SIMULATIONS

SOCIAL SCIENCE
VS.
SOCIAL SIMULATIONS

UMEÅ UNIVERSITY

Universiteit Utrecht

Scientific research methodology I

1. Formulate a research question:
    - is there enough mass to keep the universe from ever expanding?
    - What causes Alzheimer disease?
    - Can we use the SOCAV method to support Alzheimer patients at home as well?
2. Formulate a hypothesis:
    - If there is a certain amount of anti-matter the universe will not expand forever
    - Alzheimer disease is caused by a genetic deviation that causes more beta-amyloid to be formed
    - We can use this method at home if we educate the family appropriately

Scientific research methodology II

3. Set up research:
    a) Decide which data is needed
    b) Plan steps to get data
    c) Decide on analysis methods
    d) Decide when hypothesis is confirmed or rejected based on data
4. Perform actual research:
    a) Collect data
    b) Structure and analyze the data
    c) Interpret the results

Example from social science: Women are underrepresented in the media

1. The underrepresentation of women in the media is caused by gender inequality in societal positions

2. The underrepresentation of women in the media is caused by the way media function as male dominated organizations

Data

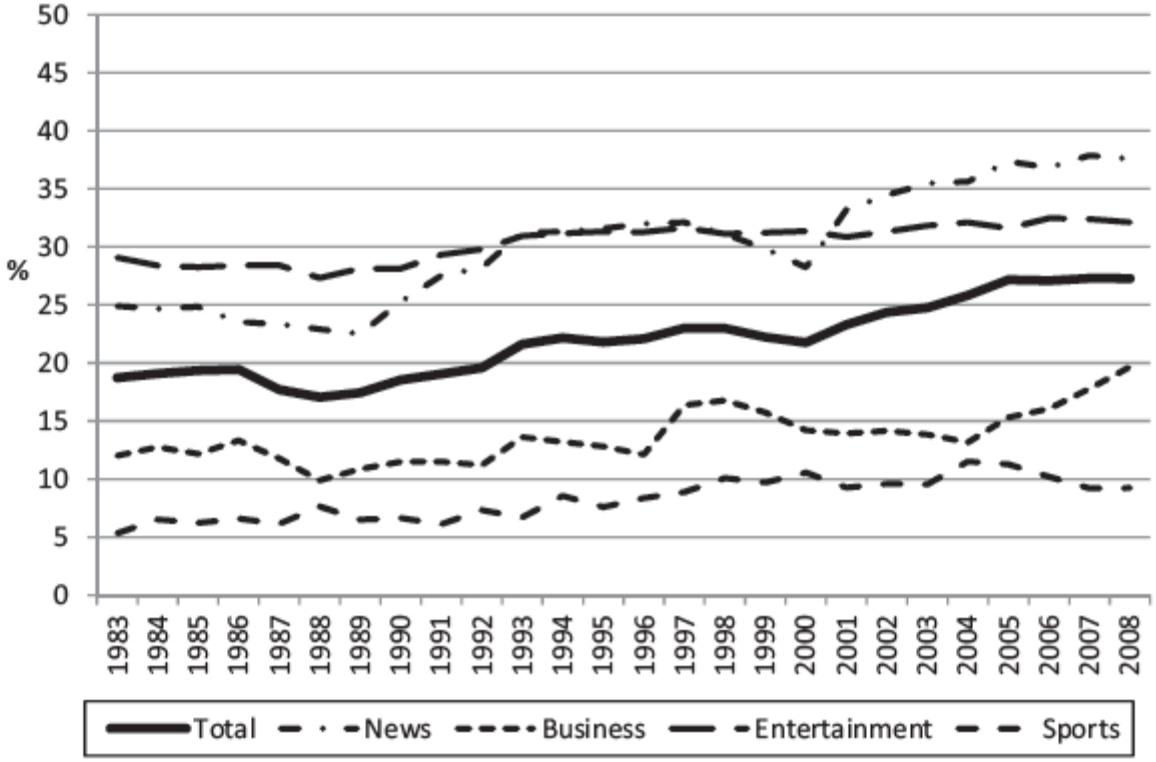


Figure 1. Trends in the Percent of Female Names Appearing in 13 U.S. Newspapers by Section, 1983 to 2008 (Historical Sample)

Hypothesis

- *Hypothesis 1:* Over time, sex differences in media coverage have decreased more among individuals who receive infrequent coverage than among people who receive regular coverage.

- *Hypothesis 2:* Newspaper sections with a female section editor will dedicate a higher proportion of their coverage to women than will newspaper sections with a male section editor.

- *Hypothesis 3:* Newspapers with a female publisher or editor will dedicate a higher proportion of their coverage to women than will newspapers with a male publisher or editor.

- Hypothesis 4: Greater representation of women among news executives and on editorial boards will be associated with higher proportions of female names in a newspaper.

- Hypothesis 5: Conservative newspapers will dedicate a smaller portion of their coverage to females.

Data (computational SS)

The primary data source is the Lydia news analysis system (Bautin et al. 2008; Bautin et al. 2010). Lydia provides time-stamped occurrences of person-names in the scanned and digital records of more than 2,000 newspapers, magazines, and online news sources up to 2009, when most online newspapers placed most content behind paywalls. For each name occurrence, Lydia provides the date, newspaper, newspaper section, sex, and sentiment with which the name was mentioned.

