The role of personal values in predicting environmentally motivated choice behavior: Evidence from Canada

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UNIVERSITY OF SOUTHERN DENMARK

Outline

1. Intro & Background
2. Data and methodology
3. Empirical results
4. Conclusions

Motivation


CARBON FOOTPRINT
REMEMBER, "OBJECTS IN MIRROR ARE CLOSER THAN THEY APPEAR."
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Motivation

- **human values** as predictors of behavior (social psychologists)
- Values considered to be
  - beliefs about desirable behaviors (standards of desirability)
  - abstract ideals, e.g. freedom, equality, sustainability

"*A value is an **enduring belief** that a specific mode of conduct or end-state of existence is personally or socially preferable to an opposite or converse mode of conduct or end-state of existence*."

(Rokeach 1973)

Motivation

- concerns regarding **global warming**
  - "sustainable consumption patterns" of public interest (really? ☺)
  - How is consumers' value system related to preferences for "sustainable" food products?

➲ power of values in predicting decision making regarding "sustainable products" (?)

Research problem

- Consumer problem:
  - How to **identify** environmentally sustainable products and processes at the point of purchase?
- "ecological [carbon/water] footprint label"
  - to the amount of CO2 created and the amount of water used during food production, processing, storage, packaging and distribution
  - Labels to transform credence into search attributes

Objective

Stated preference analysis of foods labeled for CO2 emission and water usage, focusing on role of human values (Rokeach 1973)

Human values (Rokeach 1973)

1. **Instrumental values**
   - related to modes of conduct (e.g. honesty)
   - Moral values/ competence values
2. **Terminal values**
   - preference for a *state of being* after performing some given action (e.g. happiness)
   - Second level of abstraction: **self-centered** [e.g. peace of mind] or **society-centered** [e.g. world peace]

Human values (Rokeach 1973)

- 18 **instrumental** values that relate to “modes of behavior”
- 18 **terminal** values that relate to “end states of existence”
- Values ordered along a continuum of importance and form the basis of the Rokeach Value Survey (RVS)

=> personal value system

Hypotheses

1. Distinct purchase propensities for carbon and water footprint labeling

2. Those consumers with value systems characterized by logic and wisdom (delayed gratification) are more likely to be concerned about climate change than those consumers with value systems centered around current comfort and pleasure (immediate gratification; Rokeach 1970) [F1]

Hypotheses

3. Self-centered terminal & instrumental values (Rokeach 1973) are better predictors of environmentally *un*sustainable behavioral intentions of consumers, compared to society-centered values [F4 & F5]

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Design of consumer survey

- Consumer online survey 2011 in Canada with 1551 Participants
- Rokeach Value Scale → human values
- Choice experiments → preferences

Rokeach Value Scale

- Rokeach (1973) reduced the 36 related values into fewer independent factors (factor analysis)
- 7 bipolar factors were identified

Factor	Pole 1	Pole 2
F1	***immediate gratification*** (comfortable life, clean, exciting life, pleasure)	***delayed gratification*** (wisdom, inner harmony, logical, self-controlled)
F2: primarily instrumental values	*competence* (logical, imaginative, independent, intellectual)	*religious kind of morality* (clean, salvation, forgiving, helpful)
F3 instrumental value orientation	*self-constriction* (obedient, polite, honest, self-controlled)	*self-expansion* (broadminded, capable)
F4: only terminal values	***social in nature*** (world peace, equality, freedom, national security)	***personal in nature*** (true friendship, self-respect)
F5	***family concern*** (family security, responsible, capable, ambitious)	***the nation and the world beyond*** (world beauty, equality, helpful, imaginative)
F6	*love* (mature love, loving)	*respect* (social recognition, self-respect)
F7: different type of instrumental value orientation	***other-directedness*** (courageous, independent)	***inner-directedness*** (polite)

Design of choice experiments

- Experimental design included three attributes with three levels each

1 kg ground beef			
	Price	**Carbon equivalents**	**Water usage**
Level	CAD$ 9.14 CAD$ 7.95 CAD$ 6.75	26.37 kg 22.93 kg 19.49 kg	17825 l 15500 l 13175 l

Design of choice experiments

- Numbers for carbon equivalents and water usage based on literature review
- Prices: market prices in Alberta, Canada
- Random parameter panel design (Ngene, 2 choice sets per respondents & product, 4 products => 8 choices)
- Design rotated constantly
- Survey concepts and wording tested in focus group

Example of experimental set up

Imagine you are in your usual grocery store and you would like to purchase 1 kg of ground beef you usually buy:

Do you choose Alternative A, Alternative B or Alternative C?

