Detecting Transitions in Social Dynamics

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Work with Andrea Perna





www.collective-behavior.com

Look up!



Look up!





Gallup et al., (2012) Proceedings of the National Academy of Sciences

a) stimulus of 1



b) stimulus of 5

Gallup et al., (2012) Proceedings of the National Academy of Sciences

c) stimulus of 9

Indivudal level model



Frequency of looking at suspicious characters



Number of pedestrians looking at stimulus during 12 seconds interval



Frequency of looking at suspicious characters



Number of pedestrians looking at stimulus during 12 seconds interval

Transitions

Rapid change in some global variable arising from local interactions between individuals.

Take Shelling's example, there is a sudden transition in segregation when prejudices increase slightly.

For animal groups, there is a sudden transition to flocking when 'attraction' becomes sufficiently strong.

Transitions in Aggregate Data?

- When we can measure what people (or animals) do, its 'easy' to find transitions.
- Its also 'easy' to make up sociology theories about transitions.
- But when we go out and do surveys or gather economic metrics, how do we find transitions in these?
- I don't have full answers but here are some ideas.

The Demographic Transition

- Move from having lots of children to having lots of money!
- Improvements in education and health in conjunction with an increase in economic growth and reduction in fertility.
- Question: What is the sequence of these results.

Barro & Becker; Galor; Durlauf.....

Gapminder



www.gapminder.org/



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	6 g Gross domestic product (log)														12					











Human Development Sequence

Economic Change					Cu	Cultural Change \rightarrow						Political Change					
(exist	tentia	l secu	urity)	(self-e	(self-expression values)						(democratic						
										in	istitu	tions)				
Н	U	М	A	N	D	E	V	E	L	0	Р	М	Е	N	Т		

Can we find equations forvalues Development?

Inglehart & Baker (2005) The Human Development Sequence, Cambridge Unviersity Press

Value dimensions

Traditional vs. Secular-Rational Values^a

TRADITIONAL VALUES EMPHASIZE THE FOLLOWING:					
God is very important in respondent's life.	.91	—	.7	0	
It is more important for a child to learn obedience and religious faith than independence and determination. ^b	.89	_	.6	1	—
Abortion is never justifiable.	.82	—	.6	1	
Respondent has strong sense of national pride.	.82	_	.6	0	
Respondent favors more respect for authority.	.72	_	.5	1	
(SECULAR-RATIONAL VALUES EMPHASIZE THE OPPOSITE)					
Survival vs. Self-Expression Values ^c					
SURVIVAL VALUES EMPHASIZE THE FOLLOWING:					
Respondent gives priority to economic and physical security over self-expression and quality-of-life. ^d	—	.86	-	_	.59
Respondent describes self as not very happy.	_	.81	_	_	.58
Respondent has not signed and would not sign a petition.	_	.80	_	_	.59
Homosexuality is never justifiable.	—	.78	_	_	.54
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Inglehart & Baker, American Sociological Review, 2000

Value dimensions



Inglehart & Baker, American Sociological Review, 2000

Values Development



Scandinavia



Orthodox





Transition to secular society? 1.5 — 1 5 6 1 6 6 `• 6 Traditional/Secular(y) 6 6 0.5 -٠. 0 -۶ -0.5 1 ۶ ۶ -1 ---0.5 1.5 -1 0.5 Survival/Selfish(x) dSsurvival vs. self-expression (S) 0.0074(18.9 + S)dt

traditional vs. secular (T) $\frac{dT}{dt} = 0.013(1.28S - T)$

Survival/Self-expression vs GDP



Survival/Self-expression vs GDP



Survival/Self-expression vs GDP



survival vs. self-expression (S)

Traditional/Secular vs GDP



Gross domestic product (log)

Traditional/Secular vs GDP





 $\frac{dG}{dt} = 0.002G$

$$\frac{dS}{dt} = 0.00018(G^2 - 7.69)$$

$$\frac{dT}{dt} = 0.013(1.28S - T)$$





 $\frac{dG}{dt} = 0.002G \qquad \frac{dS}{dt} = 0.00018(G^2 - 7.69) \qquad \frac{dT}{dt} = 0.013(1.28S - T)$

Development Space

• Tool for looking at indicators and value interactions. (Democracy, well-being....)

• Can include more invidual level data.

• Very much work in progress. Input and questions very much welcome.

Sex ratio and Salary



Sex ratio and Salary