Lydia determines the sex of a named person through Anaphora Resolution (statistically observed gender associations of names in U.S. Census data; for a detailed explanation of the sex classification process and a table indicating the validity of this process for a random sample of names, see Part 1 of the online supplement [http://asr.sagepub.com/supplemental]).

Historical analysis

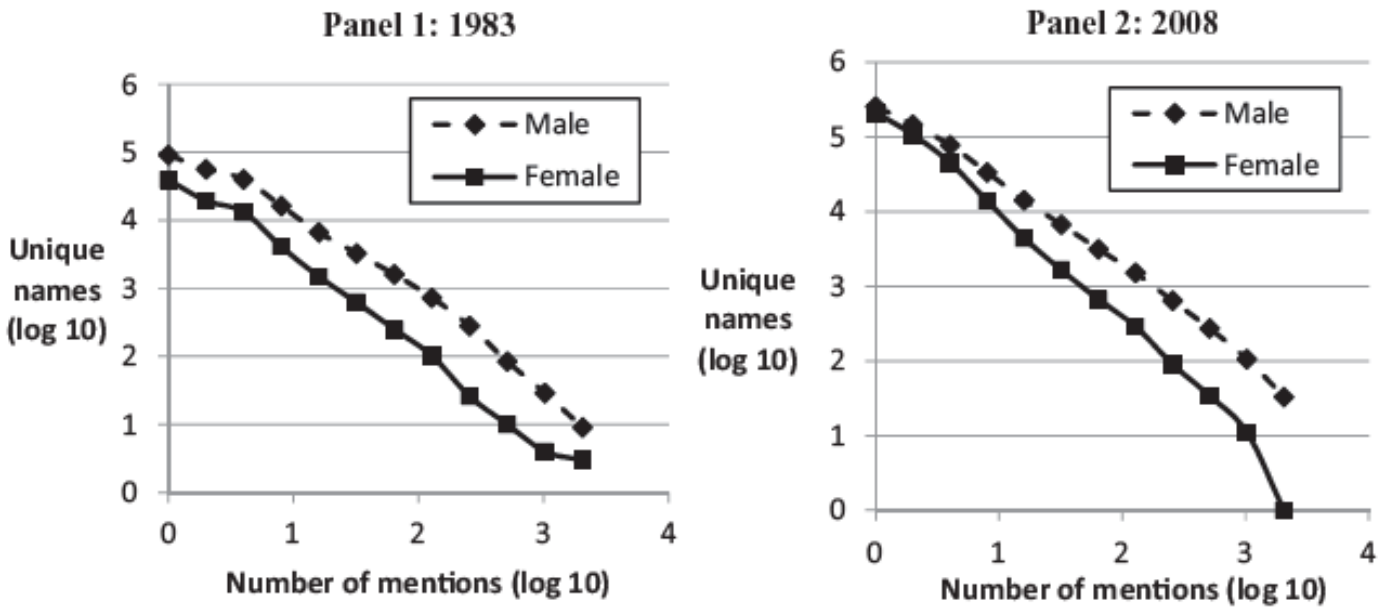


Figure 2. Distribution of Coverage by Sex in 13 U.S. Newspapers: 1983 and 2008 (*Historical* Sample)

Note: Panel 1 shows that in 1983, male names were more likely to appear both frequently and infrequently in the news. Panel 2 shows that 25 years later, in 2008, infrequent names were nearly as often female as male, but more frequent names continued to refer predominantly to men. These distributions mirror trends in real-world gender inequality: women's overall economic participation and public visibility dramatically increased, except in top positions where men continue to dominate.

Section analysis

Table 3. Random- and Fixed-Effects Panel Regressions of Factors Influencing the Proportion of Female Names in 193 U.S. Newspapers, 2004 to 2009, *Organizations* Sample

	Model 1. Random	Model 2. Random	Model 3. Fixed	Model 4. Fixed
Media-Level Characteristics				
Female publisher	.013	.010	.014	.013
	(.77)	(.75)	(.71)	(.65)
Female executive editor	−.011	−.021	−.029	−.022
	(−.79)	(−1.85)	(−1.75)	(−1.38)
Proportion of women on the editorial board	.043*	.047**	.028	
	(2.09)	(2.58)	(1.34)	
Proportion of women on the editorial board at least .35				.002
				(.27)
Newspaper conservative political slant	.062			
	(.39)			
Controls (societal-level characteristics)				
Proportion of female U.S. Senators from state	.001	−.009	−.133	−.138
	(.09)	(−.70)	(−1.83)	(−1.92)
Proportion of female U.S. House Reps. from state	.023	.016	.133*	.132*
	(.75)	(.54)	(2.40)	(2.35)
Proportion of women among local state senate members	.007	−.003	.127	.137
	(.010)	(−.05)	(1.08)	(1.16)
Female state governor	.007	.003	−.012	−.011
	(.54)	(.29)	(−.74)	(−.66)
Female mayor	.016	.013	−.005	−.005
	(1.37)	(1.27)	(−.50)	(−.44)
Proportion of women in top business executive positions in state	.387***	.370***	.277**	.282**
	(3.66)	(3.78)	(2.64)	(2.69)
Size of entertainment industry in state	.013	.024	.153*	.156*
	(.29)	(.57)	(2.09)	(2.12)
N major male sports leagues present in city	−.002	−.001		
	(−.21)	(−.15)		
City population (log 10)	−.020	−.022*		
	(−1.50)	(−1.96)		
Year	−.001	−.001	−.001	−.001
	(−.23)	(−.30)	(−.51)	(−.48)
Year^2	−.005***	−.004***	−.004**	−.004**
	(−3.65)	(−3.80)	(−3.41)	(−3.35)
Observations (newspaper years)	700	888	888	888
ρ (fraction of variance due to unobserved newspaper effects)	.405	.397	.625	.631

Note: Unstandardized coefficients are reported; cluster-robust *t*/*z* statistics are in parentheses.
*$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed tests).