1 kg of ground beef	 Alternative A	 Alternative B	Alternative C
Carbon (CO_2) emission equivalents	22.93 kg	26.37 kg	None of these
Water usage	13175.00 l	13175.00 l	
Price	6.75 CAD $	9.14 CAD $	
I would choose:	○	○	○

Data analysis

- Calculate unweighted index for each of the 2 poles of Rokeach's (1973) seven bipolar factors:
  - Sum up those values that belong to a pole, and divide that sum by the number of values included in the respective 'pole-index'

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Importance of value indices

(from 1 = least important to 18 = most important)

Value indices	Values	Mean
Health	health	14.59
Family security	family security, responsible, capable, ambitious	11.64
Self-expansion	broadminded, capable	10.74
Personal orientation	true friendship, self-respect	10.62
Love	mature love, loving	10.27
Social orientation	world peace, equality, freedom, national security	10.25
Other-directed	courageous, independent	10.15
Inner-directed	polite	9.59
Self-constriction	obedient, polite, honest, self-controlled	9.45
Immediate gratific.	comfortable life, clean, exciting life, pleasure	9.27
Delayed gratification	wisdom, inner harmony, logical, self-controlled	9.18
Competence	logical, imaginative, independent, intellectual	8.82
Societal security	world beauty, equality, helpful, imaginative	8.61
Religious morality	clean, salvation, forgiving, helpful	8.57
Respect	social recognition, self-respect	8.31

Table 3. Multinomial Logit Model (MNL) and Mixed Logit Model (MXL) Results

	MNL1	MNL2	MNL3	MNL4	MNL5	MXL5 Final	
Model	Base	Gratification	Competence	Self-control	Final	Mean	Std. Dev.
PRICE	−0.97***	−0.97***	−0.97***	−0.97***	−0.98***	−1.35***	
	(−0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	
CARBON	−0.12***	−0.10***	−0.09***	−0.09***	−0.10***	−0.17***	0.01***
	(−0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.06)	(0.02)
WATER	−0.25***	−0.25***	−0.25***	−0.25***	−0.25***	−0.35***	0.05
	(−0.02)	(0.02	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)
NONE	−14.82***	−14.86***	−14.88***	−14.88***	−14.94***	−25.69***	5.21***
	(−0.58)	(0.58)	(0.58)	(0.58)	(0.58)	(1.21)	(0.59)
C_RIMGR		0.00**	0.00***	0.00***			
		(0.00)	(0.00)	(0.00)			
C_RDELG		−0.00***	−0.00***	−0.00**	−0.00***	−0.09**	0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
C_RCO			0.00	0.00			
			(0.00)	(0.00)			
C_RRELI			−0.00***	−0.00***			
			(0.00)	(0.00)			

MIXED LOGIT (Limdep)

Explanatory Power:
Delayed grat.
Societal sec.
Family secur.
Health

SD:
Self expans.
Love
Other direct.

Ground beef	*Mean*		*Std. Dev.*	
Price	-1.35	***		
	(0.05)			
Carbon	-0.17	***	0.01	***
	(0.06)		(0.02)	
Water (in 1000 l)	-0.35	***	0.05	
	(0.03)		(0.04)	
None of these	-25.69	***	5.21	***
	(1.21)		(0.59)	
Delayed gratification*Carbon	-0.09	**	0.00	
	(0.00)		(0.00)	
Self expansion*Carbon	-0.00		0.00	*
	(0.00)		(0.00)	
Societal security*Carbon	-0.01	***	0.01	***
	(0.00)		(0.00)	
Family Security*Carbon	0.02	***	0.00	
	(0.00)		(0.00)	
Love*Carbon	0.00		0.01	***
	(0.00)		(0.00)	
Other directed*Carbon	-0.00		0.01	***
	(0.00)		(0.00)	
Health*Carbon	-0.01	**	0.00	
	(0.00)		(0.00)	

