age (24 levels)	45,1	47,3	50,0
Social Class (10 levels)	22,4	24,1	25,1
Bequests Received (dummy)	13,8	17,7	18,0
Bequests (Amount: 4 levels)	22,4	27,9	28,2
Preferences (Risk-aversion-Time preference-Family altruism: 21 levels)	**16,3**	**15,6**	**17,1**
Parents' Social Class (9 levels)	10,4	8,9	8,5
Education (6 levels)	11,7	11,5	11,8
Household Type (7 levels)	6,1	2,1	2,9
Town Size (6 levels)	7,2	4,9	5,6
Liquidity Constrained (dummy)	3,2	2,8	1,8
Employment interruptions (unemployment, health: 4 levels)	4,0	4,4	4,7
Wealth Gains or Losses (4 levels)	5,0	8,6	7,3
Theil	1,10	0,66	0,66

Explaining wealth inequality : comparing scores & scales

Variables	*Financial Wealth*	*Gross Wealth*	*Net Wealth*
Total population			
Scores (risk aversion & time preference : 9 levels)	6.9	6.3	7.6
Scales (risk aversion & time preference : 9 levels)	4.0	3.5	3.9
Wage earning population			
Scores (risk aversion & time preference : 9 levels)	17.2	11.9	13.1
Scales (risk aversion & time preference : 9 levels)	8.2	5.2	5.5

Correlations across preferences : as expected

- Foresight is associated with “altruism” : **+ 0.38**
- Foresight is opposed to short-term impatience : **– 0.12**
- Foresight seems to be related to prudence : **+ 0,34**

  (what French dictionaries say)

Distribution of the population according to degrees of foresight and prudence (%)

Risk-Attitude / ***Time Preference***	*Weak*	*Medium*	*Strong (prudent)*	**Total**
Weak (farsighted)	1,6	13,2	9,1	23,9
Medium	10,7	29,8	11,1	51,6
Strong	12,0	10,3	2,2	24,5
Total	24,3	53,3	22,4	100,0

Wealth effects of cross-scoring

- Preference effects are often non-additive : the cross-contribution of parameters gives better results
  - Limited information on saver's behavior by knowing she/he is risk-tolerant (e.g.) **or** far-sighted prudent) ; much more information by knowing she/he is **both**

- For example in the case of equity ownership :
  - Foresight has a rather small (positive) effect on holding
  - Risk-tolerance : only slightly significant positive effect
  - But being far-sighted **and** risk-tolerant has an important (and more significant) positive effect

Cross-scoring : types of savers…

- "*Conservative investors*" : prudent and far-sighted, "life-cycler" hump + precautionary saver (Modigliani)
- "*Short-sighted Prudent" : "*Buffer-stock" investors (Caroll-Deaton), target saving
- *"Hotheads"* or *"Achilles"* : adventurous and short-sighted, prone to (rational) addiction (Becker)
- *"Enterprising"* or *"Ulysses"* : adventurous and far-sighted

Conclusion

- **Further issues (new survey TNS-Sofres 2007)**
  - **How durable are preferences between 2002 & 2007 (panel)**
  - **Measure preferences of each member in couples : is there strong assortative mating in terms of preferences or not?**
  - **Build an experimental design to estimate preference parameters and compare them to the scores**