Conclusions of the research

- It seems that women get less covered in the media than men due to the fact that they are under represented in high powered positions.

- Women editors are more often mentioning women in the media than men, but this seems mainly due to the type of newspaper sections they cover. This is supported by the fact that when men are replaced by women in the newspaper the coverage does not change substantially.

- Conclusions are based on statistical analysis of the data that has been gathered.

Example of an ABM based research project

Labour Market Policies during Recessions

- Analyse the impact of typical labour market policies on the short-, medium- and long-term development of unemployment.
- Analyse the effect of:
  - 1) a reduction of unemployment benefits (UB),
  - 2) an increase in search efforts of unemployed,
  - 3) a mixture of the aforementioned policy responses,
  - 4) governmental transfers and
  - 5) short-time work

Data?

Experiment?

results

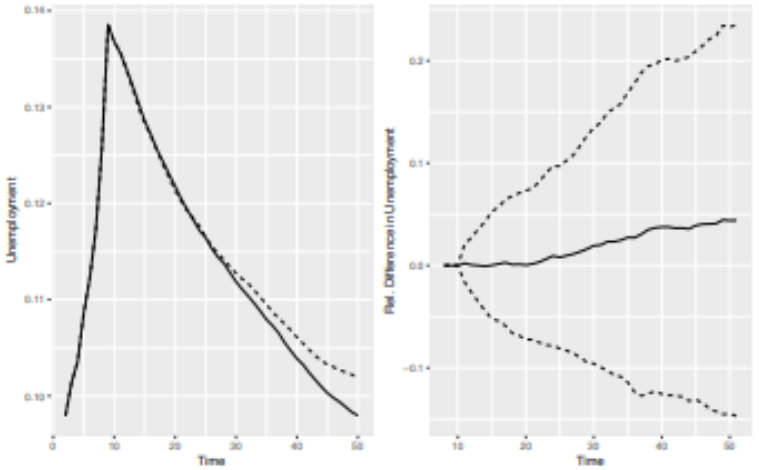


Fig. 1: Plots display the effect of an increase in search efforts and a reduction of UB (simultaneous policy shift). The left plot displays the mean development of unemployment for baseline (solid) and policy scenario (dashed). The shift starts in period 8. The right plot displays the average relative difference between baseline and policy scenario (solid) and its 95%-confidence interval (dashed). Here, the shift starts in period 3.