… let's zoom into mixed logit:

Predictor sustainable consumption:
Delayed grat. *(wisdom, inner harmony, logical, self-controlled)*
Societal sec. *(world beauty, equality, helpful, imaginative)*
Health

Predictor unsustainable consumption:
Family secur. *(family security, responsible, capable, ambitious)*

Ground beef	*Mean*	*Std. Dev. of para distrib.*
Delayed gratification*Carbon	-0.09**	0.00
	(0.00)	(0.00)
Societal security*Carbon	-0.01***	0.01***
	(0.00)	(0.00)
Family Security*Carbon	0.02***	0.00
	(0.00)	(0.00)
Health*Carbon	-0.01**	0.00
	(0.00)	(0.00)

Discussion

1st Hypothesis: *Consumers make distinction between carbon & water footprint labeling*

- **First hypothesis**: supported – consumers differentiate between carbon- and water-footprint labels for ground beef

Discussion

2nd Hypothesis: *Consumers with value systems characterized by* ***delayed*** *gratific. are* ***more*** *likely* ***concerned*** *about climate change than consumers with value systems centered immediate gratification*

- **Second hypothesis**: supported – consumers with a value structure characterized by **delayed gratification** more concerned about climate change than consumers focused on **immediate gratification**

- Significant **interaction** effect for carbon footprint and health:
  - Health status perceived to be influenced by CO2 emissions (?)

Discussion

3rd Hypothesis: *self-centered values are better predictors of **un**sustainable behavioral intentions of consumers than society-centered values*

- **Third hypothesis**: supported – significance of estimates for
  - ➢ Family security versus Societal security

→ Environmentally **unsustainable** choices are particularly motivated by consumers' value for their **immediate network (family)**, in contrast to their value for an enlarged personal network (society)

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Conclusions

- Stated preferences for lower **carbon** emissions and lower **water** usage for ground beef, but with a different magnitude
- Human values relevant in predicting ‘sustainable choices’
- **Health**, **family security** & **societal security** most powerful predictors among human values
- Consumers with **intrapersonal** values show environmentally **less sustainable** behavior, compared to those with interpersonal values

Conclusions

- Footprint labeling to support public and private **risk communication** regarding ‘sustainable behavior’ (?)

Issues?

- Established appropriate set of random parameters, starting with MNL [LR tests] (?)
- Interactions for carbon only
- Literacy of footprint labels
- use the ranking info from values explicitly

Next, with water & 2 regions?

1. Estimate new model [call it model B] with water interactions only, keeping carbon in there as well (as water was in model A)

2. use LR test and BIC/ajd Rsqu to compare model A versus B

3. generate a model C, in which all water and carbon interactions are included from A and B; test this model down via LR, BIC and ajd R square

4. generate model D, where we pool the German and the Canadian data, using a LR test for pooling, following Lusk, Roosen and Fox (2003), using the same variables as model C

5. if preference regularity is rejected, follow Lusk et al. (2003), and multiply the data for each country by the relative scale parameters

Tak!