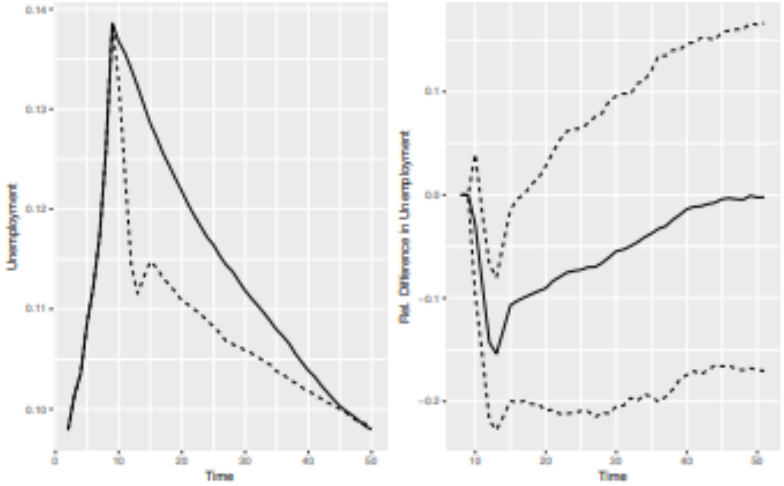
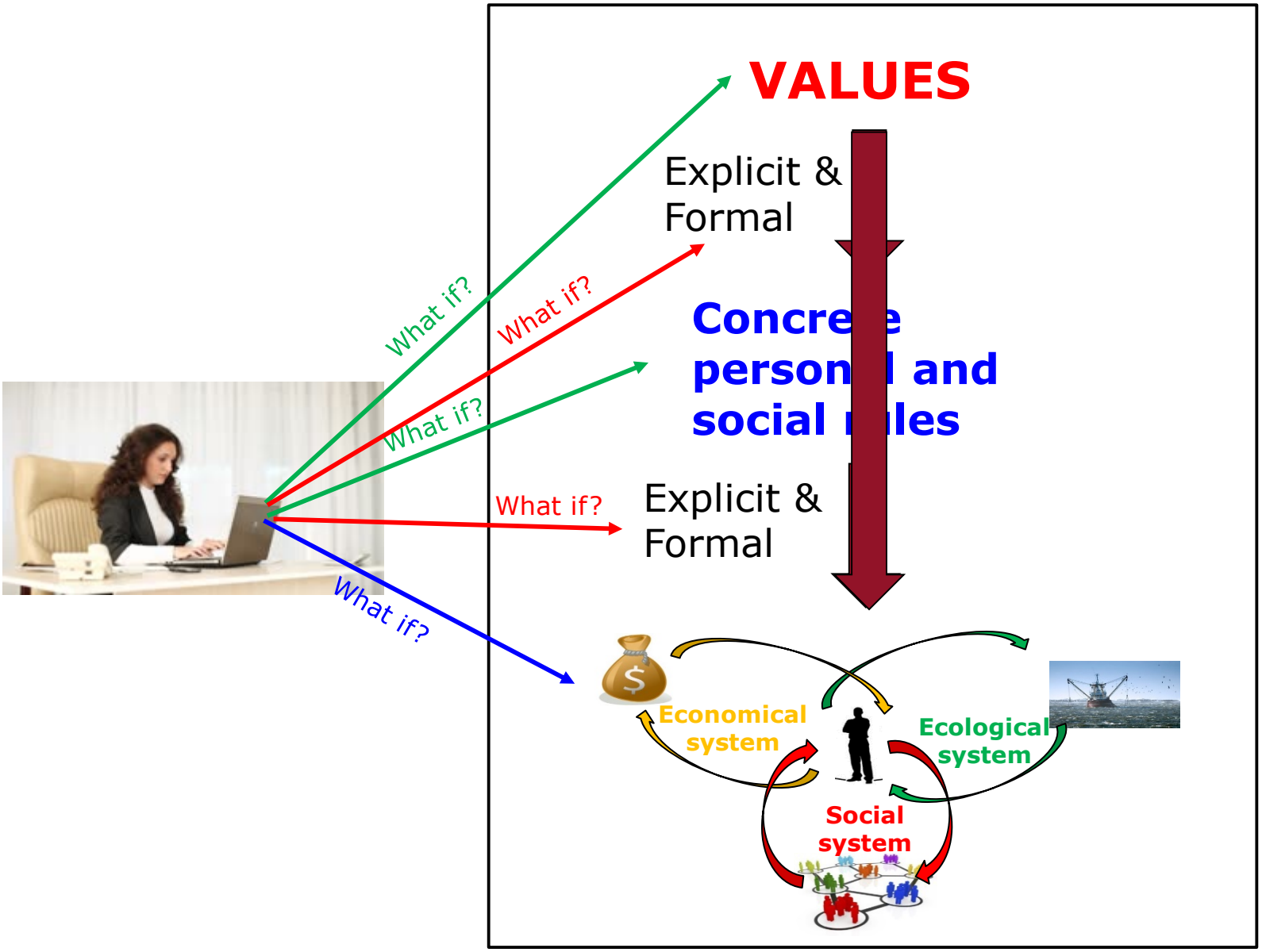


Fig. 2: Plots display the effect of an introduction of short-time work. The left plot displays the mean development of unemployment for baseline (solid) and policy scenario (dashed). The shift starts in period 8. The right plot displays the average relative difference between baseline and policy scenario (solid) and its 95%-confidence interval (dashed). Here, the shift starts in period 3.