Acknowledgements

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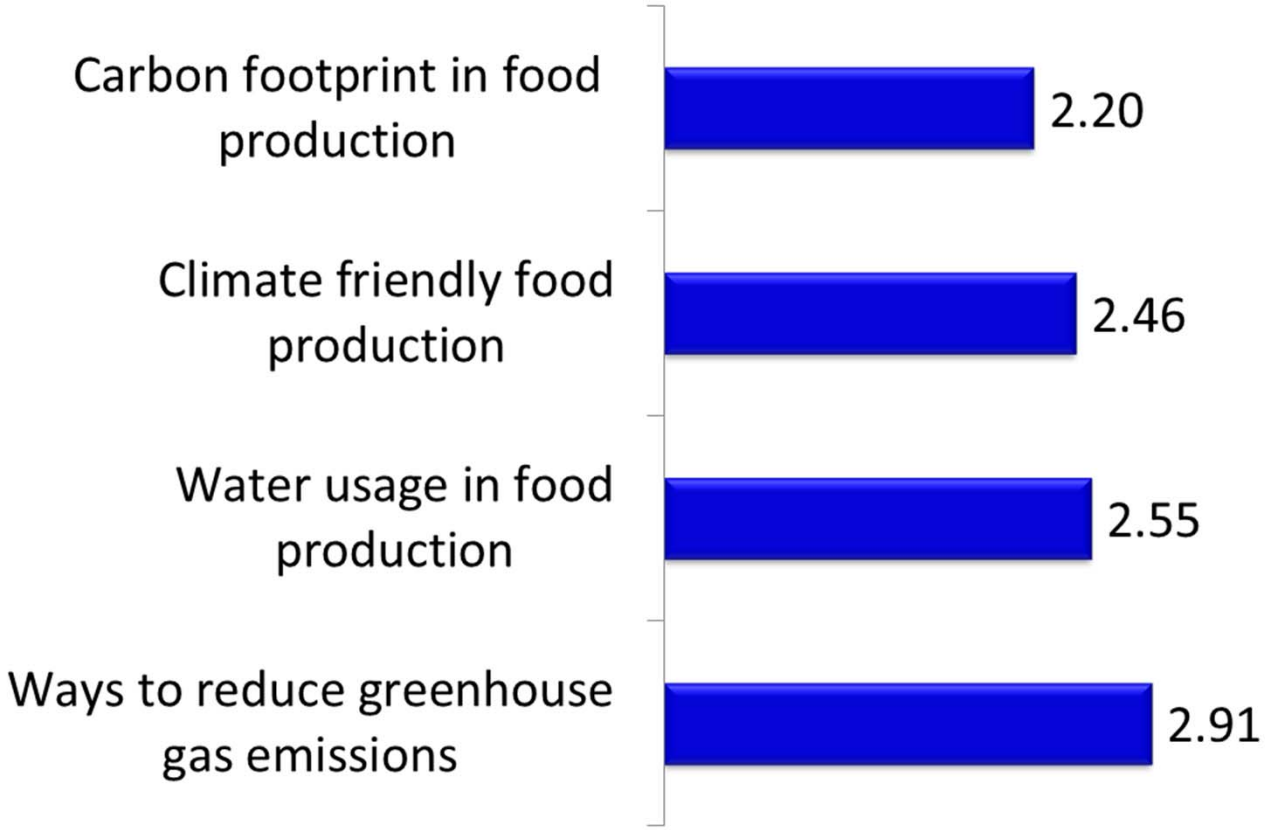
http://www.consumerdemand.rees.ualberta.ca/