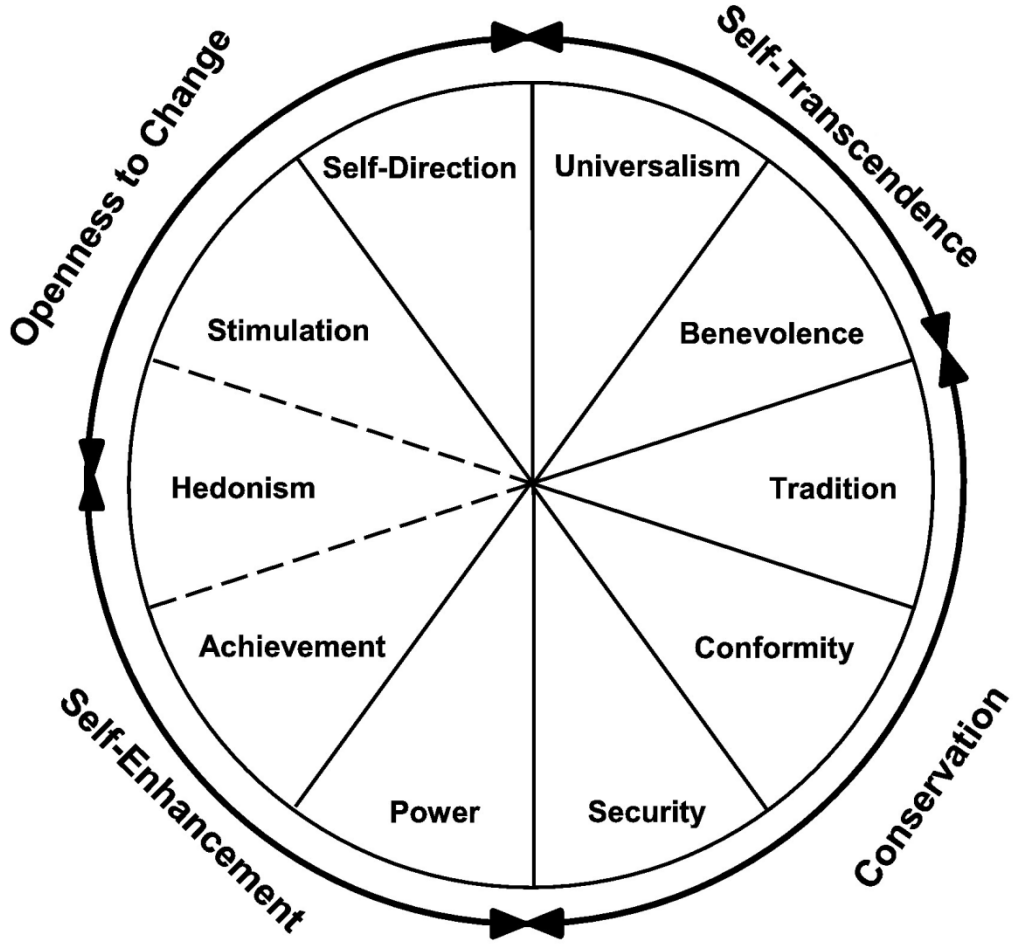
Social simulations

- Possibility to develop more abstract social theories!
- Use models of social behavior based on social psychology:
  - Norms
  - Values
  - Social practices
  - Motives and motivations
  - Personality
  - …

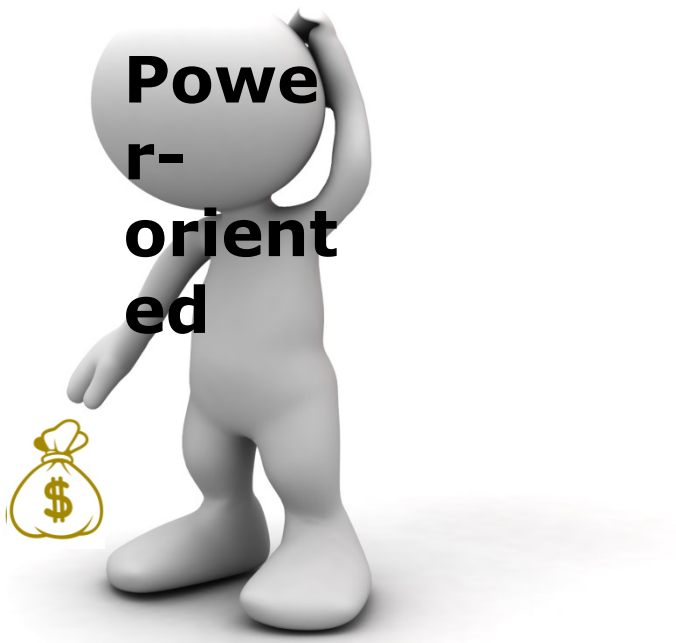
Design of social simulations



Schwartz value system



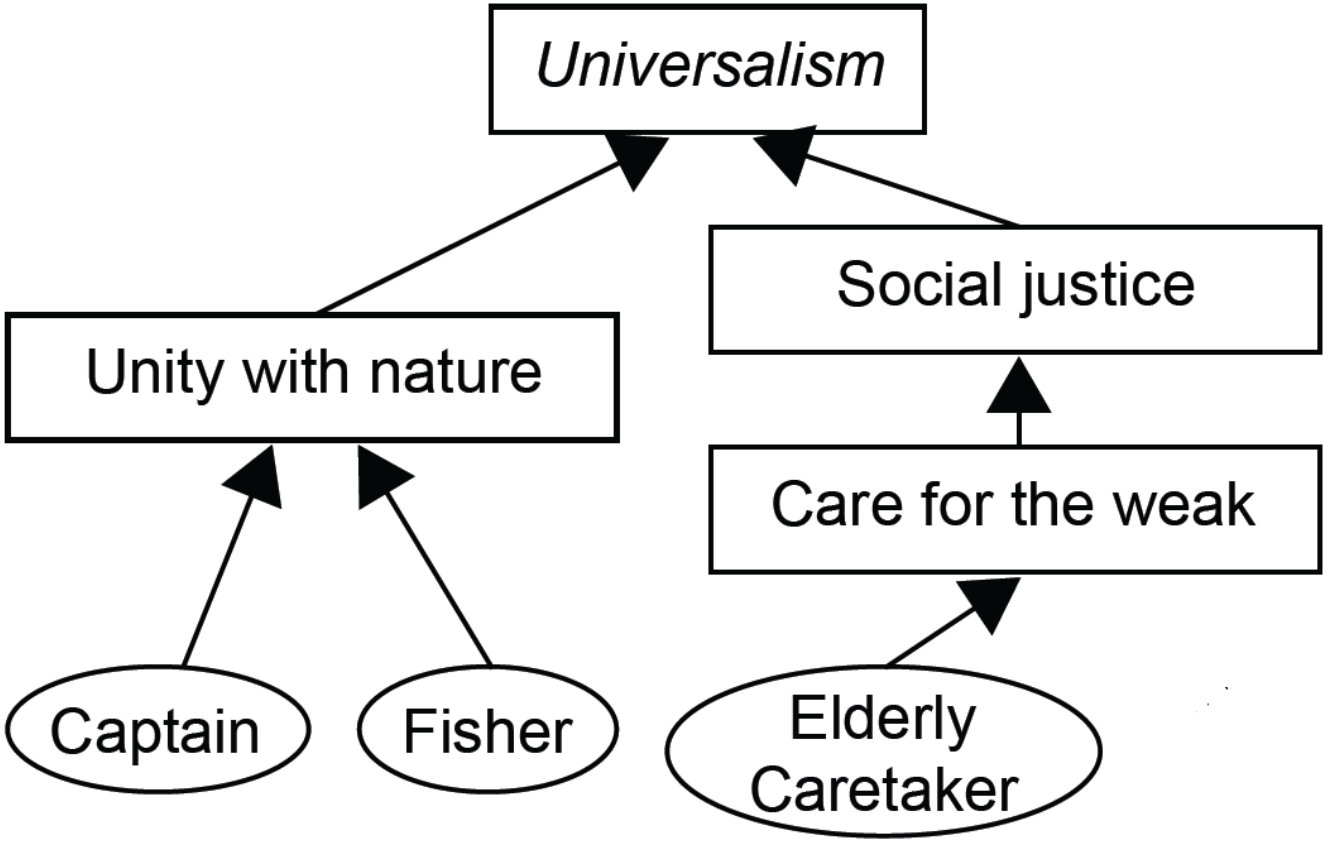
What is more profitable to me, investing in fishery or buying a bigger house?