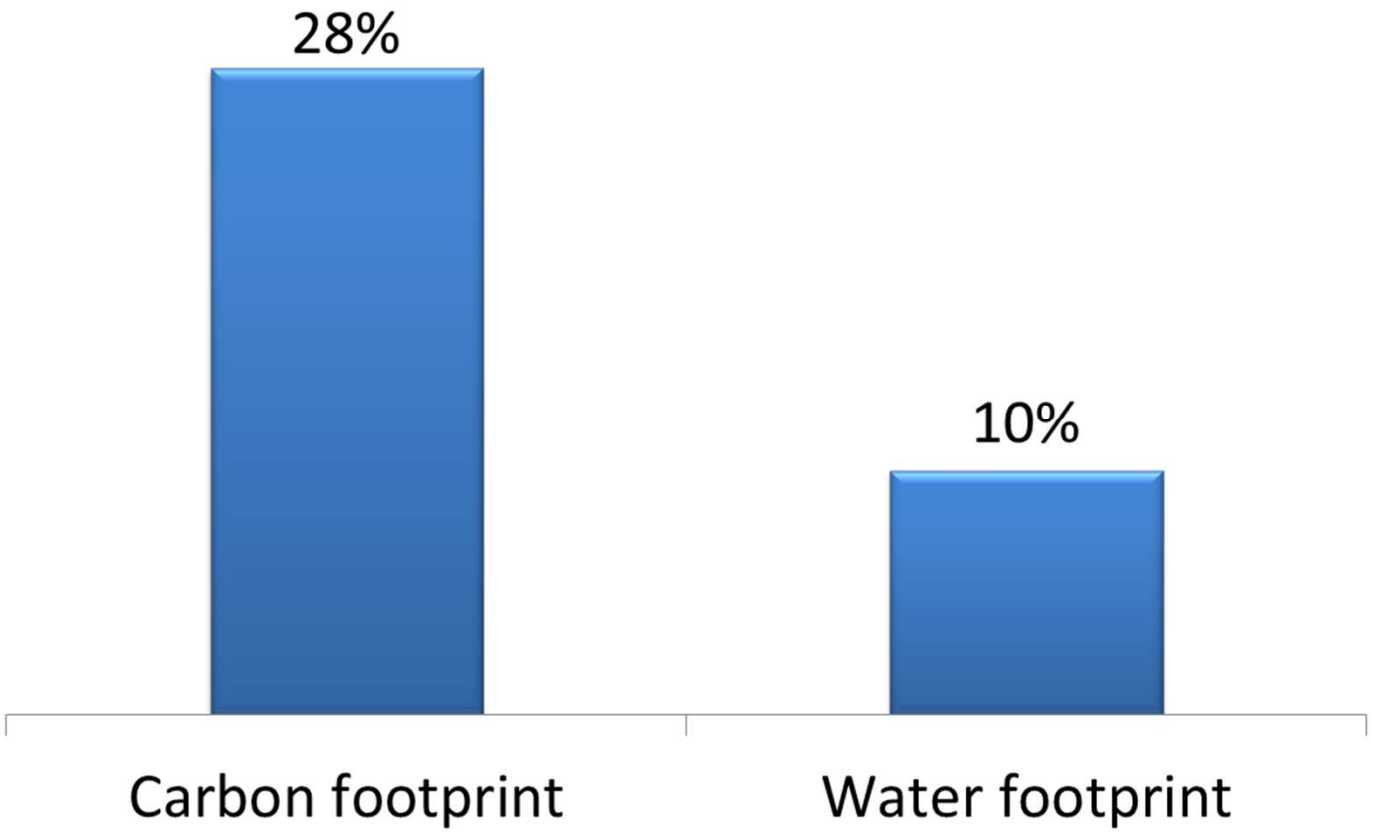
How well informed do you feel about the following issues?

(1 = no knowledge and 5 = very knowledgeable)



N=1551

Have you ever seen a carbon / water footprint before participating in this survey?



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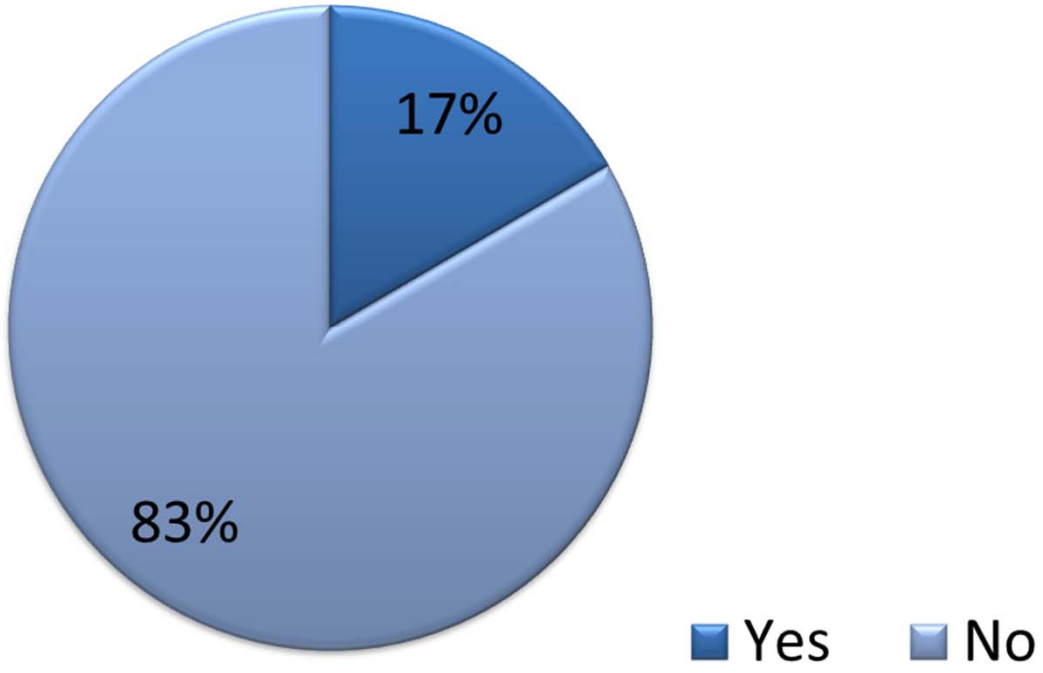
N=1551

During the past four weeks, have you purchased any grocery products because they are recognized to be climate friendly?



N=1551

Design of consumer survey

- Consumer online survey 2011 in Canada
- 1551 Participants
  - 52% female
  - On average 48 years old, the youngest being 18 and the oldest being 82 years old
  - Mean education level: master degree
  - Average annual income 42,500 CAD$
  - Household size ranked from 1 to 9 (M=2.5)
  - 20% children in the household
  - 10% of graduate students
  - 6% of undergraduate students

Pre-experimental information

UNIVERSITY OF ALBERTA

Consumers' purchasing decisions with respect to groceries

We are interested in your product choices.

PLEASE TAKE TIME TO CAREFULLY READ THE FOLLOWING INSTRUCTIONS BEFORE PROCEEDING

Imagine you are in your usual grocery store and considering the purchase of ground beef, potatoes, yogurt and bathroom tissue.
Following are 8 choice situations (decision scenarios), two for each of these products. Each choice situation includes a description of different product features. All features of the products in each decision situation are identical except that they vary in their carbon (CO2) emission equivalents, their water usage, and their price. The numbers that you will see for Carbon (CO2) emission equivalents, water usage and product prices are based on real products.

Carbon emission equivalents are the amount of Carbon Dioxide (CO2) created by the grocery product and refer to greenhouse gas emissions over the whole life of a product. [For example, from the time an apple was grown and picked from a tree until its presentation at the point of sale, e.g. in a supermarket]. The lower the emissions, the better for the environment.

Water usage refers to the water used to produce, store and distribute a grocery product. [For example, the water used in the orchard to grow an apple until it is picked from a tree and then until its presentation at the point of sale, e.g. in a supermarket]. The lower the water usage, the better for the environment.

In each choice situation, please indicate the choice you would make based on your own preferences. Specifically, you are asked which product you would choose to purchase, compared to other products that will be visible to you on the screen. Alternatively, you may choose not to purchase either product. Please carefully examine each option before you make a decision and tick the decision that you would make based on your own preferences.

IMPORTANT

- CHOOSE one of the options on each page. Or you may choose NOT TO PURCHASE either product.
- Assume that the options on each page are the only ones available.
- Do not compare options on different pages.