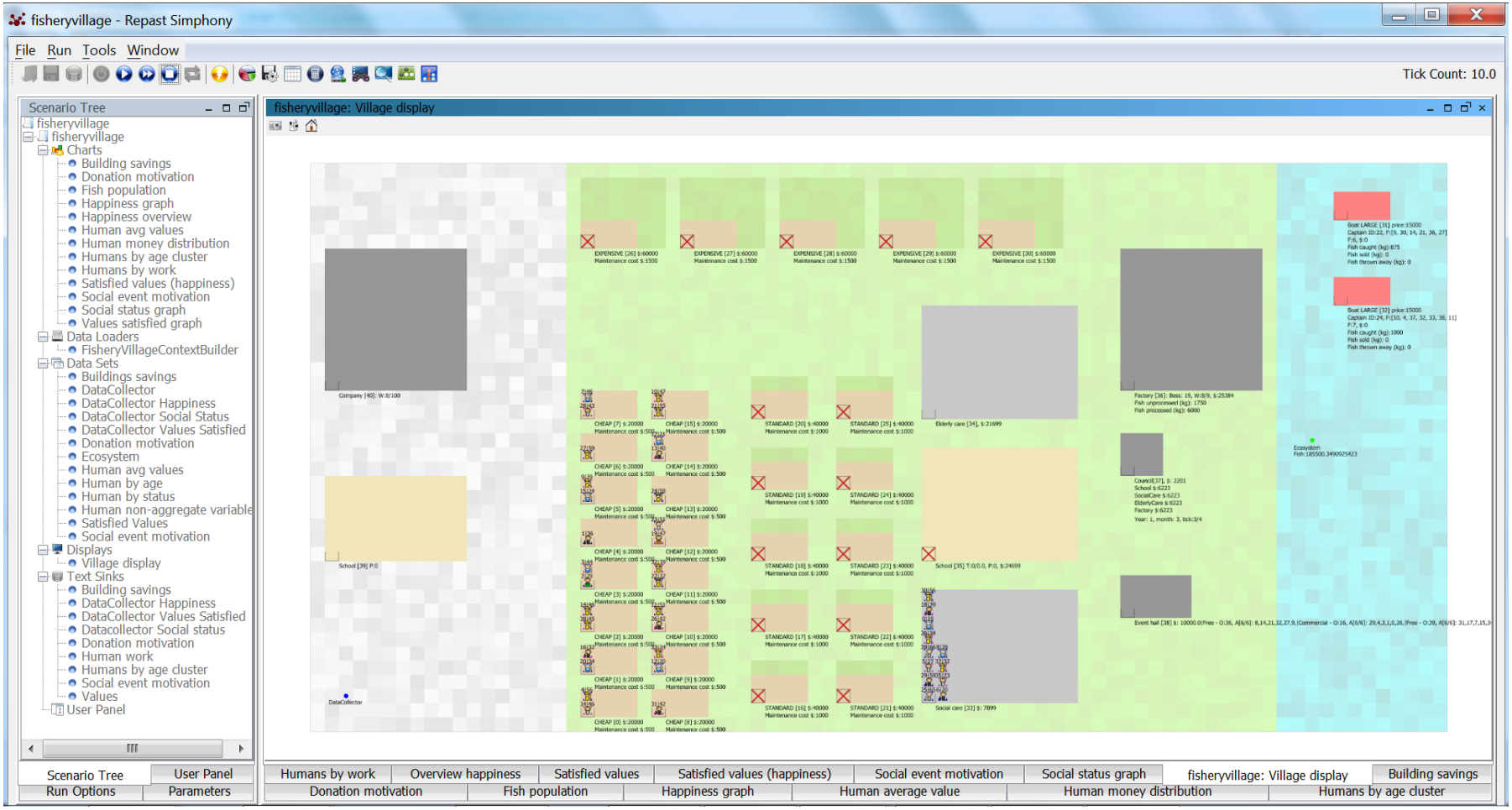
How much should I donate to public good?

Connecting values to actions

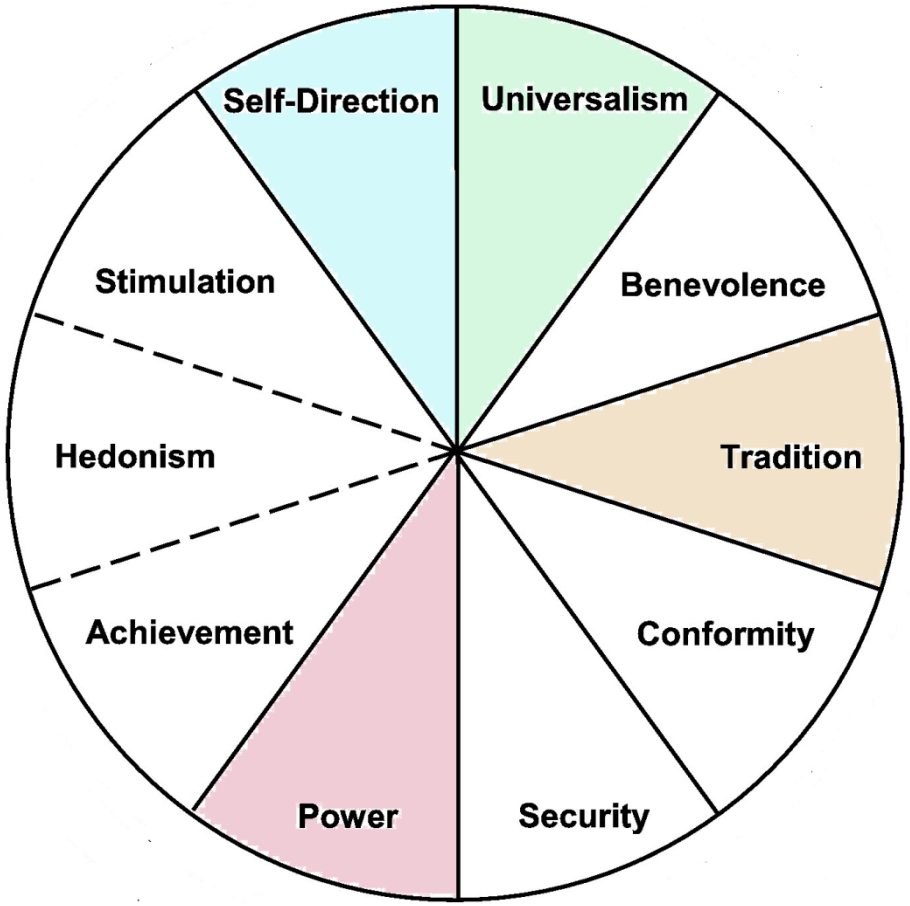
- Value trees



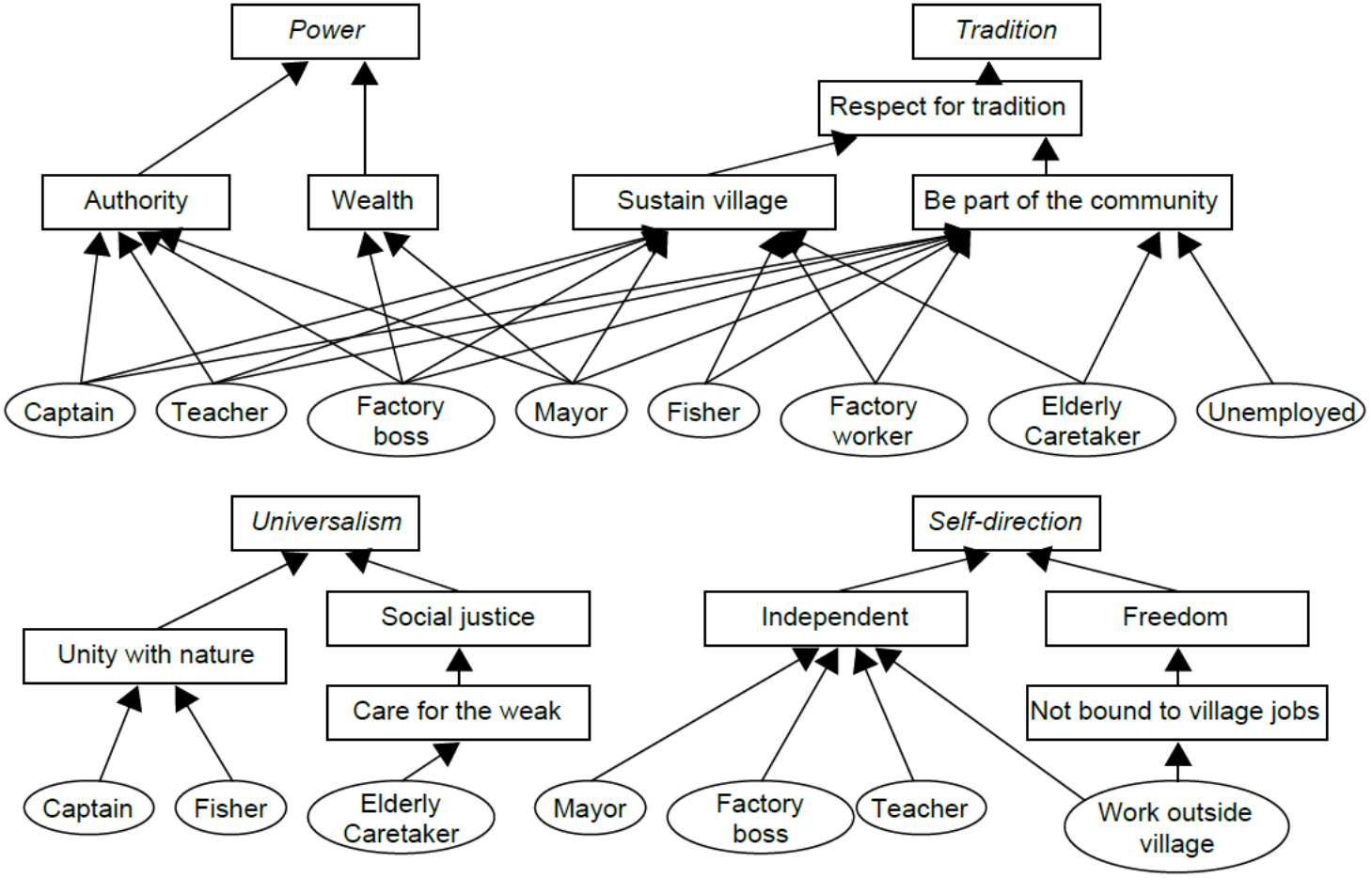
Validating value framework



Considered values



Job selection-value trees



Setting I

- $\tau(Power) = 80,$
- $\tau(Self - direction) = 50,$
- $\tau(Unisersalism) = 30,$
- $\tau(Tradition) = 50$

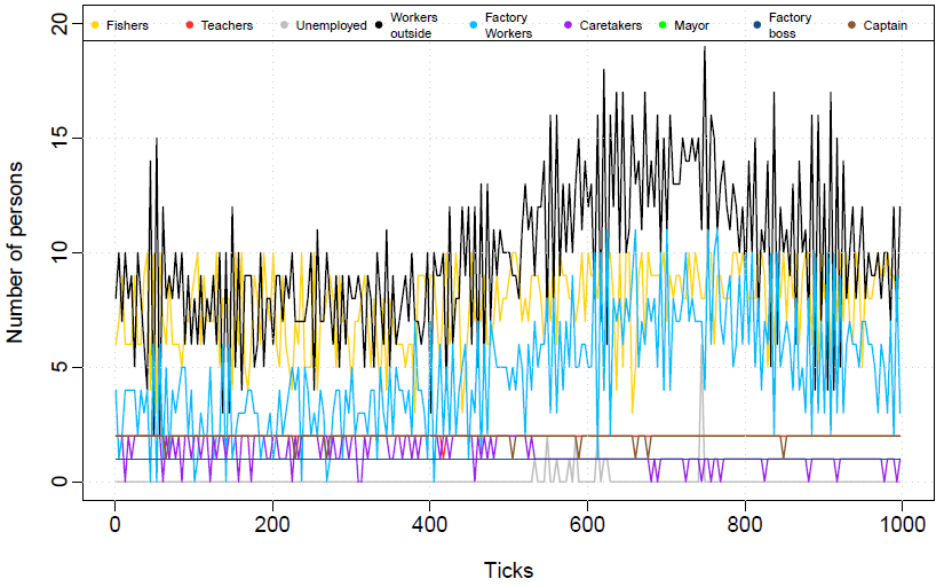