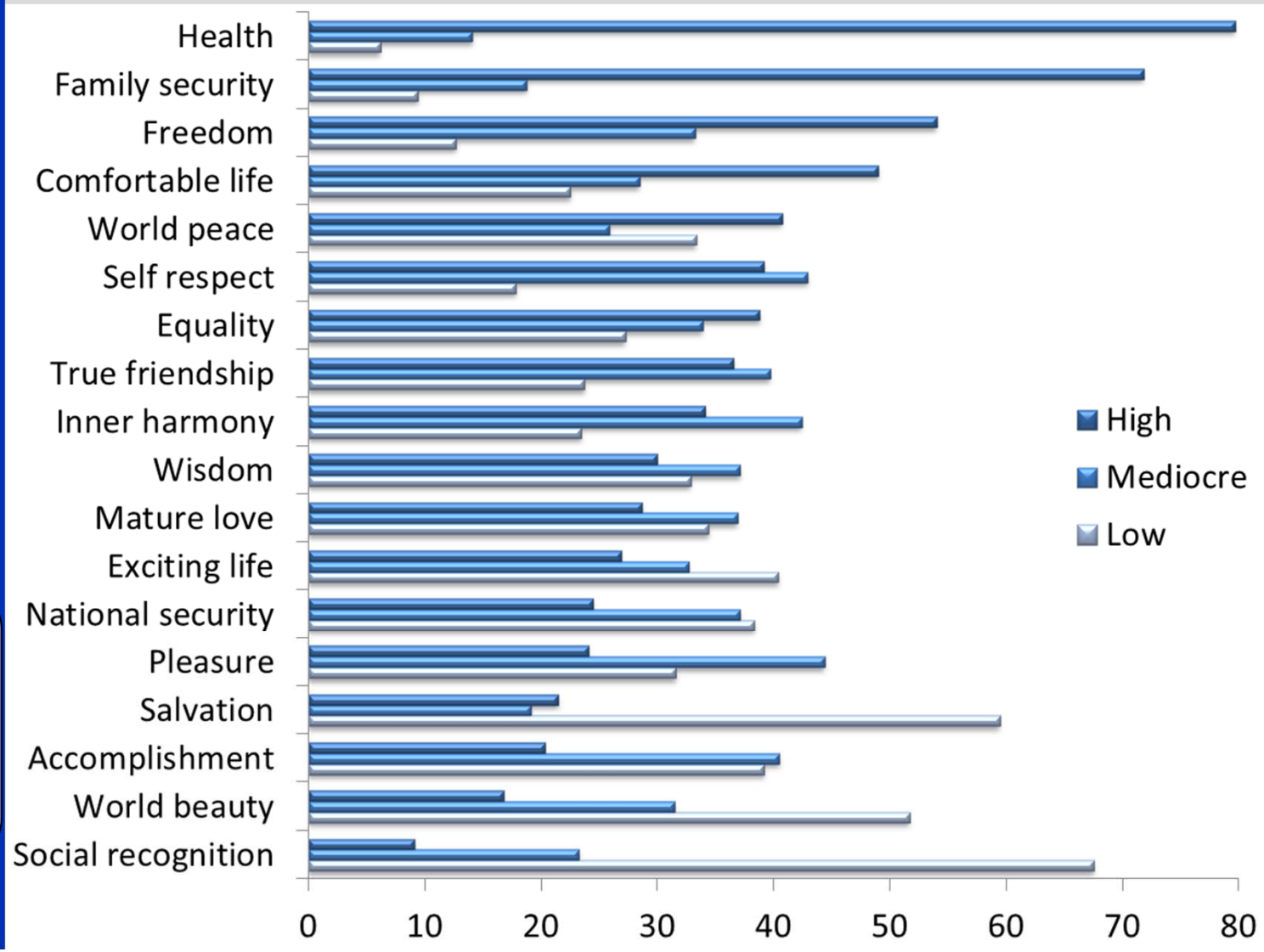
You might see a few options that may seem counter-intuitive (e.g., a lower price but a higher quality in your personal opinion). Be assured that this is not an error but part of the design of the survey. Simply choose the option that you most prefer, based on its characteristics.

Pause Next

Terminal values – importance

Most important:
Health
Family security
Freedom

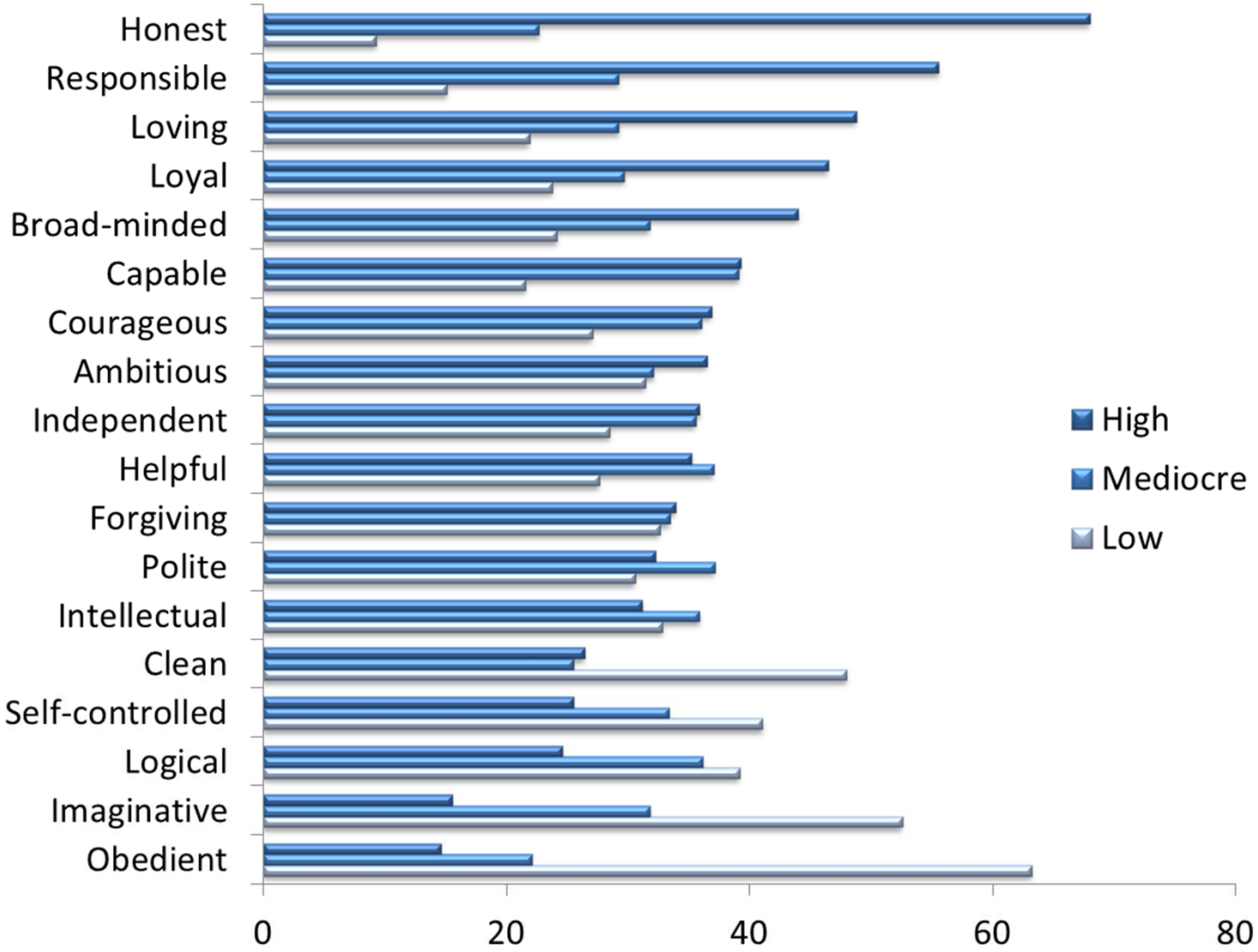
Least important:
Social recognition
Salvation
World beauty



Instrumental values – importance

Most important:
Honest
Responsible
Loving

Least important:
Obedient
Imaginative
Clean



Terminal values		Instrumental values	
A Comfortable Life	a prosperous life	**Ambitious**	hardworking and aspiring
Equality	brotherhood and equal opportunity for all	**Broad-minded**	open-minded
An Exciting Life	a stimulating, active life	**Capable**	competent; effective
Family Security	taking care of loved ones	**Clean**	neat and tidy
Freedom	independence & free choice	**Courageous**	standing up for your beliefs
Health	physical & mental well-being	**Forgiving**	willing to pardon others
Inner Harmony	freedom from inner conflict	**Helpful**	working for the welfare of others
Mature Love	sexual and spiritual intimacy	**Honest**	sincere and truthful
National Security	protection from attack	**Imaginative**	daring and creative
Pleasure	an enjoyable, leisurely life	**Independent**	self-reliant; self-sufficient
Salvation	saved; eternal life	**Intellectual**	intelligent and reflective
Self-Respect	self-esteem	**Logical**	consistent; rational
A Sense of Accom.	a lasting contribution	**Loving**	affectionate and tender
Social Recognition	respect and admiration	**Loyal**	faithful to friends or the group
True Friendship	close companionship	**Obedient**	dutiful; respectful
Wisdom	a mature understanding of life	**Polite**	courteous and well-mannered
A World at Peace	a world free of war & conflict	**Responsible**	dependable and reliable
A World of Beauty	beauty of nature and the arts	**Self-controlled**	restrained; self-disciplined