Setting II

- $\tau(Power) = 20,$
- $\tau(Self - direction) = 50,$
- $\tau(Unisersalism) = 70,$
- $\tau(Tradition) = 50$

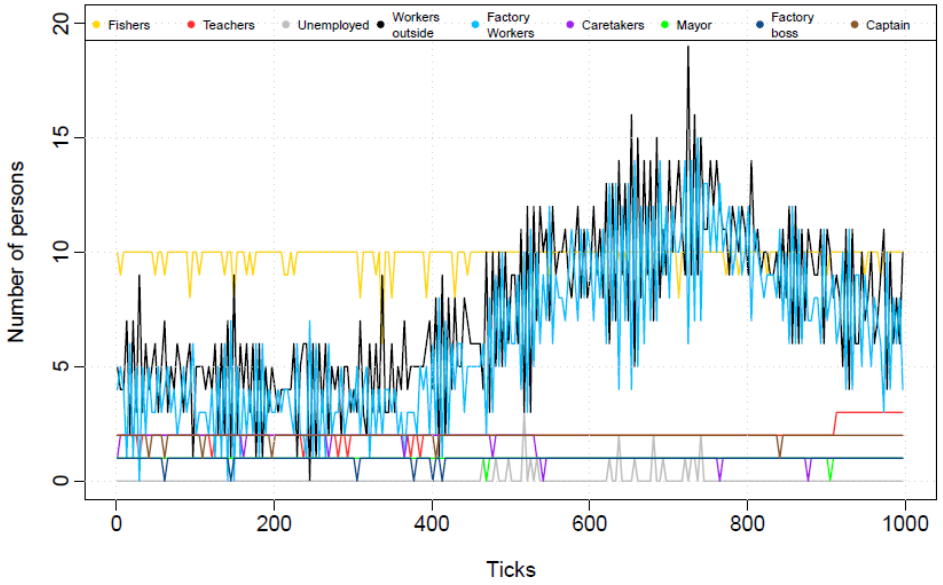
Outline

- Value theory
- Value framework
- Validating framework by ABS
- Simulation results

Job distribution



(d_1) Work distribution, setting (1)



(d_2) Work distribution, setting (